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Part VI

Assets, Debts, and Economic Behavior

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IT IS PROBABLY FAIR TO SAY that empirical and theoretical work in economics has been largely in terms of 'flow' variables to the relative neglect of 'stock' variables. Referring to familiar accounting statements, we might say that economists have tried to analyze business behavior in terms of income (profit and loss) statements instead of balance sheets. The flow variables appear in the income statements, and the stock variables in the balance sheets. Analogous remarks apply to the analysis of household behavior, although the familiar accounting statements are not generally available for the consumer sector of the economy.

At times it has been argued that the definitional relationship associating the rate of change of stocks with corresponding flows has provided a link beween flow and stock analysis of a sort that enables us to work with either type of system at our convenience. However, we shall assert without demonstration that the differences between flow and stock analysis are not trivial and that it does matter how we formulate our analysis. In truly dynamic economics and in econometric estimation, the essentiality of the difference becomes clear. It makes a difference to the solution of dynamic systems, for example, whether prices fluctuate in response to excess inventories (accumulated excess supply) or to the rate of change of excess inventories. It makes a difference in statistical inference whether economic decisions about stock holding are perturbed by a random impulse with specified autocorrelation properties or whether the decisions about the rate of change of stock holding are perturbed by the same type of random impulse. We must take great care to formulate the system correctly in terms of stocks and flows in the dynamic and the stochastic cases. There is, however, a sham dynamics where the differences may become inessential. In this case we have a period analysis with total stocks in equilibrium at the beginning and end of each period. Thus the flows must be in equilibrium also for each period as a whole. It then makes no difference whether we analyze a chronological succession of stock equilibria or a succession of flow equilibria.

The purpose of this paper is to attempt to show how balance sheet items (stocks) such as assets and debts are associated with the economic behavior of households and business firms. We shall try to summarize roughly the theoretical and empirical work done on the subject and to give a fresh formulation of the problems involved, together with a few calculations on the empirical side.

I

Economic agents may hold or trade money, securities, or goods. Money and goods are assets; securities may be either assets or liabilities (debts)

for the individual holder. A theoretical problem is to analyze the motives for holding particular amounts of assets and liabilities in the form of money or securities or goods. A further problem is to analyze the supply and demand flows of these three items during a given accounting period and to determine the prices at which transactions take place.

A theoretical model that follows along quite classical lines is one that makes the utility function for an individual household depend directly on the holding of different types of assets and liabilities at the end of each accounting period during a planned future as well as on the consumption flows of goods and services during each period. The household attempts to maximize this function subject to a constraint that states that the initial wealth of each period plus the net savings of the period are equal to the wealth at the end of the period. The maximization procedure leads to the result that the demand for goods and services and the desired stocks of assets and liabilities depend on the system of market prices and the initial stocks of wealth. This theory gives us a systematic explanation of the influence of stocks on behavior and the influence of other variables on stocks.[1]

A similar model can be developed for the theory of the firm. Hurwicz has outlined a formal theory of the firm which views the entrepreneur as maximizing a utility function with respect to a stream of withdrawals (profits) expected to accrue over a future period.[2] The withdrawals of each period depend on operating receipts and expenses, the cost of borrowing, and the returns from the holding of securities or other nonoperating assets. Utility as a function of the withdrawals is maximized subject to balance equations and the definition of withdrawals. The result expresses asset and debt holding of all types in terms of those market variables that are taken as given by the firm. Furthermore, the initial asset-debt holdings enter as explanatory variables in the several equations.

The stock of cash is a particular asset that has figured importantly in

[1] The reader is referred to the following publications for elaborations or variants of this approach: L. R. Klein, *The Keynesian Revolution* (Macmillan, 1947), Appendix; *Economic Fluctuations in the United States 1921-1941* (Cowles Commission Monograph 11, Wiley, 1950), Ch. II; J. Marschak, 'Money and the Theory of Assets', *Econometrica*, Vol. 6, Oct. 1938, pp. 311-25, 'The Rationale of the Demand for Money and "Money Illusion"', Cowles Commission Discussion Paper: Economics 272, Dec. 5, 1949, mimeographed (address delivered at the Dec. 1949 meetings of the Econometric Society); J. Mosak, *General-Equilibrium Theory in International Trade* (Cowles Commission Monograph 7, Principia Press, Bloomington, 1944), pp. 115 ff.; D. Patinkin, 'Relative Prices, Say's Law, and the Demand for Money', *Econometrica*, Vol. 16, April 1948, pp. 135-54.

[2] L. Hurwicz, 'Theory of the Firm and of Investment', *Econometrica*, Vol. 14, April 1946, pp. 109-36.

economic literature. Classically it has been introduced in a somewhat superficial way, the supply being treated as arbitrarily governed by central bank action and the demand as passively related to income for transaction purposes. With the inception of the liquidity preference theory of interest money stocks take on more importance for economic behavior. This theory has been largely treated at the macroeconomic level, but it can be related to individual decisions through the approaches to the theory of the household and the firm just discussed.

In the liquidity preference theory the demand for cash assets is related to income (transactions) and to interest rates, thus viewing the community as choosing between holding cash or securities. Households do not hold large stocks of goods other than durables, but business inventories may be very significant; therefore a better version of the theory should be such that the demand for cash depends on price fluctuations as well as the other variables. In a static theory the rate of change of price may legitimately be ruled out. The supply of cash, being an exogenous variable, influences all the variables of the system, although this influence must be traced somewhat indirectly. To a *first approximation* the direction of influence may be traced as follows: consumer spending or saving decisions may depend on the rate of interest which, in turn, is directly related to the stock of cash balances. In this way cash balances may be said to influence consumer spending or saving. In a similar manner we may trace the influence of cash on investment via interest rates.

A more direct relationship between cash assets and saving or consumption has been suggested by Pigou,[3] who writes the savings function with real cash assets as a separate variable and argues that the influence of cash on savings via the interest rate is doubtful but that the direct influence may be important. Haberler has argued similarly that the real stock of wealth should be a variable in the savings function.[4] The arguments of Pigou, Haberler, and more recently, Friedman,[5] on the relation between cash or wealth and savings have been designed to show the efficacy of flexible prices and monetary policy as instruments for a policy of full employment. The implications of their arguments show the need for further empirical research into the relation between assets, debts, and economic behavior. As will become apparent in the pages to follow, it is not satisfactory to consider cash assets alone, or to combine assets and debts

[3] A. C. Pigou, 'The Classical Stationary State', *Economic Journal*, LIII, 1943, pp. 343-51.

[4] G. Haberler, *Prosperity and Depression* (League of Nations, Geneva, 1941); 3d ed. enlarged by Part III, p. 499.

[5] M. Friedman, 'A Monetary and Fiscal Framework for Economic Stability', *American Economic Review*, XXXVIII, June 1948, pp. 245-64.

arbitrarily into wealth, or to fail to distinguish between the different effects in the household and the business sectors of the economy, or to neglect the adverse effects of the stock of real capital on investment.

Hart has frequently pointed out the need for further studies in the field of the title of this paper.[6] Originally he stressed that theorists who operated with aggregative models were subject to criticism for showing "inadequate recognition of cumulative factors", among other things. He specifically cites the stock of real capital as a variable negatively affecting investment decisions and the stock of liquid assets as a variable positively affecting consumption and investment decisions. These points are excellently developed in more detail in Hart's later contribution where he shows clearly the need for distinguishing among types of assets and debts and among types of holders. He makes the important distinction between mechanical and motivating relationships. The former are largely accounting definitions; the latter are largely behavior or technological relations. Under the heading of motivation he lists four reasons for holding assets: as operating assets, as a source of nonoperating income, for speculation, for liquidity. The same motives enter the formal theory in the production, profit, and utility functions. These are dominating motives that we try to represent in the empirical relationships.

II

In the preceding section we found that assets may play various roles in economic behavior. They may enter as 'initial conditions' in explaining why people demand or supply flows of goods; they may also be the objects of demand and supply behavior themselves. In the latter case, the 'initial conditions' may enter again as explanatory variables. At any rate, existing stocks of assets and liabilities are endogenous economic magnitudes; they may influence economic behavior and they may be influenced by economic behavior.

When studying the business sector of the economy we might single out the following balance sheet items: inventories of commodities, the stock of real fixed capital, cash, securities owned, other quick assets, short term debts, long term debts, surplus, and shares outstanding. In connection with inventories we must analyze them as an object of wealth accumulation and as a causal factor in production plans or in price formation. In other words, we want to explain why business firms accumulate stocks of goods in relation to such processes as providing raw materials for smooth pro-

[6] A. G. Hart, '"Model-Building" and Fiscal Policy', *American Economic Review*, XXXV, Sept. 1945, pp. 531-58; 'Uses of National Wealth Estimates and the Structure of Claims', *Studies in Income and Wealth, Volume Twelve* (NBER, 1950), pp. 81-104.

duction, providing finished goods to meet sales, speculation for capital gains on market price movements, the earning of interest on securities. We want to determine the relationship between the holding of 'undesired' surpluses (deficits) of goods and price drops (rises) or, in some cases, output decreases (increases). 'Undesired' stocks of commodities must be explained in terms of total stocks and those that business operators would like to hold in response to transactions or speculative motives. As a causal factor, it is clearly stocks that interest us, and as an object of accumulation stocks seem more relevant than flows because of the short term nature of this asset. On the other hand, the stock of fixed real capital (plant and equipment) includes assets accumulated over many past accounting periods, and it does not seem fruitful to attempt to express current decisions in terms of this long accumulated stock. Current annual additions are so small relative to the stock of fixed capital that the investment process can be clearly analyzed only by studying investment flows directly; hence we attempt to explain what determines gross outlays during a given accounting period. Except for depreciation, capital outlays represent the rate of change of fixed capital. This approach does not, however, rule out the need for using the stock of capital as an explanatory variable in the investment process. Fixed capital accumulation is usually regarded as a deterring factor in investment decisions in that it shows the possibility of meeting demand with existing capacity.

Cash, securities, and other current assets are, of course, short term, having a quickly operating market at all times. Like the case of inventories and unlike that of plant and equipment, we choose to explain the demand for these assets in terms of stocks. Yields on securities, price fluctuations, and the need for cash in day to day transactions are principal variables influencing holdings of current assets. The liquidity of business firms and their consequent ability to purchase capital goods is largely represented by their holdings of current assets; this determines the causal role of liquid assets in business behavior. In the case of liquidity current liabilities can be taken into account by using working capital (current assets minus current liabilities) as one of the explanatory variables in investment behavior. It is somewhat arbitrary to fix the relative effects of current assets and current liabilities in this way, and it may be more satisfactory to consider each as a separate liquidity variable.

On the debt side of the balance sheet the behavior explaining the holding of short term debts is similar to its counterpart on the asset side. The scale of operations of the business firm necessitates a certain amount of short term liability for smooth functioning. In addition, speculative motives related to short term interest rates and price fluctuations will serve to determine the stock of short term indebtedness. Long term debts and

capital stock outstanding, loan capital and equity capital respectively, influence business behavior in real capital formation via such variables as share and bond yields. The behavior decisions about the amount of long term debt or stock outstanding depend upon market yields, the scale of operations, and other variables of an institutional character. Yields show the ability to secure funds for financing real capital outlays and thus directly influence investment decisions. The yields, on the other hand, are affected by demand-supply conditions for the stocks of loan and equity capital. In this way investment behavior and the debt side of the balance sheet are related.

Finally we have the surplus account in the balance sheet. We shall regard surplus as a residual after other asset, debt, and flow (profit) variables of the firm have been decided upon; therefore, we shall not consider surplus as a stock variable to be explained in a separate relationship. But surplus may enter as an important causal factor in dividend distribution or even in capital formation decisions.

In the household sector of the economy the analysis follows a similar vein: households have stocks of current assets, durable goods, current liabilities, and long term liabilities. Inventories of goods other than consumer durables are not very important quantitatively in this case. Current assets may be bonds, shares, or cash. Holdings of these variables depend upon yields, consumer incomes, and initial conditions. Current assets, in turn, determine consumer liquidity and possibly the demand for household goods, especially durables. As in the business sector of the economy, we must analyze both the cause and effect roles of stock variables. Consumer liquidity may be represented by the difference between current assets and current liabilities, or one may choose to consider assets and liabilities as separate influences.

The analogue of the influence of the stock of capital on investment in the business sector of the economy is the influence of the stock of consumer durables on the demand for durables in the household sector. This is an extremely important relationship which has been largely overlooked in recent analyses of spending behavior.

The consumer's side of the picture is rounded out with an analysis of why long and short term debts are held. Short term debts such as consumer instalment indebtedness depend on periodic repayment charges, the length of the repayment period, consumer incomes, and initial conditions. Since instalment indebtedness is usually undertaken to purchase consumer durable goods, there is an intimate relation between it and expenditures on durables. A major item of long term consumer indebtedness is residential mortgages. Mortgage interest rates, consumer income, the demand for housing, and other variables in the residential real estate market determine the holdings of mortgage debt.

The crudest approach, and one that we shall reject immediately, is to assume that assets and debts have quantitative effects on economic behavior that are equal in absolute value but opposite in sign. This approach is carried further, especially in macroeconomic analysis, by observing that one individual's debt is another's asset, then taking a tremendous jump, using the noncancelling part of the community's wealth — cash, public debt, and net foreign debt — as the important variable influencing economic behavior.

We do not adopt this approach for at least three reasons. First, there is no evidence that the effects of assets and liabilities are equal in absolute value and opposite in sign. Secondly, asset and liability items have different effects in the business and the consumer sectors of the economy. There may even be further differences within each sector, but the fundamental difference between the household and the business sectors arises because assets and liabilities have different meanings to individuals in the two sectors where capital markets are so different. Liquidity means one thing to a business firm that can borrow at banks with relative ease on the basis of its self-liquidating operations and something quite different to a household that has only limited access to outside funds. This is a reflection of the classical remark that the main difference between the theory of the firm and the theory of the household is that the former maximizes subject to an unlimited budget while the latter maximizes subject to a limited budget. Thirdly, there is a tremendous amount of wealth in the form of real property that does not cancel out in this crude adding up process and does seem to affect economic behavior significantly. If all real property were acquired through loan funds in the form of bond issues, we would have the following asset-debt situation. Lenders would have assets equal to the total amount of bonds issued. Borrowers would have corresponding liabilities. The assets and liabilities in this form cancel out in simple addition, but the real property remains as an asset on the books of the borrower and is not offset by a liability on the books of someone else. Thus, in addition to cash, public debt, and net foreign debt we must take into account the value of real property (stock of capital). The liquid wealth — cash, government bonds, and foreign bonds — are asset values that tend to strengthen private consumption and investment, while the stock of real wealth tends to weaken consumption and investment; therefore the distinction is of the utmost importance.

III

To do a really satisfactory and complete job of studying the relationship between assets, debts, and economic behavior we need a set of balance sheets and income statements in both the business and household sectors of the economy. This set may be either a time series or a cross-section set,

or both. Comprehensive data of this sort are not yet available, though they are more plentiful in the business sector. Consequently, our procedure is to proceed piecemeal, picking up items that can be estimated and measuring some of the most important relationships. Much of the dispute concerning economic policy decisions in relation to the roles of assets and debts in economic behavior is not a matter of principle; it is more a practical matter of quantitative magnitudes; hence it is useful to go as far as we can with the limited data available.

A substantial amount of empirical work, necessarily fragmentary, has already been done but some aspects of economic behavior in relation to assets and debts are still unexplored. Tinbergen's econometric model of the United States treats asset variables in several relations, particularly housing and business behavior.[7] An entire sector of his model deals with the money market, thereby giving quantitative estimates of economic behavior with respect to holding assets and debts. The econometric models of the United States I have constructed contain asset variables in a similar way. The stock of real capital is a variable in the equation of investment behavior, while the equations of demand for cash follow the reasoning of the liquidity preference theory. In some special studies on investment in railroads and electric utilities, the interest rate, which is related to asset-debt variables of the money market, has been found to be statistically significant in influencing capital formation.[8]

Informative empirical studies on the demand for cash and on inventory behavior have been concerned both with reasons for holding cash and inventories and with the roles these variables play in other economic decisions.[9] Practically all the empirical work in this field, however, has been restricted to the asset side of the balance sheet. A. Kisselgoff's analysis of instalment credit is noteworthy in that it attempts to explain consumer behavior with respect to debts. His main contribution is to show from time series data how the demand for instalment credit can be explained in terms of consumer income and the size of the monthly instalment. The latter variable also is shown to have an effect on consumer spending, thus bringing out a relation between debt and consumption.

[7] J. Tinbergen, *Statistical Testing of Business-Cycle Theories: II, Business Cycles in the United States of America, 1919-1932* (League of Nations, Geneva, 1939).

[8] L. R. Klein, 'Studies in Investment Behavior', *Conference on Business Cycles* (NBER, 1951).

[9] See, e.g., M. Abramovitz, The Role of Inventories in Business Cycles, NBER, *Occasional Paper 26*, May 1948; A. J. Brown, 'Interest, Prices and the Demand Schedule for Idle Money', *Oxford Economic Papers*, No. 2, May 1939, pp. 46-69; C. Clark, 'A System of Equations Explaining the United States Trade Cycle, 1921-1941', *Econometrica*, Vol. 17, April 1949, pp. 93-124.

Most of the current attempts to rehabilitate the consumption function have not followed the more difficult but fruitful path of studying durables as a separate component of consumption. In this disaggregative approach new variables must be considered, important among which is the stock of consumer durables. This asset variable should be expected to play as strong a role in the purchases of consumer durables as the stock of plant and equipment does in capital formation. Reliable time series of the stock of consumer capital have never been published, but estimates for isolated years have been attempted. For example, we have the estimates of R. Cox and R. F. Breyer for January 1, 1940 and 1943, and the estimates of Miss Epstein for December 31, 1929, 1939, and 1946.[10] It is hard to infer very much on the basis of these meager data, but they do indicate that the long run growth in the stock of consumer durables was retarded and in some cases, reversed, by the war economy. We might interpret the high postwar spending as a reflection of high incomes, large liquid asset accumulations, and a small stock of durables. A valuable contribution has been reported by M. J. Ulmer in which he relates consumer expenditures to the stock of consumer durables.[11] The particular form of his consumption equation may be questioned, but the attempt to relate the stock of durables to consumption is in the right direction. His estimates of the stocks have not yet been published.

IV

The Surveys of Consumer Finances conducted for the Federal Reserve Board by the Survey Research Center provide a new wealth of data from which to analyze the problem at hand. The material obtained by the surveys may be classified in three types: economic data such as the respondent's savings, income, house purchases, durable goods purchases, debt, liquid assets, and nonliquid assets; demographic characteristics such as age of spending unit head, size of spending unit, sex of respondent, race of spending unit head, and education of spending unit head; expectations, attitudes, motives, and other psychological factors that are a part of human behavior. This sort of information is valuable for our problem because it tells us who holds many types of assets and debts, why people prefer different types of assets, who saves and dissaves, who has certain amounts of income, etc. First, it can be used in a purely descriptive fashion

[10] R. Cox and R. F. Breyer, *The Economic Implications of Consumer Plant and Equipment* (Retail Credit Institute of America, Washington, D. C., 1944); Lenore A. Epstein, 'Evaluation of Consumers' Tangible Assets', *Studies in Income and Wealth, Volume Twelve*, pp. 409-60.

[11] M. J. Ulmer, 'The Consumption Function and the Theory of Aggregation', a paper presented at the meetings of the Econometric Society, December 1949.

to show what kind of a population we are dealing with and what patterns of behavior to look for. Secondly, it provides a basis for inferring patterns of household behavior empirically. Our goal is to try to find out why people hold assets or debts of various types and how these holdings affect behavior, say saving behavior.

In using data from the Surveys of Consumer Finances in this paper, we must draw the reader's attention to certain limitations. Although the sample is well designed, following the most modern techniques, it could not be called large. Only about 3,500 households are covered in one interviewing period. For many purposes this is entirely adequate, but for our purposes — a multivariate analysis of economic behavior — the sample size may be a handicap. The reader is referred to well known articles in the *Federal Reserve Bulletin* for a more complete discussion of survey techniques, the sample, and sampling, reporting, or interviewing errors.[12]

A second limitation has to do with definitions and concepts. Income reported in the Surveys includes only money income, whereas income in kind and imputed income may influence behavior. The same applies to saving. By confining ourselves to money income and savings we may get a biased estimate of true saving behavior. Survey data are for individual spending units, and savings or income for an individual unit as opposed to an entire community should perhaps include capital gains and transfers, which are usually excluded from definitions of savings or income. Moreover, we do not have complete data for the compilation of household balance sheets. Only certain assets and liabilities can be obtained from the available surveys. Currency, inventories of consumer goods, some securities, and individually owned business assets are conspicuously absent. Asset-liability data are available for bank accounts, government securities, some private securities, insurance policies, residences, automobiles, instalment debt, personal loan debt, mortgage debt, and some other items. The wealth data are not of uniform quality. Private security holdings are estimated in only a few broad classes, and the valuation of residences involves much guesswork. Although some types of savings, income, and wealth are not included in the Surveys, it is felt that clues to behavior patterns can be obtained from the incomplete information. Even without selecting special groups we could say that the Survey data include some of the most important and strategic variables. For economic behavior, money income may be more important than nonmoney income, liquid assets than nonliquid assets, etc. But with some care in selection within the sample, definite improvements can be made. Nonmoney income is by far more important for farmers and home owners. These groups can be

[12] An especially informative article, 'Methods of the Survey of Consumer Finances', appears in the *Federal Reserve Bulletin*, July 1950.

eliminated from our study or examined separately. Asset information is more satisfactory for renters than for home owners because house valuation problems do not arise for the former; hence these two groups are treated separately. Business assets not included in the surveys are held largely by farmers and nonfarm owners of unincorporated businesses. Again, these two groups can be sorted out.

We turn first to already published material from the Surveys to see what can be learned, on a purely descriptive level, about assets and debts in American households. Liquid assets (U. S. government bonds, checking and savings accounts, postal savings, and shares in savings and loan associations or credit unions), life insurance policies, and homes are widely held in all income groups. More persons in the high income groups hold these assets than in the low groups, yet in the lowest group, $0-999, each of these assets is held by more than 40 percent of the spending units. Automobiles are somewhat less widely held, especially in the low income groups, while businesses and private securities are very heavily concentrated in the income classes above $5,000. The percentage of spending units in an income class having debts is much smaller in the lower than in the higher income classes, yet the concentration is not as severe as business and private security ownership. The holding of debts of any type ranges from about 28 percent in the class under $1,000 to 60 percent in the class over $7,500, the peak, 65 percent, being in the $4,000-4,999 class.[13]

Wealth is gradually accumulated in a relatively slow process over an individual's life span. Asset holding is less common among spending units whose head is 18-24 years old than among units with a middle-aged head. The latter spending units, in turn, hold assets more frequently than do those whose head is 65 years or older. The young have not had time to accumulate assets, and the old live, to some extent, on capital. This pattern is not uniform for all assets, however. The frequency of home ownership seems to grow approximately continuously with age to the bracket 65 years and over, and the frequency of automobile ownership reaches a peak much earlier in life than is the case for all assets, to cite only two examples. These descriptive facts are significant because they point to a definite nonlinearity that must be taken into account in the analytical work. Debt information has not been published by an age classification. However, the frequency of residential mortgages is shown to vary with the age of the house; older houses carry mortgages less often than new.[14]

[13] '1948 Survey of Consumer Finances', *ibid.*, July 1948, Part III, Table 2, p. 768, Table 11, p. 775; '1949 Survey of Consumer Finances', Aug. 1949, Part IV, Table 4, p. 901; Oct. 1949, Part VI, Table 1, p. 1184; Jan. 1950, Part VIII, Table 19, p. 31.

[14] *Ibid.*, Aug. 1949, Part IV, Table 16, p. 911; Sept. 1949, Part V, Table 1, p. 1040, Table 4, p. 1042; Oct. 1949, Part VI, Table 2, p. 1185, Table 5, p. 1188.

Many more facts concerning wealth holdings are undoubtedly relevant, but we cannot take them all up in detail. The descriptive facts are not an objective for us. We are more interested in why people hold certain amounts of various types of assets and how these holdings affect behavior. This question is asked directly in the Surveys and the results are valuable; however, all concerned recognize that the direct results must eventually be supplemented by indirect statistical inference from various interrelated facts. When respondents are asked reasons for and against holding various types of assets, their answers appear to accord with *a priori* economic analysis in the sense that the major reasons coincide with the variables in the theoretical calculus. To many asset holders, safety, liquidity, and the rate of return are important.[15] The possibility of capital loss, an important factor in theoretical dynamic economics, was often given as a reason against holding real estate. The main deviation from the theoretical scheme is the oft repeated lack of familiarity as a reason for not holding common stock. This is a perfectly sensible answer but not one we would expect from the 'economic man'.[16] There is further evidence that noneconomic variables influence holdings of assets. In various surveys on the attitudes of respondents toward United States savings bonds, personal solicitation was found to be a key factor in determining whether people buy these securities. According to a study by the Survey Research Center, about one in every two persons who were asked personally to buy savings bonds did so. If this is the case, it means that the institutional arrangement of the bond selling market is a variable to be considered. If personal solicitation merely means that one transfers an existing asset into savings bonds or that one channels new savings into this rather than into some other indifferent form, it may not be of much economic consequence, but this hardly seems likely. An important thing to point out about an institutional arrangement like personal solicitation is its pliability, so that it means little for the economist to take it as given.

By supplementing published Survey data on the percentage distribution of savings, income, and liquid assets among income deciles with unpublished data on estimates of mean savings, income, and assets, we can estimate mean values of these three variables in each income decile, thereby gaining a valuable insight into the effect of assets on saving behavior (Table 1).

Let us regard an income decile as a unit of behavior and analysis. This convenient simplification is not, of course, strictly correct. Later we shall

[15] The assets about which the questions were asked are bank deposits, U. S. savings bonds, real estate, and common stock.

[16] *Federal Reserve Bulletin*, July 1948, Part III, Table 15, p. 777; Oct. 1949, Part VI, Table 3, p. 1186.

Table 1

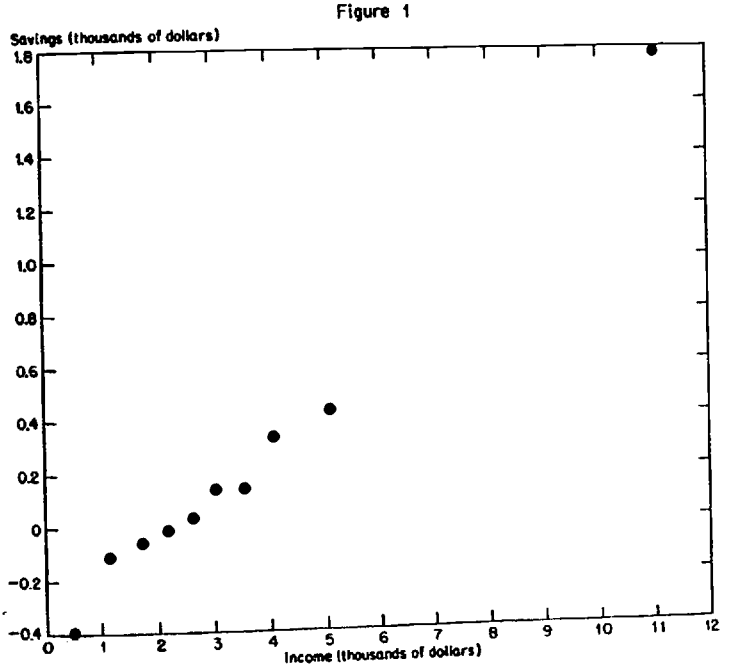
Mean Savings, Income, and Liquid Assets by Income Deciles, 1948

Income Decile		Savings	Income	Liquid Assets
Lowest	1	$−393	$489	$546
	2	−111	1,152	728
	3	−61	1,711	546
	4	−14	2,164	1,091
	5	32	2,618	1,091
	6	138	3,037	1,091
	7	138	3,526	1,455
	8	334	4,084	1,637
	9	431	5,097	2,001
Highest	10	1,775	11,032	8,004

drop this assumption and treat spending units (households) as the basic units. Table 1 is not derived from a trivariate frequency distribution; more detail and smaller cells would be needed if all three variables were jointly cross-classified. A trivariate distribution would, obviously, be more appropriate for the problem at hand. Table 1 is deficient also in that it gives liquid asset holdings for an end of period instead of a beginning of period date. The latter dating is proper in order to reflect the influence of liquid assets as initial conditions.

Mean savings and income, plotted in Figure 1, show a strong positive correlation. Can holdings of liquid assets account in some sense for the

Figure 1



deviations from the average line of relationship between savings and income? The points in Figure 1 fall very nearly along a straight line from the 2d through the 9th decile. The observation for the 1st decile lies well below such a line, and the observation for the 10th decile is above the line. Liquid asset holdings are smallest in the 1st decile and largest in the 10th decile; thus the configuration of points on the graph and the data in Table 1 suggest a positive relation between savings and liquid assets with income held constant. This relation is in the opposite direction to that assumed by theorists who stress the influence of assets on savings. To some extent, the use of end of period rather than beginning of period liquid assets may bias the results in a positive direction but this is not enough to account for the relation implied by Figure 1 and Table 1 because the correlation between liquid assets currently held and those held one year ago is very high in a cross-section sample.

It is evident from Figure 1 that a parabola would be adequate to account for the position of the observation for the 10th decile, but the observation for the 1st decile will not lie near the curve.

If we analyze the ratio of savings to income rather than total savings and at the same time transform the explanatory variables appropriately, the results are quite different (Table 2). Why these particular variables are chosen is explained below. Suffice it here to note the interrelations among these transformations of savings, income, and liquid assets.

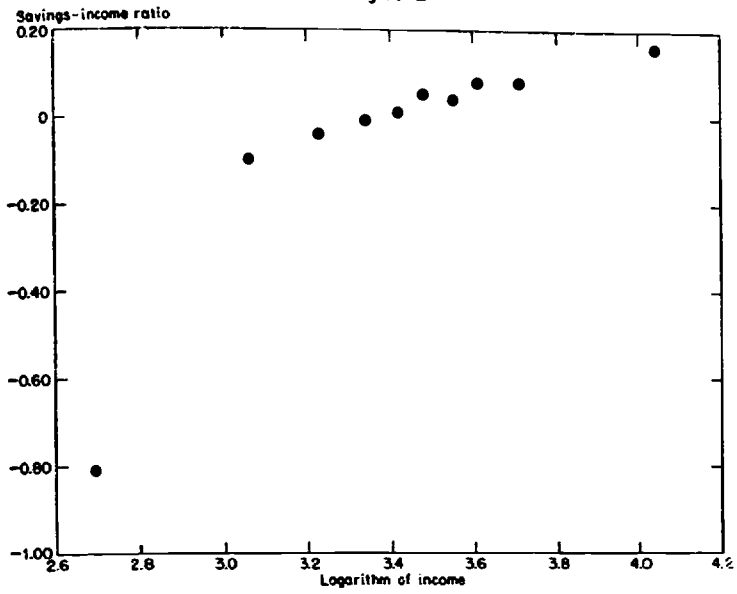
Table 2

Savings-Income Ratio, Logarithm of Income, Liquid Asset-Income Ratio, by Income Deciles, 1948

Income Decile	Ratio: Mean Savings to Mean Income	Logarithm of Mean Income	Ratio: Mean Liquid Assets to Mean Income
Lowest 1	−0.81	2.69	1.12
2	−0.10	3.06	0.63
3	−0.04	3.23	0.32
4	−0.01	3.34	0.50
5	0.01	3.42	0.42
6	0.05	3.48	0.36
7	0.04	3.55	0.41
8	0.08	3.61	0.40
9	0.08	3.71	0.39
Highest 10	0.16	4.04	0.73

In Figure 2 the relation between the savings-income ratio and the logarithm of income is approximately linear in the range from the 2d through the 9th deciles. The observed points for the lowest and highest decile fall below the line connecting the other points. Table 2 shows that the liquid assets-income ratio is by far the highest in the two extreme deciles, the larger of the two ratios observed for the 1st decile where the

Figure 2



negative deviation in Figure 2 is the larger. On the other hand, the liquid asset-income ratio for the other deciles is fairly stable. This situation is definitely consistent with the relation

$$S/Y = \alpha_0 + \alpha_1 \log Y + \alpha_2 L/Y; \alpha_1 > 0, \alpha_2 < 0,$$

where S=savings, Y=income, and L=liquid assets. If we fit an estimated equation to the ten sets of observations in Table 2, we find that our rough description gives a good picture of the interrelation, but with so few grouped observations we cannot rely on such calculations. The preceding Survey, referring to savings and income in 1947, shows the same picture except that the observed point for the 10th decile in the graph of S/Y and log Y does not deviate appreciably from the line through the points for deciles 2-9. The tabulations from the 1950 Survey of Consumer Finances, referring to data of 1949, show approximately the same pattern as the 1947 data. In both cases, the extreme negative deviation for the lowest decile associated with a high liquid asset-income ratio dominates the net correlation between S/Y and L/Y, making it significantly negative.

The main point is that the Survey material may or may not imply a strong inverse effect of liquid assets on savings; the result depends very much on how we look at the data. We proceed to a more detailed examination of the Surveys to see whether we can make a more refined decision about the basic hypotheses under consideration. We turn first to a set of calculations based on reports of savings, income, income change, liquid assets, debts, and family size by individual households. These data essen-

tially enable us to pursue further the analysis begun with Table 1. Later we turn to the analysis of data like those in Table 2.

From the 1949 Survey we sorted out all farmers and owners of unincorporated businesses. As mentioned above, it is felt that household and business accounts are so mixed in this group that true behavior patterns may be obscure from the answers given to the Survey questions. Moreover, there is the complication of the receipt of income in kind by farmers. The remaining questionnaires were then segregated into eight classes (Table 3).

Table 3

Class	Number of Cases	Disposable Income* 1948	% Income Change 1947 to 1948
I	232	$0-1,999	±4
II	207	0-1,999	+5 to +24
III	176	2,000-2,999	±4
IV	221	2,000-2,999	+5 to +24
V	133	3,000-3,999	±4
VI	210	3,000-3,999	+5 to +24
VII	125	4,000-7,499	±4
VIII	212	4,000-7,499	+5 to +24

*Disposable income equals reported money income minus estimated federal income tax liability.

Since our purpose is to explore the possibility that assets and debts influence economic behavior, in this case saving behavior, we try to hold other variables constant. There is good evidence in this and other Survey material and time series aggregates that savings are closely related to income and income change; therefore we try to see how much of the residual variation in savings after accounting for the effects of these two known variables is explainable in terms of assets and debts. The smallness of the sample prevents us from trying to hold other variables constant that may be thought in advance to be determinants of household savings. In fact, the size of the sample largely determined the choice of the eight classes and the exclusion of all others. More finely divided or higher income classes are ruled out because they would yield groups too small for statistical treatment. Only two income change classes are selected because the majority of individuals were in them in the 1949 Survey. The income of relatively few persons declined from 1947 to 1948, and the income of relatively few increased much (25 percent and over); thus to get a sizable number of respondents in each class we are confined to the two. Four variables are picked for each respondent in a given class: savings, liquid asset holdings one year ago, the number of persons in the spending unit, and total debt at the time of interview. Savings are defined as reported in the *Federal Reserve Bulletin* articles. Liquid assets are composed of U. S. government

bonds, checking and savings accounts, postal savings, and shares in savings and loan associations or credit unions. Total debt includes mortgages on homes and other real estate owned, instalment debt, unpaid charge accounts, and miscellaneous personal debt. In this set of calculations liquid asset and debt data are taken from tabulations by class intervals; therefore each respondent was assigned variables equal in value to the midpoint of the class intervals in which his stated amounts lay. Ideally we should have measured total debt one year ago instead of at the time of interview, but there are some technical difficulties in obtaining beginning of period debt for this entire sample.

The statistical approach adopted here is exploratory; hence some approximations are made that will be dropped in favor of more exact methods when a more conclusive set of calculations are made. The income and income change classes of our eight groups are evidently too broad for us to say that the income and income change effects are held constant. Eventually, all variables will be treated on an equivalent basis, but at this stage we would like to use a more general, although approximate, method that does not confine us to linear schemes, for example. Undoubtedly the intercorrelation between assets or debts and income or income change is substantial; therefore we would be running into the familiar problem of multicollinearity if all variables were dealt with simultaneously. Have we avoided this problem by keeping income and income change within the ranges of our eight groups? If income and income change were the main or sole determinants of assets and debts, then by holding the former two constant we would simultaneously be holding the latter two constant. Empirically, this is definitely not the case. When income is kept within a range of $1,000 or $2,000, liquid assets, for example, range from zero to more than $10,000. Debts have the same range of variation within the groups. Both income and income change are important variables that serve to determine the levels of assets and debts held, but other factors are also important. Age of family head is one such factor that shows up clearly in the published Survey tables, as already mentioned. Share yields, bond yields, and other interest rates also affect assets and debts, but they are supposedly the same for all respondents at the time of interview.

The nature of the relation between assets or debts on the one hand and income or income change on the other can be seen in Table 4. The reader will notice that both liquid assets and debts rise with rising income on the average in our sample. He will notice further that in every income class mean assets are larger in the ± 4 percent income change class than in the $+5$ to $+24$ percent class. Debt shows the opposite relation. The conclusions concerning income change are the weakest because decreases and large increases have been neglected.

Table 4

Class	Disposable Income	Income Change, %	Average Liquid Assets	Average Debt
I	$0-1,999	±4	$875	$102
II	0-1,999	+5 to +24	577	158
III	2,000-2,999	±4	1,795	470
IV	2,000-2,999	+5 to +24	1,085	509
V	3,000-3,999	±4	1,887	1,095
VI	3,000-3,999	+5 to +24	1,409	1,346
VII	4,000-7,499	±4	3,368	1,772
VIII	4,000-7,499	+5 to +24	2,431	1,782

The failure to hold income constant imparts a bias to the estimate of the saving-asset or saving-debt relationship if income is significantly related to savings, assets, and debts. In a simple example this bias can be formally demonstrated.

Let S = savings,
Y = income,
L = liquid assets,
u = random error.

Assume that the true relation we are trying to estimate is

$$S = \alpha_0 + \alpha_1 Y + \alpha_2 L + u.$$

Assets are dated as of one year ago and are therefore predetermined or fixed for purposes of statistical estimation. It seems best to assume that the individual looks upon his income as a given variable and attempts to adjust his spending-saving pattern to it, along with other fixed variables. If these assumptions are correct, optimum estimates of α_1 and α_2 are given by the least squares values:

$$\hat{\alpha}_1 = \frac{\begin{vmatrix} m_{SY} & m_{YL} \\ m_{SL} & m_{LL} \end{vmatrix}}{\begin{vmatrix} m_{YY} & m_{YL} \\ m_{YL} & m_{LL} \end{vmatrix}} \qquad \hat{\alpha}_2 = \frac{\begin{vmatrix} m_{YY} & m_{SY} \\ m_{YL} & m_{SL} \end{vmatrix}}{\begin{vmatrix} m_{YY} & m_{YL} \\ m_{YL} & m_{LL} \end{vmatrix}}$$

where the m's are moments of the variables in terms of deviations from sample means.

The estimates are assumed to be calculated from observations confined to an arbitrary income class, $Y_0 \leq Y \leq Y_1$. If income is wrongly treated as a constant in this income class, the estimate of α_2 is

$$\tilde{\alpha}_2 = \frac{m_{SL}}{m_{LL}}$$

The difference between the two estimates of α_2 is seen to be

$$\hat{\alpha}_2 - \tilde{\alpha}_2 = \frac{m_{YL}}{m_{LL}} (-\hat{\alpha}_1).$$

If the correlation between income and assets is positive, $m_{YL} > 0$, and if the net income effect on savings is positive, $\hat{\alpha}_1 > 0$, we have

$$\hat{\alpha}_2 < \tilde{\alpha}_2;$$

i.e., the net negative influence of assets on savings will be underestimated in absolute value by our approximate method. Replacing assets by debts we would conclude that the net positive influence of debt on savings will be overestimated. The problem is only more complicated when income change and other variables are introduced. Income is such an important variable that these general biases should be kept in mind as the probable direction of error in the empirical results that follow.

The moment matrices for S = savings in thousands of dollars, L = liquid assets one year ago in thousands of dollars, N = number of persons in the spending unit, D = total debt in thousands of dollars are given in Table 5. All moments are computed in terms of mean deviations.

Table 5

MOMENT MATRICES

Class	S	L	N	D
I	40.7574	−25.3305 1088.20	14.3222 −113.376 452.892	1.28374 −5.80887 15.3881 29.1312
II	24.3002	−12.2183 322.313	−7.79338 −42.7684 393.691	−0.906969 −7.46140 15.4843 58.4810
III	77.4888	−16.7224 1927.61	8.23500 −158.225 377.0	22.5170 −21.0724 27.8625 337.545
IV	70.1135	34.8608 1030.49	−1.71398 −75.8088 495.158	22.4938 −42.5724 26.7756 316.783
V	99.1298	−32.3609 1265.31	−20.0631 −158.624 309.970	23.8469 32.6223 4.50904 686.022
VI	122.715	51.2579 1403.88	−10.1637 −170.973 379.257	16.6309 −117.393 5.33572 1150.01
VII	291.409	9.32902 2450.29	−3.33528 −160.622 247.392	68.2997 −39.1950 43.4816 1071.20
VIII	229.685	64.2679 2584.88	−1.30877 −318.787 476.580	14.5475 −237.321 27.9354 1940.37

We cannot make controlled experiments in economics as yet, but we can attempt to simulate an experimental situation in the following way. Regard each of the 8 groups of moments as having been drawn from 8 experiments in which income and income change were controlled. If the only nonrandom differences among individuals' savings can be accounted for linearly by L, N, and D, we have something like 8 controlled experiments. This scheme, in a rough sense, is like the scheme that underlies the calculation of sampling errors. Parameters estimated from a sample are subject to error because different values for the estimates will probably arise if another sample is used. Sampling errors are designed to show the variability that would occur if the parameters were estimated over and over again in repeated samples for the *same values of the controlled variables*. We do not have a perfect simulation because the controlled variables are not the same in each sample; 8 repetitions are not enough, and other variables undoubtedly should be brought to bear on the situation.

Keeping all qualifications in mind, what can we say in a rough way from the moment matrices? In 4 of the 8 groups liquid assets and savings are negatively related. Three of the first 4 are negative, and 3 of the second 4 are positive. The correlations are low – just on the border of significance at the 5 percent level. This is worth pointing out in this connection because if we were to reverse the procedure by controlling assets and studying the savings-income correlation, the results would be much different. The author's colleague, J. N. Morgan, reports correlations of the order of 0.4-0.7 between savings and income in selected asset groups. Morgan's savings variable, it should be remarked, is different in that it includes purchases of consumer durables. In econometric time series analysis it is recommended not to argue in favor of an empirical relation on the basis of the degree of correlation. In time series analysis it is usually a case of choosing among several alternatives, all of which show high correlation, from 0.5 to 0.99, and other criteria must be considered for the choice of the correct hypothesis. Our problem now is viewed somewhat differently. On theoretical grounds it is not possible to select the correct set of variables. Assets, debts, and income are equally plausible. We then look for systematic patterns to see what relations can be established empirically. Income shows a substantial relationship, while assets show little if anything on the average.[17] We are not trying to choose between

[17] There is a wide dispersion about the line of average relationship between savings and assets in all our groups. This means that some people have a very large negative asset effect on savings, while others have a very large positive effect. On balance, the net effect for the sample is small. If these wide deviations about the line of relationship are random, there is little more to be said because there is no way of picking

two high correlations; we are trying to find out whether any variables suggested by theoretical considerations besides income and possibly income change show any systematic relation to savings.

The fact that assets are negatively correlated with savings mainly in the lower income groups is worthy of note. This finding is quite consistent with the observation that S/Y and L/Y show negative net correlation largely because of the observed values of the variables in the lowest decile.

Returning to the moment matrices once more, we find that savings and debts are positively correlated in 7 out of 8 cases. The failure to hold income constant gives an upward bias to these correlations, but, in the other direction, there is a further bias due to the fact that our debt statistics should be dated one year ago instead of at the time of the interview. The contraction of new debt is a form of negative saving; therefore end of period debt should, on this account, be less positively related to savings than beginning of period debt.

On *a priori* grounds we expect the influence, if any, of liquid assets on savings to be negative, i.e., the larger the funds available for spending, the more spending or the less saving there will be. Since debts are negative assets, we should, in the first instance, look for a positive relation between debts and savings. Debt contraction provides a source of additional funds for expenditures, thus making saving more possible. Debt must be repaid, and the reduction in debt outstanding is reckoned as savings. This reinforces the positive effect of debt on savings. The positive correlation we observe between savings and debts is not surprising.

To get some homogeneity among the different units in each group the size of the spending unit is considered as a separate variable. Large families, especially in lower income groups, must spend more than small families for minimum requirements of food, clothing, and other necessaries. This should bring about a negative correlation between savings and family size. Heads of large families may carry more insurance or maintain large amounts of special savings for the benefit of dependents, but, on the whole, we may expect a negative correlation. As an alternative to the use of N as a separate variable, we may work with per capita amounts S/N, L/N, D/N, etc. in order to conserve a degree of freedom. Rather than assume the relevance of N in our relationships, we have given

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out the positive from the negative effects. Policy recommendations would be especially hazardous in this case. Further research is required to determine whether there is some nonrandom, systematic character in the dispersion. We are not faced with the situation in which the line of average relationship is very gently inclined with a small dispersion about it – the type of situation really essential to state definitely that the asset effect on savings is small.

it a free coefficient in a linear relationship to obtain some judgment of its empirical importance. The number of persons in the spending unit is admittedly a rough indicator of the true influence of 'size'. Newborn babies entail large initial outlays for consumer goods; children consume different amounts of food and clothing at different ages, and different amounts than adults; adults in the retirement stage of life do not have the same requirements for daily living as younger adults. A weighted sum of persons in the spending unit, the weights depending upon age, would be a more satisfactory variable. We have not gone so far in this study, but an interesting attempt to get empirical measures of 'equivalent adults' has been made by Vickrey.[18]

The behavior equation we are trying to estimate is of the following general type:

$$S = f[Y, (Y - Y_{-1})/Y_{-1}] + g_0\alpha_0 + g_1\alpha_1 L + g_2\alpha_2 N + g_3\alpha_3 D + g_4 u,$$
$$g_i = g_i[Y, (Y - Y_{-1})/Y_{-1}], \; i = 0, 1, 2, 3, 4.$$

Our statistical procedure is to fix Y and $(Y - Y_{-1})/Y_{-1}$ in restricted classes and estimate the $g_i\alpha_i$. If the final equation turns out to be linear in all variables including Y and $(Y - Y_{-1})/Y_{-1}$, all the g_i are unity and our estimates are for the α_i. Table 6 contains the empirical results: standard errors are given below the estimated coefficients. R denotes the multiple correlation coefficient and $\bar{S}_u$ the standard error of estimate, both adjusted for degrees of freedom.

The relation between savings and income and even income change is unmistakable. Other writers have studied this relation, and we find a strong empirical relation similar to theirs.[19] The choice of other variables is much less certain. The sampling errors are large, and correlations are low for the other variables we selected in this preliminary experiment.

Numerous qualifications have already been stated regarding the use of Survey material for studying the problem of assets, debts, and economic behavior, but even more qualifications are to be made on the set of computations just described. Two important variables in the hypothetical savings relation are obtained from households as a result of what we may call 'memory questions'. Respondents are asked to recall their liquid assets 12 months ago and their income of the calendar year preceding the one just completed. It is well established that answers to such questions are subject to significant memory errors.

[18] W. Vickrey, 'Resource Distribution Patterns and the Classification of Families', *Studies in Income and Wealth, Volume Ten* (1947), pp. 266-97.

[19] The relation between savings, income, and income change is illustrated by the following calculations from our sample:

Class	I	II	III	IV	V	VI	VII	VIII
Mean savings, $	−50	−22	59	97	117	194	363	449

Table 6

CLASS	CONSTANT TERM $g_0\alpha_0$	COEFFICIENT OF L $g_1\alpha_1$	N $g_2\alpha_2$	D $g_3\alpha_3$	$\bar{R}$	$\bar{S}$
I	−0.087	−0.020 ±0.013	0.026 ±0.020	0.026 ±0.078	0.098	0.42
II	0.052	−0.041 ±0.019	−0.024 ±0.017	−0.015 ±0.045	0.121	0.34
III	0.002	−0.007 ±0.015	0.014 ±0.035	0.065 ±0.036	0.070	0.66
IV	0.023	0.037 ±0.017	−0.002 ±0.025	0.076 ±0.031	0.172	0.56
V	0.309	−0.034 ±0.025	−0.056 ±0.051	0.037 ±0.033	0.093	0.86
VI	0.150	0.037 ±0.021	−0.010 ±0.040	0.018 ±0.023	0.066	0.76
VII	0.309	0.003 ±0.032	−0.023 ±0.100	0.065 ±0.047	0.0*	1.53
VIII	0.313	0.028 ±0.022	0.015 ±0.050	0.011 ±0.024	0.0†	1.04

*$R^2 = 0.01556$. When adjustment is made for degrees of freedom, we get $\bar{R}^2 = 1 - 1.00885$. $\bar{S}_u^2 = \frac{m_{11}}{124}$, where there are 125 observations in the group.

†$R^2 = 0.00834$; $\bar{R}^2 = 1 - 1.00596$; $\bar{S}_u^2 = \frac{m_{11}}{211}$.

In the Surveys of Consumer Finances, farmers and persons living in high rent areas are deliberately oversampled in order to get better estimates of certain items that have greater variability for farmers and wealthy people. Moreover, response rates to Survey questions vary among different economic or demographic strata of the population. For these reasons weights are assigned to each spending unit to obtain a representative sample of the entire nation. The preceding set of computations was unweighted. The effect of weights was minimized because farmers were excluded and the sample was grouped into fairly homogeneous income classes. The correlation between rental area and income is, of course, substantial.

A striking feature of Table 6 is the systematic variation of $\bar{S}_u$ with income and income change. A basic assumption for many methods of statistical estimation of parameters of structural equations is that the variance of the random error terms is independent of the explanatory variables. In technical terms, homoscedasticity is desired. If variances are known to change in a given way, appropriate estimation methods can, however, often be developed, but according to the simple methods we are using, the generalization of the estimated savings function to the entire range of the income distribution must beware of the systematic variations observed in $\bar{S}_u$. For example, data like those in Table 1 are means from groups that have systematically changing variances; consequently, we

cannot simply study the joint variation of savings, income, and liquid assets as such by conventional methods. Table 6 shows that the addition of debt and family size variables would not improve the situation. However, if the data are transformed as in Table 2, homoscedasticity is achieved. The basic point is that the variance of savings within income classes grows with income, while the variance of the savings-income ratio is approximately uniform within all income classes. This fact is the main reason the particular variables in Table 2 were used.

A special sample of 655 spending units in the 1949 Survey of Consumer Finances, known as the reinterview sample, is composed of urban dwellers who were interviewed in the 1948 Survey and did not move between the two interview dates.[20] Although small, this sample is chosen to be representative of the urban population of U. S. spending units. We have made extensive calculations with this sample because memory errors on income change and liquid assets held one year ago are not involved if we use data from two surveys for each spending unit. Farmers are automatically excluded from the sample, but in the first set of calculations to be described we did not sort out owners of businesses. On the other hand, home owners and nonhome owners (roughly the same as renters)[21] are differentiated in that separate computations are made for each group. Unlike the cases in Tables 5 and 6, the estimates from the reinterview sample are all weighted according to response and sampling rates.

The relationship studied with the reinterview sample is

$$S/Y = \beta_0 + \beta_1 \log Y/N + \beta_2 L/Y + \beta_3 (Y - Y_{-1})/Y_{-1} + \beta_4 a + u.$$

All variables except a = age of the spending unit head (in years) have been defined. To get uniform variability within income classes we analyze S/Y instead of S. And to account for the nonlinearity of the relation between the savings-income ratio and income we transform Y to logarithms (S/Y is far from being linearly related to Y but is more nearly linearly related to $\log Y$). We introduce N arbitrarily as the denominator of per capita disposable income. We use L/Y instead of L as a consequence of the preceding calculations which indicate that S, Y, and L are approximately related in

$$S = \beta_0' + \beta_1' Y + \beta_2' L + Yu,$$

from which it follows that

$$S/Y = \beta_0' \frac{1}{Y} + \beta_1' + \beta_2' L/Y + u.$$

[20] The reinterview study of the Survey Research Center is supported by a grant from the Rockefeller Foundation.

[21] The nonhome owner group contains some persons who neither own nor rent. Many of these in turn are related secondary spending units.

We have altered this relation by using log Y (actually log Y/N) instead of $1/Y$ because the approximation is quite good by our procedure and because the tendency of log Y to be normally distributed simplifies some of the underlying statistical theory. We have left the income change variable, $(Y - Y_{-1})/Y_{-1}$, in the same form although other calculations have been made with different forms assigned to this variable. Finally, we have added the age variable as another explanatory factor in saving behavior. Both linear and nonlinear forms of this variable have been considered, but the only moderately satisfactory results have been obtained with the linear scheme above.

The estimated equations are:

Home Owners (288 spending units)

$$S/Y = \underset{(0.08)}{-0.93 + 0.35 \log Y/N} \underset{(0.02)}{- 0.21\, L/Y} + \underset{(0.05)}{0.03\, (Y - Y_{-1})/Y_{-1}} + \underset{(0.0022)}{0.0013\, a} + u$$

$$R = 0.57 \qquad S_u = 0.42$$

Renters (318 spending units)

$$S/Y = \underset{(0.11)}{-1.61 + 0.48 \log Y/N} \underset{(0.03)}{- 0.25\, L/Y} + \underset{(0.06)}{0.07\, (Y - Y_{-1})/Y_{-1}} + \underset{(0.0024)}{0.0055\, a} + u$$

$$R = 0.49 \qquad S_u = 0.56$$

Data on S, Y, L, or $Y - Y_{-1}$ were lacking for 49 cases in the entire sample; these were excluded from the above computations.

As the results indicate, income and liquid assets are the most significant variables explaining saving behavior in this sample. The influence of age is indecisive from these computations, but the similarity of the findings for the two groups and the statistical significance of the age coefficient in the renter group suggest a relationship that we may accept tentatively until further investigations have been made. There is some indication that the influence of age on savings may be obscured by a significant positive correlation between (L/Y) and a in both subgroups of the sample.

That income change is not a more significant variable in the above two equations is surprising. One reason the coefficients of income change are so small and subject to such large errors is that income increase and income decrease have different effects. At the risk of obtaining samples with too few observations we estimated the following equations for income increase and decrease categories:

INCOME INCREASE

Home Owners (199 spending units)

$$S/Y = -0.68 + \underset{(0.08)}{0.26} \log Y/N - \underset{(0.03)}{0.06}\, L/Y + \underset{(0.05)}{0.02}\, (Y - Y_{-1})/Y_{-1} + u$$

$$R = 0.26 \qquad S_u = 0.34$$

Renters (207 spending units)

$$S/Y = -0.31 + \underset{(0.05)}{0.11} \log Y/N + \underset{(0.022)}{0.00003}\, L/Y + \underset{(0.02)}{0.01}\, (Y - Y_{-1})/Y_{-1} + u$$

$$R = 0.16 \qquad S_u = 0.20$$

INCOME DECREASE

Home Owners (89 spending units)

$$S/Y = -1.15 + \underset{(0.14)}{0.47} \log Y/N - \underset{(0.03)}{0.31}\, L/Y - \underset{(0.38)}{0.54}\, (Y - Y_{-1})/Y_{-1} + u$$

$$R = 0.78 \qquad S_u = 0.50$$

Renters (111 spending units)

$$S/Y = -0.93 + \underset{(0.30)}{0.45} \log Y/N - \underset{(0.06)}{0.25}\, L/Y + \underset{(0.49)}{1.60}\, (Y - Y_{-1})/Y_{-1} + u$$

$$R = 0.59 \qquad S_u = 0.83$$

The relation between liquid assets and savings is much more marked for spending units whose incomes decline than for those whose incomes increase. The joint effect of a decline in income and the possession of liquid assets is undoubtedly stronger than the effect of either variable separately. There is some relation, however, between income change and current income. The mean income, for example, of units whose income decreases is smaller than the mean income of those whose income increases; thus we cannot be certain whether the proper interaction effect is between income and liquid assets or between income change and liquid assets. In either event, the fact that the relation between savings and liquid assets varies systematically among different households is of the greatest importance in judging the effect of monetary or flexible wage and price policies for the maintenance of a high level of economic activity. This point will be developed further below.

The more pronounced influence of liquid assets on savings in the lower than in other income groups has already been commented upon. An analysis of the residual variation of the first two equations determined from the reinterview sample brings out this difference in another way. The

mean value of the residual variation – the savings-income ratio after the effects of income, liquid assets, income change, and age have been taken into account – is calculated for four liquid asset classes. If, as the computations indicate, L is a significant variable with a positive coefficient, in addition to those already in the equations, we find that

$$\frac{\partial S}{\partial L} = \beta_2 + \beta_5 Y, \qquad \beta_2 < 0, \beta_5 > 0.$$

That is, the depressing influence of assets on savings diminishes as income grows, which is another way of bringing out an interaction between liquid assets and income.

	HOME OWNERS		RENTERS	
LIQUID ASSETS	Number of Cases	$\bar{u}$	Number of Cases	$\bar{u}$
$0- 499	108	−0.04	156	−0.02
500-1,999	79	−0.06	91	+0.01
2,000-4,999	55	+0.11	44	−0.14
5,000 & over	46	+0.19	27	+0.51

There are numerous interesting aspects about the effect of income change on savings, but a full discussion would be more proper in an article on saving behavior than in an analysis of the effect of assets and debts on economic behavior. Here we are content to note that there is an interaction effect between liquid assets on the one hand and income, income change, or both, on the other.

Critics may argue that the exclusion of 49 cases from a sample of 655 may bias our results unless we have some indication that the excluded cases really behave like the 606 cases used to estimate the two savings relations. Among the 49 excluded cases two had negative income and two zero income. Negative income arises from business losses, and there is some question whether household income should include the negative components. The zero income cases are extreme situations which are not important in the population, especially after some correction is made for interfamily transfers. Such corrections are not made in the Surveys of Consumer Finances. In any case, our empirical relations, as they are now written, involving logarithms of income cannot handle negative or zero incomes. The income variable could be redefined as $Y + \alpha$ $(\alpha > 0)$ where α is some positive constant determined by fitting an income distribution to the observed data so as to encompass the few cases of zero or negative income. However, these cases were not considered sufficiently important to warrant extensive treatment.

In all except nine of the remaining cases excluded from our calculations the Survey Research Center has attempted to assign values to the missing variables on the basis of detailed demographic and economic

classification of the total sample. A spending unit for which a variable is missing is assigned the mean value of the variable for the demographic-economic group in which it falls. The assignment of missing values by this technique is far different from assignment by substitution in our equations, though, of course, the principal is not different. Using the values assigned by the Survey Research Center to all the missing cases from our home owner group, 25 cases in all, we found that the estimation of our savings relation based on both assigned and unassigned cases is practically unchanged. This does not prove that the missing cases behave like the others, but it is the strongest scrap of evidence we are yet able to produce that our results are not biased by the omission of the 49 cases. As the renter group contained merely 11 assigned cases, we did not make the additional calculations for it.

In view of our earlier remarks about the problems of dealing with owners of businesses, especially unincorporated, in a study of household behavior as such, and our specific exclusion of this group in the first set of calculations, it was necessary to inquire into the effects of not excluding this group. In the renter group 19 cases owned an incorporated or unincorporated business in 1948. Our results remain practically unchanged when they are excluded from our calculations. There was no noticeable effect on the estimates of the parameters or on any of the estimated variances. Similar calculations were not carried out for the home owner group since the two groups are nearly alike except for one important difference that is well explained by another set of factors.

The main difference between the savings relation for home owners and renters is in the constant term: −0.93 for the former and −1.61 for the latter. The differences among the other estimated parameters are not significant. Home owners have a significant asset not possessed by renters. This does not necessarily imply that they are wealthier but, without any more information, we might expect smaller savings on their part. However, the ownership of this particular asset requires some contractual savings by home owners who have a mortgage on their property, repayment of mortgage principal being a form of saving. Approximately 46 percent of the home owners in the reinterview sample have mortgages and thus a form of contractual savings. There are two artificial reasons, in addition, why the constant term of the estimated equation is higher for the home owner group. Savings are overestimated by the amount of depreciation on owner-occupied homes, and income is underestimated by the amount of net imputed rent of owner-occupied homes. If the Surveys were redesigned to include depreciation on homes as a negative component of savings, and imputed rent as a positive component of income,

the savings-income ratio would be substantially lowered throughout the home owner group.[22]

The significance of the difference between the constant terms of the two equations, −0.93 and −1.61, could be tested by estimating their variances, then applying standard tests. We proceeded in an alternative fashion by pooling the data from the two groups and estimating an equation of the form

$$S/Y = \gamma_0 + \gamma_1 \log Y/N + \gamma_2 L/Y + \gamma_3 (Y - Y_{-1})/Y_{-1} + \gamma_4 a + \gamma_5 H + u$$

$H = 1$ if spending unit is a home owner.
$H = 0$ if spending unit is a renter.

We then use the data from the pooled sample to test the significance of γ_5. Our data from 606 cases lead to

$$S/Y = \underset{}{-1.36} + \underset{(0.07)}{0.41} \log Y/N - \underset{(0.02)}{0.23}\, L/Y + \underset{(0.04)}{0.06}\,(Y - Y_{-1})/Y_{-1} + \underset{(0.0017)}{0.0038}\, a + \underset{(0.05)}{0.13}\, H + u$$

$$R = 0.52 \qquad S_u = 0.50$$

The dummy variable representing home ownership shows unquestioned statistical significance.

More of the qualifications with regard to the nature of the Survey data apply to the home owner than to the renter group. Renters present more nearly a pure case for our analysis. They have for the most part no large physical household assets except consumer durables, and further calculations showed, as stated above, that the equations are little changed by excluding business owners. The similarity of results except for explainable differences in the constant terms leads us to look upon the findings as applicable to both home owners and renters.

Most household debt is in the form of mortgages on dwellings; however, there is a significant amount of other consumer debt, mainly short run. Getting beginning of period debt statistics for home owners offers technical difficulties because some mortgage payments cannot be decomposed into payments for interest and on principal, but beginning of year debt can be estimated for renters. For a group that is practically the same as renters in the above calculations we estimated (for 316 cases)[23]

$$S/Y = \underset{}{-1.64} + \underset{(0.11)}{0.49} \log Y/N - \underset{(0.03)}{0.25}\, L/Y + \underset{(0.06)}{0.07}\,(Y - Y_{-1})/Y_{-1} + \underset{(0.0024)}{0.0054}\, a - \underset{(0.13)}{0.09}\, D/Y + u.$$

$$R = 0.49 \qquad S_u = 0.55$$

[22] The 1950 Survey of Consumer Finances does, for the first time, estimate depreciation on owner-occupied houses in some of the savings calculations.

[23] Two renter cases were omitted because information on debt was lacking.

The sampling error of the estimated coefficient of the debt variable is so large that little can be said.[24] This coefficient could be much larger in a positive direction and could even be as large in absolute value as the coefficient of liquid assets, an interesting case, but the true coefficient could also be quite small. This particular sample shows little correlation of any sort between the savings-income and the debt-income ratio.

The interpretation of the foregoing results is not simple. Some of the statistical findings appear to be definite, but the economic implications are not entirely clear. The statistical determination of the influence of asset holding on household saving behavior, a central topic of this paper, depends in large degree upon how we look at the basic relation. The analysis using savings-income ratio, logarithm of income, and asset-income ratio is definitely superior on statistical grounds to that using savings, income, and liquid assets. In case the familiar argument is raised that we have increased the correlations by dividing both savings and liquid assets by the same variable, we can easily point to counter arguments. The correlation between S/Y and D/Y is negligible in our sample, yet S and D were divided by the same variable. If we find evidence supporting a structural relation with a disturbance term of the form Yu, it is definitely correct statistical procedure to divide both sides of the relationship by Y, then use accepted techniques to estimate the parameters of the distribution of u. We do not regard our findings of the asset effect as 'spurious' in any sense.

An economic question is whether our statistical findings support the existence of the type of savings relation assumed in the work of Pigou and Friedman on flexible wage and price policies. We have established within our sample the existence of an inverse asset effect on savings. Our variables are measured in dollar units at a particular instant when prices are roughly the same to all respondents. This enables us to say something about the effect of assets on savings at a particular price level, and as far as Pigou, Friedman, and others concern themselves with a similar effect we have corroborative statistical evidence. They have not, however, gone into the magnitude of the effect necessary for the smooth working of their policies. We have estimated an interval of approximately -0.2 to -0.3 for $\frac{\partial S}{\partial L}$ for the urban population of the United States as of the conditions prevailing in 1948. It remains to be seen whether this mag-

[24] The sampling errors in this equation are approximate and we shall not go into all the details necessary to explain the nature of the approximation. The reader can easily see, however, that the addition of D/Y has no influence on the estimated coefficients of the other variables and only a negligible effect on the equation from any other point of view.

nitude is adequate for their policy recommendations. Moreover, they view the asset effect on savings as taking place through variations in the price or wage level. Their relationship is of the form

$$S/p = f(Y/p, L/p), \qquad \frac{\partial S/p}{\partial L/p} < 0,$$

in which S, Y, and L are expressed in current prices, and p is the price level. With L fixed by the monetary authority, they ask for variability in p so that L/p will find a level bringing forth a desired amount of real savings, S/p. In our sample p is fixed, while S and L vary from household to household. It is this variation that we use to estimate the parameters of the savings relation. Variation of L/p due to fluctuating p is of a very special type in which every household experiences the same percentage change in its real asset position. We have not yet tested such special situations statistically. Many surveys carried out under various price levels would be necessary before an adequate decision could be reached on the problem of price flexibility as such.

We found in the samples studied that in order to predict the change in the savings of a spending unit whose liquid assets changed, it is important to know its income level or income change, or both. Flexible wage and price policies have the inefficient property of not distinguishing who gets percentage changes in liquid assets. An efficient policy would be one that attempted to alter liquid assets for groups that would react most sensitively in the desired direction. It is even possible that the results would be adverse or negligible if certain classes of spending units got the largest absolute changes in liquid assets. Other attempts to regulate the money supply directly will have to face the difficult problem of aiming their manipulations of liquid assets at households having the appropriate income and income change characteristics. For example, in trying to arrest a downturn in economic activity monetary authorities should adopt policies that will increase the liquid assets of persons whose incomes are relatively low or are declining. There is, as yet, no evidence that other types of households will readily respond to increases in liquid assets by saving less and spending more.

At the policy level one cannot restrict oneself to studying the effect of liquid assets and debts on household savings. The entire analytical framework must be enlarged to encompass such things as the effect of stocks of consumer durables on household saving behavior and the effect of liquid assets, debts, and the stock of productive capital on business investment behavior. Our new research findings apply to only a part of the necessary framework.

COMMENT

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Klein's paper, like the other general papers by Boulding and Brill, is the kind of work through which we can cash in on the work already done with wealth statistics, and find the further questions we need to ask. Though some of my hypotheses on the relations of wealth magnitudes may not be faring too well, as Klein points out, I am gratified that by the character of these papers two views I expressed two years ago are confirmed: that when we got down to brass tacks it would be the structure of assets and liabilities rather than totals that would count, and that the type of holder rather than the type of asset classification would be the classification we could really use.

Since I have to comment on the other two papers, and since the preliminary figures Klein presents will be superseded anyhow, I confine myself to one technical comment: that if 'savings' is to be defined as 'liquid savings' or some near equivalent (for which I can see good reasons), saving that takes the form of durable goods should be treated as an independent variable.