

Potential Effects of Income Transfers on Economic Growth with Application to Kenya

Osman Sheikh Ahmed*
and
Alfred J. Field, Jr.**

I. Introduction

Distributional issues have recently become a central focus in the development literature. This reflects the growing consensus that growth by itself may not solve the problem of poverty (e.g., Adelman-Morris), which, is a major objective of development. Further, it is now recognized that the trickle-down phenomenon may not occur and may instead be a trickle-up phenomenon (Adelman-Robinson). In that instance the problem of alleviating poverty within an acceptable time frame will have to be attacked directly instead of via growth. However, may be instances where income redistribution policies might lower growth and thus be tantamount to merely spreading poverty around. On the other hand, the observed worsening of the relative income share of the poor might reflect the Kuznets "U hypothesis" (Kuznets), and the pattern of income distribution might eventually improve with growth. The existence of the growth-equality tradeoff and the "U hypothesis" are empirical issues about which much has been written. Within this literature two principal issues which have received attention are: (a) the changes in the pattern of income distribution

* Ministry of Finance and National Economy, Saudi Arabia.

** University of North Carolina.

during the process of economic development, and (b) the effect of income transfers on economic growth.

This paper deals with the latter question, building upon a number of previous studies which have addressed this problem.¹ This research differs from the aforementioned studies in two respects. First, previous models focused primarily on Asian or Latin American countries and not on Africa. Second, the model developed herein adopts a different strategy by attempting to map changes in sectoral output to personal income and then using these links to examine the implications of different policy packages.

II. Model

Description

The study focused on investigating the short-run impact of various income redistribution policies on output, employment, imports, capital requirements, savings and the pattern of the size distribution of income. A static single-period disaggregated model was employed using estimated expenditure equations, input-output accounts, the initial pattern of income distribution within the urban, estate and rural sectors, sectoral factor use and value added. Factoral income is mapped into household income and the following steps are followed in analyzing the impact of an income transfer:

1. Income is transferred from the rich to the poor, and the effects on the level as well as composition of total consumption and savings are traced.
2. The resulting changes in the composition of demand are mapped into production via interindustry relations.
3. Changes in sectoral and overall factor usage are estimated using incremental capital-output ratios (ICORs) and fixed labor-output coefficients.
4. The changes in factoral incomes are distributed according to the occupational distribution and asset ownership of the different classes.
5. Changes in skill requirements are next estimated by multiply-

¹ Some examples are Adelman-Robinson, Hopkins et al, Paukert et al, Cline, Chinn, Bardhan, Morley-Smith and Thorbecke-Sengupta.

- ing the proportion of skilled to total sectoral employment by changes in sectoral employment.
6. Changes in intermediate and capital imports are projected by multiplying intermediate and capital input coefficients times the change in sectoral output.
 7. Imports of consumption goods are estimated once overall consumption changes are projected. The latter is the sum of the exogenous and endogenous components.
 8. Having obtained the effects on the above variables, the impact on growth is examined.² Following Cline (1975a), a maximum rate of growth is calculated given changes in savings, capital requirements and the ICOR values. However, it must be acknowledged that ICORS are highly unstable and growth depends on a host of factors other than capital accumulation. The results obtained using such a method must therefore be viewed with caution.
 9. The final pattern of income distribution is estimated in order to investigate the total (n^{th} round) impact of the transfer on the affected groups. The ultimate effect of distribution policies designed to help the low income groups will ultimately depend on the nature of the various intergroup linkage.
 10. The amount of transfer is then varied, the resulting changes estimated and the differential impacts noted. In all, three transfer schemes are analyzed.
 11. Each of these transfer schemes is coupled with complementary policies including redistribution of factoral income, import substitution and raising rural productivity. The impact of the various packages is then analyzed.

Since the model deals with the short-run, factor supplies are assumed given. Thus migration, skill upgrading and household asset accumulation are not considered. Also the qualitative aspects of redistribution (e.g., effects on entrepreneurial incentives, worker motivation, flow of technology, flow of foreign capital, flight of domestic capital, etc.) are not considered. Clearly any one or all of these factors could be pivotal in cases where radical programs are introduced in a short period of time. However, little can be said about the nature, direction and actual impact of these factors beyond the descriptive level, and their inclusion was beyond

² Inasmuch as the model is essentially short-run in nature, the growth effects of redistribution are not directly investigated.

the scope of the study.

Modeling the Effects of the Income Transfer

Assumptions

- (a) Technology remains unchanged during the period of analysis. This does not mean that overall factor use will not change as a result of redistribution. Overall factor use will change if factor intensity of goods consumed by the various classes differ.
- (b) Consumption and value added coefficients (c_{ik} , v_{kj}) remain unchanged.
- (c) Households immediately assume the consumption characteristics of the income class they move to after redistribution.
- (d) All the usual input-output assumptions (e.g., prices do not affect input use, no excess capacity, no economies of scale, etc.) are retained.
- (e) The marginal as well as average propensity to consume is less than 1 for all income classes. This insures the convergence of the expenditure part of the model.
- (f) The column sum of input coefficients is less than one; i.e., $\sum a_{ij} \leq 1$ or $v_j > 0$ for at least one sector; where all $a_{ij} \geq 0$, and $1 - a_{ij} > 0$.
- (g) $\sum_i a_{ij} + v_j \leq 1$.³

The Model

The first impact of the income transfer to (+) or from (-) class k is on the composition of personal consumption. It is postulated that

- | | | |
|-----|-------------------------------------------|---------------------------------------------------------------------------------------------------|
| | | where: |
| (1) | $C_i = f_i(Y_{kT}, Y_k, N_k)$ | $C_i =$ total expenditure on good i |
| | so | |
| (2) | $\Delta C_{ik} = f_i(Y_{kT}, \Delta Y_k)$ | $Y_{kT} =$ income transferred to (+) or from (-) class k . This portion of income is exogenous. |
| | and | |

³ This ensures the convergence of the whole system (Miyazawa, pp. 16, 21).

- (3) $\Delta C_i = \sum_k \Delta C_{ik}$ $Y_k =$ income received by class k. This is an endogenous element.
- Define
- (4) $c_{ik} Y_{kT} = \bar{C}_{ik}$ $N_k =$ average household size of class k
- and $C_{ik} =$ total expenditure on i by k out of earned income
- (5) $c_{ik} Y_k = C_{ik}$ $c_{ik} =$ C_{ik}/Y_k and is same for both C_{ik} and \bar{C}_{ik}
- and
- (6) $C'_{ik} = C_{ik} + \bar{C}_{ik}$ $\bar{C}_{ik} =$ total expenditure on i by k out of transferred income

Since income transferred (Y_{kT}) is an exogenous element, (3) is also exogenous. Urban and rural consumption are estimated separately and then combined.

Once the change in personal consumption is estimated from equation (3), the effect on the composition of output can be calculated using input-output relations

$$(7) \quad \Delta X_i = \sum_j a_{ij} \Delta X_j - m_i \Delta X_i + (1 - m_i^c) \Delta \bar{C}_i$$

where: $X_i; X_j =$ Gross output of sector i; j

$a_{ij} =$ input of i per unit of j

Equation (7) indicates that output of i changes as a result of changes in total intermediate and final demand less imports. It is assumed that other components of final demand like government expenditures, investment and exports are not directly affected during the period of analysis. Investment is affected in subsequent periods through changes in savings and capital requirements brought about respectively by changes in consumption and output composition. However, a high proportion of capital goods in the monetized sector (80% in some cases) are imported and so changes in investment demand will not appreciably affect domestic

output.⁴ Generalizing equation (7) in matrix form yields

$$(8) \quad \Delta X = (1 - A + M)^{-1} \Delta \bar{C}$$

where: $M^f =$ total intermediate imports $M^f = \sum_j m_j X_j$

$M^c =$ total imports of consumer goods

Changes in output composition lead to changes in sectoral value added. This is then distributed across households after appropriate adjustments for income earned, but not received, or income received, but not earned (Equation 12). The change in personal income, in turn, leads to a secondary set of changes in personal demand, output composition and further changes in personal income. The distribution of sectoral value added across income groups depends on (i) the factor requirements of each sector, (ii) occupational and skill characteristics and (iii) the distribution of asset ownership across households. Given (i), sectoral value added can be translated into factoral income which, given (ii), can then be apportioned to different households. While the method is theoretically attractive, it has numerous shortcomings especially as applied to Kenya. The heterogeneity of assets, the lack of efficient factor markets, the high degree of dualism in the Kenyan economy as well as the unavailability of data, especially on the distribution of asset ownership, all conspire to reduce the applicability of this method. Moreover, a vast majority of the population is self-employed on small farms or in the informal-urban sector, and a significant portion of small-farm activities are for self-consumption, further complicating the link between factoral income distribution and household or personal income distribution.

An alternative method is therefore adopted. Since $\Delta X = \Sigma X^s$ [where $s =$ organizational sector (e.g., formal-informal)], value added is first broken down into formal (agriculture and non-agriculture) and informal (small-farm and informal-urban) sectors. Second, the sectoral location of household income groups and their major sources of income are determined. Third, the share of each income group in sectoral income (both production and

⁴ Most capital formation in the rural sector like the construction and huts and water works are in the non-monetized sector.

organizational), further broken down by production activity, is calculated. The change in income of each class resulting from changes in sectoral output can be calculated once the share of each income group in sectoral income is determined.⁵ The income of the k th group is equal to the product of household sectoral value added and the share of that group in the latter.

$$(9) \quad Y_k^r = \sum_j S_{kj}^r V_j^{hr}$$

where

$$(10) \quad S_{kj}^r = f(S_{kj}^{wr}, S_{kj}^{\Pi r})$$

Y_k^r = income in the r^{th} location of the k^{th} income class

V_j^{hr} = value added by households in the r^{th} location of sector j ,

S_{kj}^w = percent share of k in j th wage bill

S_{kj}^{Π} = percent share of k in j th non-wage payments

Equation (10) indicates that S_{kj} is a function of the k th share in both sector j 's wage and non-wage income. More specifically

$$(11) \quad V_j^{hr} = W_j^r + \Pi_j^{hr}$$

W_j^r = wage income in the r^{th} location of sector j .

Π_j^{hr} = non-wage income in the r^{th} location of sector j .

where W_j^r , Π_j^{hr} are the amounts of wage income and non-wage income accruing to households. It is assumed that all wage payments directly accrue to individuals, while a portion of operating surplus goes to institutions in the form of business retained earnings, profits of public enterprises and expatriated profits.

5 The latter can be obtained from the available data.

$$(12) \quad \Pi_j^h = \Pi_j - (\Pi_j^g + \Pi_j^f + \Pi_j^d + T_j^i + \delta_j)$$

Π_j = non-wage payments of j.

Π_j^g = profits of government-owned enterprises.

Π_j^f = profits repatriated by foreign corporations.

Π_j^d = undistributed profits.

δ_j = depreciation allowance.

T_j^i = indirect taxes.

Define $D_j = \Pi_j^g + \Pi_j^f + \Pi_j^d + \delta_j + T_j^i$.

Substituting (12) and (11) in (9)

$$(13) \quad Y_k^r = \sum_j [S_{kj}^{wr} W_j^r + S_{kj}^{\Pi r} (\Pi_j - D_j)]$$

Π_j is obtained from the national accounts and D_j can be estimated. Equation (13) indicates that the income of group k is the sum of its share in sectoral wage and non-wage incomes. The share of k in jth wage income is the amount of total wages received by all households in that group (W_{kj}^r) divided by jth wage bill.

$$(14) \quad S_{kj}^{wr} = \frac{W_{kj}^r}{W_j^r}$$

W_{kj}^r is merely the product of the number of workers of type k in sector j multiplied by their wage rate, $(mw)_{kj}^r$

$$(15) \quad W_{kj}^r = (mw)_{kj}^r L_{kj}^r \quad L_j = \text{employment in sector } j.$$

L_j = employment in sector j

The share of k in j th non-wage income is calculated in a similar manner.

$$(16) \quad S_{kj}^{Pr} = \Pi_{kj}^h / \Pi_j^{hr} \quad \Pi_{kj}^h = \text{non-wage income of } k \text{ from } j$$

The distribution of Π_j^h across households will depend on the household factor ownership. In the absence of information about factor ownership, Π_{kj} was estimated.⁶ Formal sector non-wage incomes are a residual obtained by deducting the small-farm and informal-urban operating surplus from total operating surplus contained in the national accounts.

For the small-farm sector, the share of each income group in farm and non-farm operating surplus and wages can be obtained. Data on the informal-urban sector was estimated using available fragmentary information. It is assumed that the income share of each class within the relevant sector does not change as output changes.⁷ Rewrite equation (13)

$$(17) \quad Y_{kj}^r = S_{kj}^{wr} \frac{W_j^r}{W_j} \cdot W_j + S_{kj}^{Pr} \frac{\Pi_j^{hr}}{\Pi_j^h} \cdot \Pi_j^h$$

$$\text{Let } w_j^r = \frac{W_j^r}{W_j} \quad \text{and} \quad p_j^r = \frac{\Pi_j^{hr}}{\Pi_j^h}$$

where w_j^r and p_j^r are the share of residential group r in sector j 's wage and non-wage payments.

Substituting w^r and p^r in (17)

6 The reader is referred to Ahmed for a discussion of the formal estimation procedure.

7 This is a less stringent assumption than it might seem. It does not mean that the share of each group of the total income of a productive sector remains the same as output changes. The share of estate owners might increase more than small farmers as agricultural output changes. However, if the agricultural sector is divided into estate and small-farm sectors, there is a far greater chance that each income group would maintain its share within the relevant sector.

$$(18) \quad Y_{kj}^r = \sum_j S_{kj}^{wr} W_j^r W_j + S_{kj}^{\Pi r} P_j^r \Pi_j^h$$

At the level r , define

$$(19) \quad y_{kj}^w = \frac{W_{kj}}{X_j} \quad y_{kj} = k\text{'s income per unit of } j\text{th output}$$

and

$$(20) \quad y_{kj}^{\Pi} = \frac{\Pi_j^h}{X_j}$$

so that as output changes, both total and disposable income change.

$$(21) \quad \Delta Y_k = \sum_j y_{kj} \Delta X_j$$

$$(22) \quad \Delta Y_k^d = \sum_j (1 - t_k) y_{kj} \Delta X_j \quad t_k = \text{class } k\text{'s direct tax rate}$$

As disposable income changes, so does endogenous consumption (as distinguished from the portion that results from the initial income transfer).

The effect of this endogenous change in consumption demand on output composition using input-output relations is

$$(23) \quad \Delta X_i = \sum_j a_{ij} \Delta X_j - m_i \Delta X_i + (1 - m_i^c) \sum_k c_{ik} \Delta Y_k^D$$

Substituting (24) in (25) and then combining it with (6) yields

$$(24) \quad \Delta X_i = \sum_j a_{ij} \Delta X_j - m_i \Delta X_i + (1 - m_i^c) \sum [(1 - t_k^d - t_k^r) c_{ik} y_{kj} \Delta X_j + \Delta C_{ik}]$$

Rearranging (24) becomes

$$(25) \quad \Delta X_i = \sum_j a_{ij} \Delta X_j - m_i \Delta X_i + (1 - m_i^c) \sum_{jk} (1 - t_k) c_{ik} y_{kj} \Delta X_j + (1 - m_i^c) \sum_k \Delta \bar{C}_{ik}$$

Expanding, combining and placing (26) in matrix form yields

$$(26) \quad \Delta X = [1 - A + M^f - (1 - m^c) CY (1 - T)]^{-1} (1 - m^c) \Delta C$$

where $T = T^d + T^r$

and $T^d =$ direct taxes

$T^r =$ urban-rural remittance.

Equation (26) shows the enlarged inverse matrix indicating the effect of the first-round changes in final demand (resulting from income transfer) on output via interindustry relationships and induced consumption. However, consumption, unlike production, is not technically determined but results from conscious decisions by households. To separate production activity from that of consumption activity, multiply and divide the RHS of (26) by B , where $B = (1 - A + M^f)$.

$$(27) \quad \Delta X = B[I - (1 - T) (1 - m^c) CYB]^{-1} (1 - m^c) \Delta \bar{C} \\ B[I - (1 - m^c) CY (1 - T) B]^{-1} (1 - m^c) \Delta \bar{C}$$

The expression $[I - (1 - m^c) CY (1 - T) B]^{-1}$ is thus the subjoined inverse matrix and reflects the endogenous effect of changes in each income group's consumption. The initial change in group k th domestic consumption demands leads to a change in output composition and factor demand, the degree of which depends on the factor intensity differential of goods. The resulting change in the functional distribution will, when translated into personal disposable income, start a secondary chain of changes in demand, output composition and income distribution. The final pattern of income distribution might therefore differ from that envisaged by initial impact of the redistributive policy.

From equation (27) the effect on savings, imports and factor

use can be estimated. Assuming constant technology, factor input requirements can be calculated given ΔX .

$$(28) \quad \Delta L = \sum_j a_{lj} \Delta X_j \quad \begin{array}{l} L_j = \text{employment in sector } j \\ a_{lj} = \text{labor input per cent of } \\ \text{jth output} \end{array}$$

For skill-level λ , where $\lambda = 1, \dots, 4$ and $a_{l\lambda j}$ = proportion of labor input of skill λ per unit of j th output.

$$(29) \quad \Delta L_\lambda = \sum_j a_{l\lambda j} \Delta X_j,$$

$K_j =$ amount of capital utilized in sector j .

$$(30) \quad \Delta K = \sum_j a_{kj} \Delta X_j \quad a_{kj} = \text{capital input per unit of } j\text{th output.}$$

Changes in total imports and thereby foreign exchange availability is next estimated.

$$(31) \quad \Delta M = \sum_j m_j^r \Delta X_j + \sum_i m_i^c \Delta C_i^c + m^k \sum_j K_j$$

$$m_j^r = \frac{M^r}{X_j}; \quad m_i^c = \frac{M_i^c}{C_i}; \quad m^k = \frac{M^k}{K}.$$

$M^r =$ total intermediate imports

$$M^r = \sum_j m_j X_j$$

$M^c =$ total imports of consumer goods

$M^k =$ total imports of capital goods

Substituting (24) and (3) in (31)

$$(32) \quad \Delta M = \sum_j m_j^r \Delta X_j + \sum_i m_i^c [\sum_k (c_{ik} \sum_j y_{kj} \Delta X_j + \Delta \bar{C}_{ik})] + \sum_j m^k a_{Kj} \Delta X_j$$

The effect on savings can be estimated either directly (with saving propensities) or as a residual. Since changes in consumption and income have already been estimated, the latter method is used.

$$(33) \quad \Delta S_p = \sum_k [\Delta Y_{kT} + \Delta Y_k - \sum_i \Delta C'_{ik}], \text{ where } S_p \text{ is} \\ \text{personal savings.}$$

Business and government savings (S_b , S_g) can also change.

$$(34) \quad \Delta S_b = \sum_j [\Delta \delta_j + \Delta \Pi_j^d]$$

$$(35) \quad \Delta S_g = T^d + T^i + \sum_j \Pi_j^g$$

$$(36) \quad \Delta S = \Delta S_p + \Delta S_b + \Delta S_g$$

According to equation (35), government savings are the sum of direct and indirect taxes and profits of government enterprises. In the simulation experiments it is assumed that current government expenditures do not change and that changes in government revenues go to public savings.

The effect of the initial (policy-induced) income redistribution on savings, imports and input factor requirements can thus be estimated in a more integrative framework. The feedback from the initial income transfer is captured by endogenizing personal consumption and incorporating the effects of the inter group linkages. This is in contrast to studies on income redistribution and economic growth (for example, Cline and Morley-Smith) where consumption is exogenous.

In sum, the exogenous change in income (Step 1) leads to a change in consumption (Step 2). This leads to a change in output (Step 3), which in turn results in a change in the value added (Step 4), and thereby a change in income. This new pattern of income distribution (Step 5) results in a new demand composition (Step 6), and the process is repeated again.⁸

⁸ The assumption that $MPC_k = 1$ for all k is a necessary condition for convergence of the system.

The model thus integrates the production, distribution and expenditure blocks. It does not, however, account for all the income leakages out of the system, giving rise to the possibility of inconsistency between output and expenditure.⁹ To close the model, investment and government expenditures are included.

where

$$(41) \quad I + G = S + T \quad S_p = (1 - c - t) Y$$

$$(42) \quad S = S_p + S_b + S_g \quad S_b = \delta + \Pi^d$$

$$S_g = \Pi^g + T$$

$$T = T^i + T^d$$

where S_p , S_b , S_g , are respectively personal, business and government savings, and T^d refer to direct and indirect taxes. The other symbols have been defined above. Exports (E) and government expenditures (G) remain unchanged and M has been accounted for.

The convergence of the whole system rests on previously stated assumptions. From assumption (f) and (g) on page. 6,

$$(37) \quad \sum_i a_{ij} + v_j \leq 1, \text{ and } \sum_i a_{ij} < 1.$$

It follows that some of the value added (v_j) accrues to households while the rest accrues to non-individual recipients. More specifically,

$$(38) \quad v_j = \sum_k y_{kj} + d_j, \text{ where } d_j = D_j/X_j \text{ refers to the portion accruing to non-individuals.}$$

Incorporating (40) in (39) gives

$$(39) \quad \sum_i a_{ij} + \sum_k y_{kj} + d_j \leq 1$$

or

$$\sum_i a_{ij} - m_j + \sum_k y_{kj} + d_j \leq 1 \text{ for an open economy.}$$

If only the portion of value added that accrues to individuals is considered and the endogenized relationship is included, then

$$(40) \quad \sum_i a_{ij} - m_j + \sum_{ik} c_{ik} y_{kj} < 1.$$

The existence of a solution is guaranteed by (40) (see Miyazawa p. 17).

9 For example, leakages from the distribution block (σ_j , Π_j^d , Π_j^g , Π_j^f and T_j^i in equation 12) are not compensated for by any inflow.

From Equation (12)

$$(43) \quad \delta_j + \Pi_j^d + \Pi_j^g + \Pi_j^f + T_j^i = D_j$$

$$\text{Define } D_j' = D_j - \Pi_j^f$$

so that

$$(44) \quad \sum_j [D_j' + \sum_k (1 - c_k + c_k) Y_{kj}] = I + G.$$

Since D is a function of output, variable I will change with output. Thus, adding (44) to (25):

$$(45) \quad \Delta X_i = \sum_j a_{ij} \Delta X_j - m_i \Delta X_j + (1 - m_i^c) \sum_{kj} (1 - t_k) c_{ik} y_{kj} \Delta X_j + (1 - m^k) [\sum_{kj} (d_j \Delta X_j + (1 - c_k + t_k) y_{kj} \Delta X_j)] + (1 - m_i^c) \sum_k \Delta \bar{C}_{ik}$$

where $d_j = D_j' / X_j$.

While it is theoretically sound to assume that all leakages flow back into the system through investment (public or private) expenditures, it is highly improbable that this would be the case.¹⁰ Since it is not known what proportion of the leakages translates itself into investment and government demand in any one year, sensitivity analysis using different values of this ratio will be used.

Equation (45) then becomes

$$(46) \quad \Delta X_i = \sum_j a_{ij} \Delta X_j - m_i \Delta X_i + (1 - m_i^c) \sum_{kj} (1 - t_k) c_{ik} y_{kj} \Delta X_j + (1 - m^k) [Z \sum_{kj} (1 - c_k + t_k) y_{kj} + Z d_j] \Delta X_j + (1 - m_i^c) \sum_k \Delta \bar{C}_{ik}$$

10 Retained earnings might not all be ploughed back into business and increased taxes might be used to increase current government expenditures or to reduce existing deficits.

where Z is the proportion of the leakages of sector j (i.e., income that does not accrue to households) and private savings that flows back into the system through investment expenditures.

Rearranging and placing (46) in matrix form leads to

$$(47) \quad \Delta X = [I - A + M^r - (1 - m^c)cY(1 - T) - (1 - m^k) \\ \{(1 - c + T)Y - D'\}]^{-1} (1 - m^c)\Delta\bar{C}$$

With some of the outflow thus accounted for, the production-expenditure multiplier is increased. The portion that does not accrue to individual as well as personal savings flow back to the system as public or private investment.

The time lag between the leakage and reflow of income as well as the amount of income that ultimately reenters the system will depend on the components of the leakage. For example, it is very unlikely that personal savings and taxes will be translated into investment in the same year. Moreover, there is nothing in the system to guarantee that the two are *ex ante* equal (a la Keynesian arguments). The same does not apply to enterprise (public or private) savings. The amount of earnings retained by a particular enterprise is partly dependent on anticipated investment demand.

Another difference between personal and institutional savings is that it is difficult to determine the distribution of funds from personal savings and taxes across industries. In other words, there is no way of predetermining which industry gets what portion of aggregate personal savings and direct taxes. The same does not apply to enterprise savings, since the enterprise is not only the saver but also the investor. For these reasons, it is assumed that for personal savings and direct tax revenues the value of Z may be zero. Equation (47) then becomes

$$(48) \quad \Delta X = [I - A + M^r - (1 - m^c)cy(1 - T) - (1 - m^k)ZD']^{-1} \\ (1 - m^c)\Delta\bar{C}$$

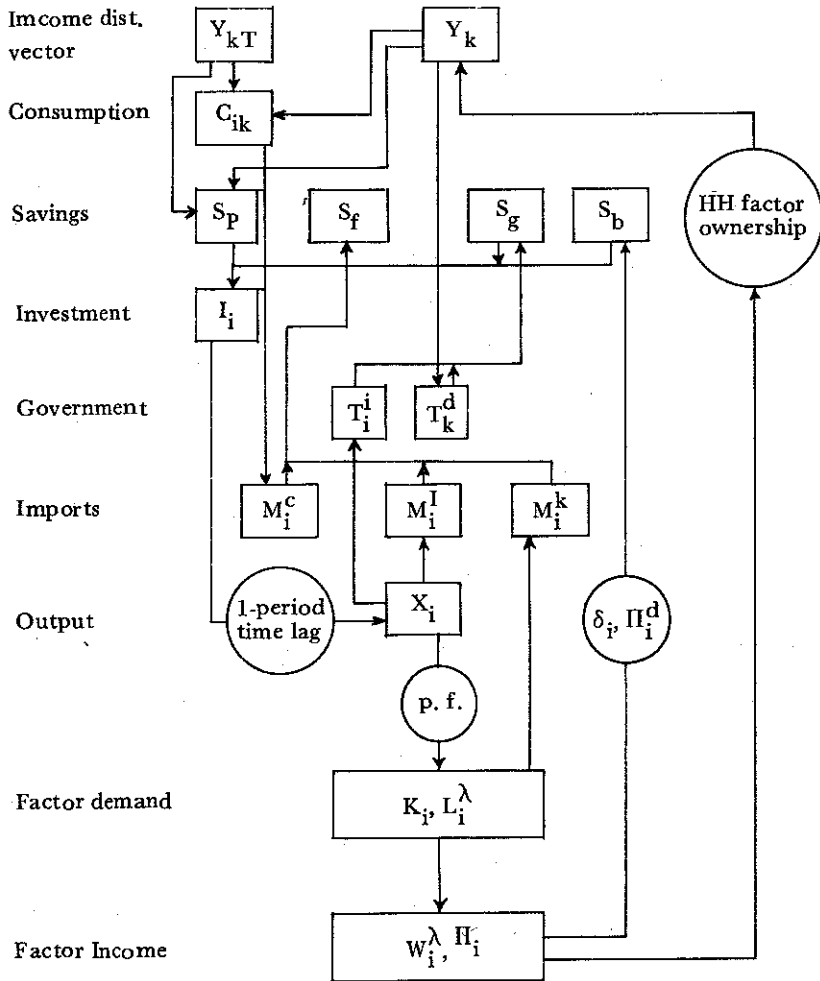
Equation (26) is the special case where $Z = 0$. Since there is little information about the value of the coefficient Z alternative values are assumed and the sensitivity of the results to these values

observed. It is assumed that, alternatively,

$$Z = 0, .3, .5, .8$$

the actual size of this coefficient will depend on the extent of funds,

Figure 1



○ Intervening factors

the outflow and the time lag between receipt and investment of funds.

In a closed system, the size of the fraction indicates the proportion of enterprise savings and indirect taxes that are invested in the current year, i.e., the extent of the time lag between enterprise savings and enterprise investment. The causal nature of the model is presented in a schematic way in Figure 1.

III. Income Redistribution Policies

The policies analyzed herein assume the continuation of the existing socioeconomic structure. The feasibility of their adoption and subsequent implementation depend on the commitment of the government and the relative strengths of the various socioeconomic groups affected. Assuming that the government is committed to achieving greater equality in the distribution of income, such policies might engender less resistance by entrenched interest groups than "radical" policies that aim at changing the whole socioeconomic structure.

Direct Transfers

1. The income of all households in the urban, rural and estate sectors earning less than the average sectoral income are raised. The total amount transferred to each group is the difference between the average and actual sectoral income multiplied by the number of households in that income group. Households earning at least three times the average sectoral income pay for the cost of the transfer with the burden progressively distributed. The average sectoral incomes are:

Urban	: £420/year or 770 shs/month
Rural	: £100/year or 167 shs/month
Estate	: £180/year or 300 shs/month

Under this plan transfer is limited, by assumption, to within each sector, and thus no net losses or gains to any sector occur. Households making less than the average sector income comprise 52.3%, 40% and 70% of total households in the urban, rural and estate sectors. These households gain as a result of the transfer. The highest 7.3%, 2.0% and 1.1% of the urban and estate

households pay for the transfer.¹¹ The total amounts transferred are £33.80 million, £28.66 million and £7.57 million. This represents about 10%, 10% and 18% of total sectoral income.

2. The second transfer plan and the amount transferred is the same as #1 above for the lower income groups. However, the burden of the transfer in any one sector no longer falls on the more well-off members of that sector, but is distributed according to the level of income regardless of sectoral location. Thus, transfer takes place both within and between sectors although adjustments are made for such factors as cost differentials between sectors so that minimum taxable income (for purposes of the transfer) is higher in urban than in rural areas. It is assumed that an urban household needs twice the income of a similar rural household and about 1.6 times that of estate households to be as well off. It is also assumed that those earning more than 2,000 shs/month, and 1,000 shs/month bear the burden of the transfer which is progressively distributed between them.

It is obvious that the choice of those figures is somewhat arbitrary, but not without logical basis. The figures for urban and estate sectors correspond to the salary of professional and managerial classes and that of the rural sector to the highest 10% of the rural households. Plan #2 closely follows #1, except that burden on high-income urban residents is greater than in #1. The total amount transferred to lower income households in each sector stays the same as #1, but the amount transferred from upper income groups changes between sectors (£56 million, £9.6 million and £5 million transferred from high income groups in the urban, estate and rural sectors).

3. The share of the lowest 50% of the population (all rural) is doubled, and upper income urban households are taxed to pay for the cost. Under this plan only between-sector transfer takes place, and the burden to the urban sector is distributed as in #2 above. The amount of income transferred from (-) or to (+) each income group under the above three plans is shown in Table 1.

Other Redistributive Policies

¹¹ These percentage figures provide a rough picture of the degree of concentration within each sector.

Table I
AMOUNT OF INCOME TRANSFERRED (±)
BY URBAN, RURAL, AND ESTATE (£000)

	PLAN I	PLAN II	PLAN III
URBAN			
Class:			
1	10,431	10,000	0
2	11,799	11,000	0
3	5,817	6,000	0
4	5,700	6,000	0
5	0	0	0
6	0	0	0
7	0	0	0
8	0	-7,000	-7,000
9	-5,300	-8,000	-9,000
10	-10,440	-16,000	-16,000
11	-18,007	-25,000	-25,000
RURAL			
Class:			
1-2	28,660	28,600	49,600
3	0	0	7,400
4	0	0	0
5	0	0	0
6	-8,024	0	0
7	-20,640	-5,000	0
ESTATE			
Class:			
1	6,038	6,000	0
2	1,530	1,500	0
3	0	0	0
4	0	0	0
5	0	0	0
6	0	0	0
7	0	-500	0
8	0	-1,200	0
9	-1,500	-1,800	0
10	-2,568	-2,600	0
11	-3,500	-3,500	0

The above transfer plans are complemented with the following policies:

1. Changing the factoral distribution of income (Exps 4-6). The wage share in the formal sector is doubled at the expense of the non-wage. One way in which this type of redistribution could be accomplished is to adopt a more labor-intensive technology. A change in relative factor usage could be accomplished by:
 - (a) Changing the relative factor prices by raising the cost of capital relative to labor. The cost of capital is kept artificially low by numerous government policies designed to encourage industrialization and by overvalued exchange rates that lower the effective cost of importing capital. On the other hand, wage rates in the modern sector are kept artificially high by minimum wage legislation and the relative strength of trade unions in the relatively protected modern sector. The combination of artificially low prices of capital and high wage rates leads to the adoption of a technology more capital-intensive than would be warranted by domestic factor availabilities. Removing these factor price distortions should stimulate the adoption of more labor-intensive technology within the range where factor substitution is possible.
 - (b) Adopting a technology more "appropriate" to the LDC factor endowments. Most of the current technology is produced in the developed countries (DCs) and therefore reflects the relative factor scarcities in these countries. It has been argued that there is a technological "ladder" containing technologies perfected in the past by the present DCs, some of which may be currently in use in relatively more developed LDCs. Each country can choose the relevant step in that ladder and subsequently "assimilate" it into the domestic economic structure.
2. Doubling the income of the rural sector (Exp 7-9). One way this could be achieved is through increased small-farm productivity. However it is brought about, the focus is not rural productivity per se, but on investigating the effect of changing the income of one sector without reducing that of another as in the transfer policies and factoral redistribution discussed above.
3. Import substitution: (Exps. 10-12) A large portion of the increases in domestic demand resulting from income redistribution goes to imported products. These leakages reduce the size of the

multiplier. To investigate the potential effect of these leakages it is assumed that any increases in domestic demand can be satisfied domestically.

IV. Empirical Results

Comparative static experiments were performed with the above redistributive policies. The effect of each policy (or policy package) on the level and composition of output, private consumption by sector, employment by skill category, imports (final, intermediate and capital goods), capital requirements and savings (public, personal and business) were measured, and the sensitivity of the results to changes in parametric values investigated. The simulation results of the redistributive policies mentioned above are shown in Tables 2 and 3. It should be emphasized that the aggregate changes in the above factors conceal changes within each category. For example, while aggregate output rises by approximately 1.2%, the output of some sectors rises while others decline (see Table 3). The item showing the greatest increase, under all experiments, is "unprocessed food" supplied by the agricultural sector. This is followed by "processed food" produced by the sector, "manufacture of food." Items for which output declines include personal and business services, housing, electricity and water, and machinery and equipment. Most other items show a modest increase. The magnitude of the changes depends on the amount of income transferred and the composition and location of the group receiving the transfer. Output for "unprocessed food" is highest under rural-urban transfers (experiments 3, 6, 9, and 12) and lowest under within-rural and within-urban transfer schemes (experiments 1, 4, 7, 10).

For employment, skill-level 3 (skilled-manual) declines for all experiments while all other skill levels show a modest increase. The high increase in total employment should be interpreted carefully. Only paid employment is included; and since the largest portion of the population is self-employed, the base is relatively small. Therefore, a given increase of employment, obtained by using labor-output coefficients, would result in a larger percent increase than if self-employment was included.

Changes in the Composition of Imports

Table 2
RESULTS FROM VARIOUS INCOME TRANSFER EXPERIMENTS CHANGES IN
OUTPUT, EMPLOYMENT, IMPORTS AND DOMESTIC SAVINGS

	Actual (1974)	1	2	3	4	5	6	7	8	9	10	11	12
Changes in													
Gross Output (f000)	1,725.11 mil ^a	27,861	21,814	23,374	28,404	20,000	16,682	27,140	18,915	15,846	31,581	23,641	20,923
Employment: Total	826,300 ^b	44,000	31,103	22,961	51,561	51,493	70,512	48,924	48,626	67,178	58,889	59,301	80,303
Skill-Level 1	24,673	1,122	696	393	1,294	1,203	1,602	1,234	1,139	1,529	1,458	1,391	1,821
Skill-Level 2	64,475	-339	-1,746	-1,640	-190	-1,106	13	-224	-1,146	-31	70	-970	177
Skill-Level 3	24,647	991	425	184	1,054	893	1,452	1,039	888	1,444	1,110	957	1,527
Skill-Level 4	711,505	42,000	31,556	23,865	49,199	50,269	67,107	46,684	47,511	63,903	56,118	53,273	76,428
Capital Requirements (f000)	- ^c	34,178	821	-40,070	38,293	14,668	-6,119	36,717	13,871	-5,801	41,898	18,788	-1,311
Imports: Total (f000)	105,810	4,628	-6,717	-7,854	3,856	-2,454	2,510	3,118	-2,798	2,326	6,184	146	5,560
Consumption Intermediate	22,420 ^d	4,416	2,056	3,012	4,611	3,895	7,004	4,084	3,739	7,002	6,363	5,842	9,288
Capital Goods	59,345	1,778	380	-79	2,135	1,686	2,985						
	17,149	-1,666	-9,353	-10,787	-2,890	-8,034	-7,479	-3,006	-8,130	-7,558	-2,588	-7,694	-7,080
Savings: Total (f000)	- ^e	-31,394	-28,214	-40,979	-27,958	-22,172	-24,502	-26,734	-22,704	-26,063	-34,749	-29,704	-33,361
Private Indiv.		-31,394	-20,163	-36,285	-28,468	-15,804	-13,912	-26,566	-16,397	-15,732	-35,711	-23,853	-23,357
Business		1,710	741	-197	1,995	1,520	1,630	1,267	921	827	2,261	1,825	1,987
Government: Total		-1,362	-8,792	-14,497	-1,485	-7,888	-12,239	-1,435	-7,228	-11,158	-1,299	-7,675	-11,991
Direct Taxes		-2,730	-8,656	-12,407	-2,989	-8,252	-11,467	-2,891	-7,581	-10,424	-2,581	-8,129	-11,314
Indirect Taxes		696	-74	-1,389	742	78	-997	721	81	-926	751	89	-964
Operating Surplus		672	-63	-700	762	286	195	735	271	142	831	365	285

Sources and Explanations:

a) Monetary = f1,534.87 Non-monetary = f190.24
 Intermediate Consumption = f817.49 GDP at Factor Cost = f907.63
 (Economic Survey, 1976, Table 2.3)

b) Refers only to wage employment
 Skill level 1 = Managerial & Professional Skill level 2 = Technical & Clerical
 Skill level 3 = Skilled-manual Skill level 4 = Unskilled

Figures obtained from Stat. Abst. 1976, Table 245.
 They refer to 1972 and have been projected to 1974.
 c) Not available.
 d) Only private consumption is included. Information on imports obtained from Stat. Abst., 1976, Table 77a.
 e) No accurate figures available.

Table 3
PERCENT CHANGES IN SECTORAL OUTPUT (ΔX_2) BY EXPERIMENT NO.

Sector	1	2	3	4	5	6	7	8	9	10	11	12
1 Non-Monetary Monetary:	1.49	6.36	16.24	.10	.06	-.06	.09	.06	-.06	—	—	—
2 Agriculture, forestry & fishing	10.52	10.42	8.48	10.27	11.93	13.84	11.51	13.23	15.35	13.65	15.68	18.19
3 Mining and quarrying	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4 Manufacture of food	2.85	2.46	1.61	3.00	3.24	3.77	2.97	3.22	3.75	3.04	3.29	3.82
5 Manufacture of clothing	.69	.28	2.30	.32	1.24	5.31	.29	1.20	5.27	.40	1.33	5.42
6 Mfc. of furniture & wood prds.	.35	-.32	-.52	.35	.03	.39	.34	.03	.39	.37	.05	.95
7 Mfc. of chemical, rubber & petrol.	.85	.66	.55	.97	.98	1.34	.94	.95	1.31	1.06	.109	1.46
8 Mfc. of non-metallic mineral prds.	.84	.68	.30	.87	.53	-.21	.87	.54	-.21	.87	.54	-.21
9 Mfc. of metal & machinery	.15	-.04	-.14	-.13	0.00	-.01	.13	0.00	0.00	.14	0.00	0.00
10 Electricity & water	-5.93	-12.11	-12.71	-5.63	-11.41	-11.19	-5.26	-10.62	-10.41	-5.49	-11.26	-11.02
11 Building & construction	.08	-.30	-.66	-.11	-.25	-.56	.11	-.24	-.56	.11	-.24	-.56
12 Trade, hotels & restaurants	.49	-.16	-.85	.57	.07	-.29	.54	.04	-.31	.63	.14	-.21
13 Transportation & communication	1.60	-3.48	-3.78	-1.53	-3.17	-2.99	-1.55	-3.19	-3.00	-1.48	-3.12	-2.93
14 Business & financial services	-1.10	-3.39	-4.46	-1.03	-3.24	-4.14	-1.03	-3.21	-4.10	-1.02	-3.22	-4.12
15 Ownership of dwellings	9.20	-4.00	-30.87	-9.31	-3.75	-30.35	-8.92	-3.61	-29.15	-9.36	-3.70	-30.29
16 Personal services	-9.86	-17.50	-11.10	-9.19	-14.23	-1.72	-9.36	-14.40	-2.62	-8.73	-13.72	-1.75

While aggregate imports fall for more than 50% of the experiments, imports of consumer items rise for all of the experiments while the reverse is true for capital goods. The increase of consumer goods is mainly due to the importation of large amounts of foodstuffs, while the decline in imported capital is mainly due to increased use of domestic capital. The overall use of capital increases for all experiments even though the overall capital intensity of production declines slightly.

Changes in the Composition of Savings

The main reason behind the fall in aggregate savings is reduced personal savings with declines in government savings a distant second. The latter is mainly due to the declines in direct taxes as income is transferred from people in high tax brackets to those in low tax brackets. Business savings register a small increase under all experiments.

Inclusion of the Non-Monetary Sector

The most important item in the consumption basket of rural households is subsistence (or non-monetary) output. The consump-

Table 4
PERCENT CHANGE IN GROSS OUTPUT, EMPLOYMENT,
IMPORTS AND SAVINGS, AND ABSOLUTE CHANGES IN
CAPITAL REQUIREMENTS WHEN NON-MONETARY SECTOR
IS INCLUDED

Experiment	Transfer Plan		
	13	14	15
Gross output	1.60	1.26	1.35
Employment	5.32	3.76	2.78
Imports	4.37	-6.35	-7.42
Savings	-17.44	-15.67	-22.77
Capital requirements (£000)	34,178	821	-40,070

tion of such items can be affected, albeit indirectly, by income transfers to farmers. A farmer could consume more of his own products because the income transfer might enable him to sell less of his products and still maintain a given level of income. Thus he could "purchase" his own products with his new-found income. Since the basic runs (exps. 1-3) excluded non-monetary consumption, another set of simulation experiments involving the three income transfer schemes was performed (exps. 13-15).

V. Conclusions

Effects on Growth-Related Variables

Gross output and employment rise under all experiments. Gross output is highest under transfer Plan I (i.e., exps. 1, 4, 7 and 10), while employment registers the biggest increase under transfer Plan III (i.e., exps. 3, 6, 9 and 12). The reason for the big employment increase under Plan III is that transfer in this case is exclusively from the urban rich (who consume relatively more capital-intensive goods). Imports also rise under all experiments. This is due mostly to the high importation of certain basic foodstuffs like rice and sugar.

Not surprisingly, aggregate savings decline for all experiments. The decline in savings should, however, be interpreted very cautiously. Accurate data are not available on the aggregate savings in Kenya; and therefore, a World Bank estimate of the savings ratio of approximately 20% of GDP is used. The aggregate figure thus obtained is therefore very approximate at best.

Capital requirements register a marked rise for all experiments under transfer Plan I, a modest rise under Plan II and a slight decline under Plan III. The difference in these responses reflects the fact that under Plan III the transfer is from urban to rural households while under Plan I the transfer is limited to within each sector. The overall capital-output ratio falls for all experiments under all three plans.

Effect on Economic Growth

Gross output rises under all experiments, mainly due to the

assumption that output is demand-constrained (a la Leontief) and that sufficient excess capacity exists during the period of analysis. If these assumptions are not realized, it is possible to see that output might, in fact, fall since savings decline and capital requirements increase under all experiments. This suggests that economic growth would fall as a result of income redistribution, thus supporting the view that there is a clear tradeoff between equity and growth.

These results, however, should be cautiously interpreted as they are based on very tentative and rough capital-output ratios and behavioral assumptions about aggregate savings. Estimates of the capital-output ratios rely primarily on the formal sector where more data are available. This tends to produce an upward bias on the overall capital-output ratio estimates. In addition, it has been assumed that income transferred to rural households are all spent on purchased products. If the alternative assumption that farmers consume more (sell less) of their own subsistence crops (in accordance with the pre-transfer consumption pattern) is granted, then capital requirements actually fall.

The decline in aggregate savings should also be interpreted in a cautious manner. Aggregate savings are composed of personal, government and business savings. A primary cause in the decline of government savings is the decline in tax revenues as income is transferred from those in high tax brackets to those in low tax brackets. It has been assumed, however, that government expenditures remain unchanged. If the latter falls with the decline in government revenues, the fall in government would be less; and, consequently, aggregate savings would not fall as much.

Business savings are also composed of depreciation allowances and undistributed profits. It has been assumed that the latter is exogenously determined, but it could very well happen that as external sources of funding become scarce in the face of higher investment needs, more investment funds would be internally generated through, for example, lower distribution of dividends. Business savings could therefore rise (it registers a small increase under all experiments), thus offsetting some of the decline in aggregate savings.

References

- Adelman, I. and C. Morris. *Economic Growth and Social Equity in Development Countries*. Stanford University Press, 1973.
- Adelman, I. and S. Robinson. *Income Distribution Policy in Developing Countries: A Case Study of Korea*. New York: Oxford University Press, 1978.
- Ahmed, Osman S. *The Potential Effects of Income Distribution on Output, Employment, Imports Savings and The Pattern of Income Distribution: The Case of Kenya*, University Press of America, forthcoming.
- Bardhan, P. *Planning Models and Income Distribution with Special Reference to India*. Mineo, New Delhi, Indian Statistical Institute, 1973.
- Chinn, D. "Distributional Equality and Economic Growth: The Case of Taiwan," *Economic Development and Cultural Change*, October 1977, pp. 65-79.
- Cline, W. *Potential Effects of Income Redistribution on Economic Growth: Latin American Case*. New York: Praeger, 1975a.
- Cline, W. "Income Distribution and Development: A Survey," *Journal of Development Studies*, February, 1975b.
- Hopkins, M., G. Rodgers and R. Wery. "A Structural Overview of Bachue - Philippines," *ILO World Employment Program*, working paper no. 20, May 1975.
- International Labour Office. *Employment, Incomes and Equalities: A Strategy for Increasing Productive Employment in Kenya*. Geneva, 1972.
- Kenya, Government of. *Census of Manufacturing*. Ministry of Finance and Planning, Central Bureau of Statistics, 1973.
- Kenya, Government of. *Consumer Price Indices for Nairobi*. Ministry of Finance, Central Bureau of Statistics, 1977.
- Kenya, Government of. *Demographic Baseline Survey Report*. (collaborated with Pop Labs at UNC-CH), Ministry of Finance and Planning, Central Bureau of Statistics, 1973.
- Kenya, Government of. *Development Plan for the Period 1970-1974*. Ministry of Finance and Planning, Central Bureau of Statistics.
- Kenya, Government of. *Economic Survey, Annual*. Ministry of Finance and Planning, Central Bureau of Statistics.
- Kenya, Government of. *Employment and Earnings in the Modern Sector*. Ministry of Finance and Planning, Central Bureau of Statistics, 1974.
- Kenya, Government of. *Input-Output Tables*. Ministry of Finance and Planning, Central Bureau of Statistics, 1976.
- Kenya, Government of. *Integrated Rural Survey*. Ministry of Finance

- and planning, Central Bureau of Statistics, 1977.
- Kenya, Government of. *Social Perspectives, Quarterly*. Ministry of Finance and Planning, Central Bureau of Statistics.
- Kenya, Government of. *Statistical Abstract, Annual*. Ministry of Finance and Planning, Central Bureau of Statistics.
- Kenya, Government of. *Survey of the High and Middle Level Manpower*. Ministry of Finance and Planning, Central Bureau of Statistics, 1972.
- Kenya, Government of. *The Pattern of Income, Expenditures and Consumption of African Middle-Class Income Earners in Nairobi*, 1964.
- Kuznets, S. "Quantitative Aspects of the Economic Growth of Nations: Distribution of Income by Size," *Economic Development and Cultural Change*, 1963.
- Miyazawa, I. *Input-Output Analysis and the Structure of Income Distribution*. New York: Springer-Verlag, 1976.
- Morley, S. and G. Smith. "The Effects of Changes in the Distribution of Income on Labour, Foreign Investment and Growth in Brazil," in *Authoritarian Brazil-Origins, Policies and Future*, (A. Stepan, ed.). New York: Pantheon, 1968.
- Paukert, F., J. Skolka and J. Maton. "Redistribution of Income, Patterns of Consumption and Employment: A Framework for Analysis," World Employment Program Research, Geneva, ILO, May 1974.
- Thorbecke, E. and G. Pyatt *Planning Techniques for a better future*. Geneva, ILO, 1976.
- Thorbecke, E. and J. Sengupta. *A consistency framework for employment, output and income distribution applied to Columbia*, Paper prepared for the Development Research Centre of the World Bank, January 1972.
- Tobin, James. "Capital-output ratios for Kenya." Institute of Development Studies Discussion Paper, Nairobi, 1972.
- World Bank, Kenya. *Into the Second Decade, A Report of a World Mission to Kenya*. Johns Hopkins University Press, 1975.

