LOCAL SHARE TAX SYSTEM IN KOREA

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I. Introduction

Prior to 1990s, the roles and fiscal functions of local governments in Korea were limited. Important projects and fiscal programs were consulted and approved in advance, and closely monitored by the central government. In this process, local residents preferences were not always reflected. The intergovernmental fiscal relation dramatically changed with the introduction of decentralization in mid 1990s. Local residents now elect local government officials, and the elected become more responsive to the demands of local residents. Since 248 local governments are not alike in many aspects, local governments are required to meet differentiated tastes of their residents. Consequently, with decentralization local residents demands a local government to do more.

Local government's autonomy tends to improve social welfare of its residents, but it comes with costs. Some problems arise. Ideally, each local governments could meet the residents' demands for local public services with its own resources. However, it is difficult to do so because tax bases and fiscal capacities are unevenly distributed across the regions. This is particularly true for Korea where local government's own revenues remain at 30% of total revenue on average (Table 1). As a result, public demands needs to be financed by not only local tax revenues but also by fiscal transfer from the central government. In 2002, only handful of local governments had sufficient

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own fiscal resources while most of local governments relied significant portion of their resources on fiscal transfer from the central government (Table 2). Typically, under this situation the marginal cost of fiscal transfer is perceived much lower than the marginal cost of raising extra dollars from local tax, local public goods are provided at inefficient level - so called 'fiscal illusion'.

Fiscally weak status of a local government raise the reliance on fiscal transfer from the central government. As shown in the Figure 1, the proportion of fiscal transfer out of total local government's revenues has risen since 1993. A decline of the ratio in early 1990s is due to a rise in local tax revenues as the central government reallocated several tax bases to the local governments[1]. This, in turn, prevents local tax system from functioning as price for local public goods and causes to lower fiscal discipline. Since the election of local governments' officials in 1995, the proportion of transfer resources to total revenues has continuously risen until the late 1990s when the financial crisis hit the economy.

The local government tax revenue is far from stable and predictable. For example, during 1997~98, the national tax revenue decreased by 3%. The local tax revenue declined by 6.8% in the same periods. This is partly because local tax revenue is sensitive to business cycles by nature as it comes heavily from taxing properties in the current tax assignment. Local governments' fiscal disciplines may be a part of the story as evidenced by the collection ratio (see Figure 2). Note that the tax collection ratios of the central and local governments co-varied over time, although they have different magnitude.

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[1] The tax bases transferred to the local governments are: cigarette tax(1989), aggregate land tax(1991) and regional development tax(1992).

Building a sound local government finance system requires an effective intergovernmental transfer system. A transfer system can be said desirable if it is 'simple, comprehensible, and reliably predictable' (Bird and Smart, 2001). A transfer system also needs to address 'vertical balance' (fiscal relations between the central and the local governments) as well as 'horizontal balance'(fiscal relations among local governments).

Previous studies suggest useful guidelines for an effective transfer system. First, a system must consider economic efficiency (by not distorting the price of local public goods) and equity in the provision of public services. Shah(1996) mentioned that fiscal transfer program which focuses on the equalization of per capita tax burden (e.g., Canadian system) can not be complete in terms of economic efficiency and equity. Second, a system must be simple, predictable, and transparent as possible as it can be. The fiscal situation differs from places to places and it is one of the primary reasons why fiscal transfers exists. It is tempting to account for regional heterogeneity as much as possible in a single distributive formula. However, as Bird and Smart(2001) pointed out, the "introduction of too many refinements" ruins the transparency and accountability of an entire fiscal transfer system. Third, various types of transfers(e.g., conditional vs. unconditional, matching vs. non-matching) have own purposes so that the objective and the use of grants must be coordinated harmoniously. Finally, a well-designed transfer should be neutral with respect to local governments' strategic behaviors. Otherwise, so-called 'perverse incentive' or 'moral hazard' problem may occur so that the system favors those who should be favored the least.

The focus of this paper is the Local Shared Tax (LST) system. the dominant form of intergovernmental transfer in Korea. It is comprehensive in a sense that the

formula considers regional differences in both fiscal needs and fiscal capacity. A wrinkle of the system is that too many refinements sometimes turns the formula into obscure and ambiguous one. In particular, the complexity in the calculation of the standard fiscal needs is point out by many scholars and several suggestions have been made to simplify the formula. Given that the current method for the standard fiscal needs ultimately relies on a few variables such as population and number of local government officials, the formula appears to be unnecessarily complicated than it should be. A special attention is given that oversimplification may ignore regional heterogeneity in fiscal situation completely. Not to make such mistake, this paper utilizes as many information as possible by using time-cross section data in stead of analyzing a single year cross section data. In addition, a simple model for net fiscal benefits is presented and an empirical analysis is carried out. Unlike previous studies, geo-spatial features are explicitly incorporated in the examination of regional variations of net fiscal benefits.

This paper is organized as follows. In the next section, general theory of grants are briefly introduced. Models for equalization grant for fiscal revenues, needs, fiscal gap between needs and revenues are explained in a illustrative way. In section III, intergovernmental fiscal transfer systems from various countries are group and compared. For each type of transfer system, the strength and weakness are discussed. Section IV introduces fiscal transfer - Local Shared Tax, Local Transfer Funds, and National Treasury Subsidy- in Korea. Legal and historical backgrounds are reviewed with emphasis on the Local Shared Tax system. Section V, the main part of this paper, consists of three parts. In the first part, a simple model for net fiscal benefits are presented. Net fiscal benefits are empirically estimated for the counties and its

distribution is examined spatially. The second part deals with issues on the simplification of fiscal needs calculation. It highlight a estimation bias caused by the use of single year cross-section data. Although not completely, such bias can be reduce when panel data sets are utilized. In the last part, factors determining Local Shared Tax are empirically tested. Section V concludes this paper.

II. General theory of grants

In this section, a general theory of grants are briefly introduced. For more rigorous and details one can refer to Bennet(1982), Shah(1994) and Kim(2001).

2-1. Resource equalization grant

The purpose of a resource equalization grant is to achieve the equity of tax bases of different local governments. A good example can be found in the Canadian system of which goal is stated in the Canadian Constitution Act(1982, 36[2]): a grant "to ensure that provincial governments have sufficient revenues to provide reasonably comparable levels of public services at reasonably comparable levels of taxation". A rationale for this type of grant is that each local government should be able to come up with the same (per capita) tax revenues at the same tax effort regardless of difference in their tax bases . In its implementation, tax bases and tax effort should be appropriately measured. Although a country might have complicated tax bases and tax rate (as a proxy for tax effort), data on these measures are easily available in most of countries.

Figure 3 graphically explains how the resource equalization grant is determined. Denote two local governments by G_i^* and $G_i^{'}$. Assume that two governments have different (per capita) tax bases such that $Y_i^* < Y_i^{'}$. The slope of R represents tax rate. Hence, tax rate of R (steeper one) is higher than that in R' (i.e., $t > t'$). Tax revenues (in per capita), the product of tax base and tax rate, are depicted along R. To raise $N_i^{'}$ as tax revenues, the local government $G_i^{'}$ applies t' to its tax base $Y_i^{'}$ while G_i^* must impose a higher tax rate t on Y_i^*.

A resource equalization grant is to guarantee that both government have the same amounts of tax revenues with the same tax efforts. To do so, a grant TF must be given to the local government G_i^* such that $Y_i^* + TF = N_i^{'}$. The result is that of total tax revenue $N_i^{'}$, the local government G_i^* raises C ($= t \times Y_i^*$) from its taxpayers and the rest ($=N_i^{'}-C$) needs to be transferred as a resource equalization grant.

2-2. Needs equalization grant

A needs equalization grant seeks an equity in the fiscal expenditures among local governments. By equity in expenditures, it means that each local government spend the same proportion of expenditures on a given public services at the same level of performance (Bennet, 1982). Tax capacity or tax burden sides of local government finance is completely neglected in this type of grant.

Per capita (or per unit) fiscal need of each local government and a national (or average) minimum standard fiscal needs are required. A fiscal need is supposed to vary across local governments with difference in its population density, the size of area, socio-historical backgrounds, geographical and others factors. A national minimum standard can be measured from expenditures on basic local public service.

Given a local fiscal need and national standard, a needs equalization grant can be determined. Let N_i'' be a national minimum standard of (per capita) needs. and N_i and N_i' be the standardized fiscal needs for local government G_i^* and G_i' in Figure 3. Then, the amount of grant for equalization is the difference between the standardized and national minimum. For G_i^*, it is $N_i - N_i''$. Note that G_i' receives $N_i' - N_i''$ as the equalization grant even if can afford it through local tax revenues.

2-3. Close the gap approach

A grant to close a fiscal gap combines features of revenue and need equalization grants. Unlike the above approaches, both fiscal needs and fiscal revenues for each local government are measured and the differences determines the size of grants of the local government. One can write the grant in the simplest form by N_i-R_i. According to Figure 3, the local government has of the grant as fiscal needs exceed the fiscal revenues. On the other hand, G_i' does not receive any grant because fiscal gap (= needs - revenue) does not exist.

Commonly, fiscal transfer creates a perverse incentive or moral hazard problem. In other words, a local government's intentional weakening of the fiscal discipline is awarded by the central government. Suppose that a local government maximizes its resident utility, which is the function of after-tax income and provision of local public services. Without any transfers, the cost of local public services must be entirely financed by local tax revenue. Thus, there exists a trade-off relationship between after-tax income and consumption of local public services. In the case where fiscal transfer fills the shortage of fiscal resources to needs, a local government is tempted to reduce tax revenues (so increase after-tax income) by making less tax efforts, hoping that

decrease in tax revenues is compensated by increase in fiscal transfer. This undesirable response can be easily seen in the Figure 3. Suppose that the government G_i^* raised tax revenue to A with a higher tax effort (t) along R_i, and total expenditures are $N_i^{'}$ which is entirely financed by local tax revenue. In this case, a utility-maximizing government equates marginal benefit from provision of public service to marginal cost of providing it, so that fiscal efficiency is naturally guaranteed. On the other hand, the government collects C as local tax revenues at a lower tax rate t'. Given the fiscal needs $N_i^{'}$, the amount of AC ($=N_i^{'}-C$) must be financed through fiscal transfer. In this case, marginal benefit from provision of public service is not equal marginal cost of providing it, yielding fiscal inefficiency.

III. Intergovernmental Fiscal Transfer in Other Countries

Extensive works have been done on the comparative analysis of intergovernmental transfer across countries. Ma(1997) compared intergovernmental transfer of nine countries. Shah(1994) looked into the reforms of intergovernmental fiscal relations in the developing and the emerging economies. In his report, Winkler(1994) investigated issues on the design and administration of intergovernmental transfer in Latin American countries.

In the study of the cross country comparison of intergovernmental fiscal transfer systems, it is important to recognize the differences in the underlying political cultures and in the national building. A well-designed fiscal transfer for a federal government may not be suitable for a unitary government. Even in the federal system, a

different structure of federalism produces different types of intergovernmental fiscal relations (Bird and Smart, 2001). Therefore, no intergovernmental transfer can be universal example and researchers must notice that each system needs to be carefully evaluated and modified if necessary, for the better fit for each individual country.

In this section, intergovernmental fiscal transfer are categorized in a couple of groups and the strength and weakness of each type are discussed, in stead of listing intergovernmental fiscal transfer systems from various countries in sequence.

2.1 Type A: Grant to fill fiscal gap (Korea and Japan)

Let N_i, R_i, and G_i denote fiscal needs, revenues, and grants, respectively. A grant to fill fiscal gap is determined by the difference of needs and revenues of each local government. In a simplest form, a grant can be written as $G_i = N_i - R_i$. From country to country, there is a slight modification of this basic formula. In Korean system, the grant formula is given by $G_i = \beta(N_i - \alpha R_i)$, where the parameter α (<1) is called the 'inclusion ratio' of fiscal revenue which provides an incentive for a local government to raise more local tax revenues, and the other parameter β is called the 'adjustment factor' that equates demand for grant to its available resources (15% of domestic tax revenues). The Japanese system is basically similar to the Korea, and it is by $G_i = \beta N_i - R_i$.

The advantage is that this type of grant serves the best for the purpose of fiscal equalization. The disadvantage is that extensive data sets on detailed fiscal information are required in order to calculate needs and revenues.

2.1 Type B: Grant to equalize fiscal capacity (Canada)

This type of grant attempts to equalize (per capita) tax revenue while the fiscal needs side being completely ignored. Mathematically, the amount of grant is determined by $G_i = [(pctb)_{avg} - (pctb)_i] \times \bar{t}$, where $(pctb)_{avg}$ is an (national) average per capita tax base, $(pctb)_i$ is per capita tax base of local government i, $\bar{t}$ is a representative tax rate, N_i is the size of population of local government i. The term $(pctb)_i \times \bar{t}$ is the tax revenue that the local government could raise if it applied an average tax rate to its tax base. For $(pctb)_{avg}$, Canada uses the tax bases from five provinces (British Columbia, Saskatchewan, Ontario, Manitoba, and Quebec) as its standards.

The advantage of this system is that it demands less data, and hence it is easy to implement. The disadvantage is, as Shah(1996) mentioned, it can not achieve economic efficiency and equity as it ignores regional difference in the fiscal expenditures in supplying local public services from a grant decision.

2.1 Type C: Other types of grant (Germany, United Kingdom)

German intergovernmental fiscal relation is distinctive in two aspects. First, all major tax revenues are basically shared by the federal and states. For example, 44% of VAT is distributed to local governments by per capita bases and by fiscal capacity(Shah,1994; Ma, 1997). Other taxes such as personal income tax and corporate income tax, are shared by the federal and the state governments. Second, a unique feature of German system is that the intergovernmental transfer is fraternal, meaning that fiscally rich states contribute the equalization funds from which fiscally needy states can withdraw. For each local government, based on its tax capacity (*TC*) and

needs (N), the amount $E_i = ATC_i - N_i$ is calculated. Depending on whether $E_i > 0$ or not, a local government either contributes to or receives from the funds (Shah, 1994).

Revenue Support Grant (*RSG*), the intergovernmental fiscal transfer in the United Kingdom, is based on three factors: Standard spending assessment(*SSA*), standard local tax income (*SLTI*), and income from non-domestic rates (*NDR*). Then, $RSG_i = SSA_i - SLTI_i - NDR_i$ (Ma, 1997). *SSA* is the government's assessment of local government fiscal spending and it is the most complicated component in the calculation. *SLTI* is obtained from centrally-set local residential property tax rate times reported tax base of the previous year. *NDR* is a separate transfer from the central to local which is determined on per capita basis (Ma, 1997).

IV. Intergovernmental Fiscal Transfer in Korea

The history of intergovernmental fiscal transfer in Korea is dated back to 1951~2 when the Local Allocation Tax Law was enacted. Since then the intergovernmental fiscal system underwent many dramatic changes. Today, three types of fiscal transfers exist in the current system: Local Shared Tax (LST), Local Transfer Fund (LTF), and National Treasury Subsidy (NTS)[2]. Figure 4 shows the trend of each type of fiscal transfer. In early 1990s, LST accounted for about 60% of total intergovernmental transfers, NTS was the next accounting for 25~30%, and LFT accounted for the rest. This compositions dramatically changed in late 1990s. In 1999~2000, LTS was about 40% of total transfer and NTS and LTF increased up to

[2] For details and comparative study on fiscal transfer system in other countries, see Ma(1997).

60%. Won(2001) pointed out that dramatic increase in NTS and LTF in late 1990s was the result of the central government's effort to make up the loss of local tax revenues during the financial crisis. Most recently, it is predicted that the share of NTS and LTF declines as the economy starts to recover from the crisis.

LST is dated back to 1951~2 when the Local Allocation Tax Law was first enacted. At that time LST was a certain percentage of a few specific tax. Over time, the tax bases for LST were broadened such that tax on electricity and gas, tax on liquor consumption were gradually included in late 1960s. In 1972, the government abruptly suspended the Local Shared Tax Law. Accordingly, total amount available for LST was determined on yearly basis by the congress. It was not until in 1983 that the funds of the LST was again set as 13.3% of the domestic tax revenue and increased in 1983 to 15% of the domestic tax revenues in 2000 (=national tax - tax on transportation, education, and rural development - custom duties). Table 4 shows the change of the Local Share Tax and related laws in a chronological order.

LST consists of two parts: the Ordinary Local Shared Tax and the Special Local Shared Tax. The Ordinary LST is a formula-based general equalization grant to financially support basic local public services. It is designed to close fiscal gap by distributing 10/11 of 15% of the domestic tax. In practice, the amount is determined by the gap between standard fiscal needs and revenues of each local government. The flow chart shows the procedures of the Ordinary LST. The Special Local Shared Tax, on the other hand, is determined not by a formula but at the government discretion. Using 1/11 of LST funds, and it finances fiscal emergency of local governments, projects of the national interests, recovery of natural disasters, and regional development. Due to lack of transparency and accountability, the Special LST is currently under a debate.

LTF was introduced in 1991, as a block grant. The purpose of the fund is to provide financial resources for projects in broadly defined five categories: Roads, sewage, regional development, rural development, and juvenile care. The resources of this fund come from 100% of liquor tax, 14.2% of transportation tax, 15.3% of special tax on rural development. The assignment of funds to projects and regions is preset.

Finally, NTS is a conditional matching grant provided by the central government to local governments. The primary purpose of NTS is to promote local projects which might have externalities beyond the local area. NTS can be classified into three: National Treasury Share, Promotion Subsidies, and Specific Grants. National Treasury is given in response to natural disasters. Promotion Subsidies is a grant for local projects, and Specific grants are given under a certain conditions such as local elections. The following table compares an contrast LST, LTF, and NT

V. Net Fiscal Benefits, Fiscal Needs, and Transfer

5.1 Measuring net fiscal benefits

One of important functions of a fiscal transfer is to improve economic efficiency. One way is to equalize net fiscal benefits across regions, reducing an economic incentive of people to disproportionately migrate from one place to other (Shah, 1994). Consider two areas, *A* and *B*. Assume that a resident derives his utility from net fiscal benefits consumption (*NB*) and private consumption (income, *w*). Thus, $U_A = NB_A + w_A$ and $U_B = NB_B + w_B$, respectively. An economically induced migration

occurs from *A* to *B* as long as $U_A<U_B$. At $U_A=U_B$, the migration stops. Interregional labor productivities may be different depending on the size of and . Different labor productivity reflects underlying economic inefficiency because overall productivity can be improved by reallocation of the residents from low productivity region to high productivity region. Under the ideal situation, $NA_A = NB_B$ that the size of local population is determined at the level $w_A = w_B$ as an equilibrium.

Measuring net fiscal benefits is a challenging task. A direct method measures costs and benefits of local public services of each local government. A less direct way is to impose structure of per capita utility function and to apply an econometric method. To be specific, suppose that net fiscal benefits (*b*, hereafter) of an individual living in a local area *i* can be written as (Boadway and Flatters, 1982):

$$(1) \qquad b_i = u(\frac{g_i}{N_i^{\beta}}, t_i) = \frac{g_i}{N_i^{\beta}} - t_i \quad \text{subject to.} \quad g_i = t_i N_i + s_i N_i$$

where g_i is the expenditures on public goods by local government *i*, N_i is the size of population, t_i is per capita tax rate, and s_i is the amount of per capita fiscal transfer from the central government. We ignore the private consumption to simplify the model. Each individual enjoys g_i / N_i^{β} amount of utilities from public goods provision, and pays t_i as a cost. The parameter $\beta \in [0,1]$ measures the degree of 'publicness' of goods provided by the local government. For pure public goods, β must be equal to 0 so that there is no rivalry in the consumption of public goods among residents (i.e., $g_i / N_i^{\beta} = g_i$). For private goods, as an opposite case, β is equal to 1, implying that a consumption of the local public goods is exclusive.

The expenditures on the public goods does not have to be financed entirely by local tax revenues. As in the budget constraint, the central government assists the local government's provision of public goods through intergovernmental fiscal transfer, s_iN_i. For simplicity, this model does not account for types of fiscal transfer methods (i.e., general, conditional, matching, and etc) and the different implications that each transfer method might have on the resident's utility. Note that the per capita transfer, does not have to be constant across the local governments[3].

Each local government is legally entitled to have a different tax rate (elastic tax) in Korea. However, the application of different tax rates across the local governments is not common in reality. Interestingly, some local governments would not lower local tax rate even if their fiscal capacities consistently exceed fiscal needs. The question why the local governments have the same tax rate is interesting but it is beyond the scope of this paper. In the model, it is assumed that $t_i=\bar{t}$ for all i. (see Table 6)

By substituting $t_i N_i + s_i N_i$ for g_i in (1), and writing in log form yields:

$$(2) \qquad s_i = \alpha + \gamma \log N_i + c_i + \varepsilon_i ,$$

where $c_i = (b_i, \bar{t})$ with $\partial c_i / \partial b_i > 0$. Perfect equalization of net fiscal benefits means that $c_i=c$ for all i. In this case c_i is identical to all local governments, and it can be absorbed into the intercept term α. Different net fiscal benefits across local governments result in different c_i, and hence (2) must be modified as

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[3] The British Non-Domestic Rates (NDR) is fixed amount per capita transfer so that s is constnat across all local governments.

(2-1)' $s_i = \theta_i + \gamma \log N_i + \varepsilon_i$,

where $\theta_i = \alpha + c_i$. One might think of calculating net fiscal benefits by estimating θ_i from (2-1). Unfortunately, this is impossible because θ_i is not distinguishable from ε_i with a single year cross-sectional data. One may attempt to include a dummy variable for each local government, but it does not work due to the well-known 'incidental parameter problem'.

The difficulty in obtaining θ_i from cross-sectional data can be solved to a certain extent by using a panel data set. Suppose that net fiscal benefits of a local a government remain relatively stable over reasonable length of time interval. That is $c_{it} = c_i$. In a panel-data version of (2), per capita transfer for local government *i* at time *t*, can be written as:

(3) $s_{it} = \alpha + \gamma \log N_{it} + c_i + \varepsilon_{it}$.

Using the standard fixed-effect model, one can estimate the parameters of (3) and obtain c_i by calculating:

(4) $\hat{c}_i = \bar{s}_i - (\hat{\alpha} + \hat{\gamma} \log \bar{N}_i)$, where $\bar{x}_i = \sum_t x_{it} / T_i$

From the estimated value of c_i, one can recover the net fiscal benefits, b_i. The results of (3) are reported in Tables 7. As expected (see Figure 6), a significant negative coefficient of (log of) population is reported. From $\hat{\gamma}$, β is calculated equal to 0.58 at

$\bar{t}$=0.125. Note that the value of β is not directly comparable to those reported in other countries because local shared tax in Korea does not include fiscal transfer for local education.

Using these values, net fiscal benefits of each local government are calculated. The estimated values of *c* are converted into the net fiscal benefits, *b*. It has a mean value of 0.877 with its standard deviation 0.066. As shown in Figure 7, the distribution of net fiscal benefits appears to be fairly dense so that 93% of all observations falls within the range of 2 standard deviations around its mean.

While the pdf of net fiscal benefits gives a useful information on its distribution, it delivers less information about the regional variations of net fiscal benefits on the spatial dimension. For the better understanding of this point, two simulated maps are created, as examples, based on the same values of net fiscal benefits used in the pdf of Figure 7. In the first map (Figure 8), a strong geographical clustering pattern is observed in the net fiscal benefits while in the second map (Figure 9) such patter is not obvious.

The figure 10 illustrates actual geographical distribution of net fiscal benefits for the counties. To see the spatial pattern of the net fiscal benefits systematically, a spatial weight, w_{ij} is defined such that w_{ij} =1 if *i* and *j* are considered as neighbors and w_{ij} =0, otherwise. Then, the association of net fiscal benefits with locational similarity can be measured by the Moran's *I* (Moran, 1948):

$$(5) \qquad I = (N / S_0)[\sum_i \sum_j w_{ij} z_i z_j] / \sum_i z_i^2 ,$$

where $z_i = nb_i - \overline{nb}$ and $S_0 = \Sigma_i \Sigma_j w_{ij}$. In the case where net fiscal benefits do not show a spatial pattern (hence no spatial correlation), the expected value of *I* is known to be close to $E(I) = -1/(N-1)$. The larger the value of *I* ($I > E(I)$), the distribution of net fiscal benefits can be said a positive spatial autocorrelation, meaning that net fiscal benefits of local *i* tends to be similar to that of local *j* which is a spatially contiguous neighbor. If $I < E(I)$, a negative spatial autocorrelation exists, meaning that a high value of net fiscal benefits of local *i* tends to be associated with a low value of net fiscal benefits of the neighboring place *j*. The statistical significance of the spatial autocorrelation is based on the *z*-statistics.

If the current intergovernmental fiscal transfer system is successful to equalize net fiscal benefits across the local governments, the degree of association between net fiscal benefits and locational vicinity should be weak. In other words, net fiscal benefits (per capital, after controlling other variables) should not be clustered geographically in a systematic way.

The result shows that the Moran's *I* has the value of -0.03 with *z*-statistics being equal to -0.21, which is insignificant at the conventional level (see Table 8). No obvious spatial autocorrelation is detected in the estimated net fiscal benefits. Consequently, net fiscal benefits among the counties seem to attain regional equality on the geographical dimension.

5.2 Calculation of Standard Fiscal Needs.

The standard fiscal needs for a local government *i* at time *t* can be written as the following:

(6) $FN_{it} = W_{it} c_t \theta_{it}$,

where W and c indicate workloads in the provision of local public services and a monetary cost for one unit of W, respectively. The last term, θ is called a modification factor, which reflects local government's specific fiscal situations.

In spite of a simple formula posited in (6), the calculation of fiscal needs are difficult and complicated in practice. The lack of transparency in (6) is due to the complexity of formula. In fact, the standard fiscal needs are based on 31 measuring units[4], although most of categories could be summarized by a limited number of the measurement units (e.g., size of population, area, number of local government officials, see the following table in the next page). This feature opens the possibility to simplify the formula substantially. Another reason for the complexity has to do with the method of modifying standard fiscal needs. A modification factor exists because a strict application of the formula is somewhat undesirable due to the heterogeneities in the fiscal situation of the recipient governments.

Without loss of generality, let assume that fiscal needs are measured by one variable[5]. Dividing both sides of (6) by W yields per unit measure of fiscal needs at a given time (subscript for time is suppressed):

(7) $FN_i / W_i = c\theta_i$ or in logarithm $fn_i = \tau + \phi_i$

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[4] In the official chart, there are 12 broadly-defined categories but each category has 2~3 subcategories so that total number practically becomes 31.

[5] The most common and typical measuring unit used in the current fiscal needs calculation. is the size of population.

where fn_i =log(FN_i/W_i), τ=log(c), and ϕ_i =log(θ_i). Note that the unit cost is uniformly applied to all local governments so that there is no subscript attached in the notation. The difference in per unit measure of fiscal needs arises from the different values of ϕ_i. From (7), the role of modification factor is to adjust fiscal amount for a better fit to the local government needs.

In a simple form, ϕ_i can be expressed as a function of standardized local fiscal needs and their national average. The standardized fiscal needs are the amounts that a local government should have in order to provide local public services given its workloads. In the calculation of 'standardized' local fiscal needs, a regression analysis is commonly used. Let A_i, e_i and w_i be expenditures, the log of per unit expenditure (i.e., e_i =$ln(A_i/W_i)$) and workloads in measuring units (i.e., w_i= lnW_i) of the local government i, respectively. The regression equation to be estimated can be written as:

(8) $e_i = \delta_0 + \delta_1 w_i + \varepsilon_i$.

One could obtain estimated parameters, (δ_0,δ_1) using a standard econometric technique. From the estimated parameters, the standardized per unit fiscal needs for the local government are given by the conditional mean of e_i given w_i. That is, $\hat{e}_i = E(e_i \mid w_i) = \hat{\delta}_0 + \hat{\delta}_1 w_i$. The national average of per unit fiscal needs is the unconditional mean which is equal to $\bar{e} = E(e_i) = \hat{\delta}_0 + \hat{\delta}_1 \bar{w}$. From $\hat{e}_i$ and $\bar{e}$, one can write ϕ_i as the following functional form:

(9) $\phi_i = \hat{e}_i - \bar{e}$.

Note that $\hat{e}_i$ is the amount that a local government with w_i needs to meet its fiscal needs from the estimation and that it is not necessarily equal to actual amount (e_i). A natural assumption is that ϕ_i increases with $\hat{e}_i$, implying a local government with larger standardized fiscal needs being treated more favorably in the calculation of fiscal transfer.

Since the average unit cost, τ, should be equal to average per unit measure of expenditure of all local governments by definition, it must be that:

(10) $\tau = \bar{e}$

By substituting (9) and (10) into (7), per unit fiscal needs can be expressed by:

(11) $fn_i = \hat{e}_i = \hat{\delta}_0 + \hat{\delta}_1 w_i$

An important point in (11) is that the formula for the standardized fiscal needs might enable a local government to affect the amount of transfer by manipulating its fiscal needs through measuring units (w_i in (11)). Therefore, it is very essential to include only variables beyond a local government control in the regression equation. Otherwise, a perverse incentive problem occurs so that a local government is able to

affect , and the central government consequently rewards the behavior of a local government which should be discouraged[6].

Less pointed out, but an equally important point is that there exists internal inconsistency inherent to (11). Calculating workloads using a measuring unit is a very challenging task and it is very likely to be imprecise. For example, the category of fiscal needs to control environmental and air pollution is calculated based on population. Although the size of population adversely affects the quality of air, many other elements are known to be crucial[7]. Moreover, the size of population of itself is subject to ab imprecise counts based on the estimation using registration documents or a statistics released. The result is that the number does not necessarily reflect the number of actual residents in a given geographical boundaries. From these facts, workloads proxied by measuring units are likely to have errors in measurement.

Imprecisely measured workloads cause a serious bias. It is getting worse in the estimated regression of standard fiscal needs because of the divisional problem of the dependent variable. To see this, assume that w_{it} (say, population) consists of a true measure, w_{it}^* and measurement error, η_{it}. For simplicity, let $E(\eta_{it})=0$ and $var(\eta_{it})=\sigma_\eta^2$. Measured population and true population is mathematically written by $w_{it} = w_{it}^* + \eta_{it}$. Per capita expenditure can be now written as:

$$(12) \qquad e_{it} = \ln(A_{it} / W_{it}) = \alpha_{it} - w_{it} = \alpha_{it} - w_{it}^* - \eta_{it} = e_{it}^* - \eta_{it} ,$$

---

[6] The number of local government officials and the number of administrative districts are inappropriate variables to use in the calculation of standard fiscal needs since theses variables are under the control of a local government and may create counter-incentive problems.

[7] Air population, for example, is more closely related to the number of running vehicles rather population.

where $\alpha_{it}=ln(A_{it})$, e_{it}^{*} is true amount of per capita expenditure while e_{it} is the observed per capita amount. Note that the measurement error(η_{it}) appears in e_{it} with the opposite sign ($-\eta_{it}$).

In the absence of the measurement error, a true relationship, $e_{it}^{*}=\delta_0+\delta_1 w_{it}^{*}+\varepsilon_{it}$ could have been estimated, yielding the consistent values for the parameters δ_0, and δ_1. With the measurement error, the regression equation becomes:

$$(13)\qquad e_{it}=\delta_0+\delta_1 w_{it}+[\varepsilon_{it}-(1+\delta_1)\eta_{it}]=\delta_0+\delta_1 w_{it}+\lambda_{it}$$

where $\lambda_{it}=\{\varepsilon_{it}-(1+\delta_1)\eta_{it}\}$. From (13), the regressor w_{it} ($=w_{it}^{*}+\eta_{it}$) and the error term λ_{it} are not independent of each other because both terms have in common. Statistically, it means $cov(w_{it}, \lambda_{it})\neq 0$, violating the classical assumptions in the regression analysis. The violation results in biased estimation of δ. The direction and magnitude of the bias can be seen as:

$$(14)\qquad \hat{\delta}_1=\delta_1-(1+\delta_1)\frac{\sigma_\eta^2}{\sigma_w^2+\sigma_\eta^2}=\delta_1\frac{\sigma_w^2}{\sigma_w^2+\sigma_\eta^2}-\frac{\sigma_\eta^2}{\sigma_w^2+\sigma_\eta^2}.$$

Note that $\delta_1\sigma_w^2/(\sigma_w^2+\sigma_\eta^2)$ is called as 'attenuation bias towards zero' due to a measurement error in the regressor. In addition, (14) shows another bias, the second term $-\sigma_\eta^2/(\sigma_w^2+\sigma_\eta^2)$, called 'divisional bias'. The direction of this bias is downward, which makes $\hat{\delta}_1$ be smaller than δ_1. From (14) it is immediate that $\hat{\delta}_1<\delta_1$ if $\delta_1>-1$.

Unfortunately, an exact value for $\hat{\delta}_1$ is unknown and it is difficult to determine the direction of bias. However, an empirical observation supports that per unit expenditure is negatively related due to economy of scales existing in the provision of local public goods. As a result, we assume that the true value of δ_1 is presumably in the range of (-1,0). This implies that $\hat{\delta}_1 < \delta_1 < 0$.

The fact that $\hat{\delta}_1 < \delta_1 < 0$ leads us to the miscalculation of a standard fiscal needs. Figure 11 illustrates it graphically. The horizontal axis represents w_i, while the vertical axis is for per unit expenditures (e_i). The steeper line is based on the regression of $e_{it} = \delta_0 + \delta_1 w_{it} + \lambda_{it}$, which yields a biased parameter ($\hat{\delta}_1$). The flatter line, on the other hand, is the regression line from $e^*_{it} = \delta_0 + \delta_1 w^*_{it} + \varepsilon_{it}$, which yields an unbiased parameter (δ_1). The different slopes of two lines reflect $\hat{\delta}_1 < \delta_1 < 0$.

Two lines pass the same point which is the mean value ($\bar{w}, \bar{e}$). For simplicity, suppose that the measuring unit for workloads of a local government decreases from $\bar{w}$ to w_1. Following the biased estimation, per unit standard fiscal needs of the local government is now determined at $\hat{e}$ while unbiased estimation yields the value of e_1 ($< \hat{e}$). In this case, a biased estimation tends to overestimate the per capita standard fiscal needs and it is true for the opposite case. Consequently, the use of biased estimation causes an excessive response to the change of w.

Table 10 and 11 show the trends of the standard fiscal needs and population during 1999~2002. According to the tables standard fiscal needs shows significant year to year variations given the change of population. For example, during 2000~2002, standard fiscal needs increased by 19.5% (2000~2001) and 14.8%(2001~2002) for cities,

while the corresponding population change were 3.57 and 1.87. The phenomenon may need explanation in oder to improve fiscal stability and predictability of intergovernmental fiscal transfer.

The form of the bias in (14) implicitly hints the method for the correction. Suppose the regression equation (13) is estimated using a panel data set in stead of cross sectional data. Specifically, one can estimate

$$(15) \qquad \bar{e}_i = \delta_0 + \delta_1 \bar{w}_i + \bar{\lambda}_i$$

where $\bar{e}_i = \sum_t e_{it} / T$ and other variables are defined similarly. In this case, the bias of a panel estimated coefficient δ_1^P from the true δ_1 is:

$$(16) \qquad \hat{\delta}_1^P = \delta_1 \frac{\sigma_w^2}{\sigma_w^2 + \sigma_\eta^2 / T} - \frac{\sigma_\eta^2 / T}{\sigma_w^2 + \sigma_\eta^2 / T}$$

where *T* denotes time series in the panel data. Whether the bias of the panel estimation is sizable depends on whether the variance of measurement error is substantial relative to the variance of true measure. Since the pure measurement error, is assumed to have zero means with a finite variance, both attenuation and division biases are degenerated as *T* increases infinitely:

$$(17) \quad \lim_{T\to\infty} \frac{\sigma_w^2}{\sigma_w^2 + \sigma_\eta^2 / T} = 1 \quad \text{and} \quad \lim_{T\to\infty} \frac{\sigma_w^2 / T}{\sigma_w^2 + \sigma_\eta^2 / T} = 0$$

From (16) and (17), the bias could be eliminated if each observation was followed tracked for indefinitely long periods of time (that is $T\rightarrow\infty$). With limited number of observations over-time, the bias may still exists but (17) shows that it can be reduced systematically as *T* increases.

As an evidence to support the above argument, the values of $\hat{\delta}_1^P$ are reported at different *T*s in Table 12. As *T* gradually increases, the estimated parameter $\hat{\delta}_1^P$ declines in a systematic way (i.e., $\hat{\delta}_1^P(T_1) < \hat{\delta}_1^P(T_2)$ as $T_1 < T_2$). It means that $\hat{\delta}_1^P(T_2)$ is less biased from δ_1 than $\hat{\delta}_1^P(T_1)$. The empirical results presented in Table 12 are consistent with the prediction. For example, the OLS estimated parameter using the single year of 2000 data set is -1.17.

Experimentally, after time horizon of the data sets, *T* being expanded to include 2~5 years, and the parameters are reestimated from the data sets with different time coverages. For example, using two years of data sets (1999~2000), the value of estimated parameter is reduced to -1.13 from -1.17. The values consistently decrease as more data sets are used in the estimation. A qualitatively similar results are obtained for the case of 1999.

5.3 Local Shared Tax

In this section, current local shared tax is analyzed and a suggestion is made based on the empirical findings. Among many elements that might affect local shared tax, a few factors are considered and explained in turn. First, as stated in the Local Shared Tax Act, local shared tax is supposed to achieve fiscal equity by giving a

favorable treatment to a local government with small population (see Kim, 2002). Empirically, it means that local shared tax is inversely related to the size of population. Second, the size of geographical area of a local government raises the managerial costs. Third, not only the size of population itself, but also its composition matters. For example, high proportion of those who need supports (say, the old and children) increases demand for public services, raising fiscal needs of a local government. Finally, less developed and remote areas need to be assigned extra fiscal resources since they usually receive less benefit from spillover effects that they would have if they might neighbor a large city. A good example is accessibility to medical facilities (e.g. general hospitals) which are concentrated in densely populated cities. Based on the above, the following equation is estimated:

$$(18) \qquad s_i = \alpha + \beta_1(\ln P_i) + \beta_2 A_i + \beta_3(Dep_i) + \beta_4(Dist_i) + \varepsilon_i ,$$

where s_i is per capita local shared tax in local government i, A_i is the size of area, P_i is size of population, Dep_i is the proportion of those how are younger than 14 or older than 60 to total population, and $Dist_i$ is the distance to the nearest metropolitan city from local government i. The predicted signs of parameters to be estimated are $\beta_1<0$, $\beta_2>0$, $\beta_3>0$, and $\beta_4>0$.

Utilizing the panel data, the results are presented in Table 13. All of he parameters have the expected sign. Population, area, and dependency is also statistically significant. Not surprisingly, the parameter of distance as measure for remote and less development area turns out to be insignificant because the current local shared tax does not consider this variable explicitly.

However, there is a good reason to include distance in determining fiscal transfer. As emphasized in the previous section (see equation (11)), a good candidate for the variables in the fiscal needs calculation must have two aspects. First, the variable should be associated with fiscal needs in a consistent way. In Korea (and presumably in other countries as well), the farther local governments away from a populated area, less developed and more isolated they is. As the provision of local public goods tends to be insufficient in these area, a distance is related to fiscal needs in a consistent way. Second, a variable used for fiscal needs calculation must be beyond a local government control. Otherwise, there is a perverse incentive for a local government to manipulate this variable in order to get more favorable treatment in fiscal transfer. From this point of view, geographical distance is one of the variables that are out of a local government influences.

VI. Conclusion

The success of fiscal decentralization depends on an effective intergovernmental transfer system. A transfer system had better to be simple, accountable, and predictable. It can address 'vertical balance' (fiscal relations between the central and the local governments) as well as 'horizontal balance'(fiscal relations among local governments). This paper focuses on the Local Shared Tax (LST), the primary intergovernmental fiscal transfer in Korea. A simple model for net fiscal benefit is presented and is empirically tested. The result shows that the current Local Shared Tax system seems to equalize net fiscal benefits.

The current Local Shared Tax is a formula-based grant based on fiscal needs and capacity. The formula-based grant is known to be better in attaining accountability and transparency. Unfortunately, many refinements turns a simple formula into obscure and ambiguous one as it tries to accommodate regional differences. The Korean case is not an exception. Simplification of the formula seems to be desirable in order to secure accountability and transparency of the system. In doing so, the utilization of detailed data can be greatly of use, enhancing stability and predictability of the system.

Several factors that might affect the Local Shared Tax are analyzed. Population, size of area, ratio of dependent population seems to be important elements in determining the current Local Shared Tax in Korea. The number of local government officials, and number of administrative districts should not be considered in the calculation of the Local Shared Tax because they are manipulable by local governments. In stead, this paper suggests to use distance from urban area along with the other variables in determining the Local Shared Tax because this variable is closely related local fiscal situations and it is beyond the government control.

Finally, it is worth to noting that intergovernmental fiscal transfer systems crucially depends on socio-political backgrounds and the national building. A well designed intergovernmental fiscal transfer for a federal government may not be appropriate for a unitary government. Even in the federal system, a different structure of federalism yields vastly different types of intergovernmental fiscal relations (Bird and Smart, 2001). Therefore, no intergovernmental transfer is universal and each system needs to be under careful evaluation and modification before applying it to other countries.

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Tables and Figures

<Table 1> Proportion of local own revenue to total revenue (2002)

	metro and provinces	Cities	counties	wards
Less than 10%	-	-	5	-
10~30%	4	21	72	4
30~50%	4	22	10	52
50~70%	2	16	4	8
70~90%	5	12	-	2
90% and more	1	1	-	3
Total	16	74	90	69

Source: Ministry of Government Administration and Home Affairs (MOGAHA)

<Table 2> Recipient and non recipient of the local shared tax in 2002

	total	special	metro	provinces	cities	counties
total	179	1	6	9	72	91
recipient	169		6	8	64	91
non	10	1		1	8	

source: MOGAHA, "Manual for local share tax", 2002

<Table 3> Comparison of the grant systems in seven countries >

	Equalizing Fiscal Capacities	Adjusting for Expenditure needs	Sources of equalization fund	Data requirement	Grant administration
US	No	No	Central government revenue	Ad hoc	Functional Depts. of the Federal Govt.
Canada	Yes	No	Central government revenue	Data on subnational tax bases	Dept. of Finance
UK	Yes	Yes	Central government revenue	Data on properties (provided by localities) and detailed expenditure factors (provided by various agencies)	Dept. of Environ
Germany	Yes	Weakly	VAT sharing, Inter-regional transfers(from rich to poor states)	Data on local tax bases and expenditure factors	Ministry of Finance
Australia	Yes	Yes	Central government revenue	Data on local tax bases and detailed expenditure factors	Grants Commission
Japan	Yes	Yes	fixed percentages of 5 central taxes	Data on local tax bases and detailed expenditure factors	Ministry of Autonomy
Korea	Yes	Yes	fixed percentages total nations tax revenues	Data on local tax bases and detailed expenditure factors	Ministry of Home Affrairs

source: Ma(1997), from Table 3.1 in "Intergovernmental Fiscal Transfer"

<Table 4> Legislation of LST

Related statute	Enforcement Year	Total amount	Scale of Special Local Shared Tax	Remark
Temporary Allocation tax law	1951	346.8/1000 ~ 133.9/1000 of Land tax & Business tax	260/1000 of Allocation tax	
Local Allocation tax law	1952	15/100 of the second class Land Income tax & Business tax	40/100 of total amount of Allocation tax	
Local Finance Adjustment Subsidy law	1954	8.8/100 of the 1st class Land Income tax 50/100 the 2nd class Land Income tax 30/100 of Amusement-Food- Drink	40/100 of total amount of Allocation tax	
Local Shared tax law	1958	① 40/100 of Business tax, Amusement-Food-Drink tax, Admission tax, Electricity-gas tax ② 8.8/100 of the first class Land Income tax 50/100 the second class Land Income tax	30/100 of total amount of General Subsidy	
	1962	① 40/100 of Business tax, Admission tax, Electricity-gas tax ② 85/100 of Coarse liquor tax in Liquor tax	10/100 of ①'s Revenue source in Total amount	
	1966	50/100 of Business tax, Electricity-gas tax, Liquor tax(except Coarse liquor tax) and Adjusted amount(Total amount of General Subsidy)	10/100 of total amount of General Subsidy	
	1968	160/1000 of Internal tax (Total amount of General Subsidy)	10/100 of total amount of General Subsidy	Legal rate(17.6%)
	1972. 8.3	Local Share tax was temporarily suspended from 1973, and the Total amount of Share tax was conformed to the Government Budget Rules		The Term was from 1972 to 1982
	1983	10/11 of domestic tax amount in corresponding Year	10% of General Subsidy	13.27%

<Table 5> Comparison of LST, LTF and NTS

	Determination Method of Financial Resource	Distribution Method among Regions	Expected Effects
Local Shared Tax	□Constant portion of Domestic Tax Revenue	□ Formula based	□Support local Finance □Induction of Differences of Financial capacity among Regions □Raise of Autonomy & Planning of Regional Finance
Local Transfer Fund	□Ties to Specific Tax Items	□Distribution by plan □Emphasis on Financial Demands in Specific Items	□Support local Finance □Effect on Expenditure's Increase in Specific projects □Promotion of balanced Development among Regions
National Treasury Subsidy	□ Determined Every year	□at discretion	□Weak Effect on Expansion of Regional Finance □Effect on Expenditure's Increase in Specific projects

<Table 6> Per capita tax rate (Counties)

Year	N	mean	Std dev
1994	84	0.105	0.036
1995	84	0.113	0.033
1996	84	0.126	0.037
1997	84	0.128	0.036
1998	84	0.130	0.033
1999	84	0.128	0.033
2000	84	0.143	0.038

source: various issues of "Fianncial Yearbook of Local Governments" from MOGAHA. overall $\bar{t}$=0.125.

<Table 7> Panel estimation (Counties)*: $s_{it} = \alpha + \gamma \log N_{it} + c_i + \varepsilon_{it}$.

Variables	Estimated coefficient
Log N	-0.0517 (0.0026)
α	0.6195 (0.0279)
R-squared	0.6928

* Numbers in the parentheses are standard errors

<Table 8> Spatial Autocorrelation (Counties): Moran's *I*

Variables	I	E(I)	sd(I)	z	p-value*
nb	-0.03	-0.012	0.086	-0.021	0.419

<Table 9> Frequency of Measuring Units

Measuring unit	Frequency	Needs Categories
Number of Local congress Member	**1**	□Legislation and Election administration expenses
Number of Election District	**1**	□Legislation and Election administration expenses
Regular staff of Public service personnel	**3**	□Gernal administration expenses
Number of Households	**3**	□Gernal administration expenses □Improvement expenses for health and life environment
Size of Population	**10**	□Education and culture expenses □Improvement expenses for Health and life environment □Social security expenses □Development expenses for House and Local society □Development expenses for Local economy □Preservation-development expenses for Country resources
Number of Workers in specially designated fields	**3**	□Improvement expenses for health and life environment □Development expenses for Agricultural-marine products □Development expenses for Local economy
Size of Area	**7**	□Improvement expenses for health and life environment □Development expenses for House and Local society □Development expenses for Agricultural-marine products □Preservation-development expenses for Country resources
Number of Automobile	**1**	□Traffic management expense
Number of Civil defense corps member	**1**	□Civil defense management expenses

<Table 10> Standard fiscal needs over time (Million Won, %)

				%change	
	2000	2001	2002	2001	2002
total	16,275,441	20,355,528	22,442,447	25.1	10.3
metro	3,288,488	3,798,522	3,989,355	15.5	5.0
provinces	2,537,058	3,074,411	3,304,529	21.2	7.5
cities	5,912,898	7,064,565	8,160,671	19.5	14.8
counties	4,536,997	6,418,030	7,041,892	41.5	9.7

source: MOGAHA, "Manual for local share tax", 2000, 2001, 2002

<Table 11> Population (Person, %)

				%change	
	2000	2001	2002	2001	2002
total	37,603,496	37,957,929	38,237,348	0.94	0.74
metro	12,722,808	12,763,724	12,780,764	0.32	0.13
provinces	24,880,688	25,194,205	25,456,584	1.26	1.04
cities	19,341,498	20,031,881	20,404,661	3.57	1.86
counties	5,539,190	5,162,324	5,051,923	6.80	2.14

source: the National Statistical Office. The population of Seoul is excluded

<Table 12> Comparison of estimated parameter

	To	
From	2000	1999
2000	-1.166	
1999	-1.127	-1.091
1998	-1.021	-0.950
1997	-0.982	-0.921
1996	-0.962	-0.911

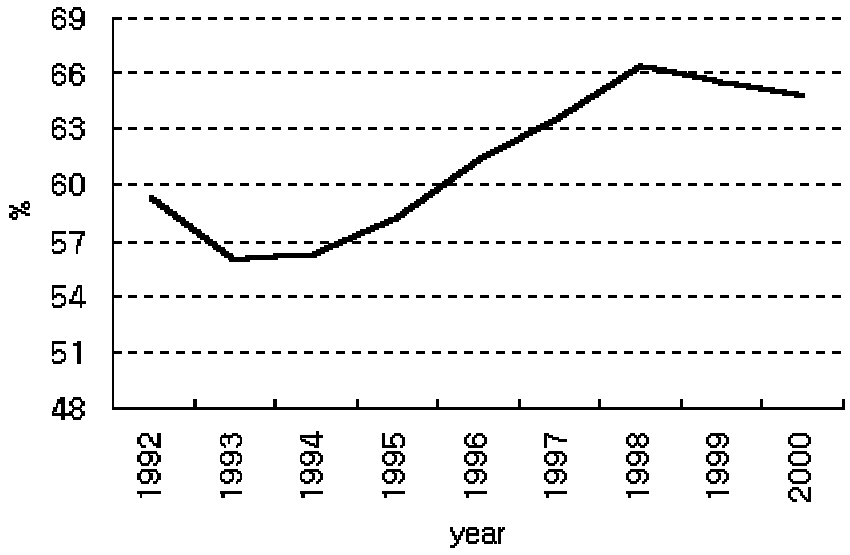
source: various issues of "Fianncial Yearbook of Local Governments" from MOGAHA.

<Table 13> Local Shared Tax

Variable	Estimated coefficient
ln Population	-0.426
	(0.025)
Area	0.181
	(0.034)
Dependency	0.27
	(0.052)
Distantce	0.274
	(0.236)
const	4.094
	(0.404)
R-squared	0.812

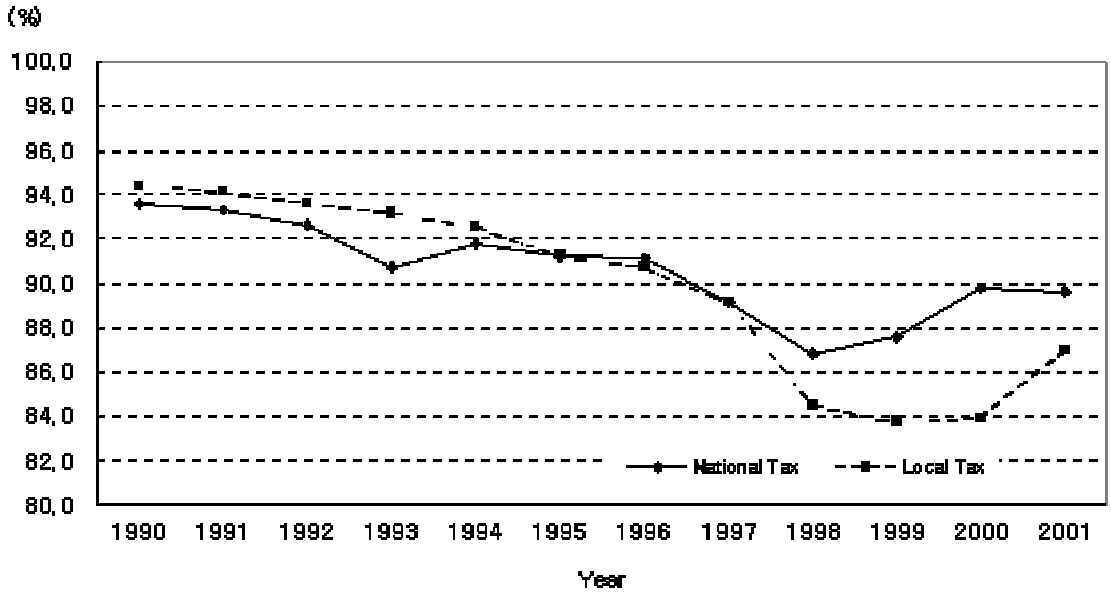
source: various issues of "Fianncial Yearbook of Local Governments" from MOGAHA.

<Figure 1 > Ratio of transfer resources to total revenue in local governments (%)



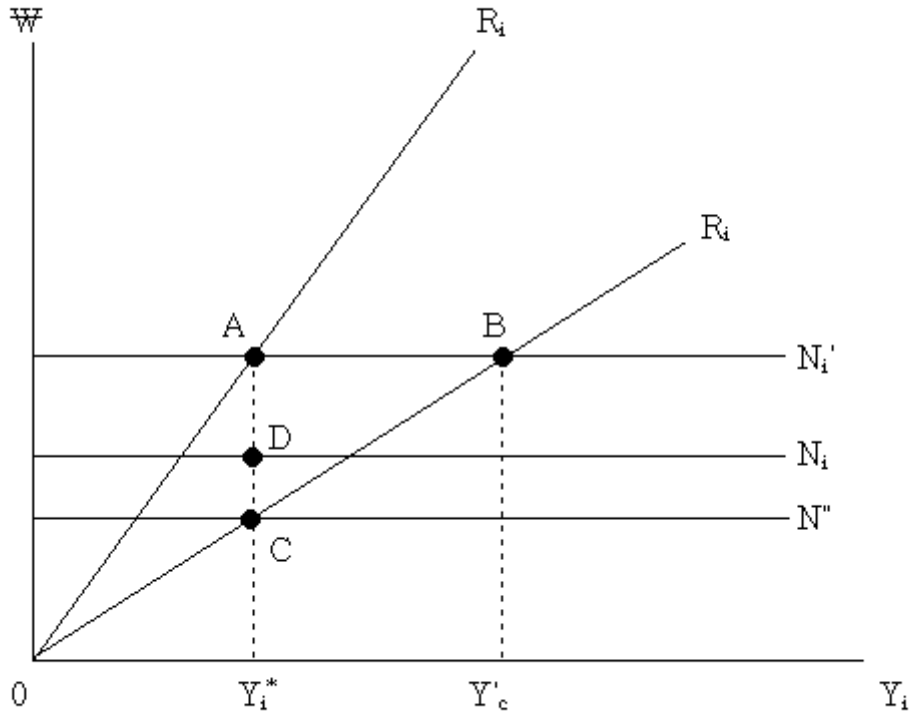
Source: various issues of "Yearbook of local government finance" (MOGAHA)

<Figure 2.> Tax collection ratio: national and local.

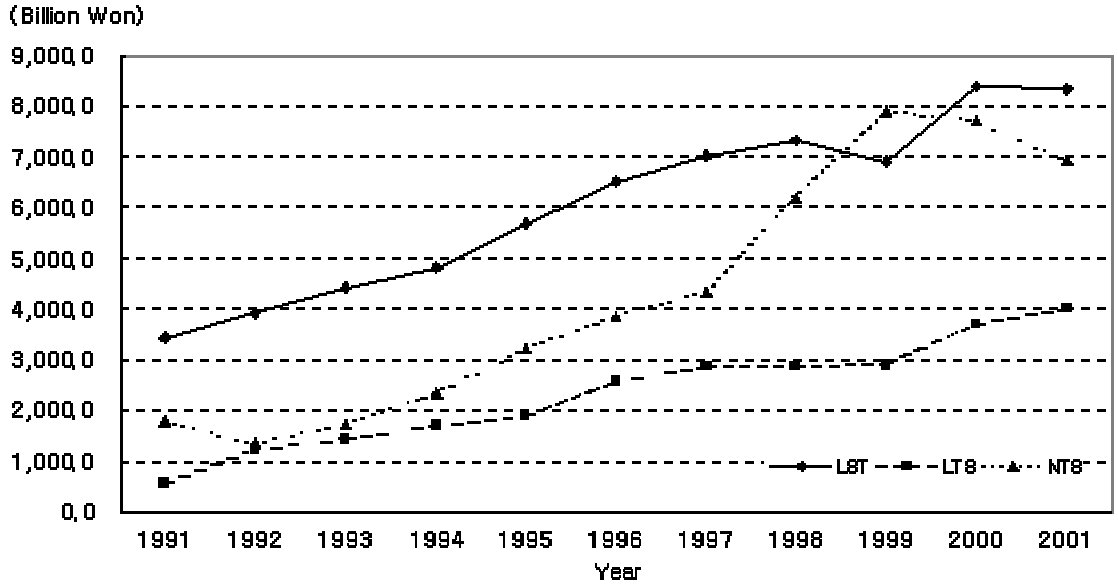


Source: various issues of "Yearbook of local government finance" (MOGAHA)

<Figure 3> Determination of grants

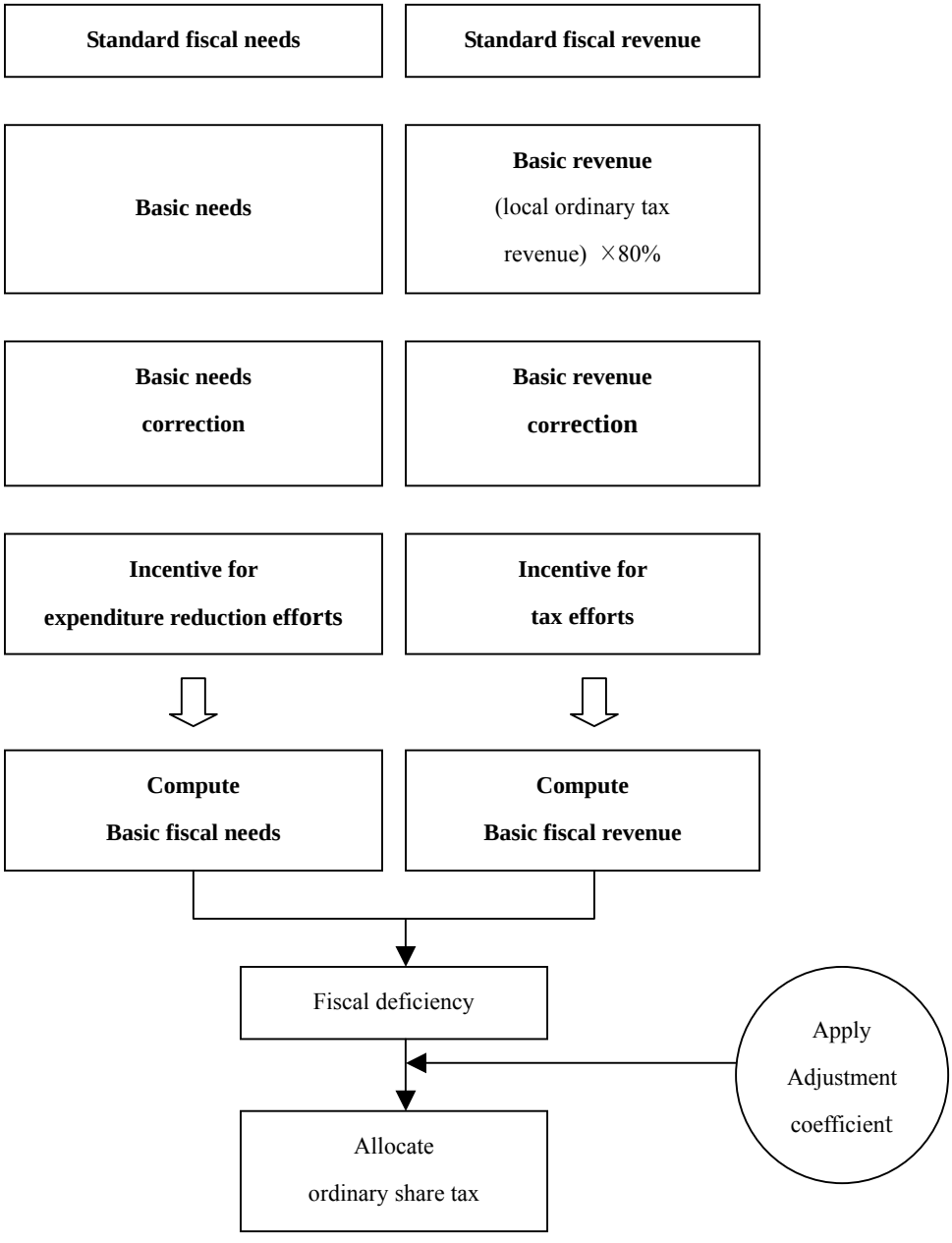


<Figure 4> LST, LTF and NTS

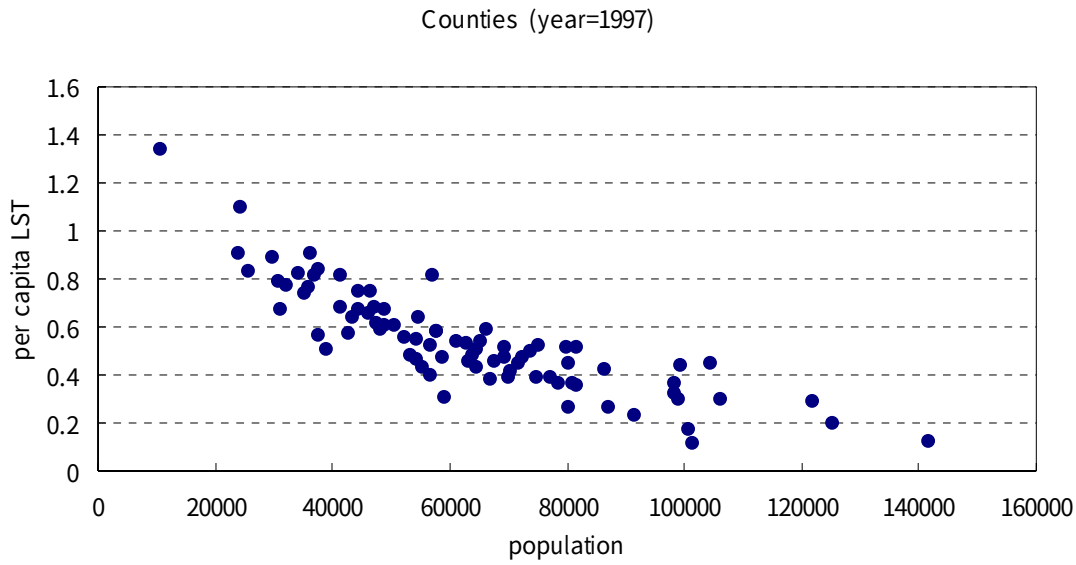


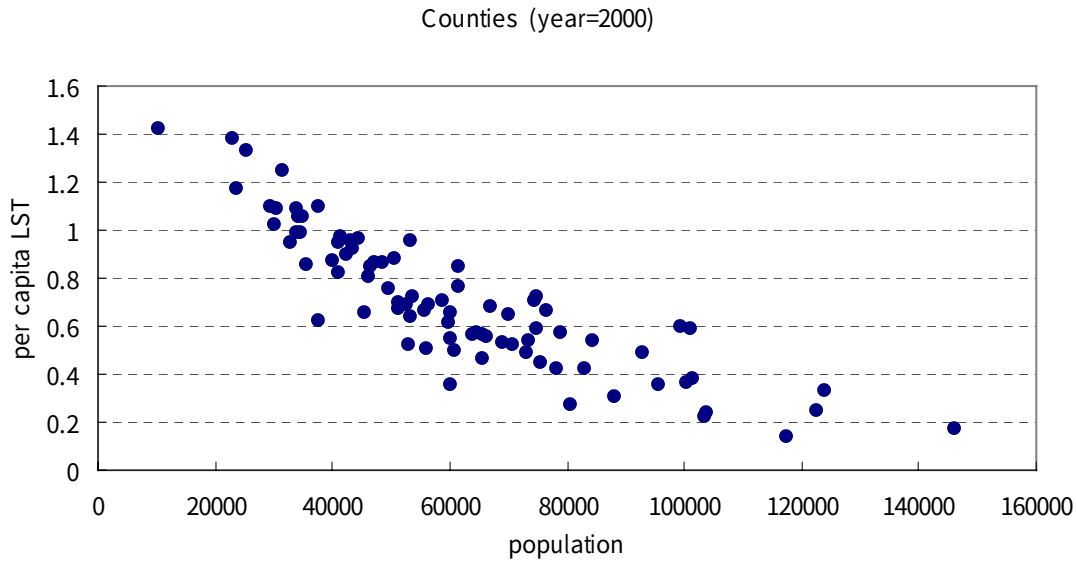
source: Various issues of "Yearbook of local government finance" (MOGAHA)

<Figure 5> Calculation of Local Share Tax

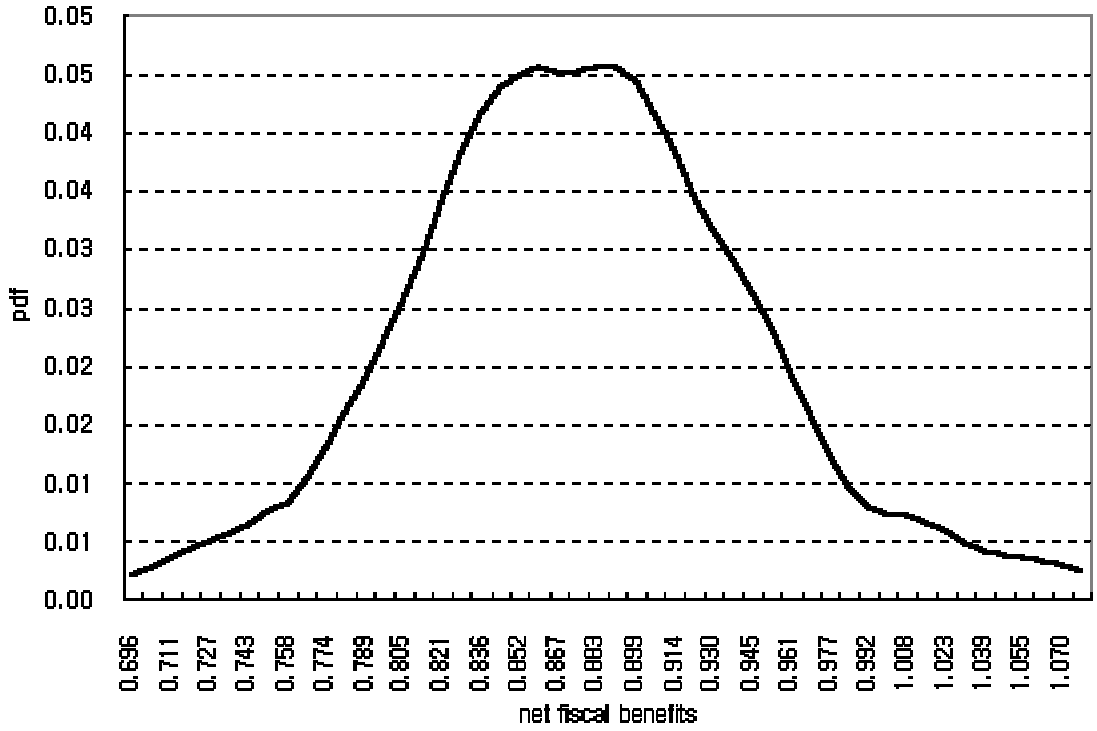


<Figure 6> Per capita LST and poulation (Counties): 1997 and 2000



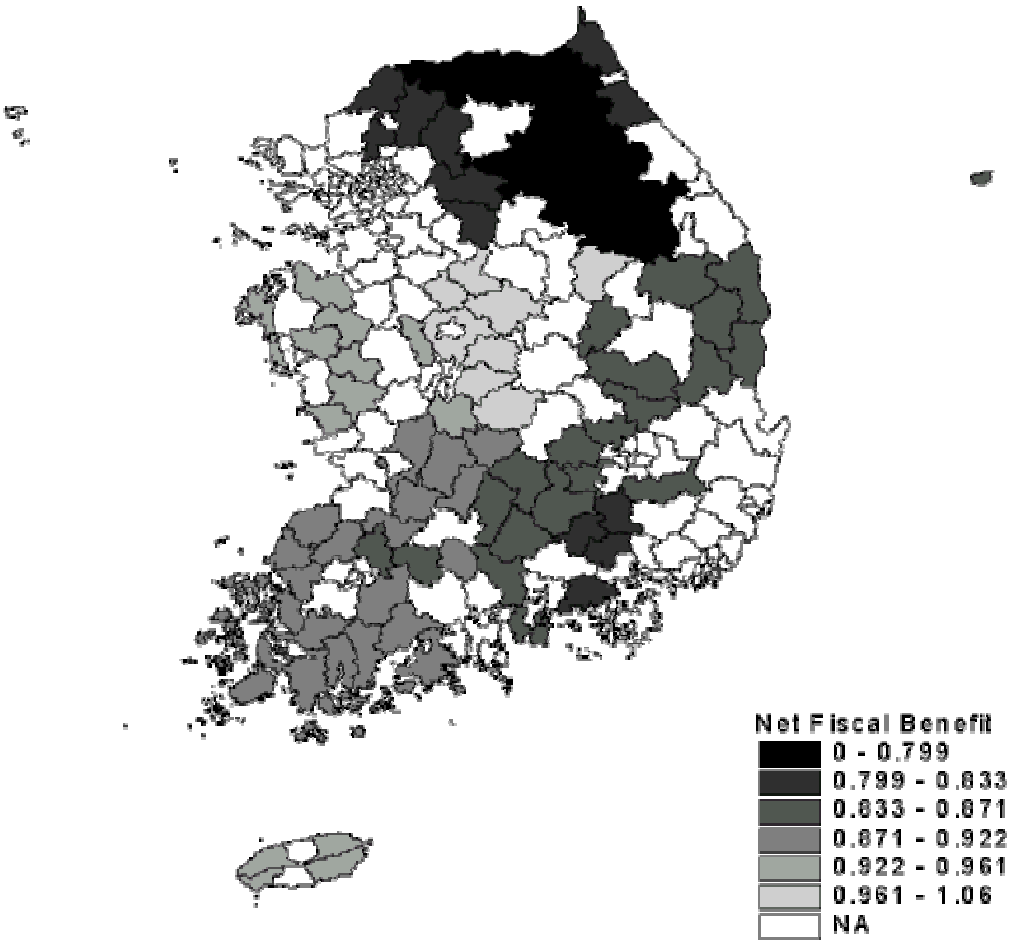


<Figure 7> Estimated Density of net fiscal benefits (Counties: 1994~2000)



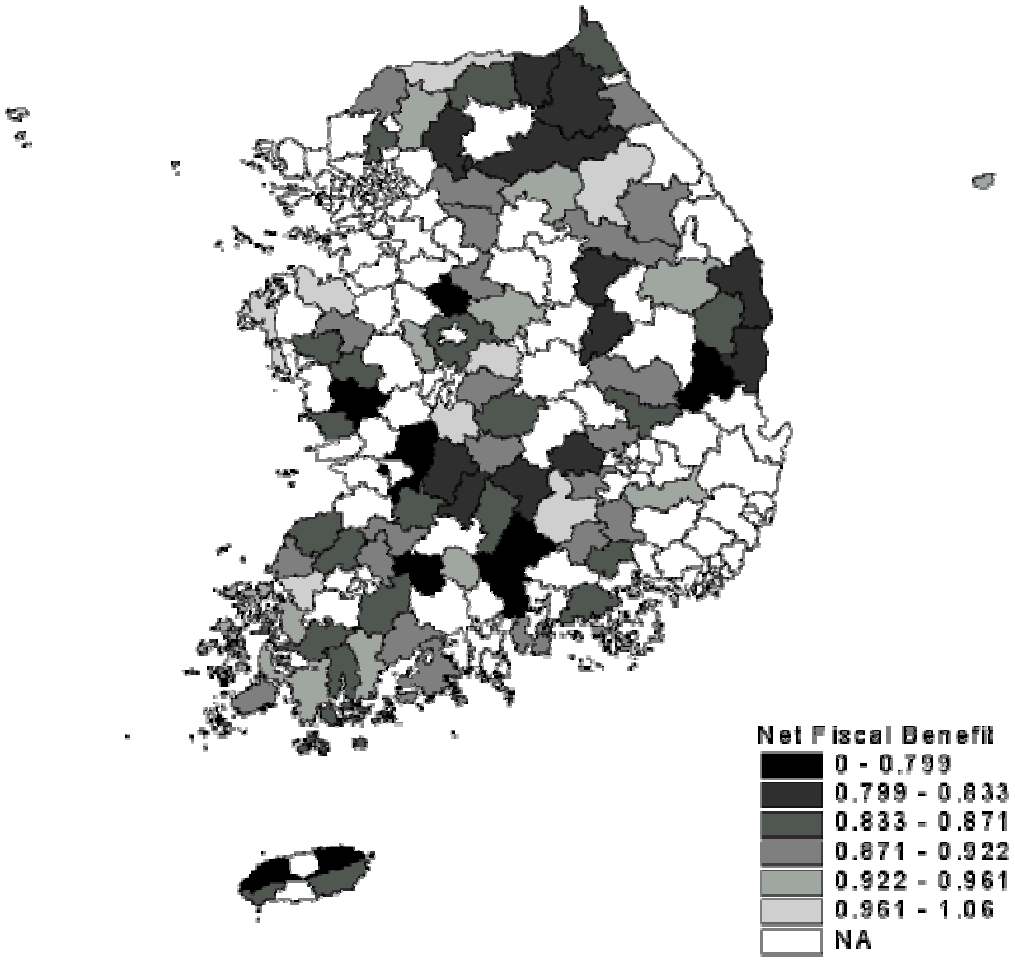
<Figure 8>. Spatial clustering of net fiscal benefits (Counties)

Moran's *I* (*z* statistics) = 0.794(9.327)

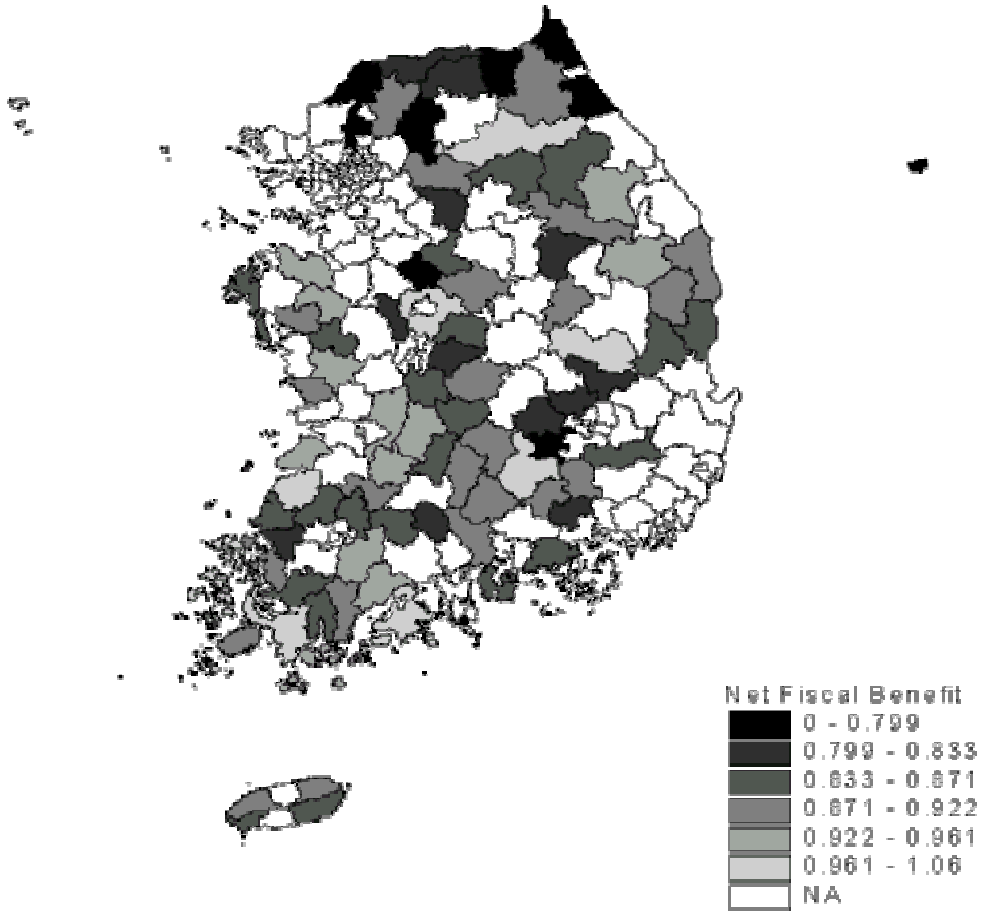


<Figure 9> Spatial randomness of net fiscal benefits (Counties)

Moran's *I* (*z* statistics) = -0.060(-0.549)



<Figure 10> Spatial distribution of net fiscal benefits (Counties)



<Figure 11> estimation of per capita fiscal needs