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Long-Run Income Expectations
And Consumer Saving^{1/}

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1. Introduction

The fundamental hypothesis impelling this study is that spending units^{1/}

^{1/} A spending unit is a group of persons who pool their income and expenditures--the basic decision-making unit of the household sector.

form long-run income expectations that are both different from current income and certain enough to affect saving decisions. Such expectations, if they exist, have a derived significance for those who would solve the riddle of aggregate consumption functions as well as intrinsic interest for students of consumer behavior per se.

Cross-section data from the "Survey of Consumer Finances" provide the empirical raw material for the investigation. Since these data do not afford direct measurement of long-run expectations, an indirect measure is devised and employed.

Interest in long-run income expectations has been sharpened in recent years by the appearance of two theoretical analyses of the household saving decision that use long-run expectations concepts. Modigliani and Brumberg, whose theory was the earlier of the two, use an expectations concept that is a simple extension of the expectations that would obtain in a world of complete certainty.^{2/} Friedman, whose theory appeared only slightly later, proposes a

^{2/} Franco Modigliani and Richard Brumberg, "Utility Analysis and the Consumption Function--An Interpretation of Cross-Section Data," Post-Keynesian Economics, ed. K. K. Kurihara, New Brunswick, Rutgers University Press, 1954, pp. 388-436.

"permanent" income concept that is an annual accrual on the household's total human and non-human wealth.^{1/} This study is primarily focussed on the relative

^{1/} Milton Friedman, "A Theory of the Consumption Function," New York, National Bureau of Economic Research, 1955. (mimeographed.)

importance of long-run expectations for understanding spending unit saving decisions. An examination of the specific aspects of the two theories will also be made but must remain secondary to the more basic question of the need for separate consideration of income expectations.

2. Theory and Hypotheses

In order to interpret evidence on the importance of income expectations, a theoretical framework is required--one that is especially adapted to the available data.

Expectations Function

There are no direct observations of long-run expectations in surveys. If it can be assumed that expectations are related to other things that are observed, perhaps a workable substitute can be devised.

Define a spending unit's long-run income expectations (E) as that annual income which as an annuity to be received each year until retirement has the same present value as the actual income expected over that same period.^{2/} Assume that,

^{2/} This definition does not take account of uncertainty. An annuity with a random component but a uniform expected value would be more appropriate.

for a spending unit, E is some function of current income (Y) that can be approximated by a linear equation:

$$[1] \quad E = eY + f .$$

Obviously this function will not be identical for all spending units in a random sample; the same current income will be associated with one value of E for a young stevedore and a quite different E for a dentist of the same age. The diversity should be substantially reduced in a sample that is homogeneous with respect to the age, occupation race, and education of the principal earner (head) of the spending unit and also homogeneous as to location. It is assumed that for a specific homogeneous group (the i th) there is an "expectations function" of the form

$$[2] \quad E = e_i Y + f_i + v, \quad i = 1, 2, \dots, n$$

(n = number of homogeneous groups, v = a stochastic variable with zero mean),

which describes the average relation of expectations to income for members of that group.

This formulation has some superficial appeal for economists, who know that income is in fact related to such objective characteristics as age, occupation, etc.^{1/}

^{1/} F. G. Adams, "Some Personal Economic Characteristics and the Size of Wage and Salary Income," a paper presented at the meeting of the Econometric Society, New York:, 1955 (mimeographed).

But are there any grounds for expecting a spending unit to take account of such factors in forming its expectations? The question is not really whether spending units explicitly realize the relevance of, say, education to their income prospects, but rather whether they can, consciously or unconsciously, correctly evaluate its quantitative importance. If, as is likely, expectations are formed by generalizing the analogous experience of others, it is sufficient for present purposes that spending units be able to recognize properly analogous experience.

Consumption Function

Spending unit consumption is assumed to be a function of income expectations, as measured by E , and net worth. The function is approximated by a linear equation. It is unnecessary to assume that all spending units have the same consumption function; but it is assumed that spending units in a homogeneous group (defined as above) have the same function except for an additive random component. The function describing the behavior of spending units in the i th group is:

$$[3] \quad C = c_1 E + d_1 + f_1 A + u \quad (i = 1, 2, \dots, n),$$

where A = net worth of the spending unit, and u = a stochastic variable with zero mean.

E is clearly the relevant income variable affecting spending unit consumption or saving decisions but it may yet be true that it differs from current income only trivially. An exception must be granted where dissaving by a spending unit, though justified by its expectations, is impossible to effect because of its limited credit and material wealth.

Net worth is also important to the saving decision. A spending unit's saving decision rests on a tentative allocation of its total disposable resources. That total includes resources at hand as well as those expected during the future.

There are a priori grounds for presuming the effect of net worth on consumption to be positive (negative for saving). This effect may be partially obscured by "personality correlations" in a cross section analysis.^{1/} Such correlations can

^{1/} This phenomenon has been pointed out in several articles; it is discussed and christened by Tobin in connection with an analysis of consumer debt. Any cross-section analysis which investigates a relationship between a flow and the stock in which the flow accumulates is particularly vulnerable in this regard. James Tobin, "Consumer Debt and Spending--Some Evidence From Analysis of a Survey," Consumer Installment Credit, 2 vols., Washington, U. S. Government Printing Office, 1957, Vol. I, pp. 527-8.

be caused by failure to hold intentions to bequeath constant. A spending unit which plans to accumulate and bequeath a small fortune will both save more and have a larger net worth than a spending unit with no such intentions. The variables that define the homogeneous groups probably have a bearing on bequest motivation. To the extent that grouping reduces the variation of bequest plans, it also diminishes the effect of "personality correlation" on the coefficient of net worth.

Ex Post Savings Function

A relation between savings, current income and net worth can now be obtained by substituting the expectations function for E in the consumption function and subtracting the result from current income. It is, for the i th group,

$$[4] \quad S = (1-c_1 e_1) Y - (c_1 f_1 + d_1) - g_1 A - (c_1 v + u) .$$

$$\text{Define: } \alpha_1 = (1-c_1 e_1),$$

$$\beta_1 = (c_1 f_1 + d_1),$$

$$\gamma_1 = g_1,$$

$$\text{and } - u' = (c_1 v + u) .$$

Equation [4] can now be written in a more convenient form as:

$$[5] \quad S = \alpha_1 Y - \beta_1 - \gamma_1 A + u' = S_1(Y,A) + u'$$

The parameter α_1 measures the effect of income on saving via changes in expectations. Its magnitude depends on both the average "sensitivity" of expectations to income change for spending units in the *i*th group and the marginal propensity to consume from expected income in that group. Given a value for c_1 , α_1 will be equal to $1-c_1$ if $e_1 = 1$, i.e., if any change in income leads to an equal change in E . If expectations are so extremely independent of current income that $e_1 = 0$, then $\alpha_1 = 1$ regardless of the value of c_1 .

General Approach

Within this framework it is possible to outline a test of the fundamental hypothesis which asserts the importance of long-run income expectations for spending unit saving decisions. Expectations may be unimportant either because of the degree of uncertainty with which they are held or because they are closely and identically related to income for all spending units. If expectations are unimportant then the data should be consistent with the hypothesis that $E = Y$

or, in terms of the theory developed above, that $e_i = 1$ and $f_i = 0$,
 $i = 1, 2, \dots, n$.

Imagine two homogeneous groups of young spending units, the i th and the j th, identical except for, say, education.^{1/} On the null hypothesis that $e_i = e_j = 1$

^{1/} The characteristics age, occupation and education refer strictly to the head (or principal earner) of the spending unit. For convenience permit the spending unit to possess those characteristics.

and $f_i = f_j = 0$, any inter-group difference in saving behavior, as described by α , β , and γ , must be attributed to the effect of education on the consumption function. For argument assume that for the same level of current income, net worth and, by the null hypothesis, the same expectations, there are no a priori grounds for expecting a spending unit with high education to consume either more or less than one with a lower education. The null hypothesis is equivalent to the hypothesis that $\alpha_i = \alpha_j$, $\beta_i = \beta_j$, and $\gamma_i = \gamma_j$, a hypothesis that can be tested empirically.

Of course, values of 1 and 0 for e_i and f_i may, for some homogeneous groups, be entirely consistent with the general hypothesis that spending units base their saving decisions on income expectations. Spending units (or homogeneous groups of them) close to retirement may have expectations in which they are quite confident, but these expectations as measured by E are very likely to be the same as current income. Comparison of saving behavior for such groups will provide no useful evidence either for or against the hypothesis.

The general approach can be simply stated. Where the expectations hypothesis and the null hypothesis imply quite different saving behavior for a group there is a basis for empirical testing. For lack of an absolute standard of comparison

the actual test must compare saving behavior of two or more groups whose expectations functions, if the null hypothesis is not true, should be quite different.

The saving behavior of different homogeneous groups can be compared in two ways. The simpler method involves comparing the amount saved by members of different groups given equal income and net worth, i.e., compare $S_i(Y^0, A^0)$ with $S_j(Y^0, A^0)$ for various combinations of Y^0 and A^0 (keeping Y^0 and A^0 within the "reliable" domains of the two functions). A more refined method, which depends heavily on the estimation procedure, would make use of the theoretical components of the parameters of the ex-post saving function, [5], and compare those parameters directly.

Hypotheses

This approach seeks evidence on the importance of expectations in a quite indirect fashion. The analysis must concede some inter-group differences in saving behavior under the null hypothesis that expectations are not important, and seek differences in saving behavior that cannot be readily explained without resort to inter-group differences in expectations. The data must therefore be approached with some notions about the kinds of saving differences that can be explained by, say, age differences if expectations are admitted on the one hand, and if they are not on the other. It is convenient in this regard to first specify the effects of age on expectations and consumption given a lifetime income profile and then specify the effects of occupation, education, etc., as factors which affect the shape and level of the income profile rather than the position along it.

Age and Expectations

The expectations of older spending units, as already suggested, tend to be the same as current income. For younger spending units there are two factors at work.

One is related to the life-cycle pattern of income receipts (or income profile), and the other to the general secular rise in income per spending unit, which tends to make expectations higher for younger age groups.

The income profile is super-imposed on the secular pattern. The effect of that profile on expectations is best discussed with direct reference to the other three variables which determine the nature of the profile. It is clear, however, that whatever the effect of the income profile on expectations it will apply in its most undiluted form to the younger age groups.

Age and Consumption

Unfortunately there is very little known about the relation of consumption to the life-cycle. The fact that spending unit size and composition changes over the life cycle gives some basis for expecting higher consumption in the child-rearing years. Variation in spending unit size, however, should be taken into account in a more direct and precise manner.^{1/}

^{1/} The empirical work to follow will make allowance for family size. Nevertheless the age composition of the spending unit will change over the life cycle and may cause uneven consumption even where family size is in some sense held constant.

The consumption of young spending units may be restricted by a credit "ceiling." that ceiling may depress consumption not only directly but also in an indirect way by increasing the need for contingency reserves.

The only other systematic effect of age arises from the asset-age relation.^{2/} If

^{2/} Modigliani and Brumberg, *op. cit.*, pp. 400 ff.

saving is done as a prelude to dissaving during retirement, net worth will normally

be higher for older spending units as long as they are still in the earning span. By the argument used earlier, a young spending unit will consume more than an older one if both have the same expectations and net worth.

Expectations And The Income Profile

The hypotheses concerning the variables other than age result from differences in income profiles associated with these variables. Income profiles may differ in shape, level, and dispersion. The analytical tools provide, at best, for differences in shape and level, but are not so well adapted for differences in dispersion. For this reason comparisons between groups which have about the same dispersion around the income profile will provide the most useful information.

Occupation is important in determining both the shape and level of the income profile. A professional's income profile rises with age while an unskilled worker's is fairly flat. A business owner's income may rise at about the same rate as a professional's but be at a higher level at any age. Unfortunately the dispersion is also related to occupation--probably much larger for business owners than for professional persons. This limits the usefulness of inter-occupation comparisons.

Education primarily affects the slope of the income profile. Higher education is therefore associated with higher expectations although actual income need not be appreciably higher in the early part of the life-cycle. If dispersion around the income profile is not related to education, or less so than to occupation, inter-education comparisons can be given more validity.

Location affects the profile because of market differences. There may be persistent differentials in real or money income from one region to another. A location providing a "shallow" market for a particular kind of service may impose an upper limit on the income profile which does not exist in a larger market. Also, perhaps, the more "perfect" the market the more will current income be an accurate

indicator of future income.

The hypotheses under this head depend on a tacit assumption that mobility is limited between occupation, education, and location groups. Some shifting surely takes place, and it becomes more common as the groups are more narrowly defined. The shifting does not affect the spending unit's ability to form expectations, it merely limits the usefulness of cross-section profiles as an indication of the nature of those expectations.

The Effects of Occupation, Education and Location on Consumption

The non-age variables are, of course, correlated with current income. Other things equal, including expectations function, there is a presumption that a smaller proportion of expected income will be consumed, on the average, in high income groups than in low ones.

If income is relatively unstable in an occupation (as may be indicated by large dispersion around the income profile) then over-all saving will be higher early in the life cycle because of the greater need to build up contingency reserves. In those cases the net worth coefficient should be large and negative so that saving ceases to be unusually high as soon as those reserves are built up.^{1/}

^{1/} Liquidity is the strictly relevant variable in a discussion of contingency reserves. In the structure assumed, the effects of liquid asset holding will be reflected in the net worth coefficient to the extent that the two variables are correlated.

High education may imply lower consumption quite apart from the income correlation, if better educated persons are more far-sighted and therefore have stronger retirement motives.

Consumption differences by location will also show the effect of the income correlation if differences in real income exist among locations. That effect may be balanced somewhat by an added incentive toward short-run, emulative consumption in locations characterized by both relatively high income and high population density.

The discussion so far has laid a foundation for empirical analysis of long-run income expectations. The important points are: a) a spending unit's expectations are, in part, determined by its socio-economic, or demographic characteristics, the more important of which are age, occupation, education and location; b) with those characteristics held constant for a group of spending units, the relation of saving to income in that group combines two conceptually distinct behavior relations--the "expectations function" and the "consumption function;" c) in general, both functions are related to the demographic variables which distinguish the groups; and d) inter-group comparisons can provide evidence that is relevant to the expectations hypothesis if allowance can be made for inter-group differences in the "consumption function."

3. Methods and Data

The preceding section has led to propositions about saving behavior within homogeneous groups of spending units. The empirical work for this study is an attempt to measure the saving behavior of such groups. This section is concerned with a description of the basic data and an explanation of the methods used in processing them.

The Sample

Obviously a very large sample of spending units is required to provide groups that are both sufficiently homogeneous and large enough to permit statistical estimation

of parameters. Cross-classification by four variables creates a large number of cells and a random sample from the spending unit population is very unevenly distributed among those cells.

Each annual Survey of Consumer Finances^{1/} is based on a sample of around 3000

^{1/} The Surveys are conducted by the Survey Research Center, University of Michigan, for the Board of Governors of the Federal Reserve System. For a full description of the survey methods used see "Methods of the Survey of Consumer Finances," Federal Reserve Bulletin, Vol. XXXVI, (July, 1950), pp. 795-809.

spending units. Although the sample from a single year's Survey does not provide enough observations in some of the groups, it is possible to combine Survey samples. The samples interviewed in the four years 1948-1951 were merged for this investigation.^{2/}

^{2/} The immediate source of the data was a deck of IBM punchcards which had been edited from the original Survey data cards for the four years. The edited deck was constructed by William Mooney for the Research Seminar in Quantitative Economics at the University of Michigan in May, 1952. I am indebted to the Seminar and to its Director, Lawrence R. Klein, for making these cards available to the Cowles Foundation which in turn made them available to me.

Not all observations obtained in the four surveys were actually used in the analysis. The sample that was finally used for estimating the parameters of the saving functions in the several groups contained 7983 observations. It fails to represent the members of these groups in the total United States population of households by the conclusion of a) all spending units that received less than \$1000 of disposable income during the year reported and b) all secondary and non-independent primary spending units.^{3/} These exclusions, and others, have enhanced the ability

^{3/} Briefly, a secondary spending unit resides in the same dwelling unit with a non-independent primary spending unit. A more complete discussion of the Survey's unit of analysis is given in: John D. Lansing, "Concepts Used in Surveys," Contributions of Survey Methods to Economics, ed. Lawrence Klein, New York, Columbia University Press, 1954, pp. 961 ff.

of the remaining data to provide evidence that is relevant to the basic hypothesis, and that is their ultimate justification.

The Observations

The Survey of Consumer Finances obtains, from each spending unit, a wide range of financial information, including (in the 1948-51 Surveys) income, saving and liquid assets. Disposable income is computed from reported gross money income by the Survey Research Center.^{1/} Saving is "constructed" from components that

^{1/} For the details of this calculation see: "Distribution of Consumer Income in 1949," Federal Reserve Bulletin, Vol. XXXVI (August, 195), Appendix, pp. 961 ff.

are separately reported by the spending unit in the interview. The saving figure attempts to measure "financial" saving: the difference between disposable income and cash outlays for consumption, including outlays for durable goods but excluding principal payments on home mortgages.^{2/} Liquid asset holdings, to be used as

^{2/} The savings concept is defined and discussed, and an alternative suggested in: "The Distribution of Consumer Savings in 1949," Federal Reserve Bulletin, Vol. XXXVI (November, 1950), Appendices I and II, pp. 1452 ff. See also: John Lansing, op. cit., pp. 29 ff.

proxy for net worth,^{3/} are defined and measured by the Survey as the sum of: a)

^{3/} The use of liquid asset holdings as a proxy for net worth relies on an assumed correlation between the two variables. The assumption is perhaps less extreme in this context since the correlation need hold only within the individual groups. A very crude indication of the gross correlation is shown by a cross tabulation of spending units by liquid asset holdings and net worth in: "Distribution of Assets, Liabilities, and Net Worth of Consumers, Early 1950," Federal Reserve Bulletin, Vol. XXXVI (December, 1950), Table 4, p. 1589.

demand deposits, b) savings, deposits, and savings and loan shares, and c) U. S. Government Savings Bonds.^{1/} The immediate data source used by this study furnished

^{1/} John Lansing, op. cit., p. 35.

the Survey's income and saving measurement to the nearest ten dollars, liquid asset holdings were recorded only by classes.

Of equal importance for this investigation, the Survey provides demographic information about the spending unit. In particular, the age, occupation, education, race, and marital status of the head of the spending unit are reported. Spending units with equity in unincorporated enterprise can be identified. The number of adults and the number of children under 18 are separately reported. Finally the location of the spending unit, by region and community size, is specified.

These data enable the empirical analysis to follow the theoretical model quite closely. The demographic variables measured permit the division of the sample into groups roughly homogeneous in age, occupation, education, race and location. As for the variables in the ex post saving function, income and saving are directly available and liquid asset holdings provide a more or less satisfactory substitute for net worth. There is also a basis for statistical control of spending unit size.

The Homogeneous Groups

The 7983 observations were classified into 187 groups for the analysis. A brief summary of the grouping criteria is given here. In the employed portion of the sample five occupational categories were used: a) business owners--all spending units that own an equity in unincorporated business, b) farmers, c) professional--including semi-professional, d) semi-retired--all employed spending units older than 64

years, and e) other non-farm--all employed spending units not otherwise classified, mostly skilled, unskilled, clerical and sales workers. The unemployed were classified as either a) retired, b) headed by an unemployed housewife, or c) involuntarily unemployed.

Education attained by the head of the spending unit was divided, wherever possible, into three categories: college, high school, and grade school or less. In some cases it was necessary, for maintaining adequate cell frequencies, to combine either the two higher or the two lower categories. In other cases no educational distinction could be made.

Five location categories were used, representing a combination of regional and community size distinctions. They are a) metropolitan, b) urban south, c) urban north, d) rural south, and e) rural north.^{1/} In some cases cruder distinctions were necessary.

^{1/} Following the Survey definitions, south here includes the South Atlantic, and the East-and West-South-Central census regions. The Survey recognizes the 12 largest cities as metropolitan areas; all other cities and town that have populations greater than 2500 are urban areas; the smaller towns and open country are designated rural.

The age interval from 18 to 64 (65 and older are in a special category) was divided into five brackets: 18-24, 24-34, 35-44, 45-54, and 55-64. The two youngest age brackets were combined where the 18-24 group was too small to work with.

Finally, two race classes were recognized, white and non-white.

The Within-Group Saving Function

The ex post saving function, [5], was modified slightly for the statistical analysis. First, liquid asset holdings (L), as mentioned above, are used in lieu of a better indicator of net worth. Replace, on this account, $\gamma_1 A$ in [5] by $\gamma_1' L$.

Second, the analysis is obliged, by its use of a merged sample, to make the observations comparable between years. One of the measures taken for this purpose was the conversion of S, Y and A to "real" values in terms of the consumer price index (p_t). Finally, previous studies have found that the error variance ($E(u^2)$) for equations like [5] is heteroscedastic and related to income.^{1/} The heteroscedasticity

^{1/} The heteroscedasticity mentioned above is common in cross-section studies of saving behavior. The phenomenon and various measures for reducing its effect on least-squares estimators are discussed in: L. R. Klein and J. N. Morgan, "Results of Alternative Statistical Treatment of Sample Survey Data," Journal of the American Statistical Association, Vol. XLVI (December, 1951), pp. 442-460.

can be reduced, and the efficiency of least-squares estimators thereby improved, by dividing all variables by Y. Incorporating all the modifications, [5] can be rewritten:

$$[6] \quad S/Y = \alpha_1 - \beta_1 p_t/Y - \gamma_1 L/Y + u'',$$

$$\text{where } u'' = u' p_t/Y$$

Factors Acting Across Groups

The effect on saving of the different years represented in the sample is partly allowed for by the use of p_t in [6]. Price change, however, is not the only year-to-year change in the variables relevant to saving decisions. Interest rates, aggregate income, and, for the fiscal years 1947-50 covered by the data, availabilities of consumer goods change also. To allow for these factors, and for whatever else may change from year to year, three "dummy" variables were introduced; x_j , $j = 1, 2, 3$. The coefficient of x_1 , δ_1 , measures the net effect on S/Y of all changes in exogenous variables between 1947 and 1948; δ_2 -- the effective difference between 1947 and 1949; etc. The δ 's are the same for all spending units regardless of group.

Spending unit size was also handled through the use of "dummy" variables. An advantage of the "dummy" variable technique in this case is the freedom it allows in the shape of the relationship between spending unit size and saving. No restrictions are placed on the marginal effect on S/Y of additional members of the spending unit. Four variables are used for this purpose: x_j , $j = 4, 5, 6, 7$. δ_4 measures the net effect on S/Y of one child under 18, δ_5 --the effect of two children, δ_6 --the effect of three or more children, and δ_7 --the effect of being married. As above, the δ 's are the same for all spending units.

In summary, the model assumed for controlling year, and spending unit size effect can be written (assuming given values for all the variables in the right-hand side of [6]):

$$[7] \quad S/Y = \sum_{j=1}^7 \delta_j x_j .$$

Where $x_1 = 1$ only for spending units from the '49 survey,

$x_2 = 1$ only for spending units from the '50 survey,

$x_3 = 1$ only for spending units from the '51 survey,

$x_4 = 1$ only for spending units with one child under 18 years,

$x_5 = 1$ only for spending units with two children,

$x_6 = 1$ only for spending units with three or more children,

and $x_7 = 1$ only for spending units whose head is married and living with the spouse.

All $x_j = 0$ except as noted above.

$$\text{Also, } \sum_{j=1}^3 x_j \leq 1, \quad \sum_{j=4}^6 x_j \leq 1, \quad \text{and } x_7 \leq 1,$$

for any one observation.

The Regression Equation

The parameters of [6] for the 187 homogeneous groups and the parameters of [7] were estimated simultaneously. The equation fitted to the whole sample can be expressed:

$$[8] \quad S/Y = \sum_{i=1}^{187} z_i (\alpha_i - \beta_1 p_t/Y - \gamma_1' L/Y) + \sum_{j=1}^7 \delta_j x_j + u^*$$

where $z_i = 1$ only for spending units in group i ,

$z_i = 0$ otherwise,

$\sum_{i=1}^{187} z_i = 1$ for any observation in the sample,

and u^* = a stochastic variable with zero mean and finite variance σ_u^2 .

The 568 parameters in [8] were estimated by the method of least-squares. The solution of the 568 linear equations needed for least-squares estimation was feasible only because of the special nature of the problem.

One shortcoming of the estimation procedure used here is that it did not yield the error of estimate for each individual parameter. The absence of error terms is an inconvenience for direct comparison of particular pairs of groups but it is felt that the advantages of the formulation in [8] outweigh the inconvenience. An alternative formulation which would yield the errors would somehow have to take account of spending unit size and year effect separately for each group. Such a procedure would either use up too many valuable degrees of freedom or make drastic linear assumptions about the relationships involved.

Not all significance tests are ruled out however; the more important ones, which evaluate the joint significance of subsets of coefficients, can be, and are, made. The differences in saving functions among, say, age groups have the same saving function; inter-group differences in, say, α_1 can be tested for significance; etc.

The weights assigned by the Survey Research Center were used for the regression calculations.^{1/} The justification for using weights in this case is not based

^{1/} The Survey's weights are based on differential sampling and response rates in various strata of the population. The stratification criteria are chosen to allow over-sampling of high-income spending units.

on the "efficiency" argument that the use of weights reduces heteroscedasticity. As noted above, this problem has been met by dividing the equation through by income. The justification for use of the sampling weights is rather that some other variable, not directly considered in the analysis, may bias the findings if the sample is not "representative" of the underlying population. This argument clearly loses force in proportion to one's confidence in his specification of the behavior model. Even with a high degree of confidence, however, the use of weights may be a wise precautionary measure.^{2/}

^{2/} The pros and cons of weighting are discussed in: L. R. Klein and J. N. Morgan, *op. cit.*

The estimates of the parameters in [8] and the tests of their significance

provide the evidence to be used in the analysis to follow.^{1/}

^{1/} The parameter estimates cannot be listed in their entirety but they can be obtained by interested parties on request to the author. Additional details on the estimation procedures and computing methods can also be made available. Write to Harold W. Watts, c/o Cowles Foundation for Research in Economics, Box 2125 Yale Station, New Haven, Conn.

4. Evaluation of the Evidence

There are two questions for the data to answer. First, is saving behavior (as measured by [6]) significantly different among the groups of the manifold classification? Second, do the differences, if significant, lend support to the expected income hypothesis? The analysis of variance is applied to extract an answer to the first question; informal inspection, for want of a better technique, is used for the second.

Inter-group Significance Tests

Allow, for the moment, the assumption that inter-group differences are reflected in all three "group" parameters of [8], α_i , β_i , and γ_i , and that the δ_j are not zero. On these assumptions the significance of the demographic variables that were used as classification criteria can be examined. Analysis of variance tests, in this case, the significance of the differences in "group" parameters associated with one or more of the demographic variables. The sums of squares needed for this analysis were obtained by fitting to the data equations of the form of [8] but using groups obtained by collapsing on one or more of the classification criteria.

Table 1 shows the results of the tests made on the demographic variables. Strictly marginal tests were made for age, education and the regional part of the location variable.^{2/} The whole location variable was tested given the effects of age,

^{2/} The regional distinction was separately tested because preliminary analysis suggested that it was the least important of the demographic variables.

Table I

SIGNIFICANCE TESTS ON THE DEMOGRAPHIC VARIABLES

Demographic variables		Sum of Squares		Degrees of freedom		F-Ratios	
added	given	explained	unexplained	used (m)	remaining (n)	F(m,n)	F _{.05} (m,n)
none	none	-	243.691	-	7973	-	-
Age	none	6.326	237.365	15	7958	14.14	1.67
Occupation and Race	Age	12.276	225.089	90	7868	4.77	1.28
Location	Occupation, Race, and Age	13.193	211.896	222	7646	2.14	1.19
Education	all others	13.936	197.960	231	7415	2.26	1.19
Age	all others	22.839	197.960	393	7415	2.18	1.16
Region	all others	10.753	197.960	195	7415	2.07	1.20
All	none	45.731	197.960	558	7415	3.07	1.13

occupation and race; occupation and race, in turn, were tested given the effects of age only. The F-ratio in each case was well above the critical value of F for a .05 level of significance ($F_{.05}$). There are, in other words, significant differences in saving behavior, as measured by α_1 , β_1 , and γ_1' associated with the demographic variables which define the homogeneous groups.

The temporary assumption that all three "group" parameters are related to the demographic variables must also be examined. Do inter-group differences in α_1 and β_1 , for example, account for most of the significance shown in Table 1, while γ_1' is nearly the same for all groups? The results of the tests on the three "group" parameters (Table 2) indicate that each of the parameters varies significantly between groups. Again, the tests were marginal; they ask whether, given inter-group differences in two parameters, there are significant inter-group differences in two parameters, there are significant inter-group differences in the third. The sums of squares for this purpose were obtained from regressions that did not include the x_j variables.

The tests made do not necessarily indicate that there are significant differences between each and every pair of parameters. The logical structure of the tests allow, at most, the assertion that the parameters are not the same for all groups. A few large differences can, in the variance analysis, compensate for a number of small, possibly insignificant, ones. The tests that examine specific differences have not been performed, primarily because of the magnitude of the computations required for such tests. The analysis shown argues that the differences found in the sample are, on the "average," significant.

Table 2
SIGNIFICANCE TESTS ON INTER-GROUP DIFFERENCES
IN INDIVIDUAL PARAMETERS

<u>parameter</u>	<u>sum of squares explained</u>	<u>degrees of freedom</u>	<u>F-Ratio*</u>
α_1	40.979	186	8.23
β_1	15.505	186	3.12
γ_1'	17.164	186	3.45

* Mean square for denominator of F is .026745 (7422 d. f.).
The critical value of F (186,7422) for .05 significance is 1.19.

This "averaging" aspect of the F-Ratio method admits the possibility that a few "odd," or extreme, observations^{1/} are distorting all the tests. Although

^{1/} A few "outlying" observations were omitted for the sample prior to analysis. It was recognized, however, that rejection criteria based on a univariate distribution are essentially unsatisfactory when the hypothesis is multivariate. The crude criteria that were used for the initial omissions certainly do not eliminate concern about the effects of "contamination" in the sample.

it is difficult to locate extreme observations in the sample, it is possible to obtain some indication of the possible extent of the distortion. An extreme observation will produce misleading results if it is classified in a group that is so small (and so distributed in the independent variables) that the extreme observation can dominate the relationship fitted in that group. If the fitted

relationship is dominated by an extreme observation, however, one or more of the parameter estimates will usually be extreme also, providing a rough basis for isolating "suspect" groups. Examination of the "explained" variation of "suspect" groups will show whether they have contributed disproportionately to the measure of "average" significance.

The groups for which the estimated marginal propensity to save (α_i^*) was either greater than .75 or less than .10 were considered "suspect." The explanation per degree of freedom used in these groups (mean square) was smaller than for the remaining, non-extreme groups.^{1/} If the distortion due to extreme observations were

^{1/} Specifically, the mean square of explained variation was .0884 for the suspect groups and .1180 for the other, where the total variance to be explained is the variance around the over-all mean. If the variance around group means is used as a base, the comparable mean squares are .0935 and .1407 respectively. Similar results were found when groups with α_i^* between zero and .10 were removed from the "suspect" class.

producing grossly misleading results, the mean square of "explanation" in the suspect groups would have been quite large relative to the mean squares for the non-extreme groups.

Significance of the "Across-Group" Variables

Seven parameters, the δ_j , were estimated to allow for the additive effect of year and spending unit size. Although the error terms for individual estimates were computed (and will be listed subsequently), a test of the collective significance of the δ_j was carried out. The hypothesis that $\delta_j = 0, j = 1, 2, \dots, 7$ was rejected at the .01 level, i.e., the variables x_j , or at least some of them, affect the saving decisions of spending units.

The reduction of the sum of squares by the introduction of the x_j , while significant, was disappointingly small. Of a total sum of squared deviations from the over-all mean equal to 259.407, 60.309 was explained without the use of the x_j . The marginal reduction on the introduction of these variables was only .538. This does not imply that the comparability of the within-group parameters was only slightly improved by the elaborate scheme for holding year and spending unit size "constant." It does suggest that the systematic effect of these variables does not exert a powerful influence on the saving behavior of individual spending units. An alternative explanation is simply that the assumption of uniform δ_j 's for all groups is unrealistic.

Preliminary Interpretation of the Results

The tests in Table 1 point out the inadequacy of a very naive version of the absolute income hypothesis--that saving (or consumption) is a simple, linear function of current income. This hypothesis implies that inter-group differences in mean saving arise only from differences in income distribution; that if the over-all effect of income is allowed for, there are no differences in mean saving among the groups. The evidence in Table 1 rejects this hypothesis; even if income were identically distributed in each group, saving would be different because saving functions are different.

Perhaps this reading of the absolute income hypothesis is over-simplified. The fact that mean income is different between the groups suggests the possibility that the differences in saving functions merely reflect different approximations of a curvilinear over-all saving function. Or, the within-group functions may show only the effect of "relative" income on saving; mean saving for a group being a linear, or curvilinear, function of the group's mean income. The demographic variables,

on the latter interpretation, define "reference groups," within which the mean consumption level possesses normative significance.^{1/}

^{1/} The model can be formalized as:

$$C_i^n = F(\bar{Y}_i) = \bar{C}_i$$

$$C = C_i^n + G_i(Y - \bar{Y}_i) \text{ for members of the } i\text{th reference group,}$$

where $C_i^n = \bar{C}_i$ = the "preferred," and also the mean, consumption level in the i th group,

and \bar{Y}_i = mean income in the i th group.

The function F here determines the relation between group means; G_i pertains only to the affect of income deviations from the mean for the group. _{i}

The relative income hypothesis does admit inter-group differences in the level of the saving function, but it is not clear that the slopes should necessarily be different. If consumption norms are "equally" influential in all groups, then the marginal, within-group, effect of current income on saving should be the same for all groups.^{2/} The tests in Table 2, however, indicate that the most

^{2/} In terms of the model given in footnote 1, p. 27, this means that $G_i = G_j = G$ for all i and j .

significant inter-group differences are, precisely, differences in the marginal effect of income on saving.

Quite apart from the within-group functions, mean saving in the homogeneous groups would, on either the absolute income or relative income hypothesis, be closely related to mean income in the groups. Figures 1 and 2 present "adjusted"

Figure 1

"Adjusted" Saving-Income Ratios and Mean Income for
Self-Employed Groups

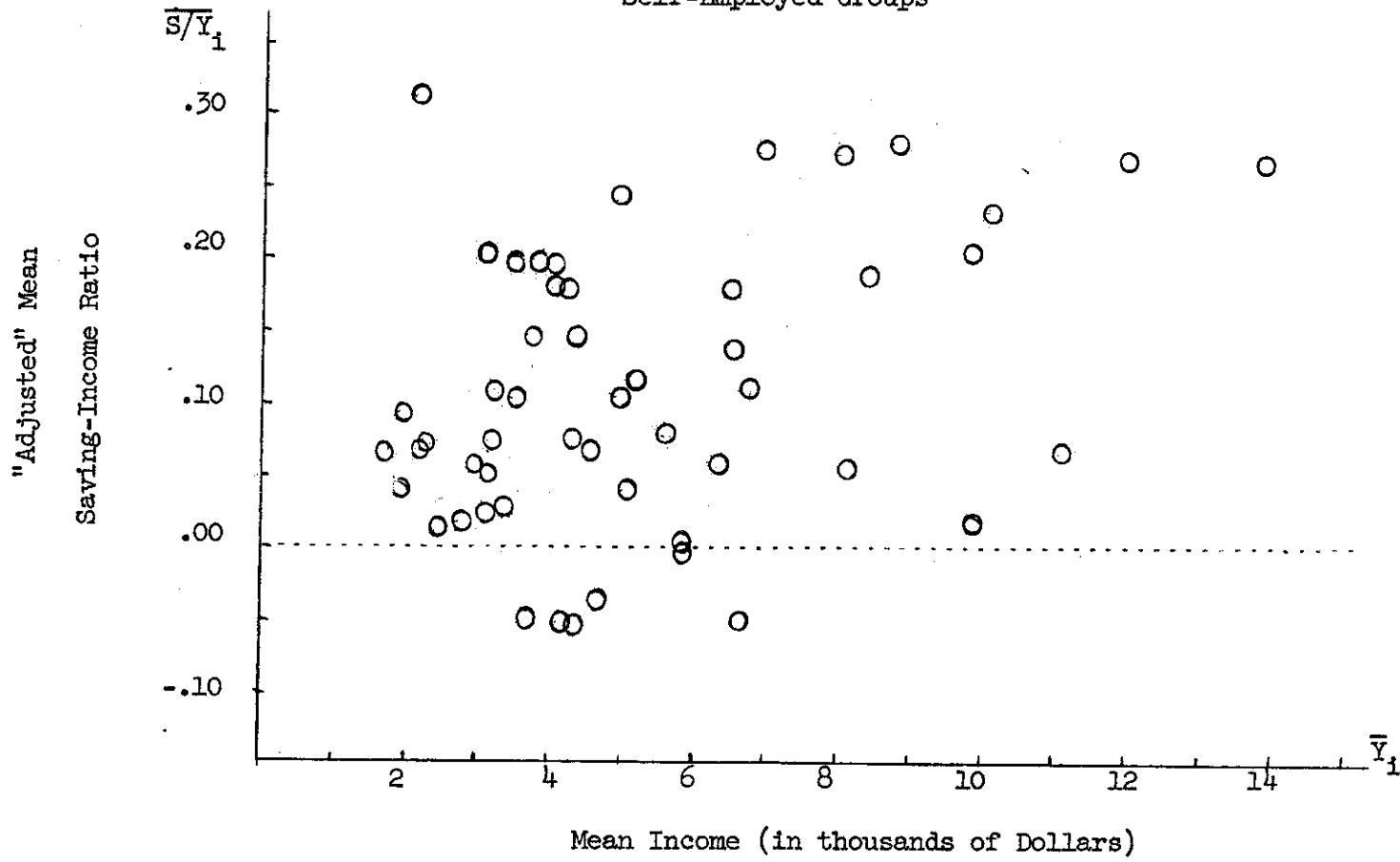
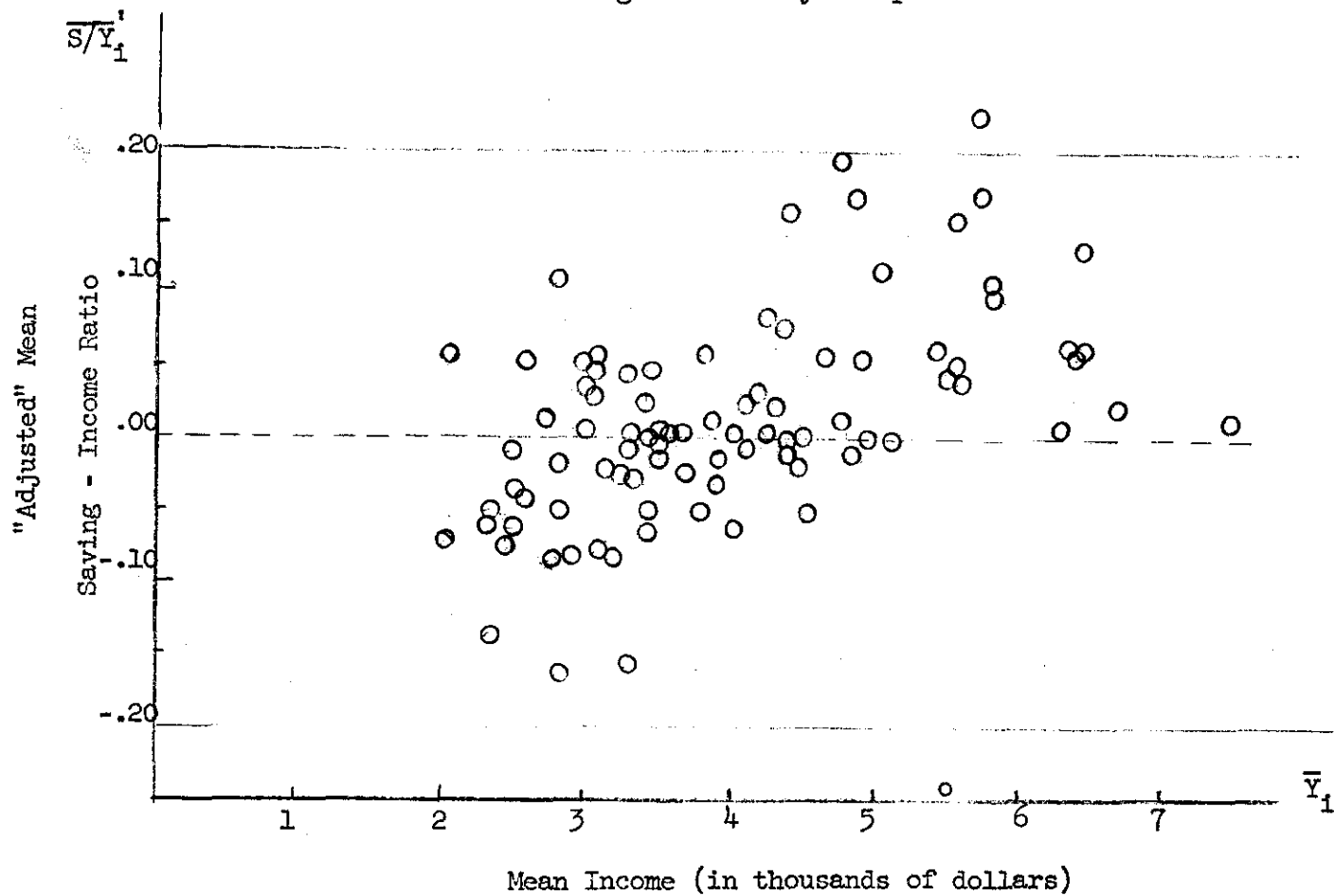


Figure 2

"Adjusted" Saving-Income Ratios and Mean Income for
Wage-and-Salary Groups



mean saving income ratios (\bar{S}/\bar{Y}_i) for groups plotted against mean group income (\bar{Y}_i).^{1/} The means for the white, employed groups are plotted in two diagrams:

^{1/} The mean saving: income ratios plotted in figures 1 and 2 are "adjusted" to allow for spending unit size and year effects; they are estimates of the α_i in [8] where the β_i and γ_i are constrained to zero.

one for the self-employed, or proprietary, groups (farmers and business owners), and one for the "wage-and-salary" groups (professional and other non-farm). The diagrams certainly do not display a "close" relationship between the group means. The scatter for the self-employed groups shows no systematic tendency; the means for the wage-and-salary groups do show a slight correlation, but they certainly do not justify the conclusion that current income is the only variable affecting the saving ratios in the homogeneous groups.

Finally, Figures 3 and 4 show the estimated marginal propensities to consume (α_i^*) plotted against \bar{Y}_i for the same, white employed groups that were used in the first two figures. If the within-group saving functions represented no more than approximations to a curvilinear over-all saving function, there should be some positive correlation between α_i^* and \bar{Y}_i . The scatters show no strong correlation of that type; indeed, for the self-employed, the very loose correlation seems to be negative.

The preliminary survey of the results suggests that the observed inter-group differences in saving behavior cannot be adequately explained by relatively simple hypotheses that rely principally on current income as the independent variable. Can the expected income hypothesis turn in a better performance? Do the demographic variables, used as classification criteria, isolate saving behavior that is most reasonably interpreted in terms of long-run income expectations? For these answers the estimated relationships must be examined in more detail.

Figure 3

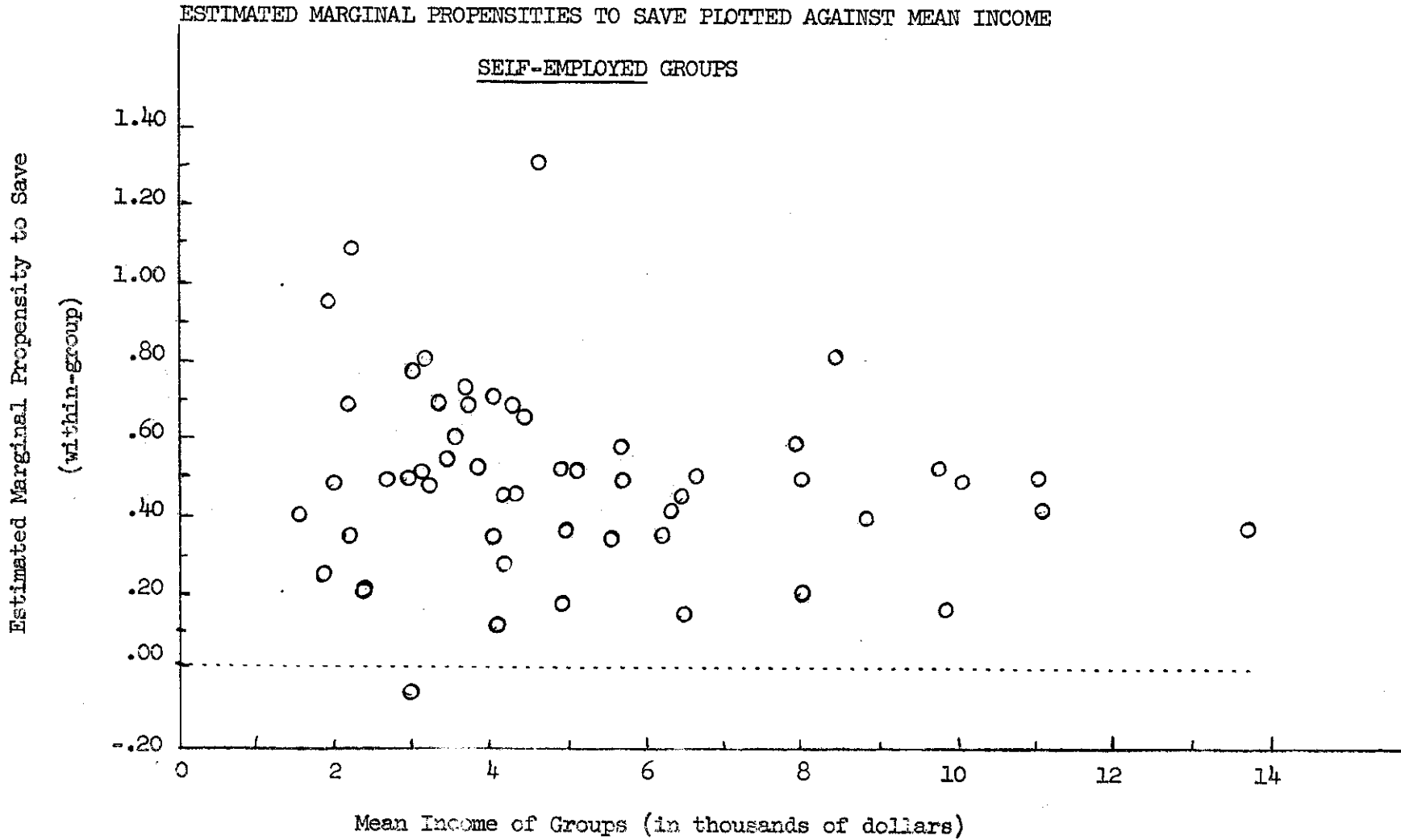
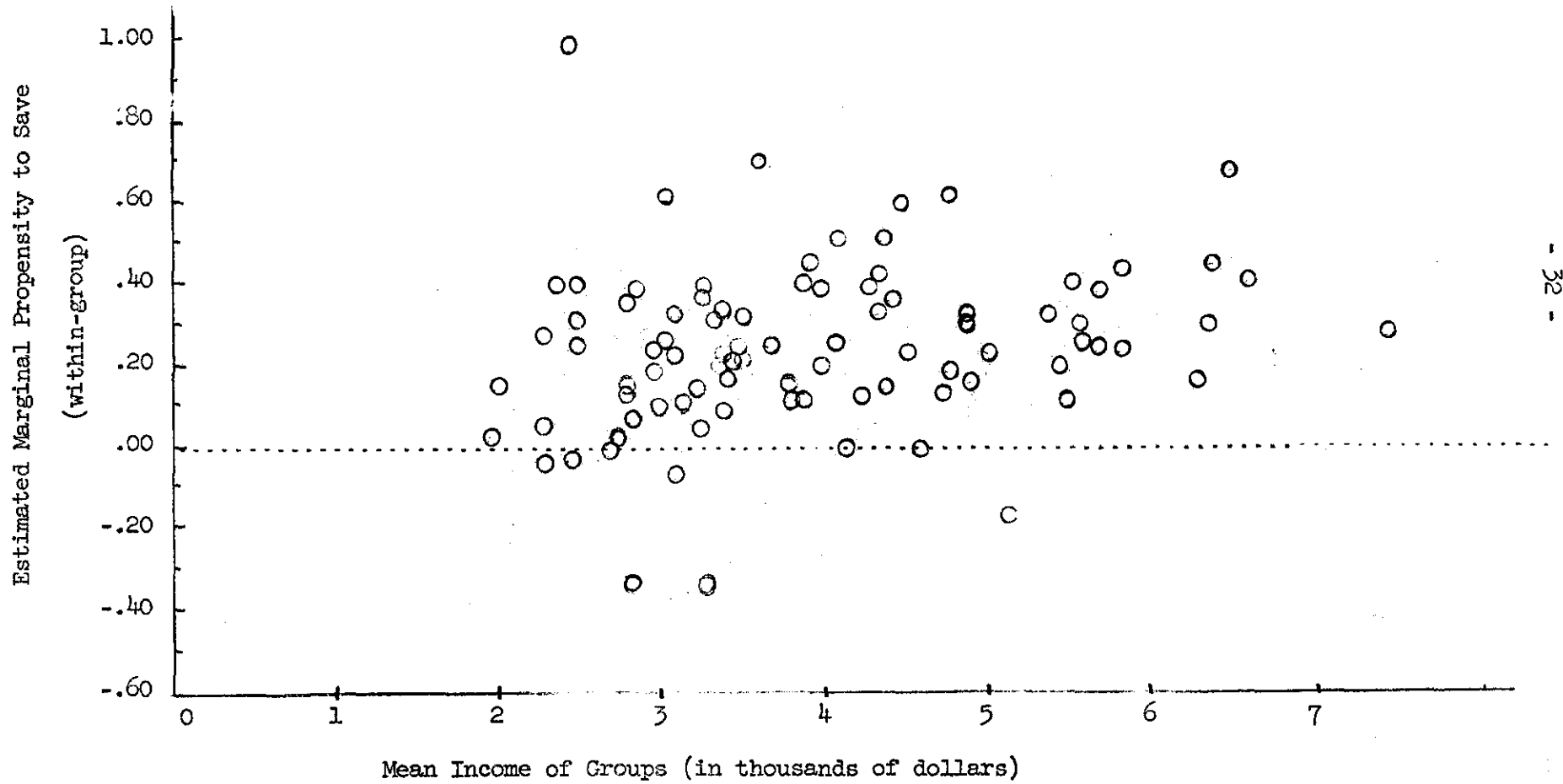


Figure 4

ESTIMATED MARGINAL PROPENSITIES TO SAVE PLOTTED AGAINST MEAN INCOME

WAGE-AND-SALARY GROUPS



Analysis of the Saving Behavior of Young Spending Units

The divergence between current and expected income should be most pronounced in the early part of the life-cycle. Since the technique used here for detecting the influence of income expectations depends heavily upon that divergence, the data pertaining to groups of relatively young spending units must carry a large portion of the argument. It is assumed that the cross-section income profile is an indicator of the expectations of young spending units. The "relative" income profile for groups of young spending units is roughly described by the mean incomes of the groups that differ from it only in age. It is clear that the actual course of income over time for any spending unit or group will be quite different from the cross-section profile, primarily because of secular change in income per spending unit. The extent to which income expectations take account of secular change is unknown, but, for purposes of comparing groups of the same age, it is sufficient that the cross-section profiles provide valid information about the relative shapes and levels of the "time-series" profiles.

From the estimated parameters of [8] a simple characterization of saving behavior in each group can be derived. Set $x_j = 0$ for all j and $p_t = 1$; let L/Y be held constant at the mean value of L/Y for the i th group (\bar{L}/\bar{Y}_i); for the i th group, the non-random part of the saving function (on multiplication by Y) becomes:

$$[9] \quad S = (\alpha_i^* - \gamma_i^* \bar{L}/\bar{Y}_i) Y - \beta_i^* = S_i^*(Y)$$

(asterisk denotes estimated values).

This simple relation provides a convenient basis for comparing the saving behavior of groups in the same age bracket. Other assumptions about the x_j could, of course, be used, but they would result in no more than an equal change in the slope of $S_i^*(Y)$

for each of the groups. The coefficient of Y in $S_1^*(Y)$ is not a "marginal propensity to save" in the partial derivative sense. It is rather a total derivative on the assumption that spending units in the same group maintain liquid assets equal to a constant proportion of their income.

Needless to say, all of the possible comparisons among the 56 "young" (under 35) groups cannot be made; comparisons are roughly limited to those between groups that have markedly different income profiles but are identical in all but one of the demographic variables.

The white, metropolitan business owners were split into two groups on the basis of education. The income profile for the college-educated group (#210) rises very rapidly compared with the profile for the high-school-or-less group (#250), although mean spending unit income is, by coincidence, equal in the two groups ($Y_{210} = Y_{250} = \$5725$). The estimated saving functions are not the same, however:

$$\begin{aligned} S_{210}^*(Y) &= .444 Y - 1736, \\ \text{and} \quad S_{250}^*(Y) &= .357 Y - 945. \end{aligned}$$

According to the estimates, given any income less than \$9092, a "college" spending unit will save less than a "non-college" one.

A similar comparison is possible for business owners in urban north locations. By the cross-section evidence the contrast in income profiles is not as sharp as in the metropolitan case but the difference in saving behavior is more pronounced. The estimates are, for college and non-college respectively:

$$S_{230}^*(Y) = .381Y - 1016, \quad \bar{Y}_{230} = \$6677,$$

$$S_{270}^*(Y) = .577Y - 1350, \quad \bar{Y}_{270} = \$4444.$$

In this instance the "college" spending units appear to save less than "non-college" ones from incomes above \$1704, which includes the "reliable" domains of the two functions.^{1/}

^{1/} The "reliable" domain of an estimated saving function is taken to include one standard deviation on either side of the mean income for the group in question.

Examination of the other inter-education comparisons for other business owners discloses the same kind of behavior. The high-education spending units appear to save less from a given income than the low-education ones. For professional spending units the metropolitan and urban north groups (#110--120 and #140--150) afford the only inter-education comparisons. The results of the urban north comparison conform to the pattern set by the business owners, those for the metropolitan comparison do not.

Farmers (aged 25-34) also conform to the "high education--low saving" pattern over the relevant range of income. In this case, however, the effect of education on the income profile seems to be confined to the level, as opposed to the shape, of the profile. Farmers between 18 and 24 years of age were treated separately, but the groups were too small to yield valid comparisons.

The evidence provided by inter-education comparisons among the "other-non-farm" groups is somewhat mixed. The comparisons are hampered by the use of a different age classification for the "college" groups. The high-school vs. grade-school comparisons for the metropolitan and north groups follow the "high education--low saving" pattern, the south groups do not. These comparisons are of dubious value, however, because the income profiles are insufficiently divergent; there may well be a difference in expectations, even in the south, but the detection device is far too insensitive to expose them.

For the non-white, urban north, non-farm groups (#910 and #930) the comparison shows the relatively high saving in the high education group. But, while the levels of the cross-section income profiles are quite different for the two groups, they are both very flat--implying that there is little opportunity for postponing saving until a later, high-income, part of the life cycle. The same may be true for the "other-non-farm" whites, who also have fairly flat profiles.

The "education" comparisons have found several instances where relatively high education and relatively high income profiles are associated with relatively low saving in the young age brackets. Are there any strong reasons for expecting that result apart from income expectations? The hypothesis stated earlier implies rather the opposite result--that relatively high education increases the propensity to save by lowering the "psychological discount" on anticipated future desires.

Regional (north-south) comparisons among the young spending units, using the cross-section income profile as a guide, do not bring out any consistent "income anticipating" behavior. The observed differences in saving behavior may be significant but they do not conform to simple hypotheses that use either current income or expectations via the income profile. The explanation of the differences by region may lie well outside the field of economics. Differences in cultural values between north and south, particularly those which concern family relationships, may effect saving behavior. It is clear that if the prevalence of inter-generation wealth transfers differs by region, or if such transfers are received mostly by the very young in, say, the north, and mostly by the very old in the south; then the regional comparisons of saving behavior are of limited value as evidence for or against the expected income hypothesis. The importance of holding the regional variable

constant while making the other comparisons is emphasized by the difficulty of explaining regional differences in saving behavior.

The comparison of saving by community size does provide some evidence that is favorable to the expected income hypothesis. The comparison least subject to sampling error, because of large cell frequencies, is for the "other-non-farm" whites with high school educations who live in the north or metropolitan areas^{1/}

^{1/} Washington and Baltimore are the only metropolitan areas which are also in the South by Survey definitions. Those cities are probably "close" enough to the North to permit direct comparison between the metropolitan and "north" groups.

(#511, 2; #531, 2; #551, 2). The cross-section income profiles are both higher and steeper in the larger communities; S_1^* (\$3000) for the 18-24 age groups is uniformly smaller for the larger communities. For the next (25-34) age groups $S_1^*(Y)$ over the interval \$3000 to \$4000 is lower in the urban north than in the rural north, and lower still in the metropolitan areas.

The evidence from "community size" comparisons is equivocal to some extent. Perhaps urban spending units, relative to rural ones, give greater weight to immediate consumption as opposed to consumption in the future, quite apart from possibly different expectations. If so, however, it seems to be peculiarity of the young spending units; in the groups referred to above the observed relationship between community size and $S_1^*(Y)$ becomes weaker with age and is finally reversed in the oldest age groups.

The expected income hypothesis has been able to account for some of the observed differences in saving behavior among the young spending units. It seems to be most useful for explaining "education" and "community size" saving differentials. Even there, of course, the agreement between data and theory is far from complete. But,

aside from the possible inadequacy of the theory, allowance for sampling errors in the estimates mitigates some of the inconsistencies.

Inter-age Comparisons of Saving Behavior

If secular increases in income per spending unit are anticipated, older spending units, other things equal, should save more from a given level of current income than younger ones. Further, this age effect should be more pronounced where a relatively steep income profile is superimposed on the secular pattern. Before the evidence relevant to the age effect is reviewed, two qualifications are in order. The first pertains to life-cycle variations in consumption. Some of the variation may be taken into account by the "family-size" variables, but, as mentioned before, the technique is not adapted to allow for varying age composition in the spending unit. The second merely reflects a basic weakness of cross-section data as a means of discovering or verifying "age" relationships. The experience of a "generation," or cohort, is, partially at least, unique; it differs from that of other generations in the events it includes as well as in the timing of these events relative to the life cycle. Direct generalization from cross-section data, however, depends on a ceteris paribus assumption about the experience of different cohorts. In this particular instance, the fact that the data were obtained shortly after World War II compels more than usual skepticism about that assumption. Undoubtedly, the war had a different effect on the financial position of spending units of different ages; it is likely that these effects will be reflected in saving behavior in the years following the war.

In general, there is an observed tendency for older spending units to save more than younger ones from a given level of income (within the "reliable" domains of the functions). The tendency does not show outstanding consistency. But, as

before, sampling errors can explain some non-conformity, and the additional qualifications outlined above explain some of the more persistent deviations. Figure 5 shows estimated saving function, $S_1^*(Y)$ for the four older groups of "other-non-farm" whites with high school educations and living in metropolitan areas (#512,3,4,5)--one of the more consistent examples of the age effect. Figure 6 (data from groups #430,3,4,5) displays a common inconsistency, relatively low saving in the 45-54 age group. Both of the qualifications permit a partial relationalization of the "slump" in that age bracket. First, the slump seems to be most pronounced in the "college educated" or relatively high income groups where costs of providing college education for children, if incompletely allowed for by the "family size" coefficients, may be expected to reduce saving. Second, a majority of the heads of spending units who were between 45 and 54 in the Survey years 1947-50 spent the war years in civilian employment--at relatively high incomes and with limited opportunity for current consumption. More of the younger male heads of spending units participated actively in the armed forces and, on generally lower incomes, had less opportunity to build up assets during the war. This consideration supplements education expenses in providing an explanation for the low saving in the 45-54 age groups.

Analysis of the Parameter Estimates

Within each homogeneous group three parameters were estimated to describe the saving behavior of that group: α_1^* , the estimated marginal propensity to save from current income; $-\beta_1^*$, the "constant term" of the linear saving function; and $-\gamma_1^*$, the liquid asset coefficient. A thorough analysis of the estimates is not attempted in this study. The absence of error terms for the individual

Figure 5

SAVING FUNCTIONS BY AGE

OTHER-NON-FARM, METROPOLITAN, HIGH SCHOOL

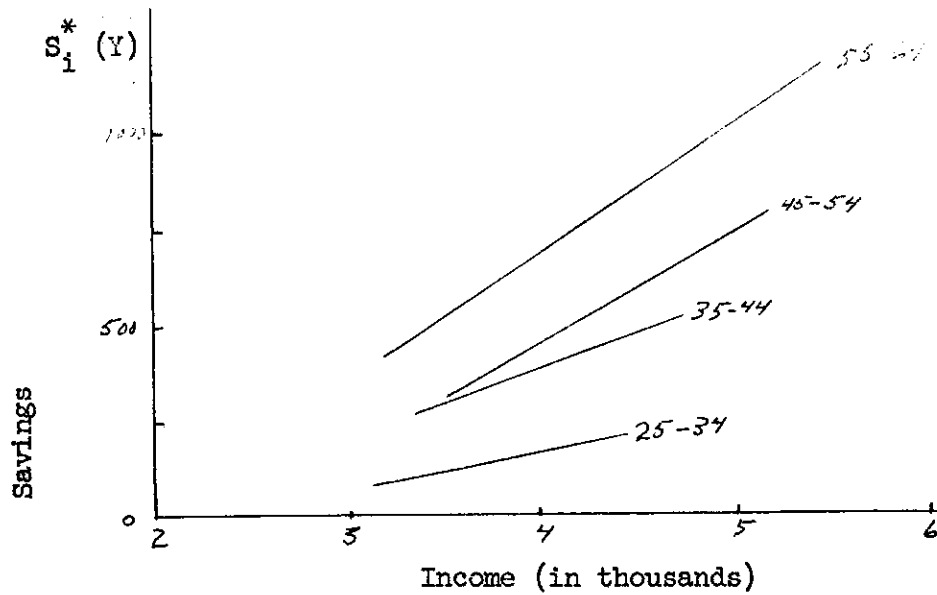
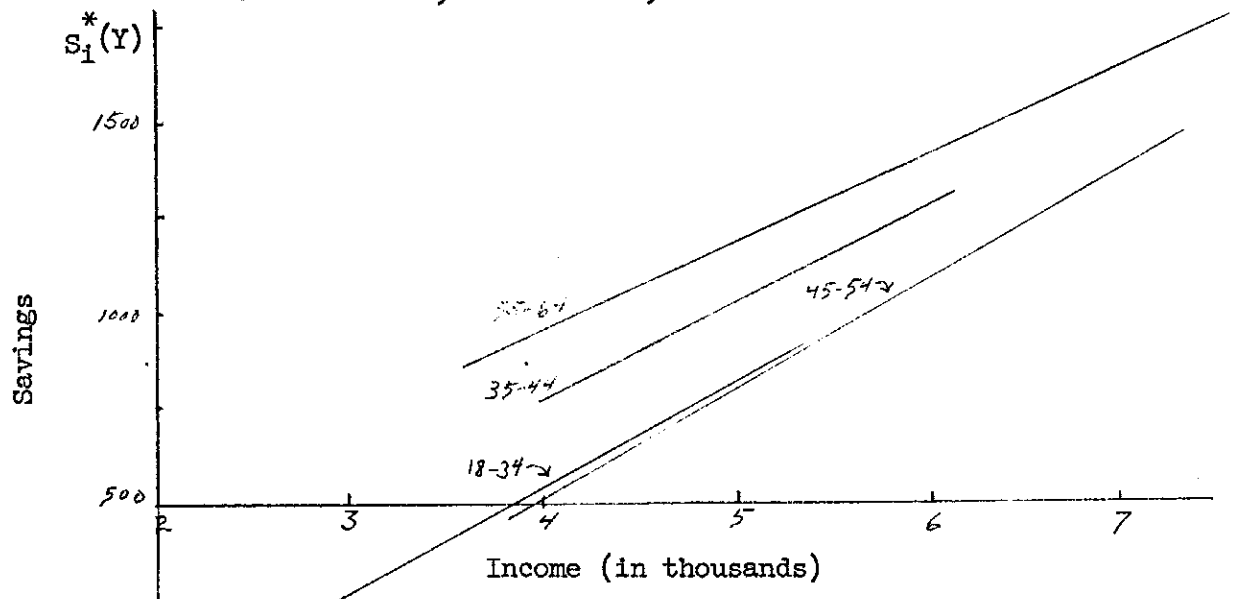


Figure 6

SAVING FUNCTIONS BY AGE

OTHER NON-FARM, URBAN NORTH, COLLEGE



estimates is a more serious handicap for an analysis of the separate parameter estimates than it is for analysis of "predicted" saving, $S_1^*(Y^0)$, which depends on all three estimated parameters. Some device for overcoming that handicap is a pre-requisite for an exhaustive analysis of the observed inter-group differences in the separate parameter estimates.

A few general remarks can be made, however. α_1^* , the estimated marginal propensity to save, is an estimate of a composite coefficient, according to the theory in Section 2. The value of α_1 depends on the sensitivity of expectations (E) to current income change (income differentials in a cross section)-- e_1 , and the marginal propensity to consume expected income-- c_1 . Specifically, the definition of α_1 is $(1 - e_1 c_1)$. As Figures 3 and 4 attest, there is a wide variety in the estimated values of α_1 ; some are negative and two are greater than one. The latter extreme implies that either e_1 or c_1 is negative--a nonsense result in terms of the theory but a rare enough occurrence to be attributable to sampling error. Negative values of α_1^* occur more frequently; they, and also the very small positive values of α_1^* , imply e_1 greater than one, i.e., spending units in those groups take current income changes (or cross-section differentials) as indication of further change (or wider differentials) in the future. This is not unreasonable in terms of the theory. It is interesting that in 6 of the 14 groups of 18 to 24 year-olds, δ_1^* is smaller than .10. The same is true for 13 of the 56 groups in the under-35 age brackets--23% compared with 13% for the over-35 groups (excepting the retired, semi-retired, and housewives). If this extreme form of extrapolation is indulged in, it is most likely to be done by the younger spending units.

Another impression from Figures 3 and 4 is that α_1^* is generally higher for business owners and farmers than for the "wage and salary" workers. This suggests that either c_1 or e_1 is relatively low in the self-employed groups. Savings, in these groups, includes business saving to some extent; that fact, by lowering c_1 , may account for the observed difference in α_1^* . On the other hand, incomes of members of the self-employed groups are relatively unstable from year to year - such instability, if recognized by spending units as a short-run phenomena, will imply smaller values of e_1 for those groups.

The estimated coefficients for liquid asset holdings are also of some interest. Liquid asset holdings were included in the regression as a proxy variable for net worth. In Section 2 it was noted that, for a cross-section, the presumed negative effect of net worth on saving may be obscured by "personality correlations". The estimates of $-\gamma_1'$ suggest that such correlations may be a substantial problem. In 63 of the 187 groups $-\gamma_1'^*$ was greater than zero. On closer examination, positive coefficients are found almost twice as frequently in the groups of spending units between 35 and 64 years of age than in the younger groups. This is certainly consistent with the "personality correlation" hypothesis; the older spending units who are unusually "thrifty" will have relatively high assets - the younger ones, who are equally thrifty, will not, because they have had less time to accumulate them.

Spending Unit Size and Saving

So far the discussion has been limited to the parameter estimates for the "within-group" savings function. The statistical model, however, included four parameters, the δ_j , $j = 4, 5, 6, 7$, for controlling the effects of family size on saving. Three "dummy variables" were used to allow for the number of children and one for marital status. "Dummy variables" were chosen to avoid restrictive linear assumptions about the effects of family size on saving behavior; the results, which are shown in Table 3, seem to justify some skepticism about such assumptions. The non-linearity of the effect of children on saving is striking. The coefficients of the "children" variables are to be interpreted as differences from the saving-income ratio that would be predicted for families with no children under 18. Note that for families with three or more children, the coefficient is not significantly different from zero; for families with one or two children, the coefficients are significant and negative. In other words, the data show families with three or more children saving almost as much, from a given income, as families with no children. The smaller, one or two child families save less than the childless ones.

There are two ways of rationalizing the high saving of the larger families. The first assumes that couples who have one or two

Table 3

FAMILY SIZE COEFFICIENTS

Coefficient for:	one child	two children	three or more	marital status
Parameter:	δ_4	δ_5	δ_6	δ_7
Estimated Value:	-.0190	-.0264	-.0089	-.0203
Error Term:	.0102	.0114	.0121	.0142

children are the same in other respects as couples who have three or more. In this case children are simply an event that "happens" to families without any prior decision on their part. On that assumption the observed saving behavior must be explained in terms of the income elasticities of present and future consumption of both parents and children. The addition of a child adds to the "needs" of the spending unit in future periods as well as the present and it may be indeed that the future "needs" are both larger and less elastic than present ones. A piling up of the inelastic future consumption requirements could, for families with three or more children, cause a very sharp retrenchment in current expenditures.

On the other hand, many spending units do control the number of children, deciding with some realization of the consequences. Perhaps utility theory can be applied, making children an economic good to be weighed against the alternative of a grand tour of Europe or, more likely, a continuation of current living standards. If parents of three or more children can, by this reasoning, be presumed to have quite different

tastes and preference scales, the observed difference in saving behavior is much less surprising.

The coefficient for the marital status variable, δ_7^* , is not significant at the .05 level (one-tailed test). Spending units that contain at least two adults do not, by this evidence, save more or less than "single" spending units. The evidence is based on relatively few observations of "single" spending units, however - less than 10% of the total "weight" of the sample represented observations of "single" spending units.

Saving Differences by Survey Year.

The net effect, on saving, of year-to-year changes in the general exogenous variables was allowed for in the statistical model by three "dummy" variables, x_j ; $j = 1, 2, 3$. The corresponding parameter estimates are presented in Table 4. They indicate that in the three later Survey years (1948-50), saving: income ratios, after allowance is made for within-group income and liquid asset effects, are significantly lower than in 1947. The differences among the later years appear to be relatively unimportant; although no tests were made, the coefficients are probably not significantly different from each other.

This is not the place to digress upon the reasons behind the observed year differences. The data provide little basis for distinguishing among a multitude of possible explanations; only the net effects are

Table 4

YEAR COEFFICIENTS

Year:	1948	1949	1950
Coefficient:	δ_1	δ_2	δ_3
Estimated Value:	-.0261	-.0299	-.0294
Error Term:	.0106	.0102	.0101

measured and they may result from any number of shifts in opposing forces. One factor, however, the relative scarcity of consumer durables in 1947, cannot escape mention as a reason for the relatively high saving in that year.

This section set out to query the data on two points. The first, concerning the significance of intergroup differences in saving behavior was answered quite unambiguously; each of the demographic variables interacts with the variables in [6] (income and liquid asset holdings), and vice versa. The second point, concerning the consistency of the observed intergroup differences with the implications of the expected income hypothesis has not been so neatly answered. The evidence in favor of the fundamental hypothesis is certainly less than overwhelming. But, given the inherent limitations of cross-section data as well as the crudeness of the technique, the favorable evidence is encouraging. The expected income hypothesis stands to be replaced by any hypothesis that offers a more satisfactory explanation of the observed inter-group differences; it is clear from the evidence that simple hypotheses,

based on current income, are not equal to the task. Finally, the evidence on the relationship between family size and saving suggests that non-linearity in the relationship is substantial, but, at the same time, the relative weakness of the relationship points out a need for further study of the possible interactions between family size and other factors - particularly the demographic variables.

5. Critical Examination of the Friedman and Modigliani-Brumberg Consumption Theories

The Introduction mentioned two theories of household consumption behavior that incorporate income expectations. Given the provisional confirmation in Section 4 of the general importance of expectations, do the data provide evidence concerning the specific details of the two theoretical formulations?

Short-Run Income Instability-Implications of the Theories

Both Friedman and Modigliani-Brumberg base their hypotheses on an interpretation of utility theory. To this common origin a common implication of the two hypotheses can be traced: namely, that spending unit consumption, being scaled to some long-run constraint, is relatively insensitive to short-run changes in income, and that saving, as a residual or buffer, will absorb virtually all of those short-run changes. In a cross-section of spending units, not all differences in current income receipts can be taken as evidence of differences in the long-run constraint. In a limiting case, the members of a sub-sample of spending units could have uniform income expectations, both short- and long-run, but diverse current

incomes. For such a group, both the Friedman and the Modigliani-Brumberg theories imply that consumption is also uniform except for random deviations (unrelated to income); for any pair of spending units in that group, the difference between their income is most likely to be equal to the difference between their savings. A least-squares consumption-income regression for such a group, as Friedman shows, 1/ would yield a cross-

1/ Friedman, op. cit., p. 45, equation (3.10).

section marginal propensity to consume equal to zero; similarly, a saving-income regression would estimate the cross-section marginal propensity to save, neglecting sampling errors, as equal to unity.

Short of the limit, the members of a cross-section sample, or subsample, will have diverse "permanent" incomes, to adopt Friedman's terminology. But, given any amount of short-run, random instability of income, "permanent" income will be less widely dispersed than "measured" income. Friedman shows that the least-squares marginal propensity to consume is proportional to the ratio of "permanent" income variation to measured income variation, P_y . 2/

2/ Ibid., p. 45, equation (3.10).

Similarly the least-squares marginal propensity to save approaches unity as P_y approaches zero.

The Empirical Evidence

This last proposition provides a means of testing the theories. A sample of spending units, such as the one used in this study, has a specific, but unknown, P_y and a specific, computable, least-squares marginal propensity to save. If the sample is subdivided into, say, occupation groups, P_y should be smaller in each sub-group than in the total sample, and the least-squares marginal propensity to save should be closer to unity. In particular, P_y for each of the 187 homogeneous groups can be presumed smaller than for the entire sample. A regression like [8], computed for the whole sample, gave a marginal propensity to save (α^*) equal to .244; the α_i^* for the more homogeneous groups, as shown in figures 3 and 4, certainly are not uniformly closer to unity.

Perhaps this is not a fair test; on Friedman's assumptions, $\alpha_i^* = (1 - k_i P_{yi})$, and, as with the c_i in [2], k_i may be different among the homogeneous groups. 1/ Table 5 shows estimated marginal propensities

1/ In Friedman's theory k is the marginal and average propensity to consume permanent income - assumed to be uniform for a homogeneous group of spending units. Ibid., p. 36.

to save from the regressions that omitted some of the demographic variables. Estimates for groups of spending units in the 35-44 age bracket are shown, for each of four occupations, with and without further subdivision by location. There is, in this case, no unanimous tendency toward unity on the part of the coefficients when the groups are split up by location, although P_y should be reduced by the subdivision. Perhaps k_i is related to

location, but if so, the relation must be quite different for the different occupations.

Table 6 shows α_i^* for 3 occupation-location groups, at 3 age levels, with and without the education distinction. The results, as well as those in the previous table, do not exhibit any strong tendency for α_i^* to approach unity as P_y becomes smaller.

Table 5

EFFECT ON α_i^* OF ADDING THE LOCATION VARIABLE

Occupation Location	Business owners	Professional	Other non-farm	Farmers
Metropolitan	.552	.656	.205	..
Urban North	.421	.460	.273	..
Urban South	.364	.376	.198	..
Rural North	.521	-.165	.238	.631
Rural South	.691	.757	.068	.587
All Locations	.484	.418	.189	.592

Table 6

EFFECT ON α_i^* OF ADDING THE EDUCATION VARIABLE

Professional Metropolitan	College	No College	All
18-34	.429	.238	.414
35-44	.682	.410	.656
45-54	.281	.124	.234

Table 6 (cont.)

Business Owners Metropolitan	College	No College	All
18-34	.584	.482	.484
35-44	.487	.508	.552
45-54	.496	.449	.443

Farmers North	High School or more	Grade School	All
25-34	.684	.536	.575
35-44	.680	.601	.631
45-54	1.312	.354	.590

Interpretation of the Findings

To what can this result be attributed? What assumption of the two theories fails to accord with the facts? The offending assumption is that, in Friedman's terminology, the marginal propensity to save the "transitory" component of income is equal to unity. This is a very extreme assumption; in view of the many counter-considerations, it is perhaps based on a too literal reading of utility theory. Tobin points out that for some spending units, negative transitory components may require net dissaving if consumption is to be maintained; if the dissaving is impossible because of limited liquidity and credit, consumption will have to adjust.^{1/} The downward inflexibility of some very common

^{1/} James Tobin, "Comments on... 'A Theory of the Consumption Function,'" pp. 6-7.

forms of saving (repayment of personal and mortgage debt, or non-term insurance) make this argument apply even where the optimum amount of net saving is positive. For positive short-run income change, a reverse order of causation may operate to lower the apparent propensity to save "transitory" income; temporary or extraordinary consumption "needs" might motivate a stopped-up rate of labor participation on the part of the spending unit. It is not absurd to suppose that spending units fix a savings "quota" for each period that will provide an acceptable retirement living standard and absorb the short-run income gains or losses in consumption over a relatively short horizon.

In view of the evidence and the arguments, the assumption of constant consumption in the face of short-run income instability seems to be very unrealistic. A slight qualification to the argument must be allowed if, as Friedman sometimes suggests, "transitory" income may be spent in purchases of durable goods, which should be accounted as saving on some definitions. If, however, proper allowance is made for depreciation of durable inventories, for trade-ins, etc., the qualification does not seem to call for major revision of the conclusion. Clearly, short-run income instability creates a problem for interpreting cross-section income differences in research on consumption of saving behavior. But, evidently, the simplifying assumption on which Friedman bases much of his theory is a singularly poor one. Until more direct information is available about the propensity to save "transitory" income, there seems to be no general reason to assume that it is either higher or lower than the propensity to consume "permanent" income.

The Average Propensity to Consume and Lifetime Income

Another feature of Friedman's theory has been criticized by Tobin - that the average propensity to consume, for spending units, is independent of the level of "permanent" income.^{1/} Modigliani and Brumberg, by their assumption

^{1/} Ibid., pp. 4-5.

of zero net lifetime savings, also assert that the proportion of income saved, or consumed, is independent of the level of lifetime income.^{2/} Can

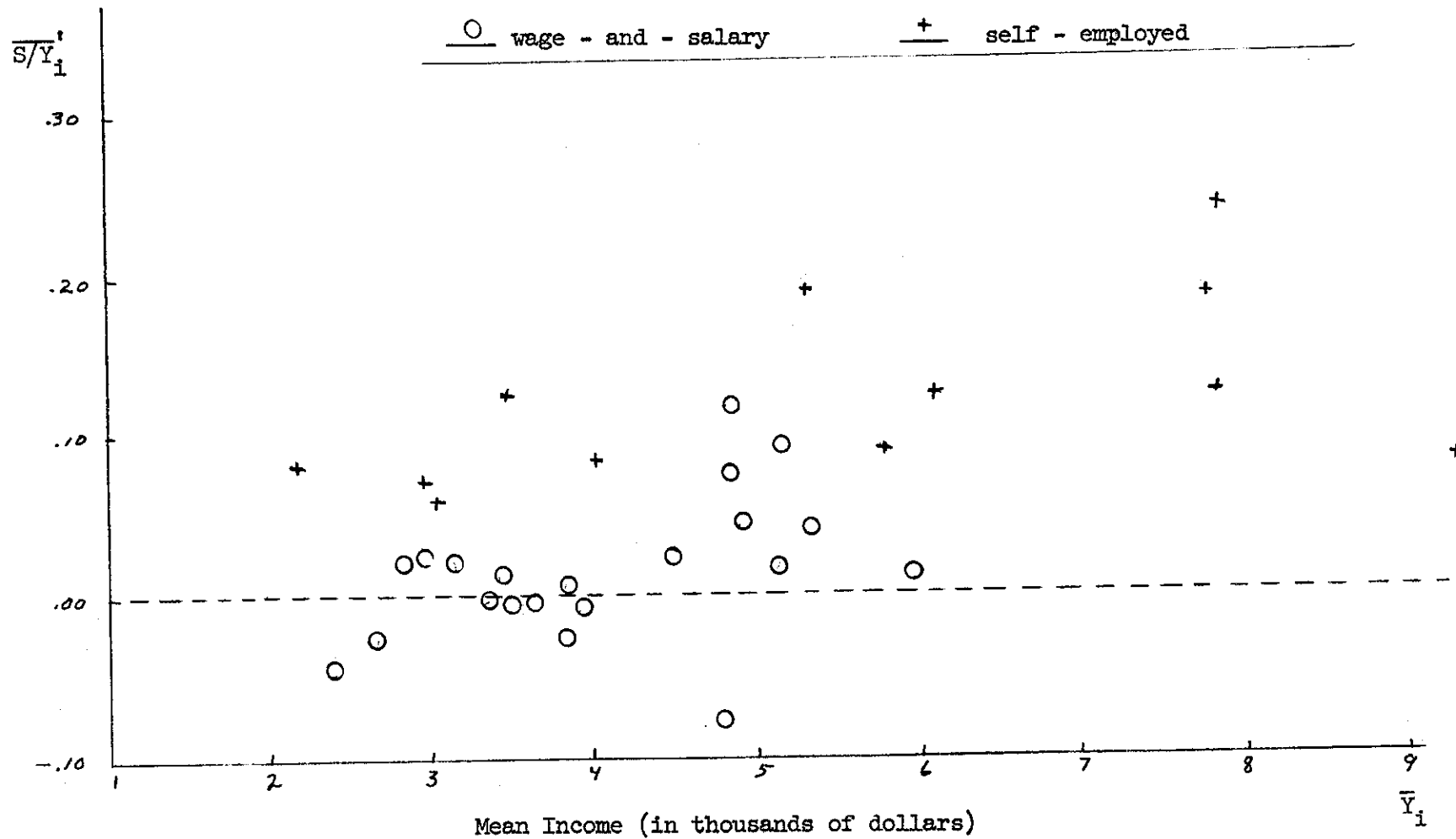
^{2/} Modigliani and Brumberg, op. cit., pp. 394-5.

the data shed any light on this important subject?

Figure 7 shows "adjusted" average propensities to save for groups that are undifferentiated as to age plotted against mean income for the groups. If these two computed mean values can be taken as uniformly related to the corresponding mean "lifetime" values, the scatter is pertinent to the question of independence between saving (or consumption): income ratios and the level of income. Although the scatter does not show any close relation between the "lifetime" averages, neither does it support the assumption of complete independence. It is one thing to deny the adequacy of a simple "income" hypothesis when contemplating a more satisfactory explanation; it is quite another to assert the complete absence of systematic relation between income and the average propensity to save or consume. The evidence in Figure 7 does not suggest that

Figure 7

"LIFETIME" AVERAGE PROPENSITIES TO SAVE AND MEAN INCOME



the average level of income alone determines the average propensity to save in the groups exhibited, but neither does it suggest that mean income is entirely irrelevant.

Family Size Effects

A shortcoming common to both theories is their failure to specify the effects of family size and composition on saving (or consumption). At a certain level of abstraction such neglect is indeed justified; it cannot be continued, however, to the stage of empirical research. The basic unit observed in cross-section surveys is composed of a variable number of "consumers". If survey data are to be used to their full advantage in investigations of consumer saving behavior, some allowance must be made for family size.

Friedman formally includes family size as a factor determining the shape of household utility functions.^{1/} Modigliani and Brumberg work with the

^{1/} Friedman, op. cit., p. 36.

assumption of uniform lifetime consumption - abstracting from all life-cycle variation in consumption "needs".^{2/} Neither can be said to provide explicit

^{2/} Modigliani and Brumberg, op. cit., p. 397.

guidance for this very important aspect of the translation between theory and data.

Malcolm Fisher, in response to the Modigliani-Brumberg "bachelor" theory of saving, has proposed a modification of that theory which explicitly includes

family size (both present and expected).^{1/} His modification, while it repre-

1/ Malcolm R. Fisher, "Explorations in Savings Behavior," Bulletin of the Oxford University Institute of Statistics, Vol. XVIII, No. 3 (August, 1956), pp. 224-226.

sents a substantial improvement on the Modigliani-Brumberg theory, embodies the assumption of linearity in the relation between family size and saving. The evidence provided by the present study suggests that such assumptions are unwarranted.

Briefly, although the empirical findings in Section 4 seem to vindicate the two theories' general concern with a long-run income concept, the evidence reinforces one's skepticism about their more specific propositions. Apparently there is yet a role for the absolute (or relative) income hypothesis within a theory that considers income expectations, namely in the explanation of "lifetime" saving or consumption. In addition, there is a need for more satisfactory treatment of short-run income instability than is provided by the two theories under review.

6. Conclusion

On the Hypothesis

The hypothesis that motivated this investigation asserted that long-run income expectations of spending units affect their saving decisions. The results of the investigation, if all the "enabling" assumptions are granted, seem to affirm the hypothesis. The demographic variables, age, occupation, race, education and location, which, according to the theory in Section 2, "determine"

the relation between current and expected income, are empirically correlated with saving behavior. More precisely, they interact with the "economic" variables, income and liquid asset holdings. Furthermore, much of the interaction that is found can be interpreted more reasonably by the expected income hypothesis than by the simpler theories that assume a much shorter income horizon. The hypothesis has not been effective in explaining some of the observed, and presumably significant interactions. Such failure might be damning if a superior alternative hypothesis were at hand - until one is proposed, however, the positive evidence must be emphasized.

By far the most conclusive finding of the investigation establishes the heterogeneity of spending unit saving behavior among demographic groups. This is a result of some consequence even if the interpretation placed on the observed differences cannot be accepted. It implies that although the simple application of regression methods to "unhomogenized" survey data may be useful for some purposes, parameter estimates obtained by such methods are conditional on the particular distribution of income at the time the data were obtained. Further, it implies that predictions of aggregate saving or consumption must consider income distribution among demographic groups; evidently distribution by size of income is not enough (see figures 3 and 4).

On the Theory

What can be said about the elementary theory that was devised for the problem? That theory is different from the other "expected income" theories mainly by its recognition of what can be termed a marginal propensity to extrapolate current income (e_i) as a distinct and variable aspect of spending

unit behavior. The data seem to favor that interpretation of least-squares savings-income slopes which uses e_i over those which assume that current, measured income is an unbiased estimate of expected income, and over those which assume there is no relation between current and expected incomes. Otherwise, the theory is distinguished by its lack of substantive propositions - what is usually called "content". This is not entirely accidental; the elementary nature of the fundamental hypothesis, on the one hand, demanded very little in the way of assumptions, given the availability of a large body of data; the partly exploratory spirit of the investigation, on the other, positively discouraged non-essential restrictions. The results do suggest that adoption of the simplifying assumptions that are used in similar contexts by Friedman and Modigliani-Brumberg would have been unfortunate. There may be no equally convenient assumptions that will adequately represent the behavior of individual decision-makers. If not, more complicated theories, perhaps combining parts of the "absolute," "relative," and "expected" income hypotheses, must be formulated.

On the Technique

Recent developments in research technology, both in data gathering techniques and in computing equipment, have opened a new set of opportunities and problems for the econometrician. One of the problems, one that stands out in this particular piece of research, concerns the procedure for analysing the wealth of relevant detail that is feasible within the new technology. Much effort has been applied in the past to the problem of drawing warranted conclusions from relatively meager supplies of information, in terms of statistical theory. Attention in the future must be directed toward the opposite problem - that of drawing warranted conclusions from much larger bodies of data, which, by subdivision,

can be brought into close conformity with the requirements of statistical theory, but at the cost of fragmenting the statistical end-product. The approach taken in this investigation involved, to put it baldly, computing the fragmented results and "looking" at them. For some purposes this may be adequate, but there remains the conviction that a more systematic approach, if one can be devised, would yield further and more conclusive evidence.

On the Whole

A list of items which would improve the analysis could be extended indefinitely. Yet, the analysis has contributed to a better understanding of spending unit saving behavior. The evidence strongly suggests that saving decisions are made with a relatively long income horizon in view; it emphatically rejects simple hypotheses that are effectively limited to current or very short-run income concepts; it insistently demands recognition of pronounced (but non-random) diversity in household saving behavior.