An Econometric Approach to Saving Analysis

by

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INTRODUCTION

The role of savings as a means of financing investment in the process of economic development is well conceived in the theories of economic growth. But what determines saving? Economists have tried to theorize about the relationship between savings and other economic aggregates in the national accounts. With the notable exception of Houthakker [16] Zohar [42] and Williamson [39] these studies were empirically verified only for U.S.A., Canada and a few other highly developed countries. An application of these models to international data is strongly desired because they generally serve as a useful frame of reference for growth and stabilization policies. The lack of such interest can be explained by the difficulties that collection and refinement of required data poses for developing countries.

(*i*) Objectives of the Present Study

(*a*) an application of selective models to international data and an enquiry into the accuracy with which saving behaviour in both developed and developing countries are explained; and

(*b*) the introduction of additional explanatory variables, and to see if these improve our results.

It is neither possible nor is our study intended to be comprehensive, but it may throw some additional light on the determinants of savings in both developed and less developed countries.

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Notations and Terminology

S	=	Personal saving = Y — C
t	=	Time
S_{t-1}	=	Lagged personal savings
Y	=	Personal disposable income
dY	=	$Y_t - Y_{t-1}$
C	=	Private consumption expenditure
C_{t-1}	=	Lagged consumption
Y^1	=	Labour income
Y^p	=	Income from property and enterprises (households)
T_d	=	Direct taxes
T_i	=	Indirect taxes
T	=	$T_d + T_i$
Y^*	=	Permanent income
Y'	=	Transitory income
P_c	=	Consumer price index
D_i	=	Year dummies
D_j	=	Country dummies
n	=	Number of observations
N	=	Population

(*ii*) Data and Methodology

The data for this study are derived from various statistical publications of the United Nations [36,37,38]. Inconsistencies and discontinuities of the published United Nations data were overcome by consulting unpublished country questionnaires at the U.N. Statistical Office at New York. U.N. publications list data on national accounts in local currencies at current factor costs. These data on savings, consumption, income and taxes were deflated using consumer price indices published in the Statistical Yearbook of the United Nations. 1958 was chosen as the base year. Finally, the data were converted into U.S. dollars using official exchange rates [20]. Deflation for prices of such data is important, as Professor Modigliani states that cyclical variation between prices and income causes a marked positive correlation even though the true relation between the two series is slight. Even if the correlation is improved by the use of undeflated figures the resultant saving function equation is a less reliable tool [31, Pp. 372;42].

Since the present study seeks to throw additional light on the determinants of personal savings, it will be more appropriate to select a large sample. Only in this way meaningful international comparisons can be made possible. However, serious limitations of data and time have forced us to restrict our study to 14 countries and to the period 1951-68 (in most cases). The choice of countries was made keeping in view the following:

(1) Countries where the market economy (of course with all its imperfections) prevails;

(2) Countries with fairly diverse economic settings. For this purpose per capita income was used as a criterion;

(3) Countries which are on the U.N. system of national accounts and have published detailed data for the period 1951-68. The following table (Table I) provides basic economic indicators for the countries included in our study.

TABLE I

Country	1967 per capita income ($)	% of GDP 1967 at current factor cost from		Average annual growth rate of real GDP, 1960-67	
		Agriculture	Industry	Total	Per capita
U.S.	3303	3	32	5.1	3.6
Sweden	2500	6	36	4.7	4.0
Canada	2087	6	32	5.7	3.8
U.K.	1560	3	39	3.3	2.4
Belgium	1600	6	34	4.7	4.0
Japan	928	12	29	9.7	8.6
Spain	707	16	31	8.1	7.2
S. Africa	521	12	36	6.2	4.0
Jamaica	439	11	26	7.0	4.0
Colombia	262	31	21	4.8	1.5
Mauritius	211	24	18	N.A.	N.A
Honduras	209	38	18	5.4	2.0
Taiwan	221	24	25	10.4	7.1
Korea	140	35	20	7.9	5.1

Source: [37].

Methodology

Our major objective in this study is to test the influence of different economic variables upon savings in order to see whether a function can adequately describe the saving behaviour in different countries of the world. A single equation multiple regression model is applied to time series data for testing different functions. We also look into the possibility of a single world saving function.

The scarcity of comparative data for such a large sample of countries has compelled us to deal only with the following explanatory variables.

(*i*) Personal Disposable Income

Data for personal disposable income is readily available, hence it is a good candidate to be included in any study on saving functions. The theoretical importance of income as an explanatory variable for saving can be emphasized by the following simple illustration [18, Pp. 404-406].

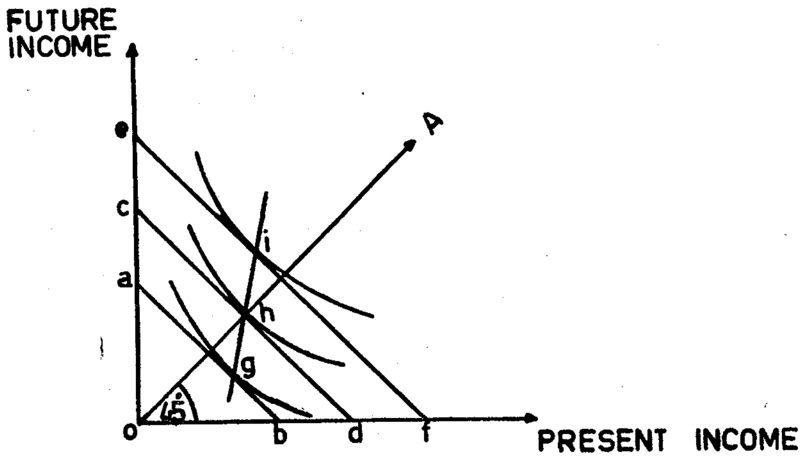

FIGURE 1

Suppose that the individual's preferences are given by the indifference map above and that he has a positive time preference at his existing level of income. We also assume that prices are constant, interest rate is zero and choice between present and future income lies on ab. As his income increases the individual will move from an initial equilibrium point g to point h. In doing so he ceases to dissave. If he gets a further raise in his income he will move to point i where he saves part of his income. Thus we postulate that the level of income affects the individual's saving behaviour.

(*ii*) Property Income

Several theories of economic growth have supported the thesis that the source of income has an important bearing on saving behaviour. Many of these models assume that the recipients of property income have a higher propensity to save than the recipients of labour income. This thesis, though strongly rooted in growth theory, has not been empirically tested with international data. We intend to explore this hypothesis.

(*iii*) Taxation: Direct and Indirect

Taxation is generally considered to have a negative effect on personal savings, but this impact depends on the type of tax used. According to two studies, by Professors Musgrave and Goode respectively, the proportions of tax revenues which can be assumed to be paid out of personal savings are as shown below [35, Pp. 116-117]:

	Musgrave (1957)	*Goode* (1950)
Federal Individual Income Tax	31	33
Proportional Income Tax	22	28
Sales Tax	18	27

An in-depth study of the effects of different kinds of taxation on savings is beyond the scope of this paper. However we will be interested in testing the general hypothesis that both direct and indirect taxes discourage savings by affecting the rate of return on investible resources and also by reducing personal disposable income.

(*iv*) Dummy Variables[1]

D_i = Year dummies

D_j = Country dummies

Dummy variables can be used to represent various factors such as temporal effects, spatial effects and other qualitative variables, which may not otherwise have been accounted for in a regression model. We may postulate that the saving function shifts between one period and another. Also, shifts in the saving function among different countries may be a consequence of cross-country differences in the economic and political environment.

The value of the estimated dummy coefficient for each year indicates the magnitude of the net effect of fluctuations during a given year on savings. The country dummy coefficients show that some socio-economic conditions within countries account for considerable differences in the propensity to save. However, an exposition of many unexplained fatcors requires a detailed study of the individual countries which is beyond the scope of the present paper [42].

SOME MODELS OF SAVINGS BEHAVIOUR

The purpose of this section is to investigate:

(*i*) Keynesian absolute income hypothesis [25];
(*ii*) Change in income model proposed by Ezekiel and Mack [28];
(*iii*) Normal income model by Friedman [9]; and
(*iv*) Houthakker and Taylor dynamic adjustment models [15].

While Keynesian theory claims that current income is the most powerful explanatory variable for current savings, Ruth Mack contends that the direction of a change in income is equally important to analyse the saving behaviour. To resolve the apparent inconsistencies of empirical data on the relationship of saving to income, Milton Friedman proposes permanent income as the main determinant of savings. Houthakker and Taylor models emphasize "habit persistence" nature of consumer behaviour.

Keynesian Model

$$S = a + b\,Y$$

This model assumes a positive linear relationship between savings and income. In the present context, this model seems to be rather naive, but it provides a good starting point for comparisons of savings function for different countries. We estimate statistically parameters a and b for all countries included in the study and the findings are presented in Table II.

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[1]See [23, Pp, 167-186; 30, Pp. 363-385; 33, Pp. 548-61).

Saving functions of 14 countries based on the Keynesian model, computed for the period 1950-68, seem to suggest that current income is a good explanatory variable for current savings. The intercept was negative for 9 countries (mostly developed) and, out of these, statistically significant for 7 countries at the 5 per cent level of significance. A negative intercept in a linear saving function implies that MPS (marginal propensity to save) everywhere exceeds the APS (average propensity to save), so the saving-income ratio has a tendency to rise as income rises. All these countries show a significant association between Y and S. The intercept was not different from zero in the case of USA, South Africa, Sweden, and Mauritius, which implies that the APS in these countries (as far as this model is concerned) equals MPS. For three countries, Colombia, Honduras and Korea, the intercept was positive and statistically significant, meaning thereby that the saving-income ratio falls as income rises. But a positive intercept in a saving function makes no economic sense. A non-linear formulation or presence of other explanatory variables in the model, may be more appropriate in these cases. Also, for these 3 countries $\bar{R}^2$ is not significant. Thus income has very little explanatory power in describing the savings behaviour in these countries.

The slope coefficients were found to be positive and less than one in all cases except for Colombia. These were statistically significant for 10 countries. By looking at the MPS for different countries, it is interesting to see whether the countries were ranked according to this criterion. Japan and Taiwan have MPS as high as .22 while U.S. ranks 11th followed by Korea and Honduras. Colombia is the only country in our model with a negative MPS.

Adjusted coefficient of multiple determination had the highest value for Japan and the lowest for Honduras. Durbin-Watson statistics indicate that there was no auto-correlation for 11 countries, but for the remaining 3 the evidence was inconclusive. The simple correlation coefficient was found to be significant for 10 out of 14 countries. Lack of any significant correlation between S and Y for the remaining 4 countries may be due either to inaccuracy of data or that variables other than income may be more important.

On the whole, the Keynesian formulation performs well, though at best it is rather elementary in nature.

Ezekiel-Mack Model

Ruth Mack has advanced the thesis that income as the only explanatory variable leaves the picture for a saving function seriously incomplete. Based on her research with U.S. data, she concluded that the direction of income change, if introduced into the model, offers a better explanation of the determinants of savings. Thus, we introduce dY as another determinant in the elementary saving function. Mathematically, the new function can be expressed as:—

$$S = a + b_1 Y + b_2 dY$$

The estimates of the parameters of regression model are presented in Table III. The introduction of dY as an additional variable does not lead to any improvements in the estimates of the basic parameters. b_2, the slope coefficient of dY was found to be significant at the .05 level for 4 countries only namely, US., Taiwan, Mauritius and Korea. In the case of U.S. and Taiwan,

b_2 being positive an increase in income has a positive effect on saving, whereas for Mauritius and Korea such a change leads to dissaving.

$\bar{R}^2$ showed an improvement for 6 countries and deteriorated for the remaining 3. The improvement was mostly for less developed countries. There was found to be no auto-correlation in 9 cases but for the remaining 5 the evidence was inconclusive.

In general, the function did not show any significant improvement over the previous simpler formulation. Our empirical findings did not establish such strong effects of changes in income on saving as is generally expected. It does not seem appropriate therefore to assign much weight to changes in income in an attempt to explain saving behaviour.

Friedman's Model

Friedman draws a distinction between permanent and transitory components of an individual's income. Savings in his model are a function of permanent income which is not subject to short run fluctuations. According to Friedman, "the man who has a lucky day at races does not buy his friend a drink and the poor fellow whose wallet is stolen does not postpone the purchase of an overcoat" [17, p. 398]. Several methods have been proposed by economists to meet the problem of estimating the permanent level of income in time series analysis. The first such method [6], is to specify the saving function as follows:—

$$S = a + b_1 Y + b_2 C_{t-1}$$

This is a transformed and truncated form of Milton Friedman's permanent income hypothesis.[2] This model was applied to time series data of 14 countries in our sample and then two regressions were run for pooled data, one for DCs (developed countries) and the other for LDCs (less developed countries). The results are presented in Table IV-1.

The coefficients of real personal income were positive and significant for 5 DCs and 5 LDCs. Lagged consumption had negative coefficients for 9 countries (3 DCs and 6 LDCs). For USA, C_{t-1} had a positive significant

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[2]This method has been used by Craig [6] for U.S. data. His defence of this derivation follows:

Friedman's wealth variable is neither liquid assets nor net wealth (A) but it is better represented by net worth. The transformation that is made on Friedman's function was first suggested by Koyck. When net worth is used to represent the wealth variable of Friedman, the resulting equation is the following:—

$$S_t = a + b_1 Y_t + b_2 C_{t-1} + b_3 A_t + b_4 A_{t-1}$$

However, A_{t-1} can be removed from this function to avoid multicollinearity problems. If wealth variable is dropped altogether, the Koyck transformation would result in the following:—

$$S_t = a + b_1 Y_t + b_2 C_{t-1}$$

Where $O < b_1 < 1$ and $-1 < b_2 < O$

This still incorporates the main idea of Friedman's hypothesis i.e. permanent income.

See also [26, Chap. 2; 8, p. 346 and 13, Pp. 272-278].

coefficient, which may be explained by the fact that the coefficient of correlation between time series of Y and C_{t-1} was as high as .94. Thus the presence of multicollinearity in our regression estimate for USA distorted the coefficients.

The intercept was not different from zero for 4 developed and 2 less developed countries. Regression based on pooled data for DCs, established a positive influence of lagged consumption on personal savings. For LDCs such an exercise showed that a higher level of lagged consumption discouraged savings, whereas an increase in real income had a positive effect on savings.

Alternately, we can estimate permanent income by taking a two year moving average of time series data on personal income [4, Pp. 37-57]. Transitory income on the other hand is measured as the difference between permanent and current income. Let our saving function be:—

$$S = a + b_1 Y^* + b_2 Y'$$

Where Y^* is permanant and Y' transitory income, defined as below:—

$$Y^* = \frac{Y_t + Y_{t-1}}{2} \quad \text{and}$$

$$Y' = Y_t - Y^*$$

Friedman contends that the marginal propensity to save (MPS) out of Y' is close to unity and that a fixed proportion of Y^* is also saved. Empirical testing of this model presented fairly interesting results. The long run MPS out of Y^* is .06 for the cross-section of developed countries and .04 for less developed nations. The MPS out of Y' is higher than the MPS out of Y^* in most cases. Canada recorded the highest value (.61) for the MPS out of Y' followed by Taiwan (.50), Japan (.30), and Korea (.30). The difference between the propensities to save out of transitory and permanent incomes are also very marked for these countries.

The highest regression coefficient for Y^* is reported for Japan and the lowest for Colombia. These coefficients are positive and significant for 10 countries (8 DCs and 2 LDCs) The coefficients of Y' are positive and significant for six countries only. These include 4 DCs and 2 LDCs.

With this particular model the explanatory power of the pooled regression for developed countries was vastly superior than that for less developed countries. However, the slope coefficients for pooled data of less developed countries does lend some support to Friedman's theory.

Thus on the basis of the above tests we conclude that Friedman's hypothesis is of considerable relevance in explaining saving behaviour.

A comparison of our results with the Williamson [39, Pp. 194-210] and Friend and Taubman [10, Pp. 113-123] studies may be fruitful. Williamson analysed 6 Asian nations for the period 1950-64 (shorter for some countries) and estimated that the MPS out of Y^* and Y' is .22 and .32 respectively for pooled data. Friend and Taubman in their study of 22 countries for the period 1953-60 found these propensities to be .06 and .48 respectively. Our results showed that MPS out of Y* was .04 and out of Y' .16 for LDCs and .06 and zero respectively for DCs. Thus both estimates of MPS for our sample of countries are lower than those of either Williamson or Friend and Taubman.

Williamson's study can be criticized on the grounds that it uses too few observations for some countries e.g. four and five for Malaysia and Vietnam respectively. Similarly, the Friend and Taubman estimates are also based on time series data for eight years only. Our estimates are more accurate as we use a greater time interval and relatively more refined data.

Houthakker and Taylor Models

Professors Houthakker and Taylor based on their research on the form of consumer demand which would adequately explain the U.S. observed data demonstrated that lagged values of some of the variables involved exert an important influence on current consumer behaviour. The presence of lags in the saving function means that adjustments in the saving behaviour of the households does not occur immediately but takes place after some time. Professor Brown has nicely outlined the basic rationale of this hypothesis [2, Pp. 355-371].

> "......the lag effect in consumer demand was produced by the consumption habits which people formed as a result of past consumption. The habits, customs, standards and levels associated with real consumption previously enjoyed become "impressed" on the human physiological and psychological systems and this produces an inertia or "hysteresis" in consumer behaviour. Because of this inertia consumer demand reacts to changes in consumer income with a certain slowness, and thus past real consumption exerts a stabilizing effect on current consumption".

In order to test this hypothesis we need to use appropriate lagged variables. Houthakker and Taylor found lagged consumption, lagged savings and lagged income to be relevant variables. They used a lag of one year only since it was assumed that the effect of "habit persistence" on savings behaviour was continuous and was an inverse function of time. The following functional forms were specified in order to test this hypothesis;

$$S_t = a + b_1 S_{t-1} + b_2 dY$$

$$S_t = a + b_1 C_{t-1} + b_2 dY + b_3 Y_t$$

The results of both models are presented in Tables IV-3 and IV-4.

The empirical testing of the first model confirmed the 'habit persistence' postulate about consumer behaviour in developed countries, but the hypothesis was not suitable for individual less developed nations in our sample. However, for the pooled data, judging by signs of slope coefficients and $\bar{R}^2$, the fit was good only for less developed countries. No useful results were obtained from the second model.

III

FURTHER EXPLORATIONS

Economics literature contains an abundance of theoretical and empirical investigations of household savings and consumption and their relationship with other economic and demographic variables. The large variety of hypotheses and the multitude of empirical evaluations presented provide evidence not only of the importance attached to these variables and their functional relationships, but also of an unfulfilled search for a complete generalized formulation of aggregate saving behaviour. Extensive attempts have been made to extend and empirically test the formal models for the U.S. economy. Many of these models cannot be applied to international comparisons and those applicable, as our analysis shows, offer no conclusive evidence. General agreement about the relative importance of different economic variables, or the manner in which they combine and interact even with respect to economically advanced nations, has not been achieved. The search for a general formulation continues [14,42].

Keeping in mind the availability of the type of international data we are in a position to extend this search. As the figures for different types of income and taxation are readily available in published form, on a comparable basis, we thought it might be a good idea to introduce additional variables like Y^p (property income), T_d (direct taxes) and T_i (indirect taxes) and experiment with a new multivariate formulation. The following functional form was used.

$$S = a + b_1 Y + b_2 Y^p/Y + b_3 T_d + b_4 T_i$$

As pointed out by a referee, it would have been more appropriate to use gross income rather than personal disposable income in the above formulation. But, unfortunately at this stage it is not possible to present estimates incorporating this important suggestion.

Basic Rationale of this Model

This model is a modest attempt to investigate the influence of personal income, property income and taxation upon savings. The model tests the effects on savings of an increase in the ratio of property income to total income. Inclusion of this ratio is important for policy implications. Taxation makes our picture more complete. A number of theoretical studies have confirmed the effects of taxation on saving and capital formation. Professor S. Ganguly has summarised the results of such studies as follows [11, Pp. 79-80]:

SUMMARY OF A PRIORI STATEMENTS

	Tax on	Substitution in favour of	Effects on savings
1.	PC only	FC and Acc	+
2.	PC only	PC and Acc	(∓)?
3.	Acc only	PC and FC	(±)?
4.	PC and FC	Acc	+ but less than No. 1
5.	PC and Acc	FC	+ but less than No. 1
6.	FC and Acc	PC	—

Symbols: PC = Present consumption
FC = Future consumption
Acc = Accumulation

An illustration as to how a direct tax on present consumption affects the saving behaviour of an individual will be in order here. Let us assume that there are only two time periods involved—the present (period 1) and the future (period 2). There are no externalities in consumption. Consumer preferences are given by smooth convex to the origin indifference curves. Consumption possibility line a b in Figure 2 describes alternative mix of present and future consumption available to this particular consumer.

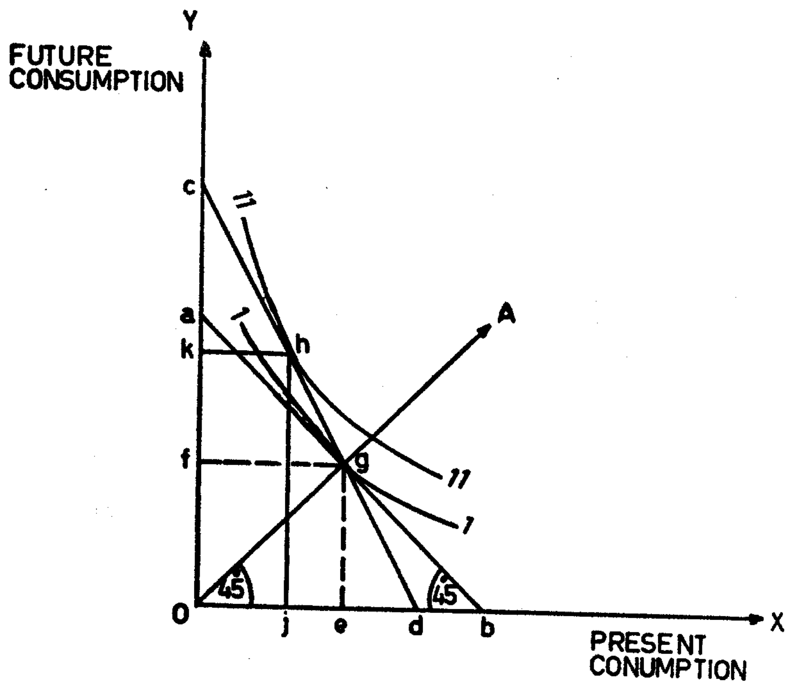

FIGURE 2

For simplicity let us assume that the rate of interest is zero. Now if the individual has zero time preference he will reach an equilibrium at a point g where he consumes equal amounts o e and o f in the present and future periods respectively.

Now government announces a consumption tax in the present period to finance a public works programme. Each individual receives back his share of tax in the next period. Imposition of this tax in period 1 alters the consumption possibility line by making present consumption dearer relative to future consumption. This situation is represented by line c d. Point h on cd describes new optimal position for this individual. He decreases his current consumption to increase his saving by j e. Point h must be on a higher indifference curve because g remains in the choice set but individual chooses h instead.

Now let us relax the assumption of zero time preference in our model. We are now describing the tastes of an individual who reveals positive time preference. Figure 3 represents such a case:

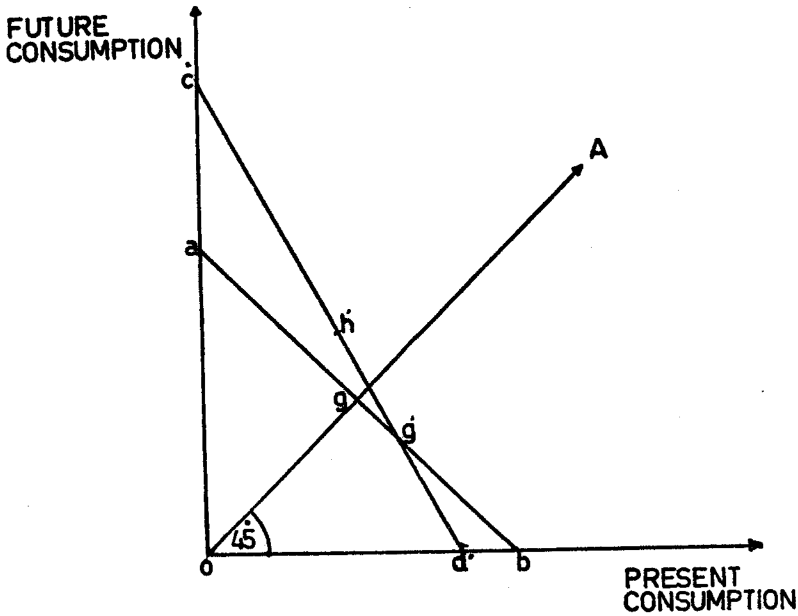

FIGURE 3

g′ represents point of initial equilibrium and h′ depicts after tax optima. Clearly the individual has moved from a position of dissaving to one of positive savings.

An individual with a negative time preference presents no difficulty. Such an individual will be initially in equilibrium at some point on the line segment ag, say point m in Figure 4.

Imposition of a consumption tax induces this individual to increase his saving further and he reaches a higher level of welfare at point w on the new consumption possibility line c′ d′. Thus theoretically a tax on present consumption which results in substitution in favour of future consumption and accumulation must result in increased savings by individuals provided assumptions behind our model hold [18, Pp. 406-410].

We intend to investigate the relationship between savings and taxation as propounded by public finance theorists.

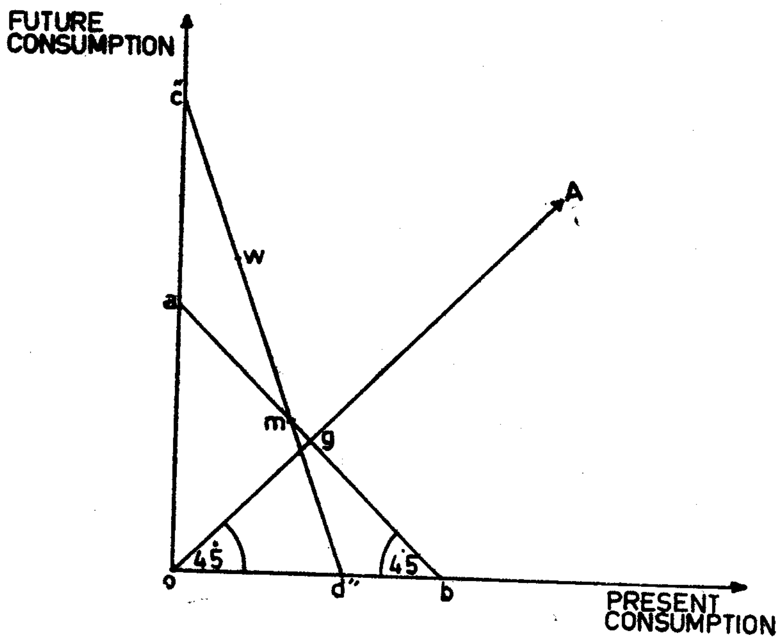

FIGURE 4

Empirical Results

This model was applied to time series data available for the countries included in our present study and estimates are presented in Table V.

The model fits remarkably well with international data. The following conclusions may be derived:

(1) $\bar{R}^2$ (coefficient of multiple determination corrected for degree of freedom) has improved remarkably for almost all countries. The results are perhaps better than achieved in any study on international comparisons of saving functions. It had a value of .99 for Japan and .95 for Taiwan.

(2) Estimated values of a, b_1, b_2 are realistic in most cases. Considering how notorious the national accounts data are supposed to be, this conclusion gives much comfort.

(3) The Durbin-Watson statistic for individual country regressions indicates the lack of significant auto-correlation.

(4) b_3 and b_4 are, in most cases, not significant. But we should be cautious about drawing any conclusion from this because T_d and T_i are highly collinear. This has resulted in a reduction of the

t-statistic. Therefore, we do not have any conclusive evidence about the true relationship between taxation and savings. However, since, we have a priori reason to believe that such a relationship, does exist, we do not reject the generally accepted hypothesis.

In order to overcome multicollinearity encountered in the above mentioned model, the following model was also tested and the results appear in Table VI.

$$S = a + b_1 Y + b_2 Y^p + b_3 (T_d/T_i)$$

The results did not show any overall improvement over our previous formulation.

As a further check, we dropped Y^p/Y and T_i as explanatory variables and fitted an exponential form given below:—

$$S = a Y^{b1} T_d^{b2}$$

or $\text{Log } S = \log a + b_1 \text{Log } Y + b_2 \text{Log } T_d$

The underlying objective was to see whether a log formulation can give a better fit. As is evident from the Table VII; the fit is good only for 3 countries. Thus, we conclude this section with the remark that in the absence of any better formulation,

$$S = a + b_1 Y + b_2 Y^p/Y + b_3 T_d + b_4 T_i + u$$

performs accurately as for as forecasting is concerned.

IV

AN INTERNATIONAL SAVING FUNCTION

We had intentionally included in our study countries with wide differences in the degree of development, and we found that they differ substantially as regards the MPS. But the MPS offers little explanation as to the degree of economic advancement. It can only provide us an alternative criterion for ranking the countries according to domestic efforts for development. Whether international data be pooled to estimate a single world saving function or countries differ as regards to saving behaviour remains an important dilemma. Cross section analysis is preferable to time series analysis for a number of reasons, the most important being its simplicity. Instead of 14 regressions and more than 50 slope coefficients (as in our present case) there is 1 regression only. This approach also avoids the problem of auto-correlation. But all these advantages are meaningless if, in fact, the basic assumption that all nations have identical saving functions is invalid. Theoretically Keynes has warned, "....in comparing one social system with another of a different type, it is necessary to take account of the manner in which changes in the subjective factors may effect the propensity to consume" [22, p. 332].

Professors Johnson and Chiu [22, Pp. 331-333], with the help of an F-Test based on a cross section of 44 countries, have shown that countries differ significantly as to their saving behaviour. However, this should not discourage us from investigating the possibility of a world saving function for predictive purposes only. Time series data for 14 countries and for the period 1951-68 were pooled to estimate an international saving function. The data for various countries were converted into US dollars using the official exchange rate [20].

The differences in savings may be due to a variety of specific factors in addition to levels of income as was evidenced in our experience with time series analysis. When observations on several countries are pooled into one regression, it becomes desirable to make some adjustment in order to hold these specific factors constant and to isolate the relationship between savings and other explanatory variables, namely real personal disposable income, ratio of property income to personal disposable income, and taxes.

The procedure followed here is to assume that intercountry as well as intertemporal differences, that are not explained by specified variables for which data are readily available, can be represented by an upward or downward shift in the function, whereas the slopes are identical for each country. A scheme of dummy variables is introduced into our model in the following manner.

$D_i = 1$ if observation relates to year i
$\quad\;\; 0$ otherwise

$D_j = 1$ for country j in all years
$\quad\;\; 0$ otherwise

There is a dummy variable for each country and for each year. A number of different formulations were tried on a step-wise regression programme and the results for these are presented in Table VIII. We shall be discussing only the results of better performing functions.

First, we regress S on 4 independent variables namely, Y, T, Y^p/Y and D_i. It gave a good fit as represented by:

$$S = -116.2 + .06^{*}Y - .001^{*}T + 907\, Y^p/Y + D_i \qquad \bar{R}^2 = .95$$
$$(.003) \quad (.007) \quad (1528.0)$$

Year i	*Di*
1951	—92.3
1952	—104.5
1953	—62.5
1954	—275.5
1955	—483.2
1956	3503.4*
1957	62.6
1958	—74.5
1959	—250.6
1960	—1128.7*
1961	—1519.2*
1962	—3850.2*
1963	—62.5
1964	129.7

Year i	*Di*
1965	—69.5
1966	2254.5*
1967	—2471.6*
1968	6931.0*

Note:—*indicates significant at .05 level. Figures in parenthesis are standard errors.

All the slope coefficients have correct signs. The results conform to the theory that personal saving is positivily associated with personal disposable income and ratio of property income to personal disposable income, but taxation (both direct and indirect) has a negative influence on the private savings of households. 41per cent of the increment in $\bar{R}^2$ was attributed to real personal disposable income and 35 per cent of the increment to year 1968.

In order to explore the possibility of inter-country differences we introduced D_j (dummy variables for countries) in our regression. Since the coefficient of Y^p/Y was not significant, we dropped this variable from our next regression. The empirical analysis of this model does lend support to the theory behind such a hypothesis.

Pooled regression for 14 countries:

$$S = 7898 + \underset{(.007)}{.05^*Y} - \underset{(.004}{.001^*T} + D_i + D_j \qquad \bar{R}^2 = .90$$

Year i	D_i	*Country J*	D_j
1951	5497.7*	U.S.	—10214*
1952	5504.8*	Sweden	—13137*
1953	5578.6*	Canada	—13734*
1954	5381.5*	U.K.	—14738*
1955	7152.7*	Belgium	—13176*
1956	4454.7*	Japan	—10334*
1957	5706.2*	Spain	—12893*
1958	3809.0*	S. Africa	—12921*
1959	5433.0*	Jamaica	—13628*
1960	4930.0*	Colombia	—12860*
1961	6451.6*	Mauritius	—13702*
1962	3645.0*	Honduras	—13631*
1963	5666.2*	Taiwan	—13711*
1964	5876.6*	Korea	—13654*
1965	5809.6*		
1956	5507.3*		
1967	5308.9*		
1968	9012.7*		

Note:—* indicates significant at .05 level. Figures in parenthesis are standard errors.

In order to capture possible non-linearity in our estimates of saving function we tried several variants of

$$S = F\,(\text{Log } Y, \text{Log } Y^p/Y, \text{Log } Y^p, \text{Log } T_d, \text{Log } T_i, D_i, D_j)$$

in semi-logarithmic forms. It did not improve our results. The slope coefficients had wrong signs in many cases.

CONCLUSIONS

Briefly, the following conclusions emerge from our study:

(1) The simple Keynesian function fits international data quite well but the MPS out of disposable income cannot be used as a criterion for ranking countries according to their degree of development. It might however be a good indicator of potential for growth.

(2) Friedman's "permanent income" hypothesis and the Houthakker Taylor "habit persistence" model have some relevance in explaining saving behaviour, although the explanatory power of these models for LDCs is very poor.

(3) The functional distribution of income plays an important role in determining saving behaviour.

(4) Increased direct and indirect taxes discourage real savings.

(5) An introduction of variables to account for temporal shifts and socio-economic differences among countries improves the fit of saving function.

(6) It is proposed that the following function best explains saving behaviour in an international and intertemporal cross section.

$$S = a + b_1 Y + b_2 T + D_i + D_j$$

TABLE II

Keynesian Model

$S_t = a + b\,Y_t$

Country	No. of observations	a	t_a	b=MPS	t_b	$\bar{R}^2$	D.W.	Simple correlation coefficient
U.S.	19	5073.3	1.0	.05*	3.3	.36	1.21	.63
Sweden	18	—347.3	—.6	.10	.0	.80	1.61	.90
Canada	18	—760.5*	—2.2	.12*	8.6	.81	1.03	.90
U.K.	18	—1191.5*	—3.0	.11*	4.8	.57	1.45	.77
Belgium	18	—38.3*	—7.7	.20*	18.2	.95	2.44	.98
Japan	19	—503.4*	—6.3	.22*	30.7	.98	0.95	.99
Spain	14	—455.1*	—3.9	.18*	6.2	.79	0.91	.87
S. Africa	15	—19.7	—.3	.11*	6.3	.74	2.10	.87
Jamaica	18	—7.5*	—2.3	.09*	4.2	.49	1.51	.72
Colombia	17	1034.3*	4.3	—.24*	—1.8	.12	2.41	—.41
Mauritius	18	4.8	.1	.07	1.0	.00	1.95	.24
Honduras	18	33.9*	2.2	.00	.2	.06	1.06	.04
Taiwan	18	—40.9*	—5.4	.22*	12.6	.90	0.55	.95
Korea	16	12.1*	2.6	.01	0.7	.03	1.98	.18

*indicates significant at .05 level.

TABLE III

Ezekiel—Mack Model

$$S_t = a + b_1 Y_t + b_2 (Y_t - Y_{t-1})$$

Country	No. of observations	a	t_a	b_1	t_{b1}	b_2	t_{b2}	$\bar{R}^2$	D.W.
U.S.	18	5649	1.1	.044*	2.9	.062*	2.7	.42	0.9
Sweden	17	—401	—.6	.106*	6.7	—.044	—.5	.74	1.6
Canada	17	—694+	—1.2	.112*	6.6	—.065	—.5	.75	1.0
U.K.	17	—1222*	—2.7	.117*	4.2	—.098	—.3	.50	1.5
Belgium	17	—39*	—6.4	.206*	12.2	—.172+	—1.1	.94	2.5
Japan	18	—990*	—5.3	.214*	15.6	.039	.04	.97	1.0
Spain	13	—63*	—3.9	.198*	5.7	.089+	1.2	.73	0.7
S. Africa	14	—19	—0.3	.109*	5.2	.180	.08	.68	2.1
Jamaica	17	—14+	—1.1	.079*	3.2	—.198+	—1.3	.47	1.7
Colombia	17	1165*	4.1	—.032+	—1.2	—.008	—.2	.11	2.3
Mauritius	17	300+	1.1	.037	.8	—.569*	—4.3	.55	2.2
Honduras	17	29	1.7	.023+	1.0	—.065	—.8	.01	1.3
Taiwan	17	—39	—5.5	.018*	7.9	.341*	2.8	.91	0.9
Korea	16	9	2.0	.041+	1.1	—.171*	—2.3	.23	2.0

*indicates significant at 0.05 level.
+indicates significant at .15 level only.

TABLE IV-1

Friedman's Model: Version I

$$S = a + b_1 Y + b_2 C_{t-1}$$

Country	No. of observations	a	t_a	b_1	t_{b1}	b_2	t_{b2}	$\bar{R}^2$	D.W.
U.S.A.	18	5343	1.3	—.09*	—2.5	.15*	4.0	.65	1.0
Sweden	17	59	.6	.17*	2.6	—.09	—1.1	.83	2.3
Canada	17	—325	—.8	.35*	3.4	—.30*	—2.4	.82	1.6
U.K.	17	—3143*	—2.0	.08	.7	.03	.2	.45	1.5
Belgium	17	—1038*	—5.0	.04	.3	.22+	1.2	.95	2.7
Japan	18	—1640*	—7.0	.30*	5.2	—.10+	—1.2	.99	0.9
Spain	13	—5562*	—4.0	.20*	3.0	.02	.2	.77	1.0
S. Africa	14	—64	—.3	.10*	4.0	.01	.5	.71	2.0
Jamaica	17	—37*	—3.0	.16*	1.0	—.04	—.3	.55	1.4
Colombia	17	138*	4.0	.01	.1	—.03	—.6	.03	2.5
Mauritius	17	—2	—.3	.50*	1.7	—.40+	—1.5	.07	2.0
Honduras	17	17*	2.0	.17*	1.2	—.20+	—1.3	.01	1.3
Taiwan	17	—98*	—4.0	.40*	5.8	—.20*	—2.3	.95	1.8
Korea	16	6	.7	.20*	2.5	—.20*	—2.3	.24	1.5
8 Developed Countries	131	726*	3.5	—.01	—.6	.08*	3.4	.90	0.6
6 LDC's	101	11*	1.7	.28*	6.6	—.30*	—5.7	.50	.1

*indicates significant at .05 level.
+indicates significant at .15 level.

TABLE IV-2

Friedman's Model: Version II

$$S = a + b_1 Y^* + b_2 Y^t$$

Country	No. of observations	a	t_a	b_1	t_{b1}	b_2	t_{b2}	$\bar{R}^2$	D.W.
U.S.A.	18	1296	.2	.06*	3.2	—.03	—.50	.33	0.8
Sweden	17	51	.5	.10*	7.0	.20+	1.7	.82	2.0
Canada	17	—509+	—1.3	.09*	5.0	.61*	2.4	.82	1.0
U.K.	17	—3083*	—2.0	.11*	4.1	—.10	—.4	.48	1.0
Belgium	17	—842*	—7.0	.20*	12.5	.10	.4	.95	3.0
Japan	18	—1795*	—10.0	.23*	23.0	.30*	2.1	.99	.9
Spain	13	—5653*	—4.0	.20*	6.0	.10	.6	.78	.9
S. Africa	14	—61	—.3	.10*	5.0	.08*	2.0	.71	2.0
Jamaica	17	—34*	—3.0	.12*	4.5	—.10	—.2	.55	1.0
Colombia	17	146*	4.0	—.03+	—1.7	.06	.6	.04	2.0
Mauritius	17	1	.1	.10	.9	.40	.9	.02	1.7
Honduras	17	20*	2.0	—.01	—.3	.10	.5	.12	1.0
Taiwan	17	—126*	—7.0	.22*	9.0	.50*	1.8	.93	1.2
Korea	16	50	.5	—.01	—.3	.30*	2.0	.16	1.3
8 DC's	131	615*	3.0	.06*	36.0	—.01	—.5	.92	.7
6 LDC's	101	11+	1.4	.04*	4.0	.16+	1.3	.27	.5

*indicates significant at .05 level.
+indicates significant at .15 level only.

TABLE IV-3

Houthakker-Taylor Model: Formulation I

$$S_t = a + b_1 S_{t-1} + b_2 dY$$

Country	No. of observa-tions	a	t_a	b_1	t_{b1}	b_2	t_{b2}	$\bar{R}^2$	D.W.
U.S.A.	18	—59	—.0	1.10*	5.8	—.05*	—2.4	.67	2.1
Sweden	17	245*	2.5	.70*	5.0	.23*	2.9	.71	2.7
Canada	17	183	.7	.70*	5.0	.42*	3.5	.79	2.3
U.K.	17	916*	2	.60*	3.5	.00	.0	.39	2.0
Belgium	17	24	.2	.90*	7.0	.36*	1.7	.86	3.0
Japan	18	—185	—.9	.99*	16.0	.29*	2.8	.98	1.0
Spain	13	223	.6	.96*	7.0	.06+	1.00	.82	1.3
S. Africa	14	321+	1.3	.72*	3.2	.07*	2.5	.47	2.2
Jamaica	17	4	.7	.72*	3.9	.09	.5	.47	2.0
Colombia	17	85	.3	—.02	—.1	—.01	—.1	.14	2.0
Mauritius	17	2.9	.6	.50+	1.3	.50+	1.6	.03	2.1
Honduras	17	7+	1.2	.50*	1.9	.14+	1.0	.10	1.8
Taiwan	17	2.7	.3	1.00*	11.7	.03	.3	.90	1.5
Korea	16	—.7	—.1	.20	.8	.16*	2.3	.20	1.6
8 DC's	131	1289+	1.1	1.10*	69.0	—.05*	—6.4	.98	2.0
6 LDC's	101	2	.5	.95*	17.6	.05*	1.7	.80	2.7

*indicates significant at .05 level.
+indicates significant at .15 level only.

TABLE IV-4

Houthakker—Taylor Model: Formulation 2

$$S_t = a + b_1 C_{t-1} + b_2 dY_t + b_3 Y_{t-1}$$

Country	No. of observa-tions	a	t_a	b_1	t_{b1}	b_2	t_{b2}	b_3	t_{b3}	$\bar{R}^2$	D.W.
U.S.A.	18	13250.11*	2.85	—.26*	5.06	—.13*	—3.90	—.22*	—3.90	.76	1.51
Sweden	17	59.23	.58	—.90	—.44	.16*	2.47	.17	.90	.81	2.30
Canada	17	—336.27	—.83	—.26	—1.10	.35*	2.94	.32	1.51	.81	1.54
U.K.	17	—2347.75	—1.34	—.14	—.63	.02	.15	.23	1.18	.45	1.67
Belgium	17	—1172.93*	—4.69	.45	1.50	.07	.51	—.14	—.62	.95	2.16
Japan	18	—1415.09	—4.50	—.25	—1.47	.26*	3.82	.42*	3.15	.99	1.00
Spain	13	—2566.47	—1.49	—1.58*	—2.30	.09	1.56	.68*	3.31	.84	1.37
S. Africa	14	—66.24	—.28	.08	.26	.09*	4.09	.03	0.15	.68	1.90
Jamaica	17	—24.01	—1.55	—.31	—1.13	.08	.49	.39	1.62	.56	1.83
Colombia	17	185.72	3.13	.24	.90	.01	.25	—.28	—1.00	.04	2.01
Mauritius	17	—2.3	—.26	—.46	—1.17	.48	1.60	.51	1.32	.01	2.09
Honduras	17	12.52	1.40	—.57*	1.97	.13	.99	.55*	1.94	.08	2.00
Taiwan	17	—50.45*	—2.06	—.71*	—3.77	.11	.96	.79*	5.16	.97	1.72
Korea	16	6.18	.65	—.35	—1.21	.21*	2.42	.32	1.17	.19	1.80
8 DCs	131	708.08*	3.33	.07*	1.99	—.01	—.49	—.00	—.03	.92	0.59
6 LDCs	101	1.94	.45	—.94*	—15.67	.05	1.54	.94*	16.22	.79	2.69

*indicates significant at 0.05 level.

TABLE V

Taxation and Savings: Model I

$$S_t = a + b_1 Y_t + b_2 Y^p/Y_t + b_3 T_d + b_4 T_i$$

Country	No. of observations	a	t_a	b_1	t_{b1}	b_2	t_{b2}	b_3	t_{b3}	b_4	t_{b4}	$\bar{R}^2$	D.W.
U.S.A.	19	5409.86	0.25	—.01	—.35	47523.94	.86	.37*	2.67	—.39+	—1.10	.74	1.70
Sweden	18	—7783.56	—.83	.23*	2.26	11020.33	.60	—.24+	1.24	—.70*	—2.12	.83	1.70
Canada	18	—4963.70*	—3.36	.09*	1.83	12275.57*	3.53	.09	.58	.08	.35	.92	2.27
U.K.	18	—3996.01*	1.70	.24*	2.88	6645.27	0.93	—.46+	—1.52	.12	.53	.56	1.96
Belgium	18	—114.73+	—1.62	.22*	2.35	142.39+	—1.32	.34+	1.49	—.34+	—1.15	.95	2.87
Japan	17	—2804.37*	—4.15	.15*	1.84	3727.97*	3.25	—.18	—.61	1.14*	2.23	.99	1.77
Spain	14	22.37	.73	.25*	2.59	—232.87*	—2.72	—.32	—.59	—.17	—.15	.82	2.16
S. Africa	15	—696.66*	—3.16	.25*	4.47	1898.38*	3.16	—1.04*	—1.85	—.00	—.24	.83	2.15
Jamaica	18	20.75	.50	.11+	1.66	—66.13	—.71	—.21	—.09	—.53	—.90	.48	1.65
Colombia	18	1107.25	.74	.01	.26	—355.71	—.13	—.23	—.15	—.31	—.83	.01	2.31
Mauritius	18	—276.82*	—2.06	.27+	1.10	514.09*	2.05	—1.25	—.46	.07	.08	.25	1.84
Honduras	18	33.38	.31	.14*	1.86	—35.32	—.21	2.57	.06	—1.27*	—2.00	.02	1.45
Taiwan	18	—236.46*	—3.78	.32*	5.21	471.56*	3.24	—1.98	—.61	—.06	.41	.94	1.36
Korea	16	—66.33+	—1.10	.01	.21	111.93+	1.23	1.45	.54	—.39	—.24	.10	2.08

*indicates significant at .05 level.
+indicates significant at .15 level only.

TABLE VI

Taxation and Savings : Model 2

$$S = a + b_1 Y + b_2 Y^P + b_3 (T_d/T_i)$$

Country	No. of observa-tions	a	t_a	b_1	t_{b1}	b_2	t_{b2}	b_3	t_{b3}	$\overline{R}^2$	D.W.
U.S.A.	18	—4226.69	—.54	—.06*	—2.4	.28*	3.08	13378.66	1.56	.68	1.56
Sweden	17	—719.78	—1.02	.07*	2.31	.20	.75	218.84	.92	.81	2.22
Canada	17	—2938.54*	—3.39	—.09*	—1.89	.94*	4.76	1805.17	1.02	.91	1.69
U.K.	17	—2455.44*	—1.70	.08	.82	.23	.47	—1983.30	—1.01	.45	1.59
Belgium	17	—1596.68*	—2.18	.16*	1.95	.13	.40	502.41	1.46	.95	2.69
Japan	18	—1749.54*	—2.87	.08	1.06	.46*	2.16	—2247.27*	—3.83	.99	1.23
Spain	13	—4974.43*	—5.11	.47*	5.11	—.59*	—3.30	—3389.31*	—1.92	.89	1.43
S. Africa	14	—488.32	—1.21	—.04	—.60	.72*	2.42	—553.09	—.75	.82	2.05
Jamaica	17	—83.36*	—2.67	—.07	—.60	.67	1.52	139.73	1.45	.59	1.68
Colombia	17	—138.75*	—2.12	—.05	—.87	.07	.55	—20.33	—.09	.04	2.26
Mauritius	17	—10.07	—.47	.13	—1.15	.90*	2.19	—11.14	—.37	.18	1.60
Honduras	17	12.07	.59	—.09	—.76	.23	.69	—20.84	—.27	.15	1.12
Taiwan	17	—245.61*	—4.38	.00	.00	.55	1.19	626.85	1.20	.94	1.57
Korea	16	—27.14	—.94	—.17	—1.19	.23	1.36	42.10	.61	.03	1.90
8 DCs	131	—58.46	—.17	—.04*	—3.39	.33*	9.10	462.33	1.49	.95	0.83
6 LDCs	101	41.05*	3.52	.12*	2.58	—.13	—1.48	—181.13*	—3.96	.41	0.65

*indicates significant at .05 level.

TABLE VII

Taxation and Savings: Model 3

$$\text{Log } S_t = \log a + b_1 \log Y_t + b_2 \log T_d$$

Country	No. of observa-tions	Log a	t_a	b_1	t_{b1}	b_2	t_{b2}	$\bar{R}^2$	D.W.
U.S.A.	19	4.711*	3.189	—0.859*	—1.864	0.906*	3.632	.635	1.231
Sweden	18	—1.128	—.253	0.955	.655	.076	0.135	.720	1.445
Canada	18	—.227	—.100	.436	.479	.465	.891	.706	1.287
U.K.	18	—55.216*	—4.205	18.254*	3.931	—5.586*	—2.420	.519	1.519
Belgium	18	—2.135*	—1.858	.127+	1.18	.237	.626	.932	3.077
Japan	17	—1.803*	—3.447	1.011*	3.021	.321+	1.047	.920	1.053
Spain	14	—4.908+	—1.333	2.131+	1.409	.446	.914	.294	0.869
S. Africa	15	—.666	—0.886	.957*	2.222	—.078	—.201	.766	2.090
Jamaica	18	—12.938*	—3.420	6.372*	3.296	—.844	—.990	.739	1.368
Colombia	17	2.591	.458	.715	.320	—1.073	—.735	.068	2.886
Mauritius	18	—7.200+	—1.045	4.133+	1.322	—2.085+	—1.366	.005	1.925
Honduras	18	1.411	.957	.075	.133	—.135*	—4.208	.119	.977
Taiwan	18	1.638+	—1.115	.953+	1.195	.948+	1.039	.714	.598
Korea	16	—1.942	—.651	1.150	.961	—.699	—.648	.044	2.141

*indicates significant at .05 level.
+indicates significant at .15 level only.

TABLE VIII

Pooled Regressions for 14 Countries

1. $S = 13080 + .02^{*}Y + 0.0\, T_d\, T_i - 9864\, Y^p/Y + D_i + D_j$ $\bar{R}^2 = .98$
$\quad\quad\quad\quad (0.15) \quad\quad\quad\quad\quad\quad (1947)$ $F = 164.5$
$n = 232$

Country j	D_j	*Year i*	D_i
U.S.	— 5163*	1951	6385*
Sweden	—15892*	1952	6087*
Canada	—15862*	1953	6385*
U.K.	—16633*	1954	6366*
Belgium	—14586*	1955	7744*
Japan	—10789*	1956	5437*
Spain	—13579*	1957	6206*
S. Africa	—15284*	1958	6496*
Jamaica	—16145*	1959	6218*
Colombia	—13618*	1960	5534*
Mauritius	—16042*	1961	7158*
Honduras	—14582*	1962	4732*
Taiwan	—14817*	1963	6384*
Korea	—13034*	1964	6610*
		1965	6495*
		1966	7825*
		1967	5993*
		1968	9100*

2. $S = 35.7 + .06^{*}Y + 761\, Y^p/Y + D_i$ $\bar{R}^2 = .95$
$\quad\quad (.005) \quad (1566)$ $F = 91.7$
$n = 232$

Year i	D_i	*Year i*	D_i
1951	—59	1960	—1143*
1952	—82	1961	—1486*
1953	—38	1962	—3844*
1954	—245	1963	—53
1955	—473	1964	142
1956	—3541*	1965	—70
1957	—46	1966	2243*
1958	—45	1967	—2517*
1959	—225	1968	6876*

3. $S = 256.4 + .06^{*}Y - .003^{*}T + D_i$ $\bar{R}^2 = .95$
$(.002) \quad (.008)$ $F = 96.5$
$n = 232$

Year i	D_i	*Year* i	D_i
1951	—67	1960	—1132*
1952	—120	1961	—1529*
1953	—41	1962	—3833*
1954	—240	1963	—66
1955	—481	1964	119
1956	—534*	1965	—79
1957	70	1966	2235*
1958	—58	1967	—2477*
1959	—245	1968	6877*

4. $S = 13417 + .06^{*}Y - .01^{*}T - 9880\ Y^{p}/Y + D_i + D_j$ $\bar{R}^2 = .98$
$(.003) \quad (.007) \quad (2837)$ $F = 158$
$n = 232$

Country j	D_j	*Year* i	D_i
U.S.	—13681*	1951	6996*
Sweden	—16623*	1952	6729*
Canada	—17129*	1953	6977*
U.K.	—18624*	1954	6912*
Belgium	—15494*	1955	8138*
Japan	—12341*	1956	5917*
Spain	—15578*	1957	6737*
S. Africa	—16088*	1958	6939*
Jamaica	—16621*	1959	6662
Colombia	—14345*	1960	6010*
Mauritius	—16520*	1961	7656*
Honduras	—15231*	1962	5085
Taiwan	—15495*	1963	6782*
Korea	—13937*	1964	6927*
		1965	6829*
		1966	8321*
		1967	6933*
		1968	9531*

5. $S = -1280 - \underset{(431)}{6946^*} \text{ Log } Y + \underset{(775)}{7965^*} \text{ Log } Y^p + \underset{(197)}{204^*} \text{ Log } T + D_j$

$\bar{R}^2 = .94$
$F = 97$
$n = 232$

Counrty j	D_j	*Country* j	D_j
U.S.	17471*	South Africa	445
Sweden	2116*	Jamaica	3469*
Canada	—1213*	Colombia	—3474*
U.K.	4974*	Mauritius	—3926*
Belgium	—1756*	Honduras	—334
Japan	406	Taiwan	—3096*
Spain	—431	Korea	—2964*

6. $S = 11534 - \underset{(6446)}{12206^*} \text{ Log } Y + \underset{(1144)}{16684^*} \text{ Log } Y + \underset{(383)}{3487^*} \text{ Log } T_d - \underset{(529)}{4767^*} T_i + D_j$

$\bar{R}^2 = .95$
$F = 134$
$n = 232$

Country j	D_j	*Country* j	D_j
U.S.	8493*	S. Africa	991*
Sweden	314	Jamaica	—13293*
Canada	602*	Colombia	—4091
U.K.	4231*	Mauritius	15207*
Belgium	—5642*	Honduras	11603*
Japan	—4327*	Taiwan	6344*
Spain	—4027*	Korea	—1070*

7. $S = 11792 - \underset{(1023)}{815} \text{ Log } Y + \underset{(1060)}{3295^*} \text{ Log } Y^p - \underset{(435)}{127} \text{ Log } T_d - \underset{(580)}{407} \text{ Log } T_i + D_i$

$\bar{R}^2 = .83$
$F = 21.4$
$n = 232$

Year i	D_i	*Year* i	D_i
1951	—657	1960	—1029*
1952	—511	1961	—1911*
1953	—457	1962	—3522*
1954	—707	1963	—243
1955	—956	1964	53
1956	3134*	1965	242
1957	181	1966	2512*
1958	—467	1967	—2182*
1959	—554	1968	7454*

8. $$S = -9764 - \underset{(528)}{5039^*} \text{ Log } Y + \underset{(608)}{7784^*} \text{ Log } Y^p + \underset{(265)}{2050^*} \text{ Log } T_d - \underset{(308)}{1572^*} \text{ Log } T_i + D_i + D_j$$

$\bar{R}^2 = .98$
F = 178
n = 232

Country j	D_j	*Year* i	D_i
U.S.	—5876*	1951	5827*
Sweden	—15435*	1952	5555*
Canada	—14869*	1953	6086*
U.K.	—16633*	1954	5851*
Belgium	—17461*	1955	6026*
Japan	—16440*	1956	5693*
Spain	—17293*	1957	6124*
S. Africa	—13580*	1958	5836*
Jamaica	—3074*	1959	5954*
Colombia	—12781*	1960	5292*
Mauritius	—2209*	1961	6845*
Honduras	—7892*	1962	4880*
Taiwan	—9272*	1963	5705
Korea	—8173*	1964	5891*
		1965	5920*
		1966	6918*
		1967	6764*
		1968	8160*

Note: Figures in parenthesis are standard errors.
*indicates significant at .05 level.

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