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EVALUATION OF REGIONAL DEVELOPMENT POLICY-AN ALTERNATIVE APPROACH

(Revised)

by

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EVALUATION OF REGIONAL DEVELOPMENT POLICY-AN ALTERNATIVE APPROACH

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As a theoretical basis in evaluation of regional development policies which include capital subsidy in the form of low interest rate financing, we have the famous Borts' criteria. The Borts' criteria, however, presupposes the existence of immobile labor force as idle resource in a specific region, and this assumption makes the criteria practically inapplicable to the situation of present Japan where the interregional mobility of labor force is extremely high. Only way to justify the meaningfulness of regional development policies with subsidy in Japan is to take the nationwide dispersion of population as a supreme social policy objective and to evaluate relative cost-effectiveness of alternative economic policies instead of cost-benefit approach of the Borts' criteria. In the present paper, different intervention policies to attain a desired distribution of population between two regions are compared from the point of view of social cost as well as that of the amount of subsidy (or tax) needed.

INTRODUCTION

As a method of efficiency evaluation of alternative tax-subsidy programs for the purpose of regional development, there is the famous and clear-cut analysis by George H. Borts (Borts [1966]). The Borts' criteria which were developed in his analysis were scrutinized by the present author (Sakashita [1970]), and recently they were extended to the case in which the cost of interregional migration was taken into account (Boadway and Flatters [1981]).

In all cases cited above, however, the theoretical prerequisite of the analysis is the existence of an immobile factor of production (usually the labor force) in a specific region of the nation.

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In Japan nowadays, however, we have extremely high mobility of the labor force among regions, and this makes the straightforward application of the Borts' criteria to the situation of Japan impractical if not impossible. Notwithstanding the strong factor mobility, still we observe extensive use of subsidizing policies by the government for the purpose of regional development in Japan.

It is my opinion that such a situation can be theoretically justified only in terms of supreme social policy objective which denies, at least partially, the desirability of population (labor force) distribution resulted from the working of market mechanism. Therefore, if we have a desired pattern of population distribution among regions, our analysis should be focused on the effectiveness of alternative policies of market intervention in attainment of the desired pattern. In this sense, the method of analysis should be changed from that of cost-benefit as in the case of the Borts' criteria to that of cost-effectiveness in our case (or in the case of Japan).

In the next section, a simple two-region model of production and distribution is developed to compare the relative effectiveness of alternative tax-subsidy policies. In the second section, using a numerical example we compare the capital or price subsidy (or tax) policy with the wage subsidy (or tax) policy from the aspect of social cost involved. The third section explores the directions of extension of our analysis.

I. POLICY INTERVENTION IN A TWO-REGION MODEL

In the first place, we define the following symbols:

Xi: (net) output in region i, i = 1, 2 (the same hereafter),

Ki: capital input in region i,

Ni: labor input in region i,

$\bar{K}$: capital endowment in the nation (given level),

$\bar{N}$: labor endowment in the nation (given level),

$\bar{k}$: $= \bar{K}/\bar{N}$, national capital-labor ratio (given level),

ki: =Ki/Ni, capital-labor ratio in region i (variable),

ρi: net rental in region i,

wi: net wage rate in region i,

xi: = Xi/Ni, per capita (net) output in region i,

ni: = $Ni/\bar{N}$, labor force share in region i.

Secondly we define a specific and well-behaved linear homogeneous production function for each region, i.e.

(1) Xi = Fi (Ki, Ni), i = 1, 2.

By the assumption of well-behaved linear homogeneity, we can deduce a productivity function for each region, i.e.

(2) xi = fi (ki), fi (ki) = Fi (ki, 1), fi' > 0, fi" < 0, i = 1, 2.[1)]

General conditions of resource constraints which hold in any equilibrium are as follows:

(3) $K_1 + K_2 = \bar{K}$, $N_1 + N_2 = \bar{N}$.

In a free market, we have the following equilibrium condition additionally: [2)]

(4) $\frac{\partial F1}{\partial K1} = \frac{\partial F2}{\partial K2}$,

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1) A well-behavedness condition fi" < 0 excludes the possibility of negative cross derivative in the original production function Fi, becuase $\frac{\partial^2 Fi}{\partial Ki \partial Ni} = -\frac{Ki}{Ni^2} fi''$

2) Here we are assuming the existence of an 'interior' solution.

(5) $\frac{\partial F_1}{\partial N_1} = \frac{\partial F_2}{\partial N_2}$.

In terms of ratio variables, Equations (3), (4), and (5) are transformed into:

$$\left.\begin{array}{ll} (6) & f_1'(k_1) = f_2'(k_2) \\ (7) & f_1(k_1) - k_1 f_1'(k_1) = f_2(k_2) - K_2 f_2'(k_2) \\ (8) & n_1 k_1 + n_2 k_2 = \bar{k} \\ (9) & n_1 + n_2 \equiv 1 \end{array}\right\} \text{Market Solution,}$$

for four unknowns, k_1, k_2, n_1, and n_2.

For this market solution, we notice that the choice of production techniques is determined by Equations (6) and (7) <u>independently</u> of the value of $\bar{k}$, national capital-labor ratio as far as there exists an interior solution. We symbolize this solution as $\hat{k}_1$, $\hat{k}_2$, $\hat{n}_1$, and $\hat{n}_2$.

Now we leave the world of unintervened free market, and we assume that there is a preassigned value of n_1, i.e. $\bar{n}_1$ as a supreme policy objective. (Needless to say, $\bar{n}_2 \equiv 1 - \bar{n}_1$.) Then we have a predetermined relation for k_1 and k_2:

(10) $\bar{n}_1 k_1 + (1 - \bar{n}_1) k_2 = \bar{k}$.

Therefore, there is only one degree of freedom for k_1 and k_2 in this case. The problem of regional development policy now becomes that of choosing another relation between k_1 and k_2 according to some 'sub-optimizing' criterion.

Consider the following sub-optimizing problem:

(11) Maximize $\{x = \bar{n}_1 f_1(k_1) + (1 - \bar{n}_1) f_2(k_2)$: national average of per capita output$\}$ under the constraint of (10).

It is easily shown that the optimizing conditions for (11) are given by the combination of:

$$\left.\begin{array}{ll}(10) & \bar{n}_1 k_1 + (1 - \bar{n}_1) k_2 = \bar{k} \\ (12) & f_1'(k_1) = f_2'(k_2)\end{array}\right\} \text{ Wage Intervention Solution.}$$

The reason why we call this combination the wage intervention solution is that it prohibits any policy intervention in capital market as shown by Equation (12) which has the same form as Equation (6). Instead, Equation (7) must be violated for the solution k_1 and k_2 of Equations (10) and (12) that means the necessity of some wage intervention program for one or both of regions.

In other words, the combination of Equations (10) and (12) is nothing other than a proof of the fact that the wage intervention is the best policy in order to achieve a given goal of interregional labor (population) distribution. In comparison with the market solution given by Equations (6) $\sim$ (9), the wage intervention solution can be taken as the second best solution in the sense that it minimizes the loss of national output induced by a compulsory goal of labor force distribution. The loss can be considered as a social cost which is brought by such a social goal.

Now let us assume that region 1 is less productive than region 2 in the market solution:

(13) $f_2(\hat{k}_2) > f_1(\hat{k}_1)$, $\hat{k}_2 > \hat{k}_1$ for the solution $\hat{k}_1$ and $\hat{k}_2$ of Equations (6) $\sim$ (9).

Under the circumstances, a self-financing market intervention by the government which aims at a higher $\bar{n}_1$ than $\hat{n}_1$ will be expressed as follows:

(14) $(1 + s\rho) f_1'(k_1) = (1 - t\rho) f_2'(k_2)$

(15) $(1 + sw) \{f_1(k_1) - k_1 f_1'(k_1)\} = (1 - tw)\{f_2(k_2) - k_2 f_2'(k_2)\}$

(16) $[s\rho f_1'(k_1) k_1 + sw \{f_1(k_1) - k_1 f_1'(k_1)\}] \bar{n}_1$

$$= [t\rho f_2'(k_2) k_2 + tw \{f_2(k_2) - k_2 f_2'(k_2)\}] (1 - \bar{n}_1).$$

$s\rho$: rate of capital subsidy in region 1,

sw: rate of wage subsidy in region 1,

$t\rho$: rate of capital tax in region 2,

tw: rate of wage tax in region 2.

Apparently, Equation (16) means a balance between subsidy expenditure and tax revenue procured by the government.

Let us prove that the additional constraint of Equation (16) does not change the solution of sub-optimizing problem (11). For that purpose we formulate the following Lagrangean form:

$$(17)\quad \phi = \{\bar{n}_1 f_1 + (1 - \bar{n}_1) f_2\} + \lambda \{\bar{k} - \bar{n}_1 k_1 - (1 - \bar{n}_1) k_2\}$$
$$+ \mu \{(1 + s\rho) f_1' - (1 - t\rho) f_2'\}$$
$$+ \nu \{(1 + sw) (f_1 - k_1 f_1') - (1 - tw) (f_2 - k_2 f_2')\}$$
$$+ \theta [\{s\rho f_1' k_1 + sw (f_1 - k_1 f_1')\} \bar{n}_1$$
$$- \{t\rho f_2' k_2 + tw (f_2 - k_2 f_2')\} (1 - \bar{n}_1)],$$

which contains all of the constraints of (10), (14), (15), and (16).

By partial differentiations, we have:

$$(18)\quad \frac{\partial \phi}{\partial s\rho} = \mu f_1' + \theta f_1' k_1 \bar{n}_1 = 0$$

$$(19)\quad \frac{\partial \phi}{\partial t\rho} = \mu f_2' - \theta f_2' k_2 (1 - \bar{n}_1) = 0$$

$$(20)\quad \frac{\partial \phi}{\partial sw} = \nu (f_1 - k_1 f_1') + \theta (f_1 - k_1 f_1') \bar{n}_1 = 0$$

$$(21)\quad \frac{\partial \phi}{\partial tw} = \nu (f_2 - k_2 f_2') - \theta (f_2 - k_2 f_2') (1 - \bar{n}_1) = 0$$

It is easily shown that $\nu = \theta = 0$ by Equations (20) and (21) and hence $\mu = 0$ by Equation (18) or (19). The constraints imposed by Equations (14), (15), and (16) are, therefore, ineffective in the formulation of (17), and then we have the original sub-optimizing problem of (11). This completes the proof.

As a matter of fact, after solving the values of ki ($= \tilde{k}i$) for Equations (10) and (12), we can calculate the values of sw and tw for this self-financing wage intervention problem by the following equations:

(22) $(1 + sw)\, \tilde{w}_1 = (1 - tw)\, \tilde{w}_2$

(23) $sw\, \tilde{w}_1\, \bar{n}_1 = tw\, \tilde{w}_2\, (1 - \bar{n}_1)$

(24) $\tilde{w}i = fi\, (\tilde{k}i) - \tilde{k}i\, fi'\, (\tilde{k}i)$, $i = 1, 2$.

Calculated values of sw and tw are:

(25) $$sw = \frac{(1 - \bar{n}_1)\ (\tilde{w}_2 - \tilde{w}_1)}{\tilde{w}_1}$$

(26) $$tw = \frac{\bar{n}_1\ (\tilde{w}_2 - \tilde{w}_1)}{\tilde{w}_2} .$$ [3)]

In the case of self-financing intervention, there is little incentive for the government to economize the amount of tax or subsidy. On the other hand, if the subsidy is financed by general fund resource without tax or if the tax is imposed on the 'rich' region without subsidizing the 'poor' region, there will be strong incentive for it to minimize the amount of such subsidy or tax.

From this point of view, now we formulate the following subsidy minimizing problem:

(27) Minimize $\left[s = \Big((f_2' - f_1')\, k_1 + \{ (f_2 - k_2\, f_2') - (f_1 - k_1\, f_1') \} \Big) \bar{n}_1 \right]$

under the constraint of (10).

In order to analyze this problem, let us express a general subsidizing (taxing) program as follows:

(10) $\bar{n}_1\, k_1 + (1 - \bar{n}_1)\, k_2 = \bar{k}$

(28) $f_2' - f_1' = g$

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3) This method of solving s and t can be also used for the capital market intervention policy and for the price intervention policy discussed later with a little modification.

in which g is an instrumental variable showing the gap between marginal productivities of capital in two regions. Then we have:

(29) $\frac{dk_1}{dg} = -\frac{(1-\bar{n}_1)}{\Delta} > 0$

(30) $\frac{dk_2}{dg} = \frac{\bar{n}_1}{\Delta} < 0$

in which $\Delta = \bar{n}_1 f_2'' + (1-\bar{n}_1) f_1'' < 0$.

Using Equations (29) and (30), we can show that:

(31) $\frac{ds}{dg} = \frac{\bar{n}_1}{\Delta} \{ -\bar{n}_1 f_2'' (k_2 - k_1) - (1-\bar{n}_1) g \}$

Starting from $g \cong 0$, first we have a phase of $\frac{ds}{dg} < 0$ by (31), then for bigger g we have smaller gap between k_2 and k_1 by (29) and (30) so that we will see a phase of $\frac{ds}{dg} > 0$ later. We can, therefore, safely say that the minimum amount of subsidy will be attained at the point where $\frac{ds}{dg} = 0$. The minimizing condition is:

$$\left.\begin{array}{ll}(10) & \bar{n}_1 k_1 + (1-\bar{n}_1) k_2 = \bar{k} \\ (32) & -f_2'' / \left(\frac{f_2' - f_1'}{k_2 - k_1}\right) = \frac{1-\bar{n}_1}{\bar{n}_1}\end{array}\right\} \text{Minimum Subsidy Solution.}$$

This solution should be a mixture of wage and capital subsidies.

Also we can formulate a tax minimizing problem as follows:

(33) Minimize $[t = \Big((f_2' - f_1') k_2 + \{(f_2 - k_2 f_2') - (f_1 - k_1 f_1')\}\Big)(1-\bar{n}_1)]$
under the constraint of (10).

In this case, we will have:

(34) $\frac{dt}{dg} = \frac{(1-\bar{n}_1)}{\Delta} \{(1-\bar{n}_1) f_1'' (k_2 - k_1) + \bar{n}_1 g\}$,

so that $\frac{dt}{dg} > 0$ when $g \cong 0$ and $\frac{dt}{dg} < 0$ for bigger g. We cannot have, therefore, an 'interior' minimum for this problem. An exclusive wage tax solution (g = 0) or a mixture tax solution or an exclusive capital tax solution (g takes the possible maximum in both of latter cases) will be the minimizing solution.

Relative desirability between the minimum subsidy program and the minimum tax program depends on the values of $\bar{n}_1$ and $(1 - \bar{n}_1)$ as easily seen by the definition of s and t. If $\bar{n}_1$ is rather big, the tax program will be preferred, and vice versa.

Turning to other forms of intervention policy, two popular schemes are shown as follows:

$$\left.\begin{array}{ll} (10) & \bar{n}_1 k_1 + (1 - \bar{n}_1)k_2 = \bar{k} \\ (35) & f_1 - k_1 f_1' = f_2 - k_2 f_2' \end{array}\right\} \text{Capital Market Intervention Solution,}$$

and

$$\left.\begin{array}{ll} (10) & \bar{n}_1 k_1 + (1 - \bar{n}_1) k_2 = \bar{k} \\ (36) & p f_1' = f_2' \\ (37) & p (f_1 - k_1 f_1') = f_2 - k_2 f_2' \end{array}\right\} \text{Price Intervention Solution.}^{4)}$$

The inferiority of these solutions to the wage intervention solution from the point of view of efficient (or least inefficient) resource allocation is already proved. We can say that the price intervention is somewhere between wage intervention and capital market intervention from this aspect as shown by numerical examples in the next section.

Returning to the wage intervention solution, the effect of a small change in the assigned value of $\bar{n}_1$ can be calculated by the method of comparative statics, and we have:

$$(38) \quad \frac{dk_1}{d\bar{n}_1} = \frac{(k_2 - k_1) f_2''}{\bar{n}_1 f_2'' + (1 - \bar{n}_1) f_1''},$$

$$(39) \quad \frac{dk_2}{d\bar{n}_1} = \frac{(k_2 - k_1) f_1''}{\bar{n}_1 f_2'' + (1 - \bar{n}_1) f_1''},$$

$$(40) \quad \frac{dx}{d\bar{n}_1} = (f_1 - k_1 f_1') - (f_2 - k_2 f_2') = w_1 - w_2.$$

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4) In this formulation, p is an additional endogenous variable which embodies the level of intervention.

If we assume that the wage intervention solution is not so far from the market solution and $\hat{k}_2 > \hat{k}_1$ for the latter (see Relation (13)), we can safely say that:

(41) $\frac{dk_1}{d\bar{n}_1} > 0 \ , \ \frac{dk_2}{d\bar{n}_2} > 0.$

In addition, if we assume that region 1 is wage-subsidized, we have the following relations:

(42) $\bar{n}_1 > \hat{n}_1$ ($\hat{n}_1$ is the market solution),

(43) $w_1 < w_2$.

Here w_i denotes, of course, the wage rate in region i <u>net of</u> subsidy. Wage rates are equated between regions with wage subsidy program.

It is clear from (40) and (43) that if one wishes to increase the labor force share of region 1, which is already wage-subsidized, further, the national average per capita output decreases further, i.e. there will be additional social cost involved in the increase of $\bar{n}_1$.

If the initial value of $\bar{n}_1$ is equal to $\hat{n}_1$, the market solusion, then obviously we have $\left(\frac{d\bar{x}}{d\bar{n}_1}\right)_{\bar{n}_1=\hat{n}_1} = 0$ because of Equation (7).

We can, however, show that:

(44) $$\left(\frac{d^2x}{d\bar{n}_1^{\,2}}\right)_{\bar{n}_1=\hat{n}_1} = (k_2 - k_1)^2 \ \frac{f_1'' \ f_2''}{\bar{n}_1 \ f_2'' + (1 - \bar{n}_1) \ f_1''} < 0,$$

which implies that the national productivity always decreases when $\bar{n}_1$ departs from $\hat{n}_1$ in either direction. Equation (44) also implies that $\frac{d(w_1 - w_2)}{d\bar{n}_1} < 0$ so that as $\bar{n}_1$ becomes bigger and bigger than $\hat{n}_1$ then the discrepancy between w_1 and w_2 becomes bigger too so that more amount of wage subsidy is needed.

Finally let us consider the case of capital subsidy. As a counterpart to Equations (38), (39), and (40), now we have:

$$(45)\quad \frac{dk_1}{d\bar{n}_1} = \frac{(k_2 - k_1)\, k_2\, f_2''}{\bar{n}_1\, k_2\, f_2'' + (1 - \bar{n}_1)\, k_1\, f_1''},$$

$$(46)\quad \frac{dk_2}{d\bar{n}_1} = \frac{(k_2 - k_1)\, k_1\, f_1''}{\bar{n}_1\, k_2\, f_2'' + (1 - \bar{n}_1)\, k_1\, f_1''},$$

$$\left(\begin{matrix} \geq 0 \\ > 0 \end{matrix} \quad \text{if } \bar{n}_1 \cong \hat{n}_1 \text{ and } \hat{k}_2 > \hat{k}_1 \right)$$

$$(47)\quad \frac{dx}{d\bar{n}_1} = \frac{\bar{n}_1\, k_2^2\, f_2'' + (1 - \bar{n}_1)\, k_1^2\, f_1''}{\bar{n}_1\, k_2\, f_2'' + (1 - \bar{n}_1)\, k_1\, f_1''} (f_1' - f_2') = k^* (\rho_1 - \rho_2),$$

(k^* is a weighted average of k_1 and k_2).

Obviously $\frac{dx}{d\bar{n}_1} = 0$ when $\bar{n}_1 = \hat{n}_1$, but $\frac{dx}{d\bar{n}_1} < 0$ when already $\bar{n}_1 > \hat{n}_1$ and therefore $\rho_1 < \rho_2$ in which ρi is the rental in region i net of subsidy.

It is not easy to obtain the second derivative of x with respect to $\bar{n}_1$, but if we can assume that k^* in Equation (47) is approximately constant, we may have:

$$(48)\quad \left(\frac{d^2x}{d\bar{n}_1^2}\right)_{\bar{n}_1 = \hat{n}_1} \cong \frac{k^*}{\bar{n}_1\, k_2\, f_2'' + (1 - \bar{n}_1)\, k_1\, f_1''} (k_2 - k_1)^2\, f_1''\, f_2'' < 0$$

which is analogous to Equation (44).

II. NUMERICAL EXAMPLES AND COMPARISON OF DIFFERENT INTERVENTION POLICIES

In this section, we give numerical examples of wage, capital market, and price intervention policies using Cobb-D ouglas production functions. As Borts emphasized in his paper, since tax collection and/or subsidy expenditure are merely the matter of income redistribution and are not related to the efficiency of resource allocation, the most important point in the comparison of different policies is the amount of national average of per capita output (x) which reflects the real social cost of the intervention policies.

For the numerical examples, we specify the productivity functions of two regions and national capital labor ratio as follows:

(49) $x_1 = Ak_1^{\alpha_1}$; $x_2 = k_2^{\alpha_2}$, $(A = 1.25,\ \alpha_1 = 0.4,\ \alpha_2 = 0.6)$

(50) $\bar{k} = 3.0$

With this specification, interregional equilibrium under the particular intervention scheme is given as follows:

Wage Intervention Scheme

(51-1) $\bar{n}_1 k_1 + (1 - \bar{n}_1) k_2 = \bar{k}$,

(51-2) $\alpha_1 Ak_1^{\alpha_1 - 1} = \alpha_2 k_2^{\alpha_2 - 1}$,

(51-3) $x = \bar{n}_1 Ak_1^{\alpha_1} + (1 - \bar{n}_1) k_2^{\alpha_2}$.

Capital Market Intervention Scheme

(52-1) = (51-1)

(52-2) $(1 - \alpha_1) A k_1^{\alpha_1} = (1 - \alpha_2) k_2^{\alpha_2}$

(52-3) = (51-3).

Price Intervention Scheme

(53-1) = (51-1)

(53-2) $p \alpha_1 A k_1^{\alpha_1 - 1} = \alpha_2 k_2^{\alpha_2 - 1}$

(53-3) $p (1 - \alpha_1) A k_1^{\alpha_1} = (1 - \alpha_2) k_2^{\alpha_2}$

(53-4) = (51-3).

In Table 1, the solution of wage intervention scheme is given for each preassigned value of $\bar{n}_1$. National average of per capita output (x) attains its maximum when $\bar{n}_1 = 0.62035$ which is equivalent to the free market equilibrium, and in the seventh column of the table indices of x relative to this maximum are given. These indices can be taken as an indicator of real social cost of intervention.

In Table 2, the solution of capital market intervention is given in the same manner. Comparison of the seventh column of Table 2 with that of Table 1 shows (marginal) inferiority of this intervention to the sub-optimal wage intervention.

In Table 3, the solution of price intervention scheme is shown with the value of price intervention level (p) in the second cloumn. Again $\bar{n}_1$ = 0.62035 gives the maximum value of x which is equal to the market solution, and p = 1 in this case. The eighth column shows the values of 'nominal' per capita output for the calculation of which the value of p is taken into consideration. The nineth column of this table shows intermediate character of this intervention compared with the seventh columns of Tables 1 and 2.

Remarkably small difference among the outcomes of these three tables implies the excess technological flexibility of the Cobb-Douglas production function which adjusts itself smoothly to the condition of different type of intervention. Probably we should not expect such strong flexibility in the real world.

III. CONCLUSION

In the preceding two sections, we discussed relative advantage and disadvantage of the different intervention policies as a measure of attaining a desired pattern of interregional population (labor force) distribution. The superiority of wage intervention from the point of view of lesser social cost is almost unchallenged, but it is not a policy which gives the minimum amount of subsidy in general.

As a further investigation, regional allocation of public investment can be also taken as a form of preferential regional policy, and the effectiveness of this policy should be studied very

Table 1 Wage Intervention Scheme: (51-1)∿(51-3)

$\bar{n}_1$	k_1	k_2	x_1	x_2	x	$((x/x_{max})x100)$
0.0	--	3.0	--	1.93318	1.93318	(97.8)
0.1	1.58808	3.15688	1.50404	1.99322	1.94430	(98.4)
0.2	1.64823	3.33794	1.52657	2.06104	1.95415	(98.9)
0.3	1.71723	3.54976	1.55182	2.13855	1.96253	(99.3)
0.4	1.79755	3.80164	1.58045	2.22834	1.96919	(99.7)
0.5	1.89265	4.10735	1.61339	2.33419	1.97379	(99.9)
0.6	2.00789	4.48816	1.65199	2.46173	1.97589	(100.0)
0.62035	2.03451	4.57764	1.66071	2.49106	1.97595	(100.0)
0.7	2.15179	4.97915	1.69836	2.61995	1.97484	(100.0)
0.8	2.33915	5.64340	1.75604	2.82439	1.96971	(99.7)
0.9	2.59897	6.61925	1.83160	3.10521	1.95896	(99.1)
1.0	3.0	--	1.93981	--	1.93981	(98.2)

Table 2 Capital Market Intervention Scheme: (52-1)∿(52-3)

n_1	k_1	k_2	x_1	x_2	x	$((x/x_{max})x100)$
0.0	--	3.0	--	1.93318	1.93318	(97.8)
0.1	1.18975	3.20114	1.33996	2.00994	1.94294	(98.3)
0.2	1.31460	3.42135	1.39453	2.09179	1.95234	(98.8)
0.3	1.45564	3.66187	1.45255	2.17882	1.96094	(99.2)
0.4	1.61450	3.92367	1.51400	2.27099	1.96819	(99.6)
0.5	1.79269	4.20731	1.57875	2.36812	1.97343	(99.9)
0.6	1.99145	4.51282	1.64656	2.46984	1.97587	(100.0)
0.62035	2.03451	4.57764	1.66071	2.49106	1.97595	(100.0)
0.7	2.21161	4.83957	1.71709	2.57563	1.97465	(99.9)
0.8	2.45343	5.18626	1.78986	2.68481	1.96885	(99.6)
0.9	2.71658	5.55079	1.86431	2.79649	1.95753	(99.1)
1.0	3.0	--	1.93981	--	1.93981	(98.2)

Table 3 Price Intervention Scheme: (53-1)∿(53-4)

n_1	p	k_1	k_2	x_1	x_2	x	x^* a)	$((x/x_{max})x100)$
0.0	--	--	3.0	--	1.93318	1.93318	--	(97.8)
0.1	0.929524	1.41176	3.17647	1.43488	2.00063	1.94406	1.93394	(98.4)
0.2	0.940863	1.50000	3.37500	1.47010	2.07474	1.95381	1.93643	(98.9)
0.3	0.953086	1.60000	3.6	1.50854	2.15666	1.96222	1.94099	(99.3)
0.4	0.966329	1.71429	3.85714	1.55076	2.24781	1.96899	1.94810	(99.6)
0.5	0.980758	1.84615	4.15385	1.59741	2.35001	1.97371	1.95834	(99.9)
0.6	0.996585	2.00000	4.5	1.64939	2.46563	1.97588	1.97250	(100.0)
0.62035	1.000000	2.03451	4.57764	1.66071	2.49106	1.97595	1.97595	(100.0)
0.7	1.01408	2.18182	4.90909	1.70786	2.59777	1.97479	1.99162	(99.9)
0.8	1.03360	2.40000	5.4	1.77417	2.75066	1.96947	2.01715	(99.7)
0.9	1.05561	2.66667	6.0	1.85054	2.93016	1.95850	2.05111	(99.1)
1.0	--	3.0	--	1.93981	--	1.93981	-	(98.2)

Note a): $x^* = p\,\bar{n}_1\,x_1 + (1 - \bar{n}_1)\,x_2$

carefully. Furthermore a combined policy of public investment and wage or capital intervention can be studied from the similar point of view (see Sakashita [1982]).

Another aspect of the regional policy is the difference in adjustment (moving) speeds of capital and labor. Any subsidizing policy cannot expect instantaneous effect if there is certain stickiness for the interregional mobility of factors. Therefore, we should distinguish long-run effect from short-run effect in such a case. The cost of short-run adjustment may make the desirable regional policy infeasible. We should proceed to this sort of dynamic analysis.

In any case, the approach adopted in the present paper can be understood as a necessary and important procedure in order to give a scientific basis to the analysis of regional development policy.

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