AN ANALYSIS OF THE INTERNATIONAL TAX EFFORT MODEL

BY

KENNA CLYDE TAYLOR, JR.

A DISSERTATION PRESENTED TO THE GRADUATE COUNCIL
OF THE UNIVERSITY OF FLORIDA IN
PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

UNIVERSITY OF FLORIDA

1979

ACKNOWLEDGMENTS

I wish to thank my chairman, Professor Frederick O. Goddard, and Professors J. Ronnie Davis, Max Langham, and Jack Vernon for their helpful comments and insights, which significantly improved the exposition and clarity of this study. I would like to express my appreciation to Professor Arthur Kenison who offered some helpful advice in the early stages of the dissertation. Eric Coody made several suggestions which contributed to the exposition in Chapter III.

I am indebted to Margot Bladen, LaWanda Jones, and Juanita Kilgore for their kind help in typing the rough draft. I wish to express my gratitude to Molly Elkins, the supervisor of the Rollins Print Shop, and Dorothy Arnold and Buz Pitts, who have been exceptionally accommodating to my requests for work on short notice. A special thanks goes to Marilyn Ross, whose dedication to her work and impeccable sense of timing made the typing stage of the dissertation much less onerous than it had any right to be.

Most of all I wish to thank my wife Jacqueline whose support and encouragement were instrumental in pursuading me to complete this study at the appropriate time.

I claim all errors as my own.

TABLE OF CONTENTS

LIST OF TABLES

Table | Page

Abstract of Dissertation Presented to the Graduate Council of the University of Florida in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy

AN ANALYSIS OF THE INTERNATIONAL TAX EFFORT MODEL

By

Kenna Clyde Taylor, Jr.

June 1979

Chairman: Professor Frederick O. Goddard
Major Department: Economics

The study examines previous international tax effort models that have been generated to help explain and prescribe the tax performance of less developed countries and discusses the methodological problems inherent in those models. The study then offers the outline of a choice theoretical fiscal decision maker model for which the traditional international tax effort model serves as a rough approximation.

In the fiscal decision maker model, the tax base availability interpretation of taxable capacity is replaced with the concept of the taxable capacity of a country as that tax share generated by the common adaptation of fiscal

decision makers to predictable changes in the socioeconomic environment in which they act. Tax effort is conceived as deriving from particular country differences in the socioeconomic environment to which the fiscal decision maker can adapt to some unknown degree. In pursuing political survival as his primary goal, the fiscal decision maker chooses those taxes and social good expenditures that maximize the probability of his reelection or reappointment. The lower is the cost of tax administration, the more closely actual social good provision approximates preferred social good provision, and the lower is actual tax resistance activity, the greater will be the probability of reelection or reappointment of the fiscal decision maker. In the reinterpreted international tax effort model, the level of development variable becomes a proxy for the nexus of changes in tax resistance and social good preference while the openness variable becomes a proxy for the cost of tax administration. Tax effort is then determined by the willingness of the fiscal decision maker to exploit taxable capacity.

The expansion of the consumption and planning horizons of the citizenry and the consequent development of representative rather than leadership role playing by the fiscal decision maker implies that taxable capacity will be dependent on particular in-country influences for fiscally complex less developed countries. Consequently, the traditional indicators of development were hypothesized as not

being able to predict taxable capacity in cross section regressions for fiscally complex less developed countries. Another implication of the model is that nonmonetary as well as monetary proxies can be used to estimate the combined change in tax resistance and social good preference that defines the fiscal dimensions of economic development. Another hypothesis was that former British and French colonial dependencies would have a higher taxable capacity than other fiscally simple less developed countries since the former have a lower cost of tax administration.

Fiscally simple and fiscally complex less developed countries are delineated, and simple linear regression equations are specified, all of which include dummy variables for former French and British colonial dependency and some of which include nonmonetary proxies for the level of development. Empirical support is found for the hypothesized fiscally simple-fiscally complex dichotomy, the hypothesized higher taxable capacity of former colonial dependencies, and the significance of nonmonetary proxies of the level of development.

The interpretation that a high tax effort by a less developed country implies that outside aid will be productively used does not receive support since tax effort and the long term rate of growth are not significantly correlated. The study suggests that several taxable equations be used to generate tax effort rankings for fiscally simple less developed countries and that those

particular countries that change rank significantly be singled out for case study. The international tax effort model should not be used for fiscally complex less developed countries.

CHAPTER I

TAX SHARE MODELS

Introduction

The observation that the public share invariably rises with the development of a country has been part of the corpus of public finance since Adolf Wagner proposed his "law of increasing public expenditures" in the late 1800s (Musgrave, 1969, Chapters 3, 4, 5).[1] Cross-country multiple regression analyses which specify the tax or public expenditure share of a country as a function of the level of development and other variables have likewise met with some success.[2] These cross-country studies using aggregate tax to aggregate income as the measure of the public share have been of two kinds: those which attempt to explain all variations in the tax share (tax ratio models) and those which attempt to delineate only "taxable capacity," wherein the residual provides a measure of "tax effort" (tax effort

---

[1]See Gandhi (1971) for five different versions of the law, which was imprecisely stated by Wagner. The version Musgrave (1969) tests is whether the elasticity of the public share with respect to GNP is greater than unity.

[2]The first of such studies was done by Jeffrey Williamson (1961). This and many subsequent studies will be discussed in this chapter.

models). Tax ratio models have been applied to samples including both more developed countries (MDCs) and less developed countries (LDCs), while international tax effort models have been applied solely to LDCs. The two models have heretofore been interpreted as having different policy implications. A tax ratio model has been viewed as supplying the policy maker with an estimate of the predicted size of the tax share as development proceeds, with no suggestion as to the appropriateness of the tax share. A tax effort model has been viewed as providing a policy maker with a normative, though somewhat tenuous, prescription concerning the appropriateness of a country's tax take. That is, the tax effort model has been used to suggest that a specific country has a low or a high tax capacity and tax effort relative to those of other countries.

The Level of Development Variable

The primary independent variable explaining the public share[3] across countries has been the level of development of a country. Rationales for using such a variable are as numerous as the proxies chosen to represent it.

---

[3]The public share can, of course, be specified in different ways among which have been current government revenue to GNP, tax to GNP and government expenditures to GNP. These problems have been discussed in the literature (Prest, 1972). We will refer to all models of these kind as either tax ratio or tax effort models or, where the difference is not crucial, as public share models--a term which can also be used when the numerator is government expenditures rather than taxes.

The most common rationale for using the level of developmemt as a major determinant of the size of the tax share has been the notion that as economic development progresses a greater "surplus" margin over subsistence becomes extant, thus implying a greater taxable capacity. Oshima (1957, p. 384) used this idea to explain the fact that the tax share of MDCs is substantially greater than that of LDCs. Lotz and Morss (1967, p. 481), Shin (1969, p. 214), and Bahl (1971, pp. 588-589) used the same rationale to explain tax share differences among LDCs.

Jeffrey Williamson (1961, pp. 46-47) offered the view that the labor-intensive government sector has a lower productivity than other sectors and that labor costs rise with development due to labor scarcity. It then follows that the size of the public share must rise with an increasing level of development in order to maintain constant public services per unit of output.

Sylvain Plasschaert (1962, p. i) noted that taxable capacity, a normative concept referring to the scope for taxation, is lower for LDCs as compared to MDCs because a lower level of development implies lower per capita income and a larger nonmonetized sector.

Hinrichs (1965, p. 548) suggested that if the nongovernment components of aggregate income tend to fall over time as aggregate income rises, then the government expenditure share must rise to maintain a full employment equilibrium over time.

Lotz and Morss (1967, p. 481) also noted that economic development is usually accompanied by a higher rate of literacy, increased monetization and stricter law enforcement and that all of these factors increase taxable capacity.

Thorn (1967, pp. 23-25) argued that the demand for public services, particularly social services, is the main reason why the public share will rise with the level of development. He reasoned that as development proceeds so does urbanization, and it is an empirical characteristic of urban man that he demands more social expenditures than rural man. Because of the physical concentration of urban populations and the development of democratic institutions, urban dwellers can make these demands politically effective. Meanwhile, the growth of aggregate income increases the relative taxable capacity of a country, which allows government to implement these demands through the tax system.

In a similar vein, Lotz (1970, p. 119) saw old age security traditionally provided by the rural family increasingly provided by the government as development proceeds. He also argued that the greater democratization which accompanied economic development induces the government to respond to new voters who demand social expenditures such as food subsidies.

Shin (1969, p. 215) felt that the greater commercialization and urbanization associated with an increasing level of development implied a higher taxable capacity

because of a more plentiful supply of tax bases (such as income and sales) associated with these features of development.

Bahl (1971, p. 589) also pointed out that the decrease in the relative size of the agricultural sector that accompanies development reduces the tax resistance of the population since historically governments have not taxed the agricultural sector heavily because of their unwillingness to tax domestic food supplies and because of the political power of the agricultural sector.[4]

Level of Development Proxies and Other Regressors Employed in Previous Studies

Tedious, but necessary taxonomic exercises fill the discussion of concepts and measurement of economic development in the literature. Not only do social scientists not have a general theory of development, they are not agreed on what exactly is meant by development. Often, economists distinguish between (economic) growth and (economic) development, the former implying increases in total or per capita aggregate product, the latter implying not only growth but also social, cultural and political changes in the institutional structure of a society (Robinson, 1972, p. 54). Nevertheless, per capita aggregate product is often used as a proxy for development as well as growth. Thorn

[4]Bahl argues that such a rationale, while plausible, cannot be used for the level of development proxy to measure taxable capacity in a tax effort model.

(1968, p. 211) argues that ". . . there is little to be gained by employing multiple measures of the level of economic development," and he holds that per capita aggregate product is one of the better measures of economic development. In contrast, Elliott (1972) rejects per capita aggregate product on theoretical grounds and uses 35 separate nonmonetary variables to form three welfare factors (economic power, income distribution, nutritional intake) to formulate a level of development index in his study.

Tax share models have invariably used the broader development concept rather than just the growth concept to explain variations in the tax share among LDCs, and these studies have generally employed single proxies, often per capita aggregate product, to represent the level of development. In two tax share studies (Lotz and Morss, 1970; Shin, 1969) where multiple proxies were employed, they were specified as separate independent aspects of the development process and were not combined to form a single index.

In Table 1 we can see that in addition to per capita national product (Y_i/P), the agricultural share of national product (Ag/Y_i), per capita money supply (Ms_o/P), and merchandise imports to aggregate income (M/Y_i) have all been used as proxies for the level of development in tax share studies. Weiss (1969) also used nonmonetary variables as proxies for the level of development and obtained results similar to those obtained using monetary proxies.

TABLE 1

A SUMMARY OF PREVIOUS PUBLIC SHARE STUDIES

Study	Sample Size and Composition	Form of Principal Equation[a]	Proxy for Public Share[b]	Proxy for Development Level[b]	Other Regressors[b]
Williamson (1961)	33 MDCs, LDCs	Log-linear	R/Y_1	Y_1/P*	
		Log-linear	E/Y_1	Y_1/P*	
Plasschaert (1962)	20 LDCs	Log-linear	R/Y_1	Y_1/P	M/Y_1**
Hinrichs (1965)	60 MDCs, LDCs	Linear	Rc/Y_1	Y_1/P*	
	20 MDCs	Linear	Rc/Y_1	Y_1/P	M/Y_1
	40 LDCs	Linear	Rc/Y_1	Y_1/P**	M/Y_1*
	30 LDCs<$300 Y_1/P	Linear	Rc/Y_1	Y_1/P	M/Y_1*
	40 LDCs	Linear	Rc/Y_1	M/Y_1*	
Lotz and Morss (1967)	72 MDCs, LDCs	Linear	T/Y_1	Y_1/P*	F/Y_1*
	20 MDCs	Linear	T/Y_1	Y_1/P	F/Y_1
	52 LDCs	Linear	T/Y_1	Y_1/P*	F/Y_1*

TABLE 1--Continued

Study	Sample Size and Composition	Form of Principal Equation[a]	Proxy for Public Share[b]	Proxy for Development Level[b]	Other Regressors[b]
Thorn (1967)	52 MDCs, LDCs	Log-linear	Rc/Y_1	Y_1/P*	M/Y_1***, D_2*, Ddg(-)*
	52 MDCs, LDCs	Log-linear	Ec/Y_1	Y_1/P**	D_2*, Ddg(-)*
	32 LDCs	Log-linear	Rc/Y_1	Y_1/P**	M/Y_1**, D_2*, Ddg(-)*
	32 LDCs	Log-linear	Ec/Y_1	Y_1/P**	D_2*, Ddg(-)*
Roe[c] (1968)	25 African LDCs	Linear	Rc/Y_1	Y_1/P*	
	25 African LDCs	Linear	Rc/Y_1	M/Y_1*	
	10 African LDCs	Linear	Rc/Y_1	Y_1/P**	
	10 African LDCs	Linear	Rc/Y_1	M/Y_1*	
Lall (1969)	46 LDCs	Linear	Ec/Y_1	Y_1/P	
	15 LDCs<\$125 Y_1/P	Linear	Ec/Y_1	Y_1/P	
	13 LDCs>\$250 Y_1/P	Linear	Ec/Y_1	Y_1/P	
	18 LDCs \$125<Y_1/P<\$250	Linear	Ec/Y	Y_1/P	

TABLE 1--Continued

Study	Sample Size and Composition	Form of Principal Equation[a]	Proxy for Public Share[b]	Proxy for Development Level[b]	Other Regressors[b]
Musgrave (1969)	32 MDCs, LDCs	Linear	T/Y_1	Y_1/P*	M/Y_1***
	20 LDCs	Linear	T/Y_1	Y_1/P*	M/Y_1
	13 LDCs<\$300 Y_1/P	Linear	T/Y_1	Y_1/P**	M/Y_1
	38 MDCs, LDCs	Linear	T/Y_1	Ag/Y_1*	
	35 MDCs, LDCs	Linear	Ec/Y_1	Y_1/P*	
	14 MDCs	Linear	Ec/Y_1	Y_1/P	
	21 LDCs	Linear	Ec/Y_1	Y_1/P*	
	16 LDCs<\$300 Y_1/P	Linear	Ec/Y_1	Y_1/P	
Shin[d] (1969)	47 MDCs, LDCs	Linear	T/Y_1	Y_1/P*, Ag/Y_1***	F/Y_1***, $\Delta Cp/Cp$***, $\Delta P/P$*
	16 MDCs	Linear	T/Y_1	Y_1/P, Ag/Y_1	F/Y_1, $\Delta Cp/Cp$, $\Delta P/P$
	31 LDCs	Linear	T/Y_1	Y_1/P, Ag/Y_1	F/Y_1, $\Delta Cp/Cp$*, $\Delta P/P$**

TABLE 1--Continued

Study	Sample Size and Composition	Form of Principal Equation[a]	Proxy for Public Share[b]	Proxy for Development Level[b]	Other Regressors[b]
Weiss (1969)	66 LDCs	Linear	R/Y_1	Y_2/P*	F/Y_1*
	64 LDCs	Linear	R/Y_1	Lit*	F/Y_1*
	64 LDCs	Linear	R/Y_1	Urb*	F/Y_1*
	64 LDCs	Linear	R/Y_1	Com*	F/Y_1*
	64 LDCs	Linear	R/Y_1	Lag L*	F/Y_1*
	47 LDCs	Linear	R/Y_1	Y_2/P	F/Y_1, Drep, Dgh***
	41 LDCs	Linear	R/Y_1	Y_2/P	F/Y_1**, $\Delta Y_2/P$
Lotz and Morss (1970)	52 LDCs	Linear	T/Y_1	Y_1/P, Ms_0/P*	M/Y_1*, Xmn/X*, T_1/T
	52 LDCs	Linear	T/Y_1	Y_1/P, Ms_0/P*	M/Y_1*, T_1/T***, X_3/X***, $X-M/Y_1$**
UNCTAD (1970)	36 LDCs	Linear	T/Y_2	Ag/Y_2*	F/Y_2
	36 LDCs[e]	Linear	T/Y_2	Y_2/P*, Ag/Y_2*	F/Y_2*, $\Delta Cp/Cp$*
	36 LDCs[e]	Linear	T/Y_2	Ag/Y_2*	F/Y_2**

TABLE 1--Continued

Study	Sample Size and Composition	Form of Principal Equation[a]	Proxy for Public Share[b]	Proxy for Development Level[b]	Other Regressors[b]
Bahl (1971)	49 LDCs	Linear	T/Y_1	Ag/Y_2**	Xmn/Y_1*
Chelliah (1971)	49 LDCs	Linear	T/Y_1	Y_1-X/P	$X-Xmn/Y_2$**, Xmn/Y_2*
	49 LDCs	Linear	T/Y_1	Ag/Y_1***	X/Y_2, Xmn/Y_2*
Chelliah, Baas, and Kelly (1975)	47 LDCs	Linear	T/Y_1	Y_1/P	F/Y_1**
		Linear	T/Y_1	Y_1-X/P	$X-Xmn/Y_2$, Xmn/Y_2*
		Linear	T/Y_1	Ag/Y_2**	X/Y_2, Xmn/Y_2*

*Significant at the 1% level.

**Significant at the 5% level.

***Significant at the 10% level.

[a]These are the principal equations with respect to the determinants of the aggregate public share. Several of the studies also disaggregated either expenditures or revenues and investigated the determinants of these disaggregated expenditures or revenues.

[b]Proxy definitions are given in Appendix A.

[c]Roe used Hinrich's data for 15 of the 25 LDCs.

[d]Shin used Lotz and Morss data for the same proxies in the two studies.

[e]UNCTAD pooled cross section and time series data.

From the 15 studies in Table 1, certain statistical results are revealed. First, because of the large data break in Y_i/P between MDCs and LDCs, the coefficient of Y_i/P had a higher level of significance for all-country regressions than for MDCs and LDCs taken separately. Second, none of the regressors was statistically significant in any of the public share equations for MDCs only. Third, Y_i/P sometimes was and sometimes was not statistically significant in the public share equations for LDCs, and there was some evidence that Y_i/P had a lower level of significance for those LDCs having the lowest aggregate incomes per capita. Fourth, alternative proxies for the level of development often had as much or more statistical significance than the traditional regressor, Y_i/P. Fifth, various forms of the merchandise foreign trade share or parts thereof sometimes were and sometimes were not significant regressors in tax share equations for LDCs.

In addition, several of the studies noted that when countries were divided into regional groupings, regressor coefficients or predicted tax shares changed. Weiss (1969) found such regional effects for Asia, Africa, and Latin America. Thorn (1967) found regional effects for former British dependencies; Lotz and Morss (1970) suggested that there were geographical effects when dividing the sample into observations from Central America and the Caribbean, former British Africa, Europe, the Far East, South America, former French Africa and the Middle East. Bahl (1971,

pp. 600-604) rigorously tested the regional effects hypothesis for Asia and the Far East, Tropical Africa, South America, Central America and the Caribbean, and the Middle East and North Africa using dummy variables. He concluded that a regional effect does exist in the intercept term but not in the coefficients of the regressors in the tax share equation (Bahl, pp. 600-604).

Purpose of the Present Study

The first Lotz and Morss tax effort model (1967) represented an extension of previous state and local tax effort models to cross-country comparisons. Their model was apparently motivated by the desire to formulate a more complete indicator of taxable capacity than Y_i. The policy implications of assuming that Y_i is the sole indicator of the taxable capacity of a country are important since a higher than average tax ratio was often taken to be indicative of a greater tax effort on the part of fiscal decision makers in that country. There then would be a presumption by international lending agencies in favor of giving (more) aid to that LDC other things being equal (Plasschaert, 1962, p. 2). Furthermore, important but misguided fiscal policy decisions could be made by national policy makers on the basis of cross-country comparisons of actual tax ratios

since this is partially dependent on "taxable capacity" over which policy makers presumably had little influence.[5]

Other studies followed the initial Lotz and Morss study, and, as indicated in the previous section, some consistent statistical results have emerged. However, the theoretical rationale for public share studies has been weak, and the necessary use of proxy variables instead of the true variables has allowed for multiple interpretations of the meaning of the statistical results. "Greater tax base availability" and "increased urbanization" are suggestive of a larger potential public share, but greater specificity of influence is necessary even in such an aggregative model as this one.

The previous problems could be greatly mitigated if the theoretical underpinnings of the tax effort model were delineated more fully, and the traditional regressors used to represent the desired variable were scrutinized more closely. In previous studies of the public share, the influence of the level of development in increasing taxable capacity either by producing a "surplus" amenable to taxation or by supplying more tax bases emerges as a dominant idea. Factors such as the low productivity inherent in the public sector, increased monetization and

---

[5]For example, a government decision maker in an LDC might believe that there was little capacity for higher taxation since the present actual tax ratio was higher in his country than for LDCs generally and so resort to the printing press to provide more social goods.

commercialization, increased urbanization, increased literacy, stricter law enforcement, greater democratization and shifts in political power also were associated with a rising level of development and a rising public share, either as part of the tax base availability thesis or as independent aspects of the development process. Clearly, a theoretical model allowing for some selectivity concerning the relative effects of various aspects of development on taxable capacity is needed, and some attention should be paid to proxy selection for the purpose of testing the model.

A major purpose of the present study is to provide a more developed theoretical framework for utilizing the tax effort approach. The rational choice assumption provides the foundation of a model developed in Chapter III. The principal choosers or decision makers in this model are the government fiscal officials who ultimately make the specific tax and expenditure choices in any society. A further assumption is that fiscal officials make those tax and expenditure choices that maximize the probability of their election or reelection. The more closely actual social good provision approximates the preferred social good provision of the citizenry, the greater the probability of reelection or reappointment of the fiscal decision maker. The less actual tax resistance activity, the greater the probability of reelection or reappointment of the fiscal decision maker. There are four variables that determine the tax and social

good expenditure choices made by the fiscal decision maker: social good preferences of individuals and groups in society, tax resistance of individuals and groups in society, the cost of tax administration resources, and tax effort. Predictable changes in societal complexity over time influence changes in both social good preferences and tax resistance from the citizenry. This in turn induces the fiscal decision maker to shift from a leadership to a representative role in ultimately making the actual tax and expenditure choices.

Chapter III will present a new tax effort approach based on the fiscal decision maker model. Or, in other words, the tax effort approach or "model" will be viewed as derived from the more fundamental fiscal decision maker model. The variables traditionally used in international tax effort equations such as "level of development" and "openness" are viewed as imperfect proxies for more fundamental variables in the fiscal decision maker model. The "level of development" notion becomes a proxy for the interaction between aggregate social good preference and aggregate tax resistance. "Openness" becomes a proxy primarily for the cost of tax administration. The residual in the traditional model, or tax effort, consists of unexplained variation in the three variables just mentioned plus the willingness of the fiscal decision maker to tax, or tax effort. By designating this residual as the

willingness of the fiscal decision maker to tax, the model developed in this study permits an unambiguous interpretation of tax effort that can prove more useful for policy inferences.

The effect of changes in aggregate preference, aggregate tax resistance and the cost of tax administration on social good and tax choices by fiscal decision are, in principle, predictable in all societies over time. However, the traditional taxable capacity variables employed in cross section tax effort models for LDCs will only be able to capture those changes for LDCs having a low level of societal complexity (i.e., fiscally simple LDCs). For LDCs having a high level of societal complexity (i.e., fiscally complex LDCs), none of the traditional taxable capacity factors will change predictably. A further implication of the model developed in Chapter III is that monetary indicators of the level of development variable have no conceptual advantage over nonmonetary indicators. Indeed, the latter may be preferable. In any case, a tax effort approach can effectively utilize nonmonetary indicators to capture the level of development idea. In Chapter IV, this new tax effort model is specified and tested with a largely new set of data. In Chapter V, the new tax effort model is evaluated and a further agenda for research is suggested.

The next chapter will examine the original Lotz and Morss study (1967), a subsequent Lotz and Morss study (1970), a study by UNCTAD (1970) and another by Bahl (1971) in order

to assess past results and point out some conceptual and methodological difficulties encountered in formulating past tax effort models. Then the relationship of these previous tax effort models to the one developed in Chapter III will be discussed.

CHAPTER II

PREVIOUS INTERNATIONAL TAX EFFORT STUDIES

The Lotz and Morss Models

Lotz and Morss attempt to account for those factors measuring a country's taxable capacity in order to determine a country's tax effort. In general, the taxable capacity of a country is the ability of a country to raise tax revenue. Traditionally this has been viewed from the revenue-raising side only as aggregate income above subsistence has been assumed to automatically constitute a "surplus" amenable to taxation. Increases in this surplus are increases in taxable capacity. Lotz and Morss define taxable capacity in this manner and define tax effort as the extent to which a government actually utilizes taxable capacity.

Therefore, in a tax effort model it is necessary to explain only those variations in the tax share due to taxable capacity factors in a multiple regression equation. Tax effort is given by the residual. That is, we have a linear model of the form: $T/Y_i = XB+U$, where $\underline{X}$ is a matrix of $\underline{k}$ taxable capacity factors for $\underline{n}$ observations, $\underline{B}$ is a vector of $\underline{k}$ coefficients and $\underline{U}$ is a vector of $\underline{n}$ disturbance

terms. A regression over the sample of n countries will yield the estimating equation, $(\widehat{T/Y_i}) = X\hat{B}$. This is the expected tax capacity--the tax capacity that would result when a particular country's values for the regressors are plugged into the estimating equation. Given the actual tax collections of this country, T/Y_i, we can then construct $TE = T/Y_i/(\widehat{T/Y_i})$ and compare this ratio with that of other countries in a tax effort ranking.

In their 1967 study, Lotz and Morss argue that in addition to aggregate national product specified in the denominator of the tax share, other factors heretofore unaccounted for also affect taxable capacity. These include the level of economic development, the size of the foreign trade sector, the size distribution of income, the industrial origin of output, and the composition of government expenditures (Lotz and Morss, 1967, pp. 481-482). Data limitations force Lotz and Morss to consider only Y_i, Y_i/P, and F/Y_i. The rationale for including the relative size of the foreign trade sector had been given earlier by Hinrichs (1965): that it is administratively easier to tax trade flows than domestic transactions and that the degree of "openness" reflects the degree of monetization, urbanization, and commercialization of the economy. Using a two or three year (mid 1960s) average for each of 72 MDCs and LDCs, Lotz and Morss ran several OLS regressions. As can be seen from Table 1, page 7, significant coefficients were obtained for the whole sample and for the 52 LDCs (those with less than

\$800 Y_1/P) taken separately[1] but not for the 20 MDCs taken separately. Thus Lotz and Morss drop the MDCs from the rest of their study arguing that the public share of a high income country ". . . is more an index of political preference for the appropriate size of a government's role than an index of taxable capacity" (Lotz and Morss, 1967, pp. 488-489).

Expanding on their first study Lotz and Morss again (1970) examined the tax effort of 52 LDCs by regressing T/Y_1 on additional taxable capacity factors. Linear OLS regressions were run on various combinations of a number of independent regressors; the regression Lotz and Morss chose to rank relative tax effort was of the form: $T/Y_1 = f(Y_1/P, M/Y_1, Ms_o/P, (X-M)/Y_1, X_2/X, T_1/T)$. The rationale for utilizing Y_1/P and a measure of the foreign trade sector, M/Y_1, has previously been noted. The remaining regressors, except perhaps T_1/T, were expected to be positively related to T/Y_1 since increases in these variables all serve to make it less economically costly to levy and collect taxes. Lotz and Morss tried three definitions of money divided by

---

[1]The Spearman rank correlation coefficient between the Lotz and Morss, 1967, equation's ranking and that given by the actual tax ration, T/Y_1, is .8951 (using Lotz and Morss data as given), and Z, the normal deviate = 6.39. The close correlation in the rankings between the two series does not invalidate the use of the Lotz and Morss approach since individual countries can and do change rank considerably depending on which scheme is used. Nevertheless, this correlation coefficient will be given as a measure of the general divergence of the rankings when alternative ranking schemes are used.

population and settled on Ms_o/P because it raised the $\bar{R}^2$ more than the other two, and it was the only one that was significant when run with Y_1/P. A monetization variable was deemed useful since it is generally administratively feasible to tax only persons who can pay in money. Income distribution differences will distort an aggregate money measure so Lotz and Morss hypothesized that a narrow definition of money should be the most significant since it is less affected by income distribution differences (Lotz and Morss, 1970, pp. 330-331). The trade surplus ratio, $(X-M)/Y_1$, was included in the regression as a proxy for the less easily taxed capital flows and invisibles (Lotz and Morss, 1970, p. 330).[2] Export concentration, X_3/X, was included in the regression to measure a country's ability to place a tax burden on non-nationals under the assumption that large-scale export products are often mainly foreign owned and operated in LDCs. According to Lotz and Morss, T_1/T may be positively or negatively related to T/Y_1 depending on which of two sets of conflicting forces is dominant. The more decentralized the government, the more confidence people tend to place in the use of tax revenues to meet their demands and the more likely are the governments to respond to these demands. Also, the existence of large-scale local government may indicate the existence of

---

[2] X_3/X loses some explanatory power when $(X-M)/Y_1$ is included in the regression equation leading Lotz and Morss to conclude that $(X-M)/Y_1$ is to some extent a proxy for the structure of the export sector of the economy.

relatively more efficient tax collection machinery. For these reasons Lotz and Morss posit a positive relation between T/Y_1 and T_1/T. On the other hand, the more centralized the government, the less politically costly it will be to levy and raise taxes and the more operable becomes the international demonstration effect on a country's leaders (Lotz and Morss, 1970, pp. 335-336).

The regression including all of the above regressors was significant at the 5 percent level with an improvement in $\bar{R}^2$ relative to the 1967 study (from .200 to .453). Dividing the countries into various regional groupings, Lotz and Morss find substantial differences among regions in comparing the percentage difference between actual tax ratios and these estimated by the above equation (Lotz and Morss, 1970, pp. 337-338).

If we divide the 52 LDCs from the Lotz and Morss studies into five regional groupings (Central America and the Caribbean, South America, Asia and the Middle East, Africa, and Europe), we can test for a regional effect on taxable capacity more rigorously using regression analysis. We can assume that the regional effect affects only the level of taxable capacity, leaving marginal impacts of the independent regressors unchanged, or we can assume that the regional effect pervades both the level of taxable capacity and the marginal impacts of the independent variables. Given the lack of information concerning interregional

effects and our arbitrary interregional separation, it seems useful to examine both assumptions statistically.

For the first assumption (interregional changes in constants but not in regressor coefficients), the general equation will be:

$$T/Y_1 = a + b_1\ Y_1/P + b_2\ F/Y_1 + \sum_{i=1}^{4} c_i D_i .$$

For the second assumption (interregional changes in constants and regressor coefficients), the general equation will be:

$$T/Y_1 = d + g_1\ Y_1/P + g_2\ F/Y_1 + \sum_{i=1}^{4} j_i D_i + \sum_{i=j}^{4} h_i D_i\ (Y_1/P)$$

Where,

D_1 = 1 if Central America and the Caribbean, 0 otherwise

D_2 = 1 if South America, 0 otherwise

D_3 = 1 if Asia and the Middle East, 0 otherwise

D_4 = 1 if Africa, 0 otherwise

D_5 = 1 if Europe, 0 otherwise

and

$D_1(Y_1/P)$ = Y_1/P if Central America and the Caribbean, 0 otherwise

$D_2(Y_1/P)$ = Y_1/P if South America, 0 otherwise

$D_3(Y_1/P)$ = Y_1/P if Asia and the Middle East, 0 otherwise

$D_4(Y_1/P)$ = Y_1/P if Africa, 0 otherwise

$D_5(Y_1/P)$ = Y_1/P if Europe, 0 otherwise

and D_5 and $D_5(Y_1/P)$ are dropped from the estimating equations to avoid the dummy variable trap. We can test the effect of region for each equation by exploiting the

appropriate F distribution.[3] The results are that the $\bar{R}^2$ rises from .214 to .378 for the case of allowing only interregional constants to change and to .338 when we allow both the constants and interregional coefficients of the regressors to change. Both equations are statistically significant at the 1 percent level relative to omitting regional effects altogether. However, there is no statistical evidence of regional interaction in addition to interregional changes in the level of taxable capacity.

The UNCTAD Model

The United Nations Conference on Trade and Development (UNCTAD) developed a tax effort model (1970) which differed from the Lotz and Morss models in that it pooled cross section and time series data. Thirty-six LDCs were included in the study, and time series of from two to fifteen years were used depending on the country's data availability. The total pooled observations totaled 346.

In the pooled equations shown in Table 1, page 7, all of the variables are significant at the 5 percent level while in the cross sectional equations F/Y_2 is not significant. While the regression coefficients for Ag/Y_2 did not vary much between the pooled and the cross section regressions, the coefficients for F/Y_2 varied greatly between the regressions run on the two types of samples. In terms of ranking the 36 LDCs by tax effort using actual

[3] See Appendix B for the statistical results.

T/Y_2, tax effort derived from pooled data, and tax effort derived from time averaged cross sectional data, there was no significant difference in the rankings.[4]

The rate of inflation regressor, $\Delta Cp/Cp$, was used in the preliminary equation run by UNCTAD and had also been used by Shin. The rationale for employing this regressor was that under a progressive tax structure a higher rate of inflation may lead to a higher tax ratio or, alternately, that a higher tax ratio may cause a higher inflation rate (Shin, 1969, pp. 215, 217). UNCTAD suggests that the highly significant and positive relation of $\Delta Cp/Cp$ to T/Y_2 derives from the high correlation between T/Y_i and Ec/Y_i found for most countries and that the higher is Ec/Y_i the greater the likelihood of inflation (UNCTAD, 1970, p. 28). UNCTAD argues that this rationale does not bear on taxable capacity and so drop $\Delta Cp/Cp$ from the regression equation for the purpose of comparison of pooled and cross section country rankings.

While the pooling technique increases the sample size it necessitates another assumption relative to the use of averaged cross section data. In pooling the data, UNCTAD implicitly assumed that factors which determine taxable capacity cross-sectionally also determine taxable capacity over time. That is, one would have to assume that long run

---

[4] A Spearman rank correlation coefficient for the actual T/Y_2 as compared to the pooled regression ranking was .7349, while it was .9969 for the pooled regression as compared to the cross section regression ranking.

or permanent secular (cross section) determinants of the tax share are the same as short run or temporary cyclical (time-series) determinants of the tax share.

The Bahl Model

The Bahl study (1971) summarized many of the previous tax ratio and tax effort models, examined their differences, and presented a tax effort model that dealt with some of the methodological and theoretical problems associated with the tax effort approach. Bahl stressed that if the regression equation is to explain only taxable capacity, care must be exercised in selecting the independent variables and the regressor proxies for these variables so that they reflect only factors related to a government's ability to tax, not a government's willingness to tax (Bahl, 1971, pp. 571-572). Bahl noted that tax effort, TE, can have many determinancs, but he concentrated on three: the relative productivity of public as compared to private investments, a desire on the part of government to intervene in the resource allocation process for distributional reasons, and historical institutional arrangements for certain activities between public and private sectors. All of these determinants affect a government's willingness to tax (Bahl, 1971, pp. 582-583).

In developing his version of the tax effort model, Bahl pointed out that data limitations precluded the inclusion of taxable capacity variables such as personal

income, income distribution, and the level of subsistence sector income in the tax share regression equation (Bahl, 1971, p. 554). Bahl included three variables measuring taxable capacity in his model: the size of the foreign trade sector, proxied by X/Y_2, the stage of development, proxied by Ag/Y_2, and a measure of the sectoral composition of value added, proxied by Xmn/Y_2 (Bahl, 1971, p. 585). Taxable capacity is assumed to be related to the size of the foreign trade sector first because a greater level of exports relative to income suggests both a greater degree of monetization and an industrial structure that is administratively amenable to taxation and, second, because the subsequent larger imports may be taxed with a minimum of administrative difficulty. The foreign trade sector was proxied by the export share rather than the theoretically more satisfactory exports plus imports to aggregate national product (since this measure reflects the total available trade tax base) because of a high degree of collinearity between the import share and export share (Bahl, 1971, p. 586). Bahl used Ag/Y_2 as the proxy for the stage of development because of certain theoretical and empirical problems associated with the use of Y_2/P as the proxy.

Bahl noted that empirically Y_i/P satisfactorily explained tax ratio variations between MDCs and LDCs but did not satisfactorily explain variance among only LDCs in previous studies. He offered two reasons for this failure: first, Y_i/P hides important structural differences that

affect taxable capacity, specifically the relative size of the monetized sector; second, conversion of local currencies into U.S. dollars makes for a large error factor in inter-country comparisons because of disequilibrium exchange rates and their incomplete measurement of the relative purchasing power of a currency in any case. The use of Ag/Y_i mitigated these problems. Also, Bahl felt that causation between Y_i/P and T/Y_i runs both ways; consequently, the specification of Y_i/P as an independent regressor in an OLS single equation regression leads to biased and inconsistent parameter estimates (Bahl, 1971, p. 581).

A higher level of activity in the agricultural sector was assumed to be associated with a larger subsistence sector, less commercialization and industrialization, and a lower per capita aggregate income. Furthermore, value added in the agricultural sector may imply a lower taxable surplus because the incomes of agricultural wage earners may be relatively low, profit margins may be relatively low when agricultural output is produced largely by many small farmers, and small agricultural enterprises are not as administratively amenable to taxation as enterprises in other sectors (Bahl, 1971, p. 590). Bahl used a third independent regressor--the mining share. It was hypothesized that sectoral income distribution affects taxable capacity independently of the overall level of development and size of the foreign trade sector. The mining share, Xmn/Y_2, was used because it was asserted that the mining sector produces

a larger surplus than any other sector and is therefore a positive determinant of taxable capacity. Mining operations are confined to a few large firms that are relatively easy to tax via income, or exports (Bahl, 1971, p. 590).

Bahl specified the tax ratio as a simple linear function of the above three regressors in a single equation OLS regression using late 1960s averages for the variables over 49 LDCs. He found that Ag/Y_2 and Xmn/Y_2 were significant explanatory variables and had the expected signs, while X/Y_2 was insignificant, apparently because of the high degree of collinearity between it and Xmn/Y_2 (Bahl, 1971, p. 593). That is, the regression coefficient of Xmn/Y_2 to a large extent included the influence of X/Y_2 as well. Bahl also undertook a comparison of tax effort using the Bahl equation and the 1967 Lotz and Morss equation (using Bahl's data) and found that they did not result in significantly different tax effort rankings.[5]

As did Lotz and Morss (1967 and 1970), Bahl found regional effects to be a significant determinant of inter-country tax share variations (Bahl, 1971, pp. 600-604). That is, when Bahl specified his model with an additional five dummy regressors to represent different levels of taxable capacity among regions, the $\bar{R}^2$ of the estimating equation increased by a statistically significant amount

---

[5]The Spearman rank correlation coefficient between the two series is .8704.

(from .411 to .522).[6] As in the Lotz and Morss model, interaction effects do not add significantly to the statistical explanation in terms of $\bar{R}^2$.

Summary

Theory and statistical methodology always intertwine, but they do so particularly in the case of a tax effort model. There is an inverse relation between the a priori confidence one has in the theoretical model postulated and the a posteriori weight given to the statistical analysis when confronting the model with real world data. This is quite evident in the contrasting approaches of Lotz and Morss and Bahl to the tax effort model.

Lotz and Morss specified factors which they felt "should" determine taxable capacity, given by $(\hat{T/Y_i})$.[7] At the same time, Lotz and Morss did not have enough information to specify the form of the equation theoretically. As used by Lotz and Morss, the regression equation generated a weighting scheme enabling them to derive a tax effort index that they presumed was more adequate for cross-country comparisons than a simple tax share because it took some

---

[6] This study has previously used Bahl's regional groupings to test for regional effects in the Lotz and Morss model.

[7] Lotz and Morss referred to their approach as "normative" (1967, p. 482). However, it can be argued that if the regressors were chosen by Lotz and Morss because they believed that such regressors "do" affect taxable capacity, then Lotz and Morss were using a positive methodology.

account of taxable capacity factors that the simple tax share omits. The primary purpose of the regression was the prediction of taxable capacity, $(\widehat{T/Y_i})$, and Lotz and Morss had a negligible interest in deriving the structural parameters of the regression equation.

Bahl, on the other hand, apparently had less a priori confidence that he could choose appropriate regressors to measure taxable capacity. Thus, he relied more on the regression results, using standard statistical tests to reject some regressors and to determine the "best" model of those investigated. Bahl was also more interested in obtaining structural parameter estimates than were Lotz and Morss.

The different approaches chosen by Lotz and Morss and Bahl can be viewed as deriving from their varying confidence that there exists a "pattern of development with respect to tax structure changes" for LDCs generally. Lotz and Morss implicitly do not question the pattern of development assumption although they provide no explanation as to the form it takes. Demand influences of particular countries can obscure the statistical relationship between taxable capacity and the tax base availability assumed to accompany a rising level of development, and so reliance on typical significance tests of parameters and the regression equation is not warranted. The regression analysis serves solely as a weighting scheme, one which is accepted as long as the estimated parameters have the appropriate sign. The

exact specification of the model becomes arbitrary since the form of the equation and statistically revealed parameter size have no theoretical interpretation. Bahl, on the other hand, implicitly questions the pattern of development assumption inherent in all tax effort models by using the statistical results to determine the variables and mathematical form of his final equation.

The tax effort approach used in the present study implies that there is a predictable tax structure development pattern that emerges over time as a country develops. But this developing tax structure is only predictable when using traditional international tax effort models involving countries that lack fiscal complexity. That is, single equation ordinary least squares regressions can predict taxable capacity only for fiscally simple LDCs. For fiscally complex LDCs, more elaborate simultaneous equation methods are implied.

In Chapter III, the conceptual basis for a new international tax effort model for LDCs is presented based on a fiscal decision maker model. Changes in societal complexity over time change the behavior of participants in the society with respect to social good choice and tax resistance. This in turn induces the decision maker to switch from playing a leadership to a representative role in making fiscal decisions. The switch from leadership to representative role playing implies greater complexity in fiscal decision making. Thus in order to predict the

taxable capacity of LDCs in this stage of development, a more complex model than those used by Lotz and Morss and others is implied.

This study does not seek to develop a more complex simultaneous equation model to better predict the taxable capacity and tax effort of fiscally complex LDCs. The purposes of this study are three: to present a more general concept of taxable capacity than the tax base availability notion employed in previous international tax effort models; to develop the outlines of an international tax effort model, based on the rational choice postulate, that can provide a conceptually more appealing basis for predicting taxable capacity and tax effort in fiscally simple LDCs; to test the new model and compare LDC tax effort rankings derived from alternative regression equations which employ new variables included as a result of using the new model.

Chapter III reviews the conceptual basis for the original Lotz and Morss model, the representative tax system approach. Then the tax base availability approach to assessing tax capacity, which is used by Lotz and Morss and others, is analyzed, and a more general concept of the taxable capacity and tax effort of a country are developed. Finally, the outlines of the fiscal decision maker model are developed, and the implications of this model when using a regression approach for predicting taxable capacity and tax effort for fiscally simple LDCs are determined.

CHAPTER III

THE STRUCTURE AND FUNCTION OF INTERNATIONAL TAX EFFORT MODELS

The Representative Tax System Approach to Assessing Tax Effort

An important impetus for the original international tax effort model presented by Lotz and Morss (1967) was the work done by the U.S. Advisory Commission on Intergovernmental Relations (ACIR). In this study (1962) a representative tax system approach was used to obtain the taxable capacity for each state. First the average national tax rate for a given tax base was defined as the rate implied by taking the total revenue actually collected on this tax base in all states and dividing this number by the total value of the taxable base in all states. Then each average national tax rate for a given base was multiplied by the actual tax base in a state to yield the taxable capacity of a given base for a particular state. Finally, the taxable capacity for each of the bases were summed for a particular state to

yield the taxable capacity of that state.[1] Thus, this method assumed that there are nationwide average tax rates that can be applied to each of the tax bases in a given state, and that when these products are summed, the estimated tax capacity of that state can be determined. If actual total tax revenues exceed estimated taxable capacity, a state is assumed to be making a higher "tax effort" than the average of states. If actual tax revenues are less than estimated taxable capacity, a state is assumed to be making a lower "tax effort" than the average of states. The implications of this exercise are that those states that are making a high tax effort are more deserving of federal grants than states making a low tax effort, since the low tax effort states could tax their residents more if they chose to. Those states making a low tax effort are assumed to be substituting federal grants for state and local tax revenues.

---

[1] ACIR average national tax rate on base j (AVE_j) $= \dfrac{\sum_{i=1}^{s} \text{taxes from state i in base j}}{\sum_{i=1}^{s} \text{value of tax base j in state i}}$, where s = 50 states

ACIR taxable capacity for a state $= \sum_{j=1}^{m} AVE_j \times (\text{value of tax base j})$, where m = 26 ACIR tax bases

There are several methodological problems with this approach as used by ACIR.[2] First, the ACIR method of calculating the taxable capacity of a state does not allow for substitution among tax bases and rates. States which exploit tax bases at levels that differ greatly from that of other states can show taxable capacities which are high or low even when the average revenue they collect from all tax bases is similar to that of most other states.[3] Second, the ACIR method of calculating taxable capacity implicitly assumes that the average national tax rate calculated is the same as the marginal tax rate that could be applied for each state. This assumption is important because a key purpose of making taxable capacity calculations for a state is to gain some idea of the additional revenue that can be expected from additions to the taxable base. Only if a linear relationship between tax revenues and the relevant tax base goes through the origin is such an assumption warranted. Since at low tax base levels exemptions are

---

[2]Akin (1973) discussed all three criticisms of the ACIR approach, and then developed a regression analysis to determine state taxable capacity. A primary conclusion he reached was that estimates of taxable capacity differ significantly when using the ACIR approach as compared to using the regression approach.

[3]For example, a state which taxes income heavily in lieu of consumption will be making a low tax effort with the ACIR formula even if its total tax rate is that of the average of all states. This result occurs because the ACIR formula will generate an average national tax rate on a sales base that is higher than the rate generated on an income base since most states tax a dollar of sales more heavily than a dollar of income.

often given,[4] we should not assume that average and marginal tax rates are identical. A linear regression approach in which tax revenues derived from a given base are regressed on the value of the tax base for all states avoids this problem since the regression equation need not be constrained to go through the origin. The derived parameter for the value of the tax base will be the "marginal national tax rate" on that base, a measure more useful for policy purposes than the ACIR average national tax rate. The regression coefficient offers the added virtue of using more information from the data (i.e., deviations from the mean) as compared to the ACIR average national tax rate, which measures only central tendency while ignoring dispersion of the data. A third methodological problem with the ACIR method of calculating taxable capacity is that the particular tax bases included in the index are arbitrarily chosen. The tax bases most used by states need not be the ones that have to be or should be used by all states.[5]

---

[4]Homestead exemptions for property taxes and low income exemptions for state income taxes are two prominent examples of commonly used exemptions.

[5]Bahl (1972) employed a representative tax system approach to measure the tax effort of 49 LDCs. Bahl's study differs from that of the ACIR in that he regressed the taxes on four tax class proxies since he did not have data for specific tax bases. Thus his approach does allow for substitutability among tax bases within tax class but does not allow for substitutability among the tax classes. Data limitations also forced Bahl to use crude proxies for an aggregate tax class. For example he used income generated in the mining and manufacturing sectors plus the value of agricultural exports to measure the corporate income tax base.

The Tax Base Availability Approach to Assessing Tax Effort

An alternative approach to assessing tax effort was employed by Lotz and Morss in the first international tax effort model (1967). Instead of using specific tax bases and tax rates derived from summing tax collections and the value of tax bases for all countries examined, Lotz and Morss used general indicators of the availability of tax bases and coefficients of these indicators derived from a regression equation to generate the marginal relationship between the indicators and the tax share. The reasons for using an alternative model to assess tax effort across countries were both theoretical and practical.

The use of indicators to measure availability of tax bases was probably prompted by empirical considerations. Lotz and Morss simply did not have an adequate data base to measure specific tax bases and rates for LDCs. Consequently, the representative tax system approach used by ACIR could not be utilized. However, the use of a regression equation rather than a deterministic formula such as that used by ACIR was certainly prompted by methodological considerations. As noted above, the regression approach utilizes more information from the data and allows a more appealing calculation of the marginal effects of changes in tax bases on taxable capacity. However, if the regression approach were used with specific tax bases as the independent variables in a tax capacity equation, the substitution problem would still remain. The Lotz and Morss tax

base availability approach, while losing the direct linkage between a specific tax and its tax base that exists in ACIR approach, did allow for cross-country variations in tax base use to achieve a given taxable capacity. That is, by using general indicators of tax base availability such as the "level of development" and "openness," Lotz and Morss allowed for some unknown alternative use of tax bases from country to country in order to obtain the same taxable capacity.

Another feature of the Lotz and Morss approach derives from the use of cross section data to imply tax structure change over time. The expected positive relation between the tax share and the level of development indicator is presumed to result not only from a widening of existing tax bases as a country grows, but the creation of new tax bases as a country develops over time. That is, the cross section regressions are assumed to reflect a common pattern of tax structure development for each LDC over time. Thus, as the level of development of an LDC increases, new forms of taxation are assumed to gradually replace old ones. The specific tax base approach of the ACIR does not recognize this kind of tax base creativity.

Methodological Problems with the International Tax Effort Model

There are three methodological problems with the international tax effort model as previously developed and interpreted. First, the attempt to capture ability-to-tax and/or ability-to-pay tax "supply" factors with proxies

defined by a tax base availability rationale is unconvincing. Second, there are good reasons to question the usefulness of attempting to use the ability-to-tax and/or ability-to-pay tax idea to define taxable capacity. There is a serious identification problem associated with specifying changes in supply and demand for public goods over time with aggregate indicators of taxable capacity. An alternative definition of taxable capacity avoids this problem. Third, all previous international tax effort models suffer from errors in variables, which negates tests of hypotheses concerning the significance of the regression coefficients.

In developing a new international tax effort model, the present study addresses all of these methodological problems while providing a theoretical foundation for such models. While the first two problems are largely solved, the errors in variable problem remains. However, its severity has been lessened by the selection of proxies with smaller measurement error in some of the regression equations used in this study.

The international tax effort model based on the tax base availability concept was developed by Lotz and Morss as an improvement on the traditional practice of comparing LDC tax effort by comparing countries' actual tax ratios (Lotz and Morss, 1967, p. 481). Lotz and Morss and subsequent authors empirically defined the estimated taxable capacity of a country as the predicted tax share when cross-country tax shares were regressed on tax base availability indicators. These tax base availability indicators were assumed to

measure the government's ability to tax and/or the ability of the populace to pay taxes. Tax effort, the residual, was then determined by the societal preferences for social goods and/or the government's willingness to tax (Chelliah, 1971, pp. 292-293; Bahl, 1971, pp. 571-572). The taxable capacity of a country was thus determined solely by "supply factors," while the unexplained residual, tax effort, was assumed to be solely determined by "demand factors." If country A reveals a higher tax effort than country B,[6] this implies that country A has a greater preference for social goods and/or a greater government willingness to tax relative to the people's ability to pay taxes and/or the government's ability to collect taxes as compared to country B. However, this interpretation of taxable capacity does not fare well under closer scrutiny.

The motivation for an international tax effort model has been that the amount of taxes an LDC can reasonably be expected to raise is in some sense a function of "objective" supply factors to which policy makers can easily respond. Previous international tax effort models assumed that variables which measure tax base availability also measure these "objective" supply factors. But tax base availability has been implicitly defined as stocks and flows of economic value that are economically feasible to tax. And this means that taxable capacity can be considered higher only when a country experiences increases in the stocks and flows of

---

[6] $(T/Y_i/(\hat{T/Y_i}))_A > (T/Y_i/(\hat{T/Y_i}))_B$

economic value that are economically feasible to tax. Consequently, tax base availability proxies such as the "level of development" and "openness" are attempting to measure tax base expansion or creation. Greater efficiency in exploiting existing tax bases, increases in tax rates, and reductions in exemptions and deductions are assumed to be included in the residual, or tax effort. Tax "supply" is thus manifested only in tax base expansion or creation while tax "demand" is manifested only in greater efficiency in tax base exploitation, higher tax rates and reductions in exemptions and deductions.

Such assumptions are unwarranted. There is no prior reason to believe that a greater ability of a government to tax and/or the ability of the populace to pay taxes is reflected only in tax base expansion or creation as previous international tax effort models have assumed. The increasing education of the citizenry which accompanies increases in Y_i/P or decreases in Ag/Y_i will likely create a more efficient pool of civil servants to assess taxes. Such a development implies a greater ability to exploit existing tax bases, a "supply" factor. Yet the interpretation of regressors such as Y_i/P and Ag/Y_i as measuring tax base availability does not allow greater taxing efficiency to be included as part of estimated taxable capacity in a cross-country regression equation. In the same vein, the existence of well developed taxing institutions in the former French and British colonial dependencies gave these

countries a greater ability to exploit tax bases than countries without this colonial heritage. Previous tax effort models, by ignoring the existence of well developed taxing institutions in their specification of tax base availability, have implied that the higher tax ratios in LDCs that result from having had such institutional development denote "tax effort."

Similarly, the creation of new tax bases in an LDC need not imply greater taxable capacity only in the sense of "supply," the ability of the populace to pay taxes and/or the ability of the government to collect taxes. Fiscal decision makers in LDCs can choose to impose an income or value added tax for development purposes despite the protestations of some of the citizenry. This would seem to be what we want to mean by greater "tax effort" since such a decision connotes greater preference for social goods or at least a willingness to impose taxes. However, when using the tax base availability approach, this interpretation is not acceptable. In the availability approach, the creation of new tax bases is assumed to imply greater "tax capacity" only in the sense of a greater ability to pay taxes or a greater ability to collect taxes.

Consequently, the use of a tax base availability rationale, which assumes that ability to tax or ability to pay taxes result only from tax base expansion or creation, is too crude to be of much use in assessing the taxable capacity of an LDC. This interpretation of taxable capacity

guarantees that some of taxable capacity will actually be tax effort and that some of tax effort will actually be tax capacity as these terms have been conceived in the models using the availability rationale. It seems preferable to generate a broader conception of the taxable capacity of a country than that denoted by tax base availability.

The second methodological problem involves the attempt to delimit supply and demand influences on the tax share of LDCs. This is also a questionable exercise. The motivation for doing this derives from some well-known problems in the theory of public goods.

The public good problem results from the supply characteristics of a public good. If we posit a rational choice model in which each individual citizen is specified as having a utility function including social and private goods, then each citizen is assumed to maximize his utility subject to income and price constraints. Aggregating over-all individuals provides an aggregate demand curve for private and social goods. A major deficiency of this approach in the case of the demand curve for social goods involves the lack of true revelation of preference for the public good component of social goods because of the characteristic of nonrival consumption.[7] Economic

---

[7]The term "social goods" is used in this study to describe goods provided by the public sector. The term "public goods" will refer to those goods only having the characteristic of nonrival consumption. Most of the social goods provided in the public sector in all countries have a

preference for a public good is manifested in the marginal evaluation schedule of an individual which relates tax price to quantity of a public good demanded. However, each individual does not independently control the provision of a public good to himself, and, once a given unit of a public good is produced, it can be made available to more than one individual at a trivial marginal cost. This characteristic of a public good is often termed "jointness of supply" (Head, 1962, pp. 52-54). Because of this characteristic, an individual generally has a tendency to conceal his true preferences for a public good either by clever but unpredictable bargaining behavior in a small number situation or by being a "free rider" in the more empirically relevant large number situation (Musgrave and Musgrave, 1973, pp. 72-74). In the latter case, the individual knows that whether or not he pays for it, he can consume the public good along with those who do pay for it. Thus the marginal evaluation schedule of the individual will not be truly revealed, and individual economic preference will be rendered a nonoperational concept. In order to induce citizens to reveal their preference for public goods, the theory of social goods posits a political process whereby citizens vote for alternative budget programs. In doing so, citizens reveal their preferences for public goods, though such preferences may be

---

greater (defense) or lesser (education) public good component.

imperfectly registered because of problems inherent in the voting process (Musgrave and Musgrave, 1973, Chapter 4).

As can be seen, the true revelation of preference for social goods by the individual citizens is unlikely except through the political process. Even within a representative democracy, the voting paradox and unpredictable voting strategies mitigate against the political outcome aggregating individual citizen preferences in a representative way. Of more importance for studies involving diverse LDCs is the fact that democratic voting processes may be severely constrained or nonexistent in many LDCs. Therefore, the assumption that budget choices by fiscal decision makers are derived from estimated individual demand curves for social goods is quite dubious.

As a result of the problem of determining the demand for a social good, the international tax effort models previously presented have relegated the demand side of social good provision to the residual, a measure of ignorance. That is, the free rider problem at the individual citizen level, voting problems at the fiscal decision maker level, and the existence of only limited democratic processes in many LDCs all mitigate against identifying the aggregate demand for social goods. Thus the international tax effort model attempts to specify the tax share as a function only of supply side factors, and this is called the taxable capacity of a country. These supply side factors are permissive in the sense of allowing more taxes

to be collected, though they do not require that they be collected. Tax effort then consists of some unknown level of preference for social goods and some unknown willingness of fiscal decision makers to tax.

The problem with this approach involves an implicit assumption underlying the international tax effort model. A cross-country regression equation over LDCs is assumed to reflect changes which would occur in each country over time. If this were not the case, neither in-country fiscal decision makers nor international aid and lending agencies could draw any policy prescriptions from these models. The international tax effort model assumes that LDCs proceed through fiscal stages over time. For example, the increasing use of direct rather than indirect taxes, and the decline in the tax share derived from customs duties were changes that evolved in the tax structure of today's MDCs when they were developing (Musgrave, 1969, Chapter Six). A similar, though not necessarily identical (Musgrave, 1969, pp. 72, 123-124, 133-136), tax structure evolution is assumed by cross-country tax share models using LDCs. In the context of the previous discussion, this assumption means that the regressors chosen to predict taxable capacity in an international tax effort model are supposed to pick up only supply influences on taxable capacity and that these are the only ones that change systematically as a country develops. That is, the idea that the influence of aggregate social good preference can be predicted to some degree must

be rejected since preference for social goods is part of the unpredictable residual, or tax effort, in an international tax effort model.

The idea that increases in the level of development influence ability to pay taxes in a predictable way but not preference for social goods seems implausible. Countries in the earliest stage of development choose public goods predictably as they grow, limiting their expenditures to administrative expenses, law enforcement and defense and basic infrastructure capital goods such as harbors, railroads and power facilities. The need and preference for such goods is obvious and not a matter of ignorance as previous tax effort models must be interpreted. Aggregate indicators such as Y_i/P and Ag/Y_i surely capture increasing social good preference along with expansion and creation of tax bases. Therefore, a broader conception of the taxable capacity of an LDC would allow an international tax effort model to capture these increases in social good preference as part of taxable capacity.

The third methodological problem with previous international tax effort models stems from the deficient data base used to estimate the taxable capacity equation in a tax effort model and the use of proxy regressors for more fundamental variables. Data on taxes, aggregate income and components thereof are known to contain errors, and the use of such data negates the desirable properties of the estimators. Hypothesis testing of the significance of

regression parameters becomes a questionable exercise, though virtually all previous studies have engaged in it. When there are measurement errors in the data, at least two approaches can be taken. First, accurate data can be obtained, if possible. In lieu of obtaining error free data, alternative estimators, such as maximum likelihood estimators or instrumental variable estimators, can be employed and are consistent. The assumptions needed to obtain consistent maximum likelihood or instrumental variable estimators are quite strong,[8] and so this study opted for selection of more accurately measured proxy regressors. It should be noted, however, that even with the new interpretation of the tax effort model offered in this study, the regressors used are still proxies for more fundamental influences on taxable capacity. Consequently, errors in the variables can be assumed, and the hypothesis tests used must not be taken too seriously.

An Alternative Concept of Taxable Capacity

This study has argued that the tax base availability notion used by Lotz and Morss and others fails to delineate taxable capacity in the sense of ability to pay taxes and/or ability to tax. Furthermore, this study argues that a

---

[8] One must know either the error variances or the ratio of the error variances in order to obtain consistent maximum likelihood estimators. Instrumental variables are arbitrarily chosen, and this approach assumes that each instrumental variable chosen is independent of all errors of observation (Johnston, Chapter 6).

broader conception of taxable capacity than that implied by the ability to pay taxes and/or ability to tax is more appropriate for the purposes for which the tax effort model is used. And when this new conception of taxable capacity is provided with a more appealing theoretical foundation, a greater range of proxies for taxable capacity is implied, some of which have fewer measurement problems than do the traditional level of development indicators.

A major theoretical problem with previous international tax effort models has been that the level of analysis has never been specified. Taxable capacity has been assumed to derive from either the ability of the citizenry to pay taxes or the ability of fiscal decision makers to tax, or both. Likewise, the tax effort that remains in the residual has been assumed to derive from either the preference of the citizenry for social goods or the willingness of fiscal decision makers to tax, or both. Without specifying the relationship between the citizenry and the actual decision makers of tax and expenditure changes, the international tax effort model does not address key policy issues.

For example, if a country has a low tax effort, does this mean that fiscal officials have not worked hard enough to generate tax revenues which could be obtained? Or does a low tax effort merely mean that the citizenry has a low level of taste for social goods? Either or both interpretations are consistent with the tax effort models previously

developed. But each interpretation does not necessarily lead to the same policy conclusion. A fiscal decision maker might believe that the low tax effort of his country was due to a lack of preference for social goods, and that this attitude was not beneficial for the country in terms of its long term growth prospects. Consequently, he would undertake educational and promotional efforts to convince the citizenry of the need for more social goods in order that taxes could be raised without political repercussions. On the other hand, the fiscal decision maker might believe that he should be more willing to tax the citizenry for social goods because the preference for them was extant. In this case, the fiscal decision maker would concentrate on raising taxes immediately without any educational or promotional efforts. Similarly, a high tax effort could be interpreted as deriving from an "excessive" taste for social goods by the citizenry, in which case an international lending agency would hardly be disposed to provide aid to feed this social good gluttony. On the other hand, were the high tax effort viewed as the result of hard work in assessing and enforcing taxes by fiscal officials, then an international aid agency might be more eager to reward such fiscal intrepidity with aid, since it would be convinced that such aid would be productively employed. Hence the international tax effort model as previously interpreted fails to reveal taxable capacity and tax effort in a meaningful way for policy purposes because the model has failed to specify the

relationship between the two levels of analysis implied in previous models.

Ideally, an international (or national) tax effort model should determine the tax share a country should attain in order to maximize long term economic growth, if the latter is viewed as the major policy goal. The theoretical (public good problems) and empirical difficulties of discovering an optimal tax share have prompted a more modest approach. International tax effort models have been motivated by the attempt to determine some average tax share that an LDC can reasonably be expected to attain, given predictable environmental change over which it has no control but to which it can adapt. And this motivation provides a more appropriate conception of taxable capacity.

This study defines the taxable capacity of a country as the tax share generated in a country as a result of the common adaptation of fiscal decision makers[9] to predictable changes in the socioeconomic environment in which they act. Tax effort is conceived as deriving from particular in-country differences in the socioeconomic environment to which an individual fiscal decision maker can adapt to some unknown degree. This approach foregoes the distinction

---

[9]The fiscal decision makers in the model are the high level politicians who ultimately are responsible for tax and expenditure decisions, not the civil service bureaucrats who administer these decisions. The "individual" fiscal decision maker generally consists of more than one person, but at the level of aggregation employed, the damage done by this heuristic device is not severe.

between supply and demand influences because it is felt that these influences cannot be separately identified, conceptually or empirically, at the level of analysis chosen. And it is the contention of this study that, in any case, at the individual citizen level, both ability to pay taxes and preference for public goods change systematically as development proceeds. We argue that an international tax effort model proves more useful for policy purposes if taxable capacity is specified as a function of these variables that are believed to affect LDCs generally over time, whether or not these variables can be characterized as supply side or demand side influences. There is no justification for the a priori assumption that ability to pay tax (supply) factors are predictable over time while preference for social goods (demand) factors are not predictable over time. By focusing on the fiscal decision maker as the choosing actor in the model, the approach herein allows for an unambiguous interpretation of a low tax effort as deriving from the fiscal decision maker's unwillingness to fully exploit a country's taxable capacity. Similarly, a high tax effort derives from the willingness of the fiscal decision maker to overexploit a country's taxable capacity. However, a normative interpretation can be placed on these actions only if a high tax effort is associated with a higher long term rate of growth than is a low tax effort. This relationship will be explored in Chapter V.

In the next section, the fiscal decision maker model will be outlined.

The Fiscal Decision Maker Model

The present model assumes that the choosing actor in the international tax effort model is a fiscal decision maker who pursues his political survival as his primary objective.[10] The fiscal decision maker wishes to make those tax and expenditure choices that maximize the probability of his reelection or reappointment to his position. Four variables are assumed to determine all tax and expenditure choices by fiscal decision makers: social good preference of groups and individuals in the society, tax resistance of groups and individuals in society, the cost of tax administration, and fiscal custom. The previous tax effort models that have been employed have used "level of development" and "openness" variables to predict taxable capacity. In terms of the fiscal decision maker model, a "level of development" variable will be interpreted as a predictable response of a fiscal decision maker to a common amalgamation of social good preference and tax resistance activity that occurs in LDCs over time. An "openness" variable will be primarily

---

[10] Peter Heller (1975) has developed an interesting model of fiscal behavior for a group of African LDCs. In Heller's model a set of budgetary decision makers is assumed to maximize their utility subject to institutional constraints. The utility function of the budgetary decision maker is specified by positing target levels for various kinds of taxes and expenditures along with the actual levels of these variables. His is not, however, a tax effort model.

interpreted as measuring the cost of tax administration, the hypothesis being that the trade sector has some economies of scale associated with taxing it.

Social good preference and tax resistance are assumed to change systematically over time in a developing LDC because of the increase in societal complexity over time which affects these variables in a predictable way. And this increase in societal complexity is reflected in a change in role playing by the fiscal decision maker as tax resistance and social good preference respond to this change in societal complexity. And in order to understand this approach, the concepts of tax resistance, societal complexity and role playing by fiscal decision makers need to be explained.

The model developed in the present study assumes that fiscal decision makers respond to two separate kinds of pressure: the tax resistance of the populace and the social good preference of the populace. That citizen tax resistance activity is largely differentiable from citizen activity designed to generate social goods becomes obvious once we examine such behavior from the point of view of an individual citizen. From the point of view of an individual citizen separable tax resistance arises for three reasons. First, tax prices are coerced, and, because they are not levied on a quid pro quo basis, a citizen may often feel that the tax price is not worth the social good benefit. Second, because countries do not create specific taxes as

permanent institutions, a citizen always has some possibility of reducing or avoiding a given tax through political behavior. Third, the citizen knows that there exist alternative means, borrowing and money creation, to finance a desired social good and these may be personally less financially painful in the short run.

There usually is no direct connection between the actual provision of a given social good and its individual tax price.[11] Consequently, it is quite rational for a citizen who desires a given social good to resist tax increases to pay for it since he may feel that the money to pay for this good can come from existing taxes now being used for social goods which give him little satisfaction. Much of this kind of tax resistance could be reduced were social goods provided with more scale and quality variations. However, the tremendous economies of scale associated with the provision of one scale and quality of social goods such as roads, bridges and schools negates this kind of multiple scale and quality of provision.

Even if the citizen is quite satisfied with the tax price he attributes to a given social good, he will have an incentive to reduce or eliminate his taxes since this need not negate the provision of the social good. The citizen may support legislation to create or expand tax exemptions, tax deductions and tax credits, he may reduce the activities

---

[11] Taxes levied on a quid pro quo basis are excluded from the data used to test the model in Chapter IV.

on which the tax is levied, and he may try to avoid compliance with the tax if he feels that the possibility of doing so without penalty is great. Predictable changes in the environment which imply more tax avoidance behavior will reduce the taxable capacity of an LDC.

A third reason for citizen tax resistance activity separate from that to promote more social goods arises because a citizen knows that a given social good can be financed by means other than taxes, means which he may feel reduce the price he pays for the social good. When faced with strong tax resistance by the citizenry, fiscal decision makers have often demonstrated their willingness to resort to these other means of financing in order to survive politically.

Societal complexity is an important concept that helps explain the relative changes in preference for social goods and tax resistance as an LDC develops. But before a technical definition of societal complexity is provided, a more descriptive view of a less complex or fiscally simple LDC illuminates the approach.

Countries at the lowest stages of development are characterized by traditional modes of behavior and attitudes which imply limited consumption horizons, including a limited preference for specific social goods. Comparisons of traditional attitudes and behavior as compared to modern attitudes and behavior have been attempted in the literature, but the key variables that transform traditional

attitudes and behavior to modern attitudes and behavior have not been agreed on. For the purposes of this study, the key behavioral characteristic of the modern man is that he perceives the opportunity for permanent economic gain and acts on that perception. The traditional man does not perceive the opportunity for permanent economic gain but rather seeks to maintain his customary economic standard of living. Both types of behavior are rational responses to the perceived environment.

Key economic variables confronted by a traditional man, specifically weather and crop disease, are often unpredictable and economically uncontrollable in a traditional environment. Information concerning changes in such variables is often received abruptly. Marginal adjustments once a crop has been planted for a while become improbable. In such a high risk environment, a strategy of maximizing expected resiliency or ability to recover is quite rational.[12]

Therefore, many of the social goods that might seem necessary to fiscal decision makers in MDCs, such as

---

[12]The assumption that traditional attitudes derive rationally from a high risk environment receives empirical support from studies showing that social returns to investment in agricultural research in LDCs (which primarily reduce experimenting risk) are quite high (Hayami and Ruttan, 1971, pp. 40-42). Hayami and Ruttan also pointed out (1971, pp. 194-198) that in Southeast Asia, rice yields per hectare increased slowly in spite of steep declines in input prices in two periods because of the economic infeasibility of investing in the necessary crop breeding research by individual farmers. Yields increased after the necessary research was undertaken by various public and quasi-public agencies.

increased administrative capability and more capital infrastructure will not be perceived as beneficial by the rural citizenry in traditional sectors of LDCs. Improved roads to urban areas and financial intermediaries will be viewed as unnecessary by rural citizenry because such facilities are untested in their view and because a goal of permanent economic gain appears to be unfeasible.

Social good preference which does emerge will often be generalized or nonspecific, and there is a tendency to look to government political leadership for guidance in public matters (Pye, 1966, pp. 81-85, 107-112). Fiscal decision makers in fiscally simple LDCs will tend to provide basic communication facilities (Pye, 1966, Chapter 8), general administrative expenses (Kamarck, 1971, p. 74), law enforcement and defense, and some fundamental infrastructure capital goods such as harbors, railroads and power facilities. As the development ethic slowly permeates the economic system, citizens and fiscal officials begin to look outward and emulate the consumption standards of citizens from other countries. Indeed, much interest in specific social goods stems from the "demonstration effect" on government decision makers.[13] A partial test of the

---

[13]As is well known, the term, "demonstration effect," was first used in an international context to describe the tendency of higher income individuals in LDCs to emulate consumption standards of their income class counterparts in MDCs (Nurkse, 1953, pp. 63-67). More recently, Prest (1972, p. 18) has suggested that the demonstration effect may be more important for social goods as compared to private goods expenditures as it affects central

demonstration effect on fiscal decision makers can be made by relating taxable capacity across LDCs to components of government expenditures that are thought to be generated largely by cross-country emulation by fiscal policy makers in LDCs. Data limitations allowed only the use of educational expenditures per capita (Ed/P) divided by aggregate income per capita (Y_2/P) to adjust for the fact that higher income countries will have previously committed themselves to substantial educational expenditure programs in the past. An ordinary least squares regression of T/Y_2 regressed on Ed/Y_2 resulted in the Ed/Y_2 regressor being positively and significantly (1 percent level) to T/Y_2 for 31 LDCs designated as less complex or fiscally simple.[14]

While there will be a slowly and predictably growing preference for social goods in less complex LDCs, resistance to a rise in existing taxes and to new forms of taxation can be quite effective, as evidenced by the paucity of the land tax take in LDCs (Kaldor, 1963; Lewis, 1974). The traditional explanations for the low taxation level in such economies have been that there are too few tax handles (Musgrave, 1969, pp. 118-121) or that traditional elites obstruct taxation of potentially large tax bases,

---

government decision making through communication with international agencies and government officials from other countries.

[14]For nine fiscally complex LDCs, the Ed/Y_2 regressor was insignificant at the 10 percent level. See Appendix C for the results.

particularly land (Hirschman, 1963, Chapter 2). This study has earlier argued that the tax handle or tax base availability thesis, as interpreted, loses its explanatory appeal when examined closely. And while the traditional elite hypothesis is not disputed for those countries in which they have not been removed from effective political power, it should be emphasized that tax resistance by the general, nonelite rural populace can be expected to be substantial as well. Rural citizenry are not aware of the possibilities of shifting their activities to avoid taxes and, in any case, the opportunities for this kind of tax avoidance are more limited in the agricultural sector. Consequently, the rural citizen is likely to strongly resist tax increases on him and, because they comprise a majority of the populace in less complex LDCs, such tax resistance is likely to be quite effective.

As can be seen, a low level of complexity is implied by a largely rural citizenry with limited consumption horizons who have a low level of economic and informational interaction with political decision makers. Systems of communication and exchange interaction are not well developed, and political decision makers take the responsibility for gathering information and discovering the needs of the citizenry. Such fiscally simple LDCs will be characterized by a low but growing preference for social goods along with a high level of tax resistance in the agricultural sector. The traditional sector will still be

politically dominant or at least highly influential because of the number of citizenry there and, in some cases, because of the traditional orientation of political elites. The modern sector will have a higher level of social good preference than the rural sector, but the modern sector will also have a lower level of tax resistance. Consequently, the cost of the growing public sector will be borne substantially by the modern sector of a less complex LDC. The tax structure will be heavily dependent on administratively cheap and politically feasible indirect taxes such as modern sector consumption duties, customs duties, and export taxes. Fiscal decision makers will tend to emulate the social good expenditure patterns of LDCs in similar circumstances and that of the MDCs through contact with international agencies.

Because of the serious constraint on taxable capacity from an administrative cost standpoint, we would expect those countries with similar economic structures but a lower cost of tax administration to be able to generate more tax revenue relative to aggregate product. One way to assess this factor is to differentiate those LDCs of recent colonial heritage from those not having had this development. Both France and Great Britain established within their dependencies a reasonably efficient civil service that was not dismantled with the coming of independence in the countries in which it existed. We would expect these former dependencies to have a higher taxable capacity because the

existence of a substantial administrative apparatus permits better tax assessment and compliance.[15] This is not to deny that the administrative machinery of the civil service in a former dependency may be stymied somewhat from acting as efficiently as before independence due to the conflicting behavioral styles of the civil service and fiscal decision makers, particularly in the immediate post-colonial period (Horowitz, 1972, Chatper 14). However, the existence of fiscal machinery in situ to exploit tax bases more efficiently is such a strong positive tax capacity factor that its effects should not be dominated by the above conflict in a post-independence LDC. This study argues that the administrative machinery established in the colonial period provides a superior ability to generate tax from a base regardless of the "effort" put forth by the fiscal decision maker. To label a historical development that is largely independent of current fiscal decision maker's actions as tax effort or willingness to tax would seem to be against the spirit of the tax effort model.

A more technical definition of societal complexity can be made in terms of the capacity of an economic system to exchange both information and goods and services. A

---

[15] Hinrichs and Bird (1963, p. 436) and Thorn (1967, p. 38) argued that revenue shares are higher in LDCs that were former British dependencies. Weiss, on the basis of his sample and the use of a dummy variable for former United Kingdom dependencies (1969, p. 361), rejected any difference between the former United Kingdom dependencies and the other LDCs in his sample.

system is said to be more complex when the potential for informational and economic interaction grows. There are four phenomena that define system complexity. First, the greater the number of nodes or points of potential interaction, the greater is the system complexity. Second, the greater the number of routes or avenues through which "interaction" can take place, the greater is the system complexity. Third, the greater the information and economic storage and processing capacity of each node, the more complex is the system. Fourth, the greater the information and economic capacity of each route, the greater is system complexity. When one of these four components of system complexity increases, migration of people to the economic system of greater complexity is encouraged. Furthermore, these four determinants of system complexity are mutually determinant. More nodes stimulate more routes, more routes stimulate more nodes, greater node capacity stimulates more nodes and routes, and greater route capacity sitmulates more nodes and routes. The result is that the complexity of a system increases nonlinearly as each of the four components increases. The effect of increases in societal complexity on tax resistance and social good preference induces a fundamental change in behavior of fiscal decision makers as they switch from leadership to representative roles in seeking to survive politically. It is this new level of societal complexity and change from a leadership to representative role playing that distinguishes fiscally simple

from fiscally complex LDCs. The choosing actors in the model are the fiscal decision makers who ultimately make tax and expenditure choices in response to the pressure of individual citizens and groups of citizens in a society. These fiscal decision makers play two roles in all societies: a leadership role and a representative role.

In his leadership role, the fiscal decision maker searches for and generates information about fiscal choices not generally available to the populace. For most of the populace, the fiscal decision maker functions as a generator, not as a receiver, of information about social goods. This behavior occurs when social good preference is primarily qualitative or general, deriving from fundamental aspirations of the populace for economic development, a greater sense of community and a consistent structure of rules and laws. Consequently, it is the responsibility of the fiscal decision maker to specify many of the particular social goods that will serve these general aspirations. In less complex or fiscally simple LDCs, such leadership behavior will be the rule. As noted earlier, there are obvious (to the fiscal decision maker and small modern sector of citizens) social good needs in the form of basic administrative expenses and capital infrastructure which all LDC fiscal leaders would attempt to provide as part of a development program. And they will look to other LDCs in similar circumstances and the historical experience of MDCs (through contact with international organizations) to help

guide some of these expenditure decisions--the international demonstration effect. However, as an LDC grows, such leadership declines in importance relative to representative behavior.

In his representative role, the fiscal decision maker weights, aggregates, and ultimately expresses specific kinds of preference for social goods and tax resistance by the tax and expenditure decisions he makes. This kind of role playing becomes necessary in order for the fiscal decision maker to survive politically as an LDC becomes more complex. Greater complexity implies greater informational and economic stocks and flows in society. The populace is now generating more information about social good needs which are becoming quite specific. At the same time, tax resistance activity by the now growing urban or modern sector has increased greatly. It is this nexus of a high level of preference for specific social goods and a high level of tax resistance activity that defines the milieu in which fiscal representative role playing becomes effective. A fiscally complex society is characterized by this milieu and thus fiscal leadership behavior. The fiscal decision maker in a fiscally complex LDC will confront the fact that various individuals and societal groups have strong preferences for particular social goods of varying quantity and quality. He must also confront the fact that the modern sector will no longer acquiesce in having its taxes raised, and, in any case, the administratively easy tax bases such

as luxury consumption taxes and customs duties, have already been heavily taxed. In offering policy packages that give political expression to the nexus of a high level of specific social good preference and a high level of tax resistance, the fiscal decision maker attempts to resolve conflicts over many specific values.

Societal Complexity and Fiscal Choice

Why does increased system complexity imply a substantial increase in social good preference and in tax resistance activity? Since this results in a shift from leadership to representative role playing by fiscal decision makers which defines fiscal complexity in the present study, the answer to this question provides the rationale for the fiscally simple-fiscally complex dichotomy made. This study argues that social good preference rises partially because the shift in the population from a traditional, rural environment to a modern, urban environment[16] creates a preference for goods that are efficiently provided by the public sector. Furthermore, social good preference will increase because, as societal complexity increases, expected individual tax costs will fall substantially. And, with respect to tax resistance, increased

[16] The urban sector in LDCs includes traditionally oriented residents (artisans), and the rural sector in the LDCs includes modern residents (agribusiness professionals). But this four-way classification adds little to our analysis since the shift in population from rural to urban areas does imply that relatively more population is modern as time passes.

societal complexity induces a fall in the cost of tax resistance activities, which implies that tax resistance activities increase.

The primary reason for the relative rise in urban population in LDCs has been rural to urban migration (Yotopoulos and Nugent, 1976, p. 224). And, what evidence exists suggests that a significant motivation for such migration has been the desire for greater economic opportunity and material gain.[17] In an urban environment which rewards nontraditional and changing job skills, the ability to acquire and store information and the ability to travel cheaply are important. The urban resident will therefore have a strong demand for communications and transport media, much of which can be efficiently provided by the government. But of even more importance in providing greater pressure for social goods is the recognition by the urban citizen that it is possible to have and utilize a good provided through the public sector without having to pay a tax price for it. By shifting his economic activities or by using other tax avoidance measures gained by political pressure (such as exemptions, deductions, and tax credits), the citizen can reduce or avoid paying the tax price for a social good he consumes. And, as a system becomes more complex, such tax avoidance becomes more likely. That is,

---

[17] Limited evidence suggests that rural unemployment rates are higher than urban unemployment rates (Yotopoulos and Nugent, 1976, p. 205).

the expected tax cost to an individual for a given social good, falls as a society becomes more complex. The effect of this fall in expected tax cost is to further increase the preference for social goods since they are perceived as cheaper in comparison to private goods. An individual's expected tax cost falls when a system becomes more complex because of the rise in the total number of taxable activities relative to a rise in the number that an individual could engage in. That is, an individual citizen perceives an increasingly lower probability of being taxed for a given proposed social good since the volume of taxable activities is increasing faster than his ability to participate in them. Thus, perceived social good costs fall relative to private good cost as societal complexity increases.

The cost of tax resistance activities also falls as a society becomes more complex primarily because of the ability of the citizenry to interact with one another and with political representatives at a lower cost. The greater spatial concentration of people in an urban environment (more nodes), the greater number of transport and communication facilities (more routes) and technological changes in communication facilities to store and process political information (more node and route capacity) imply that a given unit of time can be more effectively utilized in order to avoid or reduce taxes. That is, the cost of tax resistance activity declines. Consequently, a citizen in an LDC that is becoming more complex will both demand more

social goods and offer more tax resistance. In this kind of an environment a fiscal decision maker may be confronted with the fact that he must provide more social goods in order to survive politically, but he must not raise taxes in order to survive politically. Money creation to finance the desired social goods may be the preferable alternative to the fiscal decision maker.

Implications for the International Tax Effort Model

The international tax effort model is viewed in this study as derived from the more fundamental fiscal decision maker model just discussed. The fiscal decision maker model has a number of implications for the international tax effort model.

One important implication of the previous discussion is that LDCs should be grouped into two separate categories for the purpose of fiscal comparisons: fiscally simple and fiscally complex LDCs. While separation of MDCs from LDCs has previously been accepted because of presumed structural differences which bear on taxable capacity, the separation of LDCs into more than one group on the basis of theory has not been previously considered. The model developed herein suggests that the combination of high tax resistance and high social good preference forces the fiscal decision maker in a complex LDC to play a leadership role. In this role the fiscal decision maker must creatively search for ways to provide for social goods. Fiscal decision makers must look

inward and observe the desires of the citizenry closely. Social good and tax choices will be shaped by in-country, dynamic situational factors that need not be similar to those of other LDCs at the same level of development. Consequently, we do not expect crude indicators of the "level of development" (the nexus of social good preference and tax resistance) or "openness" (the cost of tax administration) to capture the level or pattern of tax structure development in a cross section ordinary least squares regression equation. That is, there is no easily predictable level or pattern of tax structure development for LDCs that are fiscally complex. The international tax effort model should not be used with these LDCs.

Another implication of the fiscal decision maker model is that taxable capacity is more appealingly defined when the tax base availability notion is abandoned. The international tax effort model is more useful for policy purposes when taxable capacity is specified as a function of those variables that are believed to affect LDCs generally over time, whether or not these are tax base availability (supply) factors or social good preference (demand) factors. The unexplained tax share that remains derives from the willingness or unwillingness of the fiscal decision maker to further tax the citizenry of an LDC.

An interesting aspect of the present approach to explaining tax effort is the interpretation given to the residual in the regression equation. Should proxies for the

three tax capacity variables that determine tax and social good expenditure choices of fiscal decision makers be discovered which almost completely explain taxable capacity econometrically, then little possibility of tax effort is implied for any fiscally simple LDCs. That is, if the taxable capacity of an LDC is defined as the tax share generated in a country as a result of the common adaptation of fiscal decision makers to predictable changes in the socioeconomic environment in which they act, and, if taxable capacity is well explained, then fiscal decision makers have virtually no tax choices to make that could affect the level of tax share. Then the tax share level for fiscally simple LDCs would be almost completely determined by the process of development itself. Regardless of the tax and social good expenditure choices made by a presumably politically powerful fiscal decision maker, the tax share level will be largely determined by socioeconomic variables over which the decision maker has no control. Or to put the matter differently, as the residual in the taxable capacity equation, a measure of our ignorance of determinants of taxable capacity, is reduced, the fiscal decision maker has less ability to influence the tax share outcome by the choices he makes. The fiscal decision maker model employed in the present study leaves this possibility open, but it remains quite unlikely that taxable capacity can be this well explained.

The new interpretation of taxable capacity specifies the tax share as a function of factors that determine it apart from the specific choices made by the fiscal decision maker. Consequently, common historical institutional developments in LDCs that influence the tax share independently of current fiscal choices made by the fiscal decision maker should be counted as part of taxable capacity. The model developed herein implies that the superior administrative machinery (i.e., lower administrative tax cost) existing in situ for former colonial dependencies gives them an advantage in raising taxes that is independent of the degree of tax effort models by fiscal decision makers. Yet previous tax effort models, by not accounting for this fact, have implicitly defined this institutional development as tax effort. Chapter IV provides data which allow former British and former French dependencies to be delineated and this historical development to be counted as part of the taxable capacity of an LDC.

Another implication of the model employed in this study is that monetary indicators of development such as Ag/Y_i and Y_i/P do not have any inherent advantages over nonmonetary indicators of development. Since this study argues that the traditional level of development indicators are more appropriately viewed as proxies for changes in societal complexity (which bears on social good preference and tax resistance), then indicators that attempt to proxy

societal complexity will be more appropriate than the traditional indicators. Ideally, a complete societal interaction index could be developed to test the fiscal decision maker model, but at present the data to specify it are not available.[18] As an alternative to a more complete societal interaction index, partial indexes or a single factor index of societal complexity can be employed. Such indexes may be a major improvement over the traditional indicators in several respects.

A major problem with the use of aggregate income indicators of development is their unreliability. This derives from the use of a nonequilibrium exchange rate conversion in some cases, and, in other cases, it derives from the misleading use of even equilibrium exchange rates, which are generated from traded goods and services only, to measure the value of all final goods and services in a country. A major problem with using the agricultural share derives from the undervaluation of the agricultural sector in LDCs. Thus when a country becomes more complex and modern systems of accounting are developed, the fall in the measured agricultural share is exaggerated by some unknown amount. Because less traditional nonmonetary indicators do not suffer from these problems, their use need not be

---

[18] I discovered this in an earlier attempt to gather a communications and transportation index. Appendix F indicates how such a societal interaction index would be formed.

negated because they are less comprehensive than Y_i/P or Ag/Y_i.

Telephones per capita was selected as a one factor indicator of societal complexity because of the high quality of the data (relative to other available data) and because of its obvious connection with interaction through communications. As noted earlier, all tax effort models suffer from errors-in-variables, and this negates the desirable properties of the structural parameters estimated. The Tele/P proxy mitigates the observational error considerably as compared with traditional regressors. However, because it does not completely define complexity, Tele/P must still be presumed to suffer from measurement error in the sense that it does not completely measure what it purports to.

A partial index of societal complexity based on the basic need for food and the desire for a long life by citizens in LDCs was also employed in this study. An index of protein per capita, calories per capita, and average life span was constructed (ILPRCL). The assumption in using this index was that all three components could be expected to increase as the higher living standards associated with greater societal complexity increased.

A final implication of the more precise interpretation of taxable capacity and tax effort offered by the present approach is that, for the international tax effort model to be used for policy purposes, tax effort must be related to the major policy objectives of an LDC. This

study assumes that the major policy goal of LDCs in general is the maximization of their long term growth rate. Unless tax effort is correlated with the long term growth rate (or some combination of desirable policy goals), then there is no particular virtue in a high tax effort nor any particular sin in a low tax effort. Consequently, in Chapter V, the relationship between the tax effort for fiscally simple LDCs and their long term growth rate is examined and discussed.

In Chapter IV, fiscally simple LDCs will be empirically separated from fiscally complex LDCs, taxable capacity proxies will be examined, the taxable capacity equations will be specified, regression results and hypotheses will be discussed, and cross country tax effort rankings will be compared as derived from alternative taxable capacity equations. Chapter V includes an evaluation of the present approach, a discussion of the policy implications, and a suggestion for an agenda for further research.

CHAPTER IV

DATA UTILIZED, MODEL SPECIFICATION, EVIDENCE, AND TAX EFFORT RANKINGS

Delineation of Fiscally Simple and Fiscally Complex LDCs

During the initial phase of the study an attempt was made to include all countries in the analysis for which data from readily assessable published sources could be obtained that included estimates of central and noncentral government taxes, population, aggregate product, income generated by the agricultural sector, and merchandise exports and imports. The restrictions imposed were that the countries had to be politically independent during the period examined, that average Y_2/P was less than $800 for the period, and that the above data were available for multiple and equivalent years during this period. This initial screening procedure resulted in the acquisition of data for 69 countries which were classified as less developed.

In order to delineate fiscally simple from fiscally complex LDCs, three variables were employed: the level of per capita aggregate income, the secular growth rate of per capita aggregate income, and the level of urbanization.

It was hypothesized that LDCs with a high Y_2/P relative to other LDCs had to have undergone substantial structural-behavioral changes in the past and could be considered as fiscally complex on this account alone. Selection of the Y_2/P threshold was based on the empirical evidence presented by Due (1970, Appendix) which indicated significant changes in tax share composition for countries with Y_1/P greater than \$500.[1] Since Due's data were taken from the mid-1960s, the period from which most of the data in this study were taken, using the \$500 figure seemed a less arbitrary procedure than simply halving the already arbitrary dividing line (\$800) between LDCs and MDCs in order to obtain high and low income LDCs.[2]

It was also hypothesized that structurally changing, complex LDCs must be growing secularly faster than less complex LDCs. The achievement of a continuing and substantial rate of growth is a necessary condition for a low income LDC to be considered as developing in the sense of achieving substantial forward momentum with respect to increases in aggregate product. LDCs that had an average annual rate of growth of Y_1/P less than the average for the countries in our sample for the period 1960-1969 (2.1

---

[1]The percentage of total tax revenue derived from customs duties, excise taxes, and all indirect taxes falls substantially for countries with a Y_1/P greater than \$500. Such changes are not revealed by Due's data at lower levels of Y_1/P.

[2]We use Y_2/P instead of Due's Y_1/P.

percent)[3] were considered as fiscally simple and the remaining countries were considered as fiscally complex if they also passed a third urbanization test.

The size of the urban sector critically affects both preference for social goods and tax resistance in the model developed herein. Thus, it was hypothesized that only LDCs with above average levels of urbanization relative to the rest of the sample could generate the combination of high preference for social goods and high tax resistance that induces representative role playing by the fiscal decision maker in fiscally complex LDCs. Countries that had an average urbanization share greater than the average for the entire LDC sample (30.4 percent)[4] were considered to be fiscally complex if they also passed the secular growth rate test.

The full hypothesis was that those countries revealing complex fiscal structures would have either a Y_2/P greater than $500 or else would have both higher than the sample average levels of urbanization and long-term growth rates in per capita aggregate product. This procedure resulted in 17 of the 69 countries in the sample being selected as fiscally complex, of which 10 had a Y_2/P greater

---

[3]Source (16) provided Y_1/P growth rate estimates at factor cost for all of the countries in our sample for the period 1960-1969. Data sources are given and numbered in Appendix D.

[4]We used the percentage of total population defined as urban by the country itself as given in sources (15) and (6, 1972).

than $500.[5] Of these 10 countries, Chile and Uruguay both had growth rates of Y_1/P less than the sample average, a result not necessarily unexpected since fiscal decision makers of countries having achieved a substantial amount of structural-behavioral change in the past need not be pursuing policies in a later period which sustain secular growth. That is, substantial structural-behavioral change or increased societal complexity is a necessary but not a sufficient condition for obtaining an increase in long-term growth rate in per capita product. Inappropriate monetary, fiscal, and incomes policies by decision makers or large externally induced shocks may negate the effects of structural change.

The Tax Share

Dependent variables other than the tax share have been used in past public share studies, and these were considered during the initial stages of the study. Current government revenue to national income (R/Y_i) was rejected because nontax forms of revenue that are levied on a *quid pro quo* basis are included in the current government revenue figure. Aggregate government expenditures to national income (E/Y_i) was rejected because of data unavailability

---

[5]The ten countries include South Africa, Jamaica, Trinidad and Tobago, Panama, Chile, Argentina, Uruguay, Singapore, Greece, and Spain. The other seven fiscally complex LDCs include Mexico, Nicaragua, Jordan, Iran, Iraq, West Malaysia, and Malta.

across LDCs and because of the serious difficulty of separating expenditures derived from taxation from those derived from other revenue sources such as foreign aid, a development budget financed by bond issuance, or from autonomous agencies financed by user charges.

Thus the present tax effort model followed Lotz and Morss in using the predicted tax share as the measure of taxable capacity and in using a two to four year average for the tax share as well as all independent variable observations, with only a few noted exceptions.[6] Unlike previous tax effort studies, the data for all variables employed were taken from a relatively small group of generally available sources so that cross checks are possible.

Tax Revenue includes central and noncentral government direct and indirect taxes as defined by the U.N., which includes social security. Also included are marketing board profits, licenses, registration fees, and stamp duties since all of these are assumed to be substitutes for direct and indirect taxes. Fees for services, government property receipts, and other nonfiscal receipts were excluded. GDP in market prices at current value was used for most countries. GNP was substituted for an unavailable GDP only when the historical difference between them was less than

---

[6]Data sources for tax revenue included (1), (3), (4), (6), and (11). Tax share data and all other data employed in testing the model are given in Appendix D.

2 percent of the smaller figure or when GNP was the larger figure of the two.[7]

During the initial phase of the study, preliminary and revised figures for taxes and GDP were examined to determine how substantial the revisions had been. Previous studies have noted a downward bias of aggregate income figures when preliminary estimates are used (Denton and Oksanen, 1973). For 40 countries in the present study for which data are available, the general conclusions reached are that nonestimated tax figures generally remain subsequently unchanged. Estimated tax figures reveal a downward bias as indicated by subsequent revision. GDP figures showed some tendency to be biased downward when first recorded.[8] Consequently, we employed the latest tax and GDP figures available for the year we were interested in. No estimated central government tax figures were knowingly included in our data, and an attempt was made to use GDP figures which had had a chance for revision. Local tax

---

[7]The former U.N. System of National Accounts (1960-1969) was used in all cases. Source (2) was the primary source supplemented by sources (3) and (11).

[8]Using the 1966 and 1970 U.N. Statistical Yearbook to compare tax and GDP figures in equivalent years, it was found that estimated tax figures (including provisional results, revised estimates, voted estimates and draft estimates) were revised upward by 5 percent or more in 23 revisions and revised downward by 5 percent or more in 11 revisions out of 66. Nonestimated tax figures were overestimated or underestimated by no more than 3 percent in 58 cases out of 63. GDP figures were revised upward by 5 percent or more in 21 revisions and revised downward by 5 percent or more in 3 revisions out of 104 total.

figures were estimated in a few cases as noted in Appendix E.

Monetary Level of Development Proxies

The traditional indicator of development, Y_i/P, has been used in most previous public share studies, including those of Lotz and Morss. Y_2/P will be employed in the present study as well to compare the tax effort rankings derived from it with those derived from nonmonetary indicators of development or societal complexity. However, as earlier noted, Y_i/P suffers from the well-known exchange rate conversion problem wherein only internationally traded goods are valued. And it suffers additionally from distortions due to differences in internal rates of inflation since exchange rate adjustment generally lagged behind relative changes in inflation rates in LDCs during the fixed exchange rate period from which the data used are taken. In the context of the present model, Y_i/P is expected to be a crude proxy for the increase in societal complexity that defines the level of development and determines the taxable capacity of LDCs.

An alternative indicator of development levels, Ag/Y_i, has been used in a previous tax effort model (Bahl, 1971) and will also be employed in this study. The Ag/Y_i regressor does have the advantage of being unaffected by suspect exchange rates, and it changes slowly over time. As a measure of the changes which occur in fiscally simple LDCs

which lead to a higher tax share, Ag/Y_i would seem to be a fine proxy. It does suffer from the fact that aggregate agricultural sector income figures in LDCs are known to be unreliable (Webster, 1974, p. 45), though the bias is well known. Agricultural sector income is generally understated relative to nonagricultural sector income because much of the traditional component of the agricultural sector is nonmonetized and goes uncounted by national income account statisticians. This means that as citizenry migrate from the agricultural to the nonagricultural sector in LDCs, T/Y_i will rise, since levels of taxation are higher in the non-agricultural sector. Thus Ag/Y_i falls and T/Y_i rises, and the expected relationship results because of unmeasured agricultural product in the national accounts. However, LDCs undergoing substantial structural change invariably become more monetized due to the feedback effects on the agricultural sector of a growing modern sector in urban areas of LDCs. Consequently, we would expect Ag/Y_i to rise because of the reduction in measurement error, other things being equal, even though the tax share might be rising. For this reason we felt that Ag/Y_2 would not be a significant regressor in the tax share equation for fiscally complex LDCs even if one believes that the fiscally simple-fiscally complex dichotomy is not appealing.[9]

---

[9]Also, if agricultural modernization were a policy goal in fiscally complex LDCs, correctly measured Ag/Y_i could rise, and this would hardly be indicative of retrogression in development. For the 1960s period from which

Openness Proxies

In previous tax effort models, various share measures of the merchandise foreign trade sector have been used to predict T/Y_i. The rationale for inclusion of an openness variable in past studies has derived either from the interpretation of a large trade share as "available" in the sense of being a cheaply administered tax base or more broadly in the sense of capturing changes associated with modernization such as increasing monetization, urbanization, and commercialization of the economy. By including the concept of tax resistance in a tax effort model, we can also consider the merits of the argument that trade bases are taxed because there is less tax resistance to them in LDCs. This is true because much of the foreign trade sector in LDCs is foreign owned and managed, and so there may be less tax resistance by the citizenry in this sector because of their lack of political influence. Or, in the case of mining exports, a seller's market in minerals implies that the imposition of trade or production taxes will engender little aggregate tax resistance because of cost pass-through possibilities.[10]

Specification of the tax share as a function of the mining exports share, Xmn/Y_2, and nonmining exports share,

---

the data were taken, modernization of agriculture was a primary goal of few, if any, fiscally complex LDCs.

[10] Prest (1972, p. 67) argues that there are few countries for which this rationale applies, particularly in the long run.

$(X-Xmn)/Y_2$, separately allows one to test for the coexistence of political feasibility and economic feasibility of the openness variable as separate influences on the tax share. Also, when the trade share is included as an independent variable along with per capita aggregate income or the agricultural share, an obvious problem arises if one believes that the two variables move together as an LDC develops, and since exports minus imports is included in GNP and GDP. This problem can be handled with the per capita aggregate income proxy for development by subtracting the relevant trade statistic from aggregate income, $(Y_2-X)/P$, and then using the trade share as an additional independent variable to pick up noncomplexity influences.

In the context of the present model, one would expect a rising foreign trade share to help explain a rising tax share along with a level of development proxy for fiscally simple LDCs because of the low cost of tax administration of trade base taxes with few political complications. However, for fiscally complex LDCs, tax resistance is high and rising over time, and this will be reflected in the resistance to continued taxation of imported luxury goods by the growing urban middle class and in the resistance to new taxation on imported raw materials and parts by the indigenous industrial sector as import

substitution industrialization proceeds.[11] Also, the growing involvement of the indigenous citizenry in the export sector implies a higher and rising level of tax resistance there. Consequently, a rising export, import, or mining share of aggregate income is not expected to adequately predict changes in the tax share for fiscally complex LDCs.

Nonmonetary Level of Development Proxies

Using the fiscal decision maker model, monetary indicators of the level of development of LDCs are not inherently superior to nonmonetary indicators, and, in fact, may be inferior to them. At a preliminary stage of the study, several nonmonetary indicators were considered on the basis of data availability and data reliability. Telephones per capita (Tele/P) was chosen because the data were available for a large number of LDCs for contiguous years, and telephone figures are considered relatively accurate. As a key communications vehicle, Tele/P should reflect communication interaction which is an important determinant of societal complexity. It was hypothesized that an indicator measuring a major type of interaction might crudely proxy changes in complexity in a fiscally simple LDC.

---

[11] Due (1970, pp. 54-55) points out that the customs duty to total tax ratio shows no statistical relation to Y_2/P at income levels below \$500 Y_2/P and that as imports switch from manufactures to materials and parts, custom duties fall.

In order to specify taxable capacity as a function of a standard of living index which rises as a result of increases in societal complexity, an index was deemed desirable if it had the following three characteristics: it should change slowly over time; it should proxy relatively permanent standard of living changes; and it should have no particular directional bias associated with observational errors of the components. Consequently, an index of calories per capita, protein per capita and average life expectancy at birth was constructed. Each of these components of the index was divided by the sample country average and given equal weight in the index, denoted as ILPRCL.[12] The rationale for using this index derived from the presumption that all three components of the index rise regularly with increases in societal complexity in an LDC. Both the calories per capita and the protein per capita components of ILPRCL were thought to proxy changes in income distribution across countries since increases in country food intake are generally believed to go primarily to the poor (United Nations, World Economic Survey 1969-1970, 1971, p. 28).[13] The life expectancy component of ILPRCL was

---

[12] ILPRCL = ((Grams per person per day of protein in country A ÷ mean country grams per person per day of protein + daily per person caloric intake in country A ÷ mean country daily per person caloric intake + life expectancy at birth of both sexes in country A ÷ mean country life expectancy at birth of both sexes) X 100) 3.

[13] However, Adelman and Morris (1973, pp. 178-181) argue that income distribution becomes less equally distributed as Y_i/P rises for very low income LDCs and only

thought to proxy relatively permanent improvements in health per se, as do the other two components to some extent. The life expectancy component also implies a longer individual and institutional planning horizon, a lower individual time preference and an individual economic management process stressing the possibility of attaining greater material well-being rather than the necessity of maintaining one's subsistence.

Since the ILPRCL proxy was thought to better capture the kinds of changes that eventually lead to fiscal complexity, it was hypothesized that this proxy would explain taxable capacity for fiscally complex LDCs if any single proxy would. Nevertheless, the logic of the fiscal decision maker model suggests that neither this proxy, nor any other should well explain taxable capacity for fiscally complex LDCs.

The Hypotheses

A major implication of the development of the fiscal decision maker model and the concept of societal complexity used in this study is that LDCs should be grouped into two separate categories for the purpose of fiscal analysis. Those countries designated as fiscally complex will fail to reveal a taxable capacity that is dependent upon the simple

---

begins to become more equally distributed at higher levels of Y_i/P. Their empirical support for this proposition tends to bear this out (1973, Appendix C). If this result also applies to societal complexity, then ILPRCL would be misspecified in a linear regression equation.

indices of the level of development and openness that have been traditionally employed in such models. While caution should be exercised in interpreting the results of the hypotheses tests of the significance of regression equations because of errors-in-variables, such tests will be presented to provide weak confirming or disconfirming evidence of the need to separate out these two groups of LDCs. That is, tax share regression equations including alternative level of development (societal complexity) indicators and openness (cost of tax administration) indicators will be run on the fiscally simple and fiscally complex samples taken separately, and the significance of the regression equations will be examined.

A second important hypothesis generated from the revised definition of taxable capacity and the fiscal decision maker model used in this study is that colonial heritage has given former dependencies an administrative advantage in tax assessment and compliance relative to other LDCs. That is, the administrative cost of taxing any given base will be lower for former British and French dependencies because of the institutional development of a strong civil service during the colonial period. Consequently, these former dependencies are expected to reveal a significantly larger tax capacity than other LDCs. The dummy variables for both former French and former British dependencies are expected to be positive and significant for fiscally simple LDCs.

A third hypothesis that follows from the concept of societal complexity and its influence on fiscal decision making is that monetary indicators of the level of development or societal complexity can predict the tax share as well as more traditional monetary indicators. Consequently, the nonmonetary indicators used in this study, Tele/P and ILPRCL, are expected to be significant regressions when employed in an ordinary least squares regression equation.

A final hypothesis that follows from the specification of tax effort as deriving from the willingness of the fiscal decision maker to tax the citizenry is that if a high or low tax effort is to be given a normative interpretation, then tax effort must be significantly correlated with the long term rate of growth for fiscally simple LDCs.[14] The policy implications of a high or low tax effort are much stronger both for the in-country fiscal decision maker and a potential international lending or grant agency if tax effort is positively related to the long term rate of growth of LDCs. Therefore, a ten year average (1960-1969) rate of growth will be correlated with the tax effort index to determine whether or not there is a significant relationship.

---

[14]Tax effort and the long term rate of growth could be mutually dependent. An LDC might have a high tax effort because of some structural factors associated with a high long term rate of growth. Or, of course, a high long term rate of growth could be dependent on a high tax effort if the government is viewed as the primary sector initiating development.

The Taxable Capacity Equations

The taxable capacity equations were specified as conforming to the standard assumptions of the classical linear regression model (Kmenta, 1971, pp. 347-348). Taxable capacity proxies for the level of development (societal complexity) and openness (cost of tax administration) entered the model in simple linear form as there was no a priori reason to specify them otherwise. The regressors used included five proxies for the level of development (Y_2/P, Y_2-X/P, Ag/Y_2, Tele/P, ILPRCL) and three proxies for openness (X/Y_2, Xmn/Y_2, $X-Xmn/Y_2$). In addition, dummy variables for former French dependencies (D_1) and former British dependencies (D_2) were included in the models for the fiscally simple LDCs.

The total sample of 69 LDCs were divided into 17 fiscally complex and 52 fiscally simple LDCs. Of the 52 fiscally simple LDCs, 23 were former British dependencies, 17 were former French dependencies, and the remaining 12 had gained independence before the twentieth century. All former French dependencies were classified as fiscally simple LDCs, while 16 former British dependencies were classified as fiscally simple LDCs. The regression equations employed are given below.

(1) $T/Y_2 = b_1 + b_2Y_2/P + c_1D_1 + c_2D_2$

(2) $T/Y_2 = b_1 + b_2Y_2/P + b_3X/Y_2 + c_1D_1 + c_2D_2$

(3) $T/Y_2 = b_1 + b_2Y_2/P + b_3Xmn/Y_2 + c_1D_1 + c_2D_2$

(4) $T/Y_2 = b_1 + b_2Y_2/P + b_3Xmn/Y_2 + b_4(X-Xmn)/Y_2 + c_1D_1 + c_2D_2$

(5) $T/Y_2 = b_1 + b_2(Y_2-X)/P + c_1D_1 + c_2D_2$

(6) $T/Y_2 = b_1 + b_2(Y_2-X)/P + b_3X/Y_2 + c_1D_1 + c_2D_2$

(7) $T/Y_2 = b_1 + b_2(Y_2-X)/P + b_3Xmn/Y_2 + c_1D_1 + c_2D_2$

(8) $T/Y_2 = b_1 + b_2(Y_2-X)/P + b_3Xmn/Y_2 + b_4(X-Xmn)/Y_2 + c_1D_1 + c_2D_2$

(9) $T/Y_2 = b_1 + b_2Ag/Y_2 + c_1D_1 + c_2D_2$

(10) $T/Y_2 = b_1 + b_2Ag/Y_2 + b_3X/Y_2 + c_1D_1 + c_2D_2$

(11) $T/Y_2 = b_1 + b_2Ag/Y_2 + b_3Xmn/Y_2 + c_1D_1 + c_2D_2$

(12) $T/Y_2 = b_1 + b_2Ag/Y_2 + b_3Xmn/Y_2 + b_4(X-Xmn)/Y_2 + c_1D_1 + c_2D_2$

(13) $T/Y_2 = b_1 + b_2Tele/P + c_1D_1 + c_2D_2$

(14) $T/Y_2 = b_1 + b_2Tele/P + b_3X/Y_2 + c_1D_1 + c_2D_2$

(15) $T/Y_2 = b_1 + b_2Tele/P + b_3Xmn/Y_2 + c_1D_1 + c_2D_2$

(16) $T/Y_2 = b_1 + b_2Tele/P + b_3Xmn/Y_2 + b_4(X-Xmn)/Y_2 + c_1D_1 + c_2D_2$

(17) $T/Y_2 = b_1 + b_2ILPRCL + c_1D_1 + c_2D_2$

(18) $T/Y_2 = b_1 + b_2ILPRCL + b_3X/Y_2 + c_1D_1 + c_2D_2$

(19) $T/Y_2 = b_1 + b_2ILPRCL + b_3Xmn/Y_2 + c_1D_1 + c_2D_2$

(20) $T/Y_2 = b_1 + b_2ILPRCL + b_3Xmn/Y_2 + b_4(X-Xmn)/Y_2 + c_1D_1 + c_2D_2$

Equations (1), (9), (13), and (17) were specified to compare the significance of monetary and nonmonetary indicators of development as they bear on the tax share. Equation (2) is the Lotz and Morss model and equation (11) is the Bahl model, both with the addition of dummy variables representing colonial heritage. Equations (5) through (8) were felt to be more appealing than the Lotz and Morss and Bahl models on theoretical grounds, since they allow the elimination of a bias in these models. Equations (4), (8), (12), (16), and (20) permit the separation of two kinds of

openness influences on the tax share.[15] In the next section the empirical results will be examined.

Empirical Results

Tables 2, 3, 4, 5, and 6 below summarize the regression results. All three hypotheses advanced receive at least moderate support from this evidence. The principle hypothesis that LDCs should be divided into two groups, fiscally simple and fiscally complex, and that single equation linear regressions will not explain taxable capacity for fiscally complex LDCs receives moderate support from the regression results. Of the 20 equations employed, no equations for the fiscally complex LDCs are significant at the 1 percent level, and only seven equations ((1), (5), (6), (7), (8), (17), (19)) are significant at the 5 percent level. For fiscally simple LDCs, all but one equation is significant at the 1 percent level.[16]

The hypothesis that the tax administration system created in former British and French colonial dependencies has provided these countries with additional tax capacity for this reason alone receives strong support from the regression results. Dummy variables for former French

---

[15] An equation of the form, $T/Y_1 = b_1 + b_2(Y_1-X)/P + b_3MN/Y_2 + b_4(X-Xmn)/Y_1$, which is similar to equation (8), has apparently been used by the Fiscal Affairs Department of the International Monetary Fund for deriving tax effort indices in developing countries (Bahl, 1971, footnote 42).

[16] Equation (17) is significant only at the 5 percent level.

TABLE 2

OLS ESTIMATES OF COEFFICIENTS IN TAX SHARE REGRESSIONS USING INCOME PER CAPITA AS THE DEVELOPMENT INDICATOR*

EQ No.	Sample	Y_2/P	b_1	D_1	D_2	X/Y_2	Xmn/Y_2	$(X-Xmn)/Y_2$	SSE	$\bar{R}^2$	F^{k-1}_{n-k}
(1)	69	.01388 (4.96)	9.540 (8.08)	3.4579 (2.58)	2.6325 (2.27)				1090	.2584	8.897
(1)	52fs	.02793 (5.62)	5.967 (4.35)	4.9355 (4.05)	5.7849 (4.63)				579.6	.4312	13.89
(1)	17fc	.01371 (2.21)	9.702 (2.93)						287.7	.1945	4.863
(2)	69	.01364 (4.55)	9.481 (7.80)	3.397 (2.47)	2.4902 (1.90)	.00940 (.240)			1089	.2475	6.591
(2)	52fs	.02399 (3.74)	5.953 (4.34)	4.5234 (3.50)	4.8689 (3.11)	.06118 (.973)			568.2	.4306	10.64
(2)	17fc	.01399 (2.239)	10.59 (3.06)			-.0442 (-.94)			270.7	.1880	2.852
(3)	69	.01274 (4.76)	9.391 (8.39)	3.0675 (2.40	1.9079 (1.69)		.14164 (2.068)		960.7	.3361	9.605
(3)	52fs	.02402 (4.65)	6.644 (4.86)	4.3018 (3.53)	4.7722 (3.66)		.10790 (2.068)		531.3	.4676	12.20

TABLE 2--Continued

EQ No.	Sample	Y_2/P	b_1	D_1	D_2	X/Y_2	Xmn/Y_2	$(X-Xmn)/Y_2$	SSE	$\bar{R}^2$	F^{k-1}_{n-k}
(3)	17fc	.01595 (2.40)	7.729 (1.98)				.11306 (.970)		269.6	.1913	2.893
(4)	69	.01382 (4.93)	9.679 (8.50)	3.3132 (2.58)	2.5243 (2.06)		.12149 (2.39)	-.0512 (-1.24)	937.8	.3416	8.057
(4)	52fs	.02586 (4.08)	6.806 (4.81)	4.4431 (3.53)	5.1753 (3.37)		.09003 (1.43)	-.0421 (-.510)	528.3	.4590	9.655
(4)	17fc	.01720 (2.62)	8.217 (2.15)				.09437 (.823)	-.0620 (-1.30)	238.8	.2286	2.581

*T-values are given in parentheses below the coefficient estimates.

TABLE 3

OLS ESTIMATES OF COEFFICIENTS IN TAX SHARE REGRESSIONS USING ADJUSTED INCOME PER CAPITA AS THE DEVELOPMENT INDICATOR*

EQ No.	Sample	Y_2-X/P	b_1	D_1	D_2	X/Y_2	Xmn/Y_2	$(X-Xmn)/Y_2$	SSE	$\bar{R}^2$	F^{k-1}_{n-k}
(5)	69	.01724 (4.92)	9.205 (7.42)	3.8418 (2.79)	3.6125 (2.97)				1094	.2555	8.777
(5)	52fs	.03376 (4.33)	5.843 (3.40)	5.2651 (3.80)	6.3656 (4.38)				691.6	.3213	9.049
(5)	17fc	.01394 (2.53)	11.20 (4.71)						266.8	.2529	6.416
(6)	69	.01820 (5.39)	7.611 (5.67)	3.8189 (2.89)	2.5215 (2.03)	.09066 (2.56)			992.3	.3143	8.791
(6)	52fs	.02645 (3.43)	5.024 (3.09)	4.4581 (3.36)	4.2987 (2.79)	.14976 (2.85)			590.0	.4087	9.812
(6)	17fc	.02075 (2.75)	6.685 (1.59)			.07985 (1.29)			238.4	.2848	4.186
(7)	69	.01695 (5.28)	8.669 (7.56)	3.5655 (2.82)	2.8136 (2.48)		.16893 (3.64)		906.6	.3735	11.13
(7)	52fs	.03050 (4.26)	6.147 (3.93)	4.505 (3.52)	5.0193 (3.63)		.16744 (3.33)		559.7	.4391	10.98

TABLE 3--Continued

EQ No.	Sample	Y_2-X/P	b_1	D_1	D_2	X/Y_2	Xmn/Y_2	$(X-Xmn)/Y_2$	SSE	$\bar{R}^2$	F^{k-1}_{n-k}
(7)	17fc	.01656 (2.83)	9.180 (3.18)				.13375 (1.20)		242.0	.2741	4.020
(8)	69	.01743 (5.38)	8.041 (6.22)	3.5994 (2.85)	2.4530 (2.07)		.18251 (3.79)	.04060 (1.05)	890.9	.3745	9.143
(8)	52fs	.02852 (3.73)	5.766 (3.50)	4.3813 (3.38)	4.5602 (3.02)		.18416 (3.34)	.05637 (.763)	552.7	.4341	8.824
(8)	17fc	.02355 (3.06)	4.538 (1.02)				.21812 (1.74)	.08140 (1.34)	212.5	.3136	3.437

*T-values are given in parentheses below the coefficient estimates.

TABLE 4

OLS ESTIMATES OF COEFFICIENTS IN TAX SHARE REGRESSIONS USING AGRICULTURAL SHARE AS THE DEVELOPMENT INDICATOR*

EQ No.	Sample	Ag/Y_1	b_1	D_1	D_2	X/Y_2	Xmn/Y_2	$(X-Xmn)/Y_2$	SSE	$\bar{R}^2$	F^{k-1}_{n-k}
(9)	69	-.2216 (-6.8)	20.63 (17.3)	3.2366 (2.77)	1.5065 (1.47)				879.9	.4013	16.19
(9)	52fs	-.2741 (-8.9)	21.74 (17.5)	4.2169 (4.51)	3.9164 (4.18)				364.6	.6422	31.51
(9)	17fc	-.1118 (-.75)	18.60 (6.43)						367.3	-.028	.5610
(10)	69	-.2288 (-6.4)	21.13 (13.9)	3.3456 (2.80)	1.7534 (1.55)	-.0189 (-.53)			876.1	.3945	12.08
(10)	52fs	-.2519 (-7.2)	20.13 (11.5)	3.9975 (4.25)	3.3300 (3.23)	.0572 (1.31)			351.9	.6474	24.41
(10)	17fc	-.1769 (-1.1)	21.20 (5.71)			-.0624 (-1.1)			337.9	-.014	.8920
(11)	69	-.2029 (-5.8)	19.83 (15.1)	2.958 (2.51)	1.2042 (1.16)		.06889 (1.42)		853.1	.4104	12.83
(11)	52fs	-.2618 (-7.4)	21.25 (14.9)	4.0515 (4.19)	3.6874 (3.71)		.03272 (.714)		360.7	.6385	23.52

TABLE 4--Continued

EQ No.	Sample	Ag/Y_2	b_1	D_1	D_2	X/Y_2	Xmn/Y_2	$(X-Xmn)/Y_2$	SSE	$\overline{R}^2$	F^{k-1}_{n-k}
(11)	17fc	-.1115 (-.72)	18.49 (5.87)				.01464 (.115)		366.9	.1006	.2690
(12)	69	-.2136 (-5.9)	20.72 (13.7)	3.1210 (2.64)	1.6895 (1.51)		.01479 (.929)	-.0145 (-1.2)	834.5	.4141	10.64
(12)	52fs	-.2529 (-6.9)	20.11 (11.4)	4.0169 (4.16)	3.3355 (3.19)		.05443 (1.09)	-.06154 (1.08)	351.8	.6398	19.12
(12)	17fc	-.1828 (-1.1)	21.06 (5.47)				-.0154 (-.12)	-.0689 (-1.1)	333.6	-.078	.6150

*T-values are given in parentheses below the coefficient estimates.

TABLE 5

OLS ESTIMATES OF COEFFICIENTS IN TAX SHARE REGRESSIONS
USING Tele/P AS THE DEVELOPMENT INDICATOR*

EQ No.	Sample	Tele/P	b_1	D_1	D_2	X/Y_2	Xmn/Y_2	$(X-Xmn)/Y_2$	SSE	$\bar{R}^2$	F^{k-1}_{n-k}
(13)	69	97.237	12.13	2.6096	1.8972				1267	.1379	4.627
		(3.48)	(12.3)	(1.84)	(1.54)						
(13)	52fs	252.03	9.464	4.7521	4.8127				708.8	.3044	8.439
		(4.13)	(8.53)	(3.48)	(3.58)						
(13)	17fc	53.194	14.60						350.5	.0188	1.307
		(1.14)	(6.87)								
(14)	69	93.454	11.37	2.4354	1.1280	.05718			1226	.1526	4.061
		(3.35)	(10.3)	(1.72)	(.846)	(1.46)					
(14)	52fs	208.13	7.489	4.1053	2.9734	.16703			574.4	.4243	10.40
		(3.65)	(6.39)	(3.27)	(2.21)	(3.32)					
(14)	17fc	50.530	15.50			-.0343			340.3	-.021	.8380
		(1.06)	(6.02)			(-.65)					
(15)	69	103.11	11.33	2.4500	1.0657		.18723		1037	.2832	7.717
		(4.03)	(12.3)	(1.89)	(.928)		(3.77)				
(15)	52fs	232.88	9.346	4.0553	3.5917		.17568		562.3	.4365	10.88
		(4.22)	(9.36)	(3.26)	(2.85)		(3.50)				

TABLE 5--Continued

EQ No.	Sample	Tele/P	b_1	D_1	D_2	X/Y_2	Xmn/Y_2	$(X-Xmn)/Y_2$	SSE	$\bar{R}^2$	F^{k-1}_{n-k}
(15)	17fc	72.412 (1.35)	13.09 (4.45)				.10473 (.755)		336.8	-.010	.9200
(16)	69	104.14 (4.01)	11.46 (11.2)	2.4793 (1.89)	1.1895 (.963)		.18335 (3.53)	-.0118 (-.28)	1036	.2728	6.101
(16)	52fs	216.92 (3.85)	8.364 (6.54)	3.9675 (3.20)	3.0718 (2.32)		.19988 (3.72)	.08658 (1.22)	544.7	.4423	9.088
(16)	17fc	74.093 (1.37)	13.89 (4.45)				.08715 (.615)	-.0463 (-.84)	319.2	-.031	.8330

*T-values are given in parentheses below the coefficient estimates.

TABLE 6

OLS ESTIMATES OF COEFFICIENTS IN TAX SHARE REGRESSIONS
USING ILPRCL AS THE DEVELOPMENT INDICATOR*

EQ No.	Sample	ILPRCL	b_1	D_1	D_2	X/Y_2	Xmn/Y_2	$(X-Xmn)/Y_2$	SSE	$\bar{R}^2$	F^{k-1}_{n-k}
(17)	69	12.633	.7585	2.5684	2.4022				1264	.1397	4.680
		(3.50)	(.195)	(1.81)	(1.92)						
(17)	52fs	11.152	.7041	3.4041	4.1041				889.3	.1273	3.479
		(1.97)	(.119)	(2.32)	(2.74)						
(17)	17fc	15.261	1.370						297.9	.1659	4.182
		(2.05)	(.182)								
(18)	69	12.889	-.601	2.4411	1.4273	.07469			1194	.1746	4.595
		(3.64)	(-.16)	(1.76)	(1.08)	(1.94)					
(18)	52fs	11.760	-3.07	3.0383	2.0902	.21351			657.4	.3412	7.602
		(2.39)	(-.59)	(2.38)	(1.50)	(4.07)					
(18)	17fc	14.765	2.109			-.0104			297.1	.1089	1.977
		(1.82)	(.245)			(0.20)					
(19)	69	14.286	-1.71	2.4831	1.5913		.20156		1001	.3081	8.570
		(4.38)	(-.49)	(1.96)	(1.40)		(4.10)				
(19)	52fs	12.068	-.625	2.8151	2.8637		.20328		691.7	.3068	6.643
		(2.39)	(-.12)	(2.14)	(2.08)		(3.67)				

TABLE 6--Continued

EQ No.	Sample	ILPRCL	b_1	D_1	D_2	X/Y_2	Xmn/Y_2	$(X-Xmn)/Y_2$	SSE	$\bar{R}^2$	F^{k-1}_{n-k}
(19)	17fc	24.827 (2.87)	-9.96 (-1.1)				.23719 (1.84)		239.8	.2806	4.121
(20)	69	14.272 (4.34)	-1.78 (-.50)	2.4737 (1.93)	1.5179 (1.24)		.20393 (3.97)	.00707 (.174)	1001	.2974	6.758
(20)	52fs	11.997 (2.45)	-2.53 (-.48)	2.8779 (2.25)	2.1312 (1.54)		.24227 (4.23)	.14850 (1.99)	636.8	.3479	6.442
(20)	17fc	-4.320 (-.46)	16.971 (2.36)				.20224 (1.43)	.00341 (.007)	255.4	.1749	2.131

*T-values are given in parentheses below the coefficient estimates.

dependencies (D_1) and former British dependencies (D_2) are positive and significant (5 percent level) for all 20 equations. And, for all equations except one,[17] an F distribution comparing each equation with and without the colonial heritage dummy variables yields, at the 1 percent level, a rejection of the null hypothesis that there are no positive colonial dependence effects on taxable capacity. If equation (8) is used, being a former British dependency is responsible for 31.8 percent of the tax share while being a former French dependency is responsible for 30.6 percent of the tax share on the average.[18]

The third hypothesis that nonmonetary measures of the level of development or societal complexity can predict taxable capacity also receives strong empirical support. In the eight equations employing nonmonetary variables (ILPRCL and Tele/P) to proxy societal complexity, all of the nonmonetary proxies have the appropriate sign and are significant at the 1 percent level, except equation (17), which is significant at the 5 percent level. The Tele/P equations are all highly significant for fiscally simple LDCs and

---

[17] Equation (17) has the least significance level (5 percent) when dummy variables are included as noted by an F test comparing the ratio of the change in regression sums of squares to the error sums of squares in the expanded equation, each divided by the appropriate degrees of freedom. $\frac{\Delta RSS/q-k}{SSE/n-q} = \frac{162.85/2}{889.3/4} = 4.395 > 3.19$ (critical F^2_{48}, .05). Thus we do not accept the null hypothesis negating the positive effect of colonial dependence on taxable capacity.

[18] Mean tax share for the 52 LDCs is 14.32.

insignificant (at the 5 percent level) for fiscally complex LDCs. This is particularly noteworthy for the Tele/P equations since this was considered to be the proxy which had the least measurement error associated with it. Consequently the high level of significance for the fiscally simple sample when using equation (13) and the lack of significance for the fiscally complex sample when using equation (13), can be taken more seriously than the other tests of hypotheses. And this result tends to confirm the fiscally simple-fiscally complex dichotomy made.

With regard to openness or cost of tax administration proxies, the results herein indicate that the significance of this proxy tends to vary depending on the level of development proxy used. In the Bahl equation ((11)), Xmn/Y_2 is not significant at the 10 percent level and in equation (10) X/Y_2 is just significant at the 10 percent level. Using Y_2/P as the level of development indicator reveals X/Y_2 to be insignificant at the 10 percent level (equation (2)), whereas Xmn/Y_2 is significant at the 5 percent level (equation (3)). However, in the $(Y - X)/P$ regressions, both X/Y_2 (equation (6)) and Xmn/Y_2 (equation (7)) are significant at the 1 percent level. In the Tele/P regressions, X/Y_2 in (14) and Xmn/Y_2 in (15) are significant at the 1 percent level. In the ILPRCL regressions, X/Y_2 in (18) and Xmn/Y_2 in (19) are also significant at the 1 percent level.

The use of two separate openness regressors, Xmn/Y_2 and $X-Xmn/Y_2$, in a taxable capacity equation allows for additional evidence to be brought to bear on the fiscally simple-fiscally complex dichotomy. The Xmn/Y_2 regressor is significant at the 1 percent level in the $(Y_2-X)/P$, Tele/P, and ILPRCL equations, at the 10 percent level in the Y_2/P equation and insignificant at the 10 percent level in the Ag/Y_2 equation for fiscally simple LDCs. However, only in equation (20) is the $(X-Xmn)/Y_2$ regressor significant at the 10 percent level or less. One inference that can be made from these results is that political feasibility plays a more important role in determining taxable capacity with respect to foreign trade bases than does economic feasibility in fiscally simple LDCs. On the other hand, Bahl argues (1971, p. 593) that Xmn/Y_2 picks up most of the same influence that X/Y_2 (or $(X-Xmn)/Y_2$ in our model) is supposed to, leaving little for the latter to explain. In the present model this means that Xmn/Y_2 variations capture tax share variations due to the low administrative cost of exploiting trade tax bases deriving from economic feasibility. However, this interpretation appears to be less plausible than the first one because the data do not support an ancillary inference that follows from the economic administrative feasibility rationale. If the tax share in LDCs rises because of the greater exploitation of the trade tax base as trade becomes more important, we should expect this rationale to apply to all LDCs, fiscally complex as

well as fiscally simple. Once institutional machinery for taxing a particular base becomes established, it is generally administratively cheaper to expand that base than to create administrative machinery to exploit a new tax base. And normally we should expect the efficiency of given administrative personnel to increase over time as they learn by doing. Unless other factors, such as political considerations, intervene, we would expect a rising tax share from a rising trade share across fiscally complex LDCs if we use an economic, rather than a political, feasibility rationale as implying a lower cost of tax administration. Whereas in our model, the growing political strength of the urban middle class in fiscally complex LDCs implies a substantial increase in tax resistance with respect to customs duties on imported manufactures and with respect to export taxation as the export sector begins to be better integrated with the indigenous elements of the economy. Consequently, the present model implies that there should be no predictable relation between the trade share and the tax share for fiscally complex LDCs.

The regression results provide confirming evidence for the latter hypothesis. Of the 15 equations for fiscally complex LDCs including X/Y_2, Xmn/Y_2, or Xmn/Y_2 and $(X-Xmn)/Y_2$ as the openness proxies, only three had openness proxies significant at the 10 percent level or less.[19] This result

[19] Equation (8) reveals Xmn/Y_2 and $(X-Xmn)/Y_2$ to be significant at the 5 percent and 10 percent levels.

is consistent with the model we have developed in which in-country political feasibility considerations have unpredictable effects on taxable capacity when a cross section regression is used. Because of the substantial collinearity between Xmn/Y and X-Xmn/Y , and because the lower cost of tax administration may in fact occur because of political feasibility considerations in addition to economic considerations, both openness proxies were included in the equations to be examined in the next section.

In the next section the presentation and interpretation of tax effort rankings derived from predicted tax shares is made. First, a comparison of tax effort over fiscally simple LDCs was made using the parameters generated by the Lotz and Morss (2) and Bahl (11) equations along with the theoretically more appealing equations (8), (12), (16), and (20), all of which included dummy variables for colonial dependency. Second, contrary to our a priori expectations, equation (8) worked well statistically for both fiscally simple and fiscally complex samples as well as the combined sample. We sought to determine whether or not the tax effort rankings are dissimilar for the fiscally complex sample when utilizing the equation (8) parameters generated

---

respectively, though the substantial changes in coefficients for $(X_2-Y)/P$ and Xmn/Y_2 compared to equation (7) suggest a specification error. In equations (19) and (20) Xmn/Y_2 is significant at the 5 percent level. Again, the substantial change in the ILPRCL coefficient from equation (19) to equation (20) suggests a specification error.

from all LDC observations, the fiscally simple sample, and the fiscally complex sample.

Tax Effort Rankings of Alternative Models

Table 7 provides actual tax shares and estimated taxable capacity for fiscally simple LDCs when equations (2), (11), (8), (12), (16), and (20) were used. Table 8 presents the tax effort indices and rankings for fiscally simple LDCs when these six equations were used. Table 9 presents the Spearman rank correlation coefficients to compare rankings for fiscally simple LDCs generated by equation (8) as compared to equations (2), (11), (12), (16), and (20) taken separately, and by equation (2) as compared to equation (11). The null hypothesis that the correlation between the compared rankings are equal to zero is rejected at the 1 percent level for all compared equations. That is, in the aggregate, there is no statistically significant difference between the compared rankings.

One inference that follows readily from the existence of a high degree of correlation in the tax effort rankings is that the use of nonmonetary level of development indicators generates similar overall tax effort rankings as compared to the use of monetary indicators for fiscally simple LDCs.

However, while aggregate tax effort rankings are not significantly different, particular LDCs change rank a great deal with alternative specification of the taxable capacity

TABLE 7

ACTUAL TAX SHARE AND ESTIMATED TAXABLE CAPACITY FOR FISCALLY SIMPLE LDCs USING SIX EQUATIONS*

Country	T/Y_2	$(\hat{T/Y_2})_2$	$(\hat{T/Y_2})_{11}$	$(\hat{T/Y_2})_8$	$(\hat{T/Y_2})_{12}$	$(\hat{T/Y_2})_{16}$	$(\hat{T/Y_2})_{20}$
Cameroon	13.397	14.018	11.594	14.842	13.121	14.509	15.106
Central African Republic	11.628	12.592	13.601	14.152	14.878	14.290	13.228
Chad	10.987	11.816	9.6889	12.493	10.772	13.465	14.773
Gabon	16.412	20.256	15.362	20.738	17.305	18.740	18.478
Dahomey	11.277	11.421	11.125	12.639	12.263	13.443	12.592
Ivory Coast	18.806	17.113	15.321	17.211	18.378	15.986	16.918
Mauritania	11.601	16.954	16.061	19.024	15.825	19.161	20.929
Niger	11.273	11.586	8.6879	12.810	9.467	13.234	14.518
Senegal	18.415	14.624	15.018	16.541	17.202	15.547	15.394
Togo	10.655	13.333	12.770	14.947	13.908	14.750	14.310
Upper Volta	12.250	10.690	11.256	11.780	12.273	12.946	12.893
Malagasy Republic	15.964	12.851	14.852	14.003	16.867	14.345	14.086
Mali	15.385	11.410	11.321	12.272	13.106	13.329	13.571

TABLE 7--Continued

Country	T/Y_2	$(\hat{T/Y_2})_2$	$(\hat{T/Y_2})_{11}$	$(\hat{T/Y_2})_8$	$(\hat{T/Y_2})_{12}$	$(\hat{T/Y_2})_{16}$	$(\hat{T/Y_2})_{20}$
Kenya	13.155	14.198	13.584	13.949	15.308	14.565	15.188
Tanzania	12.938	15.047	9.7684	13.652	10.994	14.744	13.718
Uganda	10.646	14.807	9.0229	14.268	9.9550	14.476	15.521
Malawi	8.4677	12.732	13.519	12.771	14.881	13.281	13.475
Mauritius	19.491	18.613	17.305	16.529	20.488	19.180	18.130
Zambia	29.067	22.900	25.773	24.979	24.913	25.094	25.952
Sierre Leone	11.767	15.104	16.484	17.333	16.610	16.113	15.747
Nigeria	9.6390	12.910	11.071	14.142	11.349	13.703	14.336
Ghana	13.712	14.471	14.587	17.664	15.960	13.980	12.696
Zaire	21.758	15.021	19.633	15.868	20.178	16.810	15.822
Ethiopia	8.4375	11.227	8.4920	7.719	5.198	9.3306	9.8896
Sudan	12.858	12.893	9.5583	13.691	10.179	13.315	13.773
Algeria	23.623	16.556	19.126	18.509	20.814	19.439	17.684
Egypt	18.518	12.771	15.237	14.640	16.468	14.642	16.032
Tunisia	24.569	13.886	18.340	16.892	20.266	16.771	15.991

TABLE 7--Continued

Country	T/Y_2	$(\hat{T/Y_2})_2$	$(\hat{T/Y_2})_{11}$	$(\hat{T/Y_2})_8$	$(\hat{T/Y_2})_{12}$	$(\hat{T/Y_2})_{16}$	$(\hat{T/Y_2})_{20}$
Dominican Republic	17.618	15.515	16.480	16.748	14.945	11.809	11.582
Haiti	9.6970	12.048	10.407	8.3475	7.639	9.614	9.7660
Guatemala	9.2807	14.939	15.477	13.946	13.686	10.928	10.927
El Salvador	10.811	16.064	15.194	12.820	13.905	11.983	12.082
Honduras	10.867	16.567	13.374	12.771	11.828	11.802	13.242
Costa Rica	14.655	17.668	16.304	16.842	15.078	14.834	14.960
Colombia	12.418	14.423	15.231	14.746	12.942	15.960	11.811
Guyana	20.363	20.726	19.187	20.644	20.740	21.702	21.085
Ecuador	15.809	14.147	14.259	12.056	12.289	11.476	11.079
Peru	17.244	16.017	18.006	16.439	15.904	13.113	12.845
Bolivia	12.368	14.397	18.794	12.658	15.543	13.693	12.822
Paraguay	8.1594	13.568	13.823	11.871	11.610	10.877	14.289
Afghanistan	5.9900	11.594	9.4930	7.439	6.552	9.487	10.621
Burma	18.300	12.441	14.781	12.824	16.225	12.873	12.492
Cambodia	16.838	12.382	12.692	13.885	14.250	13.419	13.177

TABLE 7--Continued

Country	T/Y_2	$(T\hat{/}Y_2)_2$	$(T\hat{/}Y_2)_{11}$	$(T\hat{/}Y_2)_8$	$(T\hat{/}Y_2)_{12}$	$(T\hat{/}Y_2)_{16}$	$(T\hat{/}Y_2)_{20}$
Taiwan	13.941	14.218	16.084	11.701	14.473	12.459	11.996
India	12.226	10.831	12.229	13.278	12.509	12.219	11.391
South Korea	9.9840	11.390	12.488	9.480	9.554	11.032	11.783
Thailand	12.602	13.094	14.351	9.709	12.232	10.310	12.442
South Vietnam	13.087	10.739	14.629	13.422	15.960	12.792	12.520
Sri Lanka	18.227	15.078	13.030	14.984	14.702	14.525	15.864
Philippines	9.4692	13.467	14.972	11.344	12.837	10.816	11.377
Turkey	14.997	12.866	13.449	13.062	10.721	11.105	13.397
Portugal	18.300	15.781	17.151	15.725	15.632	22.017	15.740

*The six equations employed are as follows:

Lotz and Morss (2) $T/Y_2 = 9.145 + .010867\ Y_2/P + .17454\ X/Y_2$

Bahl (11) $T/Y_2 = 21.77 - .21761\ Ag/Y_2 + .098363\ Xmn/Y_2$

(8) $T/Y_2 = 5.766 + 4.3813\ D_1 + 4.5602\ D_2 + .0285522(Y_2-X)/P + .18416\ Xmn/Y_2 + .056369(X-Xmn)/Y_2$

TABLE 7--Continued

Bahl (12) $T/Y_2 = 20.11 + 4.0169\ D_1 + 3.3355\ D_2 - .25293\ Ag/Y_2 + .054426\ Xmn/Y_2 + .061539(X-Xmn)/Y_2$

(16) $T/Y_2 = 8.364 + 3.9675\ D_1 + 3.0718\ D_2 + 216.92\ Tele/P + .19988\ Xmn/Y_2 + .086582(X-Xmn)/Y_2$

(20) $T/Y_2 = 2.533 + 2.8779\ D_1 + 2.1312\ D_2 + 11.997\ ILPRCL + .24227\ Xmn/Y_2 + .14850(X-Xmn)/Y_2$

TABLE 8

TAX EFFORT AND TAX EFFORT RANKINGS FOR FISCALLY SIMPLE LDCs
USING SIX EQUATIONS AND ACTUAL TAX SHARE

Country	T/Y_2	TE_2	TE_{11}	TE_8	TE_{12}	TE_{16}	TE_{20}	R_{T/Y_2}	R_2	R_{11}	R_8	R_{12}	R_{16}	R_{20}
Cameroon	13.397	.956	1.156	.903	1.021	.923	.887	24	28	14	32	25	28	35
Central African Republic	11.628	.923	.855	.822	.782	.814	.879	35	32	39	41	44	43	36
Chad	10.987	.930	1.134	.879	1.020	.816	.744	39	30	15	35	26	42	46
Gabon	16.412	.810	1.068	.791	.948	.876	.888	15	38	24	43	34	36	34
Dahomey	11.277	.987	1.014	.892	.920	.839	.896	37	23	27	33	36	40	32
Ivory Coast	18.806	1.099	1.227	1.093	1.023	1.176	1.112	7	19	10	21	24	14	18
Mauritania	11.601	.684	.722	.610	.733	.605	.554	36	46	44	52	48	52	52
Niger	11.273	.973	1.298	.880	1.191	.852	.776	38	26	7	34	9	38	43
Senegal	18.415	1.259	1.226	1.113	1.071	1.184	1.196	9	9	11	19	20	13	9
Togo	10.655	.799	.834	.713	.766	.722	.745	42	40	40	46	46	48	45
Upper Volta	12.250	1.146	1.088	1.040	.998	.946	.950	32	15	21	24	27	26	29
Malagasy Republic	15.964	1.242	1.075	1.140	.946	1.113	1.133	17	10	22	18	35	18	15
Mali	15.385	1.348	1.359	1.254	1.226	1.154	1.134	19	7	2	9	7	16	14
Kenya	13.155	.927	.968	.943	.859	.903	.866	25	31	30	29	40	32	37
Tanzania	12.938	.860	1.324	.948	1.177	.878	.943	27	35	6	28	12	35	30

TABLE 8--Continued

Country	T/Y_2	TE_2	TE_{11}	TE_8	TE_{12}	TE_{16}	TE_{20}	R_{T/Y_2}	R_2	R_{11}	R_8	R_{12}	R_{16}	R_{20}
Uganda	10.646	.719	1.180	.746	1.069	.735	.686	43	44	13	45	21	46	47
Malawi	8.4677	.665	.626	.663	.569	.638	.628	49	48	50	50	52	50	49
Mauritius	19.491	1.047	1.126	1.179	.951	1.016	1.075	6	21	17	13	33	20	20
Zambia	29.067	1.269	1.128	1.163	1.167	1.158	1.120	1	8	16	15	14	15	16
Sierre Leone	11.767	.779	.714	.679	.708	.730	.747	34	41	45	49	49	47	44
Nigeria	9.6390	.747	.871	.682	.849	.703	.672	47	43	37	48	41	49	48
Ghana	13.712	.948	.940	.776	.876	.981	1.080	23	29	32	44	39	24	19
Zaire	21.758	1.449	1.108	1.371	1.078	1.294	1.375	4	4	20	3	19	7	5
Ethiopia	8.4375	.752	.994	1.093	1.623	.904	.853	50	42	29	20	1	31	38
Sudan	12.858	.997	1.345	.939	1.263	.966	.934	28	22	3	30	5	25	31
Algeria	23.623	1.427	1.235	1.276	1.135	1.215	1.336	3	5	9	6	15	12	7
Egypt	18.518	1.450	1.215	1.265	1.124	1.265	1.155	8	3	12	7	17	8	12
Tunesia	24.569	1.769	1.340	1.454	1.212	1.465	1.536	2	1	4	1	8	2	1
Dominican Republic	17.618	1.136	1.069	1.262	1.179	1.492	1.521	13	16	23	8	11	1	2
Haiti	9.6970	.805	.932	1.162	1.269	1.009	.993	45	39	33	16	4	21	25
Guatemala	9.2807	.621	.600	.660	.678	.849	.849	48	50	51	51	51	39	39
El Salvador	10.811	.673	.712	.843	.777	.902	.895	41	47	46	38	45	34	33
Honduras	10.867	.656	.813	.851	.919	.921	.821	40	49	42	37	37	29	42

TABLE 8--Continued

Country	T/Y_2	TE_2	TE_{11}	TE_8	TE_{12}	TE_{16}	TE_{20}	R_{T/Y_2}	R_2	R_{11}	R_8	R_{12}	R_{16}	R_{20}
Costa Rica	14.655	.829	.899	.870	.972	.988	.980	21	37	34	36	30	23	26
Colombia	12.418	.861	.815	.842	.960	.778	1.051	30	34	41	39	32	44	22
Guyana	20.363	.982	1.061	.986	.982	.938	.966	5	24	26	25	28	27	27
Ecuador	15.809	1.117	1.109	1.311	1.286	1.378	1.427	18	18	19	4	3	4	4
Peru	17.244	1.077	.958	1.049	1.084	1.315	1.342	14	20	31	23	18	6	6
Bolivia	12.368	.859	.658	.977	.796	.903	.965	31	36	47	26	43	33	28
Paraguay	8.1594	.601	.590	.687	.703	.750	.571	51	51	42	47	50	45	50
Afghanistan	5.9900	.517	.631	.805	.914	.631	.564	52	52	49	42	38	51	51
Burma	18.390	1.478	1.244	1.434	1.133	1.429	1.472	10	2	8	2	16	3	3
Cambodia	16.838	1.360	1.327	1.213	1.182	1.255	1.278	16	6	5	11	10	10	8
Taiwan	13.941	.981	.867	1.191	.963	1.119	1.162	22	25	38	12	31	17	11
India	12.226	1.129	1.000	.921	.977	1.001	1.073	33	17	28	31	29	22	21
South Korea	9.9840	.877	.799	1.053	1.045	.905	.847	44	33	43	22	22	30	40
Thailand	12.602	.962	.878	1.298	1.0300	1.222	1.013	29	27	36	5	23	11	24
South Vietnam	13.087	1.219	.895	.975	.8200	1.023	1.045	26	11	35	27	42	19	23
Sri Lanka	18.227	1.209	1.399	1.216	1.240	1.255	1.149	12	12	1	10	6	9	13
Philippines	9.4692	.703	.632	.835	.738	.875	.832	46	15	48	40	47	37	41
Turkey	14.997	1.166	1.115	1.148	1.399	1.350	1.119	20	13	18	17	2	5	17
Portugal	18.300	1.160	1.067	1.164	1.171	.831	1.163	11	14	25	14	13	41	10

TABLE 9

RESULTS OF USING THE SPEARMAN RANK CORRELATION COEFFICIENT TO COMPARE ALTERNATIVE RANKINGS FOR FISCALLY SIMPLE AND FISCALLY COMPLEX LDCS

Equations Used	Sample	Spearman Coefficient
(2) and (11)	52 Simple	.7068
(8) and (2)	52 Simple	.7904
(8) and (11)	52 Simple	.6471
(8) and (12)	52 Simple	.7376
(8) and (16)	52 Simple	.8552
(8) and (20)	52 Simple	.8500
$(8)_{69}$ and $(8)_{52}$	17 Complex	.7279
$(8)_{69}$ and $(8)_{17}$	17 Complex	.7745
$(8)_{17}$ and $(8)_{52}$	17 Complex	.9485

equation. And since the purpose of generating tax effort indices and rankings is to assess the tax performance of individual LDCs in the sample, the aggregate results must be examined more closely to determine whether or not particular countries changed rank considerably. Given data inaccuracies and possible model misspecification, small differences in tax effort rankings between countries will have little influence on decision makers who might utilize these models. Consequently, only rank shifts of substantial size will be examined.

We chose to define a substantial shift in rank as one greater than 1/3 of that possible or 18 ranks for the fiscally simple sample of 52 LDCs. If we compare rankings generated by equation (8) with those generated by the other equations we find the following: for (8) and (2) there are 4 substantial ranks shifts; for (8) and (11), there are 11 substantial rank shifts; for (8) and (12), there are 7 substantial rank shifts; for (8) and (16), there are 2 substantial rank shifts; and for (8) and (20), there are 4 substantial rank shifts. For the five comparisons, 17 different countries were involved in at least one substantial rank shift when comparing equation (8) rankings with those of the other five equations mentioned. Of these 17 countries, one showed a substantial rank shift four times (Thailand) and one showed a substantial rank shift three times (Ethiopia), six showed a substantial rank shift two times (Niger, Uganda, Sudan, Taiwan, South Korea, Ghana),

and nine showed a substantial shift only one time (Haiti, Philippines, Cameroon, Chad, Gabon, Tanzania, Bolivia, Mauritius, Portugal). In one case (Uganda for equations (11) and (8)), the rank shift was 32 places.

Table 10 presents the tax effort indices and rankings for the 17 fiscally complex LDCs when the parameters for equation (8) generated by the fiscally complex sample, R_8^{17}, the fiscally simple sample, R_8^{52}, and the combined sample, R_8^{69}, are used to predict taxable capacity. Table 9 presents the Spearman rank correlation coefficients to compare rankings for fiscally complex LDCs when using the equation (8) parameters generated from the three samples. The null hypothesis that the correlation between these ranking schemes are equal to zero is rejected at the 1 percent level for all three comparisons.

Contrary to expectations, equation (8) well explained taxable capacity for fiscally complex LDCs and using the whole sample parameters did not significantly alter relative rankings of fiscally complex LDCs taken in the aggregate. Nevertheless, two of the fiscally complex LDCs (Jordan and Argentina) change rank substantially when the full sample (69) parameters are employed to generate tax effort rank as compared to the fiscally complex sample (17) parameters.

In Chapter V, the conclusions reached in this study will be summarized and the implications for policy will be

TABLE 10

ACTUAL TAX SHARE, ESTIMATED TAXABLE CAPACITY, TAX EFFORT, AND TAX EFFORT RANKINGS FOR FISCALLY COMPLEX LDCS USING EQUATION (8) PARAMETERS GENERATED BY THE FISCALLY SIMPLE, FISCALLY COMPLEX AND COMBINED SAMPLES

Country	T/Y_2	$(T/Y_2)_8^{17}$	$(T/Y_2)_8^{52}$	$(T/Y_2)_8^{69}$	TE_8^{17}	TE_8^{52}	TE_8^{69}	R_8^{17}	R_8^{52}	R_8^{69}
South Africa	16.937	20.458	23.892	22.577	.828	.709	.750	15	14	15
Jamaica	16.246	17.337	19.721	19.969	.937	.824	.814	9	9	13
Jordan	10.269	10.499	12.688	14.860	.978	.809	.691	8	11	16
West Malaysia	19.182	14.033	15.082	17.268	1.367	1.272	1.111	2	1	3
Malta	16.891	15.845	18.770	18.540	1.066	.900	.911	6	7	6
Singapore	12.739	12.977	11.959	14.866	.982	1.065	.857	7	4	10
Trinidad & Tobago	16.382	18.740	20.089	20.534	.874	.815	.798	13	10	14
Mexico	9.749	14.172	17.118	15.110	.688	.570	.645	17	17	17
Nicaragua	11.403	13.027	14.920	13.923	.875	.764	.819	12	12	12
Panama	14.08[illegible]	16.636	19.911	16.757	.847	.707	.841	14	15	11
Chile	26.637	21.117	24.916	20.512	1.261	1.069	1.299	3	3	2
Argentina	18.112	22.332	26.955	21.039	.811	.672	.861	16	16	8

TABLE 10--Continued

Country	T/Y_2	$(T/Y_2)_8^{17}$	$(T/Y_2)_8^{52}$	$(T/Y_2)_8^{69}$	TE_8^{17}	TE_8^{52}	TE_8^{69}	R_8^{17}	R_8^{52}	R_8^{69}
Uruguay	27.328	18.496	22.239	18.168	1.478	1.229	1.504	1	2	1
Greece	20.546	18.828	22.802	18.512	1.091	.901	1.110	5	6	4
Iran	15.086	13.737	15.148	15.231	1.098	.996	.990	4	5	5
Iraq	15.030	16.376	17.148	17.491	.918	.876	.859	10	8	9
Spain	16.099	18.110	21.984	18.005	.889	.732	.894	11	13	7

explained. Limitations of the model used will be discussed, and an agenda for further research will be suggested.

CHAPTER V

CONCLUSIONS

Summary of the Results

This study has argued that the tax base availability interpretation of taxable capacity proves too limited to capture the ability of the populace to pay taxes and/or the ability of the government to tax the populace. Furthermore, a broader conception of taxable capacity when combined with the choice theoretical fiscal decision maker model allows for an unambiguous interpretation of tax effort. Taxable capacity has been defined in this study as the tax share generated in a country as a result of the common adaptation of fiscal decision makers to predictable changes in the socioeconomic environment in which they act. Tax effort then derives from particular in-country differences in the socioeconomic environment to which an individual fiscal decision maker can adapt to some unknown degree. Taxable capacity factors specify those environmental influences that dominate individual decision making for similar LDCs on the average. Tax effort then derives from the unspecifiable willingness of the fiscal decision maker to make a tax level choice that varies from that of the average of similar LDCs.

This study argues that the dynamics of economic development lead to the creation of LDCs which, though still much less developed relative to the United States and most Western European countries, are nonetheless much more developed than another group of LDCs. At the individual citizen level, this difference in LDCs is reflected in the dominance of modern attitudes and behavior over traditional attitudes and behavior. At a higher level of abstraction, this difference in behavior is reflected in the much greater societal complexity associated with these modern attitudes and behavior. Increased societal complexity, which this study argues defines the essence of what is meant by economic development, increases both social good preference and tax resistance for all LDCs. This in turn leads to the dominance of representative role playing over leadership role playing by a fiscal decision maker in an LDC. For less complex LDCs, the influence of increasing societal complexity on fiscal decision makers can be predicted using aggregate indicators of traditional level of development and openness indicators. For more complex LDCs, the influence of increasing societal complexity on fiscal decision making is unpredictable with aggregate indicators. Representative role playing by the fiscal decision maker in fiscally complex LDCs implies many more country specific tax and social good expenditure choices than does leadership role playing.

The basic hypotheses advanced in this study are three: that LDCs can be separated into fiscally simple and fiscally complex groups, the latter of which will reveal an unpredictable taxable capacity when aggregate indicators are used; that the fiscal machinery established during the colonial period has given former French and British dependencies a significant advantage in raising tax revenue; that the logic of the societal complexity concept allows for the use of nonmonetary indicators to proxy changes in societal complexity in an international tax effort model. Furthermore, in order for the tax effort model to generate more meaningful policy conclusions, tax effort must be correlated with major development objectives such as the long term growth rate.

This study found moderate to strong support for the three hypotheses just mentioned. The fourth hypothesis, that tax effort is correlated with the long term growth rate has not yet been discussed and will be. But first, several results of previous tax share studies merit attention since these can be explained by the new international tax effort model employed in this study.

The early evidence (Lotz and Morss, 1967) that the tax share or taxable capacity is not predictable for MDCs becomes more understandable when using the present model. Lotz and Morss simply explained that the public share in MDCs is more a function of political preference for a larger government role than a function of taxable capacity (Lotz

and Morss, 1967, pp. 488-489). The present study argues that societal complexity increases nonlinearly, and that as societal complexity increases, the ability to predict the tax share with simple indicators of taxable capacity becomes increasingly less. Since, in the present study, this unpredictability is revealed for a group of LDCs, it follows that it would also be revealed for MDCs which have even more societal complexity.

Another earlier result that becomes explainable when using the present model are the results obtained by Weiss (1969). He found that the level of urbanization, the literary rate, and an index of mass comunication were positively and significantly related to R/Y_1 for LDCs. This result follows from the present model since each of these variables is associated with an increase in societal complexity for fiscally simple LDCs.

An additional result that is suggested by the present model is the positive and significant relation between T/Y_1 and $\Delta Cp/Cp$ (the rate of price change) when the latter was employed as a regressor in a cross section tax share study of LDCs (Shin, 1969; UNCTAD, 1970). UNCTAD rejected Shin's explanation that progression in the tax structure led to a higher rate of inflation as the tax share rose with the level of development. Instead UNCTAD argued that $\Delta Cp/Cp$ was not functionally related to the tax share but to the expenditure share which is generally correlated with the tax share. Consequently, UNCTAD dropped $\Delta Cp/Cp$

from the taxable capacity equation. Our model suggests that as a country becomes fiscally more complex, the fiscal decision maker confronts a higher level of political tension generated by the high and simultaneously increasing levels of tax resistance and social good preference. If government securities markets are not well developed (and they invariably are not well developed in LDCs), the fiscal decision maker will often opt for money creation to provide for social goods. Thus a higher rate of inflation should be associated with a rising tax share.[1]

Policy Implications

An important question raised by an international tax effort model is the degree to which political ideology affects the results. In the Lotz and Morss version of the model, all demand factors are included in the residual, and so the influence of political ideology can be presumed to affect tax effort along with some unknown influence of cultural taste and the willingness to tax on the part of the fiscal decision maker. The model developed in the present study implies that tax effort derives from the willingness of fiscal decision makers to exploit tax capacity. Since

---

[1]Data limitations would preclude the inclusion of $\Delta Cp/Cp$ in the present model, but, in any case, such a regressor would be inappropriate in a taxable capacity equation. The rate of inflation is a function of increased societal complexity, not a separate variable used to estimate taxable capacity. However, a positive relation between tax effort and the inflation rate would be indicative that the country in question is making "too much" tax effort.

political ideology may develop over a period of time, it is not a variable subject to the control of a particular fiscal decision maker. Therefore, if political ideology with respect to the degree of government intervention desired by the citizenry is not specified as part of the taxable capacity equation, then a country's high tax effort might really reflect a more command-oriented economic system than the average of LDCs in the sample. Consequently, we would be assuming that a high tax share was due to choices made by fiscal decision makers when, in fact, the existence of an historic political ideology is the governing factor. The problem with this explanation derives from the fact that a command-oriented LDC is likely to employ government production and user changes to implement its philosophy, so that the tax share would not necessarily bear any relation to political ideology for LDCs. In any case, political ideology variables did not exist for the period examined in order to test this hypothesis. However, should an appealing political index variable be constructed, the present model implies that such a variable should be included as part of the taxable capacity equation.

A more fundamental question than the effect of political philosophy on tax effort is the degree to which a high tax effort promotes development objectives. The implicit assumption underlying the international tax effort is that a high tax effort is more desirable than a low tax effort. Yet this assumption, which motivates the tax effort

approach, needs to be questioned. A higher tax effort should be viewed favorably only if this tends to promote major societal goals. Perhaps the primary goal of LDCs since World War II has been to achieve a high rate of economic growth.

If a higher tax share has the effect of slowing down the long term growth rate of an LDC because of the reduction of resources to the private sector, then infusion of capital into a high "tax effort" country would seem to be contrary to the purpose (economic growth) for which aid and loans are generally made. In order to determine whether or not tax effort is correlated with long term growth for the time period covered by the sample used in the present study, the 1960-69 growth rate for real GNP for fiscally simple LDCs was employed (Y_1/p_{10} in Appendix D). This growth rate average was correlated with the tax effort indices for fiscally simple LDCs as derived by equations (8), (12), (16), and (20). The long term growth rate period used both leads and lags behind the varying periods for which tax effort was calculated for particular LDCs, and so it was necessarily a crude indicator of the long term growth rate for particular LDCs.[2]

---

[2]The direction of interdependence is not clear. A significant positive relation between the long term economic growth rate and tax effort could be indicative that a higher tax share implies a higher rate of growth because of the high rate of return on social goods in the early stage of development. Or it could be indicative of the positive effect of a high rate of growth in reducing tax resistance and thus allowing a greater tax take.

In all four comparisons the correlation between the long term growth rate and tax effort was positive but low. No correlation between tax effort and long term growth was significant at the 10 percent level.[3] While data inaccuracies caution against placing great weight on these results, there seems to be little evidence that a high tax effort is positively associated with the long term growth rate. Only for particular countries are the results clear. Table 11 below lists fiscally simple LDCs with well above and well below average long term growth rates and/or well above and well below average tax effort when tax effort generated by equation (8) is used.

TABLE 11

FISCALLY SIMPLE LDCS WITH SUBSTANTIALLY DIFFERENT TAX EFFORT AND LONG TERM GROWTH RATES FROM THE AVERAGE OF LDCS IN THE SAMPLE*

High Growth Rate High Tax Effort	Low Growth Rate Low Tax Effort	High Growth Rate Low Tax Effort	Low Growth Rate High Tax Effort
Zambia	Central African Republic	Mauritania	Mauritius
Taiwan	Gabon	Guatemala	Zaire
Thailand	Togo		Dominican Republic
Portugal	Nigeria		Haiti
	Ghana		Cambodia
	Afghanistan		

*We arbitrarily defined long term growth rates greater than 2.5 percent or less than .7 percent (mean = 1.6 percent) as substantially different than the average. Likewise, we arbitrarily define tax effort greater than 1.15 or less than .85 (range - .610 to 1.454) as substantially different than the average.

[3]The correlation coefficient for Y_1/P_{10} and TE_8 was .1566; for Y_1/P_{10} and TE_{12} it was .0478; for Y_1/P_{10} and TE_{16} it was .1599; for Y_1/P_{10} and TE_{20} it was .0324.

The results given in Table 11 merit further research. There are clearly countries that have achieved high long term growth rates and have had a low tax effort, and there are clearly countries that have achieved low long term growth rates and have had a high tax effort. Consequently, these results do not offer support for a general assumption that a higher tax share is needed to support economic growth. What these results do suggest is the need to exercise informed judgment in using tax effort models to affect a policy decision whether by an international lending agency or by in-country decision makers. Does this imply that the tax effort approach should be negated in favor of complete reliance on a case by case approach to allocating international aid and loans or assessing the potential for a tax increase? I think not.

Exclusive reliance on individual country case study by a fiscal decision maker who is attempting to assess the possibilities for further taxation runs the strong risk of being too subjective. Summary information about the tax share and its determinants for other LDCs is invaluable information to the fiscal decision maker and prompts him to ask questions not otherwise addressed in coming to grips with the tax situation in his country. Exclusive reliance on individual country case studies by national and international lending agencies also runs the strong risk of being too subjective for the same reasons, and it also opens a wider door to short run political considerations in

allocating aid or loans. Exclusive reliance on case studies by aid and loan agencies also stimulates a greater amount of special pleading by individual countries based on each country's particular political, social and economic history and its short-run special circumstances. All of these factors may indeed by important and should be considered, but a tax effort model gives breadth to the analysis and some guidance as to how a specific country ranks with respect to its tax take. An inherent problem with case by case studies is the assumption that particular cultural and historical circumstances of a given LDC shape the particulars of economic behavior in that country. So-called country specific institutions may be taken as given or constants when in fact they are in the process of identifiable change that is general to a number of countries and that may even be molded by the choices made by an individual fiscal decision maker. While a high tax effort may or may not indicate that a country can productively use more financial aid, this fact does not merit the conclusion that the tax effort indices are of no use, particularly if they become more reliable with the use of better and more complete cross section data and the development of country by countries time series data.

The evidence presented in Chapter IV, which indicates that tax effort can vary substantially for particular countries when alternative equations are employed, offers an appealing way for national and international aid and loan

agencies to employ the tax effort model for policy purposes. The use of alternative taxable capacity equations such as those specified in the present study would enable the user of such studies to single out those individual countries that change rank substantially when alternative equations are employed to generate tax effort rankings. More case study effort can then be applied to those countries so revealed. And the use of a properly phased time series of the rate of inflation and the long term growth rate for individual LDCs can be combined to explore the now tenuous assumed positive relation between tax effort and the long term rate of growth or other major policy objectives.

The theoretical model presented in this study and the empirical evidence provided do suggest that the tax effort model provides little information of value about tax capacity or tax effort for fiscally complex LDCs. Case studies are assumed to provide much more useful information for policy making in fiscally complex LDCs despite inherent biases with the case by case approach.

Agenda for Further Research

The present study delineated fiscal complexity by three factors: the level of aggregate per capita income, long term growth rate and level of urbanization. The inclusion of countries in the fiscally complex sample with lower per capita incomes than $500 that had above average (for the sample of 69 LDCs) urbanization levels and long

term growth rates was probably a weak criterion in retrospect, since most economists would not classify countries such as Jordan, Nicaragua and Iraq as more developed LDCs on the basis of criteria other than income per capita and the ones we chose. Yet the methodology we employed negates the consideration of countries on a case by case basis, since the model is to serve as a complement to a case by case approach to assessing taxable capacity.

A more appealing separation of fiscally simple and fiscally complex LDCs can be made by attempting to construct an index of societal complexity based either on the structure of complexity (a routes and nodes index) or the interaction process engendered by complexity (an index of transport, communication and other economic exchange flows) or both. Appendix F suggests a way a combination of routes and nodes and flows among them could be constructed were the data available. With the use of such an index, few borderline cases would be expected to appear in a cross section study. Increasing societal complexity begets more complexity, and, because of the nonlinearities involved, a fiscally simple LDC should quickly evolve into a fiscally complex LDC once a critical mass of interaction has been reached. Such a societal interaction index calculated for each LDC would reveal a distribution of indices that is bimodal, clearly revealing the fiscally simple from the fiscally complex LDCs.

As more data become available and existing data is made more accurate for LDCs, international tax capacity equations can be constructed which are more reliable. Of particular importance is the comparison of cross section parameter estimates for the coefficients in the taxable capacity equations with estimates made for individual LDCs over time. The international tax effort model used in the present study argues that there is a predictable pattern of tax share change over time for LDCs so that cross section differences do in fact reflect time series changes for individual LDCs. The accumulating data base should soon permit the test of this assumption by the comparison of the similarity of time series and cross section coefficients in taxable capacity equations.

APPENDICES

APPENDIX A

DEFINITION OF TERMS

Ag	Value added by the agricultural sector (primary sector less mining)
Cal	Per capita caloric intake per day
Com	Index of the degree of mass communication
Cp	Consumer price index
D_1	Dummy variable for former French dependencies
D_2	Dummy variable for former British dependencies
Ddg	Dummy variable for countries with highly decentralized governments
Dgh	Dummy variable for an index of linguistic, religious, and racial homogeneity
Drep	Dummy variable for countries with representative political systems
Ec	Current expenditures for all levels of government
Ecc	Current expenditures for central government
Ed	Educational expenditures
Ed/Y_2	Educational expenditures per capita divided by gross domestic product per capita
ExR	Exchange rate
F	Merchandise imports plus merchandise exports
Lagl	Percentage of the economically active population engaged in agriculture
Life	Life expectancy at birth
Lit	Literacy rates of population aged 15 and over
M	Merchandise imports
MN	Value added in the mining sector
Ms_0	Coins and notes

Ms_1	Coins, notes and demand deposits
Ms_2	Coins, notes, demand deposits and time deposits
P	Population
Prot	Per capita grams of protein consumed per day
R	Total government revenue
Rc	Central government revenue
T	Total government taxes
Tc	Central government taxes
Tele	Number of telephones
Tl	Noncentral government tax collections
Urb	Percentage of the population living in cities
X	Merchandise exports
X_3	Three largest merchandise exports
Xmn	Mining exports
Y_1	GNP in current prices
Y_1/P_{10}	Average annual growth rate for Y_1/P for the period 1960-1969
Y_2	GDP in current prices

APPENDIX B

INTERREGIONAL EFFECTS IN THE LOTZ AND MORSS MODEL

The data employed are from Lotz and Morss (1967), Table 1 for T/Y_1 and Table 5 for the rest of the data with a couple of revisions. Brazil's Y_1/P figure given in Table 5 (\$194) was changed to be consistent with the Table 5 Y_1 and P figures (Y_1/P = \$251). Also, the figures for Malawi were revised as follows: Y_1 (from \$176 to \$248), T (from \$207 to \$21), F/Y_1 (from 57.8 to 42.3), Y_1/P (from \$45 to \$63), and T/Y_1 (from 11.7 to 8.5). In any case, the revisions do not alter Lotz and Morss results by much.

To test for regional effects we exploited an F distribution of the form F^{q-k}_{n-q} where $\frac{\Delta RSS/q-k}{SSE/n-q}$ has this distribution, and where:

q = # of variables, including the constant, when all variables are included

k = # of original variables

n = # of observations

RSS = regression sums of squares

SSE = error sums of squares when all variables are included

For Lotz and Morss (1967) equation (2) (p. 484), we obtain[1]:

$$(1)\quad (\widehat{T/Y_1}) = \underset{(7.194)}{.9.951} + \underset{(3.138)}{.00908}\, Y_1/P + \underset{(2.600)}{.07320}\, F/Y_1$$

$F^2_{49} = 7.933$

$R^2 = .2446$

$\bar{R}^2 = .2138$

SSE = .6499

[1]Figures in parentheses are t-values.

For Lotz and Morss (1967) equation (2) allowing only the interregional level of T/Y_1 to vary we obtain:

$$(2)\quad (\widehat{T/Y_1}) = \underset{(4.415)}{9.654} + \underset{(3.061)}{.01107Y_1/P} + \underset{(3.383)}{.09793F/Y_1} - \underset{(-2.352)}{4.7009D_1} + \underset{(.496)}{.98426D_2} - \underset{(-.246)}{.54274D_3} - \underset{(-.193)}{.42710D_4}$$

$F^6_{45} = 6.173$

$R^2 = .4515$

$\bar{R}^2 = .3784$

$SSE = .4719$

For Lotz and Morss (1967) equation (2) allowing both interregional constants and the coefficients of Y_1/P to vary, we obtain:

$$(3)\quad (\widehat{T/Y_1}) = \underset{(2.018)}{12.41} + \underset{(.311)}{.00445Y_1/P} + \underset{(2.945)}{.09651F/Y_1} - \underset{(-.893)}{5.9352D_1} - \underset{(-.479)}{3.2232D_2} - \underset{(-.694)}{4.5636D_3} - \underset{(-.490)}{3.0745D_4} + \underset{(.154)}{.00246D_1(Y_1/P)} + \underset{(.663)}{.01040D_2(Y_1/P)} + \underset{(.723)}{.01553D_3(Y_1/P)} + \underset{(.397)}{.00627D_4(Y_1/P)}$$

$F^{10}_{41} = 3.610$

$R^2 = .4682$

$\bar{R}^2 = .3385$

$SSE = .4575$

We can see from the $\bar{R}^2$ above that allowance for interregional changes in the constant and the coefficient of Y_1/P give a substantial improvement in explained variation relative to allowing for no interregional effects. The hypotheses tests below bear this out.

For Ho_1: $c_1 = c_2 = c_3 = c_4 = c_5 = 0$

$$F^4_{45} = \frac{.17800/4}{.4719/45} = 4.24 > 3.77 \text{ (critical } F^4_{45}, .01)$$

We do not accept Ho_1 (that there are no interregional differences in the level of taxable capacity) at the 1 percent level of significance.

For Ho_2: $j_1 = j_2 = j_3 = j_4 = j_5 = k_1 = k_2 = k_3 = k_4 = k_5 = 0$

$$F^{8}_{41} = \frac{.19235/8}{.4575/41} = 2.16 < 2.17 \text{ (critical } F^{8}_{41}\text{, .05)}$$

We do not reject Ho_2 (that there are no inter-regional differences in the level of taxable capacity and the marginal effects of Y_1/P) at the 5 percent level of significance.

APPENDIX C

REGRESSION RESULTS FOR EDUCATIONAL EXPENDITURES PER CAPITA

(1) $T/Y = 11.61 + 121.95\ Edu/P$
$\quad\quad (8.271)\ \ (2.764)$

$N = 40$

$F^1_{38} = 7.641$

$\bar{R}^2 = .1455$

$SSE = 696.3$

(2) $T/Y = 11.58 + 111.43\ Edu/P$
$\quad\quad (7.479)\ \ (2.146)$

$N = 31$

$F^1_{29} = 4.607$

$\bar{R}^2 = .1073$

$SSE = 490.3$

(3) $T/Y = 12.73 + 120.23\ Edu/P$
$\quad\quad (3.366)\ \ (1.205)$

$N = 9$

$F^1_7 = 1.452$

$\bar{R}^2 = .0535$

$SSE = 192.2$

APPENDIX D

SOURCES OF DATA USED IN THE PRESENT STUDY

(1) International Monetary Fund. Surveys of African Economics. 5 vols. Washington, D.C.: International Monetary Fund. Vol. 1: Cameroon, Central African Republic, Chad, Congo, Gabon, 1968; Vol. 2: Kenya, Tanzania, Uganda, Somalia, 1969; Vol. 3: Dahomey, Ivory Coast, Mauritania, Niger, Senegal, Togo, Upper Volta, 1970; Vol. 4: Democratic Republic of Congo, Malagasy Republic, Malawi, Mauritius, Zambia, 1971.

(2) International Monetary Fund. International Financial Statistics Supplement--1972. Washington, D.C.: International Monetary Fund, 1973.

(3) United Nations. Yearbook of National Account Statistics. New York: United Nations, 1967, 1968, 1969, 1970, 1971, 1972.

(4) World Bank. World Tables. Washington, D.C.: World Bank, 1971.

(5) United Nations. World Economic Survey 1969-1970. New York: United Nations, 1971.

(6) United Nations. Statistical Yearbook. New York: United Nations, 1969, 1970, 1971, 1972, 1973.

(7) United Nations. Survey of Economic Conditions in Africa. New York: United Nations, 1971.

(8) United Nations. World Population Prospects as Assessed in 1968. Population Studies, No. 53. New York: United Nations, 1973.

(9) Agency for International Development. A.I.D. Economic Data Book. Washington, D.C.: A.I.D., 1970.

(10) Lotz, Joergen R., and Morss, Elliott R. "Measuring 'Tax Effort' in Developing Countries." International Monetary Fund Staff Papers (November 1967), pp. 478-499.

(11) Lotz, Joergen R., and Morss, Elliott R. "A Theory of Tax Level Determinants for Developing Countries." Economic Development and Cultural Change (April 1970), pp. 328-341.

(12) United Nations. Yearbook of International Trade Statistics. New York: United Nations, 1964, 1965, 1966, 1967, 1968, 1969, 1970, 1971.

(13) International Monetary Fund. International Financial Statistics. Washington, D.C.: International Monetary Fund, 1967, 1968, 1969, 1970, 1971, 1972, 1973, 1974.

(14) United Nations. Economic Surveys of Asia and the Far East 1969. New York: United Nations, 1970.

(15) United Nations. Demographic Yearbook 1971. New York: United Nations, 1972.

(16) World Bank Group and International Bank for Reconstruction and Development. "World Bank Atlas: Population, Per Capita Production and Growth Rates." Finance and Development (March 1972), pp. 48-60.

APPENDIX E

DATA TABLE AND NOTES

TABLE 12

DATA USED IN THE PRESENT STUDY

Country*	Status**	T/Y_2	Y_2/P	$(Y_2-X)/P$	T	Y_2	P	X/Y_2	Xmn/Y_2	Ag/Y_2	Life	Prot	Cal	Tele	Ed/Y_2	Y_1/P_{10}	Urb	ExR	Years***
Cameroon (1)	FR 1961	13.40	140.0	113.21	97.8	730	5.21	19.2	3.0	48.1	38.4	59	2230	.004198	.024566	2.0	16.3	246.853 Franc	63-65 F
Central African Republic (1)	FR 1960	11.63	108.4	94.09	17.1	146	1.35	13.0	4.6	39.6	35.9	48	2170	.001938	N.A.	0.0	26.6	246.853 Franc	61-63 F
Chad (1)	FR 1960	10.99	67.5	60.29	23.8	215	3.17	11.1	0.0	55.5	35.9	78	2240	.002524	N.A.	-1.3	6.9	246.853 Franc	61, 63, 65
Gabon (1)	FR 1960	16.41	378.3	223.97	28.6	172	.46	40.1	15.2	36.3	35.9	51	2180	.002575	N.A.	0.6	16.4	246.853 Franc	61-64
Dahomey (1)	FR 1960	11.28	77.7	71.15	21.8	193	2.49	8.2	0.0	48.9	38.5	52	2170	.004611	N.A.	0.9	12.2	246.853 Franc	66-68
Ivory Coast (1)	FR 1960	18.81	265.8	188.35	196	1044	3.93	29.1	0.4	29.8	40.9	59	2430	.019736	.033093	4.7	18.9	246.853 Franc	65-67
Mauritania (1)	FR 1960	11.60	153.2	100.06	19.2	166	1.075	35.2	31.6	40.5	40.9	73	1990	.001001	N.A.	4.6	6.7	246.853 Franc	64, 68
Niger (3-1969)	FR 1960	11.27	83.2	75.96	32.7	289	3.47	8.8	0.0	60.1	38.4	78	2170	.002249	N.A.	-0.9	6.9	246.853 Franc	63-66
Senegal (1)	FR 1960	18.42	223.1	183.77	146	793	3.56	17.5	1.3	31.6	40.9	64	2300	.025484	N.A.	-0.1	24.5	246.853 Franc	64-67 F
Togo (1)	FR 1960	10.65	130.0	109.53	23.9	224	1.72	15.9	6.1	44.1	38.5	51	2210	.002780	.016779	0.0	11.9	246.853 Franc	66-68 F
Upper Volta (1)	FR 1960	12.25	47.4	45.58	28.5	233	4.81	5.9	0.0	48.3	33.5	70	2060	.002292	.026724	0.1	3.2	246.853 Franc	63-66
Malagasy Republic (1)	FR 1960	15.96	122.6	106.05	124	777	6.33	13.6	0.5	32.0	40.9	54	2330	.022756	.030483	0.0	12.7	246.853 Franc	66-68
Mali (10, 11)	FR 1960	15.38	62.2	56.52	44	286	4.6	9.1	0.0	48.0	36.0	68	2130	.004444	N.A.	1.7	10.8	246.853 Franc	64-66
Kenya (10, 11)	BR 1963	13.16	106.8	82.95	133	1011	9.47	22.3	0.0	37.6	44.9	60	2240	.052317	.019462	1.5	7.8	7.143 Shilling	63-65 F
Tanzania (10, 11)	BR 1961	12.93	64.4	45.18	96	742	11.53	29.8	2.8	56.4	39.2	4[illegible]	1620	.021837	.029638	1.6	5.5	7.143 Shilling	63-65 F

TABLE 12--Continued

Country*	Status**	T/Y_2	Y_2/P	$(Y_2-X)/P$	T	Y_2	P	X/Y_2	Xmn/Y_2	Ag/Y_2	Life	Prot	Cal	Tele	Ed/Y_2	Y_1/P_{10}	Urb	ExR	Years***
Uganda (10, 11)	BR 1962	10.65	103.4	76.52	84	789	7.63	26.0	2.3	59.6	44.9	56	2160	.018585	.021560	1.7	7.1	7.143 Shilling	63-65 F
Malawi (10, 11)	BR 1964	8.47	63.4	52.90	21.0	248	3.91	16.6	0.0	37.9	40.9	55	2150	.007351	N.A.	1.0	5.0	.358 Pound	64-66
Mauritius (1, 3)	BR 1968	19.49	289.8	145.94	35.7	183	.80	36.2	0.0	20.5	63.2	47	2360	.017000	.026796	-0.4	44.4	5.556 Rupee	68-70
Zambia (1)	BR 1964	29.07	358.2	156.11	426	1457	4.06	56.5	54.9	6.4	43.5	69	2250	.047653	.046547	5.4	30.4	.716 Kwacha	67-69
Sierra Leone (3-1969)	BR 1961	11.77	153.2	115.49	42.7	363	2.37	24.6	18.2	32.5	38.4	49	2160	.005300	N.A.	1.2	12.7	7.143 Leone	64-66
Nigeria (3)	BR 1960	9.64	94.3	79.46	448	4647	49.3	15.7	5.2	51.5	35.9	63	2350	.072449	.025893	-0.3	16.1	.357 Pound	64-66 F
Ghana (10, 11)	BR 1957	13.71	252.4	215.02	263	1918	7.6	14.8	2.9	34.3	43.4	43	2070	.032740	.076758	0.0	26.2	.357 Pound	63-65
South Africa (3)	BR 1910	16.94	631.9	543.84	2040	12043	19.0	14.2	14.2	10.1	49.0	77	2730	1.286372	.007549	3.8	48.9	.7179 Rand	65-67
Zaire (3-1969)	BR 1960	21.76	52.4	36.13	224	990	19.07	30.4	21.9	19.7	41.0	33	2040	.022946	.061725	0.2	12.4	.50 Zaire	66-68
Ethiopia (10, 11)		8.44	56.6	51.88	108	1280	22.6	8.4	0.0	61.0	35.9	64	1910	.024935	.013274	2.3	6.8	2.50 Dollar	64-66
Sudan (10, 11)	BR 1956	12.86	103.9	88.31	175	1361	13.1	15.0	0.0	56.1	45.1	59	2090	.035041	.012728	0.6	10.1	.348 Pound	63-65
Algeria (10, 11)	FR 1962	23.62	229.0	164.39	622	2633	11.5	28.2	16.3	19.5	48.1	56	1890	.149476	N.A.	N.A.	39.0	4.94 Dinar	63-64
Egypt (UAR) (10, 11)	BR 1953	18.52	130.3	122.40	722	3899	28.0	12.1	1.1	30.5	47.4	77	2690	.262554	N.A.	1.2	39.0	.435 Pound	61-63 F
Tunisia (3-1969)	FR 1956	24.57	211.4	181.49	240	975	4.62	14.0	6.1	18.5	51.6	63	2200	.054009	N.A.	2.1	40.5	.525 Dinar	65-67
Dominican Republic (10, 11)		17.62	301.8	248.39	176	999	3.31	17.7	0.9	24.7	49.7	46	2080	.027628	.018319	0.4	31.7	1.0 Peso	62-64
Haiti (10, 11)		9.70	76.0	66.99	32	330	4.34	11.9	0.0	52.2	42.0	47	1930	.004400	.009560	-1.0	15.2	5.00 Gourde	62-64 F

TABLE 12--Continued

Country*	Status**	T/Y_2	Y_2/P	$(Y_2-X)/P$	T	Y_2	P	X/Y_2	Xmn/Y_2	Ag/Y_2	Life	Prot	Cal	Tele	Ed/Y_2	Y_1/P_{10}	Urb	ExR	Years***
Jamaica (3)	BR 1962	16.25	513.8	383.32	149.8	921	1.79	25.5	12.4	11.9	65.1	59	2280	.049083	N.A.	3.0	33.4	.357 Pound	64-66
Trinidad and Tobago (10, 11)	BR 1962	16.38	723.7	327.11	115	702	.97	54.8	14.9	8.8	65.1	64	2360	.039327	N.A.	3.8	44.7	1.714 Dollar	64-66
Mexico (10, 11)		9.75	404.3	379.23	1567	16074	39.8	6.1	1.5	15.7	60.2	67	2600	.656663	.015028	3.4	52.6	12.49 Peso	62-64
Guatemala (3-1969)		9.28	301.8	258.34	124.5	1340	4.44	14.4	0.0	28.9	47.4	50	1990	.026965	N.A.	3.1	33.6	1.00 Quetzal	64-66
El Salvador (10, 11)		10.81	262.4	201.27	80	740	2.82	23.2	0.0	30.2	50.3	47	1880	.020827	.024098	1.9	38.7	2.50 Colon	63-65
Honduras (3)		10.87	254.1	186.55	64.5	593	2.33	26.7	1.4	39.2	49.0	51	2070	.010390	.026771	1.1	33.2	2.00 Lempira	66-68
Nicaragua (3-1969)		11.40	357.0	277.21	67.8	593	1.66	22.4	1.0	33.1	45.5	61	2230	.012352	N.A.	2.8	42.5	7.0 Cordoba	64-66
Costa Rica (3)		14.66	440.5	346.04	102.6	700	1.59	21.4	0.0	25.1	66.8	60	2320	.033842	.042732	2.9	35.5	6.62 Colon	66-68
Panama (3-1969)		14.08	533.1	472.20	93.3	660	1.23	12.0	0.0	25.2	61.4	61	2340	.046439	.037821	4.8	44.7	1.00 Balboa	64-66
Colombia (3-1969)		12.42	320.2	286.87	738	5958	18.63	10.3	1.7	30.8	58.6	51	2150	.559252	.012839	1.5	52.8	12.23 Peso	65-67
Guyana (3)	BR 1966	20.36	326.8	177.21	47.7	233	.71	46.0	20.9	21.3	64.7	46	2080	.012815	.014553	0.7	29.5	2.00 Dollar	67-69
Ecuador (3-1969)		15.81	224.1	191.47	182	1156	5.15	14.7	0.0	34.5	54.3	46	1880	.043666	.020669	1.2	36.75	18.18 Sucre	64-66
Peru (3-1969)		17.24	376.5	311.09	748	4330	11.65	16.3	6.9	20.4	54.0	52	2140	.137279	.036335	1.4	50.2	26.82 Sol	64-66
Chile (3-1969)		26.64	681.0	598.47	1591	5937	8.71	12.2	10.9	10.2	58.5	63	2430	.144510	.032679	1.7	68.8	3.089 Escudo	64-66
Bolivia (3)		12.37	139.5	109.75	74.9	606	4.34	21.4	20.0	22.7	43.8	46	1760	.024218	N.A.	2.4	32.0	11.88 Peso	64-66
Argentina (10, 11)		18.11	794.7	726.09	3047	16823	21.2	8.5	0.0	18.4	66.6	88	3130	1.464992	.017611	2.6	76.5	157.30 Peso	63-65
Paraguay (3-1969)		8.16	215.8	190.52	35.8	439	2.03	11.9	0.0	36.5	57.3	71	2740	.013877	N.A.	1.0	35.8	126.0 Guarani	64-66

TABLE 12--Continued

Country*	Status**	T/Y_2	Y_2/P	$(Y_2-X)/P$	T	Y_2	P	X/Y_2	Xmn/Y_2	Ag/Y_2	Life	Prot	Cal	Tele	Ed/Y_2	Y_1/P_{10}	Urb	ExR	Years***
Uruguay (3-1969)		27.33	620.1	557.38	443	1620	2.61	10.2	0.0	14.7	68.4	103	3070	.161464	N.A.	-0.8	80.8	12.037 Peso	61-63
Afghanistan (10, 11)		5.99	40.6	35.94	36.0	601	14.80	11.5	0.0	56.4	35.0	65	2060	.008683	N.A.	0.3	6.9	63.4 Afgani	63-65
Burma (10, 11)	BR 1937	18.39	68.8	58.72	306	1664	24.20	14.6	0.0	32.1	45.3	44	2010	.019357	.017805	1.8	16.5	4.791 Kyat	62-64 F
Cambodia (3)	FR 1953	16.84	122.8	109.49	122	725	5.9	10.9	0.0	41.7	47.5	46	2080	.003899	N.A.	0.5	10.3	35.0 Riel	62-64
Taiwan (3-1969)		13.94	208.2	175.38	351	2523	12.07	16.1	0.2	26.2	49.6	57	2050	.149019	N.A.	6.3	N.A.	40.10 Dollar	63-65
India (3)	BR 1947	12.23	97.3	93.68	5702	46666	480.2	3.6	0.6	44.1	45.8	50	2000	.892677	N.A.	1.1	37.6	5.383 Rupee	64-66 F
South Korea (3)		9.98	121.4	116.14	346	3480	28.37	5.3	0.8	43.0	55.2	63	2280	.277110	.020529	6.4	33.6	246.853 Won	64-66
West Malaysia (3)	BR 1969 57	19.18	314.4	188.88	470	2446	7.77	40.0	13.1	28.8	55.2	49	2190	.114833	.057269	3.8	40.0	3.07 Dollar	64-66
Thailand (10, 11)		12.60	119.2	101.05	446	3539	29.7	15.2	1.6	34.8	56.3	51	2210	.061381	.026716	4.7	13.1	20.83 Baht	62-64 F
South Vietnam (3)	FR 1955	13.09	112.9	110.68	227	1732	15.32	2.1	0.0	32.8	50.2	49	2200	.019702	N.A.	1.8	20.5	60.0 Piastre	62-64
Singapore (3)	BR 1965	12.74	619.8	28.60	156	1225	1.97	95.4	0.0	3.9	68.2	63	2430	.106466	N.A.	4.5	100.0	3.08 Dollar	66-68
Sri Lanka (10, 11)	BR 1948	18.23	146.0	109.62	290	1591	10.9	24.9	1.0	40.6	61.7	46	2100	.041200	.046435	2.1	19.1	4.758 Rupee	62-64 F
Philippines (3)		9.47	18[illegible]	162.97	563	5960	31.78	13.1	1.5	31.9	53.4	49	2020	.168196	.028776	1.9	32.0	3.91 Peso	64-66
Iran (10, 11)		15.09	248.4	190.80	9.37	6211	25.0	23.2	20.6	25.2	47.5	55	2030	.207022	N.A.	4.9	39.1	75.75 Rial	64-66 F
Iraq (10, 11)		15.03	267.0	164.75	303	2016	7.55	38.3	35.4	19.0	49.1	58	2050	.059544	.045197	3.0	48.2	.357 Dinar	62-64
Jordan (3)	BR 1946	10.27	283.3	224.45	46.1	447	1.88	5.6	1.6	22.2	49.7	65	2400	.025333	.025978	4.7	43.6	.357 Dinar	63-65

TABLE 12--Continued

Country*	Status**	T/Y_2	Y_2/P	$(Y_2-X)/P$	T	Y_2	P	X/Y_2	Xmn/Y_2	Ag/Y_2	Life	Prot	Cal	Tele	Ed/Y_2	Y_1/P_{10}	Urb	ExR	Years***
Turkey (10, 11)		15.00	257.2	243.54	1157	7715	30.0	5.3	0.4	38.4	51.7	78	2760	.309298	.027277	3.4	33.4	9.0 Lira	62-64 F
Greece (3-1969)		20.55	607.7	583.66	1088	5284	8.51	6.0	0.4	25.6	69.4	97	2920	.431977	N.A.	6.2	45.1	30.00 Drachma	63-65
Malta (3)	BR 1964	16.89	468.9	423.73	27.3	162	.32	16.3	0.0	7.3	68.9	86	2680	.023872	N.A.	4.1	51.7	.357 Pound	64-66
Portugal (3-1969)		18.30	372.9	319.03	623	3415	9.12	14.8	0.2	21.3	64.2	77	2730	.519196	.013333	4.9	35.0	28.75 Escudo	63-65
Spain (3)		16.10	584.8	557.33	2993	18570	31.72	4.8	0.4	19.7	69.5	77	2750	2.516399	.009201	6.5	45.2	59.97 Peseta	63-65

*Source for tax data is given in parenthesis.

**Indicates mother country in the colonial period and date of independence for those LDCs acquiring independence after World War II, except South Africa and Burma.

***An "F" denotes Fiscal Years.

Data Notes

Taxes (T)

Sources for tax revenue were (1), (3), (4), (6), (10), and (11) as indicated by the source number under the country name in the Data Table. Tax revenue includes federal (central) and municipal tax revenues. Tax revenues are those taxes defined by the U.N. as direct and indirect taxes, which includes social security taxes. Also included are marketing board profits, licenses, registration fees, and stamp duties. Excluded are fees for services, government property receipts, and other nonfiscal receipts. We should have included but excluded imputed rental value of government buildings and roads due to data unavailability. Solidarity fund revenues were included as part of the tax revenues of Central African Republic and Chad.

Taxes levied by autonomous agencies are not included in the tax figure unless consolidated in the account given by the sources used for a particular country. The absence of this data probably does not distort our results greatly since much of the revenue acquired by these agencies is either granted by the central government from its revenues (and so will appear in our figures if derived from taxes) or received from use charges of one type or another. In some cases, registration fees and stamp duties could not be separated from revenue from government property, and in this case, were excluded from the total. A potentially more serious omission in a few cases was the apparent exclusion of social security collections.

GDP (Y_2)

Source (2) was the primary one supplemented by sources (3) and (1).

Gross domestic product in market prices at current value was used for most countries and the former U.N. System of National Accounts (1960-1969) was used in all cases. GNP was substituted for an unavailable GDP only when the historical difference between them was less than 2 percent of the smaller figure or when GNP was the larger figure of the two, a procedure suggested by Prest (1972, p. 150).

In those cases where sources (10) and (11) were used for GDP data, one of two methods was used to obtain a revised estimate of GDP. If the period used by source (10) (fiscal or calendar year) could be determined, source (2) GDP figures were used directly. If the exact period used by source (10) could not be determined or if exchange rates fluctuated greatly during the period used, revision was undertaken as follows. Comparison of source (2) figures with source (13) figures was made to determine whether GNP had been revised over the data period. If it had not, an

adjustment to convert GNP to GDP was made as based on the percentage difference in the source (2) GNP and GDP figures. If GNP had been revised over the data period, then an adjustment to GDP was made by comparing source (2) and source (13) GDP figures as well as the previous adjustment. In most cases these revisions were upward which had the effect of lowering the actual tax ratios calculated in source (10).

Population (P)

Source (2) was the primary one supplemented by source (10) figures when the tax data from that source were used, if population estimates had not been revised by much since the Lotz and Morss study. Table figures are in millions and are midpoint figures for calendar years or averages of midpoint figures for fiscal years for the period covered.

Exchange Rate (ExR)

Source (2) was the primary one supplemented by source (10) figures when tax and GDP data were used from this source. The Data Table figures shown are end of period units per U.S. dollar official exchange rates if from source (2), with some exceptions.

For Argentina and Sri Lanka, no exchange rate was used to generate Data Table figures since source (10) gives the figure converted to U.S. dollars and source (2) and (13) ratio comparisons and other share variables could be determined without conversion. For some countries in the period covered, a rapidly changing exchange rate was the rule, and IMF Conversion Factors (annual averages of monthly data) were used to convert own currency to U.S. dollars. This procedure was used for Colombia, Chile, Uruguay, India, Portugal and South Korea so that Data Table exchange rate figures for each of these countries is the mean of the yearly IMF Conversion Factors.

Trade Shares (X/Y_2, Xmn/Y_2)

Source (2) was the primary one for merchandise exports f.o.b., and the mining component of exports was obtained generally from source (12) though in some cases source (2) was used. Conversion of own currency into U.S. dollars was made by the official exchange rate or IMF Conversion Factor except for some countries with multiple exchange rates. In these latter cases, either the export rates given in source (2) or the U.S. dollar figures given in source (2) (based on monthly conversion factors) were used if these were given.

Re-exports were included in the Data Table figures if available. Unregistered trade was excluded from the trade figures for countries in the Central African Customs Union (Chad, Central African Republic, Gabon, and People's Republic of Congo). Unrecorded trade was excluded from the trade figures for countries in the West African Customs Union (Senegal, Dahomey, Ivory Coast, Mauritania, Niger, Upper Volta, and Mali). Intra-East African trade by countries in the East African Common Market (Kenya, Tanzania, Uganda) was included in the trade figures. Central American Common Market (Guatamala, El Salvador, Nicaragua, Honduras, Costa Rica) trade and Latin American Free Trade Area trade were included in the Data Table figures.

Unregistered trade (trade with other countries of the former Equatorial Customs Union and clandestine trade) and unrecorded trade should probably be excluded under the original availability rationale or under the economic or political feasibility rationale since such trade is either governed by law which forbids taxation entirely, or, in the case of clandestine trade, is economically costly to tax and not particularly politically attractive.

Mining exports were defined to include crude minerals and fertilizers (SITC 27) metaliferous ores, coal, coke, natural gas, crude petroleum and petroleum products, non-metallic mineral manufactures (gems only), unworked and partly worked metal, and gold production. Petroleum products and unworked and partly worked metal were included in mining exports only for countries where the minerals involved were assumed to be mined. Source (2) was used for major minerals and source (12) was used for minor minerals. Mining exports that had a value of less than 1 percent of total exports for the period covered were arbitrarily considered as economically and politically infeasible to tax and are given as 0.0 in the Data Table.

Agricultural Share (Ag/Y_2)

Sources (1), (3) and (4) were used to obtain the agricultural share in either factor cost or market price, whichever was available from the source. In a few cases, source (4) figures covered the beginning and end years of the period or as close to those years as available. This was not felt to lead to significant data inaccuracy because the agricultural share for an LDC changes slowly over a period of several years.

The agricultural share includes agricultural production, animal husbandry, fishing and forestry, but does not include mining.

Telephones (Tele)

Source (6) was used to obtain the number, in millions, of public and private telephones installed that can be connected to a central exchange. In almost all cases, telephone data covered the entire tax data period.

Life Expectancy (Life)

Source (15) was used to obtain life expectancy at birth of both sexes, medium variant in Table A.8. The 1960-65 and the 1965-70 figures were used, depending on the period covered by the tax data. For the 1964-66 period, the 1960-1965 figure was used. In a few cases, no figures were given for an LDC and the mean figure for the region was used.

Protein Per Capita (Prot)

Table 162 in source (6-1972) was used to obtain protein grams per capita per day. The nearest period to that covered by the tax data was used.

Calories Per Capita (Cal)

Table 162 in source (6-1972) was used to obtain daily per person caloric intake. The nearest period to that covered by the tax data was used.

Educational Expenditure Share (Ed/Y_2)

Source (1) was used for most African countries and source (6) was used for other LDCs to obtain per capita educational expenditures by the central government only.

Average Annual Growth Rate of GNP (Y_1/P_{10})

Source (16) provided figures for average annual rate of growth of gross national product at factor cost for the period 1960-1969. Source (16), in converting own currency to U.S. dollars, attempted to approximate equilibrium exchange rates.

Urbanization (Urb)

Sources (15) and (6-1972) were used to obtain percentage of the total population living in urban areas, where

urban centers are defined by the country itself. This definition can and does vary from country to country and is sometimes of questionable validity. The figures obtained did not necessarily cover the tax data period precisely and so an urbanization growth rate often had to be inferred from two yearly figures given that were separated by several years.

Country Notes

Cameroon--Educational expenditures are for the two states in addition to federal expenditures.

Central African Republic--No estimate of municipal taxes is included in T. At least some, if not most, of municipal tax revenue is earmarked from specific taxes levied by the central government. Unregistered trade (trade with Chad, Congo [Br.], Gabon, and clandestine trade) is excluded from exports. Source (1) estimates unregistered trade to be about 25 percent of registered exports (Vol. 1, p. 167).

Chad--Source (1) figures for central government tax revenues were adjusted upward by 2.4 percent, the local tax/total tax ration given in source (11). Unregistered trade is excluded from exports. Source (1) estimates unregistered exports to be about 36 percent of registered exports for 1963 and 1965 (Vol. 1, p. 221).

Gabon--Unregistered trade is excluded from exports. Source (1) estimates unregistered exports to be about 3 percent of registered exports for the period 1962-1964 (Vol. 1, p. 326).

Dahomey--Local revenue receipts were 16.2 percent of central government revenue in 1966 as given in source (1) (Vol. 3, p. 178). This figure was used for all three years to obtain local revenue figures and 50 percent of this was arbitrarily assumed to represent local taxes.

Ivory Coast--Municipal budgets are of minor significance and so tax revenue was assumed nil at the municipal level. Mining export figures used exclude industrial diamonds. Educational expenditures include health expenditures, amounting to about 19 percent of the educational expenditures per capita figure.

Mauritania--The tax figure used is an average of the 1964 and 1968 central government tax figures from the current budget plus $1.21 million collected in taxes by the Social Security Fund in 1967. No estimate of municipal taxes is included in the figure. At least some, if not most, municipal government tax revenue is derived from specified taxes in the current budget of the Central Government according to source (1) (Vol. 3, p. 353).

Togo--Tax revenue includes $1.7 millions, the net average profits of the Office of Agricultural Products, a public marketing agency.

Upper Volta--Educational expenditures are for 1966 only and include cultural expenditures.

Malagasy Republic--Educational expenditures included those of annexed and provincial budgets in addition to those of the central government budget.

Tanzania--Zanzibar is not included in the data. Industrial diamonds are excluded from mining exports.

Malawi--Based on data given in source (3), the Y_1 figure given in source (10) was increased by 3.8 percent to obtain an estimate of Y_2.

Zambia--Source (1) indicates that 90 percent of total revenue is accounted for by the central government (Vol. 4, p. 405). Consequently, local taxes were arbitrarily estimated as half of 10 percent of total revenue.

Sierre Leone--Mining exports exclude industrial diamonds.

Nigeria--Educational expenditure data include the regional as well as the federal government data.

Ghana--Mining exports exclude industrial diamonds.

South Africa--Data include Namibia.

Zaire--Trade data were derived from source (13, January, 1974).

Haiti--Ag/Y_2 was taken from source (3-1972) and is an average of 1962 (F) and 1965 (F) at producers' values at constant prices of 1965.

Honduras--Tax figures include the profits of government enterprises.

Peru--National Income is included in the denominator of Ag/Y_2 rather than GDP.

Afghanistan--Ag/Y_2 is an average of 1961 and 1965 from source (4).

Cambodia--The average figures for Laos, North Vietnam and South Vietnam for 1964-1966 were used to obtain Prot and Cal. Trade data was taken from source (6-1969).

Thailand--Central government educational expenditures were obtained for 1963 and 1964 only.

Iraq--Agricultural services such as cotton ginning are not counted as part of the agricultural sector, and government services affecting animal husbandry and irrigation systems are similarly excluded, thus affecting Ag/Y_2.

APPENDIX F

A SOCIETAL INTERACTION INDEX

Societal complexity is defined in terms of informational and economic interaction. Specifically, as the number of informational and economic nodes and routes increase, and as the capacity of these nodes and routes increase, so does the complexity of society. An enormous volume of data would be required to specify societal complexity in terms of actual interaction, so an alternative approach becomes appealing.

An index of societal interaction can be formed by creating an index of the volume of communications media, the volume of transport routes, and the stock of financial assets relative to aggregate income. This index could be constructed as follows:

$$SI_A = \left(\sum_{i=1}^{3} ((TR_A/SQ_A)/P_A)_i/TR_i \right)/tr$$

$$+ \left(\sum_{j=1}^{6} (ME_A/P_A)_j/ME_j \right)/me$$

$$+ \left(\sum_{k=1}^{5} (FA_A/Y_2)_k/FA_k \right)/fa$$

where:

SI = societal interaction index for country A

$((TR_A/SQ_A)/P_A)_i$ = connecting miles of transport media i in country A divided by square miles in country A, the quantity of which is divided by the population in country A.

TR_i = the arithmetic mean of ((TR/SQ)/P) for each transport media i calculated over all countries in the sample.

$(ME_A/P_A)_j$ = number of messages per capita from a communications media j in country A.

ME_j = the arithmetic mean of (ME/P) for each communications media j calculated over all countries in the sample.

$(FA_A/Y_2)_k$ = stock of financial asset k in country A divided by gross domestic product in country A.

FA_k = the arithmetic mean of (FA/Y_2) for each financial asset k divided by gross domestic product calculated over all countries in the sample.

tr = count indicator of three transport media (all weather roads, railways, domestic air routes).

me = count indicator of six communications media (wires, letters, radios, televisions, telegrams, newspapers).

fa = count indicator of five types of financial assets (coins and currency and demand deposits, savings and time deposits, private bonds, government bonds, stock).

Each component of the societal interaction index for a given country, SI, would tend to be greater than one for a more developed LDC and would tend to be less than one for a less developed LDC. LDCs would fall into two distinct groups since complex LDCs would have much higher indices than those of simple LDCs. This kind of level of

development indicator has a number of advantages over more traditional monetary indicators of development and could be used in many kinds of models in addition to the international tax effort model. As a unit free indicator, SI avoids the measurement problems associated with the comparison of currency values across countries. The societal interaction index, SI, can better capture wealth distribution changes in an LDC over time as more equal income distribution would be expected to lead to more interaction in a system, since substantial economies of scale are associated with individual use of transport and communications media and because of the more rapid rise in potential connecting routes given new interacting nodes in a system. Such a societal interaction index is much more sensitive to structural changes which accompany development but are often not revealed by per capita aggregate income. The major disadvantages of this index would seem to be the lack of data availability and the assumption inherent in the model (as with ILPRCL) that all three determinants of SI have equal weight. Data could be made available more quickly were substantial international institutional effort devoted to collecting and publishing it. The assumption of equal weights seems relatively less pernicious for a level of development indicator than the traditional assumption that exchange rates can be used to value relative aggregate product among LDCs.

SELECTED BIBLIOGRAPHY

Aaron, Henry. "Some Criticisms of Tax Burden Indices." National Tax Journal (September 1965), pp. 313-318.

Adelman, Irma, and Morris, Cynthia Taft. "A Factor Analysis of the Interrelationship Between Social and Political Variables and Per Capita Gross National Product." Quarterly Journal of Economics (November 1965), pp. 555-578.

Adelman, Irma, and Morris, Cynthia Taft. Society; Politics and Economic Development. Baltimore: Johns Hopkins University Press, 1971.

Adelman, Irma, and Morris, Cynthia Taft. Economic Growth and Social Equity in Developing Countries. Stanford: Stanford University Press, 1973.

Agency for International Development. A.I.D. Economic Data Book. Washington, D.C.: A.I.D., 1970.

Akin, John S. "Fiscal Capacity and the Estimation Method of the Advisory Commission on Intergovernmental Relations." National Tax Journal (June 1973), pp. 275-291.

Almond, G. A., and Coleman, J. S., eds. The Politics of the Developing Areas. Princeton: Princeton University Press, 1960.

Bahl, Roy W. "A Regression Approach to Tax Effort and Tax Ratio Analysis." IMF Staff Papers (November 1971), pp. 570-608.

Bahl, Roy W. "A Representative Tax System Approach to Measuring Tax Effort in Developing Countries." IMF Staff Papers (March 1972), pp. 87-122.

Barber, W. J. "A Critique of Aggregate Accounting Concepts in Underdeveloped Areas." Bulletin of the Oxford University Institute of Economics and Statistics (November 1963), pp. 293-308.

Beckerman, Wilfred, and Bacon, Robert. "International Comparisons of Income Levels: A Suggested New Measure." Economic Journal (September 1966), pp. 519-536.

Bennett, M. K. "International Disparities in Consumption Levels." American Economic Review (September 1951), pp. 632-649.

Berry, B. J. "Basic Patterns of Economic Development." In Atlas of Economic Development, pp. 110-119. Edited by N. Ginsburg. Chicago: University of Chicago Press, 1961.

Bird, Richard. "A Note on Tax Sacrifice Comparisons." National Tax Journal (September 1964), pp. 303-308.

Bird, Richard M. Taxation and Development. Cambridge, Mass.: Harvard University Press, 1970.

Bird, Richard M. "Wagner's 'Law' of Expanding State Activity." Public Finance 26 (1971):1-26.

Brookfield, Harold. Interdependent Development. Pittsburgh: University of Pittsburgh Press, 1975.

Browning, H. L. "Migrant Selectivity and the Growth of Large Cities in Developing Societies." Rapid Population Growth. Vol. 2, Research Papers. Baltimore: Johns Hopkins Press, 1971.

Chelliah, Raja J. "Trends in Taxation in Developing Countries." IMF Staff Papers (July 1971), pp. 254-331.

Chelliah, Raja J.; Baas, Hessel J.; and Kelly, Margaret R. "Tax Ratios and Tax Effort in Developing Countries, 1969-71." IMF Staff Papers (March 1975), pp. 187-205.

Chenery, Hollis B. "Patterns of Industrial Growth." American Economic Review (September 1960), pp. 264-654.

Chenery, Hollis B. "Growth and Structural Change." Finance and Development (September 1971), pp. 16-27.

Chenery, Hollis B., and Taylor, Lance. "Development Patterns: Among Countries Over Time." Review of Economics and Statistics (November 1968), pp. 391-416.

Denton, Frank T., and Oksanen, Ernest H. "Data Revisions and Forecasting Accuracy: An Econometric Analysis Based on Preliminary and Revised National Accounting Estimates." The Review of Income and Wealth (December 1973), pp. 437-452.

Due, John F. Indirect Taxation in Developing Economies. Baltimore: The Johns Hopkins Press, 1970.

Duggar, Jan Warren. "An Examination of the Feasibility of Using Monetary Data for National Income Estimates." Review of Income and Wealth (December 1968), pp. 311-339.

Elliott, J. A. M. "International Comparisons of Social Welfare." Ph.D. dissertation, Yale, 1972.

Frank, Henry J. "Measuring State Tax Burdens." National Tax Journal (June 1959), pp. 179-185.

Friedman, John. Urbanization, Planning, and National Development. Beverly Hills, Ca.: Sage Publications, 1973.

Gandhi, Ved. P. "Wagner's Law of Public Expenditure: Do Recent Cross-Section Studies Confirm It?" Public Finance 26 (1971):44-56.

Geary, R. C. "Reflections on National Accounting." The Review of Income and Wealth (September 1973), pp. 221-251.

Gibbons, Jean Dickinson. Nonparametric Methods for Quantitative Analysis. New York: Holt, Rinehart and Winston, 1976.

Goffman, Irving J., and Mahar, Dennis J. "The Growth of Public Expenditures in Selected Developing Nations: Six Caribbean Countries 1940-65." Public Finance 26 (1971):57-74.

Goode, Richard. "An Economic Limit on Taxes: Some Recent Discussions." National Tax Journal (September 1952), pp. 227-232.

Goode, Richard; Lent, George E.; and Ojha, P. D. "Role of Export Taxes in Developing Countries." IMF Staff Papers (November 1966), pp. 453-501.

Gramlich, E. M. "State and Local Governments and Their Budget Constraint." International Economic Review (June 1969), pp. 163-182.

Grunfeld, Yehuda, and Griliches, Zvi. "Is Aggregation Necessarily Bad?" The Review of Economics and Statistics (February 1960), pp. 1-13.

Gupta, Shibshankar P. "Public Expenditure and Economic Growth: A Time-Series Analysis." Public Finance 22 (1967):423-461.

Gupta, Shibshankar P. "Public Expenditure and Economic Development--A Cross-Section Analysis." Finanarchiv (October 1968), pp. 26-41.

Harsanyi, John C. "Rational Choice Models of Political Behavior vs. Functionalist and Conformist Theories." World Politics (July 1969), pp. 513-538.

Hayami, Y., and Ruttan, V. W. Agricultural Development: An International Perspective. Baltimore: Johns Hopkins Press, 1971.

Head, J. G. "Public Goods and Public Policy." Public Finance 17 (1962):197-219.

Heller, Peter S. "A Model of Public Fiscal Behavior in Developing Countries: Aid, Investment and Taxation." American Economic Review (June 1975), pp. 429-445.

Heston, Alan. "A Comparison of Some Short-cut Methods of Estimating Real Product Per Capita." The Review of Income and Wealth (March 1973), pp. 79-104.

Hinrichs, Harley H. "Determinants of Government Revenue Shares Among Less-Developed Countries." Economic Journal (September 1965), pp. 546-556.

Hinrichs, Harley H., and Bird, Richard. "Government Revenue Shares in Developed and Less Developed Countries." Canadian Tax Journal (September 1963), pp. 431-437.

Hirschman, Albert O. Journeys Toward Progress. New York: The Twentieth Century Fund, 1963.

Hirschman, Albert O. "The Political Economy of Import-Substituting Industrialization in Latin America." Quarterly Journal of Economics (February 1968), pp. 1-32.

Horowitz, Irving Louis. Three Worlds of Development. 2nd ed. New York: Oxford University Press, 1972.

International Monetary Fund. International Financial Statistics. Washington, D.C.: International Monetary Fund, 1967, 1968, 1969, 1970, 1971, 1972, 1973, 1974.

International Monetary Fund. International Financial Statistics Supplement--1972. Washington, D.C.: International Monetary Fund, 1973.

International Monetary Fund. Surveys of African Economies. 5 vols. Washington, D.C.: International Monetary Fund. Vol. 1: Cameroon, Central African Republic, Chad, Congo, Gabon, 1968; Vol. 2: Kenya, Tanzania, Uganda, Somalia, 1969; Vol. 3: Dahomey, Ivory Coast, Mauritania, Niger, Senegal, Togo, Upper Volta, 1970; Vol. 4: Democratic Republic of Congo, Malagasy Republic, Malawi, Mauritius, Zambia, 1971.

Isard, Walter. Introduction to Regional Science. Englewood Cliffs: Prentice-Hall, 1975.

Johnston, J. Econometric Methods. New York: McGraw-Hill, 1963.

Kaldor, Nicholas. "Will Underdeveloped Countries Learn to Tax?" Foreign Affairs (January 1963), pp. 410-419.

Kamarck, Andrew M. The Economics of African Development. Rev. ed. New York: Praeger, 1971.

Kindleberger, Charles P. Power and Money. New York: Basic Books, 1970.

Kmenta, Jan. Elements of Econometrics. New York: Macmillan, 1971.

Kuh, Edwin. "The Validity of Cross-Sectionally Estimated Behavior Equations in Time Series Applications." Econometrica (April 1959), pp. 197-214.

Kuznets, Simon. "Underdeveloped Countries and the Pre-Industrial Phase in the Advanced Countries." In The Economics of Underdevelopment, pp. 135-153. Edited by A. N. Agarwala and S. P. Singh. London: Oxford University Press, 1958.

Kuznets, Simon. Modern Economic Growth. New Haven and London: Yale University Press, 1966.

Lall, S. "A Note on Government Expenditures in Developing Countries." Economic Journal (June 1969), pp. 413-417.

Lewis, Stephen R., Jr. "Agricultural Taxation in a Developing Economy." In Readings on Taxation in Developing Countries, 3rd ed., pp. 389-400. Edited by Richard M. Bird and Oliver Oldman. Baltimore: The Johns Hopkins University Press, 1974.

Lloyd, Peter E., and Dicken, Peter. Location in Space: A Theoretical Approach to Economic Geography. New York: Harper & Row, 1972.

Loasby, Brian J. Choice, Complexity and Ignorance. Cambridge: Cambridge University Press, 1976.

Lotz, Joergen R. "Patterns of Government Spending in Developing Countries." The Manchester School of Economic and Social Studies (June 1970), pp. 119-144.

Lotz, Joergen R., and Morss, Elliott R. "Measuring 'Tax Effort' in Developing Countries." International Monetary Fund Staff Papers (November 1967), pp. 478-499.

Lotz, Joergen R., and Morss, Elliott R. "A Theory of Tax Level Determinants for Developing Countries." Economic Development and Cultural Change (April 1970), pp. 328-341.

Loucks, William N., and Whitney, William G. Comparative Economic Systems. 8th ed. New York: Harper & Row, 1969.

Marris, R. "A Note on Measuring the Share of the Public Sector." The Review of Economic Studies 22(3), No. 59 (1954-55):214-219.

Martin, Alison M., and Lewis, W. A. "Patterns of Public Revenue and Expenditure." The Manchester School of Economic and Social Studies (September 1956), pp. 203-244.

Mellor, John W. The Economics of Agricultural Development. Ithaca, N.Y.: Cornell University Press, 1966.

Musgrave, Richard A. Fiscal Systems. New Haven: Yale University Press, 1969.

Musgrave, Richard A., and Musgrave, Peggy B. Public Finance in Theory and Practice. New York: McGraw-Hill, 1973.

Musgrave, Richard A., and Peacock, Alan, eds. Classics in the Theory of Public Finance. New York: St. Martin's Press, 1958.

Myint, H. "The Peasant Economies of Today's Underdeveloped Areas." In Subsistence Agriculture and Economic Development, pp. 99-104. Edited by Clifton R. Wharton, Jr. Chicago: Aldine, 1969.

Nelson, Joan M. "Sojourners versus New Urbanites: Cause and Consequences of Temporary versus Permanent Cityward Migration in Developing Countries." Economic Development and Cultural Change (July 1976), pp. 721-757.

Niewiaroski, Donald H. "The Level of Living of Nations: Meaning and Measurement." Estadistica (March 1965), pp. 3-31.

Nurkse, R. Problems of Capital Formation in Underdeveloped Countries. Oxford: Basil-Blackwell, 1953.

Ojha, P. D. "Taxable Capacity in Underdeveloped Economies." Journal of the University of Bombay (July 1955), pp. 22-41.

Oshima, Harry T. "Share of Government in Gross National Product for Various Countries." American Economic Review (June 1957), pp. 381-390.

Plasschaert, Sylvain. "Taxable Capacity in Developing Countries." International Bank for Reconstruction and Development, February, 1962. (Mimeographed.)

Prest, A. R. "Government Revenue, the National Income and All That." In Modern Fiscal Issues: Essays in Honor of Carl S. Shoup, pp. 137-163. Edited by Richard M. Bird and John G. Head. Toronto: University of Toronto Press, 1972.

Pye, Lucian W. Aspects of Political Development. Boston: Little, Brown and Company, 1966.

Riker, William, and Ordeshook, Peter C. An Introduction to Positive Political Theory. Englewood Cliffs, N.J.: Prentice-Hall, 1973.

Robinson, Sherman. "Theories of Economic Growth and Development: Methodology and Content." Economic Development and Cultural Change (October 1972), pp. 54-67.

Roe, Alan R. "The Government-Revenue Share in Poorer African Countries--A Comment." Economic Journal (June 1968), pp. 479-481.

Rogers, Everett M. "Motivations, Values and Attitudes of Subsistence Farmers: Toward a Subculture of Peasantry." In Subsistence of Agriculture and Economic Development, pp. 111-135. Edited by Clifton R. Warton, Jr. Chicago: Aldine, 1969.

Rostow, W. W. "The Take-Off into Self-Sustained Growth." In The Economics of Underdevelopment, pp. 154-186. Edited by A. N. Agarwala and S. P. Singh. London: Oxford University Press, 1958.

Rostow, W. W. The Process of Economic Growth. New York: Norton, 1962.

Samuelson, P. A. Foundations of Economic Analysis. Cambridge, Mass.: Harvard University Press, 1948.

Shin, Kilman. "International Difference in Tax Ratio." The Review of Economics and Statistics (May 1969), pp. 213-220.

Smith, V. Kerry. "A Note on Beckerman: Environment, Needs and Real Income Comparisons." The Review of Income and Wealth (March 1974), pp. 119-122.

Surrey, Stanley S. "Tax Administration in Underdeveloped Countries." In Readings on Taxation in Developing Countries, 3rd ed., pp. 479-499. Edited by Richard M. Bird and Oliver Oldman. Baltimore: The Johns Hopkins University Press, 1974.

Tanzi, V., and McCuiston, C. "Determinants of Government Revenue Shares among Less-Developed Countries: A Comment." Economic Journal (June 1967), pp. 403-405.

Taylor, Milton C. "Income Tax Administration and Policy in Nigeria." In Readings on Taxation in Developing Countries, 3rd ed., pp. 528-540. Edited by Richard M. Bird and Oliver Oldman. Baltimore: The Johns Hopkins University Press, 1974.

Theil, Henri. Principles of Econometrics. New York: John Wiley & Sons, Inc., 1971.

Thorn, Richard. "The Evolution of Public Finances During Economic Development." The Manchester School of Economic and Social Studies (January 1967), pp. 19-54.

Thorn, Richard S. "Per Capita Income as a Measure of Development." Zeitschrift für Nationalkonomie 28 (1968):206-216.

Turnham, D. The Employment Problem in Less-Developed Countries: A Review of the Evidence. Paris: OECD Development Center, 1971.

United Nations. Demographic Yearbook 1971. New York: United Nations, 1972.

United Nations. Economic Surveys of Asia and the Far East 1969. New York: United Nations, 1970.

United Nations. "Objectives for the Mobilization of Domestic Resources." A paper circulated at the United Nations' Conference on Trade and Development (UNCTAD). TD/B/C.3/75/Add.1, February, 1970. (Mimeographed.)

United Nations. Statistical Yearbook. New York: United Nations, 1969, 1970, 1971, 1972, 1973.

United Nations. Survey of Economic Conditions in Africa. New York: United Nations, 1971.

United Nations. World Economic Survey 1969-1970. New York: United Nations, 1971.

United Nations. World Population Prospects as Assessed in 1968. Population Studies, No. 53. New York: United Nations, 1973.

United Nations. Yearbook of International Trade Statistics. New York: United Nations, 1964, 1965, 1966, 1967, 1968, 1969, 1970, 1971.

United Nations. Yearbook of National Account Statistics. New York: United Nations, 1967, 1968, 1969, 1970, 1971, 1972.

U.S. Advisory Commission on Intergovernmental Relations. Measures of State and Local Fiscal Capacity and Tax Effort. Washington, D.C.: U.S. Advisory Commission on Intergovernmental Relations, 1962.

Webster, S. J. "Problems of Determining and Measuring the Reliability of National Accounts in Developing Countries." The Review of Income and Wealth (March 1974), pp. 41-53.

Weiss, Steven J. "Factors Affecting the Government Revenue Share in Less Developed Countries." Social and Economic Studies (December 1969), pp. 348-364.

Williamson, Jeffrey G. "Public Expenditure and Revenue: An International Comparison." The Manchester School of Economic and Social Studies (January 1961), pp. 43-56.

World Bank. World Tables. Washington, D.C.: World Bank, 1971.

World Bank Group and International Bank for Reconstruction and Development. "World Bank Atlas: Population, Per Capita Production and Growth Rates." Finance and Development (March 1972), pp. 48-60.

Yamane, Taro. Statistics, An Introductory Analysis. 2nd ed. New York: Harper & Row, Publishers, 1967.

Yotopoulos, Pan A., and Nugent, Jeffrey B. Economics of Development--Empirical Investigations. New York: Harper & Row, 1976.

Zarembka, Paul. Toward a Theory of Economic Development. San Francisco: Holden-Day, Inc., 1972.

BIOGRAPHICAL SKETCH

Kenna Clyde Taylor, Jr., was born in Washington, D.C., on March 14, 1945. He attended high school in Shadyside, Ohio, and received a B.A. in international studies at The Ohio State University in 1967. In 1969 he received an M.A. in economics at The Ohio State University. He then taught economics for two years at West Liberty State College before returning to graduate school at the University of Florida in 1971. He completed his Ph.D. course work and joined the faculty of Rollins College in 1974, where he presently teaches.

Kenna Taylor is married, and he and his wife Jacqueline have a son, Bradley. They live in Longwood, Florida.

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

Frederick O. Goddard, Chairman
Associate Professor of Economics

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

Max Langham
Professor of Food and Resource Economics

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

J. Ronnie Davis
Professor of Economics

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

Jack Vernon
Professor of Economics

This dissertation was submitted to the Graduate Faculty of the Department of Economics in the College of Business Administration and to the Graduate Council, and was accepted as partial fulfillment of the requirements for the degree of Doctor of Philosophy.

June 1979

_____

Dean, Graduate School