

# Regional Integration and Secession with Rent Seeking

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## Abstract

In this paper, we examine the effect of spillover and rent seeking on the integration and secession in two regions, using a citizen candidate model. The residents make the voting for the representative considering not only the bargaining of integration but also rent seeking activity by the representative. As a result, in case that there are spillover effect and rent seeking effect, we show that there is a possibility of secession even if the spillover effect is large ,and the existence of rent seeking raises the possibility of secession. And the minority region with population less than a critical level has some merits by given the right of secession. But, in case of the minority region with relatively large population, the right of secession is shown to be not necessary to improve the welfare in the region.

JEL,classification: D72,H77

**key word** :rent seeking, integration , secession, spillover effect

## 1 Introduction

These days, we have experienced many cases of the nationwide integration and separation, for example, from bloody conflicts of Balkan countries, the collapse of Soviet Union ,to the enlargement of European Union. Though there are several nations with long-time political stability in history, considerably many countries periodically encounter some serious separation problem among ethnic or religious regions. This is not only nationwide problem but also regional problem. Especially the conflicts among several regions have broken up constantly. Multi-racial nations are said to be destined to face the regional conflicts at any time.

And international organization and treaty are also subject to some problem of separation and entry for membership. For example, United Nations is the largest global political organization. In UN, what authority and obligation of participant countries are described? Is today's chapter regarding it in UN efficient and fair? This problem has to be examined in the process of historical development of nations. At present, the discussion about the idea of East Asian Community is made in eastern Asian countries including Japan. Then

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what commitment of political and economic level should be made in EAC? Who is a member of EAC? What is the content of secession clause? Many issues have to be resolved to come to agreement of the formation of EAC.

In Japan, the modern society has developed with two epoch-making events of "Meiji" reform made about one hundred and fifty years ago and post-World War 2 reform. As one of grand design of nation form, the discussion about the optimal degree of government' commitment for regional society and private economy has been made. Should the government delegate most of the authority of controlling the regional society to regional governments? How the design of decentralization mechanism should be done must be also deeply related to the performance of the nationwide economy and regional economies.

In this paper, the integration and secession problem of such nations, regions, or, federations among them is examined from the point of attraction power of spillover effects of public goods and repelling against political rent seeking of a dominant region. The discussions about decentralized mechanism design have been done by many authors, i.e., *Besley = Coate*(2003) and *Lockwood*(2002). Bargaining problem of regional integration with secession term has been raised as a possibility of empowering some minority group by *Oates*(1972), *Buchanan = Faith*(1987) and so on. But these researches have not given formal analysis of the influence of the governor election in an integrated government on the succession.

*Gradstein*(2004) tackled the problem and analyzed the efficient provision of public goods under several election mechanisms of regional governor in the framework of integration with secession clause, using citizen candidates model. In particular, he investigated about the discussion made by *Buchanan = Tulloch*(1962) that a minority region can avoid the exploitation of a dominant region introducing the right of secession and showed that the efficient provision of the public goods is realized by referendum type election for each region. *Gradstein* insisted that this conclusion is one of the application of Coase theorem to the economics of constitutional politics.

In my paper, we point out that the governor in the integrated government may be engaged in rent seeking activity for the budgetary process. Then we examine how the rent seeking activity influences on the provision of the public goods and the determination of integration and separation for two regions. The problem of rent seeking activity in the political process has been investigated by many researches (see *Laffont = Tirole*(1993), *Schwartz*(2002)), but there is no research about the rent seeking problem with regional integration and separation.

In section two, we explain the contents of rent seeking activity by the governor in the integrated government after introducing the two regions model with minority region. Then through the political decision of the governor, expected utility of residents in each region are obtained and the incentive for integration and separation of the integrated government is analyzed. In section three, we consider the integration problem in the case of the possibility of secession on minority region from the integrated regions. Then we show how the incentive of the secession is influenced by the rent seeking activity of the governor. In section four, we examine the bargaining problem of integration with secession terms. This is a bargaining problem over the lump sum transfer when the dominant region has an incentive of integration and the minority region has an incentive of secession. Each

residents in two regions are shown to make strategic voting on their governor elections, but the efficient provision of the public goods is not necessarily realized by the strategic voting and the rent seeking activity is shown to give some bias of the provision of the public goods.

## 2 Model

In the beginning, we consider a government consisting of two regions. One is a dominant region, called region 1, which has the equipment of provision of public goods, The other is a minority region, called region 2, which enjoys the spillover effects from region 1. This effect may be external economy or diseconomy. Note that the provision of public goods is committed geographically by region 1.

We assume that the region 1 has the population of continuum with one and the population in region 2 is  $n(< 1)$ . At first, suppose that these two regions are integrated in one region with the population of  $1 + n$ . The utility of the resident in each region depends on the quantities  $x$  of public goods and the quantities  $z$  of private goods. For the simplicity of description, the income of each resident is given exogenously and is not treated explicitly. The utility of each resident  $I$  in region  $j(j = 1, 2)$  is assumed to be

$$U_{i,j}(x, z) = a_{j,i}x + z$$

Here,  $a_{j,i}$  is a parameter of the preference for the public goods and the central value of the distribution of the parameter for each resident is assumed to be equal to be the median value of the distribution, which we denote  $A(j = 1, 2)$ . When the government levies the tax  $I$  to raise the quantities  $x$  of the public goods, assuming that the tax is equally levied on each resident, the utility of each resident in two regions is shown as follows,

$$U_j(x, z) = a_{j,i}x - I/(1 + n)$$

We note that the population is  $1 + n$  in total.

The government delegates a firm to produce the public goods in a region 1. This firm is region-specific one. The production cost of the public goods is assumed to be

$$C(x) = \frac{cx^2}{2}$$

Here,  $c$  is a positive given value. Though the government pays the cost of procurement for the firm, there are many terms for the procurement. Therefore the representative of the government has a chance of the cost padding or the requirement of unnecessary budget. This is referred as rent seeking activity. Now, denoting the real procurement cost  $T$  and the cost-padding rate  $t$ , the total expenditure of the government is  $(1 + t)T$ . Since this expenditure is raised by the tax on each resident, the utility of resident  $I$  in region  $j$  is

$$U_{i,j} = a_{j,i}x - (1 + t)T/(1 + n)(j = 1, 2)$$

**Dominant region** We assume that there is no migration of residents between two regions. The migration of residents is said to be a vote by foots and is an important factor of reducing the monopolistic power of the dominant region. But, we regard the residents in each region as fixed in the region. This is assumed in order to make the bargaining problem of integration and separation clear.

Now the representative in the government is assumed to be elected by the residents in the dominant region. This election is made by "citizen candidate model" and the governor is elected under the majority rule. But we note that the minority region does not influence the voting process in spite of having the voting right because of minority. Therefore the minority region is assumed to be politically subordinate to the region 1.

**Rent seeking problem** Now suppose that a governor is elected among residents in region 1. Let denote the preference parameter of the representative for the public goods  $a_{1,R}$ . The governor starts administrative activity on the basis of his own interest. Especially, production level of public goods, the payment for the firm of public goods production, and cost padding level have to be decided. Here there is a possibility of failing in cost padding. This depends on the ability of explanation of budget measure and the degree of auditing ability within the administrative system. When cost padding is found and considered illegal, a penalty may be imposed on the governor. Or the detection of the cost padding may lead to the reduction of budget itself. This reduction rate of the budget is denoted by  $d(> 0)$ . Then the detection probability of cost padding will depend on the rate of cost padding. We denote it  $\phi(t)$ . This is an increasing function of  $t$ . Particularly, it is specified as follows.

$$\phi(t) = \frac{mt^2}{2} \quad (1)$$

, where  $m$  is a positive value, representing the index of transparency of the budgetary process.

Then the representative with type  $a_{1,R}$  will do the administrative activity so as to maximize his expected utility. The utility of the representative is composed of the utility of public goods and the expected cost padding revenue, excluding the tax on himself. Here the expected cost padding revenue comes from the level of cost padding in case of no detection and the penalty in case of detection. Therefore it is shown to be  $tT - \phi dtT$ . And the expected total taxes are given as follows

$$\phi(t)(T + (1 - d)tT) + (1 - \phi(t))(1 + t)T = (1 + t)T - \phi(t)dtT$$

Note that this is given by the initial procurement cost minus the expected reduction amount. The average tax for each resident is the total taxes divided by total population  $(1 + n)$ . But as for the representative, in general, he receives the reward as the representative from a part of tax. Therefore the real tax for the representative is different from that for the resident in general. This real tax rate is denoted by  $k$ . Then  $1 - k$  is the rate of reward for this position.

From the above discussion, the utility maximization problem of the representative is

$$\max_{x,T,t} U_R = \max_{x,T,t} a_{1,R}x + tT - \phi(t)dtT - k((1 + t)T - \phi(t)dtT)/(1 + n)$$

$$s.t. \quad T - \frac{cx^2}{2} \geq 0$$

, where the constraint is the condition of participation of the firm for public goods production. Then the first-order condition regarding  $t$  is

$$1 - \phi'(t)dt - \phi(t)d = 0 \quad (2)$$

Therefore the rate of cost padding is

$$t = \sqrt{\frac{2}{3md}} \quad (3)$$

And the detection probability is shown by

$$\phi = \frac{1}{3d} \quad (4)$$

Hence, the rate of cost padding is a decreasing function of monitoring accuracy and the penalty rate, while the detection probability is a decreasing function of the penalty rate.

Note that the constraint condition should be satisfied in the equality in case of the utility maximization. This is because the utility of the representative increases as the production of the public goods increases as far as the constraint is satisfied. Considering this, the utility of the representative is obtained as

$$U_{1,R} = a_{1,R} \sqrt{\frac{2T}{c}} + tT - \phi(t)dtT - k((1+t)T - \phi(t)dtT)/(1+n) \quad (5)$$

Therefore, the first-order condition regarding the procurement level  $T$  is

$$a_{1,R} \frac{1}{c} \sqrt{\frac{c}{2T}} + t(1 - \frac{k}{1+n}) - \phi(t)dt(1 - \frac{k}{1+n}) - \frac{k}{1+n} = 0$$

Then, the optimal production of public goods is

$$x = \frac{a_{1,R}}{(-t(1 - \frac{k}{1+n}) + \phi(t)dt(1 - \frac{k}{1+n}) + \frac{k}{1+n})c} \quad (6)$$

From this (3), and (4), the production of the public goods is a decreasing function in  $md$ , an increasing function in the reward rate  $(1 - k)$  for the representative and the size  $n$  of minority region.

**Election of the representative** So far we obtained the optimal level of public goods and the rate of cost padding for the representative in the dominant region. Now it is a turn that each resident elects the favorable type of the representative, anticipating the behavior of the representative. This is a maximization problem for resident  $I$  as follows.

$$\max_{a_{1,R}} U_{1,i}^d = \max_{a_{1,R}} a_{1,i}x - ((1+t)T - \phi(t)dtT)/(1+n)$$

Considering (6) and the participation constraint with equality, the first-order condition is

$$a_{1,i} \frac{\partial x}{\partial a_{1,R}} - ((1+t) - \phi(t)dt)/(1+n) \frac{\partial T}{\partial a_{1,R}} = 0$$

Therefore, using (6), we obtain the most favorable type  $a_{1,R}$  of resident  $I$ .

$$a_{1,R} = \frac{a_{1,i}(1+n)(-t(1 - \frac{k}{1+n}) + \phi(t)dt(1 - \frac{k}{1+n}) + \frac{k}{1+n})}{((1+t) - \phi(t)dt)}$$

Since this is a linear transformation of resident type  $a_{1,i}$ , from a revised version of median voter theorem, the elected type of representative from residents in region 1 is represented as follows.

$$a_{1,*} = \frac{A_1(1+n)(-t(1 - \frac{k}{1+n}) + \phi(t)dt(1 - \frac{k}{1+n}) + \frac{k}{1+n})}{((1+t) - \phi(t)dt)}$$

By arranging this equation, we obtain

$$a_{1,*} = A_1 \left( \frac{1+n}{1+t - \phi dt} - (1+n-k) \right) \quad (7)$$

This is a form of a strategic voting. The first term comes from cost padding effect and the second term comes from reward effect of the representative. Then substituting (7) into (6), we have the production of public goods as follows.

$$x^* = \frac{A_1(1+n)}{((1+t) - \phi(t)dt)c} \quad (8)$$

From this, considering that the rate of cost padding decreases as the accuracy  $m$  of monitoring increases, the real production level of public goods increases as the accuracy  $m$  of monitoring increases. Though this result is seemed to be of a counter-intuition, this comes from the natural consequence of the reduction of cost padding level itself. Actually, cost padding level is obtained as

$$tT = tcx^2/2 = \sqrt{\frac{2}{3md} \frac{c}{2}} \left( \frac{A_1(1+n)}{(1+t - \phi dt)c} \right)^2.$$

From this, since the reduction effect of monitoring accuracy on the rate of cost padding is larger than the reduction effect on the real procurement cost, the cost padding level itself decreases as monitoring accuracy increases.

**Proposition 1** In rent seeking society the rate of cost padding is a decreasing function of the accuracy  $m$  of monitoring and the real production level of public goods is an increasing function of the accuracy  $m$  of monitoring, and the cost padding level itself is a decreasing function of the monitoring accuracy.

Then the expected utility of resident in region 1 is

$$U_1 = \frac{A_1^2(1+n)}{2((1+t) - \phi(t)dt)c}.$$

From this discussion, the expected utility of residents in region 2 subordinated to region 1 is shown as,

$$\begin{aligned}
U_2 &= A_2 \frac{A_1(1+n)}{((1+t) - \phi(t)dt)c} - ((1+t)T - \phi(t)dtT)/(1+n) \\
&= (A_2 - \frac{A_1}{2}) \frac{A_1(1+n)}{((1+t) - \phi(t)dt)c}.
\end{aligned} \tag{9}$$

**First-best production of public goods and election of the representative** Here, we consider the first-best production of public goods under this two region society. This is obtained as the maximization problem of total social welfare. That is,

$$\max_x (A_1 + nA_2)x - \frac{cx^2}{2}$$

Therefore, the first-best production of public goods is

$$x^{FB} = \frac{A_1 + nA_2}{c}. \tag{10}$$

Obviously the type  $\frac{A_1+nA_2}{1+n}$  should be elected in the first-best world.

### 3 Integrated region with secession

In previous section, when two regions are integrated and the region 1 is politically dominant, the region 1 decides the type of the representative and makes the administrative decision. In this situation, the dominated region 2 may secede from this integration. So we introduce the possibility of secession in our model. If the right of secession is given to the minority region, how does the dominant region change the administrative decision ?

To understand this problem, at first, suppose that the minority region seceded from this integration. Region 1 has the power of controlling the production of public goods. Therefore the region 1 makes the election of the representative and the elected representative decides the administrative job. On the other hand only what the minority region can do after secession is to enjoy the externality of the production of public goods which region 1 makes the decision about. Therefore, the decision of the dominant region 1 is obviously equal to that in case of  $n = 0$  in section two.

We examine if rent seeking is more seriously done for the government under the possibility of the secession. By the way, in the society we consider, the number of residents in dominated region may increase the political power. We assume that the monitoring accuracy against the representative increases via the eyes of residents of in dominated region.

**Assumption 1** the monitoring accuracy increases as the population in the dominated region increases. That is,  $m(n)' > 0$  is held.

Then, since the level of monitoring depends on the population in the region, eventually, the rate of cost padding also depends on the population, denoting it as  $t(n)$ . Then from assumption 1 and (3),  $t(n)$  is obviously a decreasing function of  $n$ .

**lemma 1**  $t(n)$  is a decreasing function of  $n$ .

Let us investigate the production level of public goods in region 1 after the secession of region 2. This is sought by putting  $n = 0$  in (8). Then, the production level of public goods after the secession of region 2 is

$$x^* = \frac{A_1}{((1 + t(0)) - \phi(t(0))dt(0))c}.$$

And also the the expected utility of the resident in region 1 is obtained as

$$U_1 = \frac{A_1^2}{2((1 + t(0)) - \phi(t(0))dt(0))c}.$$

Then the expected utility of the resident in region 2 is represented as follows.

$$U_2(0) = \frac{A_1 A_2}{(1 + t - \phi dt)c} \quad (11)$$

Therefore, comparing (9) with (11), the condition that the region 2 wants the secession from the integrated government is

$$A_1 \geq 2A_2 \left(1 - \frac{\Delta(n)}{(1 + n)\Delta(0)}\right) \quad (12)$$

, where

$$\Delta(n) = 1 + t(n) - \phi(n)dt(n).$$

As we said before,  $\Delta(n)$  is an decreasing function of  $n$ . Here, from the property of  $t(n)$ , the right-hand side of (12) is also an increasing function of  $n$  shown in *fig1*.

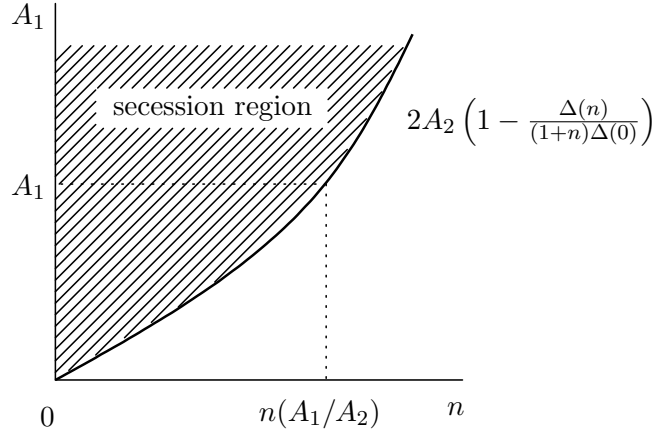


fig.1

Therefore, when the spillover effect is relatively low, the possibility of secession becomes higher. This is also counter-intuitive. But if the minority region integrates with the dominant region, the government levies relatively high tax. Therefore when the spillover effect is small, the residents in region 2 have a tough situation. On the other hand, if they make the secession, they escape from such a tax and enjoy the spillover effect which the production of public goods in region 1 brings to them. This is the reason why the possibility of secession becomes higher when the spillover effect is relatively low.

And when the spillover effect becomes larger, the merits from the production of public goods exceed the demerits from taxation. As the population in the region 2 increases, even in the minority region, the burden of the tax decreases and the positive effect of the reduction of cost padding increases. As a result, since the production of public goods increases, the critical point of spillover effect goes toward a lower direction.

Turning to the dominant region, does any merits from the integration exist there? At first, when the population of the minority region increase, the integration brings the increase of the production of public goods because of the enlargement of taxation. Furthermore when the population increases, the monitoring for the representative becomes high. As a result, political rent decreases. Therefore, when the population in region 2 increases, the expected utility of residents in the region 1 increases.

Since the properties of the expected utility in two regions are made clear, we can examine when the dominant region 1 integrate the minority region. When the population is smaller than  $n(A_1/A_2)$  in fig.2, region 2 does not want to integrate with region 2. And, when the population in region 2 is larger than  $n(A_1/A_2)$ , both of two regions will want to integrate.

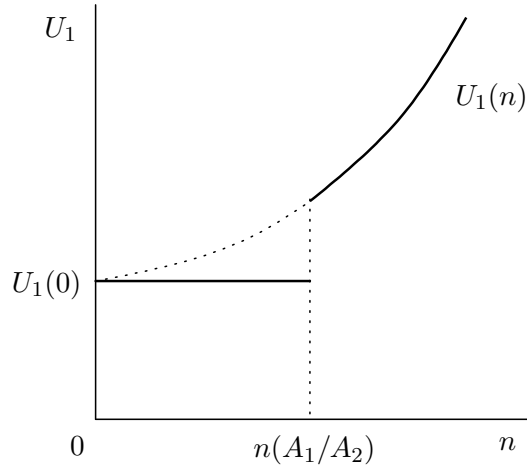


fig.2

In summary,

**Proposition 2** (1) When the spillover effect is relatively low, the possibility of secession becomes higher.

(2) When the spillover effect becomes larger, the merits from the production of public goods exceed the demerits from taxation and as the population in the region 2 increases, even in the minority region, the burden of the tax decreases and the positive effect of the reduction of cost padding increases.

(3) When the population in region 2 increases, the expected utility of residents in the region also increases.

**Proposition 3** When the population is smaller than  $n(A_1/A_2)$ , region 2 does not want to integrate and, when the population in region 2 is larger than  $n(A_1/A_2)$ , both of two regions want to integrate.

## 4 Political decision in case of no rent seeking

So far we examine how the possibility of the integration changes as the population in minority region gets large in the situation that the representative in the dominant region can do the rent seeking activity of cost padding. It is interesting to compare it with the case of impossibility of rent seeking.

Without rent seeking, the dominant region 1 levies the tax to two regions and maximizes the expected utility in the region. Therefore, then, each resident in two regions does not make any strategic voting and elects the median voter. As a result, the production of public goods is

$$x^N = \frac{(1+n)A_1}{c}.$$

Then the expected utility in region 1 is also obtained by

$$U_1^N = \frac{(1+n)A_1^2}{2c}.$$

And the expected utility in the region 2 becomes

$$U_2^N = (A_2 - \frac{A_1}{2}) \frac{A_1(1+n)}{c}.$$

On the other hand, in case of secession from the government, the production of public goods in region 1 becomes equal to the case of  $n = 0$  in the above equation. Then the region 2 with secession only enjoys the spillover effect from region 1. Therefore, the expected utility in region 2 is represented by

$$U_2^0 = \frac{A_1 A_2}{c}.$$

From this discussion, in the world of no rent seeking, the condition that the minority region makes secession from the integration, or, it is independent of the region 1 is shown as follows

$$U_2^0 \geq U_2^N.$$

Rearranged, this is written as

$$A_1 \geq 2A_2(1 - \frac{1}{1+n}). \quad (13)$$

On the other hand, the corresponding condition in the case of rent seeking is (12). Therefore even the minority region with more population is shown to want to make secession from the dominant region. And when the spillover effect is not so high, we understand that there is a possibility of secession. In this sense, the existence of rent seeking is said to raise the incentive of making secession.

Here, let us examine the rent seeking effect on the production of public goods in dominant region 1. From (8) and (10), the necessary and sufficient condition that the production of public goods in case of rent seeking is smaller than the first-best level is shown as follows.

$$A_1 \frac{1+n - \Delta(n)}{n\Delta(n)} < A_2$$

Since the left-handed side in the above equation is a decreasing function of the population of minority region, from this the condition of under-production, the possibility of under-production becomes higher as the population becomes larger.

In the case of no rent seeking, the necessary and sufficient condition that the production of public goods in the dominant region is larger than the first-best level is  $A_1 > A_2$ , which is in general satisfied from the properties of the spillover effect. Therefore, in the no rent seeking world, the over-production of public goods prevails in our discussion. On the other hand, in the rent seeking world, the under-production occurs when the spillover effect is large to some extent. That is,

**Proposition 4** In the no rent seeking world, the over-production of public goods always prevails, but, in the rent seeking world, the under-production occurs when the spillover effect is large to some extent.

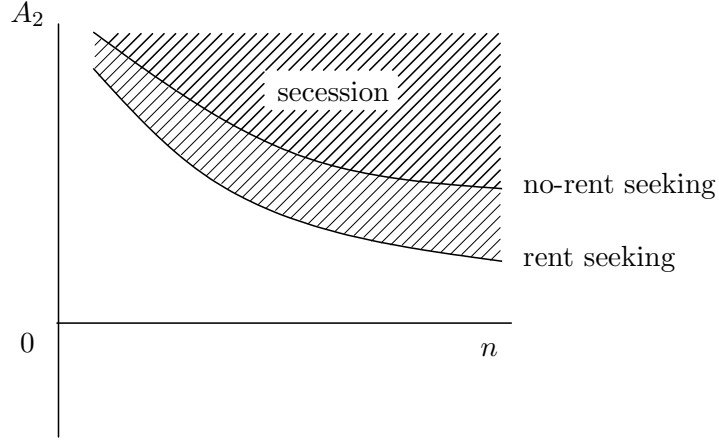


fig.3

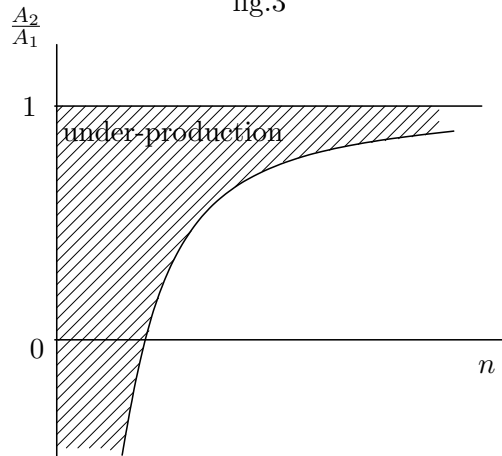


fig.4

## 5 Right of Secession and bargaining

We examine the behavior of the integrated government when the minority region has the right of secession. Then the region 1 must try to make a bargaining in order to prevent the minority region from seceding when it wants the secession from the integrated region. Here, we seek for the condition for staying in the integrated region. Therefore the election of a representative in the minority region has to be also done. Then the elections of the representatives in both of two regions must reflect the anticipation of the result of bargaining for staying. The representatives from each region make a bargaining for staying or seceding. This game is solved backwardly.

Now suppose that the types of the representatives in each region are  $a_{j,R}(j = 1, 2)$ . In the bargaining, the region 2 may demand a lump sum transfer to the region 1 as a condition of no seceding. Then the representative in the region 1 decides on the production  $x$  of

public goods, the lump-sum transfer  $H$  for the region 2 and cost padding  $t$  to maximize the utility as follows.

$$\begin{aligned} \max_{x,H,t} & a_{1,R}x + tT - \phi(t)dtT - \frac{k}{1+n}((1+t) - \phi(t)dt)T - knH \\ \text{s.t.} & a_{2,R}x + H - \frac{1}{1+n}((1+t)T - \phi(t)dtT) \geq a_{2,R}x(0) \\ & T - \frac{cx^2}{2} \geq 0 \end{aligned}$$

Here, the first constraint is the participation condition of region 2. The left-handed side is the utility of the representative in region 1 in case of integration and the right-handed side is the utility of the representative in case of secession. And when  $H$  is the lump sum transfer for each resident in the region 2, the burden of each resident in the region 1 is  $nH$  and the burden of the representative in the region 1 is  $knH$ . Obviously these two constraints have to be satisfied in equality to maximize the utility of the representative in the region 1. Then this maximization problem is rewritten by

$$\max_{x,t} a_{1,R}x + tT - \phi(t)dtT - \frac{kn}{1+n}((1+t) - \phi(t)dt)T + kna_{2,R}(x - x(0)) - \frac{k}{1+n}((1+t)T - \phi dtT).$$

From this, the first-order condition for the production of public goods is obtained.

$$a_{1,R} + ((t - \phi dt) - k((1+t) - \phi dt))cx + kna_{2,R} = 0$$

Consequently,

$$x(n) = \frac{a_{1,R} + kna_{2,R}}{(k - t(1-k) + (1-k)\phi dt)c} \quad (14)$$

is obtained. Note that the production level of public goods is decided considering the external effect on the region 2. On the other hand, the rate of cost padding is same with (3) without bargaining.

**Election of the representative** Each resident in region 1 elects the representative in the region under the anticipation of the contents of the bargaining depending on the type of the representative. The expected utility on resident in region 1 is

$$U_1 = a_{1,i}x(n) - \frac{\Delta(n)T}{n+1} - nH = a_{1,i}x(n) - \Delta(n)T + na_{2,R}(x(n) - x(0))$$

, when the type  $a_{1,R}$  is elected. Therefore the most favorite type for the resident  $a_{1,i}$  is that to maximize the utility of the resident. By getting the first-order condition for it, we have

$$a_{1,R} = \frac{M(n)a_{1,i}}{\Delta(n)} + \left(\frac{nM(n)}{\Delta(n)} - kn\right)a_{2,R}. \quad (15)$$

Here,

$$M(n) = (k - t(n)(1-k) + (1-k)\phi dt(n)).$$

From this condition, the most favorite type of the representative is a linear transformation of the type of the resident. Therefore, as a result of election, the most favorite type for the median voter is elected, which comes from a version of median voter theorem. Putting  $a_{1,i} = A_1$  in (15), the type of the representative elected in the region 1 is obtained. But we note that this type depends on the type of the representative elected in the region 2. Thus, the residents in the region 1 are shown to make the strategic voting, considering that the representative makes the decision of the bargaining on the basis of his own interests and make the cost padding through the rent seeking activity.

Next, we consider the voting decision of the residents in region 2. This discussion is not necessary in case that the political regime without the right of secession. When there is the right of secession, the voting for the representative in minority region is important since the type of the representative can influence the performance of the bargaining with the region 1. To see this situation, we take up the utility of the representative in region 2. This is

$$U_{2,j} = a_{2,j}x(n) + H = a_{2,j}x(n) - a_{2,R}(x(n) - x(0)) + \frac{\Delta(n)T}{1+n}$$

, considering the transfer  $H$  for the integration. Then the most favorite type of the representative in the region 2 is

$$a_{2,R} = \frac{a_{2,j}kn + a_{1,R}\frac{M(n)-M(0)}{M(0)} + \frac{\Delta(n)kna_{1,R}}{(1+n)M(n)}}{2kn - \frac{\Delta(n)(kn)^2}{(1+n)M(n)}} \quad (16)$$

, by getting the first-order condition on utility maximization problem of the residents in region 2. From this discussion, the most favorite type of the representative is also a linear transformation of the type of each resident in the region 2. Consequently, the type elected in the region 2 becomes equal to the most favorite type for the median voter in the region 2. Then the elected type in region 2 can be obtained by putting  $a_{2,j} = A_2$  in (16). This type also depends on the type of the representative in region 1.

We obtained the types of the representative elected in each region. But they depend on the type of the representative in the opposite region. Therefore, in the equilibrium, we have Nash equilibrium type where the anticipation of the type in the opposite region is realized. This is obtained by solving a simultaneous equation (15) and(16) at  $a_{1,i} = A_1$  and  $a_{2,j} = A_2$ .

$$a_{1,R}^B = C_1A_1 + D_1A_2 \quad (17)$$

$$a_{2,R}^B = C_2A_1 + D_2A_2 \quad (18)$$

,where X,Y,and Z are defined as follows.

$$X = 2kn - \frac{\Delta(n)(kn)^2}{(1+n)M(n)}$$

$$Y = \frac{M(n) - M(0)}{M(0)} + \frac{\Delta(n)kn}{(1+n)M(n)}$$

$$Z = \frac{nM(n)}{\Delta(n)} - kn$$

Here, as the effects of strategic voting for the dominant region,  $C_1 > 0$ (for all  $n$ ) and  $D_1 < 0$ (for all  $n$ ) are satisfied and the followings are also held.

$$\frac{dC_1}{dn} < 0, \frac{dD_1}{dn} < 0$$

] Therefore, when the external positive effect of public goods is high, the elected type of the representative in dominant region is a decreasing function of the population of minority region and, when the external positive effect of public goods is high, the elected type of the representative in dominant region is an increasing function of the population of minority region.

And as the effects of strategic voting for the minority region,  $C_2 > 0$ (for all  $n$ ) and  $D_2 > 0$ (for all  $n$ ) are satisfied and the followings are also held.

$$\frac{dC_2}{dn} < 0, \frac{dD_2}{dn} > 0$$

Therefore, as the population of minority region increases, the type of the representative in the minority region dislikes the public goods more and more

Here, as the effects of strategic voting,  $C_1 > 0$ (for all  $n$ ) and  $D_1 < 0$ (for all  $n$ ) are satisfied. And the followings are also held.

$$\frac{dC_1}{dn} < 0, \frac{dD_1}{dn} < 0$$

Here, the election of the representative in dominant region is under a strategic voting. In particular,

$$x^B = EA_1 + FA_2 \quad (19)$$

From this, the production of public goods in the integrated government with the right of secession is sought by considering the weight of the median voter's types in each region. In other words, the production of public goods reflects the evaluation of the public goods in region 2 by making the bargaining thanks to the right of secession. Then we compare the public goods level as the result on the bargaining between two regions with the first best level. To do so, we investigate the relation of  $A_1$  and  $A_2$  satisfying  $x^B = x^{FB}$ .

$$A_2/A_1 = \frac{(X + Ykn)\frac{M}{\Delta(n)} - (X - YZ)M}{(X - YZ)M(n)n - (Z + Ykn)kn} = H(n) \quad (20)$$

Here  $H(n)$  is an increasing function of  $n$  and there exist a certain level of  $n$  satisfying  $T(n) = 0$ , that we denote  $n^*$ . Therefore the public goods level under the bargaining between two regions is produced smaller than the level of efficient production when  $A_1/A_2$  is above the curve  $H(n)$  and it is produced larger than the level of efficient production when  $A_1/A_2$  is below the curve  $T(n)$ , as depicted in the figure 5.

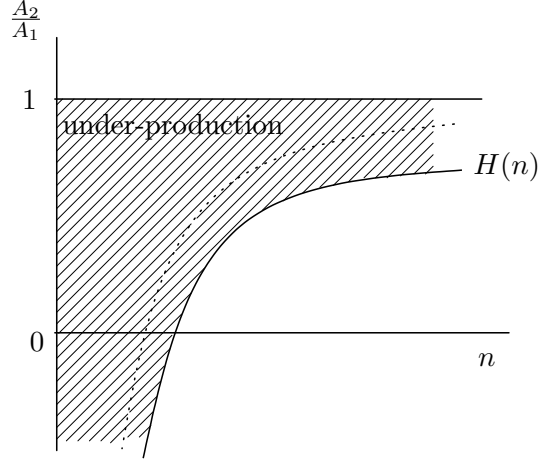


fig.5

In the no rent seeking world, as seen in *Gradstein(2004)*, the production of public goods is shown to be  $A_1/c$ . Therefore, this is the efficient level for the median voter in region 1, but, is under-production in total. This does not depend on the evaluation of public goods by the residents in the minority region via the bargaining result. On the other hand, in the rent seeking world, the level of production of public goods depends on both of evaluation of public goods in two regions and has a possibility of overprovision of public goods, depending on the form of the political regime. From the above discussion, we have

**Proposition 4** In the rent seeking world, the level of production of public goods depends on both of evaluation of public goods in two regions. In particular, when the evaluation of the minority region for public goods is sufficiently low and the population of minority region is sufficiently large, over-provision of public goods can be occurred.

So far we analyzed the allocation of resource under bargaining process to prevent the secession of minority region. Now we have to consider the possibility of participating in the integration. If the minority region is worse off as the result of the bargaining, the region will not participate in the integration and isolate itself. To see this, we compare the expected utility of the minority region in isolation with that after integration. From (17),(18), and (19), the expected utility of minority region after integration is

$$U_2^B = a_{2R}x(n) - a_{2R}(x(n) - x(0)) + \frac{\Delta(n)}{1+n}T(n) = a_{2R}x(0) + \frac{\Delta(n)}{1+n}T(n)$$

Therefore,

$$U_2^B = \left( \frac{ZknA_2 + X \frac{M}{\Delta(n)} A_1}{X - ZY} \right) \left( \frac{knA_2 + Y \frac{M}{\Delta(n)} A_1}{X - YZ} \right) / M(0) + \frac{\Delta(n)}{1+n} \left( \frac{(X + Ykn) \frac{M(n)A_1}{\Delta(n)} + (Z + kn)knA_2}{(X - YZ)M(n)C} \right)^2 / 2$$

On the other hand, the expected utility of minority region in decentralization is

$$U_2^D = \frac{A_2 A_1}{M(0)}$$

Then we can show the relationship of these two expected utilities in fig.6.

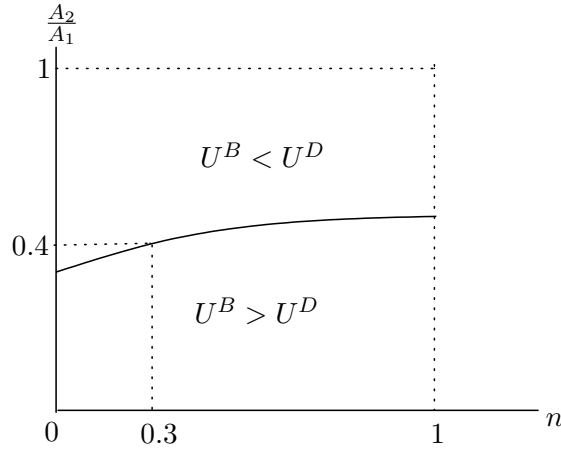


fig.6

From this figure, the following proposition is obtained.

**Proposition 5** (1)When the external effect of public goods is larger than a certain level, the expected utility of minority region under the integration regime is smaller than that under the decentralization. Therefore then minority region does not want the integration.

(2)When the external effect of public goods is smaller than the above level, the expected utility of minority region under the integration regime is larger than that under the decentralization. Therefore then minority region wants the integration.

## 6 Concluding remarks

In this paper, we examine the effect of spillover and rent seeking on the integration and secession in two regions, using a citizen candidate model. The residents make the voting for the representative considering not only the bargaining of integration but also rent seeking activity by the representative. As a result, in case that there are spillover effect and rent seeking effect, we show that there is a possibility of secession if the spillover effect becomes small, and the existence of rent seeking raises the possibility of secession. And the minority region has merits via the increases of monitoring accuracy when the population in the region increases.

As we said in the previous section, we assume that both of the representatives in two regions can stay even when the secession happens. This is important in considering the threat point in the bargaining. As an alternative institutional rule, we can assume the re-election for each representative at the point of secession as introduced in *Gradstein*(2004) in the no rent seeking world. In this case, the strategic voting is more limited.

As a final remark, we would like to point out that the production of public goods is assumed to be committed in the dominant region. But the production may be committed in the minority region (minority-specific industry and so on). Then the decision on the problem about the management of the production of the public goods becomes important, depending on a decentralized form or a centralized form.

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