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A unique feature of this study is its use of panel data to construct two measures of permanent income: An earnings function with unobserved individual differences suggests one measure, while a weighted average of past incomes yields another. These measures reject the accepted theories of savings behavior and suggest a nonlinear relationship between savings and permanent income. A new function incorporating this nonlinearity is successfully applied to the data for Indian farm households. The occurrence of this nonlinearity suggests that income redistribution policies in the less developed countries are likely to result in a reduced supply of household savings.

A major result of the received theories of consumption behavior—Friedman's (1957) permanent-income hypothesis (PIH) and Modigliani and Brumberg's (1954) life-cycle hypothesis (LCH)—is that the savings rate of a household (individual) is *independent* of the level of its permanent (lifetime) income (the independence proposition). If redistribution and growth are assumed to be the major policy objectives of most developing countries, the proposition above suggests that

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there are no economic costs to redistribution policies; that is, a redistribution of income is unlikely to affect the supply of household savings[1] and therefore growth.[2] This policy relevance of the savings-income relationship suggests that it should be subjected to extensive analysis. Though a number of such studies exist for U.S. households, lack of data has prevented a similar outpouring of research in the developing countries.[3]

A major purpose of this study is to test rigorously the savings-income relationship for farm households in rural India. As its basis, it uses the data collected by the National Council for Applied Economic Research (1974) (NCAER) on some 2,000 households in rural India. The data are unique for a developing country in that the information was collected from a panel of households for three consecutive years: 1968-69, 1969-70, and 1970-71.

A distinguishing feature of this study—namely, the emphasis it places on the *measurement* of permanent income—is made possible by the availability of longitudinal data. Cross-section, one-period data typically have too little information to adequately define the permanent income of a household. Section I exploits the panel nature of the data to yield two conceptually different estimates of permanent income. One is based on a weighted average of incomes and the other on an earnings function modified to include the impact of (permanent) unmeasured individual factors. Though not unique in construction,[4] it is likely that the latter measure has not been used before in an analysis of savings behavior.

In Section II these measures of permanent income are used with measured income to determine which concept of income provides a better explanation of savings behavior and to test the validity of the independence proposition. Section III discusses and examines the properties of various functional forms relating savings and incomes. In addition, a "new" savings function—saving rates increase non-

[1] Of the received theories of savings behavior, only the quadratic Keynesian function (i.e., marginal saving rates increasing with income) allows for an income redistribution effect on household savings. This conclusion is dependent on a given tax system and constant tastes.

[2] The connection between economic growth and the level of savings assumes that long-run income growth in developing countries is constrained by a lack of savings rather than of investment opportunities. The bulk of this finance in most developing countries comes from domestic savings—hence, their relevance.

[3] Only a handful of household studies exist for the developing countries, and even fewer for the rural areas (Snyder 1974). The paucity of household data has constrained researchers to conduct macro tests for what is essentially a theory of individual behavior. Consequently, time-series studies number well over a hundred (Mikesell and Zinser 1973).

[4] Lillard (1977), in the context of a human capital model, measures the net impact of unmeasured individual differences in constructing estimates of human wealth.

linearly with (permanent) income and approach a constant asymptotic value—is proposed and tested. Section IV summarizes the major conclusions of this paper. The Appendix contains the definitions of major variables and a description of the data used for the analysis.

I. The Measurement of Permanent Income

The permanent-income and life-cycle theories of consumer behavior use different empirical methods but employ a common theoretical model, that is, a multiperiod model which asserts that consumption is a function of permanent (lifetime) income. The empirical techniques used in this paper apply directly to Friedman's formulation of the theory—hence, the emphasis is on testing the PIH.

The salient features of the hypothesis are three: (*a*) the definition that measured consumption (C) and measured income (Y) are composed of their permanent (C_P, Y_P) and transitory components (C_T, Y_T), that is,

$$C = C_P + C_T, \tag{1a}$$

$$Y = Y_P + Y_T; \tag{1b}$$

(*b*) the assumption that these transitory components are stochastically independent, that is,

$$\text{corr}\ (Y_P, Y_T) = \text{corr}\ (C_P, C_T) = \text{corr}\ (C_T, Y_T) = 0; \tag{2}$$

(*c*) the assertion that there exists a systematic relationship between the permanent components, that is,

$$C_P = kY_P, \tag{3}$$

where k (though dependent on interest rates, tastes, composition of wealth, etc.) is assumed to be independent of Y_P (the independence proposition or, equivalently, the contention that there is a unitary elasticity between the permanent components).

A savings function can easily be derived from the equations above and is given by

$$S = (1 - k)Y_P + Y_T - C_T, \tag{4}$$

where ($Y_T - C_T$) is transitory savings and S is measured savings. (S is defined as change in net worth inclusive of consumer durables; for a complete definition, see the Appendix.)

If permanent income is indeed the relevant determinant of savings behavior, then specification bias due to "errors in variables" will occur if measured income is used. Empirical testing of the PIH (e.g., eq. [4]) involves knowledge of Y_P. Two measures of permanent income are developed next and applied to equation (4) in Section II.

Permanent Income: A Modified Earnings Function

The permanent income of a household can be defined to be $Y_P = rW$, where W is the stock of wealth and r a constant, average yield. One approach to the estimation of Y_P is to approximate it by the predicted value obtained from an earnings function, that is, a stable relationship between income and its determinants. In its most general (linear) form, the income of an individual i in year t may be expressed as

$$Y_{it} = \sum_{j=i}^{k} \beta_j X_{jit} + e^*, \tag{5a}$$

where

$$e^* = \gamma_i + \epsilon_{it} + \epsilon_t, \tag{5b}$$

Y_{it} is measured income, the X's are determinants of income, β_j's are parameters to be estimated, and e^* is a composite error term; γ_i (ϵ_t) are errors specific to an individual (time period) and ϵ_{it} is a random error with zero expectation.

The use of one-period data cannot distinguish between the components of e^*; hence, the traditional earnings function interpretation of $\hat{Y}$ (predicted value, eq. [5a]) as an estimate of Y_P is biased.[5]

Panel data (i.e., time-series data for a cross section of individuals) can allow one to obtain unbiased estimates of $\hat{\beta}$ and $\hat{Y}$. The proper estimation procedure depends on the assumptions regarding γ_i. Two possible assumptions are: (*a*) γ_i is distributed independently of the X's (variance components model) and (*b*) γ_i's are related to the determinants of income (fixed-effects model). In equation (5), the γ_i's represent the net effect of unmeasured variables. For the sample analyzed in this paper, the γ_i's reflect education, managerial efficiency, soil quality, access to extension agencies, credit, and so forth. Given this "composition" of the γ_i's, it is an untenable assumption to maintain that they are unrelated to the X's, that is, land value, physical assets, and the level of technology. Consequently, the variance components model was rejected in favor of a "fixed-effects" model.

A fixed-effects model can be estimated through the use of dummy variables. Given the inapplicability of this method due to the large number of individuals (1,980), an equivalent, alternative technique was adopted.[6]

The determinants of income (X's) remain to be defined. Income is a

[5] The residuals from eq. (5a) are not distributed independently around the (mean) permanent values. Thus, rather than being estimates of transitory income, they contain components of permanent income, e.g., γ_i. An analogous problem is encountered in human capital models which exclude ability.

[6] Essentially, this method involves estimation in terms of variables which are deviations from individual and sample means (see Nerlove [1971] for details).

return to labor (L) and physical assets, and the latter can be decomposed into land (H) and other assets (K).

The value of land owned in a given year, H_t, is given by $H_t = P_i A_{it} + P_u A_{ut}$, where P_i, P_u are the village prices of irrigated and unirrigated land, and A_{it}, A_{ut} the corresponding areas in year t.[7] The use of village prices (individual data are not available) prevents the incorporation of differences in the quality of irrigation. This error in the construction of H_t is mitigated, however, by the fact that the estimated individual constants, γ_i, capture the permanent quality differences.

Information on stocks of major capital assets (irrigation equipment, farm equipment, livestock, and other farm assets) and flows (investments) yields estimates of K_t.[8] This procedure may exclude some income-determining assets. However, this exclusion does not bias the results if it is assumed that excluded assets are proportional (and similar) to K_t.

The representation of labor assets, L, is somewhat more difficult. No information is available on the educational background or the wage rate of members of the family.[9] Occupational classifications into mutually exclusive categories of "earner," "nonearner," and "family worker" cannot be used because of their nonspecific nature. Any amount of outside earnings classifies a person as an earner and any amount of on-farm work as a family worker. Thus, a weighted representation of labor in terms of efficiency units is not possible.

One alternative to either earners or family workers is to use family size, F, as a proxy for L. Its advantage is that variations in it may indeed capture differences in earning members across families (the simple correlation coefficient between family size and income for 1970–71 was .403). An additional advantage is that F can reflect the earnings potential of future workers. An important drawback, however, is that F gives equal weight to all members of the family. Given the constraints of data availability, the disadvantages associated with

[7] It should be mentioned that land-ownership figures for the first year are suspect. Since only households with zero investments in land were included for analysis (Appendix), the more accurate third-year ownership figures were imposed on the data. The net area irrigated for the first 2 years was adjusted. The procedure was as follows: (i) The proportion of land reported to be irrigated in the first (and second) year was imputed to the land owned in the third year, and (ii) if this procedure resulted in a greater acreage being irrigated in the first 2 years, the irrigated acreage of the third year was assumed.

[8] Irrigation equipment does not have a value independent of the value of land. If the latter is also being used to estimate permanent income, double counting is avoided by ignoring irrigation equipment in the calculation of K_t. This procedure was followed in this paper. (Inclusion of irrigation equipment in K_t did not make much difference to the values of Y_P.) It should be noted that if the level of irrigation assets is a proxy for the quality of irrigation, such differences are already incorporated in the model via γ_i.

[9] This is not a major drawback since permanent differences in human capital are captured by γ_i.

TABLE 1

ESTIMATION OF PERMANENT INCOME–MODIFIED EARNINGS FUNCTION

Variables	Pooled Data (Individual Effects Included) (1)	Pooled Data (No Individual Effects) (2)	"Traditional Method," 1-Year Data, 1970–71 (3)
Constant	−42.5	675.1	615.0
	(.6)	(6.3)	(4.1)
Land value, H	.182	.096	.09
	(5.7)	(38.7)	(23.8)
Capital asset, K	.326	.217	.295
	(40.5)	(18.0)	(15.6)
Labor assets, L	188.2	290.4	270.6
(family size)	(27.2)	(10.4)	(15.2)
Technology, HYV	5.6	15.3	14.9
	(5.2)	(9.11)	(5.7)
$\bar{R}^2$	.776	.482	.56
SE	2,026	3,079	2,890
Households/observations (N)	1,980/5,940	1,980/5,940	1,980/1,980

NOTE.—The dependent variable is household income. Numbers in parentheses are the absolute values of the t-statistics. Additional variables in regressions were dummy variables for years 1 and 2 and a dummy variable representing weather quality for each of the 3 years (see n. 10 above). See Nerlove (1971) for details on estimation of "fixed" individual effects with pooled data.

family size seem to be the least. Consequently, it was used as a proxy for L in the estimation of Y_P.

Another important determinant of farm earnings in the years 1968–69 to 1970–71 was the level of adoption of the new technology. The percentage area under the high-yielding varieties, HYV_t, is assumed to reflect accurately the net contribution of technology, with γ_i capturing differences in the "sophistication" of adoption.

An all-India earnings function, specified as in equation (6), was estimated for the entire sample of households (1,980):[10]

$$Y_{it} = \gamma_i + \beta_1 H_{it} + \beta_2 K_{it} + \beta_3 L_{it} + \beta_4 \mathrm{HYV}_{it} + e. \quad (6)$$

The estimation of an all-India earnings function is defensible for two reasons: (a) The major determinants of farm income have been included and (b) the presence of γ_i captures permanent individual farm differences as well as permanent regional differences.

The results for equation (6), estimated with and without the individual coefficients, are presented in table 1. Column 2 shows that for

[10] The effect of e_{it} (eq. [5b]) is incorporated in eq. (6) through the use of time dummies for the years 1968–69 and 1969–70. In addition, a term for weather (M_{it}) (0 if conditions were average or above, 1 if below average) was included to improve the efficiency of estimation. Obviously, the effects of M_{it} or time dummies are not included in the computation of Y_P (eq. 7).

the pooled 3-year sample, 48 percent of the variation in household incomes is explained by four variables—land, labor, capital, and technology. Given the all-India heterogeneous nature of farm households, this is an encouragingly large fraction. The inclusion of individual constants, γ_i (col. 1), increases radically the explanatory power of the model, from 48 percent to 78 percent. Column 3 of the table shows the estimates that would have been obtained if only data for 1970–71 were available. Though pooling of data does not change the β's by much (cols. 2, 3), inclusion of γ_i does significantly affect them. Thus, identification of γ_i by means of longitudinal data not only yields unbiased and efficient estimates of β's but also allows one to measure permanent (and transitory) income with considerably greater accuracy than would have been possible with 1-year data.

An earnings function definition of permanent income (Y_{px}) for 1970–71 is

$$Y_{px} = \gamma_i + .18H_3 + .33K_3 + 188.2L_3 + 5.6\text{HYV}_3, \qquad (7)$$

where subscripts indicate the parameter values for 1970–71.[11] This interpretation necessitates some assumptions; in effect: (*a*) that the flow of income cannot be affected by a change in the composition of assets—land and capital; (*b*) that the composition and labor-earning power of the family stay essentially constant; and (*c*) that the technology level of the household is fixed to its 1970–71 level. An alternative to the assumptions above would have been a construction of time profiles for each of these variables and for each household—a task somewhat intractable and certainly beyond the scope of this study.

Permanent Income: Weighted Average of Incomes

An alternate, and more conventional, approach to the measurement of permanent income is in terms of a weighted average of past incomes, that is,

$$Y_P = \Sigma\, W_t Y_t, \qquad t = -\infty, \ldots, 0, \qquad (8)$$

where W_t are the weights and Y_t the measured income in time period t.

This method originated with Friedman's (1957) analysis of consumption behavior in the United States and since then has been extensively used in other studies (see Mikesell and Zinser [1973] for a representative listing). Using aggregate time-series data and an

[11] This method of estimating Y_P resulted in negative values of Y_P for a few households. Rather than eliminate these households, average 3-year income was substituted for Y_{px}.

income-expectations approach, Friedman constructed the following estimate of Y_P, at time period t',

$$Y_{P,t'} = \delta \int_{-\infty}^{t'} e^{(\delta-\alpha)(t-t')} Y_t dt, \tag{9}$$

where α is the trend rate of growth in permanent income and δ is a weighting parameter which is analogous to an adjustment coefficient relating actual to "expected" and/or permanent income, that is,

$$dY_P/dt = \delta(Y_t - Y_P). \tag{10}$$

(See Friedman [1957, pp. 143–44] for details; note that eq. [10] is consistent with [9] only under the condition that there is no trend in permanent income, i.e., $\alpha = 0$.) This method yields the following weighting pattern, for $t' = 0$: for continuous data,

$$W_t = \delta e^{(\delta-\alpha)t}, \quad t = -\infty, 0; \tag{11a}$$

for discrete data,

$$W_t = \delta \frac{(1+\alpha)^{-t}}{(1+\delta)^{-t}} \quad t = -\infty, \ldots, -3, -2, -1, 0. \tag{11b}$$

In a later article (1963), Friedman rejected the income-expectations model and offered an alternative rationale for constructing Y_P. This method, which Friedman held to be applicable to both individual and country data, was to "regard individuals as taking their past experience, adjusted for trend, as their best single estimate of their likely future experience" (1963, p. 22). This approach results in a measure of Y_P which is a weighted average of past incomes; indeed, it yields the same formula for permanent income and for weighting as equations (9) and (11), with the important difference that δ now is a direct estimate of the discount rate r rather than an estimate of an adjustment coefficient in an income-expectation formula.

Lack of appropriate data has limited the application of the methodology above to cross-section data. The panel nature of the NCAER survey, however, offers a unique opportunity to construct a measure of permanent income along the lines suggested by Friedman, with δ replaced by discount rate r in equation (9):

$$Y_{P,t'} = r \int_{-\infty}^{t'} e^{(r-\alpha)(t-t')} Y_t dt. \tag{12}$$

The application of equation (11) requires determination of α and r ($\delta = r$). The term α represents the trend rate of growth of permanent income for an individual household. The growth in actual household incomes cannot be used to estimate expected growth rates since these

TABLE 2

DISCOUNT RATES AND PREDICTED WEIGHTS

Discount Rate r (%)	W_0	W_{-1}	W_{-2}
10	.366	.332	.302
35	.437	.323	.240
50	.474	.316	.210
75	.527	.301	.172
90	.555	.292	.153
∞	1.0	0	0

NOTE.—$\alpha = 3.5\%$, $\Sigma W_t = 1$, $W_t = r(1 + \alpha)^t/(1 + r)^{-t}$, $t = 0, -1, -2$.

incomes are "contaminated" by an unmeasured (and perhaps large) transitory component. A plausible assumption (and one adopted in this paper) is that farm households base their expectations about future receipts on the observed growth in incomes of all households. The average rate of growth during the sample period was 3.5 percent per annum. Obviously, the growth rate experienced, and expected, by different households will differ from α; however, data limitations dictate that a common α be assumed.[12]

The discount rate r remains to be determined. One method would be to let the data determine the value according to a "best fit" in a particular savings function. This approach is not followed in this paper for two reasons: (*a*) It is impractical because estimates of Y_p are used for various purposes in this paper, and (*b*) no theoretical justification exists for the methodology above. On theoretical grounds, the appropriate value of r is dictated by the length of the horizon, where the horizon is defined to be $1/r$, or "the number of years purchase implied by the discount rate" (Friedman 1963, p. 7). As Holbrook (1967) has documented, Friedman's assertion that the horizon is 3 years is subject to debate. How sensitive the results might be to the particular choice of r is indicated in tables 2 and 3. Table 2 indicates the different weights which emerge for $\alpha = 3.5$ percent and r ranging from 10 percent to 90 percent (Since only 3-year data are available, the weights according to eq. [11b] with $\delta = r$ are normalized to equal unity.) These weights decline with time and, for $r = 35$ percent, are .437, .323, and .240 for incomes in periods t, $t - 1$, and $t - 2$, respectively. Table 3 shows the correlations among selected measures of permanent income. The high correlations revealed in the table (> .985) suggest that the particular choice of r is unlikely to

[12] This assumption is not expected to bias the results seriously. Holbrook and Stafford (1971), in their study with U.S. data, found little effects on the propensity to consume from changes in assumptions about the growth rates. Sensitivity analysis of changes in growth rates (α) resulted in a similar finding with the NCAER data.

TABLE 3

CORRELATION MATRIX OF SAVINGS AND PERMANENT INCOME

	S	Y_{px}	Y_{p10}	Y_{p35}	Y_{p75}	Y_a
Y_{px}	.714					
Y_{p10}	.616	.897				
Y_{p35}	.639	.923	.998			
Y_{p75}	.663	.950	.988	.997		
Y_a	.604	.883	.999	.995	.983	
Y_{pr}	.620	.894	.993	.991	.982	.993

NOTE.—Subscripts to Y_p indicate discount rate used; Y_{pr} refers to permanent income, earnings function method. Y_a refers to a simple average of income in the 3 years; S and Y_{px} refer to third year, 1970–71, data.

make a difference to the results. Indeed, savings-behavior regressions (not presented here) support this contention for Y_p measures based on discount rates which span the spectrum of possibilities—10 percent, 35 percent, and 75 percent.[13]

The subsequent sections of this paper assess the savings-income relationship for two conceptually different measures of permanent income—the earlier "earnings-function" estimate, Y_{pr}, and a weighted average of past incomes estimate, Y_{p35}. The choice of a 3-year horizon, that is, $r = 35$ percent, was dictated by two factors: (*a*) A detailed study (Bhalla 1979) suggests that an upper-bound estimate of the horizon for the same farm (NCAER) households is 3 years, and (*b*) Friedman (1957) and Mohabbat and Simos (1977) both contend that a 3-year horizon is a proper estimate for U.S. households.

II. The Savings-Income Relationship

The PIH savings function (eq. [4]) can be generalized as

$$S = k_0 + k_1 Y_P + k_2 Y_T + u. \quad (13)$$

This equation can be used to test the major features of both the PIH and the alternate Keynesian theory of saving behavior. In particular, the result that $k_0 < 0$ would support the Keynesian hypothesis (average saving rates increase with income) and reject the independence proposition which implies that $k_0 = 0$. The magnitude of k_2 indicates the marginal propensity to save (MPS) out of transitory income; it should, according to the "strict" version of the PIH, be equal to one. However, yields on transitory income[14] (Mayer 1972) and con-

[13] The insensitivity of the savings-behavior parameters with regard to changes in r suggests that undue emphasis in determining the proper discount rate may be misplaced. Alternatively, the results can be interpreted as being "robust" with regard to their implications for savings behavior.

[14] Certain assumptions (r is known and a constant, sources of income not perceived differently, etc.) dictate k_2 to be $[1 - r(1 - k_1)]$.

siderations about asset adjustments (Darby 1972) would dictate k_2 to be less than one but greater than k_1. The Keynesian hypothesis ($S = k_0 + k_1Y$), by postulating the dependence of savings on current income Y, asserts that the distinction between the sources of income (Y_P and Y_T) is irrelevant; thus, k_2 is equal to k_1.

According to the PIH, the error u in equation (13) is assumed to reflect transitory consumption, C_T. This variable, though mentioned in theoretical discussions, is often ignored in empirical analysis. A basic assumption of the PIH is that households attempt to maintain a planned level of consumption, C_P, and that shocks to consumption are absorbed entirely by changes in savings. This implies the existence of perfect capital markets—an unlikely occurrence in rural India. Both the illiquidity of rural assets (land, irrigation equipment, etc.) and the constraints on borrowing (lack of a fully developed financial system) are likely to prevent savings from being a residual; that is, not all transitory consumption needs are financed by savings. A constant level of C_P is therefore unlikely to be maintained—rather, it is expected to vary according to the level, and necessity, of C_T. Thus, if equation (13′) is estimated,

$$S = k_0 + k_1Y_P + k_2Y_T + k_3C_T + u', \qquad (13')$$

the coefficient k_3 is likely to be greater than the predicted value of minus one (or its absolute value, k_3', is less than one).

Transient expenditures, C_T, are usually not measurable. One classification in the NCAER survey is "large unexpected expenditures," U_T. These values have been used in the computation of C_T. Since U_T may contain elements of planned consumption, it was assumed that a 3-year average of U_T, U_A, reflects the permanent component of C in U_T. Thus transient consumption was defined as $U_T - U_A$.[15]

A valid test of the PIH requires that subsistence households be removed from the sample. These households are definitionally constrained to consume their entire income; thus their average propensity to save (APS) is zero.[16] (Households beyond the subsistence level presumably have an APS > 0.) An explicit dependence between the APS and permanent income is therefore built into the model, and a test of the independence proposition is inappropriate.

[15] This definition of C_T is likely to yield inconsistent estimates due to errors of measurement. However, incorporation of more information due to inclusion of C_T yields more efficient estimates. Both eqq. (13) and (13′) were estimated. It was observed that (*a*) the savings–permanent income relationship is unaffected by inclusion/exclusion of C_T, and (*b*) the explanatory power of the model is considerably greater with C_T in the eq. (13′) (table 4).

[16] Zellner (1960) discusses this "weakness" or nongenerality of the permanent-income hypothesis.

Identification of a subsistence level, however, is difficult. The subject has been discussed at length in the Indian literature, and the general consensus seems to be that an annual income of Rs 450 per capita, 1970–71 prices (corresponding to Rs 15–20 per month, 1960–61 prices) adequately describes the subsistence level. Thus, households have been classified according to whether their average per capita income, Y_{apc}, was above or below Rs 500—a conservative estimate of the subsistence level.[17] The nonsubsistence group was further subdivided into those earning ≶ Rs 1,500 per capita. (This level corresponds to the very rich—top 5 percent of the sample and top 1 percent of the rural population; high-income households were oversampled by the NCAER survey.) Classification into these three (relatively) homogeneous wealth groups is desirable if the underlying savings–permanent income relationship is nonlinear.

Table 4, part A, presents the results for equations (13) and (13′) for current income, $Y_{p\infty}$, and the two measures of permanent income, Y_{p35} and Y_{px}. Table 4, parts B through D, contain results for different classifications of households. (Within-group nonlinearities are introduced via a quadratic term $k_4Y_P^2$.) Unless noted otherwise, the discussion of results refers to the linear model without C_T. It should be pointed out that a regression of savings, estimated as in equation (13), results in errors whose variance increases with permanent income. If the assumption is made that this variance increases with the square of permanent income, the heteroscedasticity present can be corrected by deflating all variables by permanent income. All equations have been estimated with this correction. Organized by "topic," the results indicate the following.

1. *Independence Proposition* ($k_0 = 0$)

The hypothesis that saving rates are independent of the level of permanent income ($k_0 = 0$) is rejected for the aggregate sample (table 4, pt. A), as well as for the low and medium ranges of income (table 4, pts. B, C).[18] For the rich households (table 4, pt. D) the independence proposition cannot be rejected (5 percent level of confidence). The result for the subsistence group is contrary to expectations; if these

[17] The choice of Y_{apc} (ratio of sum of 3-year incomes and family sizes) as a classification variable was dictated by the need to have a common sample of households for comparison of the estimates yielded by Y_{px}, Y_{p35}, and Y_{px}.

[18] Higher average and marginal savings rates for the rich households may be observed if these households overstate their incomes relative to poorer households *and* if the savings estimates of all households are accurate. However, if savings (asset acquisition) is also understated, the direction of the bias due to measurement errors is a priori ambiguous. The exploration of the different possibilities is beyond the scope of this paper (see Bhalla 1979).

TABLE 4

SAVINGS-INCOME RELATIONSHIP

	Constant (k_0)	Permanent Income Y_P (k_1)	Transitory Income Y_T (k_2)	Transitory Consumption C_T (k_3)	$Y_P^2 \times 10^{-3}$ (k_4)	$\bar{R}^2$/SE
A. All Households (N = 1,980)						
Linear model:						
Y	−70.6	.21	...	..	...	.20
	(22.2)	(24.8)				.2115
Y_{p35}	−72.4	.22	.30	...	...	.25
	(20.6)	(24.5)	(4.2)			.2105
Y_{px}	−74.9	.23	.27	...	...	.25
	(21.2)	(25.9)	(17.8)			.2029
Linear model with C_T:						
Y	−73.9	.22	...	−.55	...	.29
	(24.6)	(27.4)		(15.7)		.1995
Y_{p35}	−74.2	.23	.34	−.61	...	.34
	(22.5)	(26.9)	(6.2)	(16.4)		.1975
Y_{px}	−77.3	.24	.30	−.60	...	.34
	(23.2)	(28.6)	(4.2)	(15.9)		.1911
Quadratic model:						
Y	−46.3	.09	...	...	.09	.24
	(11.8)	(6.4)			(10.0)	.2064
Y_{p35}	−40.1	.07	.30	...	.10	.29
	(8.6)	(4.06)	(16.9)		(10.2)	.2053
Y_{px}	−43.5	.085	.27	...	.10	.29
	(9.3)	(5.16)	(18.2)		(9.9)	.1982
B. Subsistence: Y_{apc} < Rs 500 (N = 915)						
Linear model:						
Y	−49.1	.14	...	...	...	.11
	(10.6)	(8.16)				.2138
Y_{p35}	−38.2	.10	.22	...	...	.10
	(7.0)	(5.3)	(3.3)			.2052
Y_{px}	−39.4	.11	.19	...	...	.11
	(7.1)	(5.8)	(3.0)			.1929
Linear model with C_T:						
Y	−53.5	.15	...	−.66	...	.22
	(12.3)	(9.7)		(11.7)		.1993
Y_{p35}	−39.4	.11	.25	−.69	...	.22
	(7.7)	(6.0)	(4.4)	(11.7)		.1914
Y_{px}	−41.6	.12	.21	−.61	...	.21
	(8.0)	(6.7)	(3.6)	(10.7)		.1819
Quadratic model:						
Y	−39.8	.06	...	...	.11	.11
	(8.3)	(1.20)			(1.34)	.2137
Y_{p35}	−22.1	−.015	.22	...	.18	.10
	(1.9)	(.2)	(7.9)		(1.5)	.2051
Y_{px}	−31.5	.05	.19	...	.09	.11
	(2.4)	(.59)	(8.8)		(.66)	.1930

TABLE 4 (*Continued*)

	Constant (k_0)	Permanent Income Y_P (k_1)	Transitory Income Y_T (k_2)	Transitory Consumption C_T (k_3)	$Y_P^2 \times 10^{-3}$ (k_4)	$\bar{R}^2$/SE
C. Intermediate Range: Rs 500 < Y_{apc} < Rs 1,500 (N = 940)						
Linear model:						
Y	−114.1	.26	...	...	...	.13
	(11.6)	(16.8)				.1999
Y_{p35}	−130.9	.29	.33	...	...	.22
	(8.6)	(13.4)	(1.2)			.2007
Y_{px}	−152.6	.32	.30	...	...	.23
	(9.4)	(14.4)	(.6)			.1963
Linear model with C_T:						
Y	−125.7	.28	...	−.50	...	.23
	(13.6)	(19.1)		(11.5)		.1872
Y_{p35}	−131.1	.29	.38	−.56	...	.33
	(9.2)	(14.7)	(2.6)	(12.2)		.1864
Y_{px}	−150.3	.32	.34	−.58	...	.33
	(9.9)	(15.6)	(.7)	(12.2)		.1824
Quadratic model:						
Y	−40.0	.03	...	...	.15	.15
	(2.2)	(.66)			(4.8)	.1976
Y_{p35}	−59.7	.10	.33	...	.11	.23
	(1.60)	(1.1)	(13.9)		(2.1)	.2003
Y_{px}	−115.3	.22	.30	...	.05	.23
	(2.7)	(2.3)	(14.3)		(.95)	.1963
D. Rich Households Y_{apc} > Rs 1,500 (N = 125)						
Linear model:						
Y	−295.3	.47	...	...	...	.16
	(5.04)	(12.8)				.1948
Y_{p35}	−216.6	.43	.55	...	...	.39
	(1.56)	(6.1)	(1.1)			.2072
Y_{px}	−265.9	.46	.53	...	...	.43
	(1.9)	(6.8)	(.8)			.2033
Linear model with C_T:						
Y	−363.3	.51	...	−.64	...	.25
	(6.2)	(14.0)		(3.8)		.1848
Y_{p35}	−246.9	.46	.61	−.86	...	.48
	(1.9)	(7.0)	(1.6)	(4.7)		.1911
Y_{px}	−311.6	.49	.57	−.87	...	.51
	(2.4)	(7.8)	(.99)	(4.5)		.1891
Quadratic model:						
Y	−289.4	.46	...	...	.002	.16
	(3.4)	(5.3)			(.09)	.1955
Y_{p35}	−474.9	.66	.55	...	−.05	.39
	(1.5)	(2.5)	(8.5)		(.90)	.2073
Y_{px}	−712.3	.84	.54	...	−.07	.43
	(2.1)	(3.1)	(9.7)		(1.45)	.2024

NOTE.—All equations have been estimated in per capita terms; in addition, correction for heteroscedasticity has been done as indicated in the text. Numbers in parentheses are the absolute values of the t-statistics. For the linear models, the t-statistic on k_2 represents the significance of the difference in the coefficients k_1 and k_2.

households are constrained to consume their entire income, then their consumption-income elasticity is one, or $k_0 = 0$. The presence of nonsubsistence households in the range Rs 0–500 per capita may have caused the observed result, $k_0 \neq 0$.

2. *Equivalence of Propensities to Save* ($k_1 = k_2$)

The proposition that the permanent/transitory distinction is irrelevant for savings behavior is rejected for the aggregate sample, the subsistence households, and the intermediate households (Y_{p35} definition); that is, k_2 is significantly greater than k_1. For no classification is the "strict" version of the PIH supported; that is, $k_2 = 1$. The results, however, strongly support the modified version of PIH; that is, $k_2 > k_1$ but $k_2 < 1$.[19]

3. *The Effect of Transitory Consumption*

The magnitude of k_3' reveals an interesting pattern: Its value is less than the "predicted" value of one for all ranges of income except the rich group. Two interpretations are possible for the result that $k_3' < 1$: (i) The notion of a maintained permanent level of consumption (savings as residual) is irrelevant or (ii) households are prevented from complete adjustment by liquidity constraints. The decline of k_3' with increases in permanent income (wealth) suggests that ii is the more likely explanation.[20] This is further supported by the fact that k_3' is not different from one for the rich households—a group unlikely to face capital market problems. Indeed, the size of k_3' can be an indirect test of the absence (presence) of liquidity constraints as it is equal to (different from) one.

The result that planned consumption is not necessarily maintained ($k_3' < 1$) is also supported by recent studies on famine and scarcity conditions in rural India. These studies (see Jodha 1975) indicate that like the result above, it is the preservation of income streams rather than consumption levels that is of crucial importance in determining savings behavior; that is, shocks to income levels (or consumption needs) are absorbed to an unusual degree by alterations in planned consumption.

[19] This result accords well with most other studies of savings behavior (see Mayer 1972).

[20] An implicit assumption here is that liquidity problems are inversely related to wealth and permanent income.

4. *Constancy of the Marginal Propensity to Save,* k_1

The estimated propensity to save, k_1, is found to rise with the level of Y_P—it increases from .11 (poor households) to .46 (rich households).[21] This, along with the result that $k_0 \neq 0$, suggests that average and marginal propensities to save increase with the level of permanent income. The variation of k_1 with Y_P is also confirmed by the within-group regressions. The coefficient for nonlinearity, k_4, is significant and positive for the aggregate sample and for households in the intermediate range of incomes. The sign of k_4 is "perverse" for the rich group—it is negative. Though significant at only the 10 percent level of confidence (Y_{px} definition), the result is nevertheless interesting in that it is contrary to most assumptions about savings behavior and different from the revealed tendency for the <Rs 1,500 group. A negative sign for k_4 implies that the marginal propensity to save decreases with increases in permanent income.[22]

To summarize: (i) Elements of both the standard (Keynesian) and permanent-income hypotheses are supported by the results. Saving rates (average and marginal) vary directly with the level of permanent income (negation of PIH); the distinction between permanent and transitory income is relevant (negation of the current income, Keynesian theory). (ii) Similar qualitative, and quantitative, results are obtained for two conceptually different measures of permanent income, Y_{p35}, Y_{px}. This robustness in the results (observed for all parameters k_i) increases their reliability and indicates that they are unlikely to be affected by the particular methods employed to measure permanent income.

III. Toward a New Savings Function

The theoretical and empirical discussion of savings behavior in rural areas is indicative of the following relationship between savings and permanent income: an average propensity to save which is close to zero for subsistence households but one which increases with permanent income toward an asymptotic value.[23] The geometrical pattern

[21] F-tests show that the savings functions for the three groups (both with and without the term C_T) are statistically different from each other at the 1 percent level of confidence. This is the case for all three definitions of permanent income.

[22] Actually, there are a number of reasons why one might expect this "strange" result to occur for rich households. Conspicuous consumption, favorable interaction of subsidized credit and investment opportunities (Bhalla 1978), different time preferences (Uzawa 1968), and consumption, rather than bequests, as a luxury good (Blinder 1975) are possible explanations.

[23] The "perverse" result observed for the rich group, i.e., that the MPS declines with increases in income, is (mathematically) required at the high ranges of income if it is postulated that the APS rises continuously from a low level to an asymptotic level. The

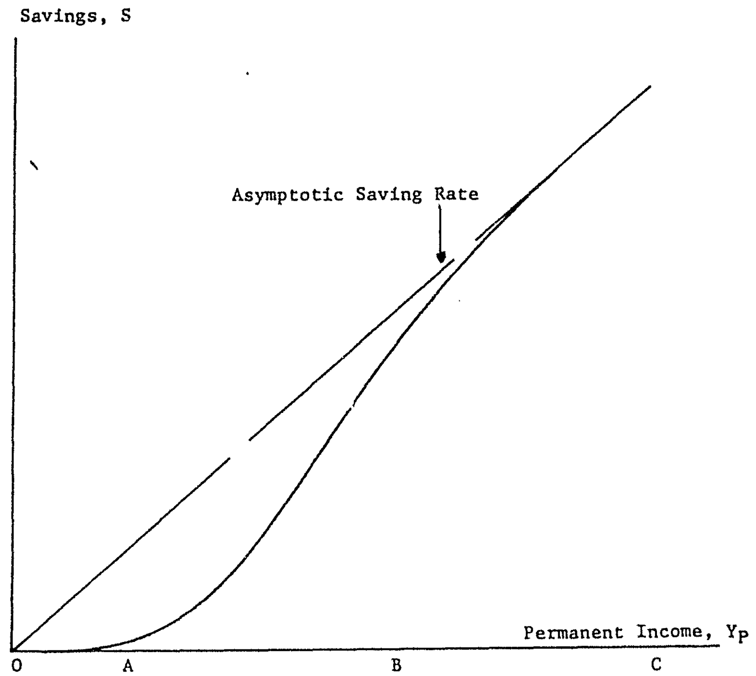

FIG. 1.—An "exponential" model of household savings behavior. Region OA = subsistence, AB = middle income, BC = rich households.

for the suggested functional relationship between S and Y_P is as indicated in figure 1.[24] The region OA incorporates subsistence level behavior; rather than a level, there is now a range of permanent incomes along which there is essentially no saving. Region AB is the middle-income range which incorporates the Keynesian contention that saving rates increase with income. Region BC contains a savings rate which is constant and independent of the level of permanent income, a relationship consistent with the PIH. The transition from AB to BC contains the region where the MPS declines and approaches an asymptotic rate equal to the APS.

An algebraic form for the relationship shown in the figure is suggested, but not tested, by Musgrove (1974):

$$\frac{S}{Y} = b_0[1 - \exp(-b_1 Y^{b_2})], \tag{14}$$

latter is a desirable property of any savings function; otherwise, the model will become explosive at high levels of income.

[24] This relationship between savings and income was first suggested by Landau (1971). His analysis, however, dealt with the savings behavior of a country through time. Ahluwalia and Chenery (1974) use a piecewise linear form of the Landau model to describe household behavior.

where b_0 is the asymptotic saving rate, b_1 a parameter indicating the point of transition toward b_0, and b_2 a parameter determining the speed of transition.[25]

Alternative ways of introducing a nonlinearity in the savings function are: (*a*) the quadratic Keynesian function,

$$S = b_0 + b_1 Y + b_2 Y^2; \tag{15}$$

(*b*) the Klein function (Klein 1954),

$$\frac{S}{Y} = b_0 + b_1 \log Y; \tag{16}$$

(*c*) the Singh function (Singh 1972),

$$\frac{S}{Y} = b_0 + b_1/(\log Y)^2 + b_2/(\log Y)^4. \tag{17}$$

Though convenient from an estimation point of view, both (15) and (16) suffer from the serious drawback that they disallow any points of inflexion in the S-Y plane. This characteristic prevents these functions from incorporating both the Friedman and Keynesian contentions about savings behavior; thus the savings pattern observed in piecewise linear form for rural India cannot be adequately represented by these models. The Singh form does not suffer from this drawback; if $b_1 < 0$ and $b_2 > 0$, then the MPS first increases and then converges to the long-run APS—a property shared by the exponential form. The APS is bounded from above by b_0; the APS is not, however, defined for the region Y approaching zero.

These four functions (eqq. [14]–[17]) summarize the relationships postulated in the literature. The exponential form (eq. [14], $b_2 = 2$) is hypothesized to capture accurately the savings-income pattern and to have desirable properties. A comparison of the different models is offered in terms of estimation[26] (table 5) and prediction (table 6). If "fit" were the sole criterion for acceptance (and for forms as different as these, this is a poor criterion), the quadratic savings function would be accepted. However, it becomes explosive very soon and yields estimates of APS = 39 percent and MPS = 72 percent at a per capita

[25] Values of $b_2 = 1$ and $b_2 = 2$ were both experimented with, but only the results for $b_2 = 2$ are presented. The latter gave consistently better results, in terms of standard error and the asymptotic values of b_0. The $b_2 = 2$ form will be referred to as the exponential form.

[26] All variables are in per capita terms, correction for heteroscedasticity was made, and the variables transitory income and transitory consumption were added to eqq. (14)–(17). Results for only the Y_{px} definition of permanent income are presented; the Y_{p35} definition gave virtually identical results. It is interesting to note that the estimates for the coefficients of Y_T and C_T are not affected by the functional relationship between S and Y_P.

TABLE 5

COMPARISON OF SAVINGS FUNCTIONS: CULTIVATORS, 1970–71

PARAMETER	EQUATION FORM			
	Quadratic	Klein	Singh	Exponential
Constant, b_0	−45.4	−1.02	1.06	.38
	(10.3)	(24.7)	(13.2)	(15.2)
Income, b_1	.093	.17	−56.4	$-.49 \times 10^{-6}$
	(6.0)	(26.6)	(9.2)	(8.6)
"Extra" term, b_2	.0001	...	665.6	2.0
	(10.7)		(5.9)	
Transitory income, b_3	.30	.30	.30	.28
	(21.5)	(21.7)	(21.4)	(20.2)
Transitory consumption, b_4	−.60	−.60	−.59	−.59
	(16.5)	(16.4)	(16.3)	(16.0)
$\bar{R}^2$	.37	.38	.38	.36
SE	.1849	.1851	.1856	.1883

NOTE.—Equations are as defined in the text; "standard" correction for heteroscedasticity has been incorporated; results are for Y_{pr} definition of permanent income (Y_{p35} definition yields virtually identical results). Absolute values of t-statistics are in parentheses.

income level of Rs 3,000; at Rs 4,000 these values become 50 and 92, respectively. The Klein form does not perform as well as the quadratic form in terms of fit, and its estimates are only slightly better at the high ranges of income. In both these forms, the marginal and average savings rates are always increasing.

The exponential and Singh forms perform equally well in terms of fit and provide similar estimates for the marginal and average propensities to save. The difference in the two functions is in their implications for low and high incomes. The exponential form yields reasonable estimates along the entire spectrum of income. The estimated asymptotic savings rate is 38 percent, and the maximum MPS (54

TABLE 6

FUNCTIONAL FORMS AND PREDICTED SAVINGS

INCOME LEVEL PER CAPITA	QUADRATIC		KLEIN		SINGH		EXPONENTIAL	
	MPS	APS	MPS	APS	MPS	APS	MPS	APS
200	13.4	−11.4	6.2	−11.0	23.7	−10.5	2.2	.7
500	19.7	5.4	22.0	4.8	39.3	4.6	12.7	4.4
1,000	30.1	15.1	33.9	16.7	47.3	17.1	37.8	14.8
1,500	40.5	21.8	40.9	23.7	51.3	23.9	53.6	25.6
2,000	50.9	27.8	45.8	28.6	53.8	28.4	54.0	32.9
5,000	113.3	60.4	61.6	44.4	61.0	41.0	38.3	38.3
7,000	154.9	81.4	67.4	50.2	63.3	45.0	38.3	38.3

NOTE.—APS and MPS = average and marginal propensities to save yielded by equations in table 5.

percent) is reached at a per capita income level of Rs 2,000. The Singh form, in contrast, does not perform well at either end of the income distribution. At low incomes (< Rs 200) the predicted MPS is 24 percent, and at high incomes (Rs 5,000) the predicted APS is 41 percent and MPS is 61 percent. Also, the asymptotic savings rate yielded by the Singh form is abnormally high (100 percent) and the coefficients for $1/(\log Y)^2$ and $1/(\log Y)^4$ are difficult to interpret. These considerations lead one to reject the Singh form in favor of the exponential form, though it should be mentioned that the latter requires nonlinear methods and so is computationally more difficult to use.

In summary, it appears that the exponential form best describes household savings behavior with respect to household permanent income. This conclusion is supported by results obtained from a piecewise linear approximation to the *S-Y* relationship and by a comparison with other nonlinear forms. The asymptotic savings rate yielded by this equation is 38 percent, which, although on the high side, is nevertheless considerably lower than the estimates yielded by other equations.

IV. Summary and Conclusions

Empirical evidence on the determinants of household savings in developing countries is sparse and is especially lacking for the rural areas of these countries, areas which often account for 60–80 percent of the total population. In this paper an attempt was made to analyze the savings behavior of rural households. As its basis, it used the NCAER household panel data for rural India, 1968–69 to 1970–71. The longitudinal nature of the data was exploited to yield two conceptually different estimates of permanent income: one based on weighted average of past incomes, Y_{pr}, and the other based on the "assets" owned by a household. The latter was an earnings function modified to include the effects of unobserved permanent individual differences. The importance of incorporating these "individual effects" was indicated by the fact that their inclusion increased radically (from 48 percent to 78 percent) the variance explained in measured income.

These measures of permanent income, Y_P, along with measured income, were tested in a general model of savings behavior. The results of this exercise indicate that (*a*) permanent (and transitory) income is a better determinant of savings than current income; (*b*) the particular definition of permanent income does not make much difference to the results, that is, the results are robust; (*c*) the MPS out of transitory income is higher than the MPS out of permanent income but less than one; and (*d*) saving rates (marginal and average) are not independent of the level of permanent income; rather, they tend to increase with Y_p and (perhaps) approach a constant asymptotic value.

These results suggest that neither the standard Keynesian model nor the permanent-income hypothesis can adequately describe the savings behavior of rural Indian households. Consequently, a new savings function was developed; this function allows saving rates to increase with permanent income and to approach an asymptotic value. When tested, the behavior and prediction of this new exponential savings function were found to be superior to other nonlinear forms.

The observed positive relationship between saving rates and permanent income suggests that both the level and the distribution of income are important determinants of household savings. This result has an obvious policy implication, one contrary to the prediction of the PIH: Redistribution policies will result in a decline in the supply of household savings and perhaps growth.[27]

Appendix

Data and Definitions

Data

The National Council for Applied Economic Research (NCAER) undertook a survey (known as the Additional Rural Income Survey [ARIS]) of 5,115 households in 1968–69 to gather data on the distribution of income and the patterns of consumption, savings, and investment of these households. The sample was selected according to a multistage, stratified probability design; higher-income households were oversampled. The survey was repeated in 1969–70 and 1970–71 on the same households, and the final version of the data refers to a core sample of 4,118 households.

For purposes of analysis only households that were cultivators for all 3 years of the survey were selected. A household was defined as a "cultivator" if it engaged in any kind of self-cultivation on owned or leased land that was greater than 0.05 acres for all the 3 years of the survey. (There were 2,952 cultivators in 1970–71; the requirement that households have been cultivators for all 3 years reduced the sample size to 2,532.) Furthermore, households were selected on the basis of occupational structure (no transactions in the land market for any year of the survey), logical consistency (savings numerically less than income), and a (possible) lack of transcription/measurement error (gross income greater than Rs 500 and a savings rate of −150 to 75 percent). These "restrictions" reduced the sample size from 2,532 to 1,980 farm households. (It is recognized that the selection

[27] The fact that the exponential form yields a decline in the MPS is not of much consequence since the inflexion point in the savings function occurs at Rs 1,800 per capita, or near the top 5 percent of income (cultivator population). Thus only if wealth were redistributed among the upper classes (an unlikely policy) would aggregate savings not be reduced.

criteria pertaining to the savings rate introduce the censored dependent-variable problem. Spot checks on the data confirmed that the savings estimate for the extreme cases was "wrong." However, rather than eliminate households on a "subjective" basis, the "objective" criterion [savings rate between −150 and +75 percent] of omitting households was preferred.)

Definitions

"Income," Y: The income of a household is defined as the total of the earnings of all the members of a household during a reference period. This income can be business income (farm or otherwise), wages, rents (land and house property), interest and dividends on financial investments, and pension and regular contributions.

"Savings," S: The savings of a household is defined as the change in net worth and computed as the difference between the change in the value of assets and the change in liabilities. This figure is adjusted for capital transfers. In other words, household savings, S, is defined to be: $S = dA - dL - dK$, where dA = gross change in the value of physical and financial assets, dL = net change in liabilities, and dK = net inflow of capital transfers.

The savings estimate includes via dA any purchase of consumer durables and nonmonetized investment that is undertaken by the household. Savings in the form of currency or gold and silver are not included due to a lack of reliable data; no adjustment has been made for capital gains or losses incurred by the household. Depreciation on assets is also ignored.

References

Ahluwalia, Montek S., and Chenery, Hollis B. "A Model of Distribution and Growth." In *Redistribution with Growth*, edited by H. Chenery, Montek S. Ahluwalia, C. L. G. Bell, John H. Duloy, and Richard Jolly. New York and London: Oxford Univ. Press, 1974.

Bhalla, Surjit S. "Aspects of Savings Behavior in Rural India." Studies in Domestic Finance no. 31, World Bank, Development Econ. Dept., 1976.

———. "The Role of Sources of Income and Investment Opportunities in Rural Savings." *J. Development Econ.* 5 (September 1978): 259–81.

———. "Measurement Errors and the Permanent Income Hypothesis: Evidence from Rural India." *A.E.R.* 69 (June 1979): 295–307.

Blinder, Alan S. "Distribution Effects and the Aggregate Consumption Function." *J.P.E.* 83, no. 3 (June 1975): 447–75.

Darby, Michael R. "The Allocation of Transitory Income among Consumer Assets." *A.E.R.* 62 (December 1972): 928–41.

Friedman, Milton. *A Theory of the Consumption Function.* Princeton, N.J.: Princeton Univ. Press (for Nat. Bur. Econ. Res.), 1957.

———. "Windfalls, the 'Horizon,' and Related Concepts in the Permanent-Income Hypothesis." In *Measurement in Economics and Econometrics: Essays in Memory of Yehuda Grunfeld*, edited by Carl Christ. Stanford, Calif.: Stanford Univ. Press, 1963.

Holbrook, Robert S. "The Three-Year Horizon: An Analysis of the Evidence." *J.P.E.* 75, no. 5 (October 1967): 525–30.

Holbrook, Robert S., and Stafford, Frank P. "The Propensity to Consume Separate Types of Income: A Generalized Permanent Income Hypothesis." *Econometrica* 39 (January 1971): 1–21.

Jodha, N. S. "Famine and Famine Policies: Some Empirical Evidence." *Econ. and Polit. Weekly* 10 (October 11, 1975): 1609–23.

Klein, Lawrence R. "Statistical Estimation of Economic Relations from Survey Data." In *Contributions of Survey Methods to Economics*, edited by Lawrence R. Klein. New York: Columbia Univ. Press, 1954.

Landau, Luis. "Savings Functions for Latin America." In *Studies in Development Planning*, edited by Hollis B. Chenery. Cambridge, Mass.: Harvard Univ. Press, 1971.

Lillard, Lee A. "Inequality: Earnings vs. Human Wealth." *A.E.R.* 67 (March 1977): 42–53.

Mayer, Thomas. *Permanent Income, Wealth and Consumption*. Berkeley: Univ. California Press, 1972.

Mikesell, Raymond F., and Zinser, James E. "The Nature of the Savings Function in Developing Countries: A Survey of the Theoretical and Empirical Literature." *J. Econ. Literature* 11 (March 1973): 1–26.

Modigliani, Franco, and Brumberg, Richard E. "Utility Analysis and the Consumption Function: An Interpretation of Cross-Section Data." In *Post-Keynesian Economics*, edited by Kenneth K. Kurihara. New Brunswick, N.J.: Rutgers Univ. Press, 1954.

Mohabbat, Khan A., and Simos, Evangelos O. "Consumer Horizon: Further Evidence." *J.P.E.* 85, no. 4 (August 1977): 851–58.

Musgrove, Philip. "Determination and Distribution of Permanent Household Income in Urban South America." Ph.D. dissertation, Massachusetts Inst. Tech., 1974.

National Council for Applied Economic Research, India. *Additional Rural Incomes Survey*. New Delhi: Nat. Council Appl. Econ. Res., 1974.

Nerlove, Marc. "A Note on Error Components Models." *Econometrica* 39 (March 1971): 383–96.

Singh, S. K. "Determinants of Aggregate Savings." Economic Working Paper no. 127, World Bank, 1972.

Snyder, Donald W. "Econometric Studies of Household Saving Behavior in Developing Countries: A Survey." *J. Development Studies* 10 (January 1974): 139–53.

Uzawa, Hirofumi. "Time Preference, the Consumption Function, and Optimum Asset Holdings." In *Value, Capital and Growth: Papers in Honour of Sir John Hicks*, edited by James N. Wolfe. Edinburgh: Edinburgh Univ. Press, 1968.

Zellner, Arnold. "Tests of Some Basic Propositions in the Theory of Consumption." *A.E.R. Papers and Proc.* 50 (May 1960): 565–73.

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