

A Scheme of Resource Transfers and Its Possible Effect on Growth and Distribution: The Case of Less Developed Economies

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1. Introduction

In the wake of growing disillusion with the trickle-down hypothesis, a new development strategy which puts equal emphasis on growth and distribution has recently emerged.

The objectives of this study are (1) to put forth a scheme of resource transfers, internal as well as external, which is consistent with a distributional objective; and (2) to explore the effect of this transfer scheme with a model which consists of the determinants of growth and distribution among different socio-economic groups in the Very Poor Countries and Poor Countries (hereafter referred to as the VPC and PC). The focal points of interest in the simulation are twofold: (1) to examine the effect of various resource transfers on the changing share of income of the poorest 40% of the population; and (2) to determine the timespan necessary for these groups to reach a target consumption level.

The dynamic properties of the model to be outlined are examined by simulation. Various attempts to simulate the income distribution and growth effect have been made by Ahluwalia and Chenery (1974), Adelman and Robinson (1973), and Bardhan (1973) in his report on the model devised by the Indian Planning Commission.¹⁾ These models simulate the

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The author is grateful to Y. C. Kim for numerous and valuable comments; and Duane Weimer, his research assistant, for the computer work.

1) See Cline (1975) for an extensive survey of the literature on income distribution and development.

distributional impact of selected policy regimes.

The model used in the present simulation is basically that of Ahluwalia and Chenery (1974). The choice of the model is due primarily to its simplicity and its compatibility with global-macro aggregation. The Ahluwalia-Chenery model provides a unified treatment of the determinants of both the growth and distribution of income among different groups. The basic distinction between the present study and that of Ahluwalia-Chenery is that the present simulation deals with the impact of a combination of external and internal resource transfers on the growth and distribution of the VPC and PC whereas the latter deals only with the impact of internal resource transfers (consumption and investment) in the Latin American type economies. The present study employs the actual data whenever possible in order to bring the result of the simulation closer to reality.

2. Pattern of Income Disparities Between Nations

In order to develop a scheme for income transfer it is necessary to classify countries according to the level of their per capita income as shown in Table I.

In 1975 roughly 57.8% of the world population lived in the VPC and PC, as defined in this classification, while 27.5% lived in the Rich and the Very Rich countries (hereafter referred as the RC and VRC). In the same period, the 57.8% of the world population living in the first groups produced less than 10% of the world's aggregate product, while the 27.5% living in the advanced countries (RC and VRC) produced 80.6% of the aggregate world product. Roughly 24.6% of the world population lived in the VPC and the average per capita GNP within this group was \$ 140. But, the per capita GNP for the poorest 40% within this group was on average below \$ 50.

In the same period 33.2% of the world's population lived in the PC with an average per capita GNP of \$ 350. For this group the per

Table 1. Population, GNP and Per Capita GNP, 1975

	Population (millions)	GNP (US \$ 000 millions)	Average GNP Per Capita (US \$)	No. of Countries
Very Poor* (less than \$ 200)	959 (24.6%)	131 (2.2%)	140	28
Poor (\$ 200 to \$ 499)	1,295 (33.2%)	457 (7.5%)	350	40
Middle Income (\$ 500 to \$ 1,999)	576 (14.7%)	590 (9.7%)	1,020	59
Rich (\$ 2,000 to \$ 4,999)	654 (16.7%)	2,034 (33.4%)	3,110	30
Very Rich (\$ 5,000 and over)	422 (10.8%)	2,876 (47.2%)	6,820	25
TOTAL	3,906 (100%)	6,088 (100%)		

Source: World Bank Atlas, 1977

*Afghanistan, Bangladesh, Benin, Bhutan, Burma, Burundi, Chad, Ethiopia, Gambia (The), Guinea, Guinea-Bissau, Haiti, India, Lao People's Democratic Republic, Lesotho, Malawi, Maldives, Mali, Mozambique, Nepal, Niger, Pakistan, Rwanda, Somalia, Sri Lanka, Tanzania, Upper Volta, Zaire.

**Angola, Bolivia, Botswana, Cameroon, Cape Verde, Central African Empire, China (People's Republic of), Comoros, El Salvador, Equatorial Guinea, Grenada, Honduras, Indonesia, Jordan, Kenya, Korea (North), Liberia, Madagascar, Mauritania, Morocco, New Hebrides, Nigeria, Papua New Guinea, Philippines, São Tome and Príncipe, Senegal, Sierra Leone, Solomon Islands, St. Vincent, Sudan, Swaziland, Thailand, Togo, Tonga, Uganda, Western Samoa, Yeman Arab Republic, Yemen (People's Democratic Republic of), Zambia.

capita GNP of the lowest 40% ranged from \$ 50 to \$ 150% depending on the income distribution and the per capita income of the individual countries within the group. Note from Table I that intercountry dispersion of the level of per capita GNP was more pronounced for the PC than for the VPC, and that a large portion of the population in the PC had income less than \$ 100. Assuming that \$ 120 per capita is the minimum desirable consumption standard, the major effort of development assistance must be concentrated on raising the living standard of these lowest income groups.

3. A Resource Transfer Scheme

3.1 The General Principle

The present study deals with two types of resource transfers: external and internal. The major considerations in allocating externally available resources between the VPC and PC are (1) to raise the per capita

income of the lowest 40% of the population whose level of consumption falls below the minimum desirable level, (2) to revise the pattern of income distribution toward more equality within individual recipient countries, (3) to narrow the relative income gap between the VPC and PC.

The transfer scheme for the VPC involves only the external resource transfer over the first 35-year period. On the other hand, the transfer scheme for the PC consists of both internal and external resource transfers: external transfers during the first 20 years and internal transfers between the year 15 and 40. The internal resource transfers for the PC are necessary to transform the pattern of income distribution from one of "high inequality" to one of "high equality."

In the proposed scheme the external transfers involved both the consumption transfers and the capital transfers, whereas the internal transfers involve only the capital transfers from the highest income group to the middle and the lowest income group. The size of the internal transfers is 2% of the GNP of each country within the PC.

3.2 The External Resource Transfer

(a) The Present Pattern and the Proposed Scheme

The proposed amount of the external transfers to the VPC and PC adds up to 0.70% of the combined GNP of the RC and VRC over and above the amount currently financed by these countries. At present, the major burden of the external resource transfers are born by the DAC countries. The total net disbursement by the DAC countries in 1975 amounted to \$13.7 billion, or 0.33% of the combined GNP of the DAC countries which is equivalent to approximately 0.30% when only the grant element is considered.²⁾ At the same time, the \$12.1 billion which represents the grant element of the \$13.7 billion corresponds to 0.25% of the combined GNP of the RC and VRC. Furthermore, the VPC and PC's share of the \$12.1 billion is \$7.8 billion, 58.6% of the total.³⁾ The

2) See *Development Cooperation* (OECD) 1977 Review, pp. 163-214.

3) *Ibid.*, pp. 200-1. Figures are based on the net receipts by individual developing countries and territories of ODA from DAC countries and multilateral agencies.

VPC's share was \$4.2 billion and the PC's share was \$3.6 billion. The \$7.8 billion is equivalent to 0.14% of the combined GNP of the RC and VRC. If the 1975 pattern of transfers and allocation continues, then, the proposed additional transfers of 0.70% combined with the present 0.14% will add up to 0.85% of the combined GNP of the RC and VRC.⁴⁾

(b) The Breakdown of the Externally Transferred Resources

The \$34.49 billion shown in Chart 1 represents 0.7% of the GNP of the RC and VRC (excluding the Soviet block) in 1979/80.⁵⁾ This amount will be divided by the ratio of 6 : 4 between the VPC and PC, respectively which gives \$20.69 billion to the VPC and \$13.80 billion to the PC.⁶⁾ From these gross values the administrative expenses are subtracted to arrive at the net resource transfers which amount to 90% of the gross transfers. The transferred capitals are further apportioned between the consumption transfers and capital transfers by a 3 : 7 ratio. The relative shares of the transferred capital among the socio-economic groups are 40%

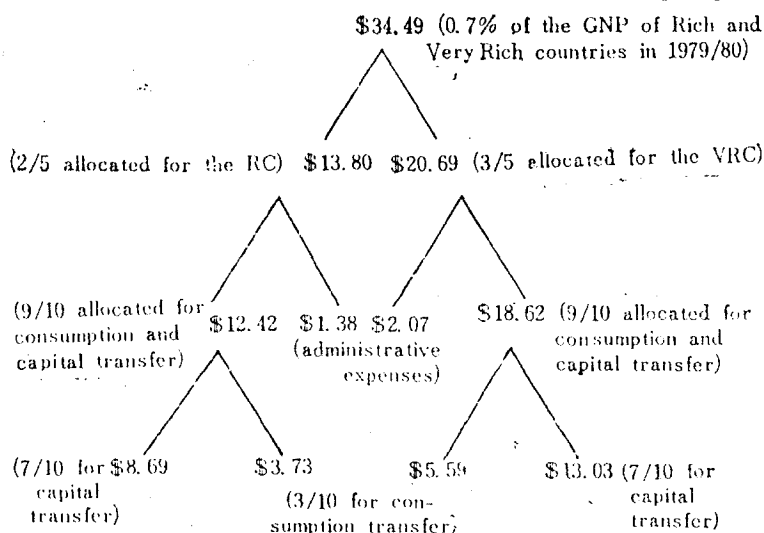


Chart 1. Breakdown of Externally Transferred Resources by Usage (in Billions)

4) The 0.85% is higher than the 0.70% recommended by the Pearson Commission (1969). Weinberg (1979) has evaluated a financial transfer of 1% of OECD gross product to LDCs.

5) See the 1977 *World Bank Atlas* for country classification and GNP figures.

6) The 6 : 4 ratio is slightly biased toward the VPC compared to the present ratio of 5.4 : 4.6.

for the lowest income group, 40% for the middle and 10% for the highest income group. The consumption transfers are apportioned between the lowest group and the middle group by the 6:4 ratio.

3.3 Target Level of Consumption and Target Pattern of Income Distribution

Any definition of poverty is bound to be arbitrary, but Ashok Rudra (1974) has set the poverty line (minimum consumption level) at approximately \$ 50 per capita per year in 1960/61 prices and exchange rates. This follows from the standpoint that persons with a consumption level less than \$ 50 cannot obtain an adequate nutrition necessary for normal health and activity. According to this definition, roughly 40% of India's population was below the poverty line. The poverty line when adjusted for 1975/76 prices and exchange rates equals \$ 120 capital per year.⁷⁾

The target pattern of income distribution set forth in the study is 32%, 42% and 26% for the top 20%, the middle 40% and the lowest 40% of the population respectively. This resembles the pattern attained by Czechoslovakia in 1969.⁸⁾

4. The Structure of Growth and Distribution

In order to illustrate the dynamics of growth and income distribution and the implications of different distributional strategies, we divide the economy into three socioeconomic groups based on their ownership of physical and human capital: the top 20%, the middle 40% and the lowest 40% of the population ranked by income levels. The economic linkage between different socioeconomic groups is determined by the flow of output from one group to another in the form of wages. It is postulated

7) For India using 1960/61 as base year, the price index for 1974/75 is 400. Then Rs 20 per month in 1960/61 is equivalent to Rs 80 per month for 1974/75 or Rs 960 per year. Since the exchange ratio in 1974/75 was \$ 1 : Rs 8, Rs 960 is equivalent to \$ 120. See page 76, Mellor (1976) for further detail.

8) See "Income Inequality: Some Dimensions of the Problem," by Montek S. Ahluwalia, Chapter 1, *Redistribution and Growth*, Chenery, et. al. (1974).

that the nature of this linkage and the distribution of physical capital and human capital between groups determine income distribution in the absence of internal and external resource transfers. The major source of income inequality in these countries is the concentration of physical asset in the top income group and the perpetuation of this concentration through a higher rate of savings by the group.

The growth process built into the model is based on the Harrod-Domar assumptions applied to the three socio-economic groups in the economy. The growth of per capita income in each group depends on: (1) the rate of accumulation of capital, (2) the productivity of capital, (3) the nature of the wage linkages, and (4) the rate of population growth. The accumulation of capital by each sector is derived from two sources: its own savings and internal and external capital transfers.

4.1 Capital Accumulation Through External Capital Transfers

Capital transfers refer to the provision of resources not for consumption but for investment in various forms of productive assets. It consists of (1) investment in human capital not only to enlarge human resource bases but to redistribute human capital (2) the provision of access to physical infrastructure (3) the creation and expansion of small and medium scale industry, particularly through investment in the infrastructure of transport and power and (4) public investment to improve the productivity in agriculture. These diverse types of investment are all encompassed by single capital stock in the model.

The key element in the present version of the "growth and distribution" approach to development is the transfer of capital from rich countries to poor countries. The growth of externally transferred capital can be expressed as follows:

$$K'_{1t} = K'_s (1+g)'h'_1 \quad (1a)$$

$$K'_{2t} = K'_s (1+g)'h'_2 \quad (1b)$$

$$K'_{3t} = K'_s (1+g)'h'_3 \quad (1c)$$

$$K'_{4t} = K'_s (1+g)'h'_4 \quad (1d)$$

$K''_{1t}, K''_{2t}, K''_{3t}$ = Stocks of externally transferred capital held by the top, middle and the lowest income group. The scripts stand for external transfer f ; linked capital l ; and time t .

K'_3 = Stocks of externally transferred capital held by the lowest income group, and n stands for nonlinked capital.

K'_0 = Initial stocks of externally transferred capital.

g = The rate of growth of externally transferred capital.

h^l_1, h^l_2, h^l_3 = The proportion of transferred capital allocated to each group as linked capital.

h^u_3 = The proportion of transferred capital allocated to the lowest income group as nonlinked capital.

The Ahluwalia-Chenery model assumes a downward income-flow linkage in such a way that the capital owned by one group does not hire labor from a higher income group. That is, all capital owned by the lowest income group is of the nonlinked variety with $K^l_3=0$. This assumption seems plausible from the standpoint of the "trickle down" hypothesis. But if we are to pursue the goal of faster growth and more equitable income shares for the lowest and the middle through a policy of external capital transfers, the plausibility declines. The efficient build-up and management of rapidly expanding production facilities owned by the lowest, under various cooperative arrangements, will require the technical and managerial skills of the middle group. This establishes a new linkage in wage flow that did not previously exist.⁹⁾

4.2 Consumption Transfers

The consumption function which incorporates consumption transfers is,

$$C_{it} = (1-s_i) Y_{it} + C^T_{it} \quad (2)$$

where

C_{it} = Level of consumption for the i th group at time t .

9) It is quite likely that the top group may also be involved in the technical assistance to the lowest income group. However, it is assumed that the top group provides free assistance in the sense they are not paid by the lowest group.

$1-s_i$ =Marginal (and average) propensity to consume.

C_{ii}^T =Consumption transfers.

Note that Y_i includes income generated from the total capital stocks of the respective income groups. The importance of consumption transfers, C_{ii}^T , lies in the fact that they can satisfy the more urgent needs of the poor without sacrificing the accumulation of capital.

4.3 Capital Accumulation through Domestic Savings and Internal Transfers

The accumulation of capital through domestic savings and internal transfers of capital from the top to the middle and the lowest can be expressed as follows:

$$\Delta K_1^I = q_1 (s_1 Y_1 - vY) \quad (3a)$$

$$\Delta K_1^R = (1-q_1) (s_1 Y_1 - vY) \quad (3b)$$

$$\Delta K_2^I = s_2 Y_2 + c_2 vY \quad (3c)$$

$$\Delta K_3^I = q_3 s_3 Y_3 + c_3' vY \quad (3d)$$

$$\Delta K_3^R = (1-q_3) s_3 Y_3 + (1-c_3') vY \quad (3e)$$

where Y_1 , Y_2 , Y_3 , Y =Income of the top, middle, lowest, and the total respectively.

K_1^I =Capital owned by the top group, using hired labor.

K_1^R =Capital owned by the top group, not using hired labor.

K_2^I =Capital owned by the middle group using hired labor.

K_3^I =Capital owned by the lowest group, using hired labor.

K_3^R =Capital owned by the lowest group, used for self-employment with no hired labor.

s_1 , s_2 , s_3 =Average propensities to save by the top, middle and the lowest.

q_1 =The proportion of savings by the top group allocated for K_1^I leaving $(1-q_1)$ for K_1^R

q_3 =The proportion of savings by the lowest group allocated for K_3^I leaving $(1-q_3)$ for K_3^R

v = The value of capital to be transferred from the top group to other groups expressed as a proportion of GNP.

c_2, c'_3 = The proportions of transferred capital to be distributed to the middle (c_2) and lowest group (c'_3) for linked capital and $(1-c'_3)$ for nonlinked capital.

Capital is "linked" (K^l) if it uses hired labor which generates a wage flow to other income groups. Capital is nonlinked (K^n) if it does not generate inter-group wage flows.

4.4 Production Relationships

For simplicity we assume the following production function for the five types of capital in the economy.

$$Q_1^l = a_1 K_1^l \quad (4a)$$

$$Q_1^n = b_1 K_1^n \quad (4b)$$

$$Q_2^l = a_2 K_2^l \quad (4c)$$

$$Q_3^l = a_3 K_3^l \quad (4d)$$

$$Q_3^n = b_3 K_3^n \quad (4e)$$

where

Q_i^l = Output of the linked capital of the i th group.

Q_i^n = Output of the nonlinked capital of the i th group

a_1, a_2, a_3 = Output-capital ratios of linked capital owned by the top, middle and the lowest.

b_1, b_3 = Output-capital ratios of nonlinked capital owned by the top and lowest.

Any predictable changes in the productivity of capital over time can be incorporated in the coefficients.

4.5 Income Structure

The total income of each group is the sum of wage income and nonwage income:

$$Y_1 = W_1 + p_1 = w_{11}Q_1^l + p_1Q_1^l + Q_1^n \quad (5a)$$

$$Y_2 = W_2 + p_2 = w_{21}Q_1' + w_{22}Q_2' + w_{23}Q_3' + p_2Q_2' \quad (5b)$$

$$Y_3 = W_3 + p_3 = w_{31}Q_1' + w_{32}Q_2' + w_{33}Q_3' + p_3Q_3' + Q_3'' \quad (5c)$$

where

W_1, W_2, W_3 = wages

p_1, p_2, p_3 = profits

w_{ij} = The wage share of output Q_j' received by group i .

$p_1 = 1 - (w_{11} + w_{21} + w_{31})$, the top group's share of profit from Q_1'

$p_2 = 1 - (w_{22} + w_{32})$, the middle group's share of profit from Q_2'

$p_3 = 1 - (w_{33} + w_{23})$, the lowest group's share of profit from Q_3'

Equations (5a), (5b) and (5c) show that the income distribution between groups is determined by the distribution of capital stocks, wage share and profit share.

Table II. Income Structure of the Economy (in period t)

	Linked Capital (Using Hired Labor)			Nonlinked Capital	
	K_1^t	K_2^t	K_3^t	K_1''	K_3''
1. Value of Capital Stocks	$K_{1t}^t = K_{10}^t + \Delta K_{1t}^t$ $+ K_{1t}^{t'} = K_{10}^t$ $+ q_1(S_1 Y_1 - vY) + K_0^t$ $(1+g)h_1^t$	$K_{2t}^t = K_{20}^t + \Delta K_{2t}^t$ $+ K_{2t}^{t'} = K_{10}^t$ $+ S_2 Y_2 + C_2 vY$ $+ K_0^t(1+g)h_2^t$	$K_{3t}^t = K_{30}^t + \Delta K_{3t}^t$ $+ K_{3t}^{t'} = K_3^t$ $+ q_3 S_3 Y_3$ $+ C_3 vY$ $+ K_0^t(1+k)h_3^t$	$K_{1t}'' = K_{10}''$ $+ \Delta K_{1t}'' = K_{10}''$ $+ (1-q_1)(S_1 Y_1 - vY)$	$K_{3t}'' = K_{30}''$ $+ \Delta K_{3t}'' + K_{3t}^{t'}$ $= K_3^t + (1-q_3)S_3 Y_3$ $+ (1-c_3')vY$ $+ K_0^t(1+g)h_3^t$
2. Output from each Capital Stock	$Q_{1t}^t = a_1 K_{1t}^t$	$Q_{2t}^t = a_2 K_{2t}^t$	$Q_{3t}^t = a_3 K_{3t}^t$	$Q_{1t}'' = b_1 K_{1t}''$	$Q_{3t}'' = b_3 K_{3t}''$
3. Incomes by Group	Profit wage $P^1 Q_{1t}^t$ $w_{11} Q_{1t}^t$	Profit wage $P^2 Q_{2t}^t$ $w_{22} Q_{2t}^t$	Profit wage $P^3 Q_{3t}^t$ $w_{23} Q_{3t}^t$	Self-Employment Income Q_{1t}''	Self-Employment Income Q_{3t}''
Y^1					
Y^2					
Y^3					
Total					

The nature of the income linkages in this system is brought out in Table II, which illustrates the interaction between the different parameters in determining growth and distribution.

4.6 population Growth

The population equation of the model is specified as follows:

$$N_{it} = N_{i0}(1+n_i)^t \quad (6)$$

where

N_{i0} = The base year population for the i th group

n_i = The growth rate of population for the i th group

5. Initial Distribution of Capital, Parametric Values and Income Linkages*

5.1 Base Year Values: The VPC

The base year values and income linkages are brought out in Table III. The initial conditions include: (1) a moderate inequality in income distribution with income shares of 51.3%, 32.6% and 16.1% associated with the top 20%, middle 40%, and lowest 40% of the population respectively;¹⁰⁾ (2) a real growth rate of GNP of 2.37% per annum; and (3) a population growth rate of 2.25%. These values are consistent with the conditions of the VPC as a group during the 1960's and the first half of the 1970's.¹¹⁾

The combined GNP of the VPC for the base year 1979/80 is extrapolated from the actual GNP figures of \$131 billions for 1975. The projected GNP for the base year using a 3 percent annual real growth rate is approximately \$147.4 billion. Although the direct measure of the capital stock for the VPC is not available, it can be approximated from the production function. In equations (4a) to (4e) we have already discussed

* In this section we present a set of values for the base year (1979/80).

10) The income distribution for India in 1964 was 50.0%, 32.0% and 16.0%, and was 45.0%, 37.5% and 17.5% for Pakistan in the same year.

11) See the 1977 *World Bank Atlas*.

Table II. Income Structure of the Economy (VPC) The Base Year (1979~80) Values

	Linked Capital (Using Hired Labor)				Nonlinked Capital			Income Share
Value of Capital Stocks	$K_1^I=295$ (68%)	$K_2^I=74$ (17%)	$K_1^N=35$ (8%)	$K_3^N=30$ (7%)	$K=434$			
Output from each Capital Stock	$Q_1^I=0.335K_1^I$ =98.83	$Q_2^I=0.335K_2^I$ =24.79	$Q_1^N=$ 0.350 K_1^N =12.25	$Q_3^N=$ 0.375 K_3^N =11.25	$Q=147$			
Income By Group	Profit	Wage	Profit	Wage	Self Employ- ment Income	Self Employ- ment Income	Income	
Y_1	$0.45Q_1^I$ =44.5	$0.19Q_1^I$ =18.8			$Q_1^N=12.3$		75.6	51.3
Y_2		$0.29Q_1^I$ =28.7	$0.60Q_2^I$ =14.9	$0.18Q_2^I$ =4.5			48.1	32.7
Y_3		$0.07Q_1^I$ =6.9		$0.22Q_2^I$ =5.4		$Q_3^N=11.3$	23.6	16.1
Y	44.5	54.4	14.9	9.9	12.3	11.3	147.3	100.0

Parameter values: $a_1=.335$ $w_{11}=.19$ $w_{22}=.18$
 $b_1=.350$ $w_{21}=.29$ $w_{32}=.22$
 $a_2=.335$ $w_{31}=.07$ $p_2=.60$
 $b_3=.375$ $p_1=.45$

the Harrod-Domar type production function of the following general form:

where

$$Q=bK$$

$$Q=GNP$$

$$b=\text{Output-Capital Ratio}$$

$$K=\text{Value of Capital Stocks}$$

Since the projected GNP for the base year 1979/80 is \$ 147.4 billion, if 0.349 is used as an overall production coefficient, then the estimated capital stock for these countries is equal to \$ 434 billion as shown in Table

II.¹²⁾

The nature of the income linkages in the system is brought out in Table I which shows the initial distribution of capital stocks and a set

12) The 1979/80 GNP of \$ 147.4 billion instead of \$ 149.0 billion shown in Table III is due to the use of 0.325 as the overall output-capital ratio.

of parameter values.

K_1 is the capital owned by the top income group which is not linked to incomes of lower income groups. We may interpret this as capital which necessitates the use of highly skilled labor, which is itself part of the top group, or capital invested abroad; in either case K_1 does not directly contribute to wage income flows.¹³⁾

The output-capital ratio used in the simulation warrants several comments. First, the output-capital ratio of 0.340 is roughly equivalent to the ratios estimated for India and for Pakistan.¹⁴⁾ Second, the ratio is in accordance with Kuznets' estimate of the overall capital-output ratio for developing countries of 3, which implies an output-capital ratio of 0.03.¹⁵⁾ Also note that the output-capital ratio for K_2 is equal to 0.375. However, it would be wrong to interpret from this higher output-capital ratio that the productivity of capital is higher in the lowest income sector. Instead, it is indicative of the backwardness of this sector. With the acceleration of capital transfers, the output-capital ratio of the lowest income sector is expected to fall, at least in the early stages.¹⁶⁾

The base year value of the savings rates for the top, middle and the lowest are approximately 9.0%, 4.5% and 2.8% of their respective income with an overall savings rate of 6.3%.¹⁷⁾ The positive savings rate

13) See Ahluwalia and Chenery (1974).

14) According to the study by Uma Ray Choudhury (1977) the 1971 average capital-output ratio (the inverse of the output-capital ratio) for India in 1960/61 prices was 3.10. For the same period the ICOR was 3.18 while the average capital-output ratio at the 1971-price was 2.90. See Ram N. Lal (1977) for more details of the measurement of capital-output ratio. For Pakistan the ratio projected for the second economic plan period (1960-65) was 3.2. See Mahbub ul Haq, (1963), Rosen (1950), and Seth (1967).

15) See Kuznets (1966), pp. 406-427.

16) It is assumed that the output-capital ratios for the top and the Middle income group remain constant at 0.325. There is some evidence that, as an economy advances, the product-mix changes in the direction of more capital-intensive goods, implying a higher capital-output ratio at a higher level of per capita income. Nevertheless, the constancy of the capital-stock/output ratio is assumed on the ground that such a tendency can be overcome through more intensive utilization of capital stock. See Kim and Kwon (1977).

17) For Pakistan the savings rate was approximately 9.7% during the 1954-69 period. See Mellor (1976), pp. 131-35.

inspite of the below minimum desirable consumption level by the lowest income group reflects the expenditures by the government on behalf of the said group that are financed through taxation and existing foreign aid programs. Other parametric values in Table III are basically the same as those of Ahluwalia and Chenery. Needless to say, there is not nearly enough economic information gathered anywhere to describe accurately all parametric values with great specificity.

The rates of growth of population are 2.00%, 2.23% and 2.40% for the top, middle and the lowest. These rates are consistent with the overall population growth rate of 2.25 percent for the VPC.

5.2 Base Year Values: the CP

The base year values and income linkages for the PC are shown in Table IV. The initial conditions include (1) a high inequality in income distribution with income shares of 59.4%, 30.8% and 9.8% for the top 20%, middle 40%, and lowest 40% of the population respectively,¹⁸⁾ (2) a real GNP growth rate of 3-4 percent per annum, and (3) a population growth rate of 2.25%. These values are consistent with the conditions of the PC in the last two decades.

The projected GNP for the base year (1979/80) is \$ 555.4 billion. The estimated stock of capital for the PC using the overall output capital ratio of 0.333 is \$ 1,667 billion, as shown in Table IV.

The savings rate for the PC are, in general, higher than that of the VPC. The base year value of the saving rates for the top, middle and the lowest are approximately 11.0%, 5.0% and 3.0% respectively with an overall savings rate of 8.4%.

The rates of growth of population are 2.00%, 2.23% and 2.40% for the top, middle and the lowest. Other parametric values are chosen to make it consistent with the "high inequality" in income distribution for the PC.

18) See Ahluwalia 1974).

6. Simulation Results

6.1 The Basic Solution

The basic solution is a projection based on the past and present patterns of external transfers to the VPC and the PC. The existing flows of external transfers correspond to 0.14% of the combined GNP of the Rich and the Very Rich countries and to 1.3% of the combined GNP of the recipient countries namely, the VPC and PC. The basic solution serves as a reference in evaluating the resource transfer solution.

The population growth rates along with other parameters remain unchanged; only the savings rates increase gradually in accordance with the gradual increase of the per capita income of each group.

6.1.1 The Basic Solution: the VPC

As shown in Table V, the rate of growth of income of all three groups increases over time as their saving rates rise,¹⁹⁾ an overall increase of approximately 0.66 of a percentage point (from 2.37 to 3.03) during the 40-year period. The distributional implications of these patterns of growth in each group can be examined in terms of shares of total income accruing to the top 20%, the middle 40% and the lowest 40%. The result shows no discernable change in income share over the 40-year period from the initial pattern of 51.3, 32.7 and 16.1 percent. This result is consistent with the proposition that distributionally neutral growth policies are incapable of solving the problem of inequality in income distribution.

More importantly, the result indicates that the lowest 40% will not

19) The rate of growth of the savings rate used in the basic solution is:

$$g_t' = i_0 (1 + g_i')$$

where i_t = ith group's saving rate in period t .

i_0 = ith group's saving rate in the base period with $i_0 = 0.090$, $i_{20} = 0.045$
and $i_{30} = 0.028$.

g_i' = ith group's rate of growth of saving rate with $g_1' = 0.005$,

$g_2' = 0.01$ and $g_3' = 0.01$.

Table IV. Income Structure of the Economy (PC) The Base Year (1979~80) Values

	Linked Capital (Using Hired Labor)		Nonlinked Capital		Income Share			
1. Value of Capital Stocks	$\alpha K_1^I=1,200$ (72%)	$K_2=267$ (16%)	$K_1^*=150$ (9%)	$K_3^*=50$ (3%)	$K=1,667$			
2. Output from each capital stock	$Q_1^I=0.330K_1^I$ $=396.0$	$Q_2^I=0.330K_2^I$ $=88.1$	$Q_1^*=0.350K_1^*$ $=52.5$	$Q_3^*=0.375K_3^*$ $=18.8$	$Q=555.4$			
3. Income by Group	Profit	Wage	Profit	Wage	Self Employ- ment Income	Self Employ- ment Income	Income	
Y_1	$0.50Q_1^I$ $=198.0$	$0.20Q_1^I$ $=79.2$			Q_1^* $=52.5$		329.7	59.4
Y_2		$0.25Q_1^I$ $=99.0$	$0.60Q_2^I$ $=52.9$	$0.22Q_2^I$ $=19.4$			171.3	30.8
Y_3		$0.05Q_1^I$ $=19.8$		$0.18Q_2^I$ $=15.9$		Q_3^* $=18.8$	51.4	9.8
Y	198.0	198.0	52.9	35.3	52.5	18.8	555.4	100.0

Parameter values = $a_1 = .330$ $w_{11} = .20$ $w_{22} = .22$
 $b_1 = .350$ $w_{21} = .25$ $w_{32} = .18$
 $a_2 = .330$ $w_{31} = .05$ $p_2 = .60$
 $b_3 = .375$ $p_1 = .50$

reach the \$ 120 minimum consumption level in the 40th year; the per capita consumption for the lowest 40% will be \$ 56 in year 40.

6.1.2 The Basic Solution: The PC

The Table IV shows that for the PC the overall average of the growth rate is 3.4% during the 40-year period.²⁰⁾ The pattern of income distribution remains basically constant at 59.37%, 30.84%, and 9.08% for the top 20%, the middle 40% and the lowest 40% and the lowest 40% respectively. During the same period the level of per capita consumption for the lowest income group reaches \$ 171 which is safely beyond the \$ 120 minimum desirable level. However, this figure should be interpreted with caution; given the wide dispersion of intercountry per capita GNP within the PC, some of the lowest income groups in the low income

20) The growth rates of savings of the PC are the same as those of the VPC. See Footnote 19.

Table V. Basic Solution (VPC)

Year	Growth Rates of Income* (%)			Per Capita Income (\$)			Per Capita Consumption (\$)			Population Growth Rates* (%)			Relative Income Shares		
	Top	Mi- dle	Lo- west	Top	Mi- dle	Lo- west	Top	Mi- dle	Lo- west	Top	Middle	Lowest	Top	Middle	Lowest
0				360	114	56	140	328	109	55	131	0.0200	0.0223	0.0240	0.0225
5	2.44	2.33	2.25	366	114	56	140	332	109	54	131	0.0200	0.0223	0.0240	0.0225
10	2.51	2.43	2.35	373	115	55	141	338	109	54	131	0.0200	0.0223	0.0240	0.0225
15	2.59	2.53	2.46	381	116	55	142	344	110	53	132	0.0200	0.0223	0.0240	0.0225
20	2.66	2.63	2.57	392	117	55	144	353	111	53	133	0.0200	0.0223	0.0240	0.0225
25	2.74	2.73	2.68	403	120	56	146	362	113	54	135	0.0200	0.0223	0.0240	0.0225
30	2.83	2.84	2.80	417	122	56	149	373	115	54	137	0.0200	0.0223	0.0240	0.0225
35	2.91	2.95	2.92	432	126	57	153	386	118	55	141	0.0200	0.0223	0.0240	0.0225
40	3.00	3.07	3.05	450	130	59	158	401	121	56	144	0.0200	0.0223	0.0240	0.0225

* Average Annual Rate for Preceding Five Years

Table VI. Basic Solution (PC)

Year	Growth Rates of Income (%)			Per Capita Income (\$)			Per Capita Consumption (\$)			Population Growth Rates (%)			Relative Income Shares		
	Top	Mi- dle	Lo- west	Top	Mi- dle	Lo- west	Top	Mi- dle	Lo- west	Top	Middle	Lowest	Top	Middle	Lowest
0				1,572	408	130	530	1,399	388	126	485	0.0200	0.0223	0.0240	0.0225
5	3.13	2.83	2.99	1,647	417	132	546	1,461	396	128	498	0.0200	0.0223	0.0240	0.0225
10	3.23	2.96	3.11	1,733	429	136	564	1,532	405	131	514	0.0200	0.0223	0.0240	0.0225
15	3.32	3.09	3.23	1,830	444	140	587	1,613	418	135	533	0.0200	0.0223	0.0240	0.0225
20	3.42	3.22	3.36	1,941	461	145	613	1,705	433	140	554	0.0200	0.0223	0.0240	0.0225
25	3.52	3.35	3.49	2,067	482	152	643	1,809	451	146	580	0.0200	0.0223	0.0240	0.0225
30	3.62	3.49	3.63	2,211	507	159	678	1,929	473	153	610	0.0200	0.0223	0.0240	0.0225
35	3.73	3.64	3.77	2,377	537	168	719	2,065	499	161	644	0.0200	0.0223	0.0240	0.0225
40	3.84	3.78	3.92	2,566	572	178	766	2,222	529	171	684	0.0200	0.0223	0.0240	0.0225

countries within the PC may not reach the \$ 120 minimum consumption requirement even when the average (of the lowest income group) for the PC reaches \$ 171.

6.2 The Resource Transfer Solution²¹⁾

6.2.1 The External Transfers

It is assumed that the flow of externally transferred capital grows at the rate of three percent annually. This reflects the projected over-all growth rate of GNP of the donor countries. It is also assumed that transferred capital has a gestation period of five years.

From equation 1 the stock of capital transferred in period t is

$$K'_{it} = K'_0 (1 + 0.03)^{hi} \quad (1')$$

where

$$h'_1 = 0.10$$

$$h'_2 = 0.40$$

$$h'_3 = 0.25$$

$$h''_3 = 0.25$$

K'_0 = \$ 13.03 billion for the VPC and \$ 8.69 billion for the PC.²²⁾

The consumption function with external consumption transfers is

$$C_{it} = (1 - s_{it}) Y_{it} + C_{i0}^T (1 + g^t)^t \quad (2')$$

where

C_{i0}^T = The amount of consumption transfers made to the i th group in the base period

g^d = The rate of growth of consumption transfers

In the simulation C_{i0}^T is set at \$ 5.59 billion for the VPC and \$ 3.73 billion for the PC, as shown in Chart 1, and g^d is set at 0.03. This also reflects the projected growth rate of income of the donor countries. Furthermore, the growth rates of saving are expected to rise even faster

21) In the present study the economic impact of the transfers on the transferring nations is not considered.

22) See Chart 1.

under the external resource transfer scheme.²³ The allocation of consumption transfer is 60% for the lowest and 40% for the middle.

The savings of the top group are divided between K_1^I and K_1^* in fixed proportions: $q_1=0.77$ and $1-q_1=0.23$. The savings of the lowest are divided between K_3^I and K_3^* in proportions of $q_3=0.30$ and $1-q_3=0.70$. It is assumed that the growth rate of population will decline from 2.40% to 2.09% for the lowest income group, and from 2.23% to 2.05% for the middle group, yet remain unchanged for the highest income group; the overall growth rate declines from 2.25% to 2.06%.

A word of warning: because of the difference in the population rate between three income groups, it is essential that the computation of the income shares for the top 20%, middle 40% and lowest 40% be carried out by appropriate adjustments for population growth.²⁴

6.2.2 Internal Resource Transfers

Internal resource transfers pertain only to the PC. Given the high inequality in income distribution and the limited amount of external resources made available for the PC, internal investment transfers will have to supplement the external transfers in order to reduce the income inequality. The proposed plan calls for the transfer of 2% of GNP from the highest income group to the middle and the lowest income groups in each country within the PC starting from the year 15 and continuing until the target pattern of income distribution is attained. Half of this amount ($c_2=.50$) is allocated to the middle group. The other half goes to the lowest income group and is further divided between K_1^I and K_3^I in the proportion of $C_3^I=.40$ and $(1-c_3^I)=.10$, respectively.

6.2.3 The Transfer Solution: The VPC

Since the VPC's pattern of income distribution is one of moderate equality and its amount of external transfers is larger than that of the PC, improvement in the VPC's income distribution will be accomplished

23) The growth rates of saving during the external transfer period are assumed to be $g_1^*=0.010$, $g_2^*=0.025$ and $g_3^*=0.020$ respectively.

24) See Chenery et. al. (1974), p. 221.

through the external transfer alone. The external resource transfers consist of the consumption transfers and capital transfers. The capital transfers end after the year 35 but the consumption transfers end after the year 20. Since the gestation period for the capital is five years, the effect of capital transfers lingers on through the year 40.

Since the major portion of the resource transfers is directed toward the middle and the lowest, the growth rate of these two groups shown in Table VII is to be compared with that of the basic solution in Table IV.

The simulation results are as follows: the average annual growth rate for the middle group in the first five-year period is 3.43%, which is one percentage point higher than the rate in the basic solution. The growth rate of the lowest is 5.25%, which is more than three percentage points higher than the rate in the basic solution. These differences in the growth rates during the first five-year period are due exclusively to the consumption transfers and are unrelated to the capital transfers. Since the transferred capital has a five-year gestation period its impact does not begin until the 6th year. The growth rates of the middle and the lowest reach their respective peaks in the second five-year period, (years 6-10), with rates of 6.45% and 10.42%, respectively. A sharp decline in the growth rate during the year 21-25 period reflects the cessation of consumption transfers in year 20.

The average annual growth rate of the lowest group is 6.7% during the 40-year period of the resource transfer solution. This is approximately twice the average growth rate of the basic solution. The growth rate for the middle is 5.47 which is also twice the growth rate under the basic solution. The aggregate average rate of growth is more than two percentage points higher under the resource transfer scheme.²⁵⁾

Of particular interest in the results is the fact that the higher growth rate for the middle and the lowest also affects the pattern of income

25) The growth rates of saving for the VPC during the transfer period are $g_1' = 0.010$, $g_2' = 0.020$ and $g_3' = 0.005$. It is also assumed that the growth rates of savings of the lowest income group increase little until it achieves the minimum consumption per capita.

distribution. In contrast to a fixed pattern of income distribution in the basic solution, we find a steady change in this pattern in Table VII. By the end of year 40, the income share of the top group declines from 51.3% to 31.3% while the shares of the middle and the lowest group increase from 32.6% to 40.0% and from 16.1% to 28.7% respectively. Thus we exceed the target pattern of income distribution.

An equally important result is that the lowest group can attain the target consumption level of \$ 120 within the first 20 years of the resource transfer solution. Furthermore, the cessation of the external transfers coincides with the attainment of the target share of income by the lowest income group. By this period the economy is expected to have entered a self-sustaining phase with sufficient momentum to maintain self-growth.

6.2.4 The Transfer Solution: The PC

The resource transfer scheme consists of the external transfers and internal transfers: the external transfers during the first 25 years and the internal transfers between years 15 and 40. The external transfers include the consumption transfers and the capital transfers. The internal transfers consist of the investment transfers of the 2% of the GNP from the highest income group to the middle and lowest income groups.

The overall average annual growth rates of the middle and the lowest income groups are 4.92% and 6.87%, respectively. The growth rate for the lowest income group under the transfer solution is twice the rate under the basic solution.²⁶⁾

The higher growth rate for the middle and the lowest relative to the top income group shift the pattern of income distribution toward more equality. The income share will change for the top income group from 59.37% to 39.88%, for the middle group from 30.84% to 38.21%, and for the lowest group from 9.80% to 21.91%. This pattern falls short of the

26) The growth rates of savings for the PC during the transfer period are $g_1' = 0.010$, $g_2' = 0.020$ and $g_3' = 0.020$.

Table VII. Resources Transfer Solution (VPC)

Year	Growth Rates of Income* (%)			Per Capita Income (\$)			Per Capita Consumption (\$)			Population Growth Rates* (%)			Relative Income Shares		
	Top	Mi- dle	Lo- west	Top	Mi- dle	Lo- west	Top	Mi- dle	Lo- west	Top	Mi- dle	Lo- west	Top	Mi- dle	Lo- west
0				360	114	56	140	328	109	55	131	0.0200	0.0223	0.0240	0.0225
5	2.47	3.43	5.25	366	120	63	146	332	114	61	136	0.0200	0.0221	0.0238	0.0224
10	2.99	6.45	10.42	381	142	83	166	343	135	83	154	0.0200	0.0217	0.0233	0.0220
15	3.14	6.08	8.58	400	167	109	188	358	157	106	175	0.0200	0.0210	0.0226	0.0214
20	3.29	5.85	7.27	422	195	133	213	375	182	129	197	0.0200	0.0205	0.0216	0.0203
25	3.44	4.96	5.28	447	220	150	235	396	204	145	216	0.0200	0.0205	0.0209	0.0206
30	3.61	5.67	6.11	478	255	177	265	420	234	171	244	0.0200	0.0205	0.0209	0.0206
35	3.79	5.64	5.78	515	295	205	300	450	269	199	274	0.0200	0.0205	0.0209	0.0206
40	3.98	5.68	5.51	560	343	236	340	485	309	228	309	0.0200	0.0200	0.0209	0.0205

* Average annual rate for preceding five years.

Table VIII. Resources Transfer Solution (PC)

Year	Growth Rates of Income (%)			Per Capita Income (\$)			Per Capita Consumption (\$)			Population Growth Rates (%)			Relative Income Shares		
	Top	Mi- dle	Lo- west	Top	Mi- dle	Lo- west	Top	Mi- dle	Lo- west	Top	Mi- dle	Lo- west	Top	Mi- dle	Lo- west
0				1,572	408	130	530	1,399	388	126	485	0.0200	0.0223	0.0240	0.0225
5	3.18	3.11	3.85	1,652	423	137	550	1,459	399	133	501	0.0200	0.0221	0.0238	0.0224
10	3.39	3.95	5.30	1,748	454	155	585	1,535	425	149	530	0.0200	0.0210	0.0233	0.0214
15	3.36	4.45	6.82	1,849	499	185	632	1,613	463	178	569	0.0200	0.0205	0.0226	0.0208
20	2.71	5.56	10.67	1,901	576	254	699	1,646	529	243	627	0.0200	0.0205	0.0216	0.0206
25	2.82	5.57	8.45	1,964	665	326	775	1,687	604	310	691	0.0200	0.0205	0.0209	0.0206
30	2.88	5.33	6.87	2,035	761	395	854	1,733	684	374	757	0.0200	0.0205	0.0209	0.0206
35	3.03	5.56	6.59	2,122	879	473	949	1,792	782	446	836	0.0200	0.0205	0.0209	0.0206
40	3.19	5.82	6.44	2,229	1,025	564	1,064	1,864	901	530	931	0.0200	0.0205	0.0209	0.0206

target pattern.²⁷⁾

Given the wider intercountry dispersion of income among the countries within the PC, only when the overall average per capita consumption for the lowest income group in Table VII has reached \$ 300 can we assume that everyone in the PC has attained the minimum consumption of \$ 120; This occurs in year 25.

7. Summary, Conclusion and Qualifications

The focal point of the present study was to simulate the effect of resource transfers on both the level and the share of income among different socio-economic groups in the VPC (Very poor Countries) and PC (poor Countries). A pair of simulations for the VPC and PC were performed yielding the basic solution and the resource transfer solution. The basic solution incorporates the past and present pattern of resource transfers while the resource transfer solution incorporates a new scheme of resource transfers.

For the VPC the proposed resource transfers pertain only to the external transfers. The external resource transfers in turn consist of the capital transfers during the first 35-year period and the consumption transfers during the first 20-year period.

The past and current rates of the external resource transfers to the VPC and PC correspond to approximately 0.15% of the GNP of the RC (Rich) and VPC (Very Rich countries). The external resource transfers proposed in the study involve the transfer of resources from the RC and VRC to the VPC and PC. The amount of the transfers recommended is 0.7% of the GNP of the RC and VRC *over and above* the current ratio of 0.15%, thus making *the total ratio equal to 0.85%*.

For the PC the resource transfers consist of the external transfers and internal transfers. The external transfers consist of capital as well as

27) The income share for the lowest income group does not reach the 26% target until the year 65 even with the continuous flow of investment transfers from the top income group.

consumption transfers during the first 20-year period. On the other hand the internal transfers which occur between the year 15 and year 40, relate to the transfer of investment resources from the highest income group to the middle and the lowest group within each country in the PC.

The breakdown of the external transfers between the VPC and PC and between capital and consumption is given in Chart 1. The minimum desirable consumption is set at \$120 per capita (in 1975/76 prices) and the target pattern of income distribution is set at 32%, 42% and 26.0% for the top 20%, the middle 40% and the lowest 40%, respectively.

The major results of the simulations are as follows:

1. For the VPC under the proposed resource transfer scheme, the lowest income group attains the target consumption within the first 20 years, and the target pattern of income by the 33rd year. These results are in contrast with the basic solution where the lowest income group falls far short of the target consumption level at the end of the 40 year simulation period. Furthermore, in the basic solution the pattern of income distribution remains virtually unchanged throughout the simulation period. This implies that the higher income which results from the accumulation of capital in the higher income group does not automatically trickle down to the lowest income group.

2. The proposed transfer scheme is intended to change the PC's characteristically "high inequality" pattern of income distribution. As a result of the external transfers as well as the internal redistribution, by the end of year 40, the income share changes from 59.37% to 39.88% for the top income group, from 30.84% to 38.21% for the middle group and from 9.80% to 21.09% for the lowest income group. While this pattern falls short of the target pattern suggesting a need for further effort toward equality, it is a striking improvement over the basic solution which shows no change in the income share over the period.

Given the wider cross-country dispersion of per capita income within the PC, it will be necessary to achieve a per capita consumption of \$300

for the lowest income group, as shown in Table VI, in order to ensure the minimum consumption of \$ 120 for everyone.

3. In the base period the income gap between the PC and VPC expressed as a ratio of per capita income was 3.8. Under the resource transfer scheme this ratio declined to 3.1 showing faster growth for the VPC.

Policy alternatives implicit in the present study require a rather complex welfare function which determines relative weights of the alternative goals. Formulating a social utility function and identifying the optimum strategy was beyond the scope of the present study which was merely concerned with (1) achieving a target pattern of income distribution between the different socio-economic groups, (2) achieving the minimum desirable per capita consumption, (3) narrowing the income gap between the VPC and PC, and (4) finally achieving these goals within a reasonable time period. Given this normative sets of objectives and constraints, the simulation results presented in the study represent the most reasonable set of outcomes as compared with numerous other alternatives considered in the study.

The basic proposition of this study is that the income of the lower income groups is constrained by a lack of capital, both physical and human, and of access to infrastructure. External resource transfers and internal reallocation of resources can provide a powerful force to remove these constraints. Furthermore, the external resource transfers, particularly during the early stages of development, have a special advantage of preventing the "spread of misery" which is often associated with internal redistribution. In spite of its limitations the present study constitutes a modest progress toward the reformulation of planning models which incorporate the determinants of both growth and income distribution among different socio-economic groups.

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