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Appendix D: The Concept of "Full Savings"

by Lewis C. Solmon

Before discussing reasons to expect particular relationships between education and savings, we must clarify our definition of *savings* and note the problems inherent in it. This study looks at savings behavior of a sample of families in 1959. The calculation of 1959 savings was initiated by deducting changes in nonhousing debt (during 1959) from changes in value of financial assets, excluding common stocks and mutual funds. To this was added the value of common stocks and mutual fund shares bought minus the value sold in order to determine additions to discretionary savings in the form of variable-price assets. The changes in variable-price assets due to appreciation or decline in value should not be considered saving or dissaving in the same sense as increases in other assets resulting from an individual's allocation of part of his income for that specific purpose. (The effects of unrealized capital gains or losses have been studied and was reported in Chapter 10.)

Savings in the form of real-property assets—namely, a change in value of nonhousing real estate and other assets valued over $1,000—is added to this concept of financial savings. Finally, mortgage principal repayments are taken into account. The action of repaying mortgage principal implies increased saving in the form of housing equity.

A number of other issues arise when an attempt is made to define savings completely. The appearance of a relation between savings, as conventionally defined, and schooling might be due to an actual relation between education and a more complete definition of savings, with the observed phenomenon due to systematic differences by education in the omitted portion of savings.

The problem can be illustrated by a simple case. Let full savings S_F equal the part included in the definition S_I plus the part excluded

S_E. Now, it is possible that the marginal propensities to save estimated using S_I decline with schooling E; i.e.,

$$MPS_I = a_1 - b_1E \tag{D-1}$$

Moreover, assume that had the marginal propensity to save in the form of S_E been estimated, the results would be the opposite; i.e.,

$$MPS_E = a_2 + b_2E \tag{D-2}$$

If $b_2 > b_1$, the true relationship between education and the marginal propensity to save would be positive if full savings could be quantified. Hence

$$MPS_F = a + bE \tag{D-3}$$

The problem then becomes one of either increasing the fraction S_I/S_F or, at least, estimating the sign and magnitude of b_2 in order to present an inference about the full-savings–income relationship. Both of these paths are followed to some extent.

First, the definition used excludes changes in debt incurred for business, farm, or equipment. The study focuses on the effects of education rather than of occupation; whether debt is incurred in these forms is a function of the latter. In the regression estimates provided later, a control variable is introduced to account for families where the head is a business proprietor or independent professional. However, both business assets and business debt are omitted from the definition of savings. Since business assets are probably acquired in part by incurring debt and in part by reducing other forms of financial and property savings, those acquiring business assets should appear to be saving less than others. Although there is probably a systematic relationship between schooling and self-employment, this will not affect the savings-schooling relationship if a self-employment variable is used to control.

Although many people accumulate physical capital to help them earn income subsequently, another type of postschool capital accumulation is also taking place, namely, accumulation of human capital in the form of on-the-job training. Rather than allocating part of earned income for business equipment or financial assets, an individual pays for on-the-job training by forgoing current income. Hence to adjust for savings in this form, not only must sav-

ings be augmented, but also a concept of full income is needed, one which includes income received and income forgone. Thus the first step is to separate *full* current income I^F into income received Y *plus* costs incurred (in terms of current income forgone) to obtain on-the-job training K. Mincer (1962, p. 54) uses the following approach to estimate on-the-job training costs:

> Such estimates are obtained on the assumption that the rate of return is the same on each year's investment whether at school or on the job. In any given year after high-school graduation, those who go on to, or have graduated from, college would have earnings (Y_j), which equal earnings of high-school graduates (X_j) plus the income earned on the differential investment in training made since graduation from high school, provided no further investment in training was incurred by them during year j. Costs of (incremental) training in year j are, therefore, measured by the difference between Y_j and X_j augmented by the (forgone) return on the previous (incremental) costs.

That is, Mincer shows that in any year j, training costs

$$K_j = X_j + \left(r \sum_{i=1}^{j-1} a_i K_i\right) - Y_j$$

$$a_i = \frac{1}{1 - (1/1 + r)^{n-j}} \qquad \text{(D-4)}$$

where a_i is a correction factor for finite life and n is the length of working life.

It is now possible to define full savings, S_j^F as equal to saving in the traditional sense of accumulating financial and property assets S_j, plus earnings forgone to obtain training, that is, saving in the form of human capital K_j.

$$S_j^F = S_j + K_j \qquad \text{(D-5)}$$

Furthermore, consumption C_j is a function of full income I^F:

$$C_j = a + bI_j^F \qquad \text{(D-6)}$$

in the simplest form. From Eq. (D-4), full income equals measured income plus income forgone to obtain training:

$$I_j^F = Y_j + K_j \qquad \text{(D-7)}$$

Substituting Eq. (D-7) in Eq. (D-6), we get

$$C_j = a + bY_j + bK_j \tag{D-8}$$

Substituting further for C_j, we get

$$I_j^F - S_j - K_j = a + bY_j + bK_j$$

hence
$$S_j = -a + (1 - b)\,Y_j - bK_j \tag{D-9}$$

Mincer's data show that on-the-job training rises with formal educational attainment and declines with age. Certain tentative conclusions can be drawn from Eq. (D-9). In a group of people whose characteristics would lead us to predict equal amounts (or percentages) of total savings (S_j^F), those with more schooling should have less savings as traditionally defined (S_j). Also, those who are older should have larger traditionally defined savings. In other words, since younger and more educated members of the labor force are saving more of their incomes in the form of investment in themselves, they probably will save correspondingly less in the form of financial assets and durables, other things being equal.

It has been argued in Chapter 10 that reasonable assumptions applied to traditional models of consumption and savings lead to the expectation that when savings are defined in the full-savings sense, more educated people *would* save more, as older members of the labor force do. The argument that includes investment in on-the-job training enables modification of these predictions. Since older workers invest less in on-the-job training, they should invest more in other forms of saving. Traditional assumptions lead to the prediction of more total saving as workers get older; hence empirically there should be a positive relationship between age and financial saving.

On the other hand, although it might be expected that more educated people save more in total, they also invest more in training, all else being equal. Thus it is unclear which way the relation between *financial* saving and education will go.

Mincer's estimates of investment in human capital (forgoing earnings to acquire on-the-job training) are for roughly the same period (1958–1959) as the data used for this study. His data permit calculation of a ratio, which we shall call d, for each age-education category of worker, d being that fraction of full income (received plus forgone) sacrificed in order to obtain on-the-job training.

The Consumers Union panel sample we use contains husband's

pretax (received) income, called H, which can be augmented to resemble full income by multiplying by $1 + d$ from the corresponding age-education group. The product of d times this full-income estimate is an estimate of earnings forgone in order to obtain on-the-job training. Hence savings should be augmented by $dH(1 + d)$ so as to incorporate investment in OJT, and family income should be increased by the same dollar amount in order to add to family income the forgone part of husband's income, thereby providing a measure of full family income. Since we are adding the same thing to both sides of the equation, the estimates will improve, partially for arithmetic rather than economic reasons. Moreover, since OJT varies with schooling, we can expect a more systematic relationship between education and saving when OJT is included. Lastly, this augmented model corresponds more to reality than one which omits OJT. The results were presented both with and without this adjustment for OJT.

Treatment of the acquisition of human capital differs somewhat from the previously described treatment of the acquisition of physical assets. In the latter case, our estimates are altered only to the extent that financial savings are reduced to acquire physical assets. In the former instance, the financial saving will be altered to the extent that financial assets are lower, or nonhousing debt higher, as a consequence of income forgone. However, on-the-job training is included in savings, while physical business assets are not. Moreover, income is adjusted only in the OJT case. This approach was chosen because of limitations of the data and the desire to highlight the effects of human capital. The result is that two equally educated people of the same age will be allotted equal saving in the form of OJT, but acquisition of business assets by one will be taken into account only by means of changes in financial saving and by the control variable for self-employment.

Two other components of saving have been excluded in these estimates. Changes in cash surrender value of life insurance were omitted, since there was evidence that this concept was not understood by many respondents, who appeared to confuse cash surrender value with face value. The variance of this variable was much larger than the variance of other components of saving. In the sample, mean saving in the form of increasing cash surrender value of life insurance did not vary systematically by schooling attainment, but remained in the 2 to 3 percent range of income. Of course, if the probability of confusing face value with the smaller

cash surrender value declines with schooling, the true share of savings in this form would rise with education, given a constant reported share of income saved in this form. The evidence implies that if life insurance saving does vary with education, the correlation is positive.

The second omission is savings in the form of pension plans. If more educated people tend to have jobs with larger pension plans, then their omission tends to understate the positive relationship between full saving and education. Using figures from Cagan (1965, p. 34) and from the current study, both of which refer to the same data set, it can be shown that savings in the form of pension plans tend to rise with education.

Appendix Table D-1 shows that, overall, those covered by pensions save 32 percent more than those not covered and that the share of people covered rises with schooling. Together, these figures indicate that if pension-plan saving were included in saving, those with a high school education or less would increase saving by 17.35 percent; those with some college, by 18.96 percent; and those with four years or more, by 20.23 percent on the average. Hence pension saving would strengthen any positive correlation between schooling and saving.

TABLE D-1
Pension-plan coverage by schooling attainment

	High school or less	*Some college*	*Four or more years of college*
*Fraction covered (adjusting Cagan's figures to include self-employed)**	0.5423	0.5925	0.6323
	Covered	*Not covered*	
$\frac{\textit{Saving (other than pension)}}{\textit{Income}}$	0.087	0.078	
$\frac{\textit{Pension saving}}{\textit{Income}}$	0.028		
$\frac{\textit{Total saving}}{\textit{Income}}$	0.115	0.078	

*$\frac{0.115-0.077}{0.115} = 0.32$; hence it was assumed that those covered saved 32 percent more than those not covered.

NOTE: Average savings increase due to pension coverage (according to schooling attainment) was obtained as the product of fraction covered (line 1) and the 32 percent.

SOURCE: Cagan (1965, p. 34) and the present study.

According to the above arguments and evidence, the omission of savings, in the form of both cash surrender value of life insurance and pension plans, tends to cause an understatement of any observed positive relationship between savings and education. The omissions are also troublesome when one tries to interpret patterns of responses to savings-attitude questions. The problem is whether more educated people considered their savings in these forms when responding. For example, it is uncertain whether the indication that a declining share of respondents save to provide for their old age as schooling level rises is due to less concern for old age, or to the realization that old age will be provided for by cashing in insurance and receiving a pension. That is, are pensions and life insurance considered part of savings? In interpreting the results, one must bear in mind that savings both in the form of cash surrender value of insurance and in the form of pension plans seem to rise with education.

One other general form of savings has been ignored so far. I refer to the accumulation of consumer durables. It is only the value of services obtained from durables during a particular period that should be considered consumption; the decision concerning whether to allocate savings to financial assets or consumer durables is really a portfolio decision.[1]

[1] These considerations lead to the prediction of a lower marginal propensity to consume, if properly measured, than those usually cited.

The "typical" United States value of the MPC is 0.75; of the APC, 0.88; and of the ϵ_y, 0.83. Permanent consumption has been estimated to be 0.9 of permanent income where C_P includes durable purchases. The relevant marginal propensity to consume dC/dY may be obtained from the following:

$$\frac{dC}{dY} = \frac{dY_p}{dY} \times \frac{dC}{dY_p} = \frac{dY_p}{dY} \times \frac{dC_S}{dY} \times \frac{dY}{dY_p} + \frac{dC_D}{dY} \times \frac{dY}{dY_p} \qquad \text{(D-10)}$$

The new subscripts on consumption C and income Y are S for service flows and D for durable purchases. Of course, $dC = dC_S + dC_D$. Equation (D-10) can be simplified to

$$\frac{dC_S}{dY} = \frac{dC}{dY} - \frac{dC_D}{dY} \qquad \text{(D-11)}$$

When substituting generally accepted values for dC/dY (0.75), dC_D/dY (0.15), and dY_p/dY (0.85), a value of the marginal propensity to consume service flows dC_S/dY is approximately 0.6. A question one would like to discuss is how education should influence this "MPC_S" or the analogous marginal propensity to save.

Other things being equal, purchase of a consumer durable will result in an instantaneous and roughly offsetting decline in financial-asset accumulations insofar as the purchase is debt financed. If a durable is purchased for X dollars and if debt increases by X dollars, the only effect on measured savings is the decline due to the debt increase. As the debt is paid off, however, savings will be larger because debt repayments are part of savings. If the durable asset is acquired for cash, measured savings will decline if financial assets are liquidated to obtain the cash.

Three types of consumer durables can be distinguished and are treated separately—housing, automobiles, and others. Following Cagan (1965), each nonhousing and nonauto consumer durable was valued at $300. An independent variable, value of consumer durables purchased, was inserted in the regressions. *Ceteris paribus,* as consumer-durable purchases increase, other savings should decline because of both the substitution of one method of deferring consumption for another and the fact that financial saving declines as durables are paid for or financed.

A similar result applies to automobiles, and so value of automobiles was inserted as a variable to explain savings as defined above. The greater the value of automobiles, the larger the auto-secured debt or the smaller the financial assets.

Purchasing a house has a similar, but probably larger, effect on savings as traditionally defined. House purchasers probably find themselves left with smaller financial savings and more need to purchase a variety of consumer durables than other savers. But a house purchaser whose other savings are low is not necessarily a person with little interest in, or desire for, savings. Hence several adjustments were made. First, those who had purchased homes in 1959 were eliminated altogether from the estimates. Then they were included, with a dummy variable inserted to control for whether a house had been purchased.

References

Cagan, P.: *The Effect of Pension Plans on Aggregate Saving: Evidence from a Sample Survey,* National Bureau of Economic Research, New York, 1965.

Mincer, Jacob: "On the Job Training: Costs, Returns, and Some Implications," *Journal of Political Economy,* vol. 70, part 2, pp. 50–79, Supplement: October 1962.