DISTRIBUTIVE IMPACT AND EVALUATION OF DEVOLUTION PROPOSALS IN JAPANESE LOCAL PUBLIC FINANCE

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P. T. N.º 22/01

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ABSTRACT

The purpose of this paper is to examine the redistributive effects of interregional transfer of local taxes and grants from central to local government. We also examine the redistributive consequences of decentralization in the local public finance system. Especially, we focus on the impacts of the devolution of revenue instruments on the local governments. To analyze the redistributive effects, we employ the Reynolds-Smolensky index based on the Lorenz function and its decomposition. Our results show that the devolution of revenue instruments to local governments may increase the income differences among the regions.

1. INTRODUCTION

The purpose of this paper is to examine the redistributive effects of interregional transfer of local taxes and grants from central to local government. We also examine the redistributive impacts of change in the taxes and grants. Especially, we focus on the impacts of the devolution of tax items to local governments.

The devolution of tax items is a controversial issue to consider within the decentralization of Japanese local public finance. The local public sector, including the 47 prefectures and 3232 municipalities, spends 74.4% of the total public expenditure. On the other hand, the share of tax revenue in the local governments is 38.9%. The taxable items and their rates that can be chosen by the local governments are highly restricted by the Local Tax Law. Under this fixed local tax system, there is an imbalance between the local tax revenue and the expenditure in many local governments. These imbalances are compensated by the grants from the national government.

To decentralize the fiscal system, it has been pointed out that the tax item should devolve to the local government and that the grants from central to local governments should be reduced. In 1997, *The Second Recommendation Report* submitted by the Committee for the Promotion of Decentralization argued that the local taxes should be completed to reduce the imbalance between public expenditure and tax revenue in local governments.

However, the devolution of tax instruments, such as income tax, may increase the income inequality among the regions. The devolution of tax items involves the reduction of grants under the fixed tax burden. A decrease in the grants that are intended to equalize the fiscal capacity among regions will also increase inequality among local governments.

Therefore, it is necessary to identify the distributive aspects of various devolution proposals for local taxes and grants. Based on this identification, the impacts of the proposals should be evaluated in terms of equity.

The rest of the paper is organized as follows. In section 2, we show the analytical framework that is based on the Reynolds-Smolensky index and its decomposition according to Lambert. In section 3, we describe the data used for the analysis. In section 4, we estimate the regional income distribution and redistributive effects of tax and transfer under the present scheme. In section 5, we present the redistributive effects under the different reforms related to taxes and grants. We offer the policy implications from our analysis in section 6.

2. ANALYTICAL FRAMEWORK

To understand how the income distribution is affected by local taxes and grants, we compare the original pre-tax and -benefit income of individuals with their final income, including the net transfer induced by the taxes and grants. Redistributive effects are measured by the Reynolds-Smolensky index. According to Lambert (1993), we decompose the Reynolds-Smolensky index into Kakwani indices, average tax rates and the reranking term. In this section, we briefly explain the analytical framework used in the below section.

For a given pre-tax and -benefit income level y, the Lorenz function is defined as follows:

$$L(P) = \int_0^y \frac{xf(x)}{\mu} dx, \qquad P = F(y), \tag{1}$$

where x, f(x) and F(x) denote the pre-tax and -benefit income, its frequency density function and its distribution function, respectively. The average income is denoted by μ. From this Lorenz function, we obtain the Gini coefficient (G) as follows:

$$G = 1 - 2\int_0^1 L(P) dP. \tag{2}$$

This equation shows the relationship between the Gini coefficient and the Lorenz function. The second term of RHS in eq.(2) corresponds to the area below the Lorenz curve.

With regard to the concentration of tax burden, the Lorenz curve is represented by the following:

$$L_T(P) = \int_0^y \frac{t(x)f(x)}{\mu t} dx, \tag{3}$$

where t(x) and t denote the tax liability of an income unit with income *x* and the average rate of tax, respectively. Thus, the concentration coefficient for tax (C_T) is represented as follows:

$$C_T = 1 - 2\int_0^1 L_T(P) dP. \tag{4}$$

A similar procedure is used to obtain the Lorenz function ($L_{B(P)}$) and the concentration coefficients (C_B) for the benefit as follows:

$$L_B = \int_0^y \frac{b(x)f(x)}{\mu b} dx, \tag{5}$$

$$C_B = 1 - 2\int_0^1 L_B(P) dP. \tag{6}$$

where b(x) and b denote the benefit received by income unit with income *x* and the average rate of benefit, respectively.

The Kakwani index is derived from the Gini coefficient and the concentration coefficient defined above. The Kakwani index for tax progressivity (Π^T) is defined as follows:

$$\Pi^T = C_T - G. \tag{7}$$

Similarly, the regressivity for benefit (Π^B) is represented as follows:

$$\Pi^B = G - C_B. \tag{8}$$

These two Kakwani indices show the degree of departure from the proportionality of tax and benefit; if the Kakwani index for tax or benefit is positive (negative), the allocation of tax or benefit is progressive (regressive).

For the final income, defined as the income after tax and benefit, the Lorenz function ($L_N(P)$) and the concentration coefficient (C_N) can be written as follows:

$$L_N = \int_0^y \frac{[x - t(x) + b(x)]f(x)}{(1 - b + t)\mu} dx, \tag{9}$$

$$C_N = 1 - 2\int_0^1 L_N(P)dP. \tag{10}$$

Note that eq.(9) and (10) are evaluated by the distribution of the pre-tax and -benefit income. For a given final income y*, the Lorenz function for the final income is evaluated by the distribution for the final income ($L_N(P*)$) as follows:

$$L_N(P*) = \int_0^{y*} \frac{x * g(x*)}{\mu} dx*,. \quad P* = G*(y*), \tag{11}$$

where x*, g(x*) and G*(y*) denote the final income, the frequency density function for the final income and its distribution function.

Using these terms as defined above, the Reynolds-Smolensky index (Π^{RS}), which represents the change in the income distribution before and after redistribution, is defined as follows:

$$\Pi^{RS} = G - G_N = (G - C_N) - (G_N - C_N) \tag{12}$$

$$= \frac{b}{1 + b - t}\Pi^B + \frac{t}{1 + b - t}\Pi^T - D.$$

The reranking term, which is denoted by D in eq.(12), vanishes only if the rank of every income unit before and after tax and benefit does not change; a positive D indicates that the principle of the horizontal equity is violated. In

this sense, D can be interpreted as a measure of inefficiency due to income redistribution where the government intends to reduce the income inequality.

Alternatively, reranking of income may occur because the government decides the allocation of tax and benefit according to criteria which ignore income. For example, differences in productivity of local public services across regions may be taken into account in the allocation of grants. And also, the government may transfer the income to compensate the utility that includes non-monetary elements. Therefore, the reranking term may be interpreted as the cost, which is measured by the inefficiency of income redistribution, of implementing the policy objects irrespective of income equality.

In the next section, we define the variables and compute the actual redistribution for the 1994 Japanese local public sector.

3. DATA AND VARIABLE DEFINITIONS

We compiled the 1994 data on Japanese local public sector, including the prefectures and the municipalities, the regional income and the national taxes from the *Annual Report on Prefectural Accounts*, *Annual Statistics of Local Government Finance* and some other tax statistics.

In order to analyze the redistributive effects, we must know the distribution of the pre-tax and -benefit income. Unfortunately, the micro data relating to personal income in each region is not available because of restriction under the Statistical Law. Instead of using the micro data, we first estimate the aggregate income in each prefecture compiled from *Prefectural Accounts*. And the average individual's pre-tax and -benefit income in each prefecture is obtained from the aggregate individual income divided by the population of each prefecture.

The aggregate individual income in the ith prefecture (Y_i^B) is defined as follows:

$$Y_i^B = W_i + A_i + R_i, \qquad (13)$$

where W_i, A_i and R_i denote compensation of employees, household's receipts of property income and entrepreneurial income of private incorporated enterprises, respectively. Then, the average pre-tax and -benefit income in the ith prefecture is obtained as follows:

$$y_i^B = \frac{Y_i^B}{N_i}, \qquad (14)$$

where N_i denotes the population in the ith prefecture[1].

Final income to be compared to the pre-tax and -benefit income is obtained by adding the net benefit, which consists of the tax burden and the benefit, to the pre-tax and -benefit income. The tax burden includes those local taxes and national taxes used to finance the grants. The benefit is measured by the local tax revenue and the grants revenue allocated by the national government to the local governments. Bonds issued by local governments are also a major revenue source for them.[2] However, we omit the bond revenue because of the difficulties relating to identify its burden and benefit. Thus the final aggregate income in the ith prefecture (Y_i^A) is defined as follows:

$$Y_i^A = Y_i^B - T_i^L - T_i^N + B_i^L + B_i^N,$$ (15)

where T_i^L and T_i^N denote the burden of local taxes and national tax used to finance the grants, respectively[3]. B_i^L denotes the local tax revenue and B_i^N denotes the grants revenue in the *i*th prefecture. All tax items discussed here are grouped into the following categories: individual income tax, corporate income tax, consumption tax, and others. This classification is presented in Table 1 (column 1 and 2).

T_i^L and B_i^L include all local taxes levied by both prefectural and municipal governments. B_i^L is measured by the actual tax revenue in each prefecture. The difference between T_i^L and B_i^L will be induced by the tax shifting. Table 1 (column 3) summarizes the assumptions relating to the tax shifting for various taxes. For income tax, we assume that the burden of the tax lies with taxpayers; tax on income does not shift. Therefore, the burden of local income taxes by prefectures is given by the corresponding tax revenue in each prefecture[4]. We also assume that the consumer fully bears the tax on consumption. Then the burden of the tax on consumption by prefectures is calculated in proportion to private consumption (for consumption tax) and the expenditures to on related goods (for tobacco tax and liquor tax) in each prefecture.

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[1] The population in each prefecture is not standardized by any equivalence scale.

[2] In 1994, 14.9% of the net revenue of local governments was financed by the local government bond.

[3] The pre-tax and benefit income includes the wage income earned by public workers in the local public sector. At the same time, a portion of the grants revenue is used for the local public workers' wages. Therefore, there partly exists a double-accounting for the wage income earned in the local public sector. The distribution for the final income estimated here may be slightly modified when we take account of this problem. We thank Yoshitsugu Hayashi for raising this point.

[4] For national income tax, the tax revenue by prefectures is not available. Alternatively, we use the share of inhabitants tax (income tax) to identify the burden of national income tax in each prefecture.

Table 1
CORRESPONDENCES BETWEEN OUR CLASSIFICATION IN THIS PAPER AND TAX ITEMS, AND HYPOTHESIS OF TAX INCIDENCE

Our Categories	Tax Items to be contained	Hypothesis of Tax Incidence
Tax on Individual Income	*National Tax*	
	Withholding income tax on interest paid to residents Withholding income tax on dividends paid to residents Other individual income taxes	Individuals who receive the income bear the burden
	Local Tax Individual inhabitants tax (per capita tax) Individual inhabitants tax (income tax) Individual inhabitants tax on interest income	Individuals who receive the income bear the burden
Tax on Corporation	*National Tax*	
	Corporate income tax Withholding tax on interest paid to corporations Withholding tax on dividends paid to corporations Withholding tax on the fees to a taxpayer whose business is providing the personal services of public entertainers for their performance	Shareholders and Consumer share the same burden
	Local Tax Corporate inhabitants tax (per capita tax) Corporate Inhabitants tax on the national corporate income tax basis Corporate inhabitants tax on interest income Enterprise tax on corporations	Shareholders and Consumer share the same burden
Tax on Consumption	*National Tax*	
	Consumption tax Liquor tax Tobacco tax	Consumer bear the burden
Other Tax	*Local Tax*	
	Property tax Other local taxes	Residents bear the burden

Notes: Other local taxes include the following items: real property acquisition tax, automobile acquisition tax, local tobacco tax, golf course utilization tax, automobile tax, mine-lot tax, hunter registration tax, hunting tax, light-oil delivery tax, light vehicle tax, mineral product tax, bathing tax, special landholding tax, urban planning tax, land development tax, business office tax and other taxes not prescribed in the Local Tax law.

These assumptions above are commonly used to analyze the distributive impacts of the taxes, but there is less agreement about the incidence of the corporation tax. We assume that the consumers bear half of the burden of the corporation tax and the other half is paid by the shareholders[5]. Other taxes, including property tax, are assumed not to shift to outside the region where the taxes are collected.

The grants made by the national government to local governments consist of local grant tax and national subsidies. Local grant tax is a non-matching grant by the national government to local governments[6]. Its source of funds is financed by the following national taxes; 32.0% of income tax, corporation tax and liquor tax; 25% of tobacco tax and 24% of consumption tax[7]. Local grant tax is allocated to each local government in accordance with the difference between the basic financial needs and the basic financial revenue. National subsidies are matching grants made by the national government to local governments, however the source of funds is not specified. In this paper, we consider the redistributive impacts through national subsidies financed by the five kinds of national tax described above. Thus, our analysis covers the 45.1% of the total amounts of national subsidies.

As a result, B_i^N is defined as the sum of the local grant tax and national subsidies financed by the following items of national taxes: income tax, corporation tax, liquor tax, tobacco tax and consumption tax. And T_i^N is defined as the burden of the five national taxes described above used to finance the local grant tax and national subsidies.

Table 2 presents the tax revenue and the allocation of the national taxes to the grants in 1994. In Table 2, the tax revenue and the national taxes used for local grant tax are the actual values obtained from the financial statistics. On the other hand, the national taxes used for the national subsidies are estimated from the revenue statistics.[8]

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[5] The burden of the tax on corporation in the ith prefecture (T_i^C) is calculated as follows:

$$T_i^C = \frac{1}{2}\left(\frac{d_i}{\sum_i d_i} + \frac{c_i}{\sum_i c_i}\right)TR^C$$

where d_i=households' receipts of dividends in the ith prefecture; c_i=household consumption in the ith prefecture; TR^C=the total revenue of tax on corporation. Data are from the *Annual Report on Prefectural Accounts*.

[6] Local grant tax consists of the ordinary grant tax and the special grant tax. The ordinary grant tax accounted for 94% of local grant tax in 1994. We refer to the ordinary grant tax as local grant tax.

[7] This scheme has been applied until 1996. Since 1997, 29.5% of the consumption tax is allocated for the local grant tax, while the allocation scheme of the other four taxes has not changed.

[8] The kth national tax revenue used to finance the national subsidies $\left(TRN_k^{SUB}\right)$ is estimated as

follows:

Table 2

TAX REVENUE AND ALLOCATION TO LOCAL GOVERNMENTS
(In millions of yen):1994

	Tax Revenue (in total)	Allocation to Local Grant Tax	Allocation to National Subsidies
National Taxes			
Tax on individual income	19,511,770	6,284,279	2,857,503
Tax on corporation	13,268,893	4,301,001	1,937,312
Tax on consumption	8,784,072	2,313,960	1,397,722
Local Taxes			
Tax on individual income	9,734,392		
Tax on corporation	7,408,909		
Other taxes	15,395,775		
Total	74,103,810	12,899,240	6,192,537

Note: Tax revenue and the allocation to local grant tax is based upon the Ministry of Finance's, *Monthly Statistical Report on Government Finance and Banking* (Zaisei Kinyu Toukei Geppou). Allocations to national subsidies are calculated by the authors.

From the definitions of variables, it is clear that the total amount of net transfer discussed here becomes zero:

$$\sum_i \left(B_i^L + B_i^N - T_i^L - T_i^N \right) = 0, \tag{16}$$

and the average rate of tax and benefit considered here become the same: $t = b$ in eq.(12).

Finally, we obtain the average final income in the ith prefecture as follows:

$$y_i^A = \frac{Y_i^A}{N_i}. \tag{17}$$

Based on the definition and the data described above, we estimate the redistributive effects under the present scheme in the next section[9].

$$TRN_k^{SUB} = S \left(\frac{TRN_k - TRN_k^{GTAX}}{R - \sum_k TRN_k^{GTAX}} \right)$$

where S=the total amounts of national subsidies; TRN_k=the total revenue of the kth national tax; TRN_k^{GTAX}=kth tax revenue used to finance local grant tax; R=total revenue in general accounts of national government.

[9] The pre-tax and -benefit income, the net benefit and the final income by prefectures are presented in Appendix.

4. REDISTRIBUTIVE EFFECTS UNDER THE PRESENT SCHEME

In this section, the Reynolds-Smolensky index for 1994 data is computed as the bench mark, and is decomposed into the progressivity index and the reranking term. We first examine the progressivity of each tax and grant measured by the Kakwani index. And we also consider the redistributive effects under the present scheme.

We begin by considering the progressivity of the tax and benefit under the present scheme. Table 3 provides the Kakwani index of each tax and benefit item together with relevant indices. The Kakwani index for each tax and benefit item is related to the overall Kakwani index as following:

$$\Pi^T = \sum_j s_j^T \Pi_j^T, \qquad\qquad (18)$$

$$\Pi^B = \sum_k s_k^B \Pi_k^B, \qquad\qquad (19)$$

where s_j^T and s_k^B denote the share of each item relating to the burden and to the benefit (column 4), respectively.

We find the following facts from Table 3. First, the Kakwani index for the tax burden as a whole (Π^T) is positive (0.0305); the burden of tax is slightly progressive. For the national tax, the Kakwani index is also positive (0.0321); that is the burden of the national taxes is progressive. This progressivity is explained by the weighted average of the progressivity of the income tax (0.0677) and of tax on corporation (0.0321) and the regressivity of the tax on consumption (-0.0534). At the same time, the burden of the local tax is also progressive, but its progressivity (0.0296) is lower than the national tax. The lower progressivity in the local tax is caused by the other taxes which include less progressive items such as property tax and tobacco tax.

Secondly, the Kakwani index relating to the benefit (Π^B) is positive (0.1478). Table-3 indicates that the concentration index of the grants is negative (-0.3703); the allocation of grants from national to local governments is highly regressive. Especially, local grant tax, whose Kakwani index is quite high (0.5436), has substantial redistributive effects. It is obvious that local grant tax has positive redistributive effects from its allocation formula under the present scheme. Furthermore, the national subsidies, which are not explicitly intended to redistribute income, also have redistributive effects. Therefore, these income transfers reduce the income difference among regions. On the other hand, the allocation of local tax, which is progressive, plays a role in increasing the income difference among regions. Such progressivity is mainly induced by local tax on corporation.

Table 3

PROGRESSIVITIES OF TAX AND BENEFIT

	Concentration index C	Kakwani Index for Tax or Benefit Π^T, Π^B	Average Rate of Tax or Benefit t or b	Share of the tax or benefit s^T, s^B
Tax Burden				
National tax	0.1336	0.0321	0.0536	0.3698
Tax on Individual Income	0.1692	0.0677	0.0254	0.1755
Tax on Corporation	0.1326	0.0312	0.0177	0.1224
Tax on Consumption	0.0481	-0.0534	0.0104	0.0719
Local Tax	0.1311	0.0296	0.0913	0.6302
Tax on Individual Income	0.1706	0.0691	0.0273	0.1885
Tax on Corporation	0.1326	0.0312	0.0208	0.1435
Other Taxes	0.1053	0.0038	0.0432	0.2982
Total for the Tax	0.1320	0.0305	0.1448	1.0000
Benefit				
Grants	-0.3703	0.4718	0.0536	0.3698
Local Grant Tax	-0.4422	0.5436	0.0362	0.2498
National Subsidies	-0.2206	0.3221	0.0174	0.1199
Local Tax	0.1437	-0.0422	0.0913	0.6302
Tax on Individual Income	0.1774	-0.0759	0.0273	0.1885
Tax on Corporation	0.1793	-0.0778	0.0208	0.1435
Other Taxes	0.1053	-0.0038	0.0432	0.2982
Total for the benefit	-0.0464	0.1478	0.1448	1.0000

Note: The average tax rate and the share for the national taxes are calculated from the tax revenue spent to finance the national grant tax and the national subsidies.

Next, we turn to the estimation of overall redistributive effects through the taxes and grants. Table 4 shows that the Reynolds-Smolensky index for the final income has positive value (0.0249).

Table 4 also presents the redistributive effects of various income concepts obtained from the decomposition of the final income. This decomposition is useful in considering which policy instrument plays a crucial role in the redistribution. The allocation of grants and the national tax burden reduces inequality of the final income (0.0261), which is mainly induced by the allocation of grants. In contrast, the revenue and burden of the local taxes have negative impacts on the income inequality (-0.0012), which are mainly induced by the tax on corporation through the tax shifting. We also see that under the present allocation of grants there are reranking effects (D=0.001) which reduce the redistributive impact.

Table 4

THE REDISTRIBUTIVE EFFECTS OF TAX AND BENEFIT UNDER THE PRESENT SCHEME

Income Concepts	Gini Index G	Concentra tion index C	Reynolds- Smolensky index Π^{RS}	Reranking term D
Pre-tax and -benefit income	0.1015	0.1015		
Income after:				
National tax burden	0.0998	0.0997	0.0017	0.0001
Local tax burden	0.0987	0.0985	0.0028	0.0002
Taxes (in total)	0.0967	0.0963	0.0048	0.0004
Grants	0.0782	0.0775	0.0233	0.0007
Local tax revenue	0.1051	0.1050	-0.0037	0.0001
Benefit (in total)	0.0833	0.0828	0.0182	0.0005
National tax and grants	0.0754	0.0745	0.0261	0.0009
Local tax burden and revenue	0.1027	0.1026	-0.0012	0.0000
Final Income	0.0766	0.0756	0.0249	0.0010

Figure 1 graphs the Lorenz curve for the pre-tax and -benefit income and that for the final income. Figure 1 shows that the distribution of pre-tax and - benefit income is dominated by the final income in the sense of the Lorenz function. Thus, we can conclude that the distribution of the final income under the present scheme is more desirable than that of the pre-tax and -benefit income if we assume the Schur-concave social welfare function cited by Atkinson (1970).

Figure 1

REDISTRIBUTIVE EFFECTS UNDER THE PRESENT SCHEME
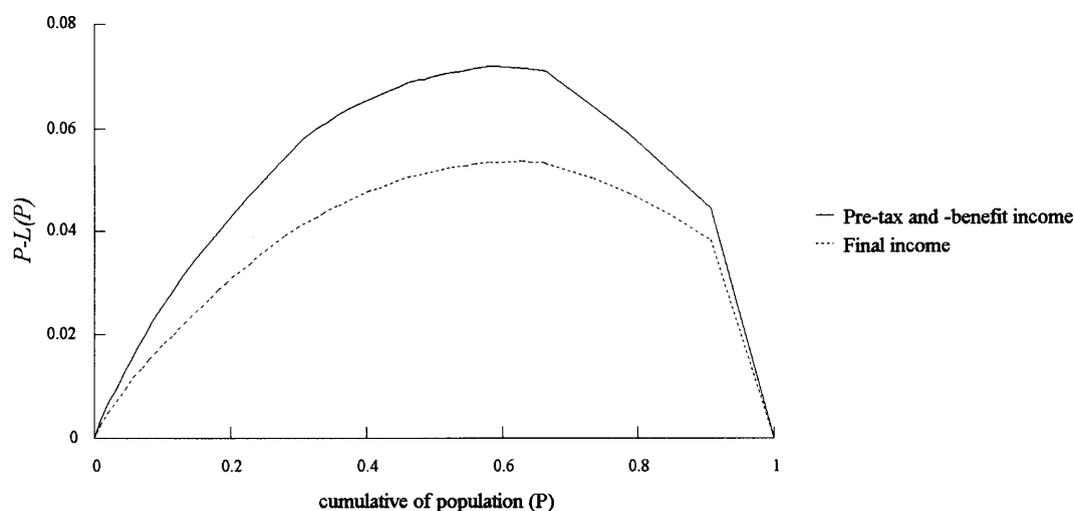
Notes: P-L(P) denotes the difference between the 45 degree line and the ordinary Lorenz curve.

It should be pointed out that there are two problems to be considered under the present scheme. First, as noted above, there exist the reranking effects under the present scheme. The existence of reranking effects means that some of the redistribution effects due to the progressive tax and the regressive benefit are canceled by the reranking of the income distribution before and after redistribution. In particular, if there exists reranking between net beneficiaries and net losers under the fiscal system, then the same redistributive effects could be achieved by less redistribution. In this sense, the transfer from the national to the local governments under the present scheme induces an inefficiency. If the lump-sum tax and transfer is fully available to the government, the same distribution as represented by the Lorenz function can be achieved by the 6 711 billion yen of the interregional transfer in total, which is 52% of the local grant tax under the present scheme, and also 91% of the net redistribution under the present scheme[10].

Second, the burden and allocation of local taxes enhance the income differences among the regions. Thus, a reform, such as an increase in the local tax to decentralize the fiscal system, may increase the regional income disparities.

In the next section, we consider the redistributive impact under the alternative scheme by simulation.

5. DISTRIBUTIVE IMPACTS OF THE REFORM

In this section, we estimate the redistributive impacts under the different reforms relating to the local taxes and grants. Although the indirect effects may occur due to the reaction of the consumer, the firm and the governments, we concentrate our attention on analyzing the direct impact. The redistributive effects under the fixed pre-tax and -benefit income are estimated for the different schemes.

Starting from the present situation, we consider the impacts of the following reforms: an increase in the local taxes, a change in the allocation scheme for grants, and decentralization caused an increase in local taxes and a decrease in grants.

5.1. An Increase in the Local Tax

In this subsection, we consider the redistributive impacts of an increase in local taxes. In order to analyze the change in redistributive effects due to local

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[10] To obtain this result, we compare the Lorenz function for the pre-tax and -benefit income with that for the final income under the present scheme. The net transfer for each income rank, B(P) is derived as $B(P) = G^{*-1}(P^*) - F^{-1}(P)$. The net redistribution under the present scheme (B^*) is defined as follows: $B^* = \frac{1}{2}\sum_i \left| Y_i^A - Y_i^B \right|$.

taxes, we consider the following two cases: an increase in the individual inhabitants tax by 5 000 billion yen in total (Case 1), and an increase in the local corporation tax by 5 000 billion yen in total (Case 2). In both of these cases, we assume that the tax burden and revenue in each region are increased in proportion to the present burden and revenue of the corresponding tax items.

Table 5 indicates the redistributive effects under these schemes. In both cases, the concentration index of the local tax revenue increases compared to the present scheme; the local tax revenue is relatively concentrated to the rich region. In Case 1, the concentration index increases from 0.1437 (under the present scheme) to 0.1484. An increase in the local corporation tax (Case 2) also induces an increase in the concentration index (0.1485).

Table 5

PROGRESSVITY AND REDISTRIBUTIVE EFFECTS OF AN INCREASE IN THE LOCAL TAX

	Gini Index G	Concentration Index C	Kakwani Index Π^T, Π^B	Reynolds-Smolemsky index Π^{RS}	Reranking D
Case 1					
Redistributive Effects					
Income after the local tax burden	0.0975	0.0972		0.0040	0.0002
Income after the local tax revenue	0.1061	0.1060		-0.0046	0.0001
Final Income[a]	0.0766	0.0756		0.0249	0.0010
Progressivity of Tax and Benefit					
Local tax burden	0.1450	0.1375	0.0360		
Local tax revenue	0.1563	0.1484	-0.0470		
Tax burden (in total)	0.1437	0.1362	0.0347		
Benefit (in total)	0.0830	-0.0264	0.1279		
Case 2					
Redistributive Effects					
Income after the local tax burden	0.0982	0.0980		0.0033	0.0002
Income after the local tax revenue	0.1062	0.1060		-0.0047	0.0003
Final income	0.0773	0.0763		0.0241	0.0010
Progressivity of Tax and Benefit					
Local tax burden	0.1420	0.1313	0.0298		
Local tax revenue	0.1614	0.1485	-0.0471		
Tax (in total)	0.1417	0.1320	0.0306		
Benefit (in total)	0.0929	-0.0264	0.1279		

a   The distribution of final income does not change, because we assume that individual income tax does not shift.

Furthermore, in Case 2, the Reynolds-Smolensky index increases from 0.0756 to 0.0763; the redistributive effects are reduced by an increase in the local corporation tax. Unlike individual income tax, the change in corporation tax alters the distribution of the final income through the tax shifting. If the burden of corporation tax shifts to the consumer, it has similar distributive effects as the origin-based consumption tax. On the other hand, if the burden of corporation tax is paid by the shareholder, it is interpreted as capital income tax subject to source principle. In both hypotheses relating to tax incidence, tax exporting may be induced by the corporation tax. The former hypothesis, especially, leads to the regressivity of the tax burden. Furthermore, the corporation tax revenue is concentrated in the rich region, because of the concentration of the economic activities by the corporations. These results suggest that corporation tax should not devolve on local governments.

5.2. Change in the Allocation of Grants

We turn to the reform relating to grants. Two reforms relating to changes in allocation of grants are considered. The first reform, which is referred to as Case 3, is the scheme that replaces matching grants with the non-matching grants. In this scheme, we assume that all grants are allocated to each local government according to the present distribution of local grant tax. In the second reform, referred to as Case 4, we assume that all grants are allocated in proportion to each region's population as opposed to the present scheme. In both cases, the grants in total are the same as in the present situation and the tax burden used to finance the grants is also assumed to be held as the same as in the present scheme.

Table 6 presents the redistributional consequences of two schemes. Replacing matching grants with non-matching grants (Case 3) results in the Reynolds-Smolensky index becoming larger than under the present scheme (from 0.0249 to 0.0283); the redistributive effects of the grants are enhanced by this reform. This result reflects the fact that the allocation of local grant tax is more regressive than the national subsidies under the present scheme. At the same time, this reform increases the reranking effects (from 0.0010 to 0.0014). An increase in the reranking term suggests that the inefficiency in the redistributive aspects is increased.

In Case 4, we find that the Reynolds-Smolensky index becomes smaller than the present situation (reduced to 0.0059). The reason is clear: the allocation of the grants in proportion to the population does not generate any redistributive effects. The redistributive effects are induced only by the tax burden used to finance the grants. We also find that the reranking effects are reduced by this reform (to 0.0001), because the reranking effects are mainly caused by the allocation of the grants.

Table 6
### PROGRESSVITY AND REDISTRIBUTIVE EFFECTS OF THE CHANGE IN THE ALLOCATION OF GRANTS

	Gini Index G	Concentration Index C	Kakwani Index Π^T, Π^B	Reynolds-Smolemsky index Π^{RS}	Reranking D
Case 3					
Redistributive Effects					
Income after the national taxes	0.0998	0.0997		0.0017	0.0001
Income after the grants	0.0748	0.0738		0.0267	0.0010
Final income	0.0732	0.0718		0.0283	0.0014
Progressivity of Tax and Benefit					
National tax burden	0.1433	0.1336	0.0321		
Grants	0.4740	-0.4422	0.5436		
Tax burden (in total)	0.1403	0.1320	0.0305		
Benefit (in total)	0.1163	-0.0729	0.1744		
Case 4					
Redistributive Effects					
Income after the national taxes	0.0998	0.0997		0.0017	0.0001
Income after the grants	0.0963	0.0963		0.0052	0.0000
Final income	0.0956	0.0955		0.0059	0.0001
Progressivity of Tax and Benefit					
National tax burden	0.1433	0.1336	0.0321		
Grants	0.0000	0.0000	0.1015		
Tax burden	0.1403	0.1320	0.0305		
Benefit	0.0971	0.0906	0.0109		

Figure 2 presents the Lorenz curve for the two cases together with those for pre-tax and -benefit income and for final income under the present scheme. We find the following facts; the Lorenz curve for Case 3 dominates that of the present scheme; and for Case 4, the Lorenz curve is dominated by that of the present scheme and dominates the pre- tax and -benefit income.

These results show the trade-off between the efficiency and equity of income redistribution among regions. From eq.(12), it is clear that under the fixed amounts of the grants, the only way to enhance the redistributive effects is with an increase in the regressivity of the allocation. However, an increase in the regressivity, as in Case 3, also increases the reranking effects, which deter the efficiency of redistribution. On the other hand, we can enhance the redistributive effects by raising the average rate of benefit even if the regressivity of the benefit is decreased by a change in the allocation scheme of

the grants, as in Case 4. However, these rising grants will also increase the allocative inefficiency caused by the taxes used to finance the grants.

Figure 2
REDISTRIBUTIVE EFFECTS OF GRANT REFORM
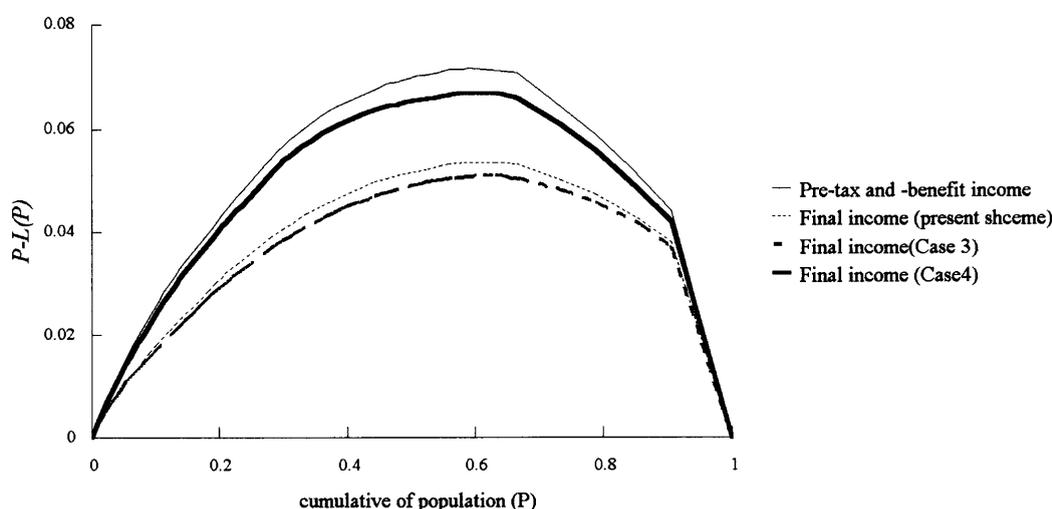
5.3. Decentralization

Finally, we consider the reform in which national taxes and the grants are decreased, while local taxes are increased to maintain the total revenue under the present scheme. This reform can be interpreted as the whole devolution program, which is recommended by the Committee.

Under the reform we assume that the local taxes are raised by 10 000 billion yen in total, while grants and the national tax burden used to finance the grants are reduced by 10 000 billion yen. We also assume that the remaining grants, which equal 9 092 billion yen, are allocated to each region in proportion to the present share of local grant tax.

Regarding the local tax items to be increased, we consider the following two schemes: all of the local taxes are raised by 10 000 billion yen in total and the tax revenue in each prefecture is increased in proportion to the present tax revenue (Case 5); and both local individual income tax and local corporation tax (except for withholding tax on interest and dividends) is raised by 5 000 billion yen, while the tax revenue in each prefecture is increased in proportion to the present tax revenue of two tax items (Case 6).

Table 7 presents the simulation results. We find that the Reynolds-Smolemsky indices for two cases are similar (0.0129 for Case 5 and 0.0119 for Case 6), and are smaller than the present final income; the redistribution effects are reduced by these reforms. From Table 7, we find that a decrease in the redistribution effects are mainly induced by the reduction of grants. We also find that the reranking effects are reduced by the reform (from 0.0010 to 0.0003).

Table 7

PROGRESSVITY AND REDISTRIBUTIVE EFFECTS OF THE DECENTRALIZATION

	Gini Index G	Concentration Index C	Kakwani Index Π^T, Π^B	Reynolds-Smolemsky index Π^{RS}	Reranking D
Case 5					
Redistributive Effects					
Income after tax (in total)	0.0968	0.0964		0.0047	0.0004
Income after benefit (in total)	0.0940	0.0938		0.0075	0.0002
Final income	0.0886	0.0883		0.0129	0.0003
Progressivity of Tax and Benefit					
Tax (in total)	0.1401	0.1315	0.0300		
Benefit (in total)	0.0764	0.0405	0.0609		
Case 6					
Redistributive Effects					
Income after tax (in total)	0.0967	0.0963		0.0048	0.0004
Income after all benefit (in total)	0.0949	0.0947		0.0066	0.0002
Final income	0.0896	0.0893		0.0119	0.0003
Progressivity of Tax and Benefit					
Tax (in total)	0.1406	0.1318	0.0303		
Benefit (in total)	0.0805	0.0475	0.0540		

Figure 3 presents the Lorenz curve for each scheme. We can see that the income distributions generated by these reforms are dominated by the distribution of the present final income and dominate the pre-tax and -benefit income.

Figure 3

REDISTRIBUTIVE EFFECTS OF DECENTRALIZATION
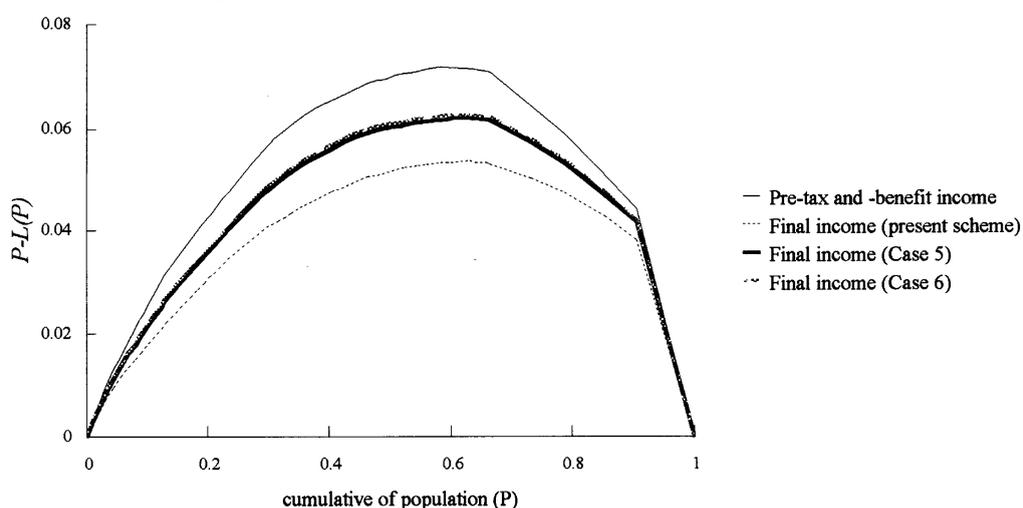
These results show that the distributive consequence of decentralization depends on the allocation scheme of the grants. Especially, the allocation method of local grant tax should be reconsidered. The income difference among regions may be increased by proposals such as reducing grants, even if the tax item devolves on the local governments.

6. CONCLUSION

In this paper, we examine the redistributive impacts of the devolution of local taxes and grants on local governments. The devolution proposals have been argued for in terms of the efficiency aspects related to the intergovernmental transfer. We have shown that the income inequalities among regions may be increased even if the efficiency is improved by the devolution program.

Our results show that the allocation scheme of the grants plays an important role in the evaluation of the devolution proposal. If we intend to devolve the tax items such a way that the redistributive impacts of the fiscal transfer system remain the same as under the present scheme, the present allocation of grants must be altered to strengthen the redistributive impact. However, an increase in the redistributive impact of grants may have negative effects on allocative efficiency due to the local governments' behavior. In this sense, we are faced with the trade-off between efficiency and equity.

In this paper, the benefit of public expenditure is measured by the revenue of tax and grants. If we allow for the difference in the production efficiency of public goods between regions, our results will be slightly modified. Some empirical results related to the production efficiency of Japanese local governments suggest that the rich regions have higher efficiency than the poor regions. From these results, we can predict that the redistributive impacts may be smaller than the results presented in this paper.

If a devolution proposal has an incentive to improve production efficiency in the poor regions, social welfare may be improved.

APPENDIX

Table A.1

PER CAPITA INCOME , TAX BURDEN AND BENEFIT BY PREFECTURES UNDER THE PRESENT SCHEME

Prefecture	Number of population N_i	Pre-tax and benefit income[a] $y_i^B = \frac{Y_i^B}{N_i}$	Burden of the local taxes[a] $\frac{T_i^L}{N_i}$	Burden of the national taxes[a] $\frac{T_i^N}{N_i}$	Local tax revenue[a] $\frac{B_i^L}{N_i}$	Grants revenue[a] $\frac{B_i^N}{N_i}$	Final income[a] $y_i^A = \frac{Y_i^A}{N_i}$	Net benefit[a] $y_i^B - y_i^B$
Hokkaido	5,665,699	2,420	225	135	214	307	2,582	162
Aomori-ken	1,507,037	2,059	173	107	161	324	2,263	205
Iwate-ken	1,428,646	2,240	181	107	173	341	2,465	225
Miyagi-ken	2,286,741	2,578	233	133	235	175	2,621	44
Akita-ken	1,226,921	2,203	174	105	173	349	2,445	242
Yamagata-ken	1,255,556	2,476	191	113	183	293	2,647	172
Fukushima-ken	2,129,647	2,427	213	114	218	231	2,550	123
Ibaraki-ken	2,935,668	2,713	226	123	235	137	2,736	23
Tochigi-ken	1,969,380	2,764	245	127	251	135	2,777	14
Gunma-ken	1,990,591	2,718	242	135	235	148	2,725	7
Saitama-ken	6,611,935	3,218	244	156	232	64	3,113	-105
Chiba-ken	5,717,741	2,892	265	161	251	68	2,785	-107
Tokyo-to	11,573,029	4,236	429	252	459	31	4,045	-191
Kanagawa-ken	8,103,918	3,219	302	180	302	32	3,072	-147
Niigata-ken	2,483,915	2,632	226	128	229	241	2,747	116
Toyama-ken	1,124,427	2,779	245	138	249	212	2,858	79
Ishikawa-ken	1,167,037	2,786	248	140	250	210	2,858	72
Fukui-ken	823,198	2,775	253	129	278	251	2,922	147
Yamanashi-ken	870,649	2,509	222	125	224	268	2,653	144
Nagano-ken	2,178,775	2,804	235	132	234	233	2,904	100
Gifu-ken	2,089,604	2,622	240	138	234	164	2,643	20
Shizuoka-ken	3,718,312	2,908	263	138	278	77	2,862	-46
Aichi-ken	6,714,789	3,143	311	179	318	42	3,014	-129
Mie-ken	1,829,721	2,780	231	131	233	169	2,820	40
Shiga-ken	1,259,880	2,838	233	132	251	163	2,887	49
Kyoto-fu	2,542,579	2,827	262	167	257	141	2,796	-31

(Sigue)

(Continuación)

Prefecture	Number of population N_i	Pre-tax and benefit income[a] $y_i^B = \dfrac{Y_i^B}{N_i}$	Burden of the local taxes[a] $\dfrac{T_i^L}{N_i}$	Burden of the national taxes[a] $\dfrac{T_i^N}{N_i}$	Local tax revenue[a] $\dfrac{B_i^L}{N_i}$	Grants revenue[a] $\dfrac{B_i^N}{N_i}$	Final income[a] $y_i^A = \dfrac{Y_i^A}{N_i}$	Net benefit[a] $y_i^B - y_i^B$
Osaka-fu	8,542,624	3,152	331	202	320	49	2,989	-163
Hyogo-ken	5,457,617	2,713	265	142	260	125	2,691	-22
Nara-ken	1,415,222	2,503	223	153	202	185	2,513	11
Wakayama-ken	1,094,933	2,349	203	121	202	272	2,499	150
Tottori-ken	618,349	2,434	195	124	183	375	2,673	239
Shimane-ken	774,624	2,161	184	112	181	450	2,495	334
Okayama-ken	1,944,167	2,604	231	127	234	193	2,673	69
Hiroshima-ken	2,861,699	2,797	249	145	250	167	2,820	23
Yamaguchi-ken	1,556,286	2,422	221	128	223	217	2,512	91
Tokushima-ken	837,226	2,472	190	118	190	333	2,687	215
Kagawa-ken	1,030,903	2,461	223	138	227	192	2,519	58
Ehime-ken	1,525,078	2,253	185	112	187	242	2,385	132
Kochi-ken	826,812	2,248	176	114	165	421	2,544	296
Fukuoka-ken	4,849,431	2,470	219	127	217	160	2,501	31
Saga-ken	882,878	2,371	188	114	186	300	2,555	184
Nagasaki-ken	1,556,612	2,226	172	104	161	314	2,426	200
Kumamoto-ken	1,858,946	2,328	180	114	164	276	2,474	146
Oita-ken	1,241,149	2,286	198	117	189	296	2,456	170
Miyazaki-ken	1,184,047	2,063	167	101	157	329	2,281	219
Kagoshima-ken	1,791,905	2,104	168	104	158	354	2,344	240
Okinawa-ken	1,266,898	1,897	134	80	127	327	2,137	240

a   in thousands of yen

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