

A Note on a Politico-Economic Model of the Allocation of Grants

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1. Introduction

Economists have examined the effects of intergovernmental grants on local public expenditure in the demand framework of local public goods. It is usually understood that while lump-sum grants only involve the income effect, matching grants involve the price effect, where the matching rate of grants is exogenous for an economic agent and the amount of matching grants is determined as a result of decision-making. As a decision-maker in the demand framework, either a representative individual or a local government who is supposed to be a loyal agent is usually set up.

On the other hand it is often said that the allocation process of intergovernmental grants is affected by the political mechanism. Politicians are estimated according to how much they have succeeded to bring grants to their electoral districts. The electorate vote to the candidate who is expected to bring more grants to their district. Some economists regard these grants as preys in the rent-seeking society.

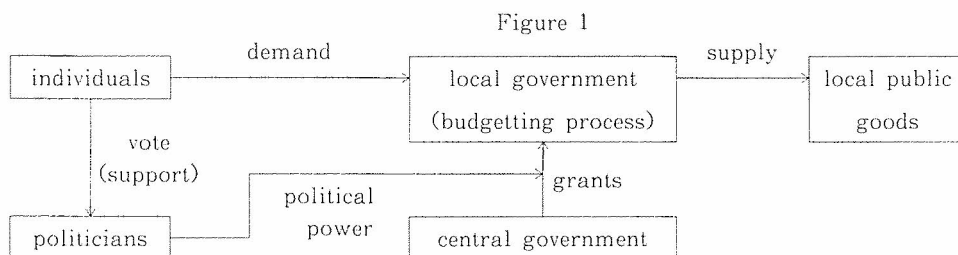
In the analysis of grants, however, these political and economic mechanism has not properly been combined. Namely the political factors have not distinctly been considered in the economic analysis of local public goods and intergovernmental grants. Thus in this paper we intend to introduce the political mechanism into the demand framework of local public goods, considering Japanese intergovernmental fiscal system. To put it concretely, we suppose that the political and economic mechanism means the allocative process of matching grants, what is called KOKKO-SHISHUTSU-KIN.

In section 2 the political and economic process is sketched in a fairly simple form. In section 3 a politico-economic model is presented in a tentative fashion which consists of five functions and forms a simultaneous equation system. In section 4 the simple analysis of reduced forms and comparative statics is attempted. Section 5 is the discussion about the applicability

of our politico-economic model to an empirical work. We expect that this paper is the preparation for an empirical analysis in future.

2. Sketch of a Politico-Economic Model

Before proposing a model in functional form, we explain the idea of our politico-economic model concerning matching grants. In Figure 1 the economic and political process is illustrated in the simple flow chart in which we depict the impact of matching grants on the demand and the supply of local public goods.



It is assumed that each individual has a utility function which includes private goods (or disposal income) and local public goods. For convenience public goods supplied by the central government are ignored. Further it is assumed that either a representative individual or a local government on behalf of whole individuals maximise his utility function. In either setting, we formally obtain the demand function for local public goods. At that time, it is predicted that matching grants involve the price effect which means the price reduction of public goods as much as the predetermined matching rate and by which the demand and the supply level of public goods is stimulated.

However we suppose that matching grants have another significant role in the political situation. For individuals would consider that the more abundant grants allocated to their district are more desirable for them. That is to say, individuals prefer more grants as much as possible and therefore estimate politicians according to whether or not they could bring grants to their district. The electorate vote to support the candidate that could bring more grants to their region.

After all the upper half of Figure 1 corresponds to the demand side of local public goods, and the lower half corresponds to the political aspect, and then the allocation process of grants stands between these both aspects.

If we sum up our concern in this paper, following three points should be mentioned. Firstly, as we have pointed above, we would introduce some political factors into the normal demand framework of local public goods. Thus we would combine the political process with the economic model.

Secondly, it appears that there is causal relationship in both directions between the amount of grants in a district and the political support from voters to a particular politician. On the one hand the amount of grants allocated to a district affects the attitudes of voters in an election and therefore the political support to (the polling score of) a candidate. On the other hand the political power of a certain politician that he has piled up with the political support from voters affects the amount of grants that he could bring to his district. We would consider this causal mutual relation into our model.

Thirdly, in the former empirical analyses in Japan which focus the allocation mechanism of grants and public investment, it has been pointed out that the so-called weight of one vote (or the difference of one vote) influences the allocative situation as a political factor. However we consider that this variable of the weight of one vote is not necessarily appropriate as a proxy of the political factor. For we can observe that the weight of one vote has the ostensible and negative connection with population scale which is related to the extent of vicissitude in each region. Therefore we can not identify the allocative result for the purpose of income redistribution and the allocative result arised from the pure political factor. There are other analyses in Japan which point out that the intergovernmental grants achieve the function of inter-regional redistribution of income. Thus in this paper we try to search for a more appropriate and direct proxy of political factors.

3. Construction of a Politico-Economic Model

In this section we try to construct a politico-economic model which forms the interdependent mechanism within the political and economic process. First of all we will show the model as a whole, which consists of five functions, and then each notational meaning.

(1) Demand Function of Local Public Goods

$$DM = a + bIN - cPR + dRC$$

(2) Price Function of Local Public Goods

$$PR = e - fGR + gWR + hRC$$

(3) Voter-Support Function

$$VS = i + jGR + kGR_{-1} + lEL$$

(4) Political Power Function

$$PW = m + nVS + oMI + pEL$$

(5) Allocation Function of Grants

$$GR = q + rPW + sDM + tRC$$

DM : Demand Level of Local Public Goods

IN : Income Level

PR : Price Level of Local Public Goods

RC : Several Regional Characters

GR : Amount of Matching Grants

WR : Wage Rate of Local Government Employee

VS : Support Rate of Votes

EL : Number of Elections in the Past

PW : Political Power of Politicians

MI : Number of Minister Experience in the Past

In this simultaneous system endogeneous variables are DM , PR , VS , PW and GR , and exogeneous variables are IN , RC , WR , EL and MI , and further pre-determined variable is GR_{-1} . We assume that each function is expressed by ad-hoc equation and all parameters are defined as positive value. Though each equation is also expressed by linear functional form, it is only for convenience. Namely each term might be taken as log-transformed one or might be applied to another transformation. We consider that it is a practical problem in the econometric stage and thus neglect this problem here. Moreover for convenience sake, we abbreviat the error terms and the letter which indicates a region in the cross-sectional setting.

It seems reasonable that the variables DM , IN and GR are treated as average or per-capita terms. And further the variable RC could be the vector variable which includes several regional characters, for example population scale, area scale, industrial structure and so on. About this variable RC , several selected variables could be used in each function. The variable PW , which means the political power, is only the categorical variable that is not actually observable. All other variables except PW are expected to be actually defined and observable. Finally note that the selection of variables over these equations is also ad-hoc and there may be another exogeneous variables which have more important effects.

In the following we will examine each function of this model by turns.

(1) Demand Function of Local Public Goods

$$DM = a + bIN - cPR + dRC$$

This function is a normal type which includes the income (IN) and the price (PR) variables and additionally the regional vector variable (RC). In the demand framework of local public goods, two settings of maximization are usually assumed, which are the maximization by a representative individual and the social welfare maximization by a local government. In either setting the demand function lead by the maximization procedure arrives at the similar form.

Here the effect of matching grants on the demand level of an individual or a local government is due to the price reduction of local public goods. Matching grants reduce the price of local public goods as much as the pre-determined matching rate. However it is not clear whether individuals or local governments grasp the true price reduced by a matching rate. In short grants might cause the so-called fiscal illusion. In any case grants have the price reduction effect to some extent. The more grants are allocated to a region, the lower the residents feel the price of local public goods.

(2) Price Function of Local Public Goods

$$PR = e - fGR + gWR + hRC$$

As noted above, matching grants (GR) influence the perception of economic agents about the price of local public goods (PR). It is normally expected that this effect decreases the price, provided that fiscal illusion brings about the lower perception price than the true price defined by the matching rate. Second, we consider that the wage rate of local government employee (WR) is positively correlated to the cost of local public goods. The higher the wage rate is, the more expensive is the price of local public goods. Third, the regional variable (RC) is additioned here. The scale merit concerning the public goods supply which results from population scale or area scale may be expected to affect the average cost. Another geographical characters may also have effect on the supply cost.

(3) Voter-Support Function

$$VS = i + jGR + kGR_{-1} + lEL$$

Individuals(voters) participate in the political process through casting a vote to a politician. To put it concretely, we suppose that the support rate of votes(VS), which is a dependent variable, is the rate of polling score of the candidates belonging to the political party in power (JIMINTO).

Aside from the preference for local public goods, it would be considered that voters are pleased with more grants allocated. It is because that the burden of the supply cost is decreased if the demand level is same, or that the larger supply level is possible if voters accept the same burden. Therefore the amount of grants allocated to a region(GR) affects the rate of polling score(VS). The variable GR is the present amount of grants which is simultaneously determined within the system and the variable GR_{-1} is the amount of grants in the last period. If the current GR is considered in this equation, the simultaneous mechanism will become complex. If GR is discarded, and instead only GR_{-1} is considered, this system will become simpler.

Next the number of past elections(EL) of the candidates belonging to the political party in power would also influences the rate of polling score(VS). It is probable that voters place confidence in the long experience of a particular politician.

(4) Political Power Function

$$PW = m + nVS + oMI + pEL$$

Here the political power(PW) implies the ability of particular politicians with which they bring grants to their districts. This variable is conceptual and is not actually observable.

At first as the rate of polling score(VS) is higher, the politicians in that region would enhance the power of voice at the central government and the national assembly, and thus increase the political power(PW). Especially in the process of a petition or an appeal, the rate of polling score at a home district is important.

Second the political power is connected to the degree of past experience of ministers at the central government(MI) and also to the number of elections in the past(EL). Both MI and EL are dealt with here as the sum total over the politicians belonging to the political party in power at a district.

(5) Allocation Function of Grants

$$GR = q + rPW + sDM + tRC$$

In this model we suppose that the matching rate of grants is settled by the central government office. This rate affects the demand level(DM) of local public goods and as a result the amount of grants(GR) in the economic process. Both grants(GR) and demand(DM) are determined simultaneously within the system.

Moreover the allocation of grants is affected by the political mechanism.

Grants are brought according to the political power(PW) of politicians in each region. In particular it appears that the grants with the political colors are allocated in the form of some project, whether it may be nationwide or regional one.

Additionally the regional characters(RC) are also taken into account here as they are considered in the national standards about the allocation procedure. For instance in the region where the supply cost of local public goods is measured more expensive, the more grants would be attached to that region.

4. Simple Analysis of Reduced Forms and Comparative Statics

From our simultaneous politico-economic model, we will calculate reduced forms, and making use of them, attempt simple comparative statics. As an instance, we will next show the equation (6), which is the result of comparative statics about matching grants(GR). Here we are calculating this equation exclusive of the predetermined variable (GR_{-1}) from the equation (3). And we also assume the vector variable RC is all the same among each equation, though this assumption is not always necessary and this variable could include different contents in each equation.

$$(6) \quad \Delta GR = \frac{sb}{\Omega} \Delta IN - \frac{cgs}{\Omega} \Delta WR + \frac{nlr+pr}{\Omega} \Delta EL + \frac{ro}{\Omega} \Delta MI + \frac{ds+t-chs}{\Omega} \Delta RC$$

where $\Omega = 1 - jnr - cfs$

From this equation we can not confirm the sign of each reduced form parameter because of the indefinite sign of Ω . So we assume the sign of Ω is positive and will interpret each effect under its assumption. The results of other comparative statics are similar to the equation (6) and we summarize those results in Table 1.

Table 1

	ΔIN	ΔWR	ΔEL	ΔMI	ΔRC
ΔDM	+	-	+	+	?
ΔPR	-	+	-	-	?
ΔVS	+	-	+	+	?
ΔPW	+	-	+	+	?
ΔGR	+	-	+	+	?

We will briefly interpret the results of Table 1 by turns. Note that the signs of each effect are all reversed if the sign of Ω is reversed. You will notice that the signs for the minute changes of the exogeneous variables except WR are the same. Moreover the signs of RC , which represents regional characters, are all uncertain as predicted from the nature of that variable.

Firstly, if the income level is increased, all variables except PR are changed to the positive direction. That is to say, an increase of income stimulates the demand level(DM) in the equation (1). The increase of demand now implies the increase of grants(GR) in the equation (5). The rise of grants next increases the support rate by votes(VS) in the equation (3) and the political power(PW) through VS in the equation (4). The price of public goods(PR) only decreases by the increase of GR in the equation (2).

Secondly, an increase of the wage rate of local government employee(WR) directly increases the price of local public goods (PR) in the equation (2). In this case all variables except PR decrease. Namely the price increase(PR) firstly reduces the demand level(DM) in the equation (1). The reduction of demand weakens the request to grants(GR) in the equation (5). The decrease of grants falls down the support rate by votes(VS) in the equation (3) and also the political power(PW) in the equation (4).

Thirdly, we see together the effects of the number of elections(EL) and the number of ministers' experience in the past (MI) because both effects are similar. The abundance of elections is advantageous for VS in the equation (3) and PW in the equation (4). Similarly the abundant experience of Ministers reinforces the political power(PW) of politicians in the equation (4). Those factors increase the amount of grants(GR) attached to that region in the equation (5). The increase of grants reduces the price of local public goods(PR) in the equation (2) and thus stimulates the demand level of local public goods in the equation (1).

5. Implications for Econometric Application

We have constructed the simultaneous system of a politico-economic model which focuses the allocation process of matching grants. Though we have intended to specify this model as simple as possible, could we still more develop an empirical analysis using this model? Remember that the variable PW , the political power of politicians, is conceptional and is not observable. Therefore when the simultaneous estimation of this system is attempted, this

variable has to be eliminated and thus this system is modified to four equations.

We expect that the model presented here could be applicable to a cross-sectional analysis at the prefectural level. There have been so far several analyses in the form of reduced forms in Japan. Therefore we could expect to estimate the reduced form like the equation (6) at least. If the empirical estimation of our simultaneous equation system is successful, we are very concerned to compare the results of reduced forms with the one of the simultaneous system.

Generally in the case of estimation of reduced forms, we can not clarify the mechanism which exists in the rear of estimation results, though the work of estimation is comparatively easy. The reduced form parameters reveal the aggregative effect of the change of an exogeneous variable within the mechanism as a whole. If the result of simultaneous estimation is regarded as reasonable one from the viewpoint of economic and political hypotheses, that result could lead to clarification of the politico-economic mechanism, and could be evaluated as the valuable contribution in this area. At the same time, as a proxy representing the political process, this analysis might offer the more appropriate variable and specification than the weight of one vote in the former analyses.

As a practical problem, however, it is normally difficult to estimate a simultaneous equation system. As a means of escape of this difficulty, there is a way that substitutes GR_{-1} , which is the predetermined variable, for GR in the equation (3). In this case the equation (3) and the equation (4) become independent of other equations. The equations from (3) to (5) come to be a so-called recursive system. In exchange for the circulation mechanism within the political process disappears, the work for estimation is fairly simplified. Ultimately the simultaneous system is condensed to two equations as follows, where the equation (7) is the one that puts the equation (1) and the equation (2) together and the equation (8) is the one that puts the equation (3), the equation (4) and the equation (5) together.

$$(7) \quad DM = f(\text{const.}, IN, WR, GR, RC)$$

$$(8) \quad GR = f(\text{const.}, GR_{-1}, DM, EL, MI, RC)$$

Still more in this case the comparative statics about GR is as follows. Note here that the variable GR in the equation (3) is discarded in calculating the following equation.

$$(9) \quad \Delta GR = \frac{mk}{\psi} \Delta GR_{-1} + \frac{r(nl+p)}{\psi} \Delta EL + \frac{ro}{\psi} \Delta MI + \frac{sb}{\psi} \Delta IN - \frac{scg}{\psi} \Delta WR \\ + \frac{s(d-ch)+t}{\psi} \Delta RC$$

where $\psi = 1 - cfs$

In this note we have tried to present the candidacy of a politico-economic model which focuses the allocation process of matching grants and is fit for an empirical analysis. Hereafter it would be anticipated that we will be able to estimate the simultaneous system and the reduced forms depending on the structural model and further compare those estimation results with the former analyses.