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E.D.R.P. 38  
D.P. Ghai  
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TAX RATES AND INCOME ELASTICITY OF  
SOME IMPORTANT TAXES IN EAST AFRICA

INTRODUCTION

It is intended in this paper to discuss the income elasticity of some important taxes in East Africa as a first step towards developing a method for forecasting tax revenues in the three East African countries. The income elasticity of a particular tax is determined by the relationship between the marginal and average rates of taxation and by the share of its tax base in the national income. This paper is concerned solely with the former determinant of the income elasticity of taxes. It is hoped to discuss in a future paper the relative changes in different tax bases as a proportion of national income.

The taxes studied here are:-

- 1) Export taxes
- 2) Individual income tax
- 3) Corporate tax
- 4) Graduated Personal Tax
- 5) Import taxes
- 6) Excise duties
- 7) Estate duties
- 8) Local government rates.

(1) Export taxes: are levied in Uganda on cotton, coffee, tea and hides and skins; the last mentioned tax is relatively insignificant and will be ignored in this paper. Kenya and Tanganyika have imposed a series of export taxes in recent years. In Kenya, export taxes are now levied on coffee and sisal; in Tanganyika on coffee, sisal and tea.

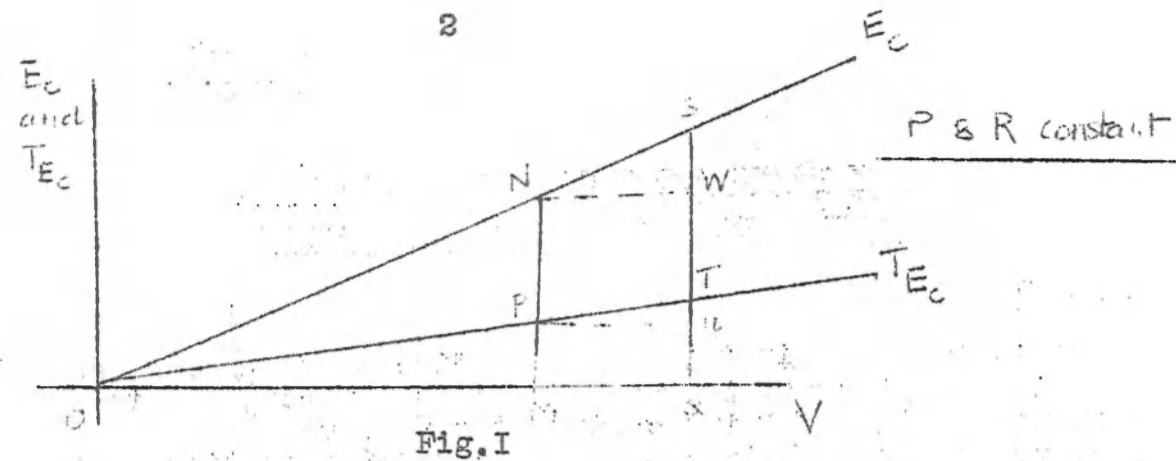
1 (a) Cotton export tax is levied only in Uganda; it goes back to the pre-war period.

There are two schedules of export tax rates applicable to the A.R. and B.R. quality of cotton lint. These rates became effective after 1st April, 1961; they are shown in Tables 1(a) and 1(b). Before considering them in detail, it may be helpful to make some general points about the factors determining the yield from the cotton export tax; they may be summarized as follows:

$$T_{E_c} = f(V, P, R) \quad (1)$$

The above equation shows that revenue from cotton export tax is a function of the volume and price of cotton exports as well as of the tax rate. Given  $P$  and  $R$ ,  $T_{E_c}$  varies proportionately with  $V$  i.e.  $\frac{T_{E_c}}{V}$  (tax per unit of output) is constant. It also means that the average rate of taxation will equal the marginal rate i.e.

$$\frac{\Delta T_{E_c}}{\Delta E_c} = \frac{T_{E_c}}{E_c}. \quad \text{This is shown in Figure I}$$



$$\frac{T_{E_c}}{E_c} = \frac{MP}{MN} = \frac{QT}{QS} = \frac{TU}{SW} = \frac{\Delta T_{E_c}}{\Delta E_c}$$

I For an explanation of various symbols, see the attached "Guide to Notation."

In this situation, the income elasticity of cotton export tax will depend on the relative share of exports in national income<sup>2</sup>; if the latter remains constant, cotton export tax will have a unitary elasticity; if it increases, the tax will have an elasticity greater than unity; if it declines, less than 1.

On the other hand, given  $V$  and  $R$ ,  $T_{E_c}$  will vary directly with  $P$ . But the effect of an increase in  $P$  on the income elasticity of cotton export tax will depend on the exact relationship between  $P$  and  $T_{E_c}$ . If the ratio of tax to price  $\left\{ \frac{\text{Tax}}{P} \right\}$  rises with price increases, then the marginal rate of taxation  $\left\{ \frac{\Delta T_{E_c}}{\Delta E_c} \right\}$  will be

an increasing function of  $P$ . In this situation, export tax will be income elastic provided the share of exports in national income does not fall by a percentage greater than the rise in the rate of taxation i.e. as long as,

$$\frac{\Delta T_{E_c}}{\Delta E_c} > \frac{T_{E_c}}{E_c} \quad \text{by more than} \quad \frac{E_c}{Y} > \frac{\Delta E_c}{\Delta Y}$$

Conversely, a rise in the relative share of exports in national income will reinforce the increase in the income elasticity of export tax due to price increases.

2.

Let income elasticity of cotton export tax be represented by  $e$

$$\begin{aligned} e &= \frac{\Delta T_{E_c}}{T_{E_c}} \bigg/ \frac{\Delta Y}{Y} \\ &= \left\{ \frac{\Delta T_{E_c}}{T_{E_c}} \bigg/ \frac{\Delta E_c}{E_c} \right\} \left\{ \frac{\Delta E_c}{E_c} \bigg/ \frac{\Delta Y}{Y} \right\} \end{aligned}$$

$$= \left( \frac{\Delta T_{E_c}}{\Delta E_c} \right) / \left( \frac{T_{E_c}}{E_c} \right) \left( \frac{\Delta E_c}{\Delta Y} \right) / \left( \frac{E_c}{Y} \right)$$

when

$$\frac{\Delta T_{E_c}}{\Delta E_c} = \frac{T_{E_c}}{E_c}, \quad \text{if } \frac{\Delta E_c}{\Delta Y} > \frac{E_c}{Y}$$

The situation where tax rate increases with the price level is illustrated below

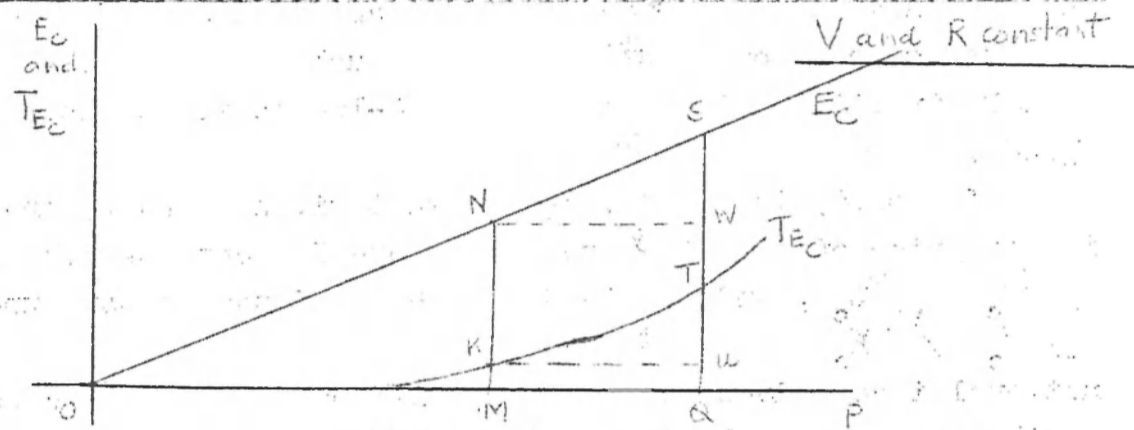


Fig. II

The ratio of tax rate to price  $\left( \frac{\text{Tax}}{\text{price}} \right) = \frac{T_{E_c}}{E_c}$

$$\frac{TU}{SW} > \frac{KM}{IN} \quad \text{or} \quad \frac{\Delta T_{E_c}}{\Delta E_c} > \frac{T_{E_c}}{E_c}$$

Our last independent variable is R, or tax rate schedule. The concept of income elasticity of a given tax implies a constancy of R; hence it is not permissible to vary R. To the extent that the tax rate schedule is increased or decreased, it will lead to a once-for-all increase or decline in the average rate of taxation. The marginal relationship will be unaffected by a mere "shift" of the tax rate schedule.

How does the above analysis apply to the export tax on cotton in Uganda? The export tax rate in Uganda varies only with the price level. Therefore, given P and R,  $\frac{\Delta T_{E_c}}{\Delta E_c} = \frac{T_{E_c}}{E_c}$ , and our earlier

remarks about the income elasticity of export taxes in these circumstances apply here. However, as far as the relationship between P and the tax rate is concerned, Table 1(a) & 1(b) show that the ratio  $\left( \frac{\text{tax rate}}{\text{Price}} \right)$  rises with P for A.R. Quality and for the B.R. quality it starts rising after the price has reached a level of 125.00 cts per lb. The duty on the A.R. Quality Cotton Lint starts when the price of cotton reaches 50 cents per lb. f.o.r. Uganda. There is a rise of 1, 2 or 3 cents per lb. lint as the price rises from 50 cents to 100 cents per lb. f.o.r. Uganda; after that the duty rises by 2 cents every 10 cents

rise in the price of lint i.e. a constant marginal rate of 20%.

With the A.R. Quality Lint, there is no price floor below which no duty is levied; the rate rises by 1 or 2 cents per pound for every increase of 25 cents per lb. until the price rises to 1.25 cents per lb.; beyond that level, the duty rises by 2 cents per lb. for every increase of 25 cents per lb. in the value of cotton lint i.e. there is a constant marginal rate of 8% in contrast to the 20% on the A.R. Quality. Furthermore, the average tax rate  $\left(\frac{\text{Tax Rate}}{\text{Average Price}}\right)$  starts rising for the B.R. quality only when the price is in excess of 125 cents per lb. The average rate of duty on the A.R. Quality Lint exceeds that on B.R. Quality in the price range 90-100 cents per lb. f.o.r. Uganda.

It would, therefore, appear that given V and R, any increase in the price of A.R. Quality Lint above 50 cents per lb. will make

$$\frac{\Delta T_{E_c}}{\Delta E_c} > \frac{T_{E_c}}{E_c},$$

and provided the share of the cotton exports in

national income does not decline, will make the tax income elastic. Similar remarks apply to the tax on the B.R. Quality when its price rises above 125.00 cents per lb. It also follows that given V, substitution of the A.R. for the B.R. quality Lint, provided the price level is in excess of 90 cents per lb. will make

$$\frac{\Delta T_{E_c}}{\Delta E_c} > \frac{T_{E_c}}{E_c}$$

and hence enhance the income elasticity of export

taxes. Our conclusion, therefore, is that given the constancy of  $\frac{E_c}{V}$ , cotton export taxes are income elastic if  $E_c$  increases due to an increase in price; they have unitary income elasticity if  $E_c$  increases due to an increase in output. In actual practice, changes in export earnings will be a function of changes in both the quantity and price of exports. The income elasticity of the export tax on cotton will, therefore, depend on the magnitude of changes in both these variables.

#### 1(b) Coffee Export Tax

Since April 1963, the price "floor" for Robusta and Arabica Coffee has been fixed at \$90 and \$195 per ton f.o.b. Mombasa, respectively. The duty on each ton of coffee is  $\frac{1}{3}$  the amount which the value of such coffee exceeds \$90 and \$195 per ton f.o.b., respectively for Robusta and Arabica i.e. there is a constant marginal rate of 33 $\frac{1}{3}$ %. Fig. III shows the relationship between export tax rate and price per ton of Robusta Coffee.

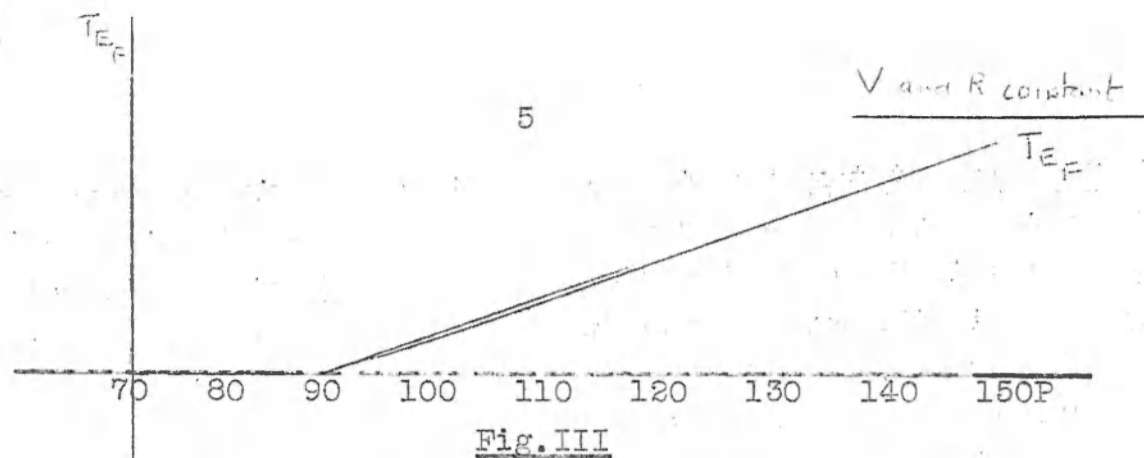


Fig. III

As the same variables determine the yield from export tax on coffee as on cotton, we need not spend too much time on a discussion of the income elasticity of coffee export tax.

$$T_{E_F} = f(V, P, R)$$

Given P and R, and increase in V (provided the price is above the "floor" level) will lead to a proportionate increase in export tax revenue i.e.  $\frac{T_{E_F}}{E_F} = \frac{\Delta T_{E_F}}{\Delta E_F}$ . On the assumption that the relative importance of coffee exports in the national income does not change, the export tax will have unitary income elasticity.

On the other hand, given R and V, and increase in P will make  $\frac{\Delta T_{E_F}}{\Delta E_F} > \frac{T_{E_F}}{E_F}$  and ceteris paribus, will enhance the income elasticity of coffee export tax.

Coffee export tax in Kenya became effective in May, 1964.

It is levied at a flat rate of \$20 per ton of coffee. The Tanganyika Government has also imposed an export tax on coffee as from June, 1964; it is levied at a flat rate of \$22 per ton of coffee exported to 'traditional' or 'quota' markets. In other words, revenue from coffee export tax is a sole function of <sup>the</sup> volume exported in both these countries. Thus, given V and R, changes in P will have no effect on revenue i.e.  $\Delta T_{E_F} = 0$ , and hence the tax will have a zero income elasticity. Given P and R, changes in V will lead to a proportionate change in export tax revenue i.e.  $\frac{T_{E_F}}{E_F} = \frac{\Delta T_{E_F}}{\Delta E_F}$ . The coffee export tax, ceteris paribus, will have a  $\frac{T_{E_F}}{E_F} = \frac{\Delta T_{E_F}}{\Delta E_F}$  unitary income elasticity. We conclude, therefore, that the coffee export tax in Kenya and Tanganyika can never have an elasticity greater than unity, provided the share of coffee exports in national income remains constant.

1(c) Tea Export tax in Uganda was levied in June, 1964, at a flat rate of 25 cents per lb. In Tanganyika, an export tax on tea has been in operation since June, 1963 at a flat rate of 10 Cents per lb. As in the case of coffee export tax in Kenya and Tanganyika revenue from this source will be a function solely of the volume of tea exported. Therefore, the above remarks about income elasticity of coffee export tax apply here also.

1(d) Sisal export tax was first levied in Tanganyika in December, 1962 and in Kenya in May, 1964. The present schedule of export tax on sisal in Kenya is identical to the one in Tanganyika before the changes in the current budget. The Kenya rates are as follows:

5% ad valorem on sisal valued at £75-100 a ton f.o.b.  
plus 10 shg. in the £ on the excess over £100.  
£10 a ton on sisal valued at £110-125 a ton f.o.b.,  
plus £1 in the £ on the excess over £110.

The following table translates the above schedule in terms of the percentage of duty paid at different price levels:

<u>Price of Sisal per ton f.o.b.</u>	<u>Actual duty</u>	<u>Per Cent</u>
£ 75-100	£3.15Shg-£5	5
£100-110	£5-10	5-9.1
£110-125	£10-25	9.1-20
£125 and above	£ 25	20 -

In the 1964/65 Budget, the Tanganyika Government imposed a new and higher rates of export duty on sisal; they are as follows:

5% ad valorem on sisal valued at £75-95 per ton f.o.b.  
£4.15Sh. per ton on sisal valued at £95-100 per ton plus  
Shs.10/- for every £ by which the price exceeds £100.  
£11 per ton on price in excess of £105 plus £1 for every  
£1 by which the price exceeds £105.

These rates may be represented as follows in terms of the percentage of duty paid at different price levels:

<u>Price of Sisal per ton f.o.b.</u>	<u>Actual Duty</u>	<u>Per Cent</u>
£ 75- 95	£3.15Sh-£4.15Sh	5
£ 95-100	£4.15Sh-£7. 5Sh	5-7.3
£100-105	£7. 5Sh-£11.	7.3-10.5
£ 110	£16	14.5
£ 125	£31.	24.8

The tax rate on sisal, like the export taxes on cotton and coffee in Uganda, varies with the price rather than the quantity of sisal exported. The relationship between the tax rate and price level for sisal is, however, different from that in the case of cotton and coffee. In order to illustrate this relationship we shall use the Kenya export tax rates. It will be seen that the marginal rate of taxation with respect to price increases is 5% when the price level is between £75-100; it rises to 50% when the price level is between £100-110, and rises further to 100% with the price level between £110-125, falling to 0% beyond that level.

As with the export tax on Cotton, an increase in sisal export earnings due to an increase in the quantity rather than price of sisal exported, will lead to a proportionate increase in tax revenue, and ceteris paribus, will make for a unitary income elasticity of sisal export tax.

With V and R constant, the effect of a rise in P on the income elasticity of sisal export tax will depend on the initial price level. Any price rise within the range of £75-100 will lead to an increase in tax revenue proportionate to the increase in the value of exports i.e. marginal rate of taxation will be equal to the average rate. If the price rise occurs within the £100-125 range, the marginal rate of taxation with respect to export value will exceed the average rate and will, therefore, make the tax income elastic. Beyond a price of £125 per ton, the marginal rate becomes 0 and the tax has zero income elasticity. An analysis of the Tanganyika export tax on sisal will proceed on similar lines with appropriate modifications for different rates within the above price ranges.

## (2) Individual Income Tax

Only a tiny fraction of the working population in East Africa are assessed for income tax. This is because of the relatively high personal and other allowances. Briefly, the following allowances are given in respect of the individual income tax:

- (a) Single allowance - £225 p.a.
- (b) Marriage Allowance - £700 p.a.
- (c) Children's allowance- £ 75 for a child under 6 years
  - £100 for a child between 6 & 12 "
  - £150 " " " " 12 & 19 "
  - £150 " " " of 17 or over receiving full-time post-secondary education.

### (d) Insurance allowances

Relief is given for life assurance premiums paid and contributions to certain pension schemes up to a maximum of 1/6th of the individual's total income and subject to certain other restrictions and conditions. In general, the first £200 is relieved at not more than Shs.5 in the £, and any balance at not more than Shs.2/50 in the £.

The first point to notice about the individual income tax structure is the relatively high exemption limit; a single individual must earn an income which is ten times the average per capita income in the country before he becomes liable to income tax; a married person has to have an income which is over 30 times the per capita income before he starts to pay any income tax. Judged by these standards, East African countries have some of the highest exemption limits in the world. However, once the individual becomes liable to income tax, the marginal tax rate rises very steeply,



starting from 10% for the first £400 of chargeable income rising to 75% for chargeable incomes in excess of £9,000. Tables II(a) and II(b) show the marginal and average rates of income taxation respectively at different levels of chargeable income.

It will be noticed from these tables that the marginal rate of taxation rises by 5% irrespective of the size of the 'income slabs'. The result is that the individual income tax is steeply progressive with rise in income. The average rate of taxation for a person with a chargeable income of £400 is only 10%, rising to 20% for chargeable incomes of £2,000, 35% for chargeable incomes of £5,000 and very nearly 50% for individuals with chargeable incomes of £10,000.

#### Income elasticity of individual income tax

Revenue from the individual income tax is a function of several variables which are summarized in the following equation:

$$T_p = f(Y_p, R, A, D, S)$$

Given  $R, A, D, S$ , an increase in  $Y_p$  will lead to an increase in  $T_p$ .

$Y_p$  will in turn depend on the distribution of incremental national income. Given  $\Delta Y$ ,  $Y_p$  and hence  $T_p$  will increase only if incremental income accrues to individuals who are already paying income tax or who will enter the tax-paying population by virtue of the increase in their income. An increase in national income may not lead to any direct increase in individual income tax revenue if it accrues to individuals in low income brackets. Furthermore, given  $\Delta Y_p$ ,  $\Delta T_p$  will be greater the larger the proportion of  $\Delta Y_p$  going to individuals in the higher income brackets, in view of the steep rise in marginal rates of taxation at higher income levels. For all these reasons, for a given  $\Delta Y$ ,  $\Delta T_p$  will be greater the more skewed the distribution of incremental income; and therefore, greater the income elasticity of individual income tax.

Revenue from individual income tax as a proportion of "actual income of employees and individuals" has amounted to 10% in recent years in Uganda.<sup>4</sup> Therefore, *ceteris paribus*, any increase in incomes accruing to persons with chargeable incomes in excess of £400 will enhance the elasticity of individual income tax. On the other hand, if all the incremental income goes to persons who are not liable to income tax,  $\frac{\Delta T_p}{\Delta Y}$  will be zero, and so will the income elasticity of individual income tax.

The next variable affecting income tax revenue that we must consider is "allowances". Given  $Y_p, D, R$  and  $S$ , any reduction in allowances will have the effect of increasing tax revenue both by

4. See D.P. Ghai: "Growth and Structure of Central Government Tax revenue in Uganda: 1948-61" E.D.R.P. 29.

pushing the existing tax-payers on to higher marginal tax brackets, and by increasing the number of tax-payers because of reduced allowances. This will lead to a once-for-all increase in the ratio  $\frac{T}{Y_p}$ , as in the case of an upward "shift" of the tax rate schedule. Its effect on future  $\frac{\Delta T_p}{\Delta Y_p}$  is, however, not so certain; though it seems likely that this ratio will rise as well, in which case the tax will become income elastic.

Similarly, any increase in the proportion of income accruing to non-resident individuals has the effect of increasing  $\frac{T}{Y_p}$  because of the relative insignificance of allowances for non-residents and the consequent higher rates of taxation on their chargeable income.

(3) Corporate Taxation is levied in East Africa on companies, clubs and trusts. One-man firms and partnerships are treated as single individuals for purposes of income tax. There is a slight difference in tax legislation on private or "controlled" companies and public companies. An attempt has been made by legislation to make taxation on "Controlled" companies conform as closely as possible to taxation on partnerships or individuals. The basic tax rate on "controlled" companies is Shs.7/50 in the £(37½%). In addition, an undistributed income tax at the rate of Shs.7/50 in the £ is levied unless certain percentages of the total profits are distributed. These percentages vary with the type of business; the current rates are 70%, 80% and 89%. Thus, depending on the type of company, only 30%, 20% and 11% of the net profits are taxed at the standard rate of Shs.7/50 in the £; the rest, unless they are distributed, are taxed at the penal rate of Shs.15 in the £ or 75%. The object is to ensure the largest possible distribution of dividends, so that the profits of controlled companies could be taxed as income of individual shareholders. In view of the maximum rate of tax on undistributed profits in excess of the above percentages, it may be safely presumed that all "Controlled" companies retain only the permitted proportion of profits so as not to attract the penal undistributed income tax rate.

There is a slightly different basis of taxation for public companies. A Corporation tax is levied on the total net profits of public companies at the rate of Shs.3/50 in the £(17½%). This tax cannot be offset against the shareholders own tax liability. In addition, there is an income tax on public companies amounting to Shs.4/- in the £. (20%). The recipients of distributed profits are credited with the amount of this income tax which has been deducted at source; their tax liability is adjusted accordingly. Thus the total tax on undistributed profits is at the rate of Shs.7/50 in the £ (37½%). On distributed profits, there is a corporation tax of Shs.3/50 in the £ plus a rate that varies with the individual recipient of dividends according to his total income including dividends /10.....

dividends. Clubs are treated as public companies for purposes of taxation, but there is a lower rate of duty of Shs.5/50 in the S (27½%) on trusts.

The chargeable income of companies on which corporate tax is levied is arrived at after a deduction of depreciation and investment allowances for various classes of capital expenditure. Unfortunately, it has not proved possible to obtain information on the total deduction granted to companies in respect of various allowances.

#### Income elasticity of corporate taxation

$T_c = f(O, R, I, A)$ , where O=Profits  
R=Tax rate  
A=Investment and Depreciation Allowances  
I=Distributed Profits.

Corporation tax revenue is a function of profits, investment and depreciation allowances, tax rate and the division between distributed and retained profits.

We have seen that the undistributed profits of public companies suffer a proportionate tax of 37½%; thus, the average and marginal rate of taxation are equal. Income elasticity of corporate tax, ceteris paribus will therefore be equal to 1. The problem is a little more complicated when we make allowance for distributed profits, which are effectively taxed at Shs.3/50 in the S (17½%) at source plus a rate dependent on the chargeable income of the recipients of dividends. If the weighted average of the marginal rate of taxation applicable to all shareholders exceeds 20%,  $\frac{\Delta T_c}{\Delta O}$  and hence income elasticity of the tax will be greater under a policy of maximum dividend distribution rather than of maximum retention of profits. It is very likely that the weighted average of the marginal rates of taxation applicable to shareholders will be in excess of 20%, as most of them will have chargeable incomes in excess of £500 p.a. Thus a policy of encouraging maximum distribution of profits is desirable in the interests of maximizing tax revenue in the short-run. But such a policy may well conflict with other objectives of fiscal policy such as accelerating the rate of capital formation and eliminating gross inequalities in the consumption pattern of different income groups.

It remains to consider the revenue implications of distribution of incremental income between the corporate sector (undistributed profits) and individuals ("non-dividend income"); the marginal tax rate on the former is 37½% and on the latter varies from 10% to 75%.  $\frac{\Delta T}{\Delta Y}$  will be higher if the incremental income goes to persons only if the weighted average of their chargeable income is above

£2,500 - a most unlikely occurrence. We may, therefore, conclude that from the point of revenue maximization, a policy favouring the more rapid growth of the corporate income vis-a-vis personal income is to be preferred.

#### (4) Graduated Personal Tax

This is the last of the important taxes on income that we shall consider here. It, however, differs from the other taxes so far discussed in that it is levied only by the local authorities in Kenya and Uganda, for whom it is a major source of revenue. In Uganda, each local authority is responsible for determining the rate and general structure of these taxes; hence there are some differences in the structure of Graduated Personal Tax as between different local authorities in Uganda. An attempt is now being made to secure uniformity of rates etc. for all local authorities throughout the country.

G.P.T. in its present form was first levied in Kenya in 1964; the structure of the tax is uniform throughout the country. Table III(a) and (b) show the rates of G.P.T. in Buganda and Kenya respectively. Unlike Kenya and Uganda, Personal Tax in Tanganyika is levied and collected by the Central Government; local rates are the major source of revenue for local authorities in Tanganyika. Personal tax rates for the year 1963 are shown in table III(c).

Personal taxes in all the three countries have the characteristic that the total income is divided into a certain number of slabs; within each of these slabs tax liability remains constant. It is an inevitable feature of this kind of slab system of taxation that the tax is regressive within each slab; but in addition, the Buganda G.P.T. is largely regressive between slabs. The Personal Tax in Tanganyika is the only one which is consistently progressive. Another feature of a slab system of taxation is a very sharp jump in taxation when an increase in income puts a tax-payer in a higher income bracket. Within a given slab,  $\frac{\Delta T}{\Delta Y}$  is zero; but on movement from one slab to another  $\frac{\Delta T}{\Delta Y}$  rises abruptly, its exact value depending on the amount of the increment in income and on the income slab in which the tax-payer finds himself. Beyond a certain income level (£600 in Kenya and Uganda and £800 in Tanganyika),  $\frac{\Delta T}{\Delta Y}$  again becomes 0. Thus the income elasticity of G.P.T. will depend on the income levels of the recipients of incremental income, being very high when incremental income pushes all the recipients on to a higher income slab, and at the other extreme, being zero when the 'slab pattern' of recipients of incremental income is completely unaffected. Lastly, the income elasticity of the tax would again be zero if all the incremental income accrued to persons with incomes above £600 in Kenya and Uganda, and £800 in Tanganyika.

TAXES ON OUTLAY(5) Import duties

We have so far been considering taxes on income. Increase in income leads to an increase in revenue from outlay taxes through increased expenditure on imports and excisable commodities. In order to determine the income elasticity of outlay taxes, we have to consider the marginal and average rates of taxation with respect to the value of dutiable goods, and the relative share of the latter in national income.<sup>5</sup> As with the taxes on income, we shall assume that the relative share of imports in national income does not change i.e.  $\frac{\Delta M}{\Delta Y} = \frac{M}{Y}$ . This assumption will enable us to concentrate on the variables determining the rate of import taxation, which is our main objective in this paper.

Revenue from import taxes is a function of the variables summarized below:

$$T_M = f(P, R, V, G) \text{ where } G \text{ stands for composition of imports.}$$

Assuming  $G$ ,  $P$  and  $R$  constant, import tax revenue will vary with the volume of imports ( $V$ ). As the rate of taxation does not vary with  $V$ , an increase in  $V$  will lead to a similar proportionate increase in  $T_M$  i.e.  $\frac{\Delta T_M}{\Delta M} = \frac{T_M}{M}$ ; and other things being equal, import taxes will have unitary income elasticity. We obtain roughly the same result if we allow  $P$  to vary, while keeping  $G$ ,  $R$  and  $V$  constant. Import taxes will have unitary income elasticity when  $P$  alone is allowed to vary only if all prices change in the same proportion and all import duties are on an ad valorem basis. The last condition is not satisfied in East Africa where considerable revenue is derived from specific duties on certain imported goods. The existence of specific duties means that the marginal rate of taxation is zero when the prices of commodities subject to specific import duties rise. In a situation like this, an equi-proportionate change in all import prices will make  $\frac{\Delta T_M}{\Delta M} < \frac{T_M}{M}$  and hence make the tax inelastic.

Once we assume that all import duties are levied on an ad valorem basis, income elasticity of the tax will be greater, greater the rise in the price of imports with higher import duties, other things being equal; the tax will be inelastic if the price rise experienced by relatively low import duty commodities is higher than the average rise.

5. Income elasticity of Import taxes =  $\left\{ \frac{\Delta T_M}{\Delta M} \right\} \left/ \left\{ \frac{T_M}{M} \right\} \right\} \left\{ \frac{\Delta M}{\Delta Y} \right\} \left/ \left\{ \frac{M}{Y} \right\} \right\}$

With P, R and V constant, a change in the composition of imports (G) will have an effect on import tax revenue; this is because the import duties are not levied at a uniform rate on all imported goods; the effective rates vary from 0 to 300% in the case of Uganda. In general, producers goods, both intermediate and capital equipment, bear a lower rate of duty than consumer goods. However, there are exceptions to this rule such as fuel, which although partly a producer's good, is nevertheless taxed very heavily. Other things being equal, a change in the composition of imports in such a way as to increase the relative importance of heavily taxed commodities will have the effect of making  $\frac{\Delta T_M}{\Delta M} > \frac{T_M}{M}$ , and hence enhancing the income elasticity of import taxes. Investment boom and the consequent import substitution both have the effect of reducing the relative importance of consumer goods, and hence lowering the elasticity of import taxes.

In an analysis of the income elasticity of import taxes, it is not permissible to vary R; we have seen above that a change in rates will lead to a once-for-all change in  $\frac{T_M}{M}$ . Furthermore, a change in rates will almost certainly be accompanied by changes in the other variables determining import revenue, such as the volume of imports. We shall not, therefore, analyze here the revenue implications of a change in import duty rates.

(6) Excise Taxes: are levied in East Africa on beer, sugar, cigarettes, tobacco, spirits and matches. The 1964/65 budgets in the three territories added another item to this list - soft drinks. It is the first four commodities mentioned above which have been the most important source of excise tax revenue in the past. It is likely that in future soft drinks will also bring in substantial excise tax revenue. Unlike import duties, the excise duties are specific rather than ad valorem, with the result that the revenue from them is a function of the tax rates and quantities of excisable commodities consumed.

$$T_x = f\{R_{\text{beer}}, V_{\text{beer}}\} + f\{R_{\text{sug.}}, V_{\text{sug.}}\} + f\{R_{\text{cig.}}, V_{\text{cig.}}\} \\ + f\{R_{\text{tob.}}, V_{\text{tob.}}\} + \dots$$

On the assumption that the relative share of excisable goods in national income stays constant i.e.  $\frac{\Delta X}{\Delta Y} = \frac{X}{Y}$ , the income elasticity of excise taxes will be determined by the relationship between the average and marginal rates of excise taxes i.e. by  $\frac{T_x}{X}$  and  $\frac{\Delta T_x}{\Delta X}$ . If prices remain constant, an increase in expenditure on excisable goods will lead to an equal proportionate change in excise tax revenue i.e.  $\frac{\Delta T_x}{\Delta X} = \frac{T_x}{X}$ , resulting in unitary income elasticity. On the other hand, if prices rise while

specific excise duty rates remain constant,  $\frac{\Delta T}{\Delta X}$  will be zero, and the tax income inelastic; the above result  $\frac{\Delta T}{\Delta X}$  is reversed when prices fall. Thus, unless prices fall, the income elasticity of anyone's excise tax can never exceed unity; but the elasticity of excise taxes as a whole can exceed unity if the importance of excisable commodities with a higher rate of taxation  $\left(\frac{T}{X}\right)$  increases relative to the commodities with a lower rate of taxation.

Apart from that, the buoyancy of excise tax revenue can only be ensured by a progressive rise in specific excise tax rates. We have so far worked on the assumption that the relative share of excisable goods in the national income remains constant. An increase in the latter ratio could also make excise taxes an elastic source of tax revenue.

#### TAXES ON CAPITAL

(7) Estate Duty was abolished in the three East African countries in 1959, was reintroduced in 1963, and abolished again in Uganda in 1964. The rates of estate duty in Kenya in 1964 are shown in Table IV. It will be noticed that there is no duty on estate worth less than £5,000. Beyond that level, the estate duty rate rises from 2% when the estate is worth £5,001-7500 to a maximum rate of 40% where the value of the estate exceeds £2 million.

The revenue from estate duty is a function of the deaths of wealthy people in any given year! As such, it is hardly likely to vary with changes in income in the short run. In the long run, the value of estates and hence revenue from estate duty will obviously adjust itself to growth in income. But since we are interested mainly in expected tax revenue in the short run, we shall not further analyze this source of revenue.

#### (8) Property Rates

Rates are generally confined to urban areas and are levied by the local authorities in all the three countries on land and/or buildings. The exact position in each country differs somewhat from the others. In Uganda, the local rate is confined to urban areas of Kampala, Jinja, Mbale and Masaka, and in the larger of the towns previously under the administration of Central Government Boards.<sup>6</sup> In the former towns, two rates are levied: a rate on the sale value of the site with a ceiling of 2% of that value plus a rate on the replacement cost of the improvements, limited to  $\frac{1}{2}$ % of that cost. In the Town Board areas, owners have been levied rates at a maximum of 20% p.a. of the rateable value of premises assessed and calculated as in the United Kingdom. This has been a rate on the whole hereditament assessed on the annual rating value and not on the Capital value. Thus in Uganda we have a system of rates

6. See "Report of the Uganda Fiscal Commission, Government Printer, Entebbe. Paragraphs 54-60."

on both the capital and annual rental value of property, with provision for partial derating of "improvements."

In Tanganyika, a site rate is levied on the unimproved value of land held under a lease or right of occupancy for a period of more than five years. This land includes most of the expensive residential and business properties in towns. The site rates vary from town to town, ranging from 3 to 4% in 1964.<sup>7</sup> In addition there is an Urban House Tax, levied in 1962 at a flat rate, which varies from district to district. This tax is levied on houses on land held under a short-term right of occupancy or customary tenure or on houses on land occupied without legal title. This tax may be looked upon as the equivalent of rural local rates (personal tax) which is not levied in urban areas. The rates levied are generally rather low, ranging from Shs.30/- to Shs.65/- p.a. in 5 towns in 1964. In addition to this, the Municipal House Tax is levied in certain small development areas of Tanganyika, previously called townships or Government minor settlements. A maximum rate of 15% is levied on net annual value of the house.

In Kenya rates on property fall into two classes: those levied by municipalities and townships and those levied by county councils.<sup>8</sup> The former are levied on unimproved site values i.e. buildings are completely derated; the rates range from to . In county council areas, rates are levied on a variety of different basis, but the commonest base is acreage; the rates are levied either on a flat or a graduated rate basis according to size or productivity of land.

As with the estate duty, we cannot expect a close correlation between changes in income and changes in capital or annual rental value of land and buildings and hence, in proceeds from local rates, in the short run. If we make the assumption that the value of land and buildings changes pari passu with changes in income, a proportionate rate of taxation on capital would imply a unitary income elasticity of local rates. But this is an unrealistic assumption to make in the short run. The experience of most countries has been that revenue from local rates is highly inelastic.

#### (9) Conclusion

Looking at the tax rates and ignoring the tax bases of important taxes in East Africa, a tax will only be income elastic if the rates are progressive with respect to the relevant tax base.

7. See Eugene C. Lee "Local Taxation in Tanganyika", Dar es Salaam, pp 45-47 (unpublished)

8. See "Kenya Fiscal Commission." 1963.



It was found that this was true of export taxes on cotton and coffee in Uganda and sisal in Kenya and Tanganyika, if export income rose due to a rise in prices; it was also true of individual income tax and to a lesser extent of Graduated Personal Tax. On the other hand, estate duties, local rates and excise duties were found to be rather inelastic according to this criterion; and to a lesser extent, export taxes on coffee in Kenya and Tanganyika, and on tea in Uganda and Tanganyika, and import taxes. Lastly, corporate tax was found to have a unitary income elasticity.

However, no conclusions about the overall flexibility of these taxes can be drawn without a study of the expected movements in their respective tax bases. This will be attempted in a future paper.

Guide to notation.

Monetary Gross Domestic Product	=	Y
Total tax revenue of Central Government	=	T
Revenue from export taxes	=	T <sub>E</sub>
Revenue from Cotton export taxes	=	T <sub>Ec</sub>
"    "    Coffee    "    "	=	T <sub>E<sub>F</sub></sub>
"    "    import duties	=	T <sub>M</sub>
"    "    excise    "	=	T <sub>x</sub>
"    "    Corporate taxes	=	T <sub>c</sub>
"    "    individual income tax	=	T <sub>p</sub>
"    "    licences	=	T <sub>L</sub>
"    "    all other taxes	=	T <sub>o</sub>
Cotton and Coffee exports	=	E
Cotton exports	=	E <sub>c</sub>
Coffee exports	=	E <sub>F</sub>
Retained imports	=	M
Value of excisable goods consumed	=	X
"Chargeable income" of companies etc.	=	Y <sub>c</sub>
"Actual" income of employees & individuals	=	Y <sub>p</sub>
Tax rates	=	R
Average price level	=	P
Volume	=	V
<b>Allowances</b>	=	A
Distribution of income by income groups	=	D
Resident tax payers	=	S
Composition of imports	=	G

TABLE I (c).

COTTON LINT EXPORT DUTY - AR. QUALITY.

Cts. Per lb. f.o.r.	Duty - Cts Per lb.	Rate Of Duty	At Lowest.	Average Rates
UGANDA.	lb.	And Highest Price		At Median Point.
0 - 50.00	Nil.	0	0	0
50.01 - 60.00	2	4.00%	3.53%	3.64%
60.01 - 70.00	3	5.00%	4.29%	4.62%
70.01 - 80.00	4	5.71%	5.00%	5.33%
80.01 - 90.00	6	7.50%	6.67%	7.06%
90.01 - 100.00	9	10.00%	9.00%	9.47%
100.01 - 110.00	11	11.00%	10.00%	10.48%
110.01 - 120.00	13	11.82%	10.83%	11.30%
120.01 - 130.00	15	12.50%	11.54%	12.00%
130.01 - 140.00	17	13.08%	12.14%	12.59%
140.01 - 150.00	19	13.57%	12.67%	13.10%
150.01 - 160.00	21	14.00%	13.12%	13.55%
160.01 - 170.00	23	14.37%	13.53%	13.94%
170.01 - 180.00	25	14.71%	13.89%	14.29%
180.01 - 190.00	27	15.00%	14.21%	14.59%
190.01 - 200.00	29	15.26%	14.50%	14.87%
200.01 - 210.00	31	15.50%	14.76%	15.12%
210.01 - 220.00	33	15.71%	15.00%	15.35%
220.01 - 230.00	35	15.91%	15.22%	15.56%
& so on- & so on	& so on	& so on	& so on	& so on
340.01 - 350.00	59	17.35%	16.86%	17.10%

TABLE I (b).

## COTTON LINT EXPORT DUTY - BR QUALITY.

CTS. PER LB. UGANDA.	f.o.r. DUTY-	CTS PER LB.	RATE OF DUTY AT LOWEST AND HIGHEST PRICE.		AVERAGE RATE AT MEDIAN POINT.
0.00	- 25.00	2		8%	16.00%
25.01	- 50.00	3	12%	6%	8.00%
50.01	- 75.00	5	10%	6.67%	8.00%
75.01	- 100.00	7	9.33	7.00%	8.00%
100.01	- 125.00	8	8.00%	6.40%	7.11%
125.01	- 150.00	10	8.00%	6.67%	7.27%
150.01	- 175.00	12	8.00%	6.86%	7.38%
175.01	- 200.00	14	8.00%	7.00%	7.47%
200.01	- 225.00	16	8.00%	7.11%	7.53%
225.01	- 250.00	18	8.00%	7.20%	7.58%
250.01	- 275.00	20	8.00%	7.27%	7.62%

Provided that when the value is more than 175 cents per pound the duty shall be increased by 2 cents per pound for every increase of 25 cents per pound or part thereof in the value.

TABLE Ia : EAST AFRICAN INDIVIDUAL INCOME TAX : MARGINAL RATES OF TAXATION.

<u>TOTAL CHARGEABLE INCOME.</u>	<u>ACTUAL RATE.</u>	<u>MARGINAL RATE.</u>
£400	First £400 at 2 shg in the £	10%
£800	Next £400 " 3 shg " " "	15%
£1,200	" £400 " 4 shg " " "	20%
£1,600	" £400 " 5 shg " " "	25%
£2,000	" £400 " 6 shg " " "	30%
£2,500	" £500 " 7 shg " " "	35%
£3,000	" £500 " 8 shg " " "	40%
£4,000	" £1,000 " 9 shg " " "	45%
£5,000	" £1,000 " 10 shg " " "	50%
£6,000	" £1,000 " 11 shg " " "	55%
£7,000	" £1,000 " 12 shg " " "	60%
£8,000	" £1,000 " 13 shg " " "	65%
£9,000	" £1,000 " 14 shg " " "	70%
£10,000	" £1,000 " 15 shg " " "	75%

Table II (b) EAST AFRICAN INDIVIDUAL INCOME TAX:  
AVERAGE RATES OF TAXATION

<u>CHARGEABLE INCOME</u>	<u>TAX LIABILITY</u>	<u>TAX LIABILITY AS A % OF CHARGEABLE INCOME</u>
£ 400	£ 40	10%
£ 800	£ 100	12.5%
£ 1200	£ 180	15.0%
£ 1600	£ 280	17.5%
£ 2,000	£ 400	20.0%
£ 2,500	£ 575	23.0%
£ 3,000	£ 775	25.8%
£ 4,000	£ 1225	30.6%
£ 5,000	£ 1725	34.5%
£ 6,000	£ 2275	37.9%
£ 7,000	£ 2875	41.1%
£ 8,000	£ 3525	44.1%
£ 9,000	£ 4225	46.9%
£ 10,000	£ 4975	49.8%

TABLE III(b)

## GRADUATED PERSONAL TAX: KENYA (1964)

Estimated Total Annual Inc. in Shgs.	Tax in Shgs.	Tax as a %age of Inc. at Lower and Upper Points	Rate of Taxation at Mid Point
Grade I 0 -- 1,920	48	2.50%	5.00%
" II 1,921 -- 2,880	72	3.75% = 2.50%	3.00%
" III 2,881 -- 4,080	108	3.75% = 2.65%	3.10%
" IV 4,081 -- 6,240	156	3.82% = 2.50%	3.02%
" V 6,241 -- 8,400	240	3.85% = 2.86%	3.28%
" VI 8,401 -- 10,820	360	4.29% = 3.49%	3.85%
" VII 10,821 -- 12,000	480	4.65% = 4.00%	4.30%
" VIII 12,001 & over	600	5.00%	-

TABLE III(a)

## GRADUATED PERSONAL TAX: BUGANDA (1964)

Estimated Total Annual Inc. in Shgs.	Tax in Shgs.	Tax as a % of Income at Lower & Upper Points	Rate at Mid Point
Grade I 0 -- 1,200	46	3.83	7.67
Grade II 1,201 -- 1,800	66	5.50 = 3.67	4.40
Grade III 1,801 -- 2,400	100	5.56 = 4.17	4.76
Grade IV 2,401 -- 3,600	150	6.25 = 4.17	5.00
Grade V 3,601 -- 4,800	200	5.56 = 4.17	4.76
Grade VI 4,801 -- 7,200	300	6.25 = 4.17	5.00
Grade VII 7,201 -- 9,600	400	5.56 = 4.17	4.76
Grade VIII 9,601 -- 12,000	500	5.21 = 4.17	4.63
Grade IV 12,001 and over	600	5.00	-

TABLE III(c)

## PERSONAL TAX IN TANGANYIKA: 1964

Total annual Inc. in Shs.	Tax in Shs.	Tax as % of Income at Lower & Upper Points	% Rate at Mid-Point
Grade I 0 -- 2,000	-	-	-
" II 2,001 -- 3,000	20	1.0 = 0.7	0.8
" III 3,001 -- 4,000	40	1.3 = 1.0	1.14
" IV 4,001 -- 5,000	60	1.5 = 1.2	1.33
" V 5,001 -- 6,000	90	1.8 = 1.5	1.64
" VI 6,001 -- 8,000	180	3.0 = 2.3	2.57
" VII 8,001 -- 10,000	250	3.1 = 2.5	2.78
" VIII 10,001 -- 12,000	350	3.5 = 2.9	3.18
" IX 12,001 -- 14,000	450	3.75 = 3.2	3.46
" X 14,001 -- 16,000	525	3.75 = 3.3	3.50
" XI 16,001 and over	600	3.75	-

TABLE IV. RATES OF ESTATE DUTY IN KENYA, 1964.

VALUE OF ESTATE IN £	RATE OF DUTY %	VALUE IN £	RATE %
0 - 5,000	Nil.	150,000 - 175,000	20
5,001 - 7,500	2	175,001 - 200,000	21
7,501 - 10,000	3	200,001 - 225,000	22
10,001 - 12,500	4	225,001 - 250,000	23
12,501 - 15,000	5	250,001 - 300,000	24
15,001 - 20,000	6	300,001 - 350,000	25
20,001 - 25,000	7	350,001 - 400,000	26
25,001 - 30,000	8	400,001 - 450,000	27
30,001 - 35,000	9	450,001 - 500,000	28
35,001 - 40,000	10	500,001 - 550,000	29
40,001 - 50,000	11	550,001 - 600,000	30
50,001 - 60,000	12	600,001 - 650,000	31
60,001 - 70,000	13	650,001 - 800,000	32
70,001 - 80,000	14	800,001 - 1,000,000	34
80,001 - 90,000	15	1,000,001 - 1,250,000	36
90,001 - 100,000	16	1,250,000 - 1,500,000	38
100,001 - 110,000	17	1,500,001 - 2,000,000	39
110,001 - 130,000	18	2,000,001 and above.	40
130,001 - 150,000	19		



#### APPENDIX

##### Some empirical estimates of the 'buoyancy' of the important Central Government taxes in Kenya, Uganda and Tanganyika 1/

The original intention was to obtain an empirical estimate of the income elasticity of various Central Government taxes in East Africa; however, it proved impossible owing to lack of information to eliminate the revenue effects of changes in tax rates, tax bases etc. during the period covered; it did not, therefore, prove possible to obtain an estimate of the built-in flexibility of either the entire tax system or of individual taxes. Instead, it was decided to estimate the 'buoyancy' of various taxes, which would relate the changes in tax revenues to changes in monetary G.D.P. over the period covered, without making any allowance for changes in tax rates & tax bases. These estimates may also be considered as a measure of the tax effort of various East African governments.

For most of the taxes the period covered was 1951-1963. It is realized that the estimates of monetary G.D.P. for the period 1951-53 are not strictly comparable with those for later years, but the advantage of obtaining a large number of observations was felt to outweigh the disadvantage of using G.D.P. figures for earlier years. Furthermore, a study of the years 1951 - 63 includes both years of rapid economic expansion and relative stagnation; while a consideration of the period 1954- 63 would have given us more biased results.

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1/ I am heavily indebted to K.Dawood and Z.Velji who did most of the computational work involved in this exercise.

Two types of equations were used to see which would give us a better 'fit'. These equations were:

$$Y = a + bX \quad - (1)$$

$$Y = ab^{X'} \quad - (2)(i)$$

$$\text{Log } Y = \log a + b' \log X \quad (2)(ii)$$

where Y = tax revenue, X = monetary G.D.P. and a and b and b' are constants. The first equation is a simple linear regression equation and assumes a constant marginal tax revenue/monetary G.D.P. ratio; while the second equation assumes a constant buoyancy ratio. The following results were obtained from the regression analysis:

A Total tax revenue

$$Y = a + bX$$

where Y = total tax revenue of the Central Govt.

(i) Uganda: 1951-63

$$Y = -2.8840 + 0.1870X$$

$$S_b^2 = 0.0004913$$

$$S_b = 0.02217$$

$$r = 0.9326$$

$$r^2 = 0.8697$$

b = regression coefficient

$S_b^2$  = Standard error

$$S_b = \sqrt{S_b^2}$$

r = Correlation Coefficient

$r^2$  = Coefficient of determination.

(ii) Kenya: 1951-63

$$Y = -1.5924 + 0.1861 X$$

$$S_b^2 = 0.000155$$

$$S_b = 0.01245$$

$$r = 0.9760$$

$$r^2 = 0.9526$$

(iii) Tanganyika: 1951-62.1/

$$Y = 2.0949 + 0.1354 X$$

$$S_b^2 = 0.000285$$

$$S_b = 0.01688$$

$$r = 0.8165$$

$$r^2 = 0.6667$$

B Individual Income Tax 2/

(i) Uganda: 1951-61

$$Y = -0.5584 + 0.02054 X$$

Y = Individual Income  
Tax revenue

$$S_b^2 = 0.00002951; \quad S_s = 0.005432$$

$$r = 0.79860 \quad ; \quad r^2 = 0.6368$$

(ii) Kenya: 1951-61

$$Y = 0.9781 + 0.03792 X$$

$$S_b^2 = 0.00000948; \quad S_b = 0.003079$$

$$r = 0.9733 \quad ; \quad r^2 = 0.9473$$

(iii) Tanganyika: 1951-61

$$Y = 1.7214 + 0.005187 X$$

$$S_b^2 = 0.00009182; \quad S_b = 0.009582;$$

$$r = 0.1981 \quad ; \quad r^2 = 0.0392$$

---

1/ It was not possible to use the 1963 G.D.P. figures as they are calculated on a different basis from the earlier ones.

2/ The period covered is 1951-61, as it is not possible to obtain a breakdown of income tax between its two components for years after 1961.

C CORPORATE TAX <sup>1/</sup>

(i) Uganda: 1951-61

$$Y = -2.2526 + 0.03863 X$$

$$S_b^2 = 0.00002652; \quad S_b = 0.00515$$

$$r = 0.9499; \quad r^2 = 0.9023$$

(ii) Kenya: 1951-61

$$Y = 0.29479 + 0.03640 X$$

$$S_b^2 = 0.00001672; \quad S_b = 0.004089$$

$$r = 0.9471; \quad r^2 = 0.8970$$

(iii) Tanganyika: 1951-61

$$Y = 1.5297 + 0.008554 X$$

$$S_b^2 = 0.0002664; \quad S_b = 0.01632$$

$$r = 0.1404; \quad r^2 = 0.0197$$

D IMPORT TAXES

(i) Uganda: 1951-63

$$Y = -6.819 + 0.1150 X$$

$$S_b^2 = 0.0004098; \quad r^2 = 0.7237$$

$$S_b = 0.02024; \quad r = 0.8507$$

(ii) Kenya: 1951-63

$$Y = -1.1622 + 0.07434 X$$

$$S_b^2 = 0.00005736; \quad S_b = 0.007574;$$

$$r^2 = 0.8966; \quad r = 0.9469$$

---

<sup>1/</sup> The period covered is 1951-61, as it is not possible to obtain a breakdown of income tax between its two components for years after 1961.

(iii) Tanganyika: 1951-62

$$Y = -3.8602 + 0.11035 X$$

$$S_b^2 = 0.00008260; \quad S_b = 0.009088$$

$$r^2 = 0.9199; \quad r = 0.9591$$

E Excise duties

(i) Uganda: 1951-63

$$Y = -3.8780 + 0.05822 X$$

$$S_b^2 = 0.00003635; \quad S_b = 0.006029$$

$$r^2 = 0.9157; \quad r = 0.9569$$

(ii) Kenya: 1951-63

$$Y = -2.3433 + 0.03676 X$$

$$S_b^2 = 0.00001550; \quad S_b = 0.003937$$

$$r^2 = 0.8953; \quad r = 0.9462$$

(iii) Tanganyika: 1951-62

$$Y = -1.8780 + 0.03957 X$$

$$S_b^2 = 0.000009817; \quad S_b = 0.003133$$

$$r^2 = 0.9206; \quad r = 0.9595$$

F EXPORT TAXES

Uganda: 1951-63

$$Y = 9.473 + 0.03948 X$$

$$S_b^2 = 0.001667; \quad S_b = 0.04086$$

$$r^2 = 0.0851; \quad r = 0.2917$$

The results obtained from the second equation -  $Y = aX^b$  - were as follows:

G Total Tax revenue

(i) Uganda: 1951-63

a =

b' = 1.1372 where b' = 'buoyancy' of the given tax

(ii) Kenya: 1951-63

a = 0.09504

r = 0.9754

b' = 1.1219

r<sup>2</sup> = 0.9514

(iii) Tanganyika: 1951-62

a = 0.2656

r = 0.9107

b' = 0.8853

r<sup>2</sup> = 0.8294

H INDIVIDUAL INCOME TAX

(i) Uganda: 1951-61

a = 0.003167;

r = 0.7674

b' = 1.3344;

r<sup>2</sup> = 0.5889

(ii) Kenya: 1951-61

a = 0.09762;

r = 0.9796

b' = 0.8433

r<sup>2</sup> = 0.9596

(iii) Tanganyika: 1951-61

a = 1.009

r = 0.1426

b' = 0.1682

r<sup>2</sup> = 0.02034

I CORPORATE TAX

(i) Uganda: 1951-61

a = 0.00002034;

r = 0.9298

b' = 2.4425;

r<sup>2</sup> = 0.8645

(ii) Kenya: 1951-61

$$\begin{aligned} a &= 0.06006; & r &= 0.9525 \\ b' &= 0.9098; & r^2 &= 0.9072 \end{aligned}$$

(iii) Tanganyika: 1951-61

$$\begin{aligned} a &= 0.5381; & r &= 0.1664 \\ b' &= 0.3122 & r^2 &= 0.0277 \end{aligned}$$

J. IMPORT TAXES

(i) Uganda: 1951-63

$$\begin{aligned} a &= 0.0001891; & r &= 0.8733 \\ b' &= 2.1893; & r^2 &= 0.7627 \end{aligned}$$

(ii) Kenya: 1951-63

$$\begin{aligned} a &= 0.05093; & r &= 0.9607 \\ b' &= 1.0518; & r^2 &= 0.9230 \end{aligned}$$

(iii) Tanganyika: 1951-62

$$\begin{aligned} a &= 0.001083; & r &= 0.9625 \\ b' &= 1.6674; & r^2 &= 0.9264 \end{aligned}$$

K. EXCISE DUTIES

(i) Uganda: 1951-63

$$\begin{aligned} a &= 0.000001187; & r &= 0.9473 \\ b' &= 3.0927; & r^2 &= 0.8974 \end{aligned}$$

(ii) Kenya: 1951-63

$$\begin{aligned} a &= 0.0004318; & r &= 0.9690 \\ b' &= 1.7649; & r^2 &= 0.9390 \end{aligned}$$

(iii) Tanganyika: 1951-62

$$a = 0.00008718; \quad r = 0.9535$$

$$b' = 2.1818; \quad r^2 = 0.9092$$

L. EXPORT TAXES

(i) Uganda: 1951-63

$$a = 206.5; \quad r = 0.2644$$

$$b' = -0.8034 \quad r^2 = 0.0699$$

Interpretation of the above results:

An uncritical use of regression analysis is full of all kinds of statistical hazards. It must, therefore, be emphasized that the conclusions drawn from the above results must be treated with the greatest caution. Before discussing the actual results, it may be useful to make some general comments on the use of regression analysis for this purpose. One of the commonest problems in the use of economic time series is that of "autocorrelation" i.e. the lag correlation of a particular time series with itself; in this case correlation between successive values of total or individual tax revenue. Some methods such as the transformation of observations have been devised to eliminate this influence. We did not have recourse to these methods because it was felt that autocorrelation problem was not significant for our data, in particular for time series of individual tax revenues.

Furthermore, our results will inevitably depend on the period used. The use of the period 1954-63 gives lower values for simple regression coefficient (b) as well as for buoyancy (b'); likewise, as 1963 was a year of substantial economic expansion in all the three countries, a consideration of the



period 1951-62 alone, as was done for Tanganyika, would give us lower value for both  $b$  and  $b'$ .

Lastly, it was found by plotting the values obtained from the two equations for different taxes in Uganda - that the 'buoyancy' equation ( $Y = aX^{b'}$ ) gave a better 'fit' - for most of the taxes. Apparently this holds true for Kenya and Tanganyika as well. We shall, therefore, use this equation in our interpretation of the buoyancy of the tax system and of the individual tax sources.

Conclusions:

- (1) The buoyancy ratio ( $b' = \frac{\Delta T}{T} / \frac{\Delta Y}{Y}$ ), for the period 1951-63, for total tax revenue was found to be 1.137 for Uganda and 1.122 for Kenya; while for Tanganyika for the period 1951-62, it was found to be 0.885 i.e. Central government tax revenue grew by a smaller percentage than monetary G.D.P. over this period in Tanganyika. For the period 1951-63, Uganda tax revenues have, therefore, been the most buoyant.
- (2) The buoyancy ratios for the four important taxes - Individual income tax, corporate tax, import duties, excise duties - for Uganda have been greater than either for Kenya or Tanganyika.
- (3) Revenue from excise taxes have been the most buoyant in all the three countries, the value of  $b'$  being 3.093, 2.182 and 1.765 for Uganda, Tanganyika and Kenya respectively.
- (4) Revenue from import taxes have also been fairly buoyant in the three countries; 2.189, 1.667 and 1.052 for Uganda, Tanganyika and Kenya respectively.

(5) Revenue from corporate taxes covering the period 1951-61 has been buoyant only for Uganda; their values being 2.443 for Uganda, 0.9098 for Kenya and 0.312 for Tanganyika.

(6) Revenue from individual income tax covering the period 1951-61 has been the least buoyant for all the three countries, the buoyancy ratios being 1.334 for Uganda, 0.843 for Kenya and 0.168 for Tanganyika.

(7) The low value of overall buoyancy for Tanganyika is wholly due to very low values for individual and corporate income tax.

(8) The buoyancy of the total tax revenues would have been much greater for Uganda except for the fact that the most important tax - export - had a negative buoyancy of -0.803 over the period 1951-63.

It is not the intention here to attempt an explanation for the trends noted above; this was done for Uganda in my paper on "Growth of Central Government tax revenue in Uganda".