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A Model of Public Investment Expenditure Dynamics In Less Developed Countries: The Kenyan Case

by

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23

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1. in equation (1.3), substitute "=" for " $\geq$ "
2. in equation (1.4), substitute $[\theta_t(\varepsilon_\theta\hat{\lambda})=]$ for $[\theta_t(\varepsilon_\theta\lambda) -]$
3. in equation (1.8), the equation is preceded by $0\leq$
4. in Table 5 substitute "B/GDP = θ_t" for "B/GDP = θ_ε"
5. in Table 7, footnote 4, substitute λ_ν for λ_1
6. in footnote 1, on page 41 substitute "$\delta_{1t}=$" for "$\delta_{1t}-$"
7. page 43, line 11, substitute "(derived from (1.11))" for "(derived from (1.1))'

I. Introduction*

Over the last decade, many less developed countries have relied on large scale public investment programs as the engine for realizing rapid rates of economic growth. As such, one important aspect of the economic development literature has been the attempt to identify policies to relax the financial and absorptive capacity constraints which have limited the attainable levels of investment. There has been a myopic quality to these efforts, in that projects, evaluated as socially profitable, are thereafter assumed to actually realize their full productivity, and thus meaningfully contribute to national economic development. This assumption appears inconsistent with the oft-repeated descriptions of public sector projects as undermaintained, undersupplied and understaffed. In this article, we shall argue that the emphasis on implementing a target level of public investment has been at the expense of the productivity which ongoing projects were designed to realize.

This loss in productivity arises from a neglect of the dynamic fiscal commitments that are engendered by public investments, particularly within the context of overall budgetary constraints on the fiscal capacity of the public sector. It is perhaps obvious that in order for any investment project to be fully productive, there must be future expenditure outlays for operations and maintenance. Machines require a certain amount of labour, if only to push buttons and oil gears. Roads require subsequent expenditures for resurfacing and upkeep. Schools and hospitals require staff and supplies

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*I am grateful for discussions with David Davies, Richard Musgrave, Stephen Marglin, Wolfgang Stolper and Richard C. Porter. The author takes responsibility for any errors.

for even minimal operations. Yet unlike private sector projects, there is no guarantee that a public sector project's social productivity will be reflected in operating revenues. Since public sector pricing policies are often formulated to meet multiple social objectives, it is not unusual for projects to incur financial deficits over their operating life. Hence, in most LDC's there are sizeable deficits that need to be absorbed by the general budget.

These project deficits are "preemptive" commitments on the use of future budgetary resources. They are presumably necessary for a project to fully realize the productivity anticipated at the time of the initial investment outlay. Future government expenditures are thus partially determined by the level of present government investments.[1] If these expenditure commitments exceed the expansion in the absolute fiscal capacity of the public sector, the government may achieve subsequent investment targets only at the expense of an underfinancing of ongoing projects,[2] with losses in their effective productivity, and a possible reduction in the national growth rate. In this article, we shall analyze the role of intertemporal public sector budgetary constraints in limiting the size and composition of present public investment expenditures that can be productively utilized.

The strength and relevance of this argument will depend on the stringency of the budgetary and foreign exchange constraints. If the government's tax structure is significantly elastic, or policy planners have recourse to

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[1]More inclusively, they are determined by the government's political and economic development targets, regardless of whether they are initially manifested in the form of capital outlays.

[2]We define a project as "underfinanced" when the actual level of recurrent revenues allocated to it is insufficient to purchase the set of inputs required to operate the project at a target level of output (see page).

additional funds through debt financing in local capital markets (without inducing prohibitive increases in the interest rate), the constraint will be less rigid. This is similarly the case if the expansion of the money supply to finance a public sector deficit is not jeopardized by insufficient productive capacity and/or a limited supply of foreign exchange reserves. Hence our arguments are primarily relevant in LDC's with shallow and relatively inelastic tax bases, underdeveloped money markets, and/or potential foreign exchange constraints. However, the model may be equally applicable where arbitrary constraints are placed upon so-called "recurrent" expenditures, without adequate analysis of the productivity implications of foregoing these expenditures.

In section II, we shall outline a model of public sector growth that embodies this induced expenditure relationship. By examining the consistency of the desired and feasible levels of public investment, it can be used to gauge the fiscal restrictions implied by the recurrent commitments of an LDC's development program. In section III, we apply this model to the current development experience of Kenya to illustrate the magnitudes of budgetary overexpansion that may have occurred, In section IV, we extend the model to incorporate varying levels of productivity from public sector investments, and public sector inflation. We conclude in section V with a short discussion on the applicability of the model in general.

II. The Model

Induced Government Consumption Expenditure

The mechanism by which a government's induced expenditure commitments may effect a binding constraint on the level and composition of future development expenditures may be illustrated by a model similar to one developed to estimate the burden of the public debt.[1] It rests on the simple assumption that each development project requires additional expenditures for operations and maintenance over the life of the project and that these are not, to a large extent, directly recouped through public sector pricing policies. To reflect this relationship, let us assume that any individual investment project m in period t, involving initial investment expenditures I_{mt}, engenders a net recurrent expenditure commitment of "$r_m I_{mt}$" in all subsequent periods. It is a "commitment" only in the sense that the government desires to realize the targeted output levels envisioned at the time the decision is made to invest in a given project. A lower level of budgetary resources will require that the envisioned level and mix of inputs will need to be changed, with probable losses in the project's output.[2]

The coefficient "r_m" denotes the ratio of these net recurrent expenditure commitments to the initial investment expenditure "I_{mt}".[3] Clearly, the level of any project's commitment may vary over time, and similarly the duration of these commitments will vary across projects. The former qualification

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[1]Evsey Domar, "The 'Burden' of the Debt, and the National Income," in Essays in the Theory of Economic Growth (New York: Oxford University Press, 1957), pp. 35-69.

[2]If the investment project m required a vector of recurrent inputs (x_{it}, ..., x_{tn}), valued at factor prices (w_{it}, ..., w_{tn}) in order to realize a target output level (q_{1t}, ..., q_{ft}), then the absolute recurrent input requirement $R = \sum_{i=1}^{n} x_{it} w_{it}$. If the public sector pricing policy was p_{it} for each unit of output q_{it}, the net recurrent expenditure requirement in any period t would be $R^*_m = R_m - \sum_{i=1}^{f} q_{it} p_{it}$. This makes no statement as to the criteria upon which the pricing policy was based. A positive value of R* in our model is tantamount to assuming that for structural or distributional reasons, full-cost recovery on an annual operating basis is unfeasible, and thus that reliance must be made on general revenues.

[3]It is the ratio of R* to I_t which defines "r_m" as we have defined it in our discussion.

can be incorporated in the model, but it does not substantively affect the model's conclusion. For the latter, we assume that on the average, the life span of most projects exceeds our planning horizon.[1]

Clearly, across projects one will find variations in the induced expenditure patterns, according to the projects' technological structures and the specific pricing policies pursued. The "r_m" coefficient arising from the operation, maintenance and staffing of a primary school or health clinic will far exceed that of a bitumen road. The range of variation can be illustrated by the net coefficients estimated for a range of projects from the current Kenyan Development Plan (Table 1).

Table 1

Net Recurrent Expenditures as a Proportion of Investment Expenditures for Several Kenyan Projects[2]

Roads	.03 - .09
Primary Education	0.3 - 7.0
Secondary Education	.22 - .72
University College, Nairobi	.023 - .028
District Hospitals	.317 - .405
Health Centres	.38 - .60
Dispensaries	1.0
Agriculture	.118
Waterways	.098

[1]Inclusion of assumptions to consider project age will also not substantively change the model's implications. It would imply that after n years, a project's recurrent commitment would terminate, thus freeing these resources for alternative uses. The weight of these commitments relative to the total level of ongoing commitments is likely to be small due to the exponential growth of investments.

[2]Peter Heller, The Dynamics of Project Expenditures and the Planning Process: with Reference to Kenya (unpublished doctoral dissertation, Harvard University, 1971), pp. 79-79, 154, and Republic of Kenya, Development Plan 1966-70 (Nairobi: Government Printer, 1966), p. 40.

By weighting each project's recurrent expenditure coefficient "r_m" by its share in the overall investment program, we can obtain a weighted coefficient "r" for public investments. The weighted average will be defined as

$$r = \frac{\sum_{m=1}^{n} r_m I_{mt}}{\sum_{m=1}^{n} I_{mt}} = \frac{\sum_{m=1}^{n} r_m I_{mt}}{I_t}$$

A change in project composition, the level of project outlays remaining the same, will affect the level of "r" depending on the change in each project's weight. Thus "rI_t" reflects the absolute level of recurrent commitments engendered by the current public sector investment program.

These recurrent expenditures are normally classified, within the national income accounts, as "public consumption" expenditures. Conceptually, it seems more appropriate to consider the induced expenditures arising from investment projects or development targets — $r_m I_{mt}$ — as "productive" consumption.[1] They cannot be considered unproductive in themselves since in many cases, they are crucial to the realization of an investment's productivity. Moreover, such expenditures contribute not only to present consumption, but may have an intertemporal impact on future benefits. To the extent that they contribute to or maintain an expansion of productive capacity, they fall within the Fisherian concept of investment.[2] Conversely, by not providing a

[1]It should also be noted that the budgetary distinction between so-called development and recurrent (or consumption) expenditures may be equally misleading, both as a measure of an expenditure's investment character or its developmental impact. The distinction in practice is highly variant across governments. Myrdal has noted that "the distinction between the current and the development budget is...based on administrative and legal conventions, modified in an opportunistic direction by political interests and pressures and is entirely arbitrary." Although its origins lie in separation of the "capital budget," its evolution has eroded the financial soundness criterion that had applied to development expenditures. See Gunnar Myrdal, Asian Drama, Vol. III (New York: Pantheon, 1968), p. 2014.

[2]A. Kamarck, "Capital and Investment in Developing Countries," Finance and Development, Vol. 8, No. 2 (June 1971), pp. 2-9.

project's complimentary inputs, explicit losses are realized which may jeopardize the present and future profitability of the initial investment.[1]

Within our model, these expenditures are induced by previous investment expenditures. They are "required" only to the extent that the government is unwilling to bear the losses and the "embarrassment" from their absence. They may be contrasted with our treatment of a second category of public consumption expenditures which we shall call "civil expenditures." These would include all expenditures for activities which are preconditions of and concommitant to, the existence of a nation state. Any state, in the process of maintaining and reproducing itself, requires expenditures on those institutions that perform this role. This would include expenditures which are primarily functions of the political and social roles of the government, such as internal security and external defense, foreign affairs, the administration of justice.[2] These are not necessarily unproductive, in that they may crucially facilitate the maintenance of those conditions which are necessary for the occurrence of development, such as stability, public safety, orderly external relations, etc.

Yet in themselves, these expenditures are not the engines of economic development, though without them, rapid economic growth would be highly unlikely. They are a necessary, but not sufficient factor for effecting growth. Commanding a greater priority by the Central government, they are also less likely to be judged by the same criteria as development projects, both by planners and public officials. We shall incorporate this within the model

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[1] Heller, op. cit., Chapter 2.

[2] In the broadest sense, one could argue that expenditures on health and education and investments to stimulate economic growth may be necessary for a political regime to maintain the loyalties of the nation, but we shall adopt a much narrower view of these functions.

by assuming that civil expenditures expand as a response to exogenous political and administrative requirements, and that this is reflected in a constant elasticity of growth with respect to GNP,[1] the elasticity being unspecified. However, one would expect it to be less than one.

Finally, we shall assume that annually there is a limit to the government's effective fiscal capacity. This represents the largest feasible share of the public sector in total output and is subject to socio-political, administrative and economic constraints. Revenues may be derived from taxes, domestic borrowing, money creation and foreign assistance grants and loans. We do not preclude a deficit of expenditures over tax and aid revenues, but assume it is covered by noninflationary debt flotation on money creation and that there is a limit to the expansion of fiscal capacity available through these means. In LDC's, the capital markets are typically undeveloped and beyond a certain level of debt flotation, one would expect a marked increase in the interest rate and a drying-up of private investment. Likewise, money creation beyond a certain point is likely to induce inflation and adverse changes in a country's foreign exchange position. By assuming the existence of a budget constraint, we are implicitly also assuming only limited possible access by the LDC to international capital markets for annual budgetary requirements. This constraint is manifested with our model through the assumption that the upper limit to the elasticity to growth of domestic revenues

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[1] There is only a limited literature which attempts to evaluate the determinants of civil expenditure growth, and most of this relates to the early hypotheses of Adolph Wagner, as to whether there is an inevitable tendency for such expenditures to have a rising share of total output. Other hypothesis relate to whether there are economies of scale realized on the provision of these services. See (1) Ved P. Ghandi, "Are There Economies of Size in Government Current Expenditures in Developing Countries," IBRD Economics Department Working Paper No. 68 (March 17, 1970) and (2) Sanjaya Lall and Jochen Schmedtje, "A Cross-Section Analysis of Government Expenditure Patterns in Less Developed Countries," IBRD Economics Department Working Paper No. 21, June 29, 1968.

is ε_θ.

Basic Model

These assumptions can be made mathematically explicit. In any period t, the government's domestic revenues (derived from taxes and noninflationary borrowing) (T_t) and external aid inflows (L_t) are equal, ex post, to the total outlay on civil expenditures G_{xt}, operating and maintenance expenditures on ongoing projects G_{Rt} (net of direct project revenues), and its target investment demand I_t, so that

$$T_t + L_t = G_{xt} + G_{Rt} + I_t, \tag{1.1}$$

where aid inflows are either in the form of grants or loans. Alternatively, this may be represented as

$$\theta_t Y_t = \gamma_t Y_t + G_{Rt} + \chi_t(\delta_t)Y_t \tag{1.2}$$

where θ_t = the domestic revenue share of GNP in period t, γ_t = the share of civil expenditures in GNP in period t, χ_t represents the share of total investment that is financed from domestic resources[1] and δ_t is the target share of public investment in GNP in period t.

Three points need be clarified. The level of aid-financed investments is not necessarily equivalent to the level of foreign aid inflows L_t since it is likely that these projects will require matching investment expenditures to be financed by the recipient government. Second, we assume that our LDC receives a constant share, $(1 - \chi_t)$% of its development expenditure requirements from external aid donors. This assumption reflects one particular view of the determinants of aid inflows, specifically that aid is received on a matching basis. Aid is given with the condition that a specified share

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1 $$\chi_t = \frac{I_t - L_t}{I_t}$$

is financed by matching funds from the local government. An alternative assumption would be that the level of aid inflows is exogenously determined by the aid donor (or an aid consortium) and is invariant with respect to the level of domestically financed public investment and has some arbitrarily defined intertemporal path. Finally, our statement of budgetary equilibrium (1.1) does not reflect the degree of "tightness" in the budget that exists in period $\underline{t}$. Although our model will impose the constraint that each new development project's recurrent expenditure requirements be fully financed, we are not attempting to correct for budgetary stringencies that may have existed up to, and including, the present period t, and which may have forced a project to receive an inadequate amount of budgetary resources (for a given set of output objectives). New projects are thus implemented in the face of past neglect. The reasons for this assumption are twofold: (1) this is probably, an adequate characterization of the institutional process by which new projects are implemented by bureaucracies separate from those that administer ongoing projects; (2) it is extremely difficult to gauge accurately the extent of underfinancing to which the stock of ongoing projects is subject. However, we shall explore the implications of a program to correct over time for the current shortfall.

The purpose of our basic model is to estimate whether the financial commitments engendered by a particular development program are within the limits set by the growth of the country's fiscal capacity. Alternatively one can ask what growth rate in total output is necessary to generate sufficient tax revenues to finance these induced expenditures. If it exceeds the target growth rate, it implies that the development program is financially overcommitted. We can derive this relationship as follows.

In the following period, investment and civil expenditure demands grow at their projected growth rates, λ_δ and λ_ν respectively, as targeted within the plan. These rates may exceed or fall short of the anticipated target growth rate in the economy. The investments of the previous period will require rI_t for operations and maintenance. If we assume that the growth elasticity of domestic revenues is ε_θ, then to finance this expenditure growth, total output must grow to a level Y^*_{t+1} in order to generate sufficient revenues to cover expenditure requirements. Hence, in (1.3) we see that

$$\theta_t\varepsilon_\theta(Y^*_{t+1} - Y_t) - \theta_t Y_t \geq \gamma_t(1 + \lambda_\nu)Y_t + (\delta_t)(1 + \lambda_\delta)\chi_t Y_t + r\delta_t Y_t + G_{Rt}(1 + \xi) \quad (1.3)$$

The expansion factor ξ in the last term allows us to handle an adjustment mechanism for either inflationary factors to which the present recurrent budget G_{Rt} is subject or for remedying past amounts of underfinancing of the recurrent budget.[1] By setting ξ to a negative value, it can also be used to handle the lapsing of past projects. Dividing through by Y_t, and substituting for G_{Rt} from equation (1.2), we obtain

$$\theta_t(\varepsilon_\theta\lambda) - \gamma_t(\lambda_\nu - \xi) + \delta_t(\chi_t[\lambda_\delta - \xi] + r) + \theta\xi \quad (1.4)$$

where $\hat{\lambda}$ is the growth rate represented by an expansion in output from Y_t to Y^*_{t+1}. If we solve for $\hat{\lambda}$, we obtain the <u>minimal</u> growth rate required to generate revenues sufficient to match the growth of expenditures, viz.,

$$\hat{\lambda} \geq \frac{\gamma_t(\lambda_\nu - \xi) + \delta_t([\chi_t\{\lambda_\nu - \xi\}] + r) + \theta_t\xi}{\theta_t\varepsilon_\theta} \quad (1.5)$$

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[1]This is in addition to the growth of recurrent expenditures due to the implementation of new projects (viz., $r\delta_t Y_t$).

The required growth rate is critically determined by the level (δ) and technological structure ("r") of the development program, government pricing policies and the sources of development finance. By the "technological" structure, we refer to the aggregative recurrent input requirements implied by the mix of projects in the development budget. We may test for the fiscal viability of a given development plan by testing for inconsistency between $\hat{\lambda}$ and the targeted growth rate.

Alternatively, from (1.5) we may ascertain the largest development budget, of a given technological structure, capable of being sustained, given the target growth rate of the economy. If we set λ as this target rate, then the maximally feasible investment level δ_{1t}, is

$$\delta_{1t} = \frac{\lambda(\theta_t\varepsilon_\theta - \gamma_t\varepsilon_\gamma) - (\theta_t - \gamma_t)\xi}{(r + \lambda[\chi_t\varepsilon_\delta] - \chi_t\xi)} . \tag{1.6}$$

In this formulation, we have shifted from the assumption in (1.5) that investment and civil expenditures grow at a specified rate, to assuming that they grow with a constant elasticity to output.[1] In (1.6) we assume that the technology mix of the development plan is presumed to remain unchanged at different development budget levels (which is obviously a strong assumption). This obviously implies that if the feasible development budget is less than the target investment budget, that a change in the mix of investments may bring consistency with the higher level of investment expenditures. Indeed,

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[1]The reason for this change is that in (1.5), the required growth rate is based on the presumption that these expenditures will rise at a specified rate. Since the $\hat{\lambda}$ is variable depending on δ_t or r, if we were to use a constant elasticity parameter for $G_{\chi t}$ or I_t, then variations in δ_t or r would imply variations in the level of these expenditures; which is inconsistent with our assumption of specified growth rates. In (1.6), we constrain the growth rate to the target rate, so that the specification of constant elasticity parameters is not inconsistent with this assumption.

we can solve for the "r" which yields a consistent solution, and this may serve as a constraint in allocating resources between sectors and/or projects.

III. The Specification of Parameter Values for the Model in Kenya

In order to illustrate the quantitative significance of the above relationships, let us examine the likely values of each parameter in the Kenyan case. There are many conceptual difficulties involved in making such specifications arising from the highly varied character of public expenditures. There is also an internal consistency that needs to be maintained in order to avoid double counting of expenditure categories. For example, should one treat government loans to public financial corporations as development expenditures, and if so, what is the level of "r" associated with such loans? Likewise, is our concept of "r" net or gross of project revenues, and what is the implication of this choice for our specification of θ_t? The chosen procedures will, by necessity, reflect a compromise between relative degrees of conceptual accuracy, and the quality and availability of the data to support a given choice. In this section, we shall give a sense of the difficulties of specifying these parameters for the Kenya case.[1]

Public Sector Investments and the Recurrent Cost Parameter "r"

There are obvious conceptual problems in identifying the components of δ, the share of government investment expenditures in GDP. Often the distinction made between development and recurrent expenditures is not highly correlated with any economic or functional delineation of expenditures. Within our model, the distinction is imprecise, implying only that the development

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[1] A more detailed discussion of these issues will be found in an earlier work by this author; see Heller, *op. cit.*, Chapters 1 and 2.

expenditure be that which is necessary to bring the project to the point of generating benefits, with the recurrent inputs being required to produce these benefits. The distinction corresponds closely to that between a plant's capital stock and its labour and working capital. Alternatively, the model suggests that the delineation occurs at the point where there is a recurrent character, both in the level and composition, to the project's inputs which is qualitatively different from the structure of inputs before this point. As we have discussed in another study, the degree to which projects conform to this ideal type may vary widely.[1]

For this model, we have chosen to use the planned development expenditures of the central government over the fiscal years 1969/70 - 1973/74, corrected for obvious instances where the development budget is used to finance clearly recurrent functions. We have chosen to include within this category all industrial and agricultural loans made by the central government, despite the fact that these have effectively a negative net "r_m".[2] We have excluded those investments that fall within the category of "civil expenditures," since their associated recurrent costs are generated by a separate expenditure function. We have also excluded the development expenditures of so-called public sector enterprises and regional public corporations (i.e., East African Power and Lighting, East African Railways or Airways, etc.) since these are financially distinct entities, both in their sources of capital finance and their capacity to internally finance operating costs.

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[1]Heller, op. cit., Chapter 2.

[2]In the Kenyan case, the lending rate of the public agricultural and industrial credit agencies is set above their borrowing rate from the Central government in order to cover administrative overhead and loan defaults.

The average share, δ_t, of central government development expenditures in GDP at factor costs has risen from 4.00% in[1] 1966/67 to 5.92% in 1969/70. In Table 2 there is a detailed sectoral breakdown of planned development expenditures by the central government during the plan period, as well as estimates of the actual expenditures during the early years of the plan. Over the entire plan period, the target δ is approximately 6.1%, with a certain variability during the period. It should be noted that these target levels have not been achieved during the early years of the plan, but the shortfall is no more than 10% of the initial targets.

From this intersectoral breakdown, we can obtain an estimate of the weighted value of "r". Our estimates of the parameters "r_m" are based on detailed project data, obtained from sources within the Kenyan government, concerning project costs and revenues. The quality of this data varies considerably, so that in some sectors we were able to make extremely detailed calculations, whereas in other sectors our estimates are necessarily crude. However, detailed analyses were made of agricultural, health, education and roads projects, which account for a substantial proportion of total development expenditures.[2] "Financial" projects involving central government loans to different sectors of the economy are assumed to have no gross recurrent cost obligation, since these are administered by autonomous public sector lending agencies. Loan repayments are presumed to finance their operating costs, and hence they do not require an operating subsidy from the central government.

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[1]Republic of Kenya Statistical Abstract, 1968, p. 149.

[2]In Chapter 2, 3 of Heller, *op. cit.*, we illustrate and discuss the problems in calculating these parameters, with specific discussion of health, education and roads projects.

Table 2

Central Government Development Expenditures of Kenya and Their Recurrent Implications: for the Years 1968/69 - 1973/74 (in 1000 Kenyan pounds; 1969 prices)

	r_i (1)	1969/70 - 73/74 (2)	Estimated External Capital Inflow (3)	Plan Estimates 1969/70 (4)	Actual Expenditures 1969/70 (5)	Plan Estimates 1970/71 (6)	Submitted Estimates 1970/71 (7)	Plan Estimates 1973/74 (8)	Actual Expenditures 1968/69 (9)
Agriculture and Livestock	.118	22146		3770		4120		4765	1698
Agriculture and land settlement loans	--	15000	35116	3750	5140[a]	2100	7100	2112	5343[b]
Irrigation	.098	2526		535		696		310	551
Natural Resources	.33	3370	2960	670	1800	670	2100	670	142.0
Tourism	.05	3530	2385	657	515	700	600	478	410
Manufacturing, Commerce and Construction	.01	11323	428	1394	1453	1887	1954	2908	1111
Education	.4	16576	13444	2573	2427	4200	2131	3010	2921
Housing	.03	14890	5564	2260	2512	2470	2613	3970	2130
Health	.220	14763	2000	2354	2043	2980	2374	3202	1172
Local Authorities	--	4500		300	300	600	440	--	100
Social, Cultural, Labor	.4	1800	1800	225	443	570	490	235	267
Rural Development	.4	2500	2500	--		250		1000	--
Roads	.07	43140	28317	8080	8794	8931	10253	9539	6024
Information and Broadcasting	.05	1798	1500	303	?	31.9	?	377	118
Airports	.098	7426	6680	486	566	715	1139	2525	108
Waterworks	.15	7960	6748	855	831	1280	--	2350	462
Financial Institutions	--	2725	--	1250	.960	1100	1100?	100	827
Total Investment (inc. Local Authorities) (I_1)		175900		29466	27784	33586	32294	37174	23384
Total Investment (exc. Local Authorities) (I_2)		171400		29166	(27484)	32986	31854	37174	23284

Table 2 (Continued)

	r_i (1)	1969/70 - 73/74 (2)	Estimated External Capital Inflow (3)	Plan Estimates 1969/70 (4)	Actual Expend- itures 1969/70 (5)	Plan Estimates 1970/71 (6)	Submitted Estimates 1970/71 (7)	Plan Estimates 1973/74 (8)	Actual Expend- itures 1968/69 (9)
$\frac{I_2}{GDP} = \delta$ [c]		.06112		.05918	.05577	.0628	.0607	.05815	.04123
$\Sigma I_i r_i / I_2$ = "r"		.1244		.1106	.1229	.1356	.11684	.1258	.1048
"r" inclusive of recurrent implications of non-British recurrent technical assistance		.15		.1366	.1504	.16	.142	.151	.13

Sources: Statistical Abstract, 1971, Republic of Kenya, pp. 152-153.
Republic of Kenya, Development Plan 1970-74, pp. 148-50.
Republic of Kenya, Economic Survey, pp. 151-52.

[a] Based on breakdown of agricultural expenditure estimates 1969/70; "r" estimated to be = .0542

[b] Of which 977 was for land adjudication.

[c] GDP in 1969 prices.

One critical problem involved in estimating these parameters is whether they should be net or gross of project revenues.

In our model, we defined "r" as a net measure, primarily because it is conceptually important to distinguish projects by the degree to which they are self-financing whether from direct project revenues or from revenues indirectly arising from a project's output. Although the self-financing capacity of a project (in narrow budgetary terms) is certainly not the sole criterion by which projects should be evaluated, this paper argues that it must be considered; if only as a constraint on the feasible set of projects.[1] Yet within our model, the choice of a net or gross measure is more accurately determined by the nature of the structural relationships which generate a project's revenue although the choice must also be tempered by the availability of statistics.

Hence if the revenues generated by a project are more responsive to the growth in the economy, than to the level of project investment I_m, we would be more accurate to use a gross measure of r in (1.3) and adjust our concept of θ_t to be inclusive of these types of revenues. For example, for road projects, whose maintenance is financed by indirect taxes on petroleum or license fees, these revenues may be more responsive to GDP than to the capital cost of the road.[2] However, using a gross measure would imply that our measure of the elasticity to growth of central government revenues would, to a certain extent, be functionally dependent on the composition and level of

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[1] Indeed, an examination of the literature of public sector pricing policy will reveal that efficiency and income distributional objectives may, in some cases, be realized by subsidization of a project from the general revenue base.

[2] For certain types of roads, the level of maintenance costs may also be responsive to this output measure, and hence we are underestimating the cost impact by relating these costs only to I_t.

expansion of δ_t.

Similarly, if a project's revenues are more closely linked to the level of investment, it would be appropriate to use a net measure of r. We thus have to estimate the expected output and revenues for each project, in addition to the estimates of input costs. For example, the direct project revenues associated with a school or hospital may be readily calculated from statistics on inpatient-outpatient attendance and composition, school fee rates, etc. We would also exclude from our measure of θ_t all revenues derived from ongoing projects and loans.

Our choice is complicated by the high level of aggregation associated with the published statistics of central government revenues. This prevents us from accurately excluding only those revenues whose growth is dependent on the expansion of projects. This constrains us to opt for using the gross measure of "r", since it seems more costly to be imprecise as to the magnitude of θ, than to be awry with respect to its dynamics. However, we can adjust for the latter by simulating with respect to the elasticity to growth of total revenues.

Hence, within θ, we have included all revenues derived from: (1) the sale of goods and services by the government, (2) interest, profits and dividends, (3) reimbursements from parastatal bodies, and (4) loan repayments. The last component involves the revenue feedback arising from loans to financial institutions.

Finally, it should be noted that the difference between the gross and net concepts of "r" is not substantial for a large proportion of the development projects. Public sector deficits on most projects are quite common. There are only four project areas — natural resources, agriculture, housing and financial loans — where some projects are effectively self-financing (and in these instances it is not clear that the pricing policy involves an amortization of the initial investment outlay such that $r < 0$). The fact that social externalities and income distributional objectives are also considered in the determination of pricing policy is the underlying basis for the occurrence of this recurrent expenditure problem. Clearly, if each project's pricing policy were capable of recouping at least these input costs, this would not be such a critical problem, except in cases where there is a substantial lag between project outlays and project output returns.

In Table 2, we have calculated the "r_m" values used for each sector. Over the entire plan period, this is approximately .1244, with variations between .1106 and .1356. For our simulations, we have varied the "r" parameter from .08 to .20 to reflect four possible structures of development programs. Since social infrastructural projects (agricultural training, health, education) have relatively high "r_m's" and physical infrastructural projects (irrigation, dams, roads) low ones, we have mnemonically labeled these four cases ($r = .08$, $r = .125$, $r = .15$, $r = .2$) as corresponding to a (1) physical infrastructural, (2) mixed infrastructural without technical assistance, (3) mixed infrastructural with technical assistance, and (4) social infrastructural program. Kenya falls within (2) and (3).

Technical Assistance

It should be noted that this neglects the substantial level of technical assistance expenditures which are made by foreign donors in addition to current development expenditures. These are usually wholly financed by the donors, with only the local costs of servicing the experts (housing, office staff, etc.), included by the recipient within its development expenditure accounts. In Kenya, total technical assistance inflows in 1969 were valued at 9.4 million, which may be contrasted with central government development expenditures in 1969/70 of 23.99 million (see Table 3). Should we raise r or δ accordingly to reflect this? The answer depends upon the structure of technical assistance inflows and the degree to which it is a subsidy (i.e., the likelihood of induced recurrent commitments).

For example, some technical assistance is provided both in an operational role, providing personnel for recurrent project requirements (i.e., doctors or teachers), as well as for once and for all development functions. For the former, it is more likely that the government will replace this foreign personnel over time, and thus there is a latent potential for an induced commitment. The amount will depend on the salary of the Kenyan replacement relative to that of the foreign personnel. The major problem is that the cost dynamics may differ from that of normal government projects. The existence of the expenditure in the present by no means implies that the replacement will occur in the next period — it may not occur for five to ten years. Second, it is unlikely that as the Kenyan education program proceeds and as pressures for Kenyanization mount, the share of technical assistance expenditures in GDP would remain constant. Third, the <u>counterpart</u> costs for these personnel are typically included within δ, so that one would not raise "r_m" or there will be a double counting of these recurrent costs. Finally, to the extent that new technical assistance is provided to help meet the recurrent staffing requirements of current and future development expenditures, the fiscal impact of these expenditures is partially alleviated.

The latter form of technical assistance personnel, i.e., for development

Table 3

Total Technical Assistance Inflows Into Kenya, by Sector: 1969

Sector	Developmental Technical Assistance	Recurrent Technical Assistance	Total	(In $1000 US Dollars of which UK subsidized)
AGRICULTURE:				
Forestry & Fishery	550	98	648	74
Land & waters	525	360	885	100
Rural Institutions	115	1860	1975	7
Plant Production	--	768	768	50
Animal Husbandry	--	2098	2098	478
Agricultural Planning	--	315	315	55
Others	--	807	807	115
Total	1485	5585	6785	700
EDUCATION:				
Primary & Secondary	130	4085	4188	2558
Technical & Vocational	270	2505	2775	403
University	50	1840	1890	461
Adult Education	261	30	291	30
Unspecified	655	--	655	2
Total	1361	8433	9802	3454
INDUSTRY:				
Mining	--	425	425	18
Tourism		142	142	21.6
Housing, Building,		150	150	47
Physical Planning				
General Planning		2850	2850	158
Transportation		36	36	
Communication				
Total		3603	3603	245
HEALTH GENERAL:				
Education		1300	1300	60
Maternal & Child Health			72	
Planning			176	
Family Planning			250	
Total		1300	1798	60
SOCIAL WELFARE		177	177	11
PUBLIC ADMINISTRATION		930	930	580
OTHERS		140	140	32
Total (in US $1000)		$23,551	$26,491	$5,082
Total (in Kenyan £1000)			K£ 9,400	K£1,815 = 7,585

Source: _Annual Report on Development Assistance other than that provided by the UNDP by the Resident Representative for the year 1969_ United Nations Development Programme (March 1970)

r - 758

purposes, are either associated with specific projects in an advisory or design capacity (so that they should be reflected in an increased δ and lower "r_m", i.e., constant "$r_m \delta_m$") or are one-shot advisors on particular problems. The latter are unlikely to be replaced so that they do not induce any recurrent commitments. An examination of the structure of technical assistance inflows in 1969 indicates that 90% of technical assistance are for recurrent functions (see Table 3).

A second consideration is the degree of donor subsidization of technical assistance costs. For example, the British Government's overseas volunteer advisory service (through the Ministry of Overseas Development) finances only the difference between the prevailing British salary for a given occupation and the salary of comparable Kenyan personnel. This is a sizeable subsidy, but the Kenyan government nevertheless will not have an expansion of expenditure commitments with the eventual termination of the technical assistance program. If the donor finances the entire salary cost, then the eventual recurrent commitment will equal the equivalent Kenyan salary rate less the net additional counterpart expenditures currently required to "service" the technical assistance personnel. The implication in terms of our model is that the "r" coefficient for technical assistance will range from zero to the ratio of Kenyan to foreign salaries (a ratio of .1 to .15 approximately).

The ultimate effect of technical assistance in the context of the model is through its impact on the level of "r". Such expenditures are effectively borne by the donor country and never enter the financial estimates of the Kenyan government. It is only at the point of transference of responsibility to Kenyan personnel that it becomes a recurrent cost burden. Hence we have assumed an "r_m" of .1 for expenditures made on recurrent technical assistance personnel and added this recurrent burden to the burden implied by the development projects in a given period. Since we only have accurate statistics for the period 1969, we have used this as a benchmark for its impact over the entire plan period. As can be seen at the bottom of Table 2, this raises the "r" range of the Kenyan plan to approximately .15. We shall use .15 as our measure of the recurrent cost parameter (although over the plan period, it varies from approximately .136 to .16).[1]

The Share of Government Revenues in GDP

Consistent with our discussion above, our measure of domestic central government revenues is defined as total revenues inclusive of appropriations-in-aid and exclusive of (i) external borrowing, (ii) external grants, and (iii) revenues derived from various parastatal corporations associated with the East African Community.[2] This is inclusive, then of the following revenue sources: (i) direct and indirect taxes, (ii) property income, (iii) interest, profits, and dividends, (iv) sales of goods and services, (v) loan repayments, (vi) reimbursements of expenditure, (vii) internal debt expansion and miscellaneous revenues. As can be seen in Table 5, θ has risen over the period from approximately 19.1% of GDP in FY 1966/67 to approximately 22.7% of GDP in 1969/70 and 1970/71. This rise is deceptive in terms of its implications for the tax elasticity since it incorporates once and for all shifts in the method and timing of tax collections, revisions in rules relating to

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[1] Here we are forced to make the crude assumption that the effect of technical assistance is to raise the "r" value by .025, which is probably not wholly accurate within a medium-term time horizon.

[2] For a further discussion on the growth elasticity of the revenue structure, see Heller, *op. cit.*, pp. 57-66.

family allowances and the taxation of corporate dividends, and shifts in jurisdictional authority over graduated personal tax revenues (from local to central government). Hence it would be inaccurate to continue to extrapolate this trend. We shall use .22 as our revenue share, and shall explore the implications of growth elasticities of 1.0 and 1.1.

The share of external financing, $(1 - \chi_t)$, has ranged between 30 and 40% over the last four years. (See Table 5). The Kenyan development plan anticipates a rise in $(1 - \chi_t)$ to 53% as is shown in the following breakdown of development revenue sources for the Development Plan:

Table 4

Sources of Revenue for the Development Plan 1969/70-1973/74

Revenue Source	Million Kenyan Pounds
1. Surplus on recurrent budget	20
2. Borrowing from National Social Security Fund	30
3. Other local borrowing (excluding Treasury bills and borrowing from the Central Bank)	10
4. Central Bank money and Treasury Bills	25
Total Domestic Financing	85
Grants and Loans from abroad	95
Total	180

Source: Republic of Kenya, Development Plan 1969-1974, p. 163.

As a proportion of the K£171 million included within our concept of public investments, the amount of external assistance is 55%. In column (3) of Table 2 we have listed, for each sector, the amount of foreign assistance the Kenyan government requested at the meeting of the aid consortia in Paris, in

Table 5

The Sources of Revenue to the Central Government of Kenya
Fiscal Years 1964/65 - 1970/71 (in 1000 Kenyan pounds)

Source of Revenue	1964/65	1965/66	1966/67	1967/68	1968/69	1969/70[f]	1970/71[f]
Direct Taxes	14,565	16,747	20,077	24.166	25,784	31,770	37.070
Income Tax	13,461	15,887	18,786	22,969	23,611	28,265	32,046
GPT	12	--	--	412	1,513	2,750	4,200
Export Duty	908	649	995	414	351	400	500
Other[a]	183	261	296	366	308	300	325
Indirect Taxes	25,701	27.131	32,895	35,190	39,017	40,758	43,694
Import Duty	15,892	17,136	20.077	19,952	21,830	22,328	23,816
Excise Duty	6,243	6,299	8,474	10,448	11,794	12,847	13,734
Other	3,560	3,640	4,330	4,780	5,300	--	--
Income from Property	1,043	1,058	1,328	1,374	1,468		
Interest, Dividends & Profits	2,632	3,117	2,411	3,634	4,767		
Transfers	10,577	6,636	4,884	3,367	2,342		
Sales of Goods & Services	4,966	4,862	5,321	6,544	7,033		
Reimbursement of Expenditure	1,180	842	1,582	1,954	1,919		
Total Recurrent Revenues	60,164	60,443	68,497	76,224	82,331		
External Borrowing: Long Term	10,698	9,427	7,240	7,831	7,101	9,470	13,300
External Grants	226	369	135	41	--	820	650
Internal Borrowing	1,028	2,238	7,835	9,006	13,882		
Long Term	819	2,006	7,817	8,285	8,292	17,380	18,000
Short Term (net)	209	232	18	721	5,590	--	--
Loan Repayments	860	1,162	1,190	3,564	3,984		
Other	284	420	200	52	3		
Total Long Term Revenues	12,652	13,264	17,055	20,453	24,970		
Total: Gross[b]	72,816	73,707	85,563	96,677	107,301	124,559	141,446
Total: Net[c]	65,922	62,193	73,829	84,922	96,649	108,655	124,608

Table 5 (Continued)

The Sources of Revenue to the Central Government of Kenya FY 1954/65-1970/71

Sources of Revenue	1964/65	1965/66	1966/67	1967/68	1968/69	1969/70[f]	1970/71[f]
A = Revenues from Domestic Sources	62,900	63,900	76,650	88,820	100,200	114,050	128,150
A/GDP[g]	.1899	.1675	.1935	.2104	.2180	.229	.239
B = Domestic Revenues less (1) parastatal organization revenues and (2) fees from the health and education department	61,724	62,895	75,550	87,320	98,700	110,000	122,000
B/GDP = θ_{ε}	.1864	.1649	.1907	.2068	.2145	.2208	.227
External Funds/Development expenditures = $(1 - \chi_t)$	.800	.6876	.4876	.4021	.29026	.3202	.384
Internal and External Borrowing/ Development Expenditures	.844	.8192	.959	.856	.862	.8224	.8623
χ^i = Internal Borrowing/Development	.0599	.15703	.499	.4595	.5722	.527	.4959
χ^e = External Borrowing/Development	.7843	.6621	.46	.397	.290	.2954	.367

[a]Includes land premia and estate duties

[b]Gross of appropriations in aid

[c]Net of appropriations in aid

[d]3-year moving average

[e]Includes E.A. Community, Rebate from E.A. Railroads, Miscellaneous income

[f]Estimates

[g]GDP at factor cost in current Kenyan - estimates for each fiscal year

Sources: Statistical Abstract 1970, pp. 146-149, Economic Survey 1970, pp. 153-157, Government of Kenya.

1970. This presumes that 66% of development expenditures are externally financed. Within our model, we simulated the impact of different levels of external assistance dependence.

Since much of this external assistance is in the form of loans, it is necessary to amend our earlier model to include the impact of future borrowing charges on the budgetary viability of the plan. This applies to domestic borrowing as well. If we assume that χ^e% and χ^i% of government investment are financed by external and internal borrowing, respectively, and if these have an immediate debt servicing cost of d per cent, this will be reflected in equations (1.5') and (1.6') as follows:

$$\hat{\lambda} \geq \frac{\gamma_t(\lambda_\nu - \xi) + \delta_t\{[\chi(\lambda_\delta - \xi)] + d[\chi^e + \chi^i] + r\} + \theta_t\xi}{\theta_t\varepsilon_\theta} \qquad (1.5')$$

$$\delta_{1t} = \frac{\lambda(\theta_t\varepsilon_\theta - \gamma_t\varepsilon_\gamma) - (\theta_t - \gamma_t)\xi}{(r + \lambda[\chi_t\varepsilon_\delta] + [\chi^i + \chi^e]d - \chi\xi)} \qquad (1.6')$$

The debt servicing implications of both the internal and external financing of the plan are reflected in our parameters χ^e, χ^i and d. Within the last five years the share of development expenditures internally debt financed has stabilized between 50 and 57%, whereas the external borrowing share has varied between 30 - 40%. Our parameter d is intended to reflect the recurrent interest-cost burden implied by both forms of debt. With the exception of low-cost A.I.D. and I.D.A. loans, the largest proportion of debt is financed at rates varying between 6 and 7%,[1] with interest payments commencing almost immediately. The repayment on principal is, however, made on different

[1]A.I.D. and I.D.A. loans have typically been made on soft terms, with an interest rate ranging between 3/4 and 2% and a debt servicing extended over 60 to 80 years. Both terms are well below the financing charge for the bulk of Kenya's debt finance.

terms for internal and external debt.

For the former, repayment occurs at the maturity date of the bonds, and is financed by the flotation of a new set of bonds, a process quite analogous to the refinancing process in most developed economies. For the latter, repayment occurs over a 25-30 year period, usually after a 6-year grace period has lapsed, with an implied amortization cost of 3%-4% per annum. This complicates the problem within our model, because of the different terms and because of the nascent impact of previous debt-financed expenditures in the early years of Kenya's independence, whose grace period will lapse within the plan period. We shall handle this by including the expansion in such payments within the growth of civil expenditures (as broadly defined below).

Civil Expenditures and Public Sector "Inflation"

Finally, in order to gauge γ_t, the share of civil expenditures in GDP, it is necessary to distinguish those ministries which unmistakably fall within the civil expenditure category. In the Kenyan case, this would probably include the following ministries: the Office of the President and Vice President, Foreign and Home Affairs, Defense, Information and Broadcasting, Office of the Attorney General, Judiciary, National Assembly and Exchequer and Audit Departments. The magnitude of such expenditures could be enlarged if one examined all the other "development-oriented" ministries in greater detail and attempted to distinguish those expenditures not induced by project expenditures or by their overhead requirements. In 1969/70, the recurrent and development expenditures of the aforementioned ministries accounted for approximately 28-30% of the estimated recurrent expenditure budget and 6 to 11% of the development budget respectively (see Table 6). Conceptually, it

Table 6

Civil and Financial Expenditures
(in 1000 Kenyan pounds)

	1964/65	1965/66	1966/67	1967/68	1968/69	1969/70	1970/71
A = General Services[a]	17,831	19,351	22,251	24,315	24,377	28,804	29,600
B = Unallocable Expenditures[b]	2,862	2,901	3,110	2,906	3,673	3,791	4,286
C = A + B	20,693	22,250	25,400	27,700	28,000	32,500	33,800
C/GDP[c]	.0625	.06412	.06562				
D = Financial Obligations	16,959	20,192	18,898	19,014	19,967	20,160	24,736
E = D + C	37,652	42,450	44,400	46,700	48,000	52,600	58,500
E/GDP	.1137	.1113	.11209	.11063	.1044	.1055	.109
F = E - Interest Payments	33,243	37,720	39,150	41,300	42,000	46,330	51,400
F/GDP	.100	.098	.10	.098	.091	.0926	.096

[a] General Services include: (1) administration: central and provincial, (2) conduct of foreign affairs, (3) Police and Judicial functions, (4) Defense, (5) Revenue Collection and Financial Control.

[b] Unallocated expenditures include: (1) building-residential and non-residential, (2) Ministry of works, unallocable, Government Printer, other.

[c] GDP, at factor cost, has been linearly interpolated from calendar year, to fiscal year.

Source: Statistical Abstract 1971, Government of Kenya, pp. 152-153.

is consistent to include also the development expenditures of these ministries within our measure of γ_t (although it might give a misleading indication of the magnitude of γ_t if there is a significant variability in the development expenditures involved).

If we include recurrent financial obligations, excluding interest payments, within our definition of financial obligations (reflecting our discussion above), the share of civil expenditures has fluctuated between 9.1 and 10% over the last 6 fiscal years. We include amortization payments within this measure.[1] In our simulations, we have also assumed, both from past data and from theories relating to the growth of such expenditures[2] that the elasticity to growth, ε_γ, is not more than unity, and is more likely to be approximately .95.

Finally, we have assumed that there is a wage-push (or productivity) factor raising the recurrent costs of the government by 1% per annum, although this is still within the conceptual framework of real growth in public sector product. This reflects the increment patterns embedded within the wage structure, and which correspond ostensibly to the expansion in the marginal productivity of civil servants.[3] Since Kenya is characterized by a relatively young

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[1] Also included are (1) contributions to various government sinking funds, (2) subscriptions to international organizations, (3) pensions and gratuities, (4) passages and leave expenses, and (5) transfers to local authorities.

[2] See Heller, op. cit., pp. 51-57.

[3] Specifically, one might find wage pressures arising from the need to match the productivity-induced wage increases in the industrial sector of the dual economy. This may be a dubious proposition, but it is the rationale of policy-makers which underlies the dynamics of the public sector wage structure. See (1) Hans Singer, "Dualism Revisited," University of Sussex Institute of Development Studies Communication Series, #41 (October 1969);
(2) Republic of Kenya, New Conditions of Service for the Kenya Civil Service (Director of Personnel, Nairobi, 1968);
(3) Elliot J. Berg, "Wage Structure in Less Developed Countries," in A.D. Smith (ed.) Wage Policy Issues in Economic Development (London: MacMillan & Co. Ltd., 1969)

civil service, these increases are not offset through the replacement of higher-paid retirees by new employees at the lower end of the wage scales. We have embodied this increment pattern through our expansion parameter ξ. Hence any value of ξ more than .01 is presumed "inflationary."

The Implications of the Model for Kenya

In Table 7, we have listed the values of the required growth rate $\hat{\lambda}$, and the maximum feasible investment level δ_{1t}, corresponding to various development program levels and structures, levels of external financing and levels of public sector inflation. We have estimated these parameters under the following circumstances: (1) where the investment target corresponds to the actual share of investment currently financed (δ = .058); (2) where δ corresponds to the plan target (δ = .0611); (3) where recurrent costs are annually pushed upward by a 1% wage hike due to the civil service increment structure; (4) where this "wage push" factor is assumed neutralized by a lapse of past projects with a recurrent cost burden equal to 1% of ongoing recurrent costs. For each of these cases the relevant benchmark growth rate is the 6.8% real growth rate in GDP envisioned in the plan and often achieved in the Kenyan economy. Likewise, we have calculated the maximal feasible investment share (δ_{1t}) that corresponds to a real growth rate of 6.8%, and this may be compared with the aforementioned target and actual investment shares.

With the exception of the physical infrastructural case (r = .08), the growth rates required to finance the recurrent implications of Kenya's projects exceed the target and actual growth rates in all cases. If we include the impact of technical assistance (so that r = .15), we see that in case A the required growth would need to be approximately 8.6% if Kenya were to

Table 7

Required Growth Rates ($\hat{\lambda}$) and Maximal Investment Levels (δ_{1t}) for Kenya's Development Programme

	Case A[1,3] With Normal Salary Increments			Case B[2,3] With Salary Increment Offset by Project Lapses			Case C[4] With Salary Increment and 1% Public Sector Inflation	
	$\hat{\lambda}$ with target investment shares of δ_t=5.8%	δ_t=6.11%	δ_{1t}	$\hat{\lambda}$ with target investment shares of δ_t=5.8%	δ=6.11%	δ_{1t}	$\hat{\lambda}$ with target investment shares of δ_t=6.11%	δ_{1t}
r = .08								
Aid = 70%	.0635	.0655	.0591	.0591	.0611	.0658	.0734	.0608
Aid = 50%	.0663	.0684	.0549	.0624	.0645	.0606	.0763	.0565
Aid = 35%	.0684	.0706	.0521	.0648	.0671	.057	.0785	.0537
r = .125								
Aid = 70%	.0743	.0768	.0456	.0699	.0725	.057	.0847	.047
Aid = 50%	.0771	.0798	.043	.0732	.0759	.048	.0877	.044
Aid = 35%	.079	.082	.0414	.0756	.0785	.046	.0899	.0425
r = .15								
Aid = 70%	.08	.0832	.04	.0759	.0788	.045	.091	.0417
Aid = 50%	.083	.086	.038	.0792	.0822	.0428	.094	.0396
Aid = 35%	.0852	.088	.037	.0816	.0848	.041	.096	.0382
r = .2								
Aid = 70%	.092	.0958	.0330	.0879	.0914	.037	.1036	.034
Aid = 50%	.095	.0987	.0317	.091	.0949	.0354	.1066	.0326
Aid = 35%	.097	.101	.0308	.0936	.0974	.034	.1088	.0317

(1) $\xi = .01$

(2) $\xi = 0.0$

(3) Other Parameter Values

$\varepsilon_\theta = 1.1$ $\varepsilon_\gamma = .95$ $\varepsilon_\delta = 1.0$ $\lambda = .068$ $d = .065$ $\gamma_t = .096$

$\theta_t = .22$ $(\chi_e + \chi_i) = .85$ $\lambda_\nu = .055$ $\lambda_\delta = .068$

(4) Parameter Values

$\varepsilon_\theta = 1.1$ $\varepsilon_\nu = .95$ $\varepsilon_\delta = 1.0$ $\lambda = .078$ $d = .065$ $\gamma_t = .096$

$\theta_t = .22$ $(\chi_e + \chi_i) = .85$ $\lambda_1 = .062$ $\lambda_\delta = .078$

realize both its planned investment targets and anticipated level of external financing [1] (viz., $\delta_t = 6.11\%$ and $\chi_t = 50\%$.) If its investment share and aid inflow corresponded to current shares, this would be at 8.52%. In case B, this is lowered to 8.16%. If Kenya need not bear the recurrent implications of some current technical assistance flows, the required growth rates range from 7.5% to 7.9%. In the listed cases we have assumed that the share of tax revenues and civil expenditures are elastic and inelastic, respectively, implying fiscal surplus elastic to growth. If we were to assume unitary elasticity, the required growth rates would be larger. It is also clear that a social infrastructural program is far more expensive in terms

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[1] This does not imply that an expansion of Kenya's fiscal capacity equal to the amount necessary to plug these revenue shortfalls will be sufficient to resolve this problem. It has been recently suggested by Stanley Please of IBRD that the absolute level of government expenditures may indeed be responsive to the absolute level of the fiscal surplus. Please noted that although increasing tax effort has been accepted "almost universally" as the way to raise the total flow of savings in an economy,

> "without denying an adequate flow of government funds for meeting the recurrent development expenditures of the government...the attempt to increase domestic savings by increasing tax performance has been frustrated by the growth of current nondevelopmental expenditures which was causally related to tax effort."

He also notes that the causality is likely to be strongest inversely to the country's willingness or ability to cause excessive monetary expansion to cover budgetary deficits. If Please's arguments are valid, then one would find that an attempt to expand either the growth rate or the tax base in order to generate additional revenues may not prove successful, as current expenditure expansion immediately follows. The problem with Please's hypothesis is that it does not distinguish the type of expenditures that expand — are they for civil or productive consumption? Do they reflect an expansion in public output or induced public sector inflation? May the expansion of expenditures not be a reflection of the underfinanced status of many projects so that the Please effect misspecifies the developmental intent of the expenditure changes? Most empirical attempts at verification have not adequately disaggregated to estimate this. For further discussion, see: Stanley Please, "The Please Effect Revisited," IBRD Working Paper No. 182 (7/70). For empirical analyses of this hypothesis, see K. Krishnamurty, "Savings and Taxation, an Empirical Study," IBRD Economic Department Working Paper No. 23 (August 1968), Joergen Lotz, "Pattern of Investment Spending in Developing Countries," IMF Paper DMI 67/38, June, 1969.

of its recurrent revenue requirements.

These results are mirrored by the maximal feasible investment shares δ_{1t}. Relative to the target investment share of 6.1%, the recurrent financial capacity of the Kenyan government is sufficient to finance investments of the Plan's composition of approximately two-thirds of this level. In the technical assistance case, with planned aid inflows of 50% of the total investment, δ_{1t} is only 3.8%.

Finally, we have estimated case C under the assumption of a 1% wage hike and a 1% rate of public sector inflation (viz., $\xi_1 = .02$). In this case, we would use as a benchmark the nominal growth rate of GDP in the Kenyan economy, 7.8%, that has been realized in the last year. This is quite high and is likely to be above Kenya's long-run growth capacity. The model's sensitivity to the higher rate of inflation is clear from case C. The required growth rate rises by an additional 1%, and hence we still find that the public-sector revenue base is inadequate to meet the recurrent implications of its development projects.

It should also be noted that for any given development structure, the impact of variations in the level of aid inflows, within a reasonable range, does not have a substantial impact on the fiscal viability of the development program. In the case of Kenya's mixed infrastructure program, a permanent aid inflow in excess of the level of total public sector investment would be required in order to enable the Kenyan government to shift its own resources to recurrent cost needs.

IV. The Productivity of Public Sector Investment

One problem with the above model is that it inadequately deals with the productivity of public investment projects. Implicit throughout the preceding equations is the presumption that growth occurs independent of the activities of the public sector. For example, in (1.6'), we explicitly solve for the maximal level of public sector investment expenditures, given a target growth rate in output. It thus ignores the implications for that growth of a level of investment below the targeted investment rate. Furthermore, if the full realization of government investment targets is inconsequential in terms of total output growth, then failure to realize these targets is only critical if it violates political or social constraints. The former assumption may be partially justified in that only 18% of total domestic capital formation (and 20% of investment in the monetized sector of the Kenyan economy) originated in the public sector.[1]

Yet there is an obvious artificiality in an economic model for which the capital-output ratio in the private sector is some value, specified such as "C_p", while in the public sector it is implicitly infinite. It could be argued that one could view the role of public investment as a complementary input necessary for the private sector to obtain this level of productivity, but then surely variations in the level of δ should affect the private sector's productivity (unless the weights as between investment in each public sector varied so as to insure that the most important facilitating investments

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[1]As a proportion of the sum of private sector capital formation and public development expenditures, the government's development expenditures (I_t) are approximately 24.6% in the total economy and 26.9% in the monetized sector of the economy.

continued to be financed).[1] Hence it would be desirable to incorporate the effect of public investment on the growth rate explicitly. By doing this, the government realizes an indirect tax revenue feedback, arising out of the productivity of public sector projects.

We shall handle this within a Harrod-Domar framework, by explicitly assuming that the productivity of public and private investments are independent. Conceptually, one could functionally relate the two forms of investment in the model, but lacking any a priori sense of specification beyond certain minimal presumptions, it is unclear how much would be added to the model.[2] Hence, private-sector investment accounts for an exogenous growth in the economy of λ_e, and public sector investment of δ_t raises this by (δ_t/C_g) where C_g is the capital-output ratio of public sector projects. We shall assume that the <u>level</u> of private capital formation is independent of public investment levels, so that the former yields a lower limit on the actual growth rate.[3]

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[1]Even if this were the case, our assumption of constant "r" would then be rather artificial in the face of changes in the project (and thus project technology) mix.

[2]For example, we could set $C_p^* = f\ (C_p, r, \delta_t)$ where C_p^* and C_p are, respectively: (1) the actual capital output ratio of private sector projects, (2) a measure of the "neutral" productivity inherent in the technology of the project within the context of the economic environment. The sign of dC_p^*/dr is indeterminate.

[3]There are pitfalls in drawing too close an analogy between public and private capital-output ratios. Much discussion in the last decade has questioned any bald assertions on the contribution of capital formation in general to growth. The issues therein are compounded when we attempt to specify the magnitude or dynamic pattern of the productivity of public sector investments. There is likely to be a far longer lead time before any recognizable output is realized. The effect on productive capacity may be through an expansion in the level and quality of potentially available inputs to the economy. For example, the output may be a healthier or more educated population. If these outputs are not translated into an expansion in the level of the employed labour force, or a qualitative improvement in its productivity, then the effect

The effect of public sector investment is twofold. Through (1.5'), we saw that an increase in δ_t, ceteris paribus, requires an increase in the growth rate in order to yield the tax revenues to finance the expansion in total project costs. Likewise, by embodying the productivity of public investment within the model, an increase in δ_t increases the expansion of output capacity, thus contributing to a rise in the potential level of tax revenues. The limiting factor to δ_t arises, then, from future budgetary constraints, even if the initial investment is wholly financed by external sources. The effect of a change in the level of public investment I_g is to increase revenues by $\frac{(\varepsilon_\theta \theta - \varepsilon_\nu \nu)}{C_g} \frac{dI_g}{dt}$ and costs by $(r + [\chi^e + \chi^i]d) \frac{dI_g}{dt}$. So long as the former is larger, no binding revenue constraint is faced. Yet the productivity of public sector investment is unlikely to be sufficiently high for this inequality to hold.

These relationships can be expressed in terms of our equation (1.5'), where

$$\lambda_e + \left[\frac{\delta_t}{C_g}\right] \geq \frac{(r + [\chi^e + \chi^i]d)\delta_t + \xi(\theta_t - \gamma_t - \chi_t\delta_t)}{(\theta_t\varepsilon_\theta - \gamma_\varepsilon\varepsilon_\gamma - \delta_t\chi_\delta)} \qquad (1.7)$$

The left-hand side reflects the independence of public and private sector project productivity, and the right-hand side is taken from (1.6').

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upon the tax base may be minimal. The capital-output ratio would be very high indeed. Likewise the specific distribution of these outputs will determine the extent to which the output expansion adds to the tax base. For other projects, complementary inputs — improved modes of transportation, etc., may facilitate the growth of the private sector and the externality effects may dynamically set into motion further expansions in the level of private sector production. One must thus approach this parameter with considerable caution. In this sense, our earlier simple model in (1.5) may be as representative of reality as that in (1.7).

We seek the maximal share of investment in GDP for which present and future budgets are balanced. Let us refer to this hereafter as δ_{2t} in order to distinguish it from our previous notation. We can solve for δ_{2t} in (1.7) and will obtain the following inequality:

$$\left[\frac{-\chi\varepsilon_\delta}{C_g}\right](\delta_{2t})^2 + (\lambda_e[\theta_t\varepsilon_\theta - \gamma_t\varepsilon_\nu] - \xi[\theta_t - \gamma_t]) + \delta_{2t}\left[\frac{\theta_t\varepsilon_\theta - \gamma_t\varepsilon_\gamma}{C_g} - r - [\chi^e + \chi^i]d + \chi_t\xi - \lambda_e\chi_t\varepsilon_\delta\right] \qquad (1.8)$$

This is a quadratic equation in δ_{2t}. We are obviously interested only in the positive solution values for the relevant range of parameter values. In Table 8, we have calculated the maximal investment level, for our different cases, under alternative assumptions on the productivity of public sector investments with capital-output ratios ranging from 2 to 5. Theoretically, these alternatives would arise through changes in the mix of projects for each type of development program. The implicit capital-output ratio for public sector development expenditures in the plan was approximately 3.0.[1] In (1.8), we are again assuming that we are obtaining the maximal level of δ_{2t}, the technology structure of the program (in terms of "r") remaining unchanged.

For private sector investments, we have estimated the capital output ratio as between 3.39 to 3.48. This was derived by using the actual and projected sectoral private investment shares in 1969 and 1974, and the World Bank estimates of the sectoral capital-output ratios.[2] Since private capital

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[1]One can derive this by setting (δ_t/C_g) equal to 6.8% less (I_p/C_p) (where I_p is total private sector investment). Since the latter is estimated at approximately 4.75% and $\delta_t = .061$ for the plan, C_g is approximately 3.0. This will correspond to the high productivity case illustrated in Table 8.

[2]The World Bank estimates for each sector's capital output ratio were: agriculture - 2.11; forestry - 2.11; mining and quarrying - 2.51; manufacturing

Table 8

Maximal Feasible Levels of the Kenyan Development Programme under Alternative Productivity Assumptions

	Case A[1,3] With normal salary increment			Case B[2,3] With salary increment offset by project lapses			Case C[4] With salary increment and 1% public sector inflation		
	The maximal investment share with capital-output ratios of			The maximal investment share with capital-output ratios of			The maximal investment share with capital-output ratios of		
	$C_g=2$	$C_g=3$	$C_g=5$	$C_g=2$	$C_g=3$	$C_g=5$	$C_g=2$	$C_g=3$	$C_g=5$
r = .08									
Aid = 70%	.0723	.05805	.04964	.0828	.0676	.0583	.07516	.0605	.0518
Aid = 50%	.0628	.0526	.04611	.0707	.0603	.05338	.0652	.0548	.0481
Aid = 35%	.0575	.0493	.04382	.0642	.05597	.05027	.05974	.0514	.0457
r = .125									
Aid = 70%	.048	.0407	.03622	.0568	.0406	.0429	.05008	.0425	.0378
Aid = 50%	.044	.0382	.03438	.0507	.0446	.04027	.04584	.0398	.0359
Aid = 35%	.0415	.0365	.03313	.0474	.04214	.03852	.04321	.0381	.0346
r = .15									
Aid = 70%	.0402	.03492	.03147	.0473	.04132	.03739	.042	.0364	.0326
Aid = 50%	.0375	.033	.03009	.0436	.03868	.03265	.03909	.0345	.03143
Aid = 35%	.0357	.0318	.02914	.0414	.03695	.03405	.0372	.0332	.0304
r = 2									
Aid = 70%	.03027	.02705	.0249	.0359	.0322	.02971	.0316	.0282	.026
Aid = 50%	.0288	.02597	.02405	.0338	.0306	.02629	.03004	.02712	.0251
Aid = 35%	.02777	.02522	.02346	.03238	.02957	.0276	.0289	.0263	.0245

(1) $\xi = .01$

(2) $\xi = 0.0$

(3) $\varepsilon_\theta = 1.1$ $\varepsilon_\gamma = .95$ $\varepsilon_\delta = 1.0$ $\lambda = .068$ $d = .065$ $\gamma_t = .096$

$\theta_t = .22$ $(\chi_e + \chi_i) = .85$

(4) $\varepsilon_\theta = 1.1$ $\varepsilon_\gamma = .95$ $\varepsilon_\delta = 1.0$ $\lambda = .078$ $d = .065$ $\gamma_t = .096$

$\theta_t = .22$ $(\chi_e + \chi_i) = .85$ $\xi = .02$

formation is approximately 16-17% of GDP, our independence assumption implies that private sector investment effects a real growth in the economy of 4.75%.[1]

An examination of nearly all the results of Table 8 reveals that unless the capital-output ratio in the public sector falls below two, the fiscally consistent investment level will remain below our target investment level. A higher growth rate, through a larger level of public investment, will lead to an excess of recurrent commitments. In the Kenya cases, (r = .125 and .15) and with the productivity implied on the plan (C_g = 3.0), the maximal

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and repairs - 3.4; building - 3.63; electricity and water - 4.22; transportation and communications - 4.85; other sectors - 2.61; IBRD, Economic Prospects, Appendix 4, p. 3.

[1]We can demonstrate that δ_{2t} dominates δ_{1t} for all positive levels of investment by solving for δ_{1t} in terms of δ_{2t} from equations (1.6') and (1.8). We find that

$$\delta_{1t} = \left[\frac{\chi_t\varepsilon_\delta(\delta_{2t})^2 + C_g[\lambda - \lambda_e][\theta_t\varepsilon_\theta - \gamma_t\varepsilon_\gamma]}{C_g[r + \lambda\chi_t\varepsilon_\delta + \{\chi^e + \chi^i\}d - \chi_t\xi]}\right] - \delta_{2t}\left[\frac{\theta_t\varepsilon_\theta - \gamma_t\varepsilon_\gamma}{C_g[r + \lambda\chi_t\varepsilon_\delta + \{\chi^e + \chi^i\}d - \chi\xi]} - 1\right]. \qquad (1.9)$$

This relationship defines a set of points OA as shown in Diagram 1. If we rule out all negative values of δ_{1t} or δ_{2t}, then the function reveals that δ_{2t} dominates δ_{1t} for all points below the 45° line. At the intersection of the line with the function, we find that dominance exists for all investme shares δ_{2t} less than $\{(\theta_t\varepsilon_\theta - \nu_t\varepsilon_\nu)/\chi_t$ This means all points for which our budget constraint is satisfied and with positive values of r and c. If the public investment share exceeds $(\varepsilon_\theta\theta_t - \nu_t\varepsilon_\nu)/\chi_t$ per cent of GNP, to meet the budget constraint, our investment must have a negative r or c, which would be rather improbable. By varying χ_t from 1 to 0 we can push the function out further, the dominance thus potentially existing over a wider range of investments.

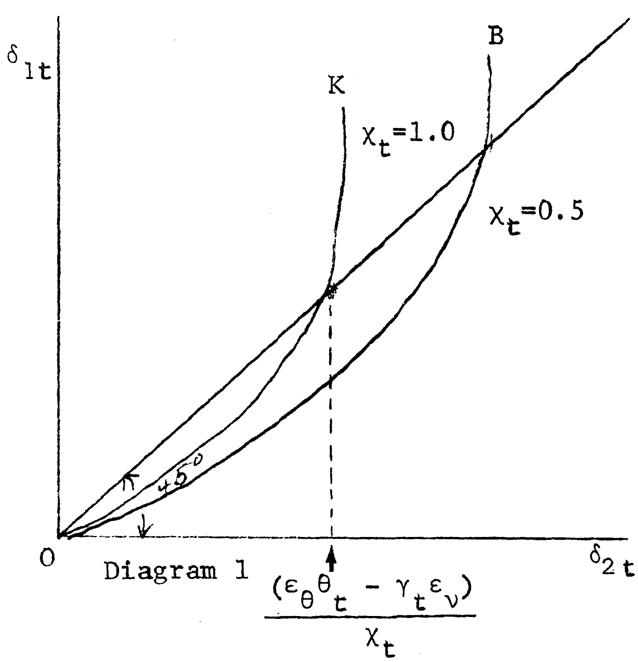


Diagram 1

investment level is approximately 3.30% - 3.68%. Hence, the imputation of a specified productivity to public sector projects is not sufficient to render the Kenyan development plan feasible.

A second interesting result from these simulations is that the maximal δ_{2t}'s are less than the δ_{1t}'s obtained earlier (see comparable cases from Table 7), for most cases. This reflects our inadequate treatment of the implied productivity of public and private sector investments. The implicit level of C_{gt} necessary to obtain the δ_{1t}'s corresponding to the earlier results (under our present assumptions on the impact of private investment) was approximately 2.10. In Table 8, we see that only by raising the productivity substantially will it be possible to sustain the financial implications of a higher level of investment.

Finally, our analysis has implicitly assumed that the level of "C_{gt}" and "r" in public sector projects are technologically independent. Clearly this is not a valid assumption. Intuitively, one would expect that the structure of project technologies would be such as to imply some relationship between the level of productivity of the initial investment expenditures and the level of sustaining recurrent costs required to realize that productivity (reflecting an explicit trade-off between present and future costs for a given level of output). Yet in (1.8), we sought the budgetarily consistent investment level that could be financed, holding both C_g and r constant, which obviously presumes that the given combination of C_g and r are technologically consistent. Let us tentatively explore the relationship between these two variables, both in a technological and budgetary context, and show the way in which these relationships interact to constrain the range of policy solutions discussed in (1.8).

Within the set of budgetary constraints embodied in (1.7), one can show for any target growth rate λ_1, there is an inverse relationship between the level of r and C_g that are financially consistent. Specifically, if we let

$$\lambda_1 = \lambda_e + \frac{\delta_{2t}}{C_g}, \tag{1.10}$$

solve for δ_{2t} and substitute in (1.7), we can solve for C_g as a function of r.

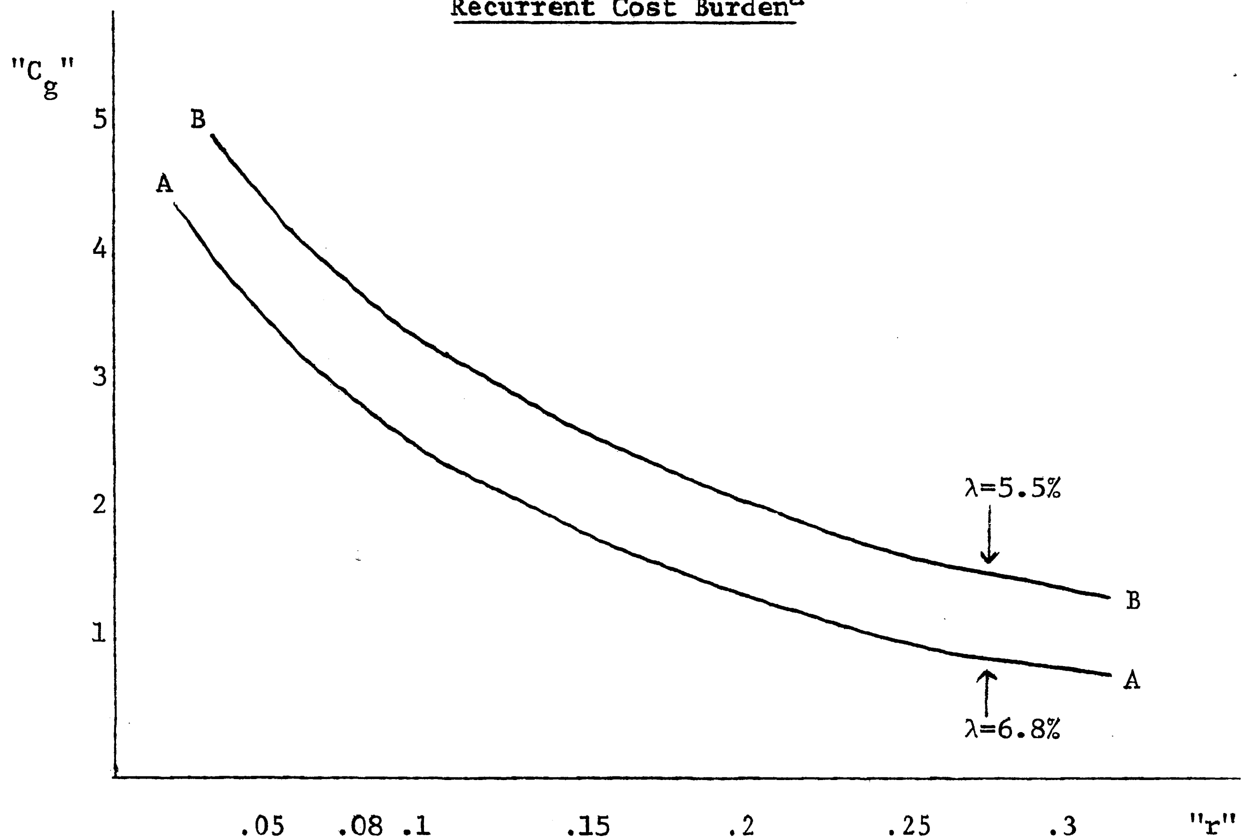
$$C_g^* \leq \frac{\lambda[\theta_t \varepsilon_\theta - \gamma_t \varepsilon_\gamma] - (\theta_t - \gamma_t)\xi}{[r + \lambda \chi_t \varepsilon_\delta - \chi_t \xi + [\chi^i + \chi^e]d](\lambda - \lambda_e)} \tag{1.11}$$

This implies that if we choose a particular structure of investment projects with composite recurrent cost parameter of r_o, then the only way in which we can obtain a rate of public sector revenue growth rapid enough to meet these commitments, is if that investment mix has a marginal capital-output ratio of less than C_g^* (derived from [1.1]). Once we have determined C_g, (1.10) will imply the minimal level of investment required. Both parameters are highly aggregative statistics, calculated for the entire development program, and the relationship is obviously affected by the choice of budgetary parameters.

In Diagram 2, we have plotted the boundary of this relationship, using the parameters of Table 7 above, and with varying growth rates. Hence for a growth rate of 6.8%, curve AA relates the maximal C_g that can be tolerated for a given development program with a recurrent parameter r_o. The negative relationship reflects the lower revenue growth requirements that can be tolerated as one lowers the "r" burden of the development program. By varying certain parameters, this boundary will shift forward or backward. For example, the more rapid the desired growth rate, assuming a constant growth arising from the private sector, the lower must be the level of C_g in order

Diagram 2

The Budgetary Trade-off Between Project Productivity and Recurrent Cost Burden[a]



a/

ν_t = .097 ε_ν = .95 ε_δ = 1.0

θ_t = .22 ε_θ = 1.0

χ_t = .65 ξ_i = .01

to finance a development program of given r, and the curve shifts inward. Similarly, for a given C_g, a lower level of r allows us to sustain a higher level of investment and thus a more rapid growth rate.

Independently one would expect r and C_g to be related in terms of the technological characteristics of individual projects. The nature of this relationship is quite complex and will depend on the assumptions made with respect to the constancy of the factor prices facing government decision makers and the production function structure at different scales of output.[1] It is thus impossible to specify a priori, whether the technological relationship of r and C_g will be positive or negative sloped. For a range of projects, it is likely that both sets of relationships will be observed.

If we obtain similar relationships between r and C_g for the range of projects that are viable within the public sector we can trace out a lower boundary envelope which obtains the minimum C_g corresponding to a given r.

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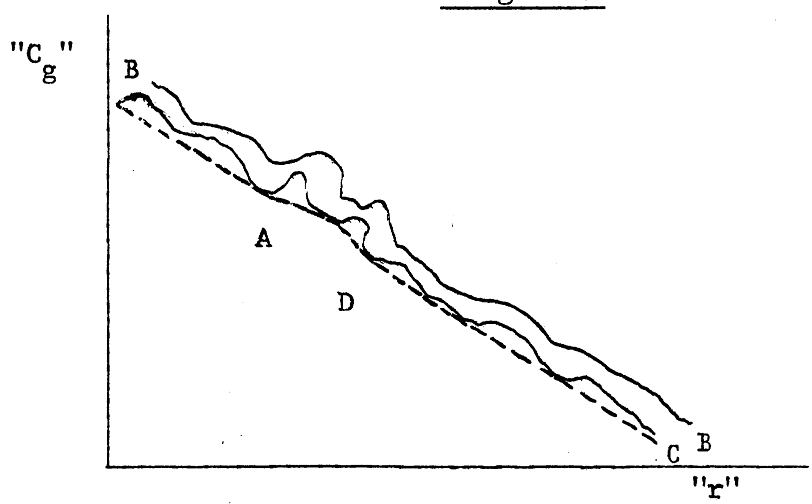
[1]This may be visualized in terms of the trade-off between current and future inputs (labour and capital) in choosing the production technology for a public good, and where r is the ratio of labour to capital costs and C_g is the ratio of capital expenditures to total output. Theoretically, one would also have to consider the role of nonsubstitutible inputs. The relevant points on the production function, from a cost-minimization standard, will depend on the extent of factor price variability. Given the latter, then the relationship will be determined by the elasticity of substitution that exists, at different output scales, between these inputs. If one assumes a constant set of factor prices, then the relevant relationship is defined by the expansion path at different output levels. Here the question of economics of scale and the degree of homogeneity observed in the production function crucially determines the relationship. For example, if we were to assume either constant or increasing returns to scale, one finds that for the most part there is either an inverse relationship or (if homogeneous of degree one) a point or vertical relationship observed. Likewise with decreasing returns to scale, there is a slightly larger band of observably positive relationships between r and C_g. There is thus a reasonable presumption that one will find a certain number of negative sloping project technology curves for the set of projects available, and it is this which proves important for the discussion above.

Any point on the envelope reflects the technology characteristics of a specific project. Clearly the convexity or slope over all ranges is not determinate. Such a lower boundary is shown in curve BB in Diagram 3. In doing this, however, we have neglected to consider the effects of public pricing policy on any project's r. If r is considered net of such revenues, this will lower the r for any value of C_g, and our curves will be shifted inward, say to CC.

Diagram 3

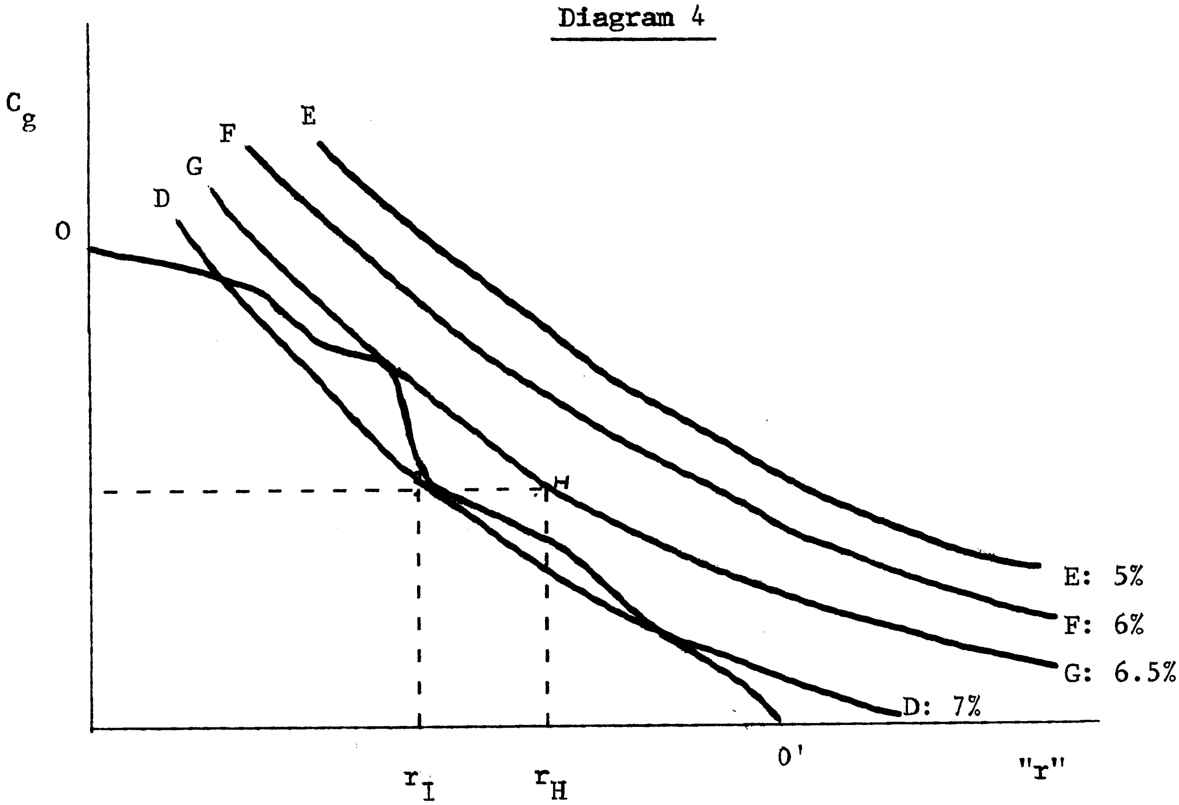


By choosing a mix of projects (such as is associated with points A and D) we can obtain a downward-sloping project technology mix curve (the dotted line) which reflects the effect of choosing, for a given r, the mix with the highest productivity. If we are constrained in the degree of allowable sectoral concentration in the development program, the method of deriving this mix curve will be more complex and the curve will lie above the curve in Diagram 3. The final curve indicates the technological constraints imposed on the choice of a development program, given a set of pricing policy decisions.

By relating the budgetary and technology functions, we can obtain a sense of the range of choice available to the government. The technological constraints restrict our project choice to mixes that lie above curve CC in Diagram 4. The budgetary constraints restrict us to regions below the relevant curve associated with a given target growth rate (i.e. GG or FF). The shaded region thus represents the feasible technology mixes available to the government. Clearly, the more rapid the growth rate, the fewer the technological options available, unless the government attempts to structurally change some of the parameters of the system (i.e., changes in pricing policy can push the CC curve inward, thus enlarging the choice area). If we are constrained in terms of the mix of project across sectors, this has the effect of pushing the technology curve outward, further narrowing the feasible mix of projects to sustain any given growth rate.

The implication of this type of analysis is that it is not sufficient to assess the productivity of a given set of development projects in isolation from an analysis of the future budgetary capacity to finance the recurrent input costs which are crucial to the realization of that productivity. A program with technology mix H may be implemented at a level of investment such that it would imply a growth of 7%. Yet this would be inconsistent with the limited capacity of the government budget to both finance the investment and recurrent costs associated with that investment, since only if $r = r_I$ would this consistency be obtained. The effect is that in the long run, the productivity of the higher investment level will be inadequate, as projects begin to show the effects of underfinancing. The higher growth rate can be realized only by raising the productivity of a lower level of investment or by lowering the recurrent cost implications associated with the initial investment level.

Diagram 4



V. Conclusion

This type of analysis raises several important issues in the areas of public expenditure and planning and budgeting analysis. The failure to adequately consider the implied fiscal commitments arising from a set of projects gives rise to a "constraint crisis" manifested in losses at the project level. The existence of this crisis is not easily gleaned from a perusal of the statistical materials published by governments since very little project input or output data is ever explicitly produced. Moreover, it is difficult to assess whether expenditures are adequate to meet project commitments unless detailed information is available on the output objectives of the underlying technological relationships. This cuts both ways. One could argue that our model's specifications may be "overambitious" in the technological standards to which it holds Kenyan projects. Yet the only way of measuring the deviation from the minimal technological standards is either by a project-by-project *ex post* evaluation procedure (and this still does not reveal whether there are divergences from the initial output objectives) *or* by assuming that our parameter values reflect realistic technological coefficients and assessing whether the budget is fiscally capable of meeting its commitments.

Second, whether or not this is deemed to be a problem can legitimately be raised in terms of the losses from underfinancing relative to the benefits from a larger (underfinanced) development program. The criteria by which this trade-off is measured is complex and rests not only on the current losses but on the dynamic implications of current period underfinancing for a project's productivity in future periods.[1] An LDC may consciously spread its project's resources thinly in order to maintain an expanded level of investment, and this may be a socially optimal strategy. It is, however, unlikely that this is a realistic reflection of the rationale underlying current planning decisions in most LDCs.

Third, even if tax revenues do prove adequate at the macro level, there is no assurance that the budgetary allocative process is sufficiently flexible to ensure that the induced budgetary commitments in each sector are met. This is particularly true where the level and composition of δ_t is managed by a planning apparatus which is distinct from the institutional apparatus which implements and finances the recurrent commitments. Although their loci of responsibility are technologically interdependent, their decision processes

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[1]See Heller, *op. cit.*, Chapter 2.

may not be integrated. Hence one can have a δ_t and r which are compatible with the overall growth of tax revenues, but still have disequilibrium on a sectoral level. In fact, one often finds tremendous external pressures on LDCs to maintain this disequilibrium. The stress placed by donors on expanded fiscal effort as a criterion of aid, coupled with the unwillingness of donors to finance the recurrent costs leads to a neglect of the recurrent budget in order to generate a greater fiscal surplus for investment. The costs of this neglect are rarely examined. This requires a greater understanding of the developmental impact of many so-called "consumption" expenditures.

Finally, this problem is certainly exacerbated by the excessive wage rates often prevailing in the government sector of many LDCs. In the face of extensive underemployment of educated manpower, the argument that high wages must be paid to compete with the capital-intensive private industrial sector loses some of its force. Its effect is to bloat the wage costs of any project, inhibit the utilization of labour-intensive production technologies and severely contribute to the existence of the recurrent costs problem.

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