The Choice of Local Governments under Two Principals: The Case of Tax Hike Policy of South Korea Noncompliance of Local Governments to Tax Hike Policy

Daejin Kim*

Abstract: The Korean central government introduced a package of tax hikes on real estate in order to achieve tax levy equity. This remarkable tax innovation, however, resulted in conflicts between the central government, residents, and local governments, which were followed by area-wide tax competitions among the local governments in the Seoul Metropolitan Area (SMA). This study analyzes the property tax resistance of the SMA using the form model approach to the principal and agent. It is assumed in the study that residents, local governments, and the central government have a divided principal-agent relationship. With several descriptive analyses and some data for the case, however, the theoretical model gives a logical explanation for the behaviors of residents, local governments, and the central government in the short-term tax resistance. That is, under short-term conditions, local governments tend to respond to residents' request for tax cuts, dependent upon their fiscal independence and neighboring local jurisdictions' decision-making on property tax cuts. The pattern of the property tax cuts over time implies that local government's elected officials may be very sensitive to their re-election. Further, it provides long-term prediction for the behavior of the three actors, dependent upon institutional change. When the information on institutional change is perfect, or the uncertainty is removed in the institutional change, they ultimately reach the Nash equilibrium. Finally, it is fair to say that the formal model contributes to this study by complementing the lack of empirical data/precedent literatures, and clarifies the causality between the factors of interest.

Keywords: Delegation of Tax Discretion and Implementation, Two Principals and Agent, Property Tax Hike, Tax Resistance, Fiscal Independence

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INTRODUCTION

Although the local autonomy system of South Korea began in 1992, local governments have been subject to the central government. The strong administrative culture of centralism is also a great obstacle to the use of local discretion, which should be independent of the central government. From 1948, at the inception of the Korean government, a strong centralization system was in place up to 1992, when decentralization was declared. This tradition of centralization is also embedded in the minds of some political leaders and higher officers of Korean central government. Thus, the central government frequently tries to limit the use of discretion by local governments and strongly requires that they execute their discretion in favor of the central government's policy. Thus, local governments still have the status of agents for the central government and frequently implement national policy regardless of whether they readily regard it as a principal.

Despite incessant debates about the relationship between central and local governments, the centralized tradition has usually been respected up until the point where the Korean central government introduced a package of tax hikes on real estate in order to achieve tax levy equity. This remarkable tax innovation, however, resulted in conflicts between the central government, residents, and local governments, which were followed by area-wide tax competition among local governments of the Seoul Metropolitan Area (SMA). Residents who own high priced real estate strongly resisted the property tax hike of the central government and many local governments cut property tax rates for their residents competitively. Following in the footsteps of Gang-nam Gu, which cut its tax hike rates by fifty percent in May, 2004, twenty four local districts or local cities in the SMA cut their property tax rates by 10 to 30 percent in a bid to soothe the growing complaints from residents who owned residential real estate. More local governments, however, cut the property tax rates in 2005 and 2006, although the central government did not complement the loss in the tax revenue as it warned in 2004.

As described in the first paragraph, local governments have taken a lesser role than the central government and generally do not take actions against the ideology of the central government. In the case of the SMA, however, it seems that local governments have accepted the risk of a possible loss in tax revenue.

From this brief description, we have one puzzle to solve: *If some local governments cut the property tax despite loss in revenue, do they really have an irrational preference that is inconsistent with their past preferences?: If they are not irrational, then how can we explain their revolt against the central government in the rational choice model? Also, what determines local government's choice of whether to cut property tax rates or not, and how much to cut them?* This study will answer these

questions using the form model approach to the principal and agent scenario. It is assumed in the study that residents, local governments, and the central government have a divided principals-agent relationship (Epstein & O'Halloran, 1996). This relationship will be discussed specifically in the next section. To analyze this relationship, the study will employ the formal model for policy implementation and delegation of discretion that Epstein and O'Halloran designed in their seminal study. In the discipline of public administration, the formal model approach is not widely employed but it is frequently used in the research area of political science or economics. This approach is, however, very useful in clarifying causality in cases such as the implementation issue, which is less testable (Morton, 1999)[1]. The model will be designed in the third section.

PRINCIPAL-AGENT MODEL AND THREE ACTORS IN SMA

In the principal-agent model, a principal gives an agent a broad range of discretion because the agent can implement policy more efficiently. Implementation of the policy requires live, on-the-spot information, and the agent generally has better information for the practice because they are specialists or closer to the field. Accordingly, the agent usually has more exact information on the outcome of the policy. Utilizing this information asymmetry, the agent frequently seeks its own rent (Stiglitz, 1987). Thus, the principal designs monitoring and control systems or incentive systems to discourage the agent from deviating from the principal's preference. The agent compares the benefits from rent-seeking with the risk from deviation and decides whether or not they will deviate from the preference of the principal (Sappington, 1991).

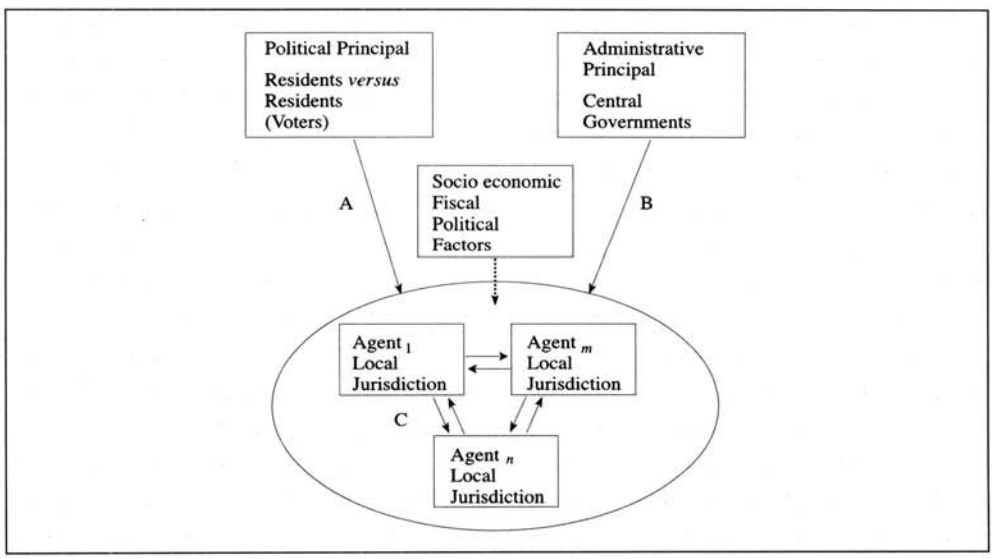
With a system of strong incentives or sanctions, the principal can therefore decrease the possibility of the agent's deviation. Such a system is more effective when the agent has some weakness in the economic resources for their survival. The organizations or institutions make diverse types of contracts to manage their agents by controlling the latter's weaknesses or preferences (Milgrom & Roberts, 1992). One serious problem, however, is that the agent frequently does not follow the principal's preference in spite of strong sanctions or its internal weakness. While most applied studies of the implementation issues around principal-agent relationships focus on the private

1. Testable models for this case are established in Bae and Kim's (2007) study of the local tax mimicking. Their study, however, lacks a theoretical model and has a different perspective than this study. It approaches the case with an empirical model of the tax competition (Brueckner 2001).

corporation, some studies examine the public area: Why does the agent deviate from the preference of the principal despite strong monitoring systems? (Hill & Weissert, 1995), or, how does the principal delegate discretionary power to agents to control them under the equilibrium? (Epstein & O'Halloran, 1996).

Hill and Weissert show that the ironical implementation delay is also one of the rational choices by actors. In their model, it is the result of strategic interaction between principal and agents to maximize their utility under the given incentives-sanctions system. In this study, the information asymmetry unfavorable to the central government does not matter either. The central government already knows of the deviation of local government from its preference. Also, the local government faces the loss of the property tax revenue both from its actions as well as the central government's sanctions. Nonetheless, many local governments move to cut their property tax against the property tax hike. Thus, the case of the SMA has similarities with Hill and Weissert's ironical policy implementation.

Figure 1. Triangles of Residents, Central Government, and Local Governments



This study examines the noncompliance of sub-governments (local governments of the SMA) to the superior government (the central government). In their seminal studies (1996, 1999), Epstein and O'Halloran argue which factors determine Congressional delegation of power to government agencies with regard to the trade policy under the divided government system. The structure of delegation and implementation under the divided government also provides some implications in the analysis of the

case of the SMA. It provides a protocol model to predict the long-term delegation of fiscal discretion and the short-term tax cut policy outcome of the conflict in the SMA between local governments, the central government, and residents.

In section 3, this study will discuss the utility of three actors—residents, the central government and local governments—and analyze aspects of implementation and delegation in the noncompliance of local governments of the SMA. Also, a formal model will be derived to represent the vertical relationship between these three actors and to clarify the strategic behavior of each actor (see Figure 1). In the model, local governments are agents who have two principals (Mezzetti, 1997). The residents are the political principals of the local government because they are potential voters in upcoming local elections (relation A). The residents as potential voters can give political life to the careers of the elected political leaders of local governments. In comparison with the status of residents, we can say that the central government is the administrative principal of the local government because the central government gives them power and authority for implementation through legislation and delegation (relation B).

Based on the triangle of three actors, a theoretical model will be derived and the conditions for the equilibrium will be examined in the next section.

THEORETICAL MODEL OF IMPLEMENTATION AND DELEGATION

To explain issues about the implementation and delegation of discretion inherent to the strategic tax resistance of the local governments, I have designed a theoretical model based on the implementation model under divided government (Epstein & O'Halloran, 1996). Since their formal model employs the simple quadratic function to formalize each actor's utility, it seems too simple to be concrete. Instead of sacrificing the delicate details, however, it provides wide applicability to the implementation issue (although follow-up studies are rare). Delegation of power is usually followed by the delegation of responsibility or obligation. If an agency gets more discretionary power related to implementation, then it is common sense that it has to accept more responsibility. Therefore, in the issues of delegation or implementation of discretionary power, actors face a tradeoff between freedom vs. obligation or between more resources vs. better performance. Thus, the optimal point to maximize the utility of discretionary power will be found somewhere between minimum and maximum use of discretionary power, which means the utility function will take a quadratic form (concave function) rather than a monotonous linear form.

In their study, Epstein and O'Halloran assume, for the convenience of analysis, that the preference of the public agency is the same as that of the President. It makes sense

that the Presidency and its agencies have the same preference for specific policy because the President will select agency heads with the same preferences, and who will show maximum loyalty. In the SMA case, however, the central government (President) cannot select the majors or directors of local governments because they are elected directly by residents in local elections. Rather, the preference of the central government can be compared to that of the Congress in Epstein and O'Halloran's model.[2] In my model, it is residents of the local jurisdiction who can select the local government as an agent. Residents of a local jurisdiction select local political leaders whose preferences are closest to theirs through local elections. It is assumed, therefore, that residents have the status of principal. However, the residents have nothing to allocate or re-delegate, whereas the President allocates or re-delegates the discretion (budget) to the agency after getting the discretion (budget) from the Congress. Thus, it is reasonable that all discretions relevant to property tax in this case are assumed to be from the central government (and the government party in the Congress). Also, such conditions lead us to conjecture that the local government will decide the (actual) final tax rate between the ideal rates of residents and of central government. This is different from the assumption that the preference of public agency is always set to the preference of the president in Epstein and O'Halloran's model.

PREFERENCES OF THREE ACTORS FOR THE PROPERTY TAX

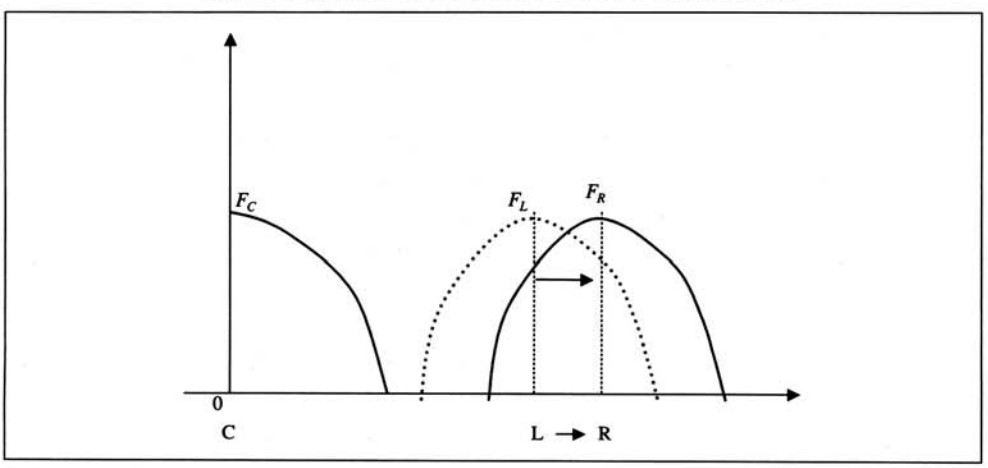
There are three actors with different preferences for the property tax hike in this model. The central government wants to drive the redistribution policy through the property tax hike and to encourage the local governments to follow it. Thus it will prefer no property tax cut (and a larger supply of social welfare services). As a local government cuts its property tax rate more, the degree of the preference of central government for the final tax rate will decrease rapidly. Thus its preference will take the quadratic form at the right side of the Y axis.

It is expected, however, that each local government makes the final decision on the property tax rate within the range of its own discretion,[3] in consideration of the loss in property tax revenue and the political support from residents in the coming local elec-

2. The government party had the majority power in the National Congress over three years. It is assumed, therefore, that there is no difference between the preferences of the central government and the Congress in this case.
3. According to local tax 81-3, the local government may change (raise/cut) the property tax rate by 50%, depending on its fiscal condition.

tion. This implies that the final rate of tax levied to the property of local residents is likely to be lower than the standard property tax rate which the central government recommended initially. Owners of residential property, who have a strong preference for a lower tax but need the public goods less, want the local government to lower tax rates maximally at the expense of public goods. If the owners are the median residents, the combination of low tax rate (high tax cut) and less public goods will be preferred by a majority of residents through the pre-electoral competition.[4] If non-owners of real estate are the median, the combination of high tax rate (low tax cut) and more public goods will be preferred by the majority of residents. Thus all actors are assumed to have a concave quadratic function of preference for the progressive tax policy. Equation (1) represents an easy-to-understand form of a concave quadratic function. A main intuition of this function is that it includes the trade-offs specific to each actor in the function form of utility or preference. This is a general characteristic of most economic functions related to utility or benefit.

Figure 2. Quadratic Preference Functions of Three Actors



* **C**, **L** and **R** denote the ideal point of the use of discretion for the central government, local governments, and residents respectively. Note that the X axis represents the property tax cut. By definition of the function, $\alpha > 0$, $\beta > 0$, and $\gamma > 0$. τ is the optimal tax rate, which is assumed to be different for each actor.

4. The home voter hypothesis supports that, even prior to the local election, the owners of house/real estate would object to the policy and lead the local government to repeal it with political power if it decreases the value or price of their house/real estate (Fischel, 2001). Also, the median voting model has a solution to the pre-electoral competition between political candidates when the policy is one dimensional and the voters have the single-peaked preference. For a detailed explanation, see Gans and Smart 1996.

$$F(\tau) = -\alpha(\beta - \tau)^2 + \gamma \quad \Lambda\, eq \tag{1}$$

One notable point in this implementation model is that the local government (agent) has two different principals. The residents as potential voters are the political principal of the local government and the central government is the administrative principal of the local government. The former can give political life to the political leaders of local governments through the election, whereas the latter gives power and authority for implementation through legislation and delegation.

In this study, the theoretical model is derived based on the quadratic function, subject to the assumption and conditions as argued above. This model especially focuses on the derivation of causality between critical factors influencing the delegation and the execution of discretion. Let be the preference function of the central government, local governments, and residents respectively.

$u_c(\tau) = -(C - \tau)^2$: the preference function of the Central Government
$u_l(\tau) = -(L - \tau)^2$: the preference function of Local Government
$u_r(\tau) = -(R - \tau)^2$: the preference function of Residents
(Here, Central government (C), Local government (L), and Residents (R))

Now, suppose that the specific assumptions of the model between three actors are as follows: First, it is assumed that the central government sets its ideal point 'C' to 0. A zero ideal point of the central government is optimal as the reference point for identifying other points in our interest. Note again that the central government strongly urges the local governments not to cut the standard tax rate for achieving the redistributive policy goal, and that the residents and some local governments want a positive tax cut ($\rightarrow + \Delta t$, that is, positive change on the progressive-regressive line). As shown in Figure 2, the preference function of the central government implies that when the zero point is 0, its utility will be maximized. This represents the situation that the present tax policy of the central government is set to the progressive tax policy, and the central government wishes strongly that the progressive tax policy be implemented faithfully by local governments. Also, the function shows that, as a change in the policy (the property tax cut) is larger, the preference of the central government is decreasing slowly first, and when a change is very large, its preference will be decreasing very fast.

Second, the local governments have ideal point 'L'. As the local government weakens the progressivity of present tax policy by making a change in the policy with its discretion (for example, by cuts to the property tax rate for residents), the utility of local government will increase because it can get more political support from resi-

dents. When the local government cuts its tax rate more than '*L*', it will be aware that the benefit of political support cannot cover the cost of the reduction in tax revenue and the sanction from the central government. It makes sense that they must tolerate a sharp decrease in the property tax revenue if local governments exercise too much discretion when changing the policy of central government. Thus, the preferences of local governments also take quadratic function.

Third, the preference of residents in the model is assumed to be the median preference in the jurisdiction. Suppose that residents have an ideal point '*R*' for the property tax cut. If residents are the owners of houses or condominiums, their ideal point for the property tax cut is supposed to be closer to the maximum point of discretion than the minimum point, because they want a positive tax cut. If residents are not the owners of houses orcondominiums, but are tenants, then their ideal point is possibly closer to the minimum point for the property tax cut than to the maximum point. It is certain, however, that residents perceive the tradeoff between tax cuts and public goods in both cases. That is, they have to tolerate a decrease in the public goods when they want the property tax cut. (Note that the central government will not complement the loss in the revenue from a property tax cut). It makes sense that a group of residents with median property would prefer the proper combination of public goods and the property tax rate over one of them.[5] Thus, the preference function of residents also takes a quadratic form which has the largest value at a point *R* and decreases as the degree of tax cut passes the point *R*.

DELEGATION AND IMPLEMENTATION OF PROPERTY TAX DISCRETION

Suppose a progressive tax policy is finally determined or changed by three factors: a present platform of policy (Γ), an unexpected event (s), and the discretion of local government (d_F). For analytical convenience, the progressive tax policy is expressed as the simple sum of three factors. According to Equation (2):

$$\tau = g(\Gamma + s + d_F) \quad \Lambda\, eq \tag{2}$$

'Γ' represents the platform of the present tax policy in Equation (2). The incremen-

5. If the residents have the convex indifference curve function (or concave utility function) for the property tax and the public goods, then they will choose the combination of two choices rather than All-In to one (Chiang, 2000).

talism or decrementalism in the policy decision-making is assumed in this item. All policies are changed gradually from the present policy rather than being created from a zero-based platform. In the case of the SMA, the original plan of the tax hike policy is the platform of the present tax policy, because the central government does not want any change in the present policy platform.

's' denotes all possible events that influence the progressivity of the tax policy, and is assumed to occur randomly. An enlarged economic gap between people, or repeated events such as illegal collective tax evasions by large corporations, may lead people to support strongly a government with a progressive ideology. A strong progressive government will emphasize the equity of tax policy and the regulative function of policy. When tax policy with a certain progressivity comes into effect, the local government also responds to the change in the ideology of tax policy in order to maximize the combination of its political and economic interests.

The local government utilizes its fiscal discretion (d_F), especially tax discretion, to increase its benefit or to minimize the cost from the ideological change. 'd_F' represents a set of fiscal discretion delegated by the central government. It is assumed in this case that the set of fiscal discretion is the authority for local governments to cut taxes, as delegated by the central government. For example, according to existing law, the local government can cut or raise a standard property tax rate, considering its fiscal condition. It can cut the property tax rate by 50% maximum. Then, the discretion to be executed by local government can be expressed as follows. (Note that $| d_F | \leq M_F$, where M_F is the maximum discretion delegated by law.)

The present central government proposed the redistributive tax policy $P(s_2)$, which seems too progressive to residents who own their own house/condominium. Residents in the local jurisdiction have requested a less progressive policy, and local governments are trying to satisfy their residents by using their discretion. Lastly, all decision-making should be within the possible policy range of $-M_F \sim + M_F$, which is defined by the institutional limit of tax discretion. As a result, the policy outcome becomes closer to the preference of residents and more distant from the preference of the present central government. Lastly, for analytical convenience, the final product of policy 'τ' is the simple sum of $\Gamma + s + d_F$, which means that function $g(\cdot)$ is linear. Based on the concept operationalization above, the tax policy outcome can be classified as follows:

$$\tau = \begin{cases} s + \Gamma + d_F & if \quad -M \leq s \leq L - \Gamma - d_F \\ L & if \quad L - \Gamma - d_F \, s \leq \leq L - \Gamma + d_F \\ s + \Gamma + d_F & if \quad L - \Gamma + d_F \leq s \leq + M \end{cases} \begin{matrix} \text{Possible} \\ \left.\begin{matrix} \\ \text{Policy} \\ \end{matrix}\right\} \\ \text{Outcome} \end{matrix}$$

To derive a formal model, Equation (2) takes the quadratic form, like Equation (1), and is multiplied by $P(s)$. Next, it will be integrated on the possible condition 's' for the policy. Specifically, the possible property tax cut and the preference of each actor for it will determine its utility. The final outcome from this calculation is intuitively the expected utility of the possible policy outcome set. Thus, the equation is solved for the maximization of central government utility (Note here that C is set to 0 thus the preference function of central government is $u_c(\tau) = -(0-\tau)^2$. For a more realistic situation, suppose the local government considers both the preference of residents and the preference of the central government, and the local government sets its ideal point to the weighted average of the two preferences. The local government's ideal point for the policy will be located somewhere between the ideal points of central government's and residents'. That is, the local government's ideal point is written as follows.

$$L = \varepsilon \cdot R + (1-\varepsilon) \cdot C = \varepsilon \cdot R + (1-\varepsilon) \cdot 0 = \varepsilon \cdot R \; (0 \le \varepsilon \le 1)$$

Note that when $\varepsilon = 1$, this condition is identical to the condition of Epstein and O'Halloran's. Also, I add one condition for the sanction of central government against the property tax cuts by the local government to the model. That is, is the function of the fiscal independence (δ) which the local government has (Choi 2005).[6] Then, the ideal point of local government is re-rewritten as:

$$L = \varepsilon(\delta) \cdot R + (1-\varepsilon(\delta)) \cdot C = \varepsilon \cdot R + (1-\varepsilon) \cdot 0 = \varepsilon(\delta) \cdot R \; (0 \le \varepsilon \le 1)$$

Plugging possible outcomes into the central government's quadratic function of the preference, the expected utility of the central government is expressed as follows:[7]

$$\max_{C,R} \; EU_c = \sum u_c(\tau) \cdot p(s)$$

$$= -\int_{-M_F}^{cR-\Gamma-d_F} (s+\Gamma+d_F)^2 \frac{1}{2 \cdot M_F} ds \quad \text{(if equation continuous)}$$

6. Let's assume that the fiscal independence of local government from the central government is given exogenously. Also, in South Korea, fiscal independence is generally estimated by the own source revenue/the total expenditure. Therefore, this concept is sometimes used as the indicator for the fiscal health.
7. The possibility of any possible outcomes is assumed to be even on the line of the maximum and minimum outcomes. This is the same assumption as Epstein and O'Halloran's, and the equation (3)-3 generalized the maximum utility function Epstein and O'Halloran developed in their study (Epstein and O'Halloran 1996).

$$-\int_{cR-\Gamma-d_F}^{cR-\Gamma+d_F} L^2 \frac{1}{2\cdot M_F} ds - \int_{cR-\Gamma+d_F}^{M_F} (s+\Gamma+d_F)^2 \frac{1}{2\cdot M_F} ds$$

$$= \frac{3(\Gamma)^2\cdot d_F - 3(\Gamma)^2\cdot M_F - (M_F)^3 - 3\varepsilon^2 R^2\cdot d_F - 3(d_F)^2 M_F + 3(M_F)^2\cdot d_F + (d_F)^3}{3M_F} \quad \Lambda\, eq \quad (3)$$

From Equation (3)

$$\frac{\partial EU_C}{\partial(\Gamma)} = -\frac{2\Gamma(M-d)}{M} = 0 \text{ for } \Gamma = 0 \quad \Lambda\, eq \quad (4)$$

$$\text{Also, } \frac{\partial EU_C}{\partial d_F} = 0 \rightarrow \frac{(\varepsilon R + M_F - d_F)(\varepsilon R - M_F + d_F)}{M_F} = 0 \quad \Lambda\, eq \quad (5)$$

By the assumption of R > 0, $d_F^* = M_F - \varepsilon \cdot R$ can be the solution equation for the optimal discretion for the central government to delegate. The central government will delegate less fiscal discretion to the local government. As residents want the local governments to use more discretion, the central government has the incentive to decrease the level of fiscal discretion and, finally, to remove it. In the case of the SMA, the central government decided to cut grants-in-aid and even considered amending the clause of property tax discretion in existing law.

Now, the optimal expected outcome of progressive tax policy is:

$$E(\tau) = \int_{-M_F}^{\varepsilon R - d_F} (s+d_F)\frac{1}{2\cdot M_F} ds + \int_{\varepsilon R - d_F}^{\varepsilon R + d_F} R\frac{1}{2\cdot M_F} ds + \int_{\varepsilon R + d_F}^{M_F} (s-d_F)\frac{1}{2\cdot M_F} ds$$

$$= \frac{\varepsilon R\cdot d_F^*}{M_F} \quad \Lambda\, eq \quad (6)$$

From the point of view of the central government, this condition is different from the original model of Epstein and O'Halloran's because the local government is considering the preference of residents now.

Again, the first order condition for maximizing central government's utility is

$$\frac{\partial EU_C}{\partial(\Gamma)} = 0 \text{ for } \Gamma = 0$$

The central government always wants the local government to not deviate from its preferred policy. What the first order (necessary) condition means is clarified more

intuitively with regard to the magnitude of discretion. This condition intuitively implies that the central government's dominant strategy is that it should strongly ask the local governments not to cut taxes at all.[8] In this case, the central government will set the change of the policy to 0 under the equilibrium.

However, the optimal discretion the central government will delegate is different from that of the first model.

$$d_F^* = M_F - \varepsilon \cdot R \quad \Lambda\, eq \tag{7}$$

In this equation, the optimally delegated discretion d_F^* is possibly smaller than $d_F^{E*} = M_F - R$, discretion delegated when $L = R$ $(0 \leq \varepsilon \leq 1)$. d_F^{E*} is the same condition as in Epstein and O'Halloran's model. That is, in only one case are they the same, that is, if $\varepsilon = 1$, then $d_F^* = d_F^{E*}$. This means that if the local government will consider a part of the preference of the local government, it can avoid the extreme case that the central government withdraws the entire discretion so as to offset the effect of the property tax cut in the long term.

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8. If the central government accepts the property tax rate that the local government decided (that is $\Gamma \neq 0$), the local government can enjoy more discretion under this condition. That is, the central government will also decrease the tax discretion as follows in the solution. (Please note $L = \varepsilon \cdot R + (1 - \varepsilon) \cdot C$).

   $d_F^{**} = M_F - \sqrt{(\varepsilon \cdot R + (1 - \varepsilon) \cdot C - \Gamma)(\varepsilon \cdot R + (1 - \varepsilon) \cdot C + \Gamma)}$

   If 0 is put into C and Γ, then d_F^{**} is exactly same as $d_F^* = M_F - \varepsilon \cdot R$, which is the solution of equation for the optimal discretion the central government delegate. Let's suppose, however, that the central government decides to accept the property tax cut by the local governments for some reason (again $\Gamma \neq 0$). Intuitively, this will break the equilibrium and the choice of the central government would not be optimal any more. In addition, the local government will perceive that it can use more discretion to take the advantage of this unstable situation. Mathematically, the final discretion given to local government will be rewritten as follows: Note that C = 0

   $d_F^{**} = M_F - \sqrt{(L - \Gamma)(L + \Gamma)} \geq M_F - L = M_F - (\varepsilon \cdot R + (1 - \varepsilon) \cdot C)$

   $d_F^{**} = M_F - \sqrt{(L - \Gamma)(L + \Gamma)} \geq M_F - L\,(\Gamma \neq 0) = M_F - L\,(\Gamma = 0)$

   A solution to the equation under the condition of $\Gamma \neq 0$ shows that the local government can enjoy more tax discretion than $M_F - L$ because $M_F - \sqrt{(L - \Gamma)(L + \Gamma)} > M_F - L$ when $\Gamma \neq 0$. This implies that if the central government retreats from its position or accepts the deviation of the local governments officially, the local government can enjoy more discretion consequently and use it to maximize its utility. (Note that the geometric means is always smaller than or same as arithmetic mean ($\leftarrow \sqrt{a \times b} \leq {}^{(a+b)}/_{2}$ (both sides equal when $a = b$).

Now, the expected tax policy will be transformed as follows by plugging Equation (7) into $E(\tau) = \frac{\varepsilon \cdot R \cdot d_F^*}{M_F}$.

$$E(\tau) = \frac{\varepsilon \cdot R \cdot d_F^*}{M_F} = \frac{\varepsilon \cdot R \cdot (M_F - \varepsilon \cdot R)}{M_F} \quad \Lambda \, eq \tag{8}$$

Based on Equation (8), the median resident will maximize its utility when the idealpoint of residents R is set to $\frac{M_F}{2\varepsilon}$. The final policy outcome to maximize the utility of residents under the long-term central government institutional change is $\frac{M_F}{4}$, which exists between 0 and $\frac{M_F}{2\varepsilon}$ or between 0 and M_F (if $\frac{M_F}{2\varepsilon} > M_F$). Usually $\frac{M_F}{2\varepsilon}$ is same as or larger than $\frac{M_F}{2}$ because ε should be between 0 and 1 as we assumed. Also $\frac{M_F}{2\varepsilon}$ is larger than M_F if ε is smaller than 0.5. This is, however, unrealistic because the residents know well the maximum level of the property tax cut cannot be larger than M_F. Therefore, ε should be larger than 0.5 or same as 0.5. (That is, $0.5 < \varepsilon < 1$)

Another interesting point is that we cannot find $\varepsilon(\delta)$ in the optimal outcome. This implies that no matter how the local government considers the preference of its residents, the central government will control the policy outcome by varying the discretion delegated, and the same outcome will be produced under the equilibrium.

If local governments rarely represent median residents' preference (for example, ε is 0.1), the median residents may request more tax cuts than the maximum of tax discretion (50%). But this is unrealistic and the median residents generally want the tax cut to be equal to M_F because they know well that M_F is the maximum they can get without huge additional costs to change the law. Also, the local government will consider a part of the preference of residents to avoid the extreme case, as argued above. In Equation (3)-8, the value of ε to maximize the policy outcome is $\frac{M_F}{2R}$.[9] Even if the residents would set R to M_F, the local government would not cut the property tax as much as the maximum of tax discretion (50%), but would consider partly the residents' ideal point—roughly one-half of residents' requests. Finally the choice of each actor is made simultaneously in the process of utility maximization, and the three

9. By differentiating the equation 3-(8) for ε, we can get the following first derivative to find ε to maximize the expected policy outcome.

$$\{E(\tau)\}' = \partial\left(\frac{\varepsilon \cdot R \cdot M_F - \varepsilon^2 \cdot R^2}{M_F}\right) / \partial\varepsilon = \frac{R}{M}(M - 2\varepsilon \cdot R)$$

actors (residents, local governments, and the central government) reach the equilibrium under some conditions.

ANALYSIS AND DISCUSSION

This model provides the theoretical prediction that no matter how much the residents want to cut the property tax, the final tax cuts will be generally between 0 and 50%. Table 1 shows the real outcome of tax cut policy over time in the SMA (Table 1 is found on the next page). As the theoretical model expected, indeed, most local governments which cut the property tax did not use their discretion fully over three years. Especially in 2004, all jurisdictions did not cut the property tax by 50% (the possible maximum tax cut), but actually cut it by 10% to 30%. Table 1 also provides information describing property tax competition in 2004, 2005, and 2006. Four more jurisdictions cut the property tax in 2005 than in 2004. Thirty-seven local jurisdictions planned to cut the property tax in 2006, one year before the nation-wide local election was expected in May, 2006. Also, the mean degrees of the property tax cut among all sixty observations are 8.85% in 2004, over 15% in 2005, and about 20% in 2006. This shows that on average across all sixty jurisdictions, real property tax cuts are smaller than 25% ($M_F/2$). As well, the mean degrees of the property tax cuts among tax-cut observations are 21.2% in 2004, 31.2% in 2005, and 32.02% in 2006. These figures also support that on average, the tax-cut jurisdictions do not execute their discretion fully. All mean values of the degree of the property tax cuts imply that the local govern-

Table 1. Descriptive Statistics of Tax Cuts over Time

% of Tax cut Yr	2004	2005	2006
Mean of all observations	8.85	15.08	19.75
Mean**	21.2	31.20	32.02
Max	30	50	50
Min	10	10	10
50%	0	8	11
40%	0	2	3
30%	6	6	7
25%	0	0	1
20%	**14**	**10**	**11**
15%	2	0	1
10%	3	3	3
SUM	25	29	37

*: all sixty local jurisdictions

**: only local jurisdictions which cut the property tax

ments will consider the preference of the central government as well as the preference of the residents in the model.

In association with individual local government's choice, the mode of the tax cut is in the middle point in the range of local governments' tax discretion over three years (0% min to 50% max). The largest number of the local governments in the tax cut chose a 20% tax cut. This result is also consistent with the analysis of the mean values of the property tax cut. However, 20% is larger than $\frac{M_F}{4} = 12.5\%$. Also several local governments cut the property taxes 30% to 50%. Although the tax cut rates are smaller than the maximum value M_F (50%), the degree of tax cuts by local governments is larger than the optimal degree of the property tax cut.[10] One possible reason for this difference is the effect of imperfect information on the other actor's strategy. For example, in the short-term, local governments and residents may try to cut the tax rate more than the optimal level because they may be nearsighted and not predict a change in the delegation of tax discretion. By not considering that possible institutional change, they will take a strategic action. Under this condition, $-\varepsilon \cdot R$ is ignored in $d_F^* = M_F - \varepsilon \cdot R$. Thus the policy outcome is finally

$$E(\tau) = \frac{\varepsilon \cdot R \cdot d_F^*}{M_F} = \frac{\varepsilon \cdot R \cdot (M_F - 0)}{M_F} = \varepsilon \cdot R \; \Lambda \; eq\, 3-(8)'$$

Furthermore, uncertainty concerning the credibility of the central government's strategy may also bring in the same result. That is, should the present central government/majority party be defeated in the next presidential election/general election, it is not guaranteed that the withdrawal of discretion of the property tax cut will be continued after the change in political power. Thus, changes expected by local governments and residents in the government anti-tax cut policy, due to the turnover of political power, may cause them to choose a higher tax cut than the optimal level (Hill and Weissert 1995). These two possibilities make sense, in that such an institutional change is sometimes uncertain and takes a long time. In sum, the imperfect information about the government's strategy, or uncertainty about the central government's anti-tax cut actions, result in property tax cuts greater than the optimal level. Finally, property tax cuts in recent years are not optimal under the equilibrium of this model.

Now we turn to the determinants of the property tax cut. With uncertainty in the

10. Although the Epstein and O'Halloran style model is helpful to explain the noncompliance of the local government to the tax hike and the condition for the Nash equilibrium, it is not designed to provide an exact estimate for the real outcome—here, a property tax cut.

withdrawal of the tax discretion, the final policy outcome of the property tax cut is $\varepsilon \cdot R$ (under disequilibrium). From the theoretical model and Table 1, we can expect thatis $\varepsilon \cdot R$ the function of some factors (Table 2). It may be that fiscal independence and the timing of the coming nation-wide local elections will determine ε. Condominium price represents the preference of residents R. Also the choices in neighboring local jurisdictions may influence both ε and R. Based on some evidence, these expectations will be examined in the following part.

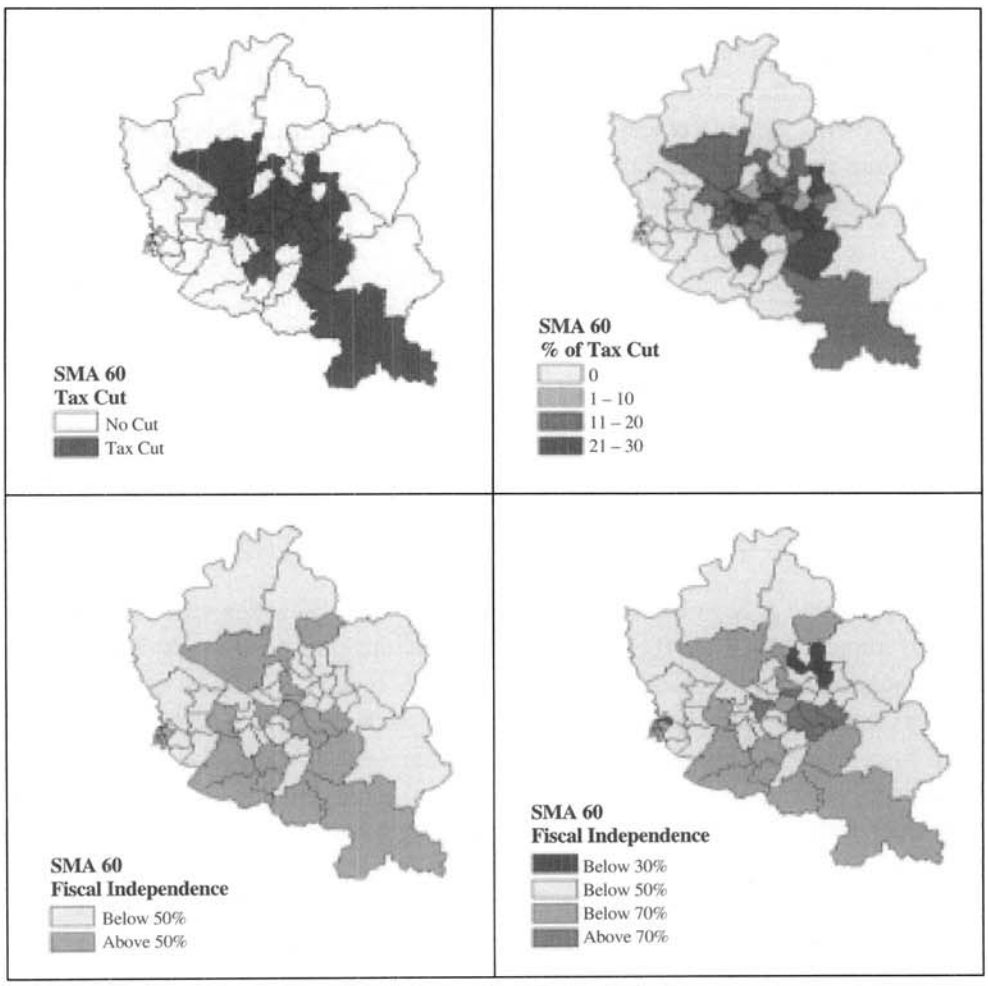
Table 2. Possible Determinants

Determinants	Description
Neighbor's Choice	Degree of Tax Cuts by Neighbor local governments which share the administrative boundary
Degree of Fiscal Independence	Own Source Revenue/Total Expenditure (=(Total Revenue-Intergovernmental Grants)/Total Expenditure)
Condominium Price	Average Price of Condominium per 3.3 m^2 in local jurisdiction
Time	Time to 2006 national local election.(= 2006 - year)

First, possible policy outcome is the function of the fiscal independence of the central government $\varepsilon(\delta)$. Thus $\varepsilon(\delta) \cdot R$ is determined by the ideal point of residents and the fiscal independence. For example, Gang-nam and Seo-cho Gu in Seoul city, which cut their tax rates very actively in the given period, both have a strong and broad tax revenue base, whereas Tobong and Eunpyung Gu are weak in their level of fiscal independence. Figure 3 provides the distributive maps of the property tax cuts and fiscal interdependence. It shows that in 2004, many local districts (GU) and cities which cut the property tax rates had relatively strong levels of fiscal independence. Areas of the property tax cuts and areas of strong fiscal independence roughly overlap. This supports the expectation from the theoretical model: $L = \varepsilon(\delta) \cdot R$ $(0 \leq \varepsilon \leq 1)$. Strong fiscal independence leads local governments to represent the preference of residents more because they are less influenced by the central government. That is, non-own source revenue, such as an intergovernmental fund, generally represents the exogenous uncertainty with regard to the fiscal condition (Florida Auditor General 2007). The exogenous uncertainty includes the political influence from the superior government as well as the change in the socio-economic environment. If local governments are more dependent on the grant-in-aid from the central government, they should consider what the central government prefers.

Local jurisdictions such as Seo-cho Gu and Yong San Gu had strong requests for property tax cuts by their residents. In Figure 3, Seo-cho Gu and Yong San Gu have more total value of higher-priced condominiums than ToBong and Kum-Cheon have.

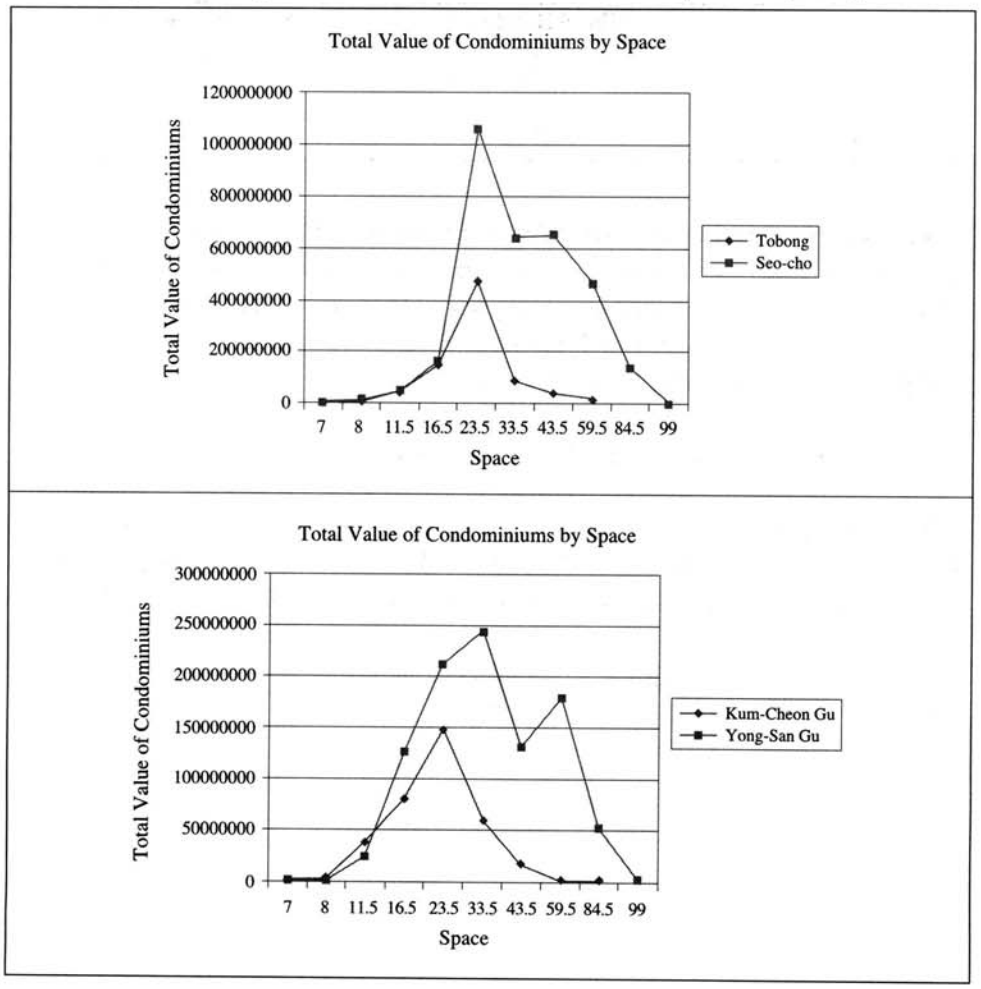
Figure 3. Tax Cut and Fiscal Independence, 2004



This indicates that it is owners of higher-price condominiums who are the strongest objectors to the property tax hike of the central government. This result is consistent with Fischel's argument in *The Homevoter Hypothesis* (Fischel 2001). Residents respond negatively to government policies that areunfavorable to the value of the real estate asset they own.

Table 3 provides the correlations between Fiscal Independence and Tax Cut and between Price of Condominium and Tax Cut. Correlations are all positive over the three years. Except for 2005, the correlations are relatively high. It is fair to say, therefore, that the degree of the property tax cuts is a function of 'the strength of preference

Figure 4. Comparison of Total Value of Condominiums (1000 won, 2004)[11]



of residents for the tax cut and the fiscal independence.

In 2005 and 2006, more local governments did not cut the property tax competitively. To explain this dynamic trend in property tax cuts over time, I add another condition for the local election to the model. The possibility of re-election can be heightened

11. Total value of condominiums is calculated by the mean value of the condominium in local jurisdiction the number of condominiums. Data for the mean value of the condominium is provided by the NHN Corporation. Also, data for the number of condominiums are found in the Annual Statistical Report of Local Governments, the Korean National Statistical Office.

Table 3. Correlations

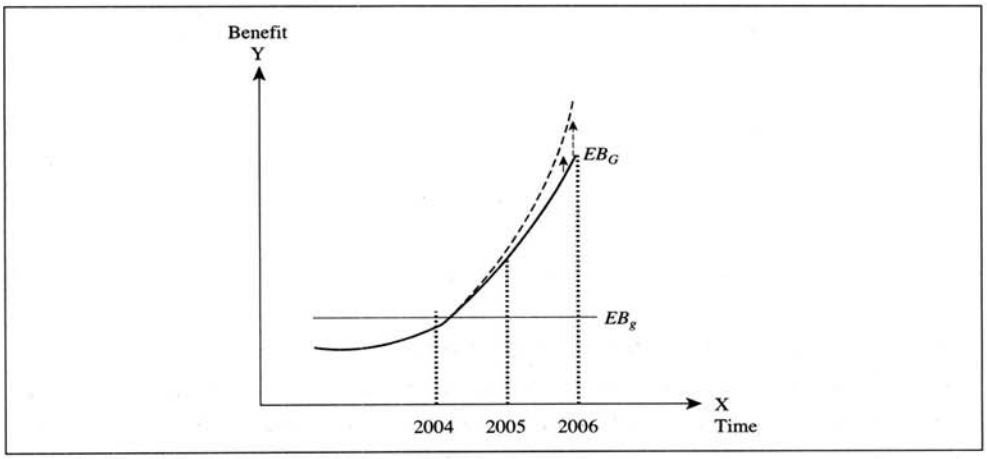
	Fiscal Health	Price of Condominium
2004	0.52	0.46
2005	0.32	0.30
2006	0.59	0.48

by the implementation of policy favorable to the residents. The impact of the policy will be larger as the date of the election comes closer because the memory of the benefit from the policy will be forgotten as times goes by.[12] Then, ε can be the function of the time to the local election (t) which the local government has. $\varepsilon(t)$ The ideal point of local government can then be re-rewritten as:

$$L = \varepsilon(t) \cdot R + (1 - \varepsilon(t)) \cdot C = \varepsilon \cdot R + (1 - \varepsilon) \cdot 0 = \varepsilon(t) \cdot R \; (0 \leq \varepsilon \leq 1)$$

The benefit of the property tax cut will increase rapidly as the date of the local election comes closer (see Figure 5). Finally, the number of the local governments which cut their property taxes is increasing over time. In 2004, 25 local jurisdictions

Figure 5. Benefit of Tax Cuts over Time



12. Let's assume that the impact of the policy at each point will have the reverse weight whose denominator decreases as the date of the election comes close. For example,
$X_t^p = \frac{1}{2} x_t^p + \frac{1}{4} x_{t-1}^p + \frac{1}{8} x_{t-2}^p$ (X is the impact of policy over time. is the impact of the policy at each time point (Koyck 1954).

cut their tax levels, 29 in 2005, 37 in 2006. This dynamic trend demonstrates how sensitive the political leaders of local governments are to political supports for their re-election. Unless other socioeconomic factors, including fiscal independence, are not changed radically in 3 years, it makes sense that the time until the election influences property tax cuts.

The maps in Figure 3 give one hint about the pattern of the property tax cuts. Many local jurisdictions which cut the property tax are close to each other geographically. This geographical pattern is also observed among jurisdictions which did not cut taxes. When one local government decides to cut the property tax, it may be influenced by the decisions of neighboring local governments (Doreain 1980, 1981; Anselin 1988). This is explained by the relative satisfaction of residents with the property tax cut. If residents are influenced by the property tax cuts by other residents living in the neighboring jurisdictions, the final policy outcome under uncertainty of the central government policy is modified as follows:

$$L = \varepsilon \cdot R_A(\Delta t_N) + (1-\varepsilon) \cdot C = \varepsilon \cdot R + (1-\varepsilon) \cdot 0 = \varepsilon \cdot R_A(\Delta t_N)\ (0 \le \varepsilon \le 1)$$

Based on this, the spatial interdependence between tax cuts of local jurisdictions will be examined. Here spatial interdependence is conceptually replaced with spatial correlation in order to estimate it statistically. Spatial correlation, a basic concept for spatial statistics, means the correlation among values of a single variable strictly attributable to their relatively close locational positions on a two-dimensional surface, introducing a deviation from the independent observations assumption of classical statistics (Griffith 2003, 3).[13] To estimate the spatial correlation, Moran's I indicator and Moran scatter plot are employed in this study. Moran's I statistic of spatial autocorrelation is a useful measure to identify the spatial autocorrelation.[14] The value of Moran's I ranges

13. The correlation in the statistics is the direction and degree of linear relationship between two variables, whereas the spatial correlation is the spatial (linear) relationship between multiple observations for one variable. Since the relationship is assumed to exist between observations in one variable, not between variables, spatial correlation is called spatial autocorrelation more frequently than not.

14. Moran I statistic is estimated by comparing the values of neighboring spatial units according to the following formula.

$$I = \frac{n\sum\sum w_{ij}(x_i - \bar{x})(x_j - \bar{x})}{W\sum(x_i - \bar{x})^2}$$

From the above formula of Moran's I statistic, we can know intuitively that the value of Moran's I ranges from -1 for negative spatial autocorrelation to +1 for positive spatial autocorrelation.

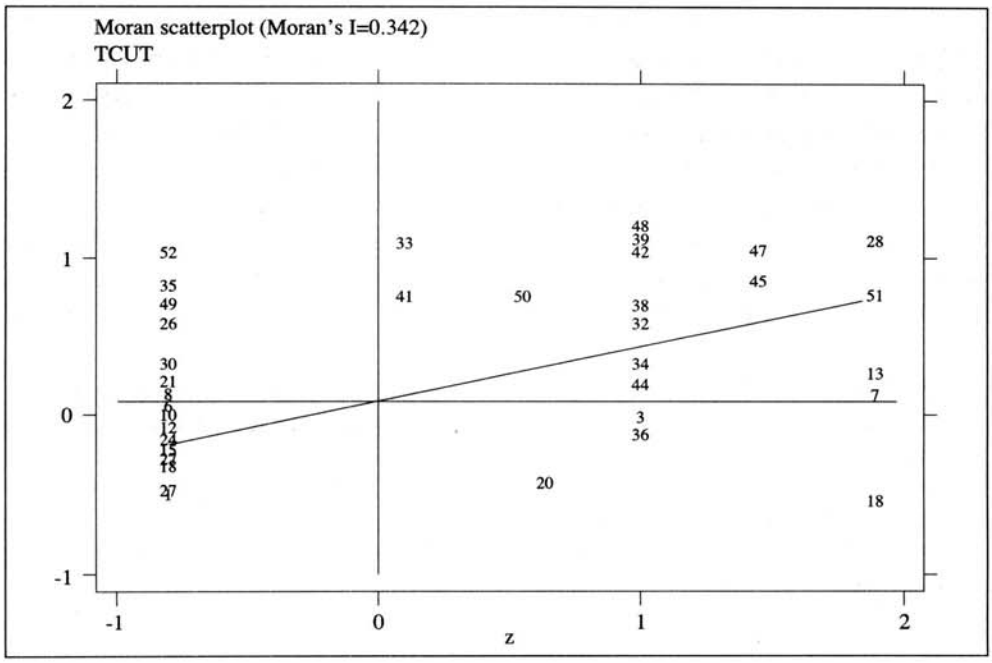
from -1 for negative spatial autocorrelation to +1 for positive spatial autocorrelation. If neighboring spatial units have similar values over the entire region, it will have positive spatial correlation. If they have dissimilar values, it is called negative spatial correlation. No spatial autocorrelation means that there is no particular systematic structure of how the pattern is formed (i.e., the pattern is close to a random pattern).

Table 4 provides the Spatial Correlation between Tax Cuts of local jurisdictions in 2004. Moran's I statistic under the border matrix[15] shows that there is a positive spatial interdependence between Tax Cuts of jurisdictions when the other two key factors, fiscal

Table 4. Spatial Interdependence between Tax Cuts of Neighboring Jurisdictions

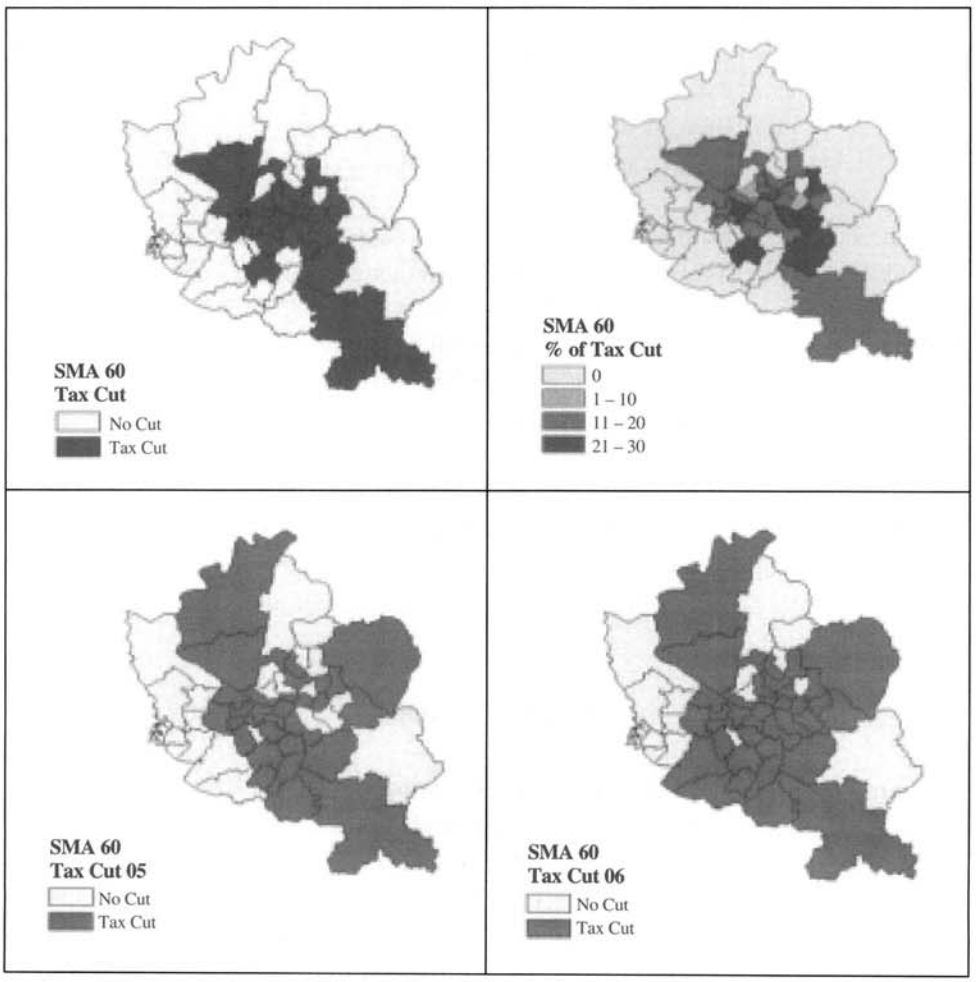
Variables	Moran I	z	p-value*
Property Tax Cut	0.321	4.425	0***
Fiscal Independence	0.159	2.359	0.009***
Condominium Price	0.604	8.327	0***

Figure 6. Moran Scatterplot



15. Border matrix is a symmetric matrix which is composed of 1 and 0. 1 is given to local governments if they share the boundary with each other. If not, they will be coded by 0.

Figure 7. Spatial Patterns of Property Tax Cuts in SMA over Time



independence and condominium price, are controlled. Also fiscal independence and condominium price have a spatial correlation. This implies that the spatially correlated property tax cuts are the result of two key factors.

The Moran scatter plot is a measure of global spatial autocorrelation or overall clustering in a dataset.[16] It provides a statistic (Moran s I) to determine the extent of linear association between the values in a given location (X-axis), and values of the

16. Glossary of Terms in GeoDa site, p 10, https://www.geoda.uiuc.edu/support/help/glossary.html.

same variable in neighboring locations (y-axis). To compare a location's values with its neighboring values, the Moran scatterplot regresses a spatial variable (y-axis) on the original standardized variable (x-axis). The values of X are standardized in mean of zero and a variance of one. The four quadrants of the scatterplot describe an observation's value in relation to its neighbors; starting with the x-axis, followed by y: High-high, low-low (positive spatial autocorrelation) and high-low, low-high (negative spatial autocorrelation).

In the Figure 6, the slope for overall Moran's I statistic is clearly positive, and spatial interdependence possibly exists in the data, although a Moran I statistic is not calculated for 2005 and 2006 due to the lack of relevant data from 2005 and 2006. It is predictable that this spatial interdependence will be stronger in 2005 and 2006. Figure 7 compares the distributive maps of property tax cuts in 2004 with the maps for 2005 and 2006 (Figure 7). We can notice that the geographical proximity also exists between the local governments which cut the property tax in 2005 and 2006. In addition, the tax cuts are spatially diffused over time. It seems that the social learning or competition occurs in the adoptions of the property tax cut policy across jurisdictions of the SMA. Finally, it is fair to say that the theoretical model explains logically why the property tax cuts occur ed in a domino fashion and are diffused across the SMA.

CONCLUSION

For my theoretical analysis, I modified the formal model that Epstein and O'Halloran designed and applied it to the case in this study because it considers three different perspectives of main actors in the model of the property tax cuts (Figure 1). Based on the formal model, this study analyzes the property tax resistance of the SMA from the viewpoint of policy implementation and delegation of the administrative discretion. The model examines three different strategies which three actors used to maximize their utility, although it focuses a little more on local government's strategic use of the delegated discretion under the condition of two principals. The model in this study also analyzes the SMA case dynamically, tracing the time line of the tax competition over three years.

This study shows that the conflicts between residents, local governments, and the central government in the property tax hike is the result of the short-term equilibrium under imperfect information or uncertainty, which is the property tax cut beyond the optimal level tax cut. Under short-term conditions, the local government tends to respond to the residents' request for a tax cut, depending on their fiscal independence and neighboring local jurisdictions' decision-making on the property tax cuts. The pat-

tern of property tax cuts over time implies that many local governments may be very sensitive to their re-election. These behaviors all result from imperfect information about, or uncertainty in, the central government's institutional sanction—withdrawal of the property tax discretion. From the long term view, the residents and local government will have more information on the strategy which the central government will take. Then they will consider the institutional sanction in their decision-making. However, if the sanction is voided in the near future for reasons such as the turnover of political power, then the new equilibrium will be the solution to the interaction of the three actors.

Although Epstein and O'Halloran designed their model to analyze the pattern of implementation and delegation in the long-term international trade policy under the divided government system, its modified version is also very well applicable to the short-term implementation and delegation issue. This model will not bring specific figures to the analysis, but can formalize the fundamental characteristics of the three actors' interactions. Formalized models—formal models—generally look unrealistic because they require a great deal of simplification of the real cases. In the formal model of this study, many specific points of the real case, such as the details in the property tax system or the political ideology, are bridged through the formalization (Margo and et al., 1998, Nice, 1987). With several descriptive analyses and some data for the case, however, the theoretical model gives a logical explanation for the behavior of residents, local governments, and the central government in the short-term tax resistance. Further, it provides a long-term prediction for their behaviors, depending on the institutional change.

Finally, the formal model contributes to this study by complementing the lack of empirical data/precedent literature, and clarifies the causality between the factors in which we are interested. The empirical model's approach provides a statistical test of the causality between the result and causes with real data. However, the empirical test does not guarantee that the result of the test is always robust from the possibility of statistical biases. Sometimes the result of empirical analysis is simply the result of a spurious relationship between the dependent and independent variable (especially when the observations are quite limited). The formal model approach has the weakness in providing empirical evidence but clarifies the logical causality between the result and causes in the mathematical form. This approach is, therefore, known as one of the scientific methods for policy analysis when it is very hard to conduct an empirical analysis on the case or to find scholarly works relevant to the case (Morton, 1999).

Future study needs to introduce some constraints in the model and to develop the empirical model further. To establish the empirical model, it should identify the constraints which can represent the real conditions, combine them into the solution of the

theoretical model properly, and finally derive the equation for the empirical analysis. It is believed that with enough data and a reasonable empirical model, future research will attain more reliability as well as consistency. Also, the horizontal competition (or conflict) between local governments must be analyzed more clearly in the future study. In this study, the spatial correlation between tax cuts is examined. The significant spatial correlation implies the existence of the spatial interdependence which in turn means that the empirical model should not overlook the simultaneous interactions between local governments.

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