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Institute of Economic Development and Research
SCHOOL OF ECONOMICS
University of the Philippines

Discussion Paper No. 68-12

April 1, 1968

INCOME GROWTH AND SAVINGS

by

Jeffrey G. Williamson, 1935-

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UPEDP 197
12-74-97

INCOME GROWTH AND SAVINGS*

by

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" . . . it is perfectly possible to have coherent growth models which employ a classical savings function but postulate a neo-classical production function with perfect competition. Conversely it is easy to analyze a model where there is "learning by doing" and an absence of perfect competition and yet savings are proportional to income. The question, which kind of savings hypothesis is appropriate, is not one of belief and dogma but of fact."

[Hahn and Matthews, 1964]

* Thanks are due to José Encarnación's thoughtful criticism of this paper and to the research assistance of Duane Kexel and Francisco Aseniero. A revised version of this paper will be forthcoming in the Philippine Economic Journal.

1. Introduction.

The growth pessimism of the 'fifties in Asia has been partially dissipated by the evidence of wide disparities between marginal and average savings rates. The present flood of two-sector, two-factor growth models has, as a rule, accepted the classical savings hypothesis and thus views the current rise in domestic savings capacities with no surprise. The focus of these models, of course, is both on the profits share and on the functional distribution of personal income. The present paper does not attempt a challenge to the classical proposition. Instead, it begins by recognizing the important contribution of voluntary household saving to high overall marginal savings rates in Asia. We then attempt to supply an additional explanation for the impressive increase in Asian savings rates.

We might begin by recognizing that the simple Keynesian savings function has long since been replaced by more complex hypotheses which make the savings decision dependent upon the events of many preceding periods and also expands it to include the stock of wealth.^{1/} The consequences have been

^{1/} And, in good neoclassical tradition, even interest rates. See Wright [1967] for a recent attempt, and this time successful, to estimate the substitution effect of a change in the interest rate. On the other hand, Zellner, Huang and Chau [1965] were less successful.

profound. The permanent income hypothesis, the wealth-consumption hypothesis and the life-cycle hypothesis all question the traditionally assumed causal relation between savings and income growth. The challenge, of course, comes from quite a different sector than that which spawned the savings paradox in employment theory. The new hypotheses appear to suggest that even under conditions of full employment, the savings ratio can readily be determined by income growth. This somewhat startling result is forthcoming even if we assume a constant rate of return on assets and/or we assume a perfectly inelastic saving response to a rise in the rate of return on assets - a rise which is likely to be closely associated with a quickening in growth. Given the rapidly accumulating research on aggregate production functions and technical change, even accepting the factor-augmenting thesis without criticism,^{2/} it would appear that

^{2/} The disembodiment thesis awards very few medals to capital formation as a contributor to growth. The more sensible factor-augmenting and vintage models, most recently summarized by Solow [1966], restore capital formation somewhat to its traditional position of prominence. However, even those models leave us in some doubt. R. Nelson [1966], in discussing the impact of aggregate production function research on growth policy, has underscored our uncertainties about the

rapid income growth is as likely to produce higher savings ratios as vice versa.✓

Very little research on these new consumption hypotheses have been applied to the less developed world. In fact, Malinvaud [1966], for one, has suggested that these hypotheses "may perhaps be incapable of generalization to less wealthy countries."^{3/} A few years ago, Ball and Drake [1964] argued that the permanent income and life-cycle consumption theories "impose upon the individual consumer a rigorous course of intertemporal utility maximization, simple to assert, but difficult to execute."^{4/} If such calculus is difficult in an environment of stability, near

2/ (cont.)

magnitude of the embodiment effect (p. 481). Nelson argues that these models do not indicate how much gross investment is required to keep a nation's stock of capital from falling out of date nor how much more would be needed to update embodied technology. See also Hahn and Matthews [1964].

3/ Malinvaud [1966], p. 117. A more intolerant position is taken by Vanek: " . . . none of the existing theories of saving - whether the Keynesian, or that based on the so-called permanent-income hypothesis, or that based on the so-called relative-income hypothesis - is really adequate to explain the phenomenon of savings in many, if not most, less developed countries." J. Vanek, Estimating Foreign Resource Needs for Economic Development, (New York: McGraw-Hill, 1967), p. 22.

4/ Ball and Drake [1964], p. 63.

certainty and near perfect knowledge, one certainly doubts its applicability to the less affluent environment of instability, uncertainty and highly imperfect knowledge. Even granting as much, this still leaves an abundance of sensible hypotheses which are rich in policy implications for the developing nations.

In spite of the inherent interest which these theories engender, and their profound implications for policy, there has been very little empirical exploration of them within the environment of Asian, African or Latin American households. Most less developed nations lack annual economic series of sufficient length, and have no quarterly data at all, making time series tests almost impossible. The research by Pavlopoulos [1966] on Greece is one exception to this generalization and Williamson [1967] is another. The latter attempts to overcome the national data constraints by utilizing intertemporal cross-sections from Asia. Section 2 reviews some, but certainly not all,^{5/}

^{5/} We exclude, for example, the permanent income and life-cycle variants although the conclusions here are similar. "The saving income ratio may be an increasing function of the rate of growth of income. This could be so because of the life-cycle element in savings" Hahn and Matthews [1964], p. 799. For an excellent, though dated, review of the literature see Ferber [1962].

of the theoretical literature which appears to us to be especially promising and scrutinizes the important implications for underdeveloped economies, namely that "low rates of savings . . . may not simply be the cause of low rates of income growth, but also the effect of low rates of growth."^{6/}

2. A Brief Review of the Hypotheses.

2.1 Distributed Lags.^{7/} We begin in an elementary fashion by making consumption linearly dependent upon the incomes of preceding periods,

$$\boxed{1/} \quad C_t = \alpha_0 Y_t + \alpha_1 Y_{t-1} + \dots + \alpha_h Y_{t-h} + \beta + \epsilon_t.$$

and where $(C_t - \epsilon_t)$ can be interpreted as "planned" consumption in t . If we assume the incomes of all preceding periods to be constant, then α_0 becomes the short-run marginal propensity to consume. When all present and past incomes are increased by one unit, then the long-run marginal propensity to consume is defined as $\sum_{i=0}^h \alpha_i$.^{8/}

^{6/} Ball and Drake [1964], p. 70.

^{7/} This section draws very liberally on the excellent exposition in Malinvaud [1966], pp. 102-135.

^{8/} Ball and Drake [1964], p. 68, argue that this is both a long-run marginal propensity to consume and the coefficient that obtains under stationary conditions. On this point, see also Lydall [1963], p. 244-246.

Since all the α 's are positive the long-run mpc exceeds the short-run mpc.

Now current consumption can, of course, be replaced by the difference between current income and saving. By doing so, $[1]$ can be rewritten

$$[2] \quad S_t = (1 - \alpha_0)Y_t - \alpha_1 Y_{t-1} - \dots - \alpha_h Y_{t-h} - \beta - \epsilon_t,$$

and it should be clear that the short-run mps exceeds the long-run mps. The model presented in $[2]$ implies that sudden income changes, such as those produced by a revolutionary plan implementation or by a sharp improvement in the external terms of trade or by a sudden inflow of foreign resources, have a much different impact upon current saving than if the income change is gradual and spread over many years. Furthermore, if the growth rate is constant over h time periods, then each past income level can be expressed in terms of current income and that growth rate, so that the savings ratio becomes stable also. A movement to a higher permanent growth rate raises the saving ratio. In summary this hypothesis suggests that sudden changes in income levels and growth rates in Southeast Asian nations, which previously had adjusted to stable but very low growth

rates, should generate very high marginal and average savings in the short-run. Furthermore, if the rate of income growth accelerates over time, then so too will the long-run average saving ratio.

As an alternative, many economists have hypothesized current consumption to be a function of past consumption levels rather than past income.^{9/} Thus,

$$\boxed{3} \quad C_t = \alpha_0 Y_t + \delta_1 C_{t-1} + \dots + \delta_h C_{t-h} + \beta' + \epsilon'_t.$$

The estimation of either $\boxed{1}$ or $\boxed{3}$ is beyond the scope of present econometric methods but many approximations have been offered. One suggestion is simple enough; consider

9/ Inertia and habit persistence is implicitly hypothesized here. Zellner, Huang and Chau [1965] recently attempted to distinguish between these and an expectations or permanent income hypothesis. Beginning with

$$C_t = k_1 C_{t-1} + k_2 Y_t^e + u_{1t}$$

and converting Y_t^e into observables by making the same assumptions as those which appear below on page 10 they estimate

$$C_t = (k_1 + \delta) C_{t-1} - \delta k_1 C_{t-2} + k_2 (1 - \delta) Y_t + u_{1t} - \delta u_{1t-1}.$$

The coefficient δk_1 is insignificantly different from zero, and the habit persistence hypothesis is rejected on the basis of U.S. data. An extension of this model to the LDC would be fruitful.

only one preceding time period so that

$$\boxed{4} \quad C_t = \alpha_0 Y_t + \alpha_1 Y_{t-1} + \beta + \epsilon_t,$$

or $\boxed{5} \quad C_t = \alpha_0 Y_t + \delta_1 C_{t-1} + \beta' + \epsilon'_t,$

according to the two hypotheses developed above. We have already shown that the short-run and long-run mpc's are

α_0 and $(\alpha_0 + \alpha_1)$, respectively, in $\boxed{4}$. The derivation of these parameters from $\boxed{5}$ may not appear so straightforward but a little algebra transforms $\boxed{5}$ into

$$\begin{aligned} \boxed{6} \quad C_t = & \alpha_0 Y_t + \alpha_0 \delta_1 Y_{t-1} + \alpha_0 \delta_1^2 Y_{t-2} \\ & + \alpha_0 \delta_1^3 Y_{t-3} + \dots + \beta' (\delta_1 + \delta_1^2 + \delta_1^3 + \dots) \\ & + (\delta_1 \epsilon'_{t-1} + \delta_1^2 \epsilon'_{t-2} + \dots). \end{aligned}$$

When all the income increases are unity, then we get

$$\Delta C_t = \alpha_0 [1 + \delta_1 + \delta_1^2 + \delta_1^3 + \dots] = \alpha_0 / (1 - \delta_1),$$

which, of course, is the long-run marginal propensity to consume. Since $0 \leq \delta_1 < 1$, the long-run mpc must be greater than or equal to the short-run mpc. Similarly, $\boxed{6}$ can be rewritten in terms of saving and the long-run marginal propensity to save becomes

$$\Delta S_t = \frac{1 - \delta_1 - \alpha_0}{1 - \delta_1}.$$

It would appear that [3] also predicts that high growth rates may generate high savings since that is the message of its simplest formulation, [6].^{10/}

Expression [5] can be derived in an entirely different way, employing different assumptions about economic behavior. We can do so by utilizing the distributed lag model which has become so popular since the contributions of Koyck [1954] and Nerlove [1958] first appeared. We can rewrite [1] as

$$[7] \quad C_t = \alpha_0 \sum_{\tau=0}^{\infty} \delta^{\tau} Y_{t-\tau} + \beta + \varepsilon_t, \quad \delta^{\tau} < 1,$$

where we assume that the α coefficients in [1] decrease exponentially over time. It then follows that

$$[8] \quad C_t = \alpha_0 Y_t + \delta C_{t-1} + \beta(1 - \delta) + (\varepsilon_t - \delta \varepsilon_{t-1})$$

which certainly bears a striking resemblance to [5].

^{10/} The result that the "saving-income ratio may be an increasing function of the rate of growth of income . . . also follows from the hypothesis that consumption is a function of past income (or past consumption) as well as current income." Hahn and Matthews [1964], p. 799.

2.2 The Stock Adjustment Model Without Wealth.^{11/}

An even simpler approach is to express the desired level of current consumption as a function of current income

$$C_t^* = \gamma_0 + \gamma_1 Y_t + \epsilon_t''$$

Further, assume that the difference between the desired and actual levels of consumption are only partially made up, so that

$$(C_t - C_{t-1}) = (1 - \eta) (C_t^* - C_{t-1})$$

where η lies between zero and one: if $\eta = 0$, then the adjustment is complete in one period and if $\eta = 1$ the result breeds nonsense. From here

$$(C_t - C_{t-1}) = (1 - \eta) [\gamma_0 + \gamma_1 Y_t - C_{t-1} + \epsilon_t'']$$

and finally

$$\boxed{9} \quad C_t = (1 - \eta) \gamma_0 + (1 - \eta) \gamma_1 Y_t + \eta C_{t-1} + (1 - \eta) \epsilon_t''$$

which is equivalent to $\boxed{8}$, when $\delta = \eta$, $\beta = \gamma_0$ and

$$\alpha_0 = (1 - \eta) \gamma_1$$

2.3 The Wealth-Consumption Models. All of the preceding models predict a positive association between income growth and the savings ratio. Each is based, however,

^{11/} See Christ $\boxed{1966}$, pp. 204-208.

upon a distinctive set of assumptions about consumer behavior. Ball and Drake [1964] offer us an approach even more distinctive (and to many, including the present writer, more reasonable). It turns out, however, that the wealth-consumption models make the same crucial prediction that the savings ratio and income growth should be positively correlated.

Before elaborating the Ball and Drake framework, we might emphasize with Lydall [1963] that the hypothesis which postulates a significant influence of accumulated wealth on current saving is obvious and elementary.^{12/} Although Pigou (and Scitovsky before him) focused his attention on the real balance effect, he did postulate a significant negative influence of wealth stocks on saving. A decade or so later Ackley [1951] made a careful statement of the hypothesis but his contribution was subsequently ignored. Furthermore, Ackley pointed out that the hypothesis predicts stable saving ratios when the growth rate of income is stable and that variations in the saving ratio are produced when income growth is unstable. Most of the

^{12/} Lydall [1963], pp. 228-231.

empirical work which followed during the 1950's more or less restricted itself, however, to the impact of liquid assets on saving.

We mentioned above that Ball and Drake view the permanent income and life-cycle theories as requiring an unreasonable course of intertemporal utility maximization. Instead they postulate shortsightedness and a dominance of a precautionary motive for asset holding.^{13/} The utility function

$$U_{it} = F_i(W_{it}, C_{it})$$

is homogeneous to the first degree where W_{it} is current wealth. If we assume proportionality between consumption and wealth

$$\boxed{10} \quad W_{it} = k_i C_{it}$$

and
$$W_t = C_t \sum_{i=0}^{\infty} w_{it} k_i = C_t k$$

where w_{it} is the i^{th} individual's share in total consumption. Combining $\boxed{10}$ with the budget constraint

$$Y_{it} = C_{it} + W_{it} - W_{i,t-1}$$

and then aggregating, Ball and Drake get

$$\begin{aligned} Y_t &= C_t + kC_t - kC_{t-1} \\ &= (1 + k) C_t - kC_{t-1} \end{aligned}$$

^{13/} The relevant pages in Ball and Drake [1964] are 63-70 where the wealth-consumption theory is developed.

and thus (without the stochastic term) we have

$$\boxed{11} \quad C_t = \left(\frac{1}{1+k} \right) Y_t + \left(\frac{k}{1+k} \right) C_{t-1} .$$

The only difference between $\boxed{11}$, $\boxed{9}$, $\boxed{8}$, and $\boxed{5}$ is that the Ball-Drake formulation excludes an intercept and further that the coefficients on income and lagged consumption sum to one. For convenience, write $\boxed{11}$ as

$$C_t = (1 - \delta_1) Y_t + \delta_1 C_{t-1} , \quad 0 \leq \delta < 1 .$$

To convert to the saving function

$$S_t = Y_t - C_t = Y_t - (1 - \delta_1) Y_t - \delta_1 C_{t-1}$$

$$\delta_1 Y_t - \delta_1 C_{t-1} = S_t$$

$$\delta_1 (Y_t - Y_{t-1} + Y_{t-1} - C_{t-1}) = S_t$$

$$\boxed{12} \quad S_t = \delta_1 \Delta Y_t + \delta_1 S_{t-1} .$$

Now $\boxed{12}$ is identical with $\boxed{11}$ and it turns out below in Section 2.4 that it is similar to the results of the Lydall-Spiro wealth-stock adjustment model.

The growth rate of income can be expressed as the ratio of current to lagged income so that $\boxed{12}$ can be rewritten as

$$\begin{aligned}\frac{S_t}{Y_t} &= \delta_1 \left(\frac{\Delta Y_t}{Y_t} \right) + \delta_1 \left(\frac{S_{t-1}}{Y_t} \right) \left(\frac{Y_{t-1}}{Y_t} \right) \\ &= \frac{\delta_1 (\lambda - 1)}{\lambda} + \delta_1 \left(\frac{S_{t-1}}{Y_{t-1}} \right) \left(\frac{1}{\lambda} \right) .\end{aligned}$$

Given a constant growth rate, Ball and Drake show what Ackley asserted fifteen years ago - namely that the savings ratio converges on an equilibrium level^{14/}

$$\left(\frac{S}{Y} \right)_e = \frac{\delta_1 (\lambda - 1)}{\lambda - \delta_1} .$$

The prediction is quite unambiguous: high rates of income growth produce high saving ratios. Secular stability in the saving ratio must imply stability in secular income growth too. If the rate of income growth is stable around zero, e.g. $\lambda = 1$, then the savings ratio approaches zero also. As the growth rate becomes negative, e.g. $0 < \lambda < 1$, the savings ratio becomes negative. The upper limit on the savings ratio is δ_1 . If the wealth-consumption hypothesis is confirmed, then we are still left with the question of importance. The elasticity of savings ratio response to changes in income growth are determined by δ_1 (see Diagram 1). Quite clearly, an acceptance of this behavioral

^{14/} If, of course, $\delta_1 < \lambda$. Since $\delta_1 < 1$, this becomes crucial only at exceedingly high negative growth rates.

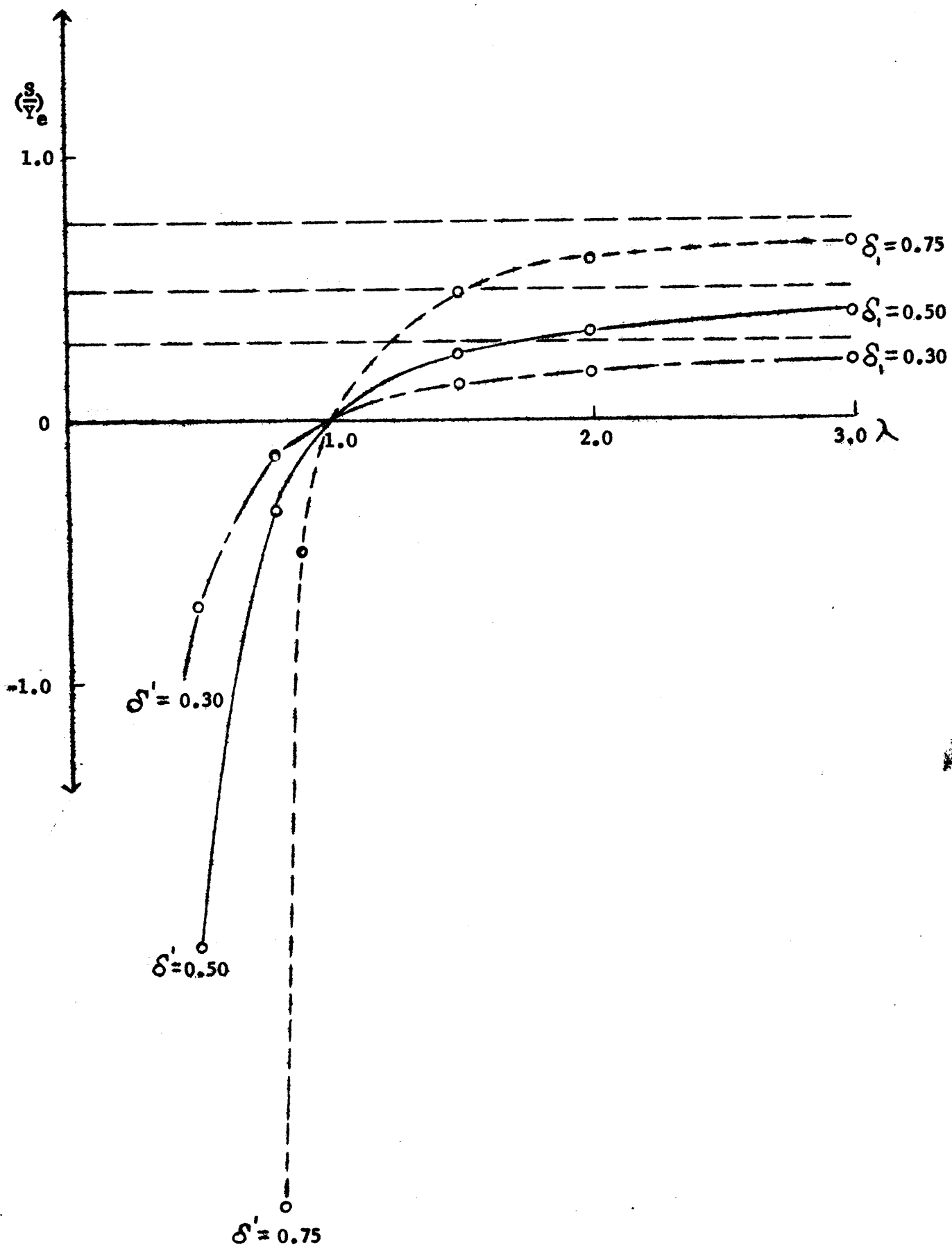


Diagram 1. EQUILIBRIUM SAVINGS RATES AND INCOME GROWTH
FROM THE WEALTH CONSUMPTION HYPOTHESIS

hypothesis does not ensure its quantitative importance.

Both issues are evaluated in Section 3.

As a postscript, it should be noted that Stone and Rowe [1962] reach a similar conclusion under, again, an entirely different set of assumptions. Stone and Rowe view income, consumption and wealth each as having two component parts -- a permanent and a transitory part. Then they hypothesize that permanent consumption is a linear function of permanent wealth and permanent income. Transitory consumption is a function of transitory income only. Both permanent income and permanent wealth are estimated by distributed lag functions of geometrically declining weights. This rather clumsy model also predicts a positive relation between the savings ratio and income growth, and the upper limit is also the short-run marginal propensity to save.

2.4 The Wealth-Stock Adjustment Model. A few years ago Spiro [1962] developed a model in which "savings are the result of a discrepancy between the actual and the desired stock of wealth"^{15/} and Lydall [1963] followed

^{15/} Spiro [1962], p. 399.

shortly thereafter with a similar approach. The basic hypothesis is that

" . . . an individual of given age, tastes, responsibilities, and so forth has - consciously or unconsciously - some view about the 'ideal' relation between the level of his consumption expenditure during a given period of time and the amount of accumulated wealth which he would like to pass on to subsequent periods. The reasons for balancing 'passed on' wealth against current consumption may be various: a desire for security in old age; a desire to bequeath property to descendants; a desire for the income, prestige or power which wealth provides; or simply a love of wealth for its own sake."^{16/}

Thus the individual sets a target (or desired) level of wealth

$$W_{it}^* = k_i C_{it} .$$

^{16/} Lydall [1963], p. 231.

Assuming a partial response to a discrepancy between last period's actual level of wealth and the current desired level, we have

$$S_{it} = \psi_i (W_{it}^* - W_{it-1}) .$$

Usually we would write desired wealth as a function of normal or expected income, but if we assume the time period to be short and introduce the budget constraint, then the above collapses into

$$\boxed{13} \quad S_{it} = \left(\frac{\psi_i k_i}{1 + \psi_i k_i} \right) Y_{it} - \left(\frac{\psi_i}{1 + \psi_i k_i} \right) W_{it-1}$$

or to simplify

$$S_{it} = k_i \phi_i Y_{it} - \phi_i W_{it-1} .$$

Lydall then makes the usual restrictive assumptions regarding distributional stability so that aggregation is possible, and by considering long period situations he gets

$$\boxed{14} \quad S_t = k \phi Y_t - \phi W_t .$$

Since we have no hope of getting observations on the stock of current wealth from the developing countries of Asia, and by recognizing that this year's wealth is last year's wealth plus last year's saving, $\boxed{14}$ can readily be converted into $\boxed{15}$:

$$\boxed{15} \quad S_t = k \quad \phi (Y_t - Y_{t-1}) + (1 - \phi) S_{t-1}$$

which is certainly similar to, but not as restrictive as, the Ball-Drake results given in expression $\boxed{12}$. Nevertheless, the implication for growth is the same:

"If income continues to grow at a steady rate for some years the saving ratio will approach its 'equilibrium' value. If this process is interrupted by a change in the rate of growth of income . . . the saving ratio will fluctuate sharply." $\boxed{17}$

3. The Models Explored on Asian Data.

In the present paper, we further hypothesize that any consumption theory which applies to secular variations or cross-sections within countries should also apply to variations between a group of fairly homogeneous nations. Following the contributions of Houthakker $\boxed{1961, 1962 \text{ and } 1965}$, Friend-Taubman $\boxed{1966}$ and Williamson $\boxed{1967}$, we shall compare individual country saving parameters with those derived by pooling nations together under the

$\boxed{17}$ Lydall $\boxed{1963}$, p. 244.

assumption that the "taste" parameters in the national regressions are not significantly different. Since we hardly object to this assumption when pooling widely divergent individual households within countries, it is but a short, and not entirely unreasonable, step to appeal to this assumption as between national units.^{18/}

The data source underlying the quantitative tests has been described in Williamson [1967] and we shall review that description only briefly here. The basic source of our income and consumption data is the United Nations' Yearbook of National Accounts Statistics. The income and consumption variables have all been deflated by 1960 national cost of living indices and are expressed in per capita terms. The data are converted into United States dollars at 1960 official exchange rates.

Early work by the present writer and others has underscored the advisability of disaggregating income into functional classifications when exploring Asian consumption patterns with time series data. These countries are now

^{18/} Given the limited macro data we have on Asian economies, the advantages derived from intertemporal cross-sections are obvious and indisputable.

undergoing profound changes in economic structure over short periods of two decades or less, and suffer important short term variations in income flows associated with devaluation, decontrol and/or factor pricing policy. The income breakdown used here is of three parts: labor income, property income, and transfers. Thus we have

S_{it} = personal saving in per capita in
nation i at time t ,

C_{it} = consumption expenditures per capita
(including durables),

Y_{it}^p = personal income per capita,

Y_{it}^w = wage and salary income per capita,

Y_{it}^e = non-labor income per capita,

Y_{it}^T = direct taxes on households minus net
transfers to households per capita,

Y_{it}^d = disposable income per capita,

$Y_{it}^d = Y_{it}^w + Y_{it}^e - Y_{it}^T = S_{it} + C_{it}$.

Furthermore, we define the real rate of interest as the difference between money rates and the rate of price inflation.

Basically, there are two competing models under scrutiny - the wealth-consumption models of sections 2.3 and 2.4, and the distributed lag models of sections 2.1 and

2.2. These are embellished somewhat in the present investigation. Because of the recent success in isolating the impact of interest rates on the savings decision by Wright [1967], we thought it fruitful to do so in our sample too where it is often argued that target saving is more prevalent. A glance at the results presented in Tables 1.B and 2.B indicates once again that interest rates play no apparent role in determining consumption shares - at least in our models as specified. Having said as much the remainder of this paper deals with the more fundamental issues raised in section 2 and the distributional effects mentioned above.

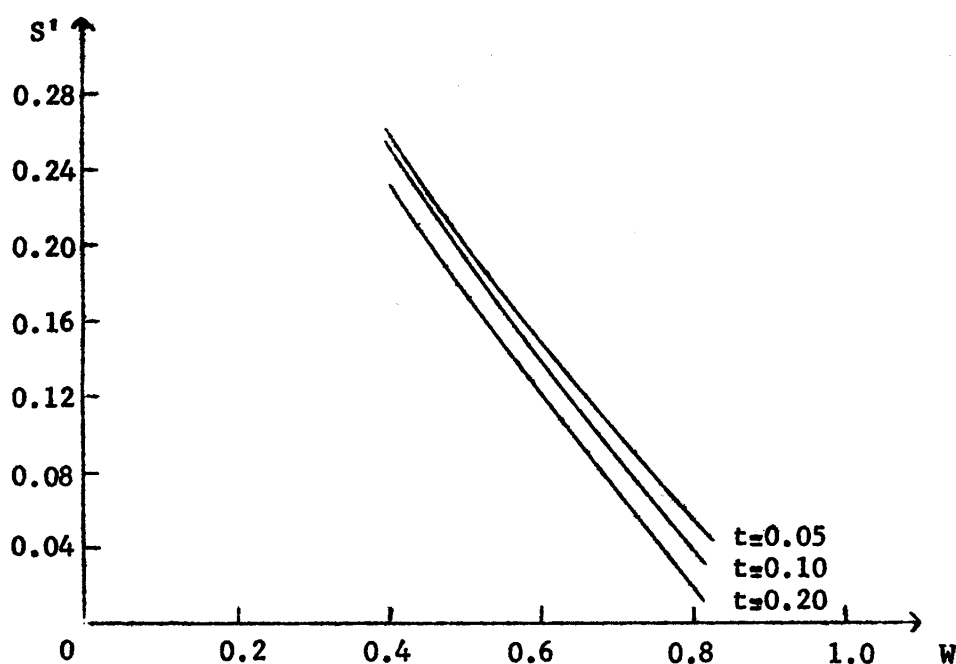
The distributed lag consumption hypothesis performs very well on this Asian sample judged by the usual tests of significance. Furthermore, problems of autocorrelation are almost totally absent from our results. What the distributed lag model underscores, of course, is the wide discrepancy between short-run and long-run savings propensities. In fact, according to the model long-run savings rates are quite low indeed in Asia (with the exception of Taiwan and Japan) but rapid income growth,

acceleration and short-run instability contribute enormously to the increased ability of Asian nations to raise observed savings rates. In short, high savings rates are now possible in Asia precisely because a predictable world of constant growth rates no longer characterizes the Asian region. These results are presented in Table 2.^{19/}

Perhaps even more interesting are the results presented in Table 2.C where the income variable is disaggregated in the distributed lag model. The results here are not quite so easily summarized but we can clearly see that the coefficients are of the expected sign and size. To derive estimates of long-run savings rates, we need exogenous evidence on the functional distribution of income and tax rates. However, the sensitivity of long-run savings rates to variations in the "wages share" is enormous. Assume that a tax rate on personal income of 5 per cent prevails in Asia over a fairly long time horizon. Suppose too that the share of wages and salaries in total personal income (w) falls from .6 to .4 as it has

^{19/} Note also that the requirements that $0 \leq \delta_1 < 1$ and $0 \leq \alpha_0 \leq 1$ are fulfilled.

2-a. Long-run Savings Rates(S') and the Wages Share(W): Asia II



2-B. Long-run Savings Rates(S') and the Direct Tax Share(t): Asia II

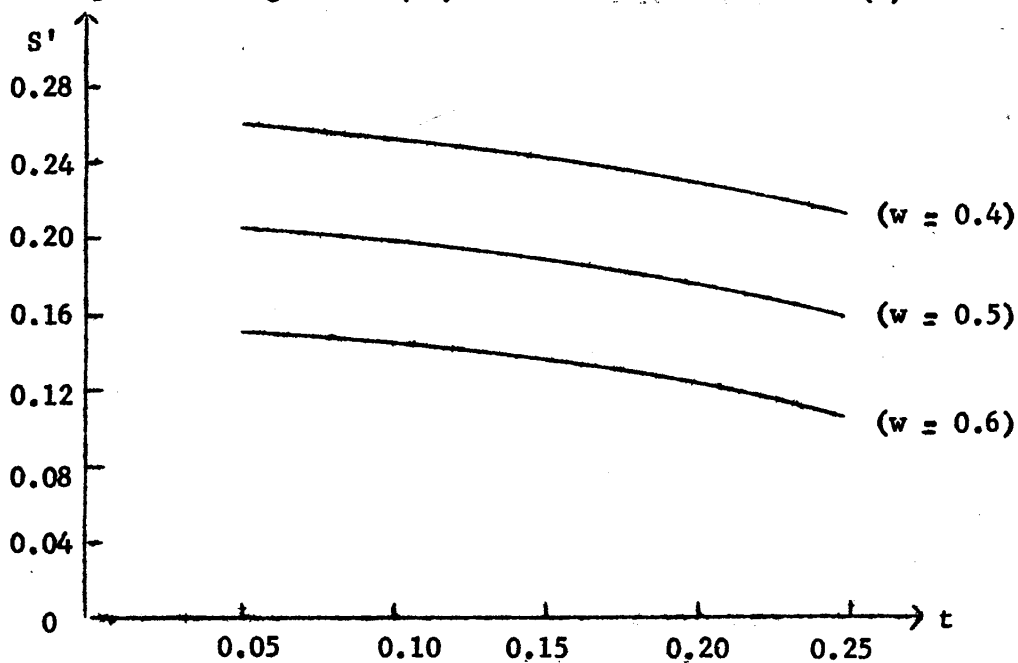


Diagram 2. LONG-RUN MARGINAL SAVINGS RATES, THE WAGES SHARE AND TAX SHARE, - FROM THE DISTRIBUTED LAG CONSUMPTION FUNCTION

in Japan since 1950. The impact on the long-run savings ratio is to raise it from .15 to .26. (The savings ratio rises twice as fast as w falls indicating a very elastic response.) Alternatively, since the early 1950's Taiwan has undergone a rise in w from .45 to .55. Holding everything else constant, the savings ratio should have declined by 6 per cent. The interaction between the long-run savings rate and the wages share (in personal income) is displayed in Diagram 3.A under the assumption of constant tax rates. On the other hand, long-run savings rates are relatively insensitive to variations in overall tax rates. Assuming w fixed at .5, a rise in the tax rate from 15 to 20 per cent would lower the savings ratio by only 1.5 per cent.^{20/}

The results of our exploration of the wealth-consumption hypothesis on Asian data are presented in Table 1. In terms of the traditional significance tests our estimates are quite reliable. Furthermore, with the

^{20/} This experiment makes the very strong assumption that the actual (as opposed to legal) tax rate on the two income groups is the same and remains so over the experimental period.

TABLE 1.A

The Wealth-Consumption Hypothesis (A): $C_t = \alpha_0 Y_t^d + \delta_1 C_{t-1}$

Sample	$\hat{\alpha}_0$	$\hat{\delta}_1$	$\hat{\alpha}_0 + \hat{\delta}_1$	$M_{\max}(\frac{\hat{S}}{\hat{Y}})$	k	λ (mean)	$(\frac{\hat{S}}{\hat{Y}})^*$ (at mean)	DWT	$\frac{-2}{R}$
[1] Japan, 1950-1964	.3230 (.1023)	.6427 (.1351)	.97	.64	1.799	1.117	.16	2.3981	.9994
[2] Taiwan, 1951-1964	.5974 (.0852)	.3671 (.0980)	.97	.37	.912	1.081	.04	1.7685	.9991
[3] Burma, 1950-1963	.6924 (.0845)	.2255 (.0977)	.92	.23	.291	1.062	.02	2.2228	.9987
[4] Asia I: Japan, Taiwan, Burma, South Korea, and Philippines	.2578 (.0288)	.7349 (.0354)	.99	.73	2.772	1.065	.14	2.1283	.9990
[5] Asia II: Japan, Taiwan and Burma	.2949 (.0398)	.6863 (.0502)	.98	.69	2.188	1.087	.15	2.2339	.9991

TABLE 1.B

The Wealth-Consumption Hypothesis (B): $C_t = \alpha_0 Y_t^d + \delta_1 C_{t-1} + \delta_2 \left\{ r_t - \frac{d_{pt}}{P_{t-1}} \right\}$

Sample	$\hat{\alpha}_0$	$\hat{\delta}_1$	$\hat{\alpha}_0 + \hat{\delta}_1$	$\hat{\delta}_2$	$\text{Max}(\hat{S})$	k	λ (mean)	$(\frac{\hat{S}}{Y})^*$	DWT	R^2
								(at mean)		
[1] Japan, 1950-1964	.3418 (.1041)	.6240 (.1383)	.97	.3267* (.3288)	.61	1.607	1.117	.14	2.1158	.9994
[2] Taiwan, 1951-1964	.5865 (.0862)	.3906 (.1013)	.98	-.0852* (.0883)	.39	.641	1.081	.05	2.0559	.9992
[3] Burma, 1950-1963	.6954 (.0913)	.2228 (.1042)	.92	-.0117* (.0852)	.22	.287	1.062	.02	2.1686	.9987
[4] Asia I: Japan, Taiwan Burma, South Korea, and Philippines	.2608 (.0289)	.7298 (.0357)	.99	.0616* (.0560)	.73	2.701	1.065	.14	2.1338	.9990
[5] Asia II: Japan, Taiwan and Burma	.3026 (.0404)	.6745 (.0513)	.98	.0775* (.0724)	.67	2.072	1.087	.14	2.2222	.9991

* Insignificantly different from zero at 5% level.

TABLE 2.A

The Distributed-Lag Consumption Hypothesis (A): $C_t = \alpha_0 Y_t^d + \delta_1 C_{t-1} + \beta$

Sample	$\hat{\alpha}_0$	$\hat{\delta}_1$	$\hat{\beta}$	LRMPS	DWT	$\frac{2}{R}$
[1] Japan, 1950-1964	.4771 (.1048)	.3618 (.1584)	15.5822 (6.1871)	.25	1.9296	.9937
[2] Taiwan, 1951-1964	.5975 (.0697)	.2017 (.1034)	14.9443 (5.8945)	.25	2.3585	.9623
[3] Burma, 1950-1963	.6847 (.0980)	.2201 (.1066)	.6103* (3.3734)	.12	2.2098	.9426
[4] Asia I: Japan, Taiwan, Burma, South Korea, and Philippines	.2964 (.0317)	.6710 (.0425)	2.2748 (.9014)	.10	2.0443	.9971
[5] Asia II: Japan, Taiwan and Burma	.3517 (.0428)	.5918 (.0587)	3.4539 (1.2817)	.14	2.1091	.9971

* Insignificantly different from zero at 5% level.

TABLE 2.B

The Distributed-Lag Consumption Hypothesis (B): $C_t = \alpha_0 Y_t^d + \delta_1 C_{t-1} + \delta_2 \left\{ r_t - \frac{d_{pt}}{P_{t-1}} \right\} + \epsilon_t$

Sample	$\hat{\alpha}_0$	$\hat{\delta}_1$	$\hat{\delta}_2$	$\hat{\beta}$	Long-Run Saving Ratio	DWT	R^2
[1] Japan, 1950-1964	.5391 (.0943)	.2582 (.1438)	.5386 (.2428)	18.7073 (5.4962)	.27	1.9108	.9958
[2] Taiwan, 1951-1964	.5963 (.0742)	.2080 (.1221)	-.0095* (.0837)	14.6137 (6.8554)	.25	2.3742	.9624
[3] Burma, 1950-1963	.6868 (.1038)	.2144 (.1162)	-.0173* (.0933)	.8013* (3.6956)	.13	2.1273	.9429
[4] Asia I: Japan, Taiwan, Burma, South Korea, and Philippines	.2987 (.0317)	.6671 (.0426)	.0573* (.0540)	2.2440 (.9010)	.10	2.0492	.9972
[5] Asia II: Japan, Taiwan and Burma	.3528 (.0432)	.5905 (.0592)	.0374* (.0704)	3.2920 (1.3277)	.14	2.0985	.9971

* Insignificantly different from zero at the 5% level.

TABLE 2.C

The Distributed-Lag Consumption Hypothesis (C): $C_t = \alpha_0^w y_t^w + \alpha_0^e y_t^e + \eta T_t + \delta_1 C_{t-1} + \beta$

Sample	$\hat{\alpha}_0^w$	$\hat{\alpha}_0^e$	$\hat{\eta}$	$\hat{\delta}_1$	$\hat{\beta}$	DWT	$\frac{-2}{R}$
[1] Asia I: Japan, Taiwan, South Korea and the Philippines	.1860 (.0356)	.0330* (.0546)	-.1544* (.1255)	.8904 (.0429)	3.2734 (1.5208)	2.1728	.9955
[2] Asia II: Japan, Taiwan	.2375 (.0566)	.1215 (.0672)	-.1426* (.1663)	.7671 (.0755)	9.0527 (3.1859)	2.4700	.9954

* Insignificantly different from zero at the 5% level.

exception of Burma (1950-1963), the sum of the current income and lagged consumption coefficients ranges between .97 and .99,^{21/} while theory imposes the restriction that they sum to unity. Quite clearly the wealth-consumption hypothesis fails to explain Burmese postwar experience but it performs very well in all other cases. The maximum savings rates attainable by the economies in our sample ranges widely between .22 for Burma and .73 for the full Asian sample. None of these nations approached those maxima, of course, since none of them grew at the impossible rates required of them to reach those limits. Recalling the equilibrium savings ratio as

$$\left(\frac{s}{y} \right)_e = \frac{\delta_1 (\lambda - 1)}{\lambda - \delta_1} ,$$

then had these nations grown at constant rates equal to their actual average performance, Japan would have obtained a savings ratio of .14 and Burma .02. The remaining nations fall in between. The model also predicts

^{21/} We were not able to perform a significance test of the hypothesis that these coefficients sum to unity, but their covariance would have to assume unusual values indeed to reject the wealth-consumption hypothesis from all samples except Burma.

wealth-consumption ratios (k) which could be used to submit the model to further test - were adequate wealth data available. Again ignoring the Burmese results, k varies between quite reasonable limits: from .9 for Taiwan to 2.8 for Asia as a whole.

✓ Finally, and most interesting, the model estimates the elasticity of response of equilibrium savings ratios in the household sector to growth rates in disposable income (see Diagram 3). It appears that in a large portion of Asia equilibrium savings rates have a more elastic response to changes in growth rates than in the Western world. ✓ A once and for all rise in growth rates from 2 to 6 per cent per annum would produce the following percentage point increases in savings rates:

Burma	1.1%	Japan	5.8%
Taiwan	2.1%	Asia I	7.0%
United States ^{22/}	2.3%	Asia II	8.3%
United Kingdom ^{22/}	3.9%		

^{22/} The United States (1929-41) and United Kingdom (1950-60) calculations are made on the basis of the parameters estimated by Ball and Drake [1964], p. 76, Table 1.

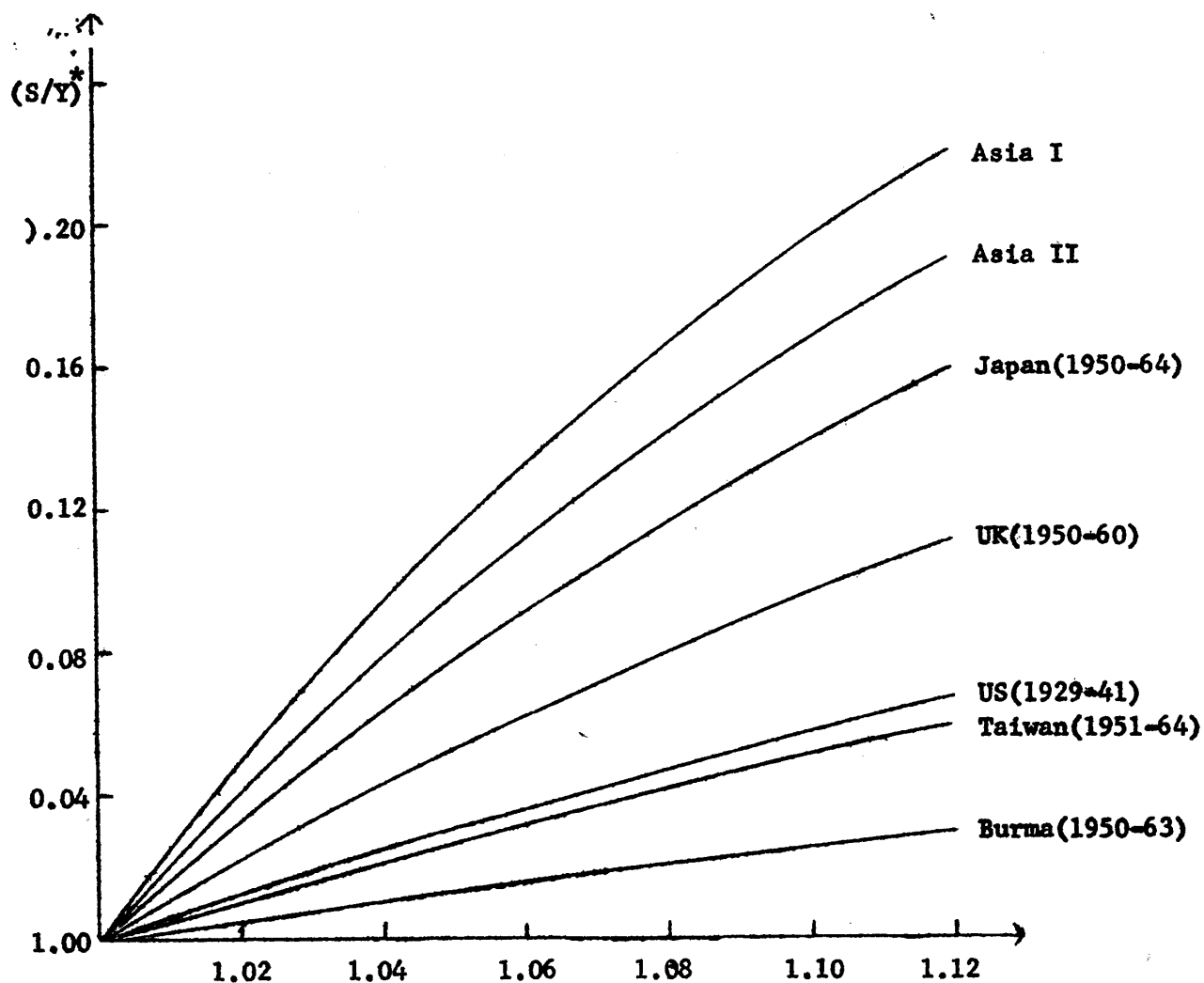


Diagram 3. EQUILIBRIUM SAVINGS RATES AND INCOME GROWTH
FROM THE WEALTH-CONSUMPTION MODEL: EMPIRICAL RESULTS ON ASIA

Thus, not only do these results support the speculation that the wealth-consumption hypothesis is "[capable] of generalization to less wealthy countries"^{23/}, but the quantitative impact of income growth on savings is much more important in Asia than in Western Europe or North America.

✓ In summary, there seems to be some confirmation of the hypothesis that "low rates of savings . . . may not simply be the cause of low rates of income growth, but also the effect of low rates of growth"^{24/} in Asia. ✓ Our results for Asia have been confirmed by Landau's work on Latin America^{25/} and, apparently, by Modigliani's as yet unpublished research utilizing international cross-sections. The underlying theoretical models are not always clear in these empirical studies, however, and their use of gross domestic savings rather than household savings seems to muddy the waters even further. The approach used here appears to us to avoid many of the

^{23/} Malinvaud [1966], p. 117.

^{24/} Ball and Drake [1964], p. 70.

^{25/} Landau [1966].

problems of model misspecification which have plagued so much of the recent research on the determinants of aggregate savings over time. ✓ Our results show quite clearly for Asia that income distribution plays the powerful role normally attributed to it but that the growth rate of per capita income is likely to explain most of the remaining variation in savings ratios in the household sector. Furthermore, the underlying assumptions of these models seem well-suited to the underdeveloped world. In particular, it seems to the present writer that the basic assumptions of the wealth-consumption model, shortsightedness and a dominance of a precautionary motive for asset holding, are far more applicable to underdeveloped Asia than to the affluent Western nations for which the model was originally formulated. ✓

x x x

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