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## CHAPTER VIII

### A Miscellany

THIS chapter comments on a few items that do not fit into the organization of the preceding chapters, yet seem to deserve some mention. The common feature of the sections that follow is that all are primarily tentative speculations about possible further work rather than records of completed work; this is the reason why they have not been covered by the preceding chapters and yet why they seem to me to deserve inclusion. The items considered are: (1) the regression of income on consumption; (2) the extension of the permanent income hypothesis to expenditures on particular categories of consumer goods; (3) the relevance of the hypothesis to analyses of the distribution of income; (4) the connection of the hypothesis with the observed distribution of wealth; and (5) additional tests of the hypothesis.

#### 1. *Regression of Income on Consumption*

In the preceding chapters, we have dealt almost exclusively with the regression of measured consumption on measured income, and have paid little attention to the regression of measured income on measured consumption. Yet as noted at various points in the theoretical discussion, these two regressions are symmetric; for every statement about the one, there exists a dual for the other. The reason we have concentrated on the consumption-income regression is that this regression is the one mainly considered in consumption research and the only regression that can be computed from most published budget study data; the published tables almost always classify consumer units by measured income classes and give average values of income, total consumption expenditures, and other magnitudes for such classes; they seldom give comparable data for measured consumption classes.

The absence of such data is much to be regretted; they would add to our substantive knowledge of consumption behavior and provide additional evidence on the acceptability of the permanent income hypothesis. Just as, on our hypothesis, the elasticity of consumption

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with respect to measured income can be viewed as a measure of  $P_y$ , the fraction of the variance of income contributed by the permanent component of income, so the elasticity of income with respect to measured consumption can be viewed as a measure of  $P_c$ , the fraction of the variance of consumption contributed by the permanent component of consumption.<sup>1</sup> Just as this interpretation requires that the measured income elasticity of consumption be less than unity and would be contradicted by observed elasticities greater than unity, so it requires that the measured consumption elasticity of income be less than unity and would be contradicted by observed elasticities greater than unity.<sup>2</sup> To put it in terms that may be clearer, this interpretation requires that the elasticity of consumption with respect to income be less than unity when it is computed from the regression of consumption on income and greater than unity when it is computed from the regression of income on consumption.<sup>3</sup> Just as the value of  $P_y$  estimated from the regression of consumption on income can be combined with the observed variation in income to give estimates of the dispersion of the permanent and transitory components of income so the value of  $P_c$  estimated from the regression of income on consumption can be combined with the observed variation in consumption to give estimates of the dispersion of permanent and transitory components of consumption. And just as correlations between incomes of the same consumer units in different years can be used to construct independent estimates of  $P_y$ , so correlations between consumption of the same consumer units in different years can be used to construct independent estimates of  $P_c$ .

Among the various bodies of data examined in preceding chapters, I have been able to estimate readily the regression of income on measured consumption for only one, the Survey of Consumer Finances data for 1947-48 analyzed by Morgan and used in Chapter IV, section 4, as evidence on the effect of change in income. Some comparisons for income and consumption from these data are summarized in Table 21. These comparisons are extremely suggestive. According to line 1,  $P_c$ , as estimated from the regression of income

<sup>1</sup> In both cases, the same conditions must be satisfied for these statements to hold true: for arithmetically linear regressions, the elasticities must be computed at the mean and transitory components average out to zero; for logarithmically linear regressions, the equality holds more generally.

<sup>2</sup> For arithmetically linear regressions, this implication of our hypothesis is that the intercepts of both regressions be positive.

<sup>3</sup> Though we have ample direct evidence that the first condition is satisfied almost uniformly, we have too few estimated regressions of income on consumption to be able to assert with anything like the same confidence on the basis of direct evidence that the second condition is. A few pieces of direct evidence are cited later in this section, in the text and in footnotes.

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**TABLE 21**  
**Relative Dispersion of Measured Income and Measured Consumption and Their Permanent and Transitory Components, Based on Survey of Consumer Finances Data, 1947 and 1948**

	Income	Consumption
1. Fraction of variance attributable to permanent components	.82	.98
Relative dispersion of:	┌───────────┐	
2. Permanent components	.68	
3. Transitory components	.32	.09
4. Total	.75	.69

Source:

Computed from sums of observations on income and savings, squares of observations, and cross-products kindly made available to me by James Morgan of the Michigan Survey Research Center.

Derivation:

*Line 1*

Income = elasticity of consumption with respect to income computed from least-squares arithmetic linear regression of measured consumption on measured income at mean income. Consumption = elasticity of income with respect to consumption computed from least-squares arithmetic linear regression of measured income on measured consumption at mean consumption.

*Line 2*

Ratio of square root of product of line 1 and corresponding variance of original observations to corresponding mean. See footnote 5 of text for proof that result is the same for income and consumption.

*Line 3*

Ratio of square root of product of complement of line 1 and corresponding variance of original observations to corresponding mean.

*Line 4*

Ratio of standard deviation of original observations to mean.

on consumption,<sup>4</sup> while less than unity as the hypothesis predicts, is decidedly larger than  $P_c$ , as estimated from the regression of consumption on income. Transitory factors apparently account for only some 2 per cent of the variance of measured consumption compared with some 18 per cent of the variance of measured income. Expressed as a ratio to the mean, the estimated standard deviation of the transitory component is only 9 per cent for consumption, over 30 per cent for income; the ratio for income is very nearly the same as the corresponding ratio estimated for all urban or nonfarm

<sup>4</sup> Elasticities of income with respect to consumption can be computed for the separate change of income classes in the same way as the elasticity entered in Table 21. However, these cannot be interpreted as estimates of  $P_c$  because the condition that the mean transitory components be zero cannot be regarded as holding for them. In computing the income elasticities in Table 11, we avoided this problem by determining graphically the slope of log-log regression lines of consumption on income. I do not have the data for the corresponding regression lines of income on consumption. The computed elasticities of income with respect to consumption are .849, .961, .998, .952, .995 for the

families in 1935-36 and 1941 (see Table 4). Only one number is recorded in the table for consumption and income for the estimated relative dispersion of the permanent component. The reason is that a common relative dispersion is implied by the permanent income hypothesis; it asserts that permanent consumption is simply a common multiple ( $k$ ) of permanent income, which means that the two must have the same relative dispersion; and this requirement is embodied in the computational procedures for deriving the estimates in Table 21.<sup>5</sup>

It certainly seems plausible that transitory factors should affect total consumption expenditures to a much smaller extent than they affect income. Total measured consumption is the sum of expenditures on a large number of separate consumption items. Some transitory factors doubtless affect all or many of these items alike, for example, a decision to spend a year abroad; others affect different items in opposite directions, for example, an illness that raises medical expenses and lowers clothing or recreational expenses; still others, and perhaps the most important, affect separate items more or less independently, for example, the accidental state of inventories of various consumer goods, variations in weather, fluctuations in relative prices. The third class of transitory factors tends to average out; the variance of their sum is the sum of their variances and so the relative dispersion of their sum is less than the (weighted) average of their relative dispersions—this is the so-called “law of averages” or “law

down more than 25 per cent, down 5 to 25 per cent, down 5 per cent to up 5 per cent, up 5 to 25 per cent, and up more than 25 per cent classes, respectively; all are less than unity; however, it is possible that correction for the non-zero mean transitory components would push one or more over unity. A corresponding elasticity can also be computed for the 123 spending units for which the change in income was not known; the computed value is 1.152; this contradiction to the hypothesis cannot be given much weight, both because of the small number of cases and because the nonavailability of income-change data may well mean abnormality in other respects as well.

See also footnote 6 below.

<sup>5</sup> The estimates of  $P_v$  and  $P_c$  in Table 21 are given by

$$P_v = r_{cv} \cdot \frac{\sigma_c}{\sigma_v} \cdot \frac{\bar{y}}{\bar{c}},$$

$$P_c = r_{cv} \frac{\sigma_v}{\sigma_c} \cdot \frac{\bar{c}}{\bar{y}},$$

where  $r_{cv}$  is the correlation coefficient between income and consumption, and  $\sigma_v$ ,  $\sigma_c$  are the standard deviations, and  $\bar{y}$  and  $\bar{c}$ , the arithmetic means of income and consumption, respectively. The estimated relative dispersion of the permanent components of income and consumption are:

$$\frac{\sigma_{y_p}}{\bar{y}} = \frac{1}{\bar{y}} \sqrt{P_v \cdot \sigma_v^2} = \sqrt{r_{cv} \cdot \frac{\sigma_c \cdot \sigma_v}{\bar{c} \cdot \bar{y}}},$$

$$\frac{\sigma_{c_p}}{\bar{c}} = \frac{1}{\bar{c}} \sqrt{P_c \cdot \sigma_c^2} = \sqrt{r_{cv} \cdot \frac{\sigma_c \cdot \sigma_v}{\bar{c} \cdot \bar{y}}}.$$

of large numbers." The second class makes for an even larger reduction in the relative dispersion: these factors tend systematically to offset one another, and so the variance of their sum is less than the sum of their variances. Only the first class transmits its impact in full to total consumption. Measured income, too, is the sum of a number of items; but the number of sources of income that can be regarded as independently or offsettingly affected by transitory factors is much smaller than the corresponding number of consumption categories, and generally one source, the earnings of the principal earner, is the major source of measured income and cannot itself be broken into many constituents that can be regarded as independently affected by transitory factors. In short, there is much less opportunity for or likelihood of the averaging out of the effect of the accidental forces impinging on measured income than of those impinging on measured consumption.<sup>6</sup>

<sup>6</sup> Some evidence on the regression of income on consumption is also available for two other studies: the 1934-36 Bureau of Labor Statistics wage-earner study, and the 1941 study. I have relegated this evidence to a footnote because for both studies the effect of classifying by consumption is confounded with the effect of adjusting for size of family; the tabulations by consumption classes are for consumer units classified by consumption per equivalent adult. There might be much merit for our purposes in segregating families of different size; I am inclined to believe that it lessens the value of the data to express them per equivalent unit. The scales generally used for this purpose have the effect of putting large families in the lower income and expenditure classes and small families in the higher classes; and they do this to a much greater extent than the tendency for income to rise with size of family produces the opposite result for unadjusted data. Insofar as large families have a higher  $k$  than small families, the result is to introduce a systematic difference in  $k$  along the income or consumption scale.

For the 1934-36 data, the elasticity of consumption with respect to income, graphically estimated from data unadjusted for family size, is .89; the relative dispersion of measured income, .34; of the permanent component of income, .32; of the transitory component of income, .11. The elasticity of income with respect to consumption, graphically estimated from average family income and expenditure for classes determined by "unit expenditures," the term used for expenditures per equivalent adult, is .94. If we assume that the same elasticity would be obtained for classes determined by family expenditure, this would imply a relative dispersion of the transitory component of consumption of about .08. Presumably, however, the systematic differences in  $k$  mentioned in the preceding paragraph mean that the elasticity for classes determined by family expenditure would be lower than for classes determined by expenditure per equivalent adult, so .08 must be regarded as an underestimate. Without this adjustment, it is close to the .09 entered in Table 21. The relative dispersion of total family expenditures, computed from the averages for classes determined by "unit expenditures," is .20, which would imply a relative dispersion of the permanent component of consumption of .20 and of the transitory component, of .05. As might be expected, these are decidedly lower than those implied by the other classification, for the variance computed from average consumption for classes formed by a variable other than consumption itself is necessarily smaller than for classes formed by consumption. These results on the whole clearly conform well to our hypothesis and give numerical results similar to those recorded in Table 21 for the 1947-48 data. For the data used in the above calculations, see Williams and Hanson, *Money Disbursements of Wage Earners and Clerical Workers*, pp. 12, 22, 52, 56.

The evidence for the 1941 study comes from special tabulations that were obtained

The small dispersion of the transitory component of consumption, if it should be confirmed by other evidence, gives empirical justification to a proposal by William Vickrey that measured consumption replace measured income as the primary basis for classifying families in tabulating data from family budget studies.<sup>7</sup> On our hypothesis, this method raises the same problem in principle as classification by measured income; the disturbing effects of transitory components of consumption are simply substituted for the disturbing effects of transitory components of income; and just as comparisons of consumption-income regressions reflect not only differences in consumption behavior but also differences in the strength of transitory forces impinging on the income distribution, so comparisons of income-consumption regressions reflect not only differences in consumption behavior but also differences in the strength of transitory forces impinging on the distribution of consumption. But these effects are all matters of degree, and if transitory components of consumption were sufficiently small, their disturbing effects might not be serious, in which case, measured consumption, adjusted so far as possible to an accrual basis, could be used as a reasonably good approximation to permanent consumption.

Of course, it is better to eliminate or adjust for the disturbing

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by William Vickrey. These combine Bureau of Labor Statistics data for urban communities and Bureau of Home Economics data for rural nonfarm communities, with weights of 2 and 1. The data are given in the form of a cross-tabulation, the variables of classification being income per equivalent adult and expenditures per equivalent adult. The graphically estimated elasticity of consumption per equivalent adult with respect to income per equivalent adult is .87; of income per equivalent adult with respect to expenditure per equivalent adult, 1.00; the relative dispersion of income per equivalent adult is .93, of the corresponding permanent component, .87, of the corresponding transitory component, .33. The coefficient of variation of expenditures per equivalent adult is .78. It is clear that these data do not conform well either to our hypothesis or to the results in Table 21. On our hypothesis, the elasticity of income with respect to consumption should be less than unity, and the relative dispersion of permanent components should be the same for consumption and income. Put differently, these numbers imply a zero or negative relative dispersion for the transitory component of consumption, which is impossible. I do not know whether these results deserve to be regarded as a significant contradiction of the hypothesis or simply as a reflection of the deficiencies of the variables used to classify the consumer units. As noted above, we might expect an elasticity of income with respect to consumption computed from data unadjusted for family size to be less than one computed from per equivalent adult data, and this difference is in the right direction to account for the divergence of the above results from expectation. Unfortunately, however, I have no evidence on the likely magnitude of this effect. For the data underlying the above calculations, see William Vickrey, "Resource Distribution Patterns and the Classification of Families," *Studies in Income and Wealth*, X (New York: National Bureau of Economic Research, 1947), pp. 276-277.

<sup>7</sup> *Ibid.*, pp. 266-297; see also the comments by Alice C. Hanson, Margaret G. Reid, Dorothy S. Brady, and Jerome Cornfield, *ibid.*, pp. 305-324, and Vickrey's reply, *ibid.* pp. 324-329.

effects of both transitory components when this can be done readily and at little additional cost. But it may sometimes be difficult, unduly costly, or impossible to do so. And when this is the case, comparisons among regressions of income on consumption may come closer to being dominated by differences in consumption behavior proper than comparisons among regressions of consumption on income.

2. *Application of Permanent Income Hypothesis to Individual Categories of Consumption*

The permanent income hypothesis, which we have applied only to total consumption expenditures, clearly has implications also for individual categories of consumption. The planned expenditures of a consumer unit on, say, food, may be expected to be related, via the consumer unit's tastes and preferences, to the prices that it expects to have to pay for food and other items, and to the income that it expects to receive, or the permanent component of income. Its measured expenditures on food differ from its planned expenditures because of a transitory component of food expenditures, and its measured income differs from its permanent income because of a transitory component of income. When the regression of measured expenditures on measured income is computed from budget data for a group of families—the regression that has come to be called an “Engel curve”—the transitory component of food expenditures tends to average out, but the transitory component of income does not, for reasons that have been emphasized repeatedly above. In consequence, the elasticity of measured expenditures with respect to measured income reflects not only the consumer unit's tastes and preferences but also the importance of transitory components of income.

Let  $c_f$  stand for the mean observed consumption on food of families with a given measured income, and assume that the transitory component of food expenditures is uncorrelated with the permanent or transitory component of income and averages zero for the group as a whole, so that  $c_f$  can be regarded as the mean permanent component of food expenditures. The elasticity of  $c_f$  with respect to measured income then is

$$\eta_{c_f, y} = \frac{dc_f}{dy} \cdot \frac{y}{c_f} = \frac{dc_f}{dy_p} \frac{dy_p}{dy} \cdot \frac{y}{y_p} \cdot \frac{y_p}{c_f}$$

(8.1)

$$= \frac{dc_f}{dy_p} \cdot \frac{y_p}{c_f} \cdot \frac{dy_p}{dy} \cdot \frac{y}{y_p} = \eta_{c_f, y_p} \eta_{y_p, y}$$



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But, on our hypothesis,  $y_p = c_p/k$ , which means that

$$(8.2) \quad \eta_{y_p y} = \frac{dy_p}{dy} \cdot \frac{y}{y_p} = \frac{1}{k} \frac{dc_p}{dy} \cdot \frac{ky}{c_p} = \frac{dc_p}{dy} \cdot \frac{y}{c_p} = \eta_{c_p y},$$

so that

$$(8.3) \quad \eta_{c_p y} = \eta_{c_p y_p} \eta_{c_p y}$$

The first elasticity on the righthand side, between permanent food expenditures and permanent income, reflects the influence of tastes and preferences proper; the second, the influence of transitory factors affecting income.

It follows that differences among groups of families in the observed income elasticity of particular categories of consumption cannot be interpreted as reflecting solely the influence of differences in tastes or of differences in prices or similar factors affecting opportunities; they may reflect a third set of forces, namely, differences in a particular characteristic of the income distribution, the importance of transitory components of income.

If the permanent income hypothesis is accepted, and if, further, permanent income is taken to mean the same thing for the different categories of consumption as for total consumption, the effect of this third set of forces can be readily eliminated. From equation (8.3), the ratio of the observed measured income elasticity of expenditures on the particular category to the corresponding elasticity of total consumption is an estimate of the elasticity of expenditures on that category with respect to permanent income. An alternative is to classify the families by measured income, to compute mean expenditures on an individual category of consumption and on all categories combined for each such class. Under the relevant assumptions about correlations and mean transitory components of consumption, these means are estimates of the mean permanent components of the individual category and of total consumption. The relation between them is then an estimated relation between permanent components.<sup>8</sup>

One possible source of difficulty with this approach is the necessity of taking permanent income to mean the same thing for the different categories of consumption. We have interpreted the exact meaning of permanent income in terms of the horizon of the consumer unit. Now there seems to be no reason why the horizon should be the same for all individual categories of consumption and some reasons why it should differ systematically. For example, it seems highly

<sup>8</sup> Note that this is *not* the same as the procedure suggested by Vickrey and discussed in the preceding section of classifying families by total consumption expenditures and then relating expenditures on individual categories to total expenditures. See Reid, "Effect of Income Concept upon Expenditure Curves of Farm Families," pp. 170-174.

plausible that housing expenditures are planned in terms of a longer horizon, and so a different concept of permanent income, than expenditures on, say, food.<sup>9</sup> If this turns out to be a meaningful way of looking at the problem, the concept of permanent income applicable to total consumption will have to be regarded as an average of the concepts applicable to each category and our roughly estimated horizon of three years, as an average of shorter and longer horizons.

I have not myself done any work with the individual categories of consumption, so I have no basis for judging whether this difficulty will in practice turn out to be serious or whether, on the contrary, the use of the same concept of permanent income for all categories will yield acceptable results.

Though these comments are phrased in terms of budget data, they clearly apply equally to time series data and to the numerous attempts to estimate demand functions, or price and income elasticities, from such data.<sup>10</sup> The elasticities that are generally computed are elasticities with respect to measured magnitudes; yet they are interpreted as if they were elasticities with respect to permanent components; and the result is systematically to bias the estimates and the conclusions.

We have already commented on another feature of current practice in such demand studies that the permanent income hypothesis brings into question, namely, the combination of budget and time series data by using elasticities computed from budget data as equally valid for time series data (see Chapter V, section 2c above). The preceding comments suggest one way in which the two kinds of data might validly be combined: compute from budget data the elasticity with respect to the permanent component, say by using equation (8.3); estimate from time series data the relative importance of transitory components, say by computing the fraction of the variance of the observations accounted for by deviations from a three or four year moving average of the original observations; use this to convert the budget data elasticity to a time series elasticity. Though this procedure seems free from bias, it probably would be preferable to go still farther and to restate the demand function to be computed in terms of permanent and transitory components. Besides permitting

<sup>9</sup> This range of considerations was impressed on me primarily as a result of conversations with Margaret Reid about a study she is making of the determinants of housing expenditures.

<sup>10</sup> Guy H. Orcutt, "Measurement of Price Elasticities in International Trade," *The Review of Economics and Statistics*, XXXII (May, 1950), pp. 117-132, and Arnold C. Harberger, "A Structural Approach to the Problem of Import Demand," *American Economic Review*, XLIII (May, 1953), pp. 148-159, discuss biases in such estimates that, while not described by them in these terms, can be regarded as reflecting the effects of transitory components and the use of measured price or measured income as a direct estimate of "permanent price" or "permanent income."

the direct use of information from budget data, this has the great advantage that the results are not wedded to the length of the particular time series from which they have been computed, but, sampling fluctuations aside, are invariant with respect to the length of the series.

### 3. *Relevance to the Analysis of the Distribution of Income*

The permanent income hypothesis makes information from studies of the distribution of income relevant to the analysis of consumption behavior. Clearly, the relation is reciprocal. If accepted, the hypothesis makes information from studies of consumption behavior relevant to the analysis of the distribution of income.

One example may suggest the rich possibilities opened up in this way by the coordination of two previously distinct problems and bodies of data. Distributions of income by size are generally based on the measured income of individual income units for a single time period, typically a year. These distributions reflect the influence of differences among individual units both in what we have called the permanent component of income and in what we have called the transitory component. Yet these two types of differences do not have the same significance; the one is an indication of deep-seated long-run inequality, the other, of dynamic variation and mobility. In consequence, comparison of such distributions of income for different countries or periods may be extremely misleading if the relative importance of permanent and transitory differences is not the same in the different countries or periods compared. This problem has been one motivation for the studies of the incomes of identical units in different time periods that we used in Chapter VII.

On our hypothesis, the income elasticity of consumption expenditures is a measure of the fraction of the total variance of income attributable to the permanent component. The host of budget studies for different countries over a wide period of time are thereby made available to supplement and extend the data on the incomes of identical units in different years—a body of data that is much more limited in scope than the rich store of family budget data.

An obvious example is the comparative degree of inequality of income in Britain and the United States. Casual observation suggests that relative income status is decidedly less variable—the transitory component of income less important—in Britain than in the United States, so that distributions of annual income are a misleading basis for judging the degree of underlying inequality. But how much of a correction is needed on this account? On our hypothesis, the comparison made in Chapter IV, section 2b, between the income elasticity

of consumption in the two countries gives a measure: according to this comparison, something like 13 per cent of the variance is accounted for by transitory components in Britain, something like 18 per cent in the United States. This comparison was for a single pair of studies and so the resulting estimates must be regarded as rather crude even though the studies are an exceptionally favorable pair for comparative purposes. However, much additional data could almost surely be brought to bear to improve these estimates.

#### 4. *Connection between the Permanent Income Hypothesis and the Distribution of Wealth*

The distribution of wealth—by which is meant here only nonhuman wealth—is typically very much more widely dispersed than the distribution of measured income. At first sight, this difference seems inconsistent with the permanent income hypothesis.<sup>11</sup> If planned savings—by which we mean again only savings embodied in nonhuman wealth—are the same fraction of permanent income at all levels of permanent income, does this not imply a tendency for the distribution of wealth to become similar to the distribution of income? True, at some initial point there might be a discrepancy, but would not the tendency for savings to accumulate at a constant percentage of permanent income tend to eliminate the discrepancy? Would not income from property tend to become the same fraction of income at all income levels?

A minor reason why there is, or at any rate need be, no inconsistency between the hypothesis and the stated facts is that the numerical value of  $k$  differs among groups; these differences may not be produced by differences in permanent income, yet they may be associated with them. For example, nonfarm entrepreneurs have higher average income than nonfarm nonentrepreneurs and also a lower  $k$ . Such differences in  $k$  are cumulative in their effect.

The major reason why there need be no inconsistency is precisely the very difference between measured income and permanent income that is the heart of the hypothesis. The hypothesis asserts that planned savings are the same fraction of permanent income at all income levels and have the same relative dispersion as permanent income. But equally, it asserts that the actual savings of any unit equal its planned savings plus the transitory component of income, positive or negative, minus the transitory component of consumption, positive or negative. The result is that the absolute dispersion of measured savings is necessarily higher than that of planned savings; insofar as the transitory components of income average out, average

<sup>11</sup> I am indebted to Simon Kuznets for calling this to my attention.

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savings are unaffected, so the relative dispersion of measured savings is also higher. A few figures will illustrate the magnitudes involved. Let us take the value of  $k$  to be .9 for each of a group of consumer units for whom the dispersion of the various components of income and consumption is of the magnitude specified in Table 21, and suppose that transitory components average out for the group as a whole. We can then summarize the elements determining the relative dispersion of measured savings as follows:

Relative dispersion of permanent component of savings (equals relative dispersion of permanent component of income or consumption)	.68
Dispersion of transitory component of income as a ratio to average savings (10 times relative dispersion of transi- tory component of income, since savings average one- tenth of income)	3.20
Dispersion of transitory component of consumption as ratio to average savings (9 times relative dispersion of transitory component of consumption, since savings average one-ninth of consumption)	<u>.81</u>
Estimated relative dispersion of measured savings (square root of sum of squares of above three figures, since the several components are assumed uncorrelated)	3.37
To be compared with estimated relative dispersion of measured income from Table 21	.75

Given these estimates, therefore, our hypothesis implies that the relative dispersion of measured savings is some  $4\frac{1}{2}$  times that of measured income, 337 per cent instead of 75 per cent.<sup>12</sup>

Wealth is the accumulation of savings. The process of accumulation brings into play the law of averages and so, on this account, tends to reduce the relative dispersion of wealth below that of savings. The size of the effect depends critically on the correlation of transitory components in successive years: clearly if a large positive transitory component in one year tends systematically to be associated with a large positive transitory component in the next, there will be much less averaging out than if successive years are uncorrelated. Now as we saw earlier (Chapter VII, section 4), the assumed zero correlation

<sup>12</sup> To avoid confusion, it may be worth pointing out explicitly how the dispersion for total savings can be larger than the figure recorded for each of the components, a result that seems at first sight to run counter to the "law of averages." The reason is that the *average* of each of the two transitory components separately is zero, so that adding these components adds nothing to the denominator of the relative dispersion, while it increases the standard deviation in the numerator. The figures recorded for the transitory components are not their own coefficients of variation—these are infinite under the assumed conditions—but the ratio of their standard deviations to the mean of the first item, the permanent component. This is the difference between this and the case that follows. Accumulating savings in different years add to the denominator as well as the numerator of the ratio defining the coefficient of variation.

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between transitory and permanent components of income or consumption in any one year does not imply zero correlation of transitory components in successive years; the size of the correlation between years depends on the horizon of the consumer unit, and is larger, the longer the horizon.

But the process of accumulation also has another effect that works in the direction of increasing the variance of wealth for any population as a whole, namely, it introduces differences in the number of years of accumulation and so introduces divergences between consumer units of different ages that are not present in the distribution of the savings of a single year. Differences in age are a source of dispersion in permanent income and of correlation between transitory components; but they are an even more potent source of differences in nonhuman wealth: the process of using up a particular piece of human capital, if I may speak so cold-bloodedly, consists very largely of replacing it by nonhuman capital.

To illustrate these effects, consider a simple hypothetical case. Suppose the only source of transitory components of income is the age cycle in earnings, that transitory components of consumption are zero and that we take the individual as our elementary consumer unit. To avoid negative wealth, suppose that each individual separately comes into our purview only at age 20, when he begins to receive, say, \$4,500 per year as earnings, that he receives identically the same earnings in each of 40 years to age 60, when he goes into partial retirement, receiving \$2,000 a year earnings and using up his accumulated savings until he dies at age 70, that all individuals follow identically the same course, and that the population as a whole consists of an equal number of individuals of each age. To avoid the necessity for tedious computation, assume that the interest rate is zero. Suppose, as seems reasonable under the bizarre circumstances assumed, that the individual's horizon is his lifetime. His permanent income in each year is then \$4,000; he saves \$500 per year for each of the 40 years of earnings and accumulates thereby \$20,000 to provide a supplement to earnings of \$2,000 a year to support consumption of \$4,000 a year for 10 years of semiretirement. What are the associated distributions and dispersion of permanent income, measured income, and wealth? For permanent income, dispersion is zero; everyone has a permanent income of \$4,000. For measured income the distribution is:

80 per cent of the population receive	\$4,500
20 per cent of the population receive	2,000

or a mean measured income of \$4,000, a standard deviation of \$1,000, and a coefficient of variation of .25. For wealth, as of the end of

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the accounting year, including those who die then but not including the new entrants, the distribution of wealth is:

For the 80 per cent of the population who saved during the year:

2 per cent have	\$500
2 per cent have	1,000
.....	
2 per cent have	20,000

For the 20 per cent of the population who dissaved during the year:

2 per cent have	18,000
2 per cent have	16,000
.....	
2 per cent have	0

The mean wealth is \$10,000; the standard deviation of wealth is \$5,788; the coefficient of variation, .579; or over twice that for income. I hasten to add that this result depends on the particular numbers assumed; it is possible to choose numbers that yield a dispersion of income greater than the dispersion of wealth.<sup>13</sup> But the example does show some of the complications involved in connecting the distribution of measured income with the distribution of wealth under our hypothesis.

One complication which this example does not exemplify and may rather conceal is worth noting explicitly, though it is implicit in the general statement that preceded the example. The example is one in which transitory components average out to zero for each individual separately during his lifetime. This is so only because the age-earnings cycle is the only source of transitory components considered. More generally, transitory components need not and will not tend to average out to zero for each individual during his lifetime. This point is important, because it is easy to confuse our hypothesis with the very different one that the appropriate time unit for studying consumption behavior is the individual's horizon, whether it be his lifetime or a shorter period, and that the individual is to be regarded as making and, more important, carrying out successfully, plans for that period—what might be called a "planning period" hypothesis. Our hypothesis is quite different: the horizon determines only what factors he regards as transitory; his estimate of permanent income is not for a defined period but an estimate of a rate at a moment of time that is revised over time and may never conform to experience.

<sup>13</sup> For this kind of an example, let  $p$  be the fraction of years at the higher income,  $q$  at the lower, and  $r$ , the ratio of the lower income to the higher, and suppose people to be distributed continuously by age. Then, under the special assumptions of this hypothetical case, the coefficient of variation of wealth is always .578, of measured income, it is  $(1 - r)\sqrt{pq/(p + qr)}$ , which can vary from 0 to  $\infty$  for  $r$  between 0 and 1.

The analogy is an estimate that a particular coin is fair. I may use this estimate to judge the outcome of, let us say, 100 tosses. This does not, however, mean that I expect the number of heads to equal precisely the number of tails over the particular 100 tosses; if 52 heads come up, 50 is the permanent component and 2 is the transitory component for the 100 tosses. The permanent component in our hypothesis is the same kind of concept. Transitory components need not average out for each individual or for each group; their failure to do so is a source of variation in wealth holdings that is not taken into account in the preceding simple example.

##### 5. *Additional Tests of the Permanent Income Hypothesis*

The various tests of the permanent income hypothesis made in earlier chapters can obviously be extended to a wider range of data and can be improved in detail and precision in many respects. The two kinds of tests that it would probably be most interesting to extend in this way are those involving the effect of change in income (Chapter IV, section 4) and those using data on incomes in different years (Chapter VII), both because these tests are in some ways the most searching and precise, and because the data we have been able to use in making these tests are so incomplete.

In respect of these tests, and of others that we have made, there are three improvements that are sufficiently important and sufficiently general to justify mention. Perhaps the most important would be to take explicit account of the effect of the life cycle of income and consumption. Again and again, we have implicitly or explicitly supposed that changes in permanent income or relative income status from one year to the next could be neglected. This seems a reasonably good approximation, to judge from our results; yet it certainly would be a much better approximation, and one that could be relied on over longer spans of time, if it were made for groups of consumer units at the same stage in the life cycle, so that the effects of "aging," instead of simply being neglected, could be allowed for explicitly. Another improvement of the same kind would be a more satisfactory treatment of durable consumer goods. Though our theoretical analysis calls for treating the purchase of such goods as a capital transaction and including in consumption only their use value, we have in the main, particularly for budget data, been forced to use a concept of consumption that includes as current consumption expenditures on durable goods other than housing. The third improvement would be a more satisfactory treatment of sampling error. I have resorted again and again to intuitive judgments about the likelihood that a particular difference could or could not be regarded



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as attributable to sampling fluctuation. It would be highly desirable to have such judgements supplemented by formal tests of statistical significance wherever possible.

In addition to tests of this kind, which follow so directly from our earlier discussion that they need little explicit consideration, there are others that justify somewhat more extended consideration.

A crucial element in our hypothesis is the asserted lack of correlation between transitory components of income and consumption. The first two tests listed below seem likely to be especially sensitive to a failure of this element of our hypothesis. The other tests are less specific.

a. In 1950, a special life insurance payment was made by the government to veterans.<sup>14</sup> This payment seems to have been largely unexpected and so to qualify as a "windfall" or clearly transitory element. It was made only to some veterans and there seems no reason to expect that the veterans who received the payment differ systematically from those who did not. The Bureau of Labor Statistics made an extensive budget study for 1950 covering a large number of consumer units. If it is possible to distinguish veterans from others, and to subclassify the veterans into those who did and those who did not receive the special insurance payment, a comparison of their consumption-income behavior would provide almost a controlled experiment. On our hypothesis, the windfall should affect consumption only insofar as it raises permanent income; for the rest it should be treated as a transitory component. If consumption can be defined to exclude major consumer durables, the hypothesis predicts that the elasticity of consumption with respect to income excluding the special payment will turn out to be the same for veterans who did and those who did not receive the payment; and that the regression for the former will be higher than for the latter by an amount that is a small fraction of the average insurance payment—on the basis of our estimate that the horizon is about 3 years, say under one-third. If the insurance payment were the same for different veterans, this would be the whole of the story. Insofar as it differs fairly widely, additional tests are possible. Deviations from the regressions described above can be correlated with the size of the payment; the correlation should be low and the regression coefficient small, about .3 or so.

b. We have so far simply taken the permanent component of income for granted and have not inquired into the factors responsible for its size. It is clear, however, that the permanent component of income is itself a resultant of a host of factors many of which are

<sup>14</sup> I owe the suggested test that follows to Irwin Friend.

specifiable and observable, such as location, age, occupation, education, and the like.<sup>15</sup>

Suppose a regression were computed for a broad group of consumer units, say a sample of all units in the United States, and the corresponding elasticity estimated. Suppose this broad group were broken down into subgroups, say by the communities in which they reside, and separate regressions computed for each community. An appropriately weighted average of the corresponding elasticities should then be smaller than the elasticity for the group as a whole, and smaller by an amount calculable from the income data for the separate communities. The classification by communities eliminates one source of variability in permanent components, and so should reduce the variance of permanent components and hence the elasticity.

This process can be continued. For each community, the groups can be classified by occupation; within occupation by education; within education by age and family size, and so on. At each stage in the hierarchy the average of the elasticities of the different groups should be lower than the elasticity for the broader group of which they are part. As the groups are more and more rigorously defined, the elasticity should approach zero.

c. The time unit used in the material cited in preceding chapters is a year. Suppose data were available for a shorter time unit, say a quarter. The effect would be to increase the variance of the transitory component without affecting the variance of the permanent component and so, on our hypothesis, to reduce the measured income elasticity of consumption. Conversely, the use of a longer time unit, say a biennium, would have the opposite effect. These results could be expected for either family budget data or time series data.

One test piece of evidence along these lines has already been cited: that from Klein's analysis of some Consumer Finances data (see Chapter IV, section 2f). Another is available from a comparison made by Reid.<sup>16</sup> The 1941 budget study cited in preceding chapters covered both 1941 and the first quarter of 1942. Reid computed elasticities for the year 1941 and for the first quarter of 1942 for urban, rural nonfarm, and farm families. In each case, the elasticity was noticeably higher for the annual data. Both these pieces of evidence are from budget data. It would be desirable to have similar evidence from time series data.

d. Section 2 above suggests a test using data on expenditures for

<sup>15</sup> See Friedman and Kuznets, *Income from Independent Professional Practice*, pp. 361-362, for an attempt to estimate the quantitative influence of some of these factors.

<sup>16</sup> Contained in an unpublished paper by Margaret Reid, "The Relation of the Within-Group Transitory Component of Incomes to the Income Elasticity of Family Expenditures."

particular categories of consumption. Classify the consumer units covered by a family budget study into a number of groups that can be expected to have much the same tastes and preferences and to be faced with the same prices but to differ in the relative importance of transitory components of income—for example, different occupational groups in the same community, especially salaried versus independent groups; or even better, farm and nonfarm groups. Compute the elasticity of various categories of consumption with respect to measured income for each group. Divide each of these by the corresponding measured income elasticity of total consumption expenditures; according to (8.3), the result is an estimate of the elasticity of expenditures on the particular category with respect to permanent income. Our hypothesis would lead us to expect such elasticities to differ less from group to group than the elasticities with respect to measured income.

It may be, as suggested in section 2, that different concepts of "permanent" are required for the several categories. In that case, the ratio of the measured income elasticity for one category to that for total consumption is not a satisfactory estimate of the relation between permanent components. Nonetheless, it is plausible that the procedure described in the preceding paragraph would yield values differing less from group to group than the measured income elasticities. The reason is that one might expect that, while a change in the definition of the permanent component would change the fraction of the variance attributable to it, differences among these fractions from group to group would be highly correlated for different definitions. For example, if a smaller fraction of the variance is accounted for by permanent components for entrepreneurial groups than for others when "permanent" refers to a horizon of three years, then it seems plausible that the same result will hold when "permanent" refers to a horizon of ten years. Of course, even if true, this does not guarantee that the adjusted elasticities will be more homogeneous than the original; "over-correction" will occur and may be sufficient to spread them more widely.

e. Data for groups of consumer units like those described in the preceding test could also be used in another way. Choose groups for which there is reason to expect the relative importance of transitory components of income to differ but of consumption to be roughly the same. From regressions of consumption on income, estimate  $P_v$ ; from regressions of income on consumption,  $P_c$ . Our hypothesis would lead us to expect the estimates of  $P_c$  to be more alike for the different groups than the estimates of  $P_v$ .

f. Another way to estimate  $P_c$  is from data on consumption of

identical units in different years. If such data were available, as well as income for the same units in at least one year, they would of course, permit a comparison of alternative estimates of  $P_c$  like the comparison of alternative estimates of  $P_y$  in Chapter VII. In addition, however, if the data included incomes in both years, estimates of  $P_y$  and  $P_c$  for the same group would be available, both based on the interyear correlation data. The implied ratio of transitory components  $(1 - P_c)\sigma_c^2 / (1 - P_y)\sigma_y^2$  is then the information needed to compute for each year the so-called "mutual regression," which in the present context is the relation between the permanent components. Compute those regressions, including a constant term if the data are used in arithmetic form; and not restricting the regression coefficient to unity, if the data are used in logarithmic form. On our hypothesis, the constant term of the arithmetic relation should not differ significantly from zero if the transitory components of income and consumption can be regarded as averaging out to zero, and the slope of the logarithmic relation should not differ significantly from unity. Further, the computed variances of "error terms" yield independent estimates of  $P_y$  and  $P_c$ .

g. By the method in item f, estimates of  $k$  can be computed for some groups of families. For other groups for which the mean transitory components of expenditure and income can be taken to be zero,  $k$  can be computed from the ratio of mean income to mean expenditures. On our hypothesis, the  $k$ 's so computed are related to variables such as the rate of interest, the ratio of wealth to income, and the importance of the transitory component of income. The latter two variables might be expected to differ most among groups and therefore to be the most promising variables to investigate.

h. A test that is a special case of the one just mentioned is to estimate the variance of the transitory component of income for any group of families by multiplying the observed variance of income by the complement of the measured income elasticity of consumption. The larger the corresponding measure of relative dispersion of transitory components, the greater the need for a reserve against emergencies and the lower, therefore, should be  $k$ . If mean transitory components of income and consumption are zero,  $k$  is given by the ratio of mean consumption to mean income for the group of families considered. Accordingly, our hypothesis leads us to expect a negative correlation between the relative dispersion of transitory components, computed as described, and the average propensity to consume or the ratio of consumption to income at the mean of the group.

If these parameters were available for a large number of groups of families, this correlation should, on our hypothesis, emerge despite

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the fact that mean transitory components of income and expenditures may not be zero and despite other differences among groups that may affect  $k$ . For there seems no reason why these features of the groups considered should themselves be correlated with the size of the transitory component, hence no reason why they should do more than reduce the closeness of correlation.

This is doubtless only a partial list of the kinds of confrontation of the hypothesis with empirical evidence that will be suggested in the course of using the hypothesis. They are listed here and described as "tests" primarily to give a taste of the breadth of evidence relevant to the hypothesis, rather than because I believe their completion to be a prerequisite for the use of the hypothesis in substantive empirical research. On the contrary, the hypothesis has, in my view, been tested searchingly enough on a sufficiently broad range of data, and has yielded sufficiently good results, to justify its acceptance as a working hypothesis. Further evidence on it will develop, and improvements in it be suggested, in the course of using it, and it is as by-products of this kind that the tests listed above should probably be made.

From this point of view, the analyses of data listed above as "tests" could equally be termed ways of using the hypothesis to discover empirical regularities, describe basic characteristics of consumption behavior, and summarize efficiently masses of detailed evidence. This is particularly so for items b, d, and g; it applies in some measure to every item in the list.