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THE ROLE OF SOURCES OF INCOME AND INVESTMENT OPPORTUNITIES IN RURAL SAVINGS

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This paper investigates the effect that sources of income and investment opportunities have on the savings behavior of farm households in rural India. The panel nature of the data (agricultural years 1968–69, 1969–70 and 1970–71) allows for the identification of the permanent and transitory components of a household's income. It is shown that income variability (rather than investment opportunities) can account for observed differences in the propensity to save out of different sources (agricultural/non-agricultural). A direct test of the effect of investment opportunities on savings is offered in the second part of the paper. It is observed that capital market conditions have an important effect on this relationship; poor households save more, and rich households save less, in response to an increase in investment opportunities.

1. Introduction

The traditional view that low incomes in rural areas of developing countries preclude the generation of savings has been challenged by the contention that low rates of return to investment result in low savings. This 'new' view[1] implicitly assumes that aggregate household savings respond positively to increases in rates of return to investments (savings). The assumption is important because of its implication for development strategies; in particular, it suggests that the setting up of financial intermediaries, and a 'realistic' interest rate policy, will not only lead to an improvement in the capital market, but also to an increase in rural savings, capital formation and growth.

The absence of detailed data on financial intermediaries impairs the testing of any relationship between interest rates and rural savings. However, *farm* households (a major proportion of 'saver' households) receive a return on

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[1]See Schultz (1964) for a detailed discussion of this view. Also see McKinnon (1973) and Adams (1973).

their savings through on-farm investments. Evidence on household responses to differences in these rates of return (investment opportunities) can be used, therefore, to generalize to a statement on the yield sensitivity of savings, e.g. if savings are inelastic with respect to rates of return on investments, then interest rate policy will not have a substantial effect on household savings.

Differences in investment opportunities, however, are difficult to measure; consequently, a *direct* test of their effect on household savings has (apparently) never been conducted. A popular form of an *indirect* test is to divide income into its sources – profits and wages for aggregate data, and agricultural/non-agricultural income for rural household data.[2] Observed differences in the propensities to save from the respective sources are then ascribed (partly) to differences in investment opportunities.

Section 2 offers a critical assessment of these studies. It is argued that the emphasis on investment opportunities as an explanator of savings may be misplaced. An alternative explanation, [Friedman (1957)] – namely, that propensities to save reflect the variability of income streams – is offered and empirically tested. The basis for these tests is the data collected by the National Council of Applied Economic Research (NCAER) on 1980 farm (cultivator) households in rural India for three years – 1968-69 to 1970-71. This data has detailed information on the production, consumption, savings, and sources of income for these households.[3]

Section 3 is concerned with a direct test of the hypothesis relating investment opportunities and farm household savings. The theoretical basis of the hypothesis is examined, and it is shown that assumptions about the nature of the capital market crucially affect the conclusions regarding farm household savings: in particular, a perfect market for funds will imply a *decline* in household savings with an increase in investment opportunities. The attributes of a proper measure for investment opportunities are discussed, and the longitudinal nature of the data exploited to construct such an index. The section concludes with an empirical test which conforms favorably with theoretical predictions. Section 4 summarizes the conclusions of this paper.

2. Sources of income and savings

The propensity to save out of different sources of income has received considerable attention in both the growth theory and economic development literature. Identification of the source of income (profits, wages, agricultural income, non-agricultural income, etc.) is not relevant per se for a study of savings behavior. A rupee is a rupee and presumably the household does not

[2]A partial listing of these studies includes Kaldor (1955), Houthakker (1965), Kelley-Williamson (1968), Shinohara (1970), Ong Adams Singh (1976).

[3]See appendix 1 for a brief description of the data. Also see NCAER (1974).

determine its behavior on the basis of the source of income. Rather, its importance is derived from the assumption that such a classification allows one to stratify households according to differences in the economic environment. Thus, sources of income become a proxy for economic unobservables, and conclusions about the effect of the latter can be drawn from observations on the former.

As mentioned previously, one particular economic unobservable for which sources of income can act as a proxy is investment opportunities. A traditional method of analysis is to divide income on the basis of occupation into two sources – profits (entrepreneurs) and wages (workers). The higher observed propensity to save out of profits is then interpreted as supporting the notion that savings are interest elastic – this under the assumption that capitalists systematically face higher rates of return on their investments, and therefore save more.[4]

However, alternative explanations are possible. Profits and marginal saving rates may be positively correlated with levels of permanent income;[5] hence, the higher observed propensity to save out of profits. Further, differences in the variability of the (profits and wages) income streams may cause differences in the observed propensities. If it is assumed that entrepreneurial income is inherently more variable than salary income, then at any given level of income, transitory income will form a larger part of total income for the self-employed. Thus, any cross-section data will show a higher saving rate for the entrepreneur.[6]

The above explanations for the higher propensity to save on the part of the capitalists are not mutually exclusive. Thus, there is no way to choose between the different explanations – is it the higher level of permanent income, or the greater variability, or profitable outlets for saving or just tastes that cause entrepreneurs to save at a higher rate?

The longitudinal nature of the NCAER data allows one to be more precise about the different causes of savings. In particular, a relatively rigorous test of Friedman's contention, that it is the variability in income which accounts

[4]The assumption that capitalists face higher rates of return on their investments is plausible. Real rates of interest on financial savings are low, if not negative, in most developing countries. See McKinnon (1973) for an elaboration on this point.

[5]Both the permanent income hypothesis (PIH) of Friedman (1957), and the life cycle hypothesis (LCH) of Ando Modigliani-Brumberg assert that saving rates are *independent* of the level of permanent lifetime income. This 'independence proposition' has proved to be controversial and a summary of the conflicting evidence is provided by Mayer (1972). It should be noted that not a single study for a developing country supports the independence proposition. See Bhalla (1976a, 1976b) and Musgrove (1974) for a refutation of the proposition for India and Colombia, respectively. In these studies, saving rates are shown to *increase* with the level of permanent income.

[6]This requires the assumption that the marginal propensity to save (*MPS*) out of transitory income is greater than the *MPS* out of permanent income – an assumption supported by most analyses of savings behavior.

for higher observed propensities, is conducted in the latter half of this section. But first a 'traditional' analysis of savings and sources of income is presented.

2.1. Research with farm data

The easy distinction between a capitalist and a worker is lost when one attempts to study the sources of income hypothesis for farmers. The income from a farm is a return to *both* labor and capital, and cannot be easily separated into its components. Farm incomes can, however, be divided into their on-farm and off-farm components, and thus a division of income into separate sources can be achieved. This differentiation is comparable to the traditional capitalist/worker dichotomy since a major component of off-farm income is labor income. Thus, it can be asserted that a household which derives all of its income from a farm systematically differs from one which derives only 50 percent of its income in a like manner. The former is likely to have greater control over physical assets, a higher ratio of profit/income and (perhaps) greater investment opportunities.

This sources of income hypothesis has been tested by Kelly-Williamson (1968) for Indonesia and by Ong et al. (1976) for Taiwan.[7] The empirical methodology of these studies consists essentially of first grouping households by their share of agricultural income in total income, and then estimating the following equation for each group:[8]

$$S = a + b(Y_a + Y_o), \tag{1}$$

where S, Y_a and Y_o represent savings, agricultural income and non-agricultural income, per capita, respectively. (For a complete definition of these variables, see appendix 2.)

In both studies, the average and marginal saving rates are found to increase with the share of agricultural income. This result is then interpreted by the authors as supporting the theory that entrepreneurs, or farms with greater control over assets, save more; alternatively, the higher savings rate is presumed to reflect the higher investment opportunities of the full time farmer.

Given the capitalist/worker (or profits/wages) dichotomy, this result is not surprising, a priori. However, there are two problems associated with the methodology of these studies. Firstly, estimating an equation like (1) forces

[7]Other studies of this kind include the following for Japan: Mizoguchi (1970), Noda (1970), and Shinohara (1970).

[8]Kelly-Williamson employ a slightly different estimation procedure i.e. they estimate equations which reflect the cumulative proportions of income that are derived from agriculture – 11 percent, 21 percent, ... 91 percent.

the propensities to save to be the same within each group; thus, it is impossible to test whether propensities to save differ by source of income. Secondly, an increasing ratio of agricultural income/total income may be positively correlated with increasing total income. (The simple correlation between the two is 0.24 in the NCAER data.) If savings rates are associated with the level of income, then what one observes by running regressions of ratio groups is simply the effect of higher incomes rather than the effect of 'control over assets', 'entrepreneurial income' or 'investment opportunities'.

A 'proper' test of differences in propensities to save income is to estimate an equation like

$$S = a + b_a Y_a + b_o Y_o \tag{2}$$

for each homogeneous group of households. Differences in b_a and b_o can then be interpreted as indicative of differing propensities to save.

The NCAER data for the 1970–71 agricultural year was used to estimate eqs. (1) and (2) for 1980 farm households. In order to duplicate earlier research efforts, the sample was divided into six groups – households grouped by the share of agricultural income in total income, S_{ag} (<50 percent, 50–75 percent and >75 percent), and land owning categories (<5 acres, 5–15 acres, and >15 acres).[9]

The results for eqs. (1) and (2) (and associated data) are presented in table 1. As also observed by Kelly–Williamson and Ong et al., the *overall* propensity to save income does increase with the share of agricultural income and land ownership. However, as the table makes clear, the size of income also increases and therefore attribution of differences in the marginal propensity to save (*MPS*) to sources of income is questionable.

Regarding eq. (2), it is seen that except for one group (S_{ag} = 50–75%), the *MPS* out of non-agricultural income, b_o, is always higher than the *MPS* out of agricultural income, b_a. The two coefficients are significantly different for the following groups – all households, S_{ag} >75%, and land categories <5 acres and 5–15 acres. For the exception group, S_{ag} = 50–75%, b_o is less than b_a, but the difference is not significant at the 10 percent level of confidence.

These results are contrary to expectations. If it is assumed that Y_a roughly corresponds to profits and Y_o to wages, then one should have observed that b_a was *greater* than b_o. Analogously, the size of Y_a could be a proxy for investment opportunities – again, prior belief would indicate that $b_a > b_o$.

Though contrary to other hypotheses, the result that $b_o > b_a$ is entirely consistent with the interpretation that sources of income merely reflect the

[9]The classifications were chosen to create homogeneous groups – it is implicitly assumed that the size of farm owned and/or the *share* of agricultural income are indicative of asset holdings, ratio of profits to wages, investment opportunities, etc.

Table 1

Sources of income and savings – cultivators, 1970–71.

	Sample averages:			Average savings rate, S/Y (%)	Regression coefficients:			Number of observations
					Eq. (2)		Eq. (1)	
	Land owned (acres)	S_{ag} (%)	Income, Y (Rs.)		b_a	b_o	b	
Land categories								
<5 acres	2.6	63.9	2838	4.5	0.24 (2.73)	0.31	0.25	810
5–15 acres	9.3	86.4	5099	12.6	0.34 (3.34)	0.47	0.35	743
>15 acres	28.8	93.0	8716	21.4	0.43 (0.80)	0.49	0.43	427
Share of agricultural income (S_{ag})								
<50%	4.3	33.2	3322	8.9	0.20 (0.97)	0.38	0.35	360
50–75%	6.8	63.5	3773	9.4	0.45 (1.70)	0.20	0.36	365
>75%	13.8	96.0	5766	15.8	0.39 (1.98)	0.53	0.39	1255
All observations	10.8	78.6	4959	14.1	0.38 (2.30)	0.43	0.38	1980

Note: Values in parentheses indicate the absolute value of the t-statistic for the *difference* in the marginal propensities to save, b_a and b_o.

composition of income i.e. their permanent/transitory nature. Non-agricultural income is mainly composed of wages and salaries from outside employment. Small farmers supplement their annual income with outside work since their own farms are not large enough to keep them fully employed. (Outside income formed only 7 percent of total income for households owning more than fifteen acres.) Outside income, however, is likely to be more uncertain than on-farm income, since it is dependent on the probability of obtaining a job. Apart from its regular component, outside work is also resorted to under 'special' (and transitory) conditions of the family. Thus, Y_o is likely to have a greater transitory component than Y_a, and if the *MPS* out of transitory income is higher, then the observed propensities to save (b_a and b_o in eq. (2)) can be explained by reference to transitory components.

Though plausible, the above interpretation remains conjectural. The permanent and transitory components of sources of income are not usually identifiable with one-period data. However, the longitudinal aspect of the NCAER data *can* be used to estimate the permanent and transitory components (to be exact, the variances of each component) of each source of income. Thus, the 'variability of income' hypothesis of savings can be empirically tested. The methodology and empirical estimates follow.

2.2. *Savings and the variability of income*

Analogous to Friedman (1957), each source of income is assumed to be composed of a permanent component (Y'_a and Y'_o) and a transitory component (Y''_a and Y''_o). Further, the transitory components are assumed to be uncorrelated with the permanent components. Thus the following relationships hold:

$$Y_i = Y'_i + Y''_i, \qquad i = a, o, \tag{3a}$$

$$\operatorname{cov}(Y'_i, Y''_i) = 0, \qquad i = a, o. \tag{3b}$$

Let $b'(b'')$ represent the common propensity to save out of permanent (transitory) income.[10] Given these assumptions, the 'true' model of savings behavior is:

$$S = a' + b'(Y'_a + Y'_o) + b''(Y''_a + Y''_o). \tag{4}$$

[10]It is assumed that the propensity to save permanent income is unaffected by the source of the income. This assumption implies no more than the simple assertion that a (permanent) rupee is a rupee, regardless of the source. A test of *this* assertion is beyond the scope of this paper. Holbrook and Stafford (1971) found roughly constant permanent propensities to save out of different sources of income with U.S. data.

An equation, estimated as in (1),

$$S = a + b_a(Y'_a + Y''_a) + b_o(Y'_o + Y''_o), \tag{5}$$

is mis-specified and b_a and b_o are biased estimates of the propensities to save, b' and b''. However, a relationship does exist between the observed propensities b_a, b_o and the unmeasured propensities, b' and b'' i.e.[11]

$$b_o - b_a = (b'' - b')(A + B + C),$$

where

$$A = \text{var } Y''_o \text{ var } Y'_a - \text{var } Y''_a \text{ var } Y'_o,$$
$$B = \text{cov}(Y''_a, Y''_o)(\text{var } Y'_a - \text{var } Y'_o),$$
$$C = \text{cov}(Y'_a, Y'_o)(\text{var } Y''_o - \text{var } Y''_a).$$

Since it can safely be assumed that $b'' > b'$ (see note 6), the observed results $b_o > b_a$ can only occur if $(A + B + C) > 0$. If the extreme assumption is made that the covariances between the permanent and transitory components [$\text{cov}(Y'_a, Y'_o)$ and $\text{cov}(Y''_a, Y''_o)$] are zero, then b_a and b_o are equal to

$$b_a = b'(\text{var } Y'_a/\text{var } Y_a) + b''(\text{var } Y''_a/\text{var } Y_a), \tag{6a}$$

$$b_o = b'(\text{var } Y'_o/\text{var } Y_o) + b''(\text{var } Y''_o/\text{var } Y_o). \tag{6b}$$

In other words, b_a and b_o are weighted averages of the shares of permanent and transitory income in each source of income; and the statement that differences in observed propensities merely reflect the permanent/transitory nature of different income streams is verified if $b_o > b_a$ is observed along with

$$\text{var } Y''_o/\text{var } Y_o > \text{var } Y''_a/\text{var } Y_a. \tag{6c}$$

The exactitude of the above statement is lessened if one allows for the possibility that the two covariances, $\text{cov}(Y'_a, Y'_o)$ and $\text{cov}(Y''_a, Y''_o)$ are non-zero. In particular, if either B or C is *positive* it can no longer be asserted that $b_o > b_a$ because Y_o has a greater transitory component than Y_a. On the other hand, if B and C are both negative, then one has the 'strong' result that $b_o > b_a$ because of differences in the transitory nature of incomes. The likelihood of such a result is examined first by looking at the expected sign of terms B and C, and later their magnitude.

[11]See Bhalla (1976a) for algebraic details.

On an a priori basis, one would expect the term cov (Y''_a, Y''_o) to be negative for a given point in time. This is because a household is expected to maintain a given level of total income-unexpected changes in one source are partially made up by opposite changes in other sources of income. However, one factor that might cause the correlation to be *positive* should be mentioned namely, the weather. One component of non-agricultural income is the wages earned on *agricultural* land of non-family households and it is expected that incomes from this source will move in the same direction as agricultural incomes.[12] The net result is therefore ambiguous, though it is likely that the correlation will be negative.

Amongst groups classified by land holdings, one would expect the correlation between the permanent components (Y'_a, Y'_o) to be positive. This is because it is expected that factors like education and access to market affect both incomes simultaneously. If these factors are associated positively with other determinants of on-farm income (land, other assets), then a 'high education' household is likely to have a higher on-farm income as well as higher off-farm income in the form of salaries, non-farm business etc. However, if the classification of households is sufficiently broad, this correlation can be negative. For instance, a large land owning household is likely to keep its family members employed on the farm, whilst a small farm household is likely to supplement its labor income with work off the farm. The probability of a negative correlation amongst the permanent components is reduced (but not eliminated) by the fact that households have been classified into relatively homogeneous groups.

The terms $(\text{var } Y'_a - \text{var } Y'_o)$ and $(\text{var } Y''_o - \text{var } Y''_a)$ need to be examined before the signs of B and C are determined. If the (reasonable) assumption is made that each source of income has approximately the same coefficient of variation, i.e.

$$\text{var } Y_a / (\bar{Y}_a)^2 = \text{var } Y_o / (\bar{Y}_o)^2, \qquad \bar{Y}_a, \bar{Y}_o \text{ are mean values.}$$

and if agricultural income is a major part of income,[13] (i.e. $\bar{Y}_a > \bar{Y}_o$), then it follows that $(\text{var } Y'_a - \text{var } Y'_o)$ is positive when non-agricultural income has a greater transitory component.[14] Additional restrictions are necessary to assign a sign to $(\text{var } Y''_o - \text{var } Y''_a)$: the empirical evidence, however, strongly suggests that this is negative when non-agricultural income is more transitory (see table 2). Thus, $(\text{var } Y'_a - \text{var } Y'_o)$ is positive and $(\text{var } Y''_o - \text{var } Y''_a)$ is

[12] Strictly speaking, the sign of the correlation is unclear and dependent on the relative shift in the labor demand curve (inward) and the labor supply curve (outward) that is caused by the bad weather.

[13] Except for one classification ($S_{aq} < 50\%$), this is the case for all groups. See table 1.

[14] If $\text{var } Y''_o / \text{var } Y_o > \text{var } Y''_a / \text{var } Y_a$, then $\text{var } Y_a / \text{var } Y_a > \text{var } Y'_o / \text{var } Y_o$, or $\text{var } Y'_a / \text{var } Y'_o > \text{var } Y_a / \text{var } Y_o$, or $\text{var } Y'_a / \text{var } Y'_o > (\bar{Y}_a / \bar{Y}_o)^2 > 1$.

expected to be negative. This coupled with the assumption that $\text{cov}(Y''_a, Y''_o)$ is negative and $\text{cov}(Y'_a, Y'_o)$ is positive, implies that B and C are *both* negative. Thus, under 'expected' conditions, one obtains the 'strong' result that $b_o > b_a$ when non-agricultural income is more transitory than agricultural income.

Even if the correlations are of the 'wrong' sign, it is likely that the magnitudes of B and C are much smaller than A, and therefore negligible. Expanding terms A, B, and C one obtains

$$\text{var } Y'_a(\text{var } Y''_o + \text{cov}(Y''_a, Y''_o)) + \text{var } Y'_o(\text{var } Y''_a + \text{cov}(Y''_a, Y''_o))$$
$$+ \text{cov}(Y'_a, Y'_o)(\text{var } Y''_o - \text{var } Y''_a) > 0, \quad \text{for} \quad b_o > b_a. \tag{7}$$

If the variances are much larger than the covariances, as expected, then the positive nature of $\text{cov}(Y''_a, Y''_o)$ adds only a negligible amount to the first two terms. Further, the (small) negative covariance between the permanent components is multiplied by the difference *between* the transitory variances. Thus it appears that a strong test of the 'variability' hypothesis of savings is the association of the observed propensities $b_o > b_a$, with the relationship $\text{var } Y''_o \text{ var } Y_o > \text{var } Y''_a \text{ var } Y_a$.

Two assumptions are necessary in order to isolate the variances of the permanent and transitory components. Firstly, it is assumed that transitory incomes, regardless of sources, are uncorrelated with each other for the first and third year of the survey.[15] The second assumption concerns the relationship between the permanent components of the first and third year. Growth in incomes is expected to cause a systematic deviation between the two variables. Growth in *actual* incomes for individual households cannot be used to estimate expectations about permanent income since these incomes are 'contaminated' by the (unmeasured) transitory component. Further, the growth experienced during the three years by an individual household may not be a valid indicator of its *expected* profile of permanent income. A plausible assumption is that farm households adjust their expectations about growth in permanent income by the *average* growth experience of similar households. This is the assumption used in this paper; though questionable, it should be emphasized that the classification of farm households into relatively homogeneous groups increases the validity of the assumption.

If the first year values are represented by lower case letters, the assumptions are as follows:

$$\text{cov}(y''_i, Y''_t) = 0, \qquad i = a, o, \tag{8a}$$

[15] A zero correlation between transitory terms two years apart implies a 'horizon' of three years. [According to Friedman (1963, p. 3), one definition of the horizon is 'the length of time a factor must affect income before it is considered permanent'.] Empirical support for this assumption is provided in Bhalla (1976b) where it is shown that three years is an *upper bound* estimate of the horizon for farm households in India.

$$y'_a = g_a Y'_a, \qquad g_a = \mathrm{E}(y_a)/\mathrm{E}(Y_a), \tag{8b}$$

$$y'_o = g_o Y'_o, \qquad g_o = \mathrm{E}(y_o)/\mathrm{E}(Y_o). \tag{8c}$$

Eqs. (3) and (8), and the covariances of income in the first and third year of the survey are enough to isolate the variances of permanent and transitory components of income:

$$\begin{aligned} \mathrm{cov}(y_a, Y_a) &= \mathrm{cov}(y'_a + y''_a, Y'_a + Y''_a), \\ &= \mathrm{cov}(y'_a, Y'_a), \\ &= g_a \,\mathrm{var}\, Y'_a. \end{aligned} \tag{9a}$$

Analogously,

$$\mathrm{cov}(y_o, Y_o) = g_o \,\mathrm{var}\, Y'_o. \tag{9b}$$

Eqs. (9a) and (9b) allow one to estimate the variances of the permanent components. Estimates of the transitory variances are obtained from the relationship,

$$\mathrm{var}(Y_i) = \mathrm{var}\, Y'_i + \mathrm{var}\, Y''_i, \qquad i = a, o. \tag{10}$$

Table 2 presents the results for the estimated proportions of income variance, by source and type of income. Estimates of b_o and b_a, reported in table 1, are also presented. It is observed that the result $b_a > b_a$ is always associated with the result $\mathrm{var}\, Y''_o/\mathrm{var}\, Y_o > \mathrm{var}\, Y''_a/\mathrm{var}\, Y_a$. In the one case that $b_a > b_o$, the opposite (and consistent) result that $\mathrm{var}\, Y''_o/\mathrm{var}\, Y_o < \mathrm{var}\, Y''_a/\mathrm{var}\, Y_a$ is obtained.

These results confirm, in a rather striking manner, the Friedman hypothesis that differences in the propensities to save, b_o and b_a, are observed because of differences in the variability of income streams. This result is not inconsistent with the observed positive relationship between the share of income derived from agriculture (and land ownership) and savings. However, the latter result cannot be interpreted to be in support of the hypothesis that entrepreneurial income (and/or investment opportunities) are positively related to savings for two reasons: (a) mean income levels *also* increase with the saving rates of the groups, and therefore might be a major cause of the observed result, and (b) *within* group regressions resulted in propensities to save being *higher* out of non-agricultural income.

3. Investment opportunities and savings: A theoretical discussion

The previous section discussed the use of an indirect method for deriving

Table .

Variability in different sources of income.

	Land-owning categories			Share of agricultural income			
	<5 acres	5–15 acres	>15 acres	<50%	50–75%	>75%	All observations
Mean, Y_a	319	659	1060	159	330	816	607
Std. dev., Y_a	315	585	906	150	260	722	652
Mean, Y_o	153	89	63	318	188	26	109
Std. dev., Y_o	176	189	205	267	157	94	191
Mean, y_a	316	572	859	228	343	670	529
Std. dev., y_a	363	582	797	294	355	672	601
Mean, y_o	186	123	117	281	177	100	147
Std. dev., y_o	383	221	246	486	222	237	304
corr (Y_a, y_a)	0.564	0.537	0.453	0.593	0.548	0.494	0.559
corr (Y_o, y_o)	0.241	0.499	0.411	0.290	0.593	0.148	0.357
var Y''_a/var Y_a	0.34	0.38	0.51	0.19	0.28	0.44	0.41
var Y''_o/var Y_o	0.57	0.58	0.73	0.40	0.11	0.90	0.58
MPS Y_a, b_a	0.24	0.34	0.43	0.29	0.45	0.39	0.38
MPS Y_o, b_o	0.31	0.47	0.49	0.38	0.20	0.53	0.43

Notes: (1) Upper case lower case represent third year, first year values.
(2) Y''_a, Y''_o represent the transitory components of agricultural and non-agricultural income, respectively.

the response of investment opportunities to saving. The importance of this subject was emphasized by Schultz (1964), who, in his classic study on traditional agriculture, stated that 'although there has been a long standing concern about the effects of the level of per family income upon percentage of income that is saved, there has been no comparable concern about the effect of difference in relative prices of new income streams upon savings and investment' (1964, p. 74). It is the purpose of this section to test *directly* the effect of investment opportunities on savings.

The term 'investment opportunity' was first formalized by Irving Fisher. He defined it as follows: 'The concept of investment opportunities rests on that of an "option". An option is any possible income stream open to an individual by utilizing his resources, capital, labor, land, money, to produce or secure said income stream. An investment opportunity is the opportunity to shift from one such option, or optional income stream, to another' (1934, p. 151). For farm households such as those analyzed in this paper, an investment opportunity can be defined to be a perceived shift in their production possibilities.

The green revolution years of the late sixties provide a rare and ideal representation of shifts in production possibilities. The introduction of high yielding varieties (HYV) afforded farmers the chance to increase significantly their rates of return from investment; this investment opportunity meant

increased profits from both old capital (irrigation) and from new investments. But did this improvement in the return to existing and additional capital result in more short-run savings on the part of farm households?

The effect of investment opportunities on savings is analogous to the effect of interest rate on savings, e.g. Wright (1967), Weber (1970). These studies, however, were done in the context of time series data with *all* households assumed to face the same rate of interest. In this paper, cross section variation in the investment opportunities faced by otherwise *identical* households plays the role of interest rate variation in time-series studies. The variation in investment opportunities is best illustrated by fig. 1, which shows

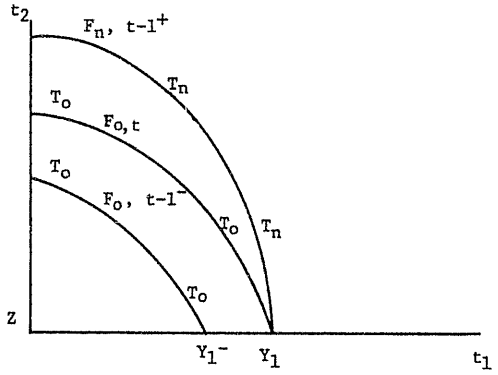
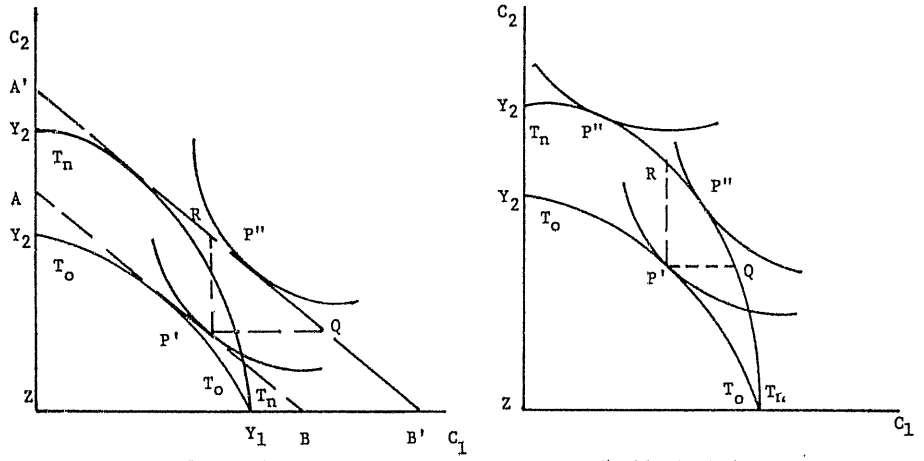


Fig. 1. Investment opportunity loci faced by F_o (old technology farmer) and F_n (new technology farmer).



(a) Perfect Capital Market (b) No Capital Market

Fig. 2. Investment opportunities and savings.

the technology frontier (T_oT_o) faced by an old technology farmer, F_o (e.g. farmer in a Bihar district) and the frontier (T_nT_n) faced by a new technology farmer, F_n (e.g. farmer in a Punjab district). Prior to the introduction of the HYV's, in time period $t-1^-$, F_n earns an income Y_1 which is less than the income earned by F_o. (Implicit assumption is that F_n owns a smaller acreage of quality adjusted land than F_o.) With partial and immediate adoption of HYV's F_n now faces a new technology frontier, T_nT_n, in time period $t-1^+$ and beyond. Since the analysis pertains to 'otherwise identical' households, both farmers are shown to have the same first period income, Y_1. With investments, each farmer can enjoy a higher income in period 2, Y_2, by moving along his technology frontier. (Note that investments only affect income in future period: Z is second period income with zero first period investment.) T_nT_n is shown to have a higher slope at each investment point in order to incorporate the assumption that the new technology is more profitable.

The theoretical relationship between investment opportunities and savings can be shown by use of diagrams similar to fig. 1. These two-period diagrams illustrate the optimal consumption and investment decision on the part of a farm household.[16] These decisions are crucially affected by the nature of the capital market in which the household operates: thus, two polar cases are analyzed (1) a perfect capital market (rich farmers), fig. 2a, and (2) no capital market or a Robinson Crusoe economy (poor farmers), fig. 2b. In both figures, the comparison is between similar farmers (equal first period income) facing different productive (investment) opportunities. C_1 and C_2 represent present and future consumption, P' and P'', the equilibrium points, and AB the (exogenous) rate of exchange between the two periods.

In the case of a perfect capital market, the shift in the opportunity locus (T_oT_o to T_nT_n) implies an increase in wealth (AB to A'B') with the relative price of consumption in each period (i.e. the interest rate) held constant. Thus, there is no substitution effect (change in relative prices) involved with a change in the locus. If it is now assumed that consumption in each period is a superior good, then the point of tangency for farmer F_n, P'', has to be in the triangle, P'QR, representing increases in consumption in both time periods (wealth effect). Thus, first period consumption is higher, and savings lower, for households with greater investment opportunities: i.e. rich new technology farmers save less than rich old technology farmers if credit is freely available.

In the self-finance world of Robinson Crusoe, the effect of a shift in the technology locus on first period investment (savings) is a priori ambiguous. As shown in fig. 2b, consumption in the first period can either increase or

[16]The theory of inter-temporal choice (optimal investment decision) was developed by Fisher and elaborated by Hirshleifer (1958, 1970). The reader is referred to Hirshleifer for a detailed analysis of investment choice in the context of a two-period model.

decrease. The reason for the ambiguity is the simultaneous presence of both wealth and substitution effect associated with the change in technology. The point of tangency for farmer F_n will be the left of P' (more first period savings) if the substitution effect dominates the wealth effect.[17]

The ambiguity in the savings behavior can be removed if one makes the (realistic) assumption that 'lumpy' investments are needed for a successful adoption of the new technology. In this instance, T_nT_n might not be the appropriate representation of the technology faced by the Punjabi farmer. Even though F_n has increased the flow of income by adoption of the new technology on *available* irrigated land, further 'lumpy' investments in irrigation and land improvement may be necessary to successfully adopt the new technology. In a Robinson Crusoe economy, the resources for this additional investment can only come from increased savings. Thus, in fig. 2b, if savings greater than $Y_1 - P'$ are needed for transfer to T_nT_n, then those households planning to use the new technology have to save greater than $Y_1 - P'$ in the 'transformation' years. Hence, poor new technology farmers are likely to save more than poor old technology farmers. Thus, if discrete investments in the new technology are possible, the effect of investment opportunities on savings is ambiguous: if sufficient 'lumpiness' is allowed for, the effect is positive.[18]

In summary, the theoretical results indicate that the effects of investment opportunities on savings depend on assumptions about the capital market. In a perfect capital market case, the effect is an unambiguous decline in savings.[19] In a self-finance economy, the effect is ambiguous, unless lumpy investments are assumed. In the next section, an index reflecting the different investment opportunities is constructed, and the propositions outlined above are empirically tested.

3.1. Investment opportunity: Construction of index and empirical results

The households covered by the NCAER survey presumably face different marginal rates of return on any new investment. This likelihood is enhanced by the fact that the period covered by the survey – 1968-69 to 1970-71 – encompasses the years when the new technology was being adopted by farms in India. However, the construction of an index which will reflect

[17]The wealth effect of an increase in investment opportunities is dependent on the *size* of savings. For poor people, this, and consequently the wealth effect, is likely to be small. This is another argument for expecting the *net* effect of a change in productive opportunities to be positive for poorer farmers.

[18]McKinnon (1973, p. 13) also uses the lumpiness in investment assumption to argue that a lack of access to external funds implies that 'the constraint of self-finance sharply biases investment strategy toward marginal variations within the traditional technology'.

[19]In the case of an imperfect capital market, the effect is ambiguous, a priori, and dependent on assumptions about the relative costs of borrowing and returns from investment.

differences in the perceived rate of return on investments is not an easy task. Any attempt to construct such a measure is fraught with difficulties: nevertheless, the index should incorporate the following factors:

(*a*) *Adoption status (HYV cultivation/non-HYV cultivation) of households:* The reason for including this information is obvious. The new technology, if adopted properly, can significantly increase the returns from cultivation.

(*b*) *Extent and type of irrigation:* The new technology is heavily dependent for its success on the availability and controlled supply of water. A tube well investment may therefore be expected to yield different returns than a canal irrigation system.

(*c*) *Regional location:* Land differences are likely to affect the profitability of certain investments: further, the perceptions of a farmer in a successful area of the green revolution (e.g. Punjab) probably differs systematically from those of an identical farmer in an unsuccessful region (e.g. Bihar).

(*d*) *Cropping pattern:* The cultivation of wheat has proved to be more profitable than the cultivation of rice. Identical on-farm investments, when used in the production of different crops, are likely to yield different returns.

(*e*) *Fertilizer and credit:* Successful adoption of the new technology is dependent on the availability and proper application of fertilizers, pesticides etc. Working capital requirements increase significantly with the new technology: thus, access to working capital, and its cost, affects the perceived profitability of the new technology.

The above list of relevant factors affecting an investment opportunity index is necessarily incomplete: it, nevertheless, points out the difficulties involved in the construction of such an index. A proper definition of an index notwithstanding, the purpose of this section remains the testing of an investment opportunity effect on savings. The previous discussion has made clear that the adoption status of a household should be included in any assessment of the rates of return perceived by a household. Thus, it might seem appropriate to classify households according to whether they have, or have not, adopted the technology. This 'index', however, has several drawbacks. It attributes equal opportunities to an adopter regardless of the crop grown, or its regional location. Most importantly, it attributes no investment opportunity to a farmer who might very well be on the verge of adoption.

An alternative index of differing perceptions of investment opportunities is the adoption rate of the new technology in the district in which a household resides. Soil quality, pattern of crops produced (wheat, rice, etc.) presence of extension programs, credit availability (government, co-operatives etc.) are all variables which vary more amongst districts than amongst households *within* a district. Differences in profitability of investment between regions should be

reflected in differences in district adoption rates. Moreover, use of this index assigns the same investment opportunity (IO) to all households within a district, regardless of whether any individual household had actually adopted the technology. Comparing non-adopters, it is likely that a farm household in a Punjab district perceives a greater investment yield on its opportunities than a household in a Bihar district, and differences in district adoption rates should reflect this perception.

Though not perfect, the district adoption rate comes closest to a *desired* index of investment opportunities. The NCAER survey contains data for 2952 cultivator households in 1970-71. These households were aggregated into 100 districts, and a weighted percentage of adopter households was estimated for each district.[20] This percentage was then assigned as an IO index to each household within the district. Since the analysis of savings is for the third year of the survey, perceived opportunities of a household are likely to be based on *past* rates of adoption. Consequently, district adoption rates for the *second* year of the survey were chosen for analysis.

The hypothesis to be tested is whether, ceteris paribus, investment opportunities have a positive effect on savings. An important determinant of savings which one would like to control is the *permanent* income of a household, Y_p. (This roughly corresponds to the flow of income proportional to Y_1 in fig. 2.) This, however, causes additional problems. What measure should one use for permanent income? In Bhalla (1976a), two conceptually different measures of permanent income (Y_p) were constructed. Considerations of discount rates, expected income and expected growth in income dictated one measure, Y_{pi}. Thus, a discount rate of 35 percent, (corresponding to a three year horizon see note (15), and an expected growth rate in incomes of 3.5 percent per year, yields

$$Y_{pi} = 0.437 Y_0 + 0.374 Y_{-1} + 0.275 Y_{-2},$$

where Y_0 is measured income, 1970-71.

An earnings function approach dictated the other measure of permanent income, Y_{px}. This method relates the determinants of income (X) to measured income, Y; i.e. the regression

$$Y = b_0 + b_1 X_1 + b_2 X_2 + \ldots . b_n X_n + e,$$

is estimated and predicted values of Y, $\hat{Y}$, are taken to be estimates of permanent income. Though acceptable, there is a serious problem with this approach. The residuals ($Y - \hat{Y} = \hat{e}$) rather than identifying the assumed

[20]The NCAER survey did not sample its respondents on a random basis: consequently, population weights are used to obtain estimates on a district basis.

transitory components of income, might reflect just the opposite, i.e. differences in permanent levels. The panel nature of the NCAER data avoids this bias and makes possible an improved 'earnings function' estimate of Y_p; in particular, it allows for the decomposition of the error term e_i into an unobserved permanent component γ_i and a 'true' error term, e_i. This 'fixed effects' error components model yields

$$Y_{px} = \gamma_i + 0.182H + 0.33K + 188.7L + 5.6T,$$

where the determinants of income are individual constants (γ_i), land value (H), capital assets (K), family labor (L), and the level of technology (T). [For details on the construction of the measures Y_{pi} and Y_{px}, see Bhalla (1976a).]

In order to provide a partial check on the robustness of the results, both measures of permanent income are used in the empirical analysis. For sake of a 'complete' analysis, tests using current income (argued by some to be the relevant variable for savings behavior) for 1970-71 are also presented.

One problem remains - how should households be classified into 'Robinson Crusoe' and 'perfect capital market' economies. It is difficult to assert that any rural household in India faces a perfect capital market. However, an approximation to differences in capital markets can be achieved by a division of households into self-finance and 'open access' categories. If the wealth (permanent income) of a household is indicative of its ability to borrow, then the arbitrary (but plausible) division of households into subsistence, non-subsistence categories is meaningful. Identification of a subsistence level, however, is a difficult matter. 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-Rs 20 per month, 1960-61 prices) adequately describes the subsistence (or poverty) 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.[21] Though the non-subsistence group is unlikely to face a perfect capital market, it is likely that its access is considerably greater than the subsistence group.

If the index of investment opportunities, IO, is presumed to be roughly indicative of differences in rates of return earned by the household, then the effect on savings of IO can be tested by estimating eq. (11):[22]

[21]The choice of Y_{apc} (ratio of the sum of three 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 the two 'preferred' measures of permanent income Y_{pi} and Y_{px}.

[22]A level regression in savings, estimated as in eq. (11) results in errors whose variance increase with permanent income. If the assumption is made that the variance of the residuals increases with the square of permanent income, then the heteroscedasticity present in eq. (11) can be corrected by deflating all variables by permanent income. All equations have been estimated with this correction for heteroscedasticity.

$$S = a_1 + a_2 IO + b_1 Y_p + b_2 Y_t + e, \tag{11}$$

where all variables are in per capita terms, and $Y_p (Y_t)$ = permanent (transitory income) of household, 1970–71, IO = investment opportunities index (weighted district average of the adopters of new technology, 1969–70).

This equation (with the rate of interest on savings, r, replacing IO) is similar to those estimated for the U.S. [see C. Wright (1967), Weber (1970) and L. Taylor (1971)]. These authors make the assumption that r reflects both the cost of borrowing and the return on lending. Due to the presence of opposing income and substitution effects, this causes the coefficient of r to be ambiguous on an a priori basis. The results pertaining to eq. (11) are not strictly comparable. The assumptions regarding the capital market – in particular, that subsistence households are likely to obtain little credit for investment, and that non-subsistence households obtain such credit at relatively constant rates of interest – remove some ambiguity about the sign of a_2. The coefficient is predicted to be positive for poor households and negative for non-subsistence.

The empirical results strongly support these assertions (see table 3).[23] For the subsistence group, coefficient a_2 is positive: holding constant the level of permanent income, poor households with greater investment opportunities save more. (Coefficient a_2 is significant at the 5 percent level; for Y_{px}, significance is at the 10 percent level, two-tailed test.) Members of the non-subsistence group (better access to a capital market) decrease their savings in response to an increase in investment opportunities.[24] (Coefficient a_2 is negative and significant at the 1 percent level). It should be emphasized that this is a partial effect: it is not contended that richer households save less, or at a lower rate (note that the non-subsistence group has a MPS out of Y_p of 0.36: the corresponding figure for the subsistence group is 0.11).

The results are invariant with respect to the particular measure used to represent permanent income. This robustness in the results, as well as the fact that the *sign* of the IO coefficient, a_2, changes in a predictable fashion for different income groups, supports the contention that the effect of investment opportunities on savings cannot be viewed in isolation. The firm household nature of farm families makes it imperative that capital market conditions be explicitly incorporated into the analysis.

[23] Similar results are obtained if the marginal propensity to save out of permanent income is allowed to vary with investment opportunities [addition of term $b_2 \cdot Y_p \cdot IO$ in eq. (11)] and a_2 assumed to be zero. Allowing for changes in both a_2 and $b_2 (a_2 \neq 0,\ b_2 \neq 0)$ introduces multicollinearity and causes some (IO) coefficients to be statistically insignificant.

[24] If non-subsistence households are sub-divided into groups earning above and below Rs. 1500 per capita, then the coefficient a_2 is negative, but not significant (at the 5 percent level) for the richest group. This 'inconsistent' result for the rich households (top 1 percent of the rural population) may be due to the small sample size (125 observations) and the relatively lower variation in the investment opportunities index.

Table 3

Effect of investment opportunities on savings.

	Constant	Coefficients (eq. 11)			$\bar{R}^2$	Standard error
		Investment opportunity a_2	Permanent income b_1	Transitory income b_2		
Subsistence						
$Y_{apc} \leqq$ Rs. 500 ($N=915$)						
$Y_p = Y_{px}$	−41.4	15.6	0.11	0.20	0.11	0.1927
	(7.3)	(1.7)	(5.8)	(8.9)		
$Y_p = Y_{pi}$	−41.2	20.6	0.11	0.21	0.11	0.1942
	(7.3)	(2.2)	(6.0)	(8.2)		
$Y_p = Y$	−52.4	21.6	0.14		0.11	0.2133
	(10.8)	(2.3)	(8.2)			
Non-subsistence						
$Y_{apc} >$ Rs. 500 ($N=1065$)						
$Y_p = Y_{px}$	−181.3	−62.0	0.38	0.33	0.31	0.1984
	(13.4)	(3.7)	(22.0)	(16.9)		
$Y_p = Y_{pi}$	−163.6	−57.4	0.36	0.36	0.31	0.1927
	(12.6)	(3.5)	(22.0)	(16.6)		
$Y_p = Y$	−130.6	−42.3	0.31		0.19	0.2014
	(14.2)	(2.9)	(23.1)			

Notes: (1) Figures in parentheses represent the absolute value of the *t*-statistic.
(2) Results are based on eq. (11) of text; Y_{px}, Y_{pi}, Y represent permanent income (earnings function), permanent income (three year weighted average) and measured income 1970–71, respectively.

4. Summary and conclusions

This paper has examined the effects of sources of income, and investment opportunities, on the savings behavior of farm households in India. The sources (composition) of income effect on savings was critically examined by relating savings to the agricultural and non-agricultural components of income. It was observed that the propensity to save out of non-agricultural income was *higher* than the propensity to save out of agricultural income. This result is 'unexpected' if one presumes that agricultural incomes reflect 'entrepreneurial income', investment opportunities and 'control over assets'. However, the permanent income hypothesis offers an alternative explanation for the observed result – the *MPS* out of non-agricultural income is higher because this income has a larger transitory component. The longitudinal nature of the data was used to isolate the permanent and transitory components of income variance for each source of income. The results consistently supported the 'variability' hypothesis i.e. *MPS* out of non-agricultural income was higher when its transitory component was larger.

In the second part of the paper the theoretical relationship between savings and investment opportunities was discussed and it was established that savings rates could either increase or decrease with an increase in these opportunities. The result depended critically on the possibilities available to the household for transactions in the capital market. Two polar cases were studied: (1) perfect capital market and (2) no capital market. Opposite effects of investment opportunities on savings are predicted for the two groups savings should decline for the former group and increase for the latter. The conditions necessary for a proper investment opportunities index was extensively discussed, and an index proposed and tested. The empirical results supported the theoretical predictions: investment opportunities increased savings, ceteris paribus, for the subsistence group of households (no capital market) and had a negative effect for the non-subsistence group (relatively perfect capital market).

Appendix

1. 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 pattern of consumption, savings and investment of these households. The sample was selected according to a multi-stage 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 core sample of 4,118 households.

For purposes of analysis only households that were *cultivators* for all three 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 three years of the survey. (There were 2,952 cultivators in 1970–71; the requirement that households have been cultivators for all three years reduced the sample size to 2,532.) Further, 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 saving rate of −150 percent to 75 percent). These 'restrictions' reduce the sample size from 2,532 to 1,980 farm households.

2. *Definitions*

(*a*) *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 pensions and regular contributions.

(*b*) *Agricultural/non-agricultural income* (Y_a, Y_o): Any income obtained from work on owned farm (crop income, rental of land and agricultural implements) is considered to be agricultural income, Y_a. All other income (self-employment non-farming income, salaries, wages etc.) is considered to be non-agricultural income, Y_o.

(*c*) *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:

$$S = \mathrm{d}A - \mathrm{d}L - \mathrm{d}K,$$

where:

$\mathrm{d}A$ = Gross change in the value of physical and financial assets,

$\mathrm{d}L$ = Net change in liabilities,

$\mathrm{d}K$ = Net *inflow* of capital transfers.

The savings estimate includes via $\mathrm{d}A$ any purchase of consumer durables, and non-monetized investment that is undertaken by the household. Savings in the form of currency or gold and silver are not included due to lack of reliable data; nor has any adjustment been made for capital gains or losses incurred by the household. Depreciation on assets is also ignored.

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