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CRITERIA FOR THE REGIONAL ALLOCATION OF PUBLIC RESOURCES

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Based on a spatial development policy objective of continuous regional growth to reduce interregional gap and unemployment, the paper develops simple criteria for the regional allocation of public resources for development from a regional growth model that uses the well-known Harrod-Domar growth equation as extended by a neoclassical production function.

1. Introduction

Although interregional inequality — however measured — in a less developed country (LDC) is widely recognized and a considerably large chunk of national government expenditures has continued to be directed to the problem, there have been no well-defined criteria for determining the regional allocation of government development resources. What is being done, at least in the case of the Philippines, is to use as allocational guidelines for *all* categories of government expenditures, some poverty level indices or the perceived needs of the national economy's various regions articulated through political representation.

Of the following major categories of government expenditures on social overhead capital, (1) those that are explicitly directed to immediate welfare — specific social services such as social security, medical and health care, education, peace and order, etc., and (2) those that explicitly bear on production activities such as infrastructures, agricultural support programs, small-scale industry assistance schemes, technology dissemination and related extension programs for all production sectors, etc., geographic resource allocational guidelines based on poverty level indices and/or political representation may suffice for the first category of government expenditure owing to its general character — this expenditure category is independent of an economy's development level and allocated more or less equally on per capita basis among the population.

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Indeed in highly developed countries where explicit production-related components of social overhead capital are largely well in place so that government expenditures have very little or no relation to these but are directed largely to social services, political articulation of these needs, by and large, determines the regional share in this type of government expenditure.

While social services are always present in less developed countries' government budgets and their geographic allocation determined in like manner as in developed countries, production-related expenditure items claim the largest share out of an LDC's public resources for obvious reason. Hence, in the case of LDCs, the use of poverty level indices, political representation or lobbying and the like alone, are not only insufficient but perhaps inappropriate since the *actual* requirement of production activities may not be accurately matched by the allocation and is thus distortive. Here the capacity of industries in the region to use resources efficiently must be taken into account. Furthermore, in LDCs with persistently large interregional inequality — say, in terms of real per capita regional output or income — so that an obvious major policy objective is to reduce the interregional gap, a regional allocation scheme that simply matches the requirement of production activities is not enough. Narrowing down inequality among the economy's regions requires the setting of targets, say, in terms of growth rates.

Besides the policy objective of reducing the interregional gap, the other equally-important and related rationale for setting target growth rates includes:

(a) Warding off the onset of the *steady state* through measures that enhance continuous growth;

(b) Reducing unemployment — a problem recognized to be more serious among depressed regions than in relatively more progressive areas — by means of a resource-augmentation scheme that makes the region's capital resource exceed the capital requirement of the increment in its labor force alone as reflected by its population growth; and,

(c) Providing more leeway for wider spatial-sectoral spread effects of regional growth stimulation thus strengthening regional interdependence and proclivities toward industrial dispersion.

Under these conditions, public resources for economic development must therefore be allocated among the economy's regions

in such amounts that meet the requirement of the regions' target growth rates. It is to this broader problem that this paper is addressed.

2. The Allocation Criteria

The objective of this paper is to develop simple criteria for the regional allocation of government development expenditure. Thus the allocation scheme to be developed is intended only for the category of government expenditures that are clearly production-related. The well-known Harrod-Domar[1] model's income growth equation extended with the use of a neoclassical production function, is employed at the regional level along with the definition of per capita regional output or income. In effect, since regional output per capita is used, a neoclassical regional growth model is generated which is then made the basis for the criteria.

At this juncture, the conditions that the criteria must satisfy or, at least, be consistent with, need to be mentioned. These conditions are:

1. The criteria must not be distortive. That is, the allocation scheme must conform with the neoclassical notion that more resources should flow into the areas where they have higher returns, presumably the relatively resource-scarce or depressed regions, than the progressive regions.

2. Considering the production activities in a region, the scheme must take into account the region's ability to use the resources efficiently.

3. The scheme should, over time, be able to fulfill its functions of stimulating regional growth and reducing the interregional gap.

To begin with, consider an economy with $i = 1, 2, 3, \ldots, n$ geographical or regional delineations.

Using the Harrod-Domar model's equation for income growth at the regional level, we have for the national economy's ith region that

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[1]The paper ignores doctrinal disputes on the model. The model is used here simply to identify the factors and check their compatibility with, and role in, economic growth. Using a neoclassical production function that extends the Harrod-Domar model, the growth process is described in the appendix to this paper.

$$(1) \qquad (\Delta Y/Y)_i = (s/v)_i$$

which says that the rate of growth of the ith region's total output $(\Delta Y/Y)_i$ is equal to the ratio of its propensity to save s_i to its capital-output ratio[2] v_i.

The ith region's per capita output or income is

$$(2) \qquad y_i = (Y/P)_i$$

where Y_i is the region's total output, P_i its population. Taking the logarithm of (2) and then its derivative, we have the expression for the rate of growth of the ith region's per capita output,

$$(3) \qquad (\Delta y/y)_i = (\Delta Y/Y)_i - (\Delta P/P)_i$$

where $(\Delta Y/Y)_i$ is the rate of growth of the region's total output, and $(\Delta P/P)_i$ is the rate of growth of its population.

Finally, substituting from (1) into (3), we obtain the regional per capita income growth equation, [3]

$$(4) \qquad (\Delta y/y)_i = (s/v)_i - n_i,$$

where

$$n_i = (\Delta P/P)_i$$

Now, suppose target growth rates of regional output per capita for the regions are set. These target growth rates need not be the same for all the regions in the economy. In fact, to accord with the policy objective of the regional allocation of government development expenditure of reducing interregional inequality in output per capita, the target growth rates must be inversely proportional to regional output per capita to allow depressed or lagging regions to catch up with relatively more progressive regions over time. If a regional development plan were adopted, the time at which regional output per capita would have converged may be a part of the targets. In this instance, the target growth rates of per capita regional income may be set to conform with the target time frame.

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[2] In practice, the "incremental capital-output ratio" (ICOR) defined as the ratio of investment or change in the capital stock to the change in total output is used, instead of the capital-output ratio owing to problems in the measurement of the capital stock.

[3] If per capita output is maximized, we obtain from (4) the well-known equation of the steady state path $(s/v)_i = n_i$ where n_i is the rate of growth of the population or the labor force.

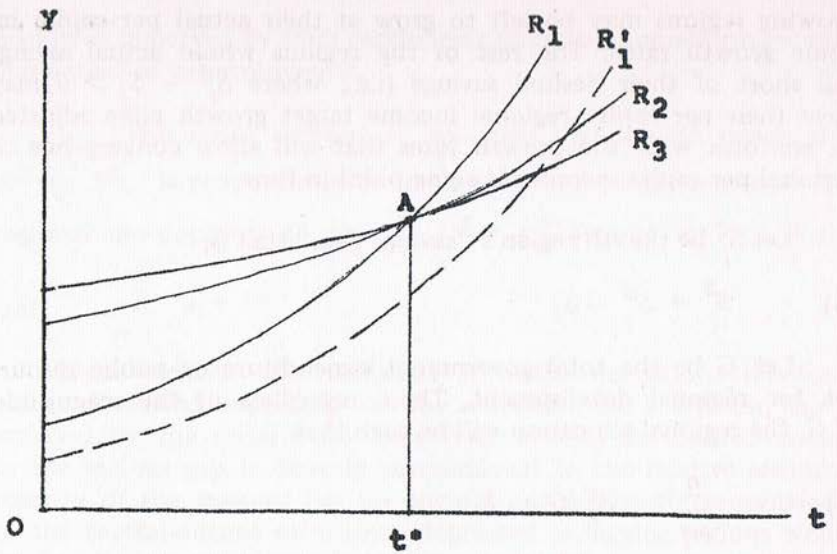

Figure 1

These points are illustrated by the following diagram for three regions.

Figure 1 shows the paths over time of regional output per capita of regions R_1 R_2, and R_3, converging at point A at some point in time t^*. Also shown by the broken line R_1' in the diagram is the path over time of the per capita income of region 1 if its actual or target growth rate is different from that in R_1'. Adjusting the growth rate in R_1' to that in R_1' makes the region's per capita income's time path conform with the convergence point.

A concomitant requirement of the setting of target growth rates of regional income per capita is the regions' savings requirement or desired savings S_i^d which will enable the various regions' propensities to save to achieve the target growth rates, given the regions' capital-output ratios and population growth rates. Suppose s_i and r_i are the ith region's propensity to save and target growth rate of its per capita output, respectively. Then from (4) we may have

$$(5) \qquad (s/v)_i - n_i \gtreqless r_i$$

The relationships in (5) indicate the magnitude and regional direction of public resources. There is no resource flow problem for regions whose actual savings are greater than or equal to desired savings. To eliminate the "greater than" inequality in (5), fast-

growing regions may be left to grow at their actual per capita income growth rates. The rest of the regions whose actual savings fall short of their desired savings (i.e., where $S_i^d - S_i > 0$) may have their per capita regional income target growth rates adjusted to conform with the growth rates that will allow convergence of regional per capita incomes at some point in time.

Let S_i^g be the ith region's "savings gap," that is,

$$S_i^g = S_i^d - S_i \tag{6}$$

Let G be the total government expenditure or public resources for regional development. Then, regardless of the magnitude of G, the regional allocation will be such that

$$\sum_{i=1}^{n} S_i^g/G = 1 \tag{7}$$

where clearly, S_i^g/G is the ith region's relative share in G.

Certain problems relating to the savings gap S_i^g need to be mentioned. From the preceding discussion, it is clear that,

$$S_i^g = f[r_i(G)], \text{ where } \frac{dS_i^g}{dr_i} \frac{dr_i}{dG} > 0 \tag{8}$$

There is evidently no allocational problem if G is not a constraint. Here r_i may be set as high as what may be deemed to be *realistically* attainable. If, however, G is a constraint, then r_i will have to give way. In any case, the allocation of G among the economy's regions will still be in keeping with the relative share of the regions shown in (7).

3. Summary and Conclusion

The criteria for regional allocation of public resources for development are:

1. The allocation augments the regions' resources to enable them to achieve their respective target growth rates either in terms of their total output or their output per capita, given their respective capital-output ratios and population growth rates.

2. The allocation is proportional to the resource needs of the regions and conforms with their capacities to efficiently absorb

resources indicated by their capital-output ratios, population growth, and extent of unemployment.

3. The *actual* amount of resources that the *i*th region gets, $R_i^g \left(\gtreqless S_i^g\right)$, is proportional to the *actual* total public resources for regional development G, that is, $R_i^g = a_i G$, where $a_i = S_i^g / G$ and $\sum_{i=1}^{n} a_i = 1$.

These criteria are consistent with the conditions set forth earlier. Focusing especially on the non-distortive condition, this is satisfied by the criteria for three reasons: (a) the desired savings or the savings gap is directly proportional to the relative resource-scarcity of the regions; (b) the savings gap is directly proportional to the capital-output ratio since depressed or lagging regions would tend to be less productive in their resource-utilization than relatively more progressive regions; and (c) the periodic calculation (e.g., annually) of the variables and parameters of the actual rates of growth of regional output per capita allows for modification of the target growth rates. This effectively captures the regional distribution of the population due to population movement, and changes in regional resource utilization efficiency (reflected by changes in the capital-output ratio) due to changes in the spatial structure of production activities. In addition, any spread effect arising from regional interdependence is reflected by these changes.

Implicit in the criteria is a revenue-sharing scheme since while government revenue is proportional to the economic development level of the regions, the regional allocation of this revenue through expenditure is inversely proportional to the economic development level of the regions. Lastly, the criteria are consistent with the balanced growth approach to regional development.

Appendix

Extension of the Harrod-Domar Model with a Neoclassical Production Function

This appendix has the following objectives:

1. To derive the per capita income growth equation, $(\Delta y/y)i = (s/v)_i - n_i$ using a neoclassical production function thus amending

the fixed coefficient production condition of, and extending the, Harrod-Domar model;

2. To describe the growth process which encapsulates all the rationale behind the setting of a target growth rate.

Since the discussion that follows pertains to a region, the subscript is dropped. Under the assumption that the production function exhibits constant returns to scale, the discussion proceeds in terms of *per capita* variables, so that no distinction may be made especially between the rate of growth of the population and the rate of growth of the labor force.

With constant returns to scale the production function is:

(A.1) $y = f(k)$

where $y = Y/P$ is output per capita

$k = K/P$ is capital stock per capita

Saving per capita is,

(A.2) $s^* = sy$

In equiiibrium,

(A.3) $s^* = I^* = \Delta k$

where I^* is investment per capita, and Δk is the change in capital stock per head.

Then from (A.2) and (A.3), we have

(A.4) $\Delta k = sy$

Let $\Delta P/P = n$ be the rate of growth of the population (or labor force). To employ more than just the increment in population and for the continuous growth of output per head, the rate of growth of capital per head must exceed the rate of growth of the population or labor force, i.e.,

(A.5) $\Delta k/k > n$

or,

(A.6) $\Delta k > nk$

From (A.4) and (A.6), we have

(A.7) $sy > nk$

All these are shown in the diagram below:

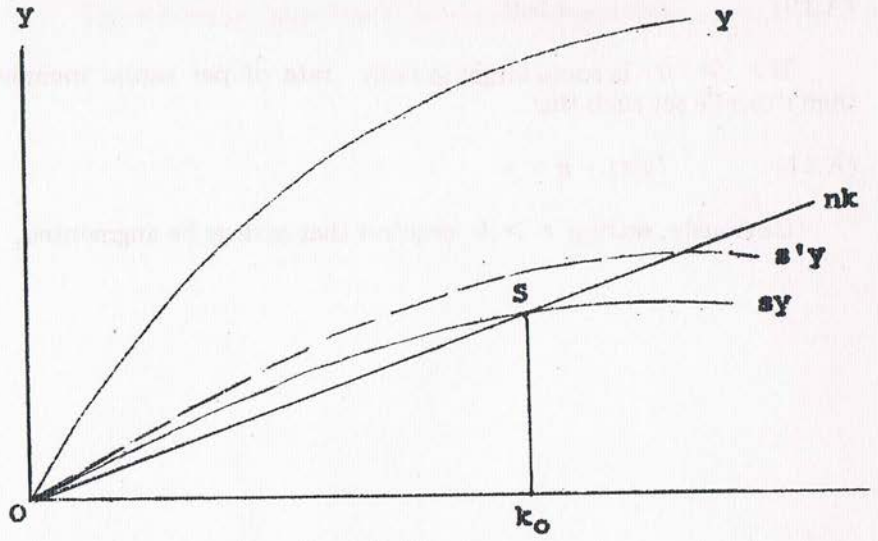

Figure A.1

In the diagram, curve O_y shows the shape of the production function. sy is the savings curve while nk shows investment per head or change in capital per head that the rate of growth of the population alone requires. At $k < k_o$, $sy > nk$ so output per capita continues to grow. At point S the *steady state* is reached, where

(A.8) $sy = nk$

which occurs at capital per head k_o. Here output per capita ceases to grow and its level is simply being maintained by investment that matches the capital requirement of population growth at the capital per head k_o.

The steady state is certainly not the objective of any less developed economy. This means that unemployment is being left undiminished. To ward off the steady state and raise employment it is necessary that sy be kept higher than nk by systematic resource-infusion that raises the propensity to save s (to say s') thus shifting upward the saving function so that per capita income continues to grow. Hence, the requirement in (A.7). Alternatively, since $y = Y/P$ and $k = K/P$, (A.7) may be rewritten as

(A.9) $(s/v) > n$

or, as an explicit expression of the rate of growth of per capita output or income (in the main text of the paper),

(A.10) $(s/v) - n > 0$

If $r > 0$ is some target growth rate of per capita income, then r can be set such that

(A.11) $(s/v) - n = r$

Obviously, setting $r > 0$ requires that savings be augmented.

References

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