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An Empirical Evaluation of Theories of Saving

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The theories of saving presented by Keynes, Duesenberry, and Friedman use three different measures of income to explain saving, and each theory has been supported by empirical evidence. The evidence consists of tests of a wide variety of hypotheses contained within or derived from the theories. The tests use many different kinds of data. The objective of this paper is to submit the basic behavioral hypothesis of each theory to a common test on constant data. The results show that the theories are equally acceptable on empirical grounds.

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1. Determinants of Saving Other Than Income

Although income is the principal explanatory variable in all three theories it is obvious that there are many other variables which affect the level of consumers' saving. Some of the more important non-income variables are those which differentiate consumers according to life-cycle, asset holdings, entrepreneurial activity, and the stage of the business cycle at the time of observation. Since some of these variables (e.g., age, asset holdings) are also correlated with income, it is convenient to estimate their effects on saving before testing hypotheses about income. When these effects have been removed from the original data the residuals are relatively free of the effects of collinearity which would confound tests of the combined effects of income and non-income variables.

The following regression equation specifies, for the purpose of this study, a relationship between saving and some variables which describe the life-cycle and balance sheet positions of the spending units observed[1]:

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[1]The data used in this paper were collected in the Surveys of Consumer Finances of 1950 and 1951. See [7] for a description of methods used in the surveys.

(1) $$100\,\frac{S}{Y} = b_0+b_1A+b_2N+b_3N^2+b_4H+b_5\,(Y^*L)+u_s$$

where $\frac{S}{Y}$ = fraction of income saved,

A = age of head of spending unit in coded form:

1 = 18-24	4 = 45-54
2 = 25-34	5 = 55-64
3 = 35-44	

N = number of persons in the spending unit,

H = 1 if the spending unit owns its home,

0 if the spending unit does not own its home,

Y*= 1 if the spending unit's current annual income is less than the previous year's income by 25% or more,

0 if a decline in income of 25% or more did not occur,

L = amount of liquid assets held at the beginning of the current year.

u_s= residual term.

A similar equation (2) provides a basis for estimating the effects of non-income variables on the level of expenditures for durable goods (G):

(2) $$100\,\frac{G}{Y} = b_0+b_1A+b_2N+b_3N^2+b_4H+b_5(Y^*L)+u_g$$

The residuals, u_s and u_g, become dependent variables below.

Equations (1) and (2) have been estimated for each of four groups of consumers. Spending units in which the principal source of income is the operation of a farm or an unincorporated business are defined as entrepreneurs. Other spending units are non-entrepreneurs. The surveys for 1949, a recession year, and 1950, in part a war-boom year, provide an opportunity to contrast the effects of economic fluctuations. Table 1 shows the estimated regression coefficients for entrepreneurs and non-entrepreneurs in 1949 and 1950.[1]

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[1] The following spending units were excluded from the samples: (1) those for which the values of one or more of the variables used in this study were not ascertained; (2) those in which the head was 65 years of age or older.

The results do not justify the treatment of durable goods expenditures as saving and the two measures are kept separate for further analysis. The life-cycle variables contribute to an explanation of expenditures on durable goods but do not explain the saving ratio. The durable goods ratio varies with age among non-entrepreneurs but not among entrepreneurs. Home ownership and consequent repayments of mortgage principal contribute to an explanation of saving except among entrepreneurs in 1949. A reduction in saving, varying with liquid asset holdings, when income declines sharply is indicated in both years and both groups. The effect of economic fluctuations shows up most clearly in the entrepreneur groups where the combined effects of

Table 1

Summary of Regressions on Demographic and Balance Sheet Variables

Regression Coefficients

Independent Variable	Durable Goods				Saving			
	Entrepreneurs		Non-Entrepreneurs		Entrepreneurs		Non-Entrepreneurs	
	1949	1950	1949	1950	1949	1950	1949	1950
Intercept	14.75	41.43	118.19*	69.44*	28.97	15.23	-3.81	3.29
A	.85	-13.42	-19.77*	-9.55*	-2.59	-.83	- .93	-.36
N	59.51*	67.28*	25.08*	44.81*	-8.33	1.29	2.18	-2.09
N^2	- 6.31*	- 7.45*	- 3.02*	-5.54*	1.05	-.15	- .28	.25
H	-14.70	- 9.37	13.58	8.68	8.99	10.09*	10.90*	10.10*
(Y*L)	- .19	- .12	.38*	1.40*	- .19*	-.61*	- .15*	-.59*
R^2	.015	.039	.025	.024	.025	.153	.028	.026
F ratio	1.31	3.47*	11.30*	10.97*	2.18	13.56*	12.75*	11.91*
Sample Size	436	442	2,264	2,288	436	442	2,264	2,288

*The null hypotheses are rejected at a significance level of 5% or less; the regression coefficients are at least twice their standard errors.

all variables were significant in 1950 but not in 1949, for both saving and durable goods expenditures.

2. The Effects of Alternative Measures of Income on Saving

The residuals u_s from the regression equations indicated by the estimates in Table 1 are the dependent variables in hypotheses which are described in this section. The results of the tests are shown in Table 2.

Keynes' Theory

The absolute amount of income is the primary independent variable in the Keynesian consumption function. Thus the relevant hypothesis is that saving is positively related to absolute income (Y), and the test supports this hypothesis.

Duesenberry's Theory

Relative income, i.e., "percentile position in the income distribution" [2, p. 45] is an important variable in the Duesenberry theory. Income deciles were used in the test instead of percentiles. Deciles have values ranging from one, for the lowest ten percent of spending unit incomes, to ten, for the highest ten percent of spending unit incomes. Results of the test support the hypothesis that saving is positively related to income decile (D).

A Modification of the Relative Income Hypothesis

In presenting his theory Duesenberry noted that a person is impelled to increase his consumption by the fact that his associates consume goods which he does not consume. The demonstration effect therefore occurs among associated consumers. To make the effect occur among all consumers it is assumed that they live in a classless society in which interdependence is diffused through the consumer sector in a fairly homogeneous fashion. This assumption justifies using relative income position to explain variation in consumption.

There are, nevertheless, socio-economic classes in the United States and it is conceivable that the effect of interdependence may be stronger within subgroups of consumers than within the whole consumer sector. The 65 subgroups of consumers used to test this modification of the demonstration effect were obtained by classifying consumers according to race, region, occupation, education, and age.[1] Within each subgroup the intensity of the

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[1] The 65 subgroups are the same as those shown in [5, pp. 487-490] except that spending units in which the head was 65 years or older were omitted from the present analysis. A few small subgroups were collapsed into adjoining age groups.

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demonstration effect is measured by the difference between the highest observed value of income decile (D*) and the decile position of a particular spending unit (D).

The difference in decile positions (D*-D) tends to reverse the scale of measurement relative to D, i.e., a spending unit with a high decile value (D) would have a low difference (D*-D). The sense of the modification is therefore expressed in the hypothesis that saving is negatively related to the difference between an individual spending units' income decile and the highest observed decile within a group of associated spending units. Results of the test support this hypothesis. It should be noted, however, that the data do not suggest that the modification is superior to the original Duesenberry hypothesis.

The Friedman Theory

Two of the more provocative components of Friedman's theory are the postulate that consumption is not correlated with transitory income and its corollary, that saving is positively and highly correlated with transitory income. The latter is the hypothesis tested here.

Whether the test is appropriate to the theory or not is open to question. Short of detailed observations of a consumer unit over time there is no operational method of distinguishing permanent from transitory income. The method used here is at least distantly related to one of Friedman's examples [3, p. 21]. The 65 subgroups of consumers who are relatively homogeneous with respect to race, region, occupation, education, and age are regarded as containing spending units who have common levels of permanent income. The median income decile (D_M) within each subgroup is considered to be a measure of size of permanent income. The observed

income decile (D) for an individual spending unit is considered to be a measure of size of total income. The difference between the two values $(D-D_M)$ therefore measures, approximately, transitory income. Results shown in Table 2 are consistent with the hypothesis that saving is positively related to transitory income but the correlation coefficient is no higher than those obtained for other measures of income.[1]

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[1] It is interesting to note that the formulation of the hypothesis and the results of the test are also consistent with the "New Suburbia Thesis": social pressure causes families to consume at the normal level for their class, regardless of their income. See [9].

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3. The Effect of Alternative Measures of Income on Expenditures for Durable Goods

The residuals u_g from the regression equations indicated by the estimates in Table 1 are the dependent variables for the analysis reported in this section. The results are shown in Table 3.

The amount of saving, as calculated in the Surveys of Consumer Finances does not include an offset for depreciation of the spending unit's stock of durable goods. If it is assumed that the stock of durable goods remains constant over time, each item being replaced as it is worn out, purchases of durable goods could be used as a proxy measure of consumption. This disposition of durable goods becomes less tenable, however,

Table 2

Summary of Simple Correlation Coefficients of Saving and Specified Measures of Income

Income Variable	Correlation Coefficients* Entrepreneurs 1949	Entrepreneurs 1950	Non-Entrepreneurs 1949	Non-Entrepreneurs 1950
Y (Keynes)	.18	.28	.17	.18
D (Duesenberry)	.22	.33	.19	.17
D*-D (Variant of Duesenberry)	-.25	-.31	-.17	-.16
$D-D_M$ (Friedman)	.27	.31	.11	.12
R^2	.13	.09	.04	.04
F ratio*	16.63	10.69	24.79	21.19
Sample size	436	442	2,264	2,288

* The null hypothesis is rejected at a significance level of 5% or less.

if stocks increase over time or if expenditures tend to be "lumpy," e.g., the purchase of a house may entail unusually large expenditures for durable goods. Under the latter conditions durable goods expenditures include some element of saving. Given the nature of the original data there seems to be no satisfactory procedure for avoiding the ambiguity.

The parallel analysis of saving and expenditures for durable goods offers some prospect of resolving the ambiguity, but the results are not decisive. Table 1 showed marked differences among the non-income variables with respect to their effects on saving and durable goods. A similar sharp difference shows up in the effects of income on saving and durable goods expenditures. Table 2 shows statistically significant correlation between saving and each measure of income. With only two exceptions, Table 3 indicates that differences in income do not affect expenditures on durable goods. If durable goods expenditures are regarded as consisting primarily of saving the two significant correlation coefficients offer modest support to the Duesenberry theory and to the Friedman theory.

The joint effect of all four measures of income produces three statistically significant coefficients of determination. These results are consistent with Tobin's suggestion that the best empirical explanation of the relationship between saving and income may lie in combinations of different measures of income [8].

Conclusions

Three major theories of consumers' saving have been submitted to

Table 3

Summary of Simple Correlation Coefficients of Durable Goods Expenditures and Specified Measures of Income

Income Variable	Correlation Coefficients: Entrepreneurs 1949	Entrepreneurs 1950	Non-Entrepreneurs 1949	Non-Entrepreneurs 1950
Y (Keynes)	-.05	-.07	.01	.00
D (Duesenberry)	-.02	-.05	.07*	.04
D*-D (Variant of Duesenberry)	-.03	-.03	.03	.02
$D-D_M$ (Friedman)	.05	.11*	-.05	-.05
R^2	.03	.00	.01	.01
F ratio	2.86*	.56	3.93*	3.32*
Sample size	436	442	2,264	2,288

* The null hypothesis is rejected at a significance level of 5% or less.

similar tests on the same data. The results are consistent with each of the theories, and no single theory is obviously superior to the others on empirical grounds. If a choice among the theories must be made -- and it is not clear that there must be a single correct theory -- then the choice must be made on the basis of other empirical results or other criteria.

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