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CHAPTER VI

The Relation Between the Permanent Income and Relative Income Hypotheses

THE preceding two chapters demonstrate that the permanent income hypothesis is consistent with a wide variety of empirical evidence on consumption behavior. It offers a simple interpretation of the rough constancy of the average propensity to consume both among budget studies made at widely separated dates and over time as recorded in aggregate time series data spanning more than half a century. It gives plausible explanations of (1) differences in the observed consumption-income regressions among consumer units living in different countries, deriving their livelihood from different pursuits, and differing in race; and of (2) different ratios of savings to income for consumer units headed by persons differing in age. It predicts correctly the effect on budget study consumption-income regressions of classifying families by the change in their measured income from an earlier period and on similar regressions computed from aggregate time series data, of the length of the period covered and the form in which the data are expressed. It accounts for both the major characteristics of the long-period time series data and many of their details, and it suggests an aggregate consumption function that gives strikingly good results when fitted to these long-period data.

This is impressive evidence for our hypothesis. But, as is always the case in empirical work, there must be numerous other hypotheses with which this same evidence would be consistent; insofar as we choose ours, it is because we regard it as simpler and more fruitful than others that have come to our notice, or because we can find additional evidence consistent with ours but not with some of these others. In particular, much of the evidence cited as consistent with our hypothesis has also been cited as evidence for a specific alternative hypothesis: the relative income hypothesis proposed by Brady and Friedman, Modigliani, and Duesenberry. Indeed, the literature bearing on that hypothesis has been an important source of the data cited in the two preceding chapters. The purpose of this chapter is to explore the relationship between the permanent income hypothesis and the relative income hypothesis. Both of these are offered as alternatives to what I shall call the absolute income hypothesis—that consumption is a function of the absolute value of current measured real income—so we shall have occasion to consider it as well.

The relative income hypothesis asserts that the ratio of measured consumption to measured income is a function of the relative position of consumer units in the income distribution. Now it is intuitively clear that there is at least a family connection between this hypothesis and our own. Suppose that transitory components of income and expenditure average out to zero for any one group as a whole. The measured income of consumer units whose measured income is equal to the average for their group then equals their permanent component of income, and their average consumption is, on our hypothesis, equal to k times their income. For units at this position in the measured income scale, the ratio of consumption to income varies from group to group only because of differences in k; there are no differences in the ratio of permanent to measured income to introduce additional variation. Similarly, the mean transitory component of income is positive for incomes above the average and negative for incomes below the average, so that classifying units by their relative position rather than their absolute income at least makes the sign of the transitory component the same for units in the same relative income class but in different groups. Under certain conditions, then, our hypothesis predicts that the ratio of measured consumption to measured income is a function of relative income position.

Though closely related in this way, the two hypotheses are not identical. In order to examine the relation between them more thoroughly, we must consider separately two variants of the relative income hypothesis that have been used in the literature: (1) the basic variant measures relative income position by the percentile position of the consumer unit in the income distribution of the group to which it is regarded as belonging; (2) because data frequently do not permit satisfactory estimates of percentile position, a secondary variant uses the ratio of the income of the unit to the average income of the group as an approximation to the relative income position. These two variants give the same results—in the sense that regressions of the consumption ratio on relative income position computed for different groups diverge to the same extent—if, and only if, the income distributions of the several groups differ only by a scale factor, which is equivalent to their all having the same Lorenz curve. Although variant (1) is regarded as the basic variant, it is simpler to show the relation of variant (2) to our hypothesis; accordingly, we shall consider it first.

It is well to be explicit in advance about the question to be asked in comparing the two hypotheses. For any one group of consumer units taken by itself, there is no possibility of conflict between the two hypotheses: the regression of consumption on measured income of the kind that we have been interpreting in terms of our hypothesis (call this a relation of Type *A*) can be converted to a relation between the ratio of measured consumption to measured income and the ratio of measured income to mean income (call this a relation of Type *R*) by algebraic manipulation, including a change of scale. The relative income hypothesis says nothing about the size of the parameters, and hence says nothing about one group of consumer units taken by itself. Our hypothesis says that the parameters of the regression depend on k and P_y. Insofar as these can be independently estimated, our hypothesis does say something about a single group and in this way is more fruitful than the relative income hypothesis. The essential content of the relative income hypothesis is for a comparison among groups. It says, first, that relations of Type *A* can be expected to differ significantly among groups that have different income distributions; and, second, that these differences are reduced or eliminated if the relations are converted into Type *R*. It predicts, that is, that groups whose consumption behavior must be regarded as heterogeneous if judged by relations of Type *A* will be found to be homogeneous if judged by relations of Type *R*. Now our hypothesis can be used to predict when relations of Type *R* will be the same, and here a possibility of conflict arises. The question to be asked of our hypothesis is therefore the conditions under which, according to it, relations of Type *R* are the same for different groups and the conditions under which they diverge. For the first set of conditions, the two hypotheses agree; evidence for one is equally evidence for the other. For the second set of conditions, the two hypotheses disagree; if these conditions can be identified empirically, they offer the possibility of discriminating between the two hypotheses.

On either variant, one reason why, on our hypothesis, relations of Type *R* (or for that matter Type *A*) might diverge is because of differences in the mean transitory components of income or consumption. Such differences would tend to alter the heights of such relations while leaving the slopes unaffected. Since these effects are so straightforward, we shall confine the detailed discussion that follows to other effects. For simplicity, therefore, we shall assume in the next two sections that the mean transitory components of income and consumption are zero for any group considered, so that the mean measured income and measured consumption for the group are equal to the corresponding mean permanent components.

1. *Relative Income Status Measured by Ratio of Measured Income to Average Income*

Under these conditions, from (3.10) and (3.11), the regression of consumption on measured income is given by

$$c = k(1 - P_y)\bar{y} + kP_y \cdot y. \tag{6.1}$$

Dividing both sides by y, we have

$$\frac{c}{y} = kP_y + k(1 - P_y)\frac{\bar{y}}{y}. \tag{6.2}$$

This is a linear relation between the consumption ratio and the reciprocal of the ratio of measured income to mean income. However, for a narrow enough interval, it can be approximated by a linear relation in terms of relative income itself.[1] More important for our purpose, equation (6.2) implies that relations of Type R will be the same for different groups, on our hypothesis, if, and only if, k and P_y are separately the same for those groups.[2] For any groups for which this is so, this variant of the relative income hypothesis gives the same results as our hypothesis, though our hypothesis is more fruitful in that it says something about the form of the function and about the determinants of its parameters.

If, in addition to k and P_y, $\bar{y}$ is also the same for different groups, then relations of Type A, namely (6.1), will also be the same for different groups, so all three hypotheses—the permanent income, relative income, and absolute income hypotheses—will give the same results. However, at least for the linear terms of the relations, this

[1] It should be noted that our hypothesis does not predict that a linear regression will fit the observed means for successive income classes. The equation (6.1) is derived by asking what the parameters of a linear regression would be if they were computed for a set of data described by our hypothesis. The observed means will in fact fall on a straight line under our hypothesis if transitory factors are equally important at all levels of permanent income, not otherwise. This is one reason why we have carried along in our theoretical discussion, and mostly used in the empirical work, the logarithmic variant of our hypothesis. Empirically, the condition of equal effect of transitory factors seems better satisfied for the logarithms than for the original data.

Similarly, our hypothesis implies that the regression of the consumption ratio on the reciprocal of relative income will be linear only under the same conditions. Again, therefore, one would expect the logarithmic variant to approximate linearity more closely than the arithmetic variant.

[2] On the logarithmic alternative

$$C = K + \bar{Y}(1 - P_y) + P_y \cdot Y. \tag{6.1$'$}$$

Subtracting Y from both sides, we have

$$C - Y = K + (1 - P_y)(\bar{Y} - Y). \tag{6.2$'$}$$

As for the arithmetic relations, logarithmic relations of Type R will be the same for different groups, on our hypothesis, if and only if K and P_y are separately the same for those groups.

requirement is more stringent than is necessary. In order for relations of Type A to be the same to linear terms, kP_y and $k(1 - P_y)\bar{y}$ must be the same; and any triplet of values of k, P_y, and $\bar{y}$ that makes these combinations of them the same will yield the same relations of Type A; a higher mean income for one group than for another might be offset, for example, by an appropriately higher P_y and lower k.

This is in part an obvious result: since relative income in this variant is defined as the ratio of absolute income to mean income, it must be capable of accounting for at least some differences in consumption-income regressions that reflect differences in mean incomes; and, on the other hand, it cannot account for differences between groups that have the same mean income. What are perhaps less obvious are the implications of our hypothesis about the circumstances, other than differences in mean income, under which the other two hypotheses will both fail.

Suppose we have two groups for which the regression of consumption on income is given by (6.1), i.e. for which the arithmetic variant of our hypothesis holds and for which it is appropriate to regard $\bar{c}_t = \bar{y}_t = 0$, but for which either P_y or k or both differ. How will the two relations of Type R compare? From (6.2), the consumption ratio increases as $\bar{y}/y$ increases, since $k(1 - P_y)$ is necessarily positive. But $y/\bar{y}$, or relative income, decreases as $\bar{y}/y$ increases, so the relations of Type R have a negative slope. Suppose k is the same but P_y differs. The larger P_y, the smaller the positive slope of (6.2), which means the smaller the absolute value of the negative slope of the relation of Type R, or the flatter this relation is with respect to the axis of relative income.[3] The two relations intersect at the mean income or relative income of unity, where the consumption ratio equals k. For given P_y, the larger k, the higher the consumption ratio, and so the relation of Type R; and it is higher in the same ratio for all values of relative income. For given P_y, the larger k, the greater the slope in absolute value or the steeper the relation of Type R.

These algebraic results admit of a simple interpretation on our hypothesis. Consider, for example, consumer units with measured incomes twice the average incomes of the groups to which they belong. The permanent income of these consumer units will, on the average, be somewhere between the average income of the groups to which

[3] More formally, differentiate the right hand side of (6.2) with respect to $y/\bar{y}$. The result is

$$d\left(\frac{c}{y}\right)\Big/d\left(\frac{y}{\bar{y}}\right) = -k(1 - P_y)\left(\frac{\bar{y}}{y}\right)^2,$$

so the slope is smaller in absolute value the larger is P_y (and also the smaller is k). The derivative with respect to the savings ratio clearly has the same numerical value but the opposite sign.

they belong and their measured income. Consumption being adjusted to this permanent income, it will be less than twice the average consumption of the groups to which the consumer units belong. In consequence, the consumption ratio will be less than the ratio of average consumption for the group to average income. This is the explanation for the negative slope of relations of Type *R*.

Suppose, now, that some of these consumer units are from a group for which P_y is low, that is, for which transitory factors play a sizable role in producing differences in measured income, and the rest are from a group for which P_y is high. Consumption will be adjusted to a lower permanent income for the first set of consumer units than for the second set, since transitory factors will account for a larger part of the deviation of their incomes from the average. In consequence, the consumption ratio will be lower for them than for the second set even though the ratio of average consumption to average income is the same for the groups to which the two sets belong. This is the explanation for the steeper relation of Type *R* for a low P_y than a high P_y.

To put even more succinctly the conditions under which the relations of Type *R* can be expected to differ for different groups: measured relative income means the same thing for different groups only if relative income status is equally stable for the different groups. And P_y is a measure of the stability of relative income status.

One of the charts in the paper by Brady and Friedman exemplifies these effects. They plot the ratio of savings to income against both absolute and relative income for urban families for four budget studies: the 1901, 1917–19, 1935–36, and 1941 studies listed in my Table 1.[4] The use of relative income produces a striking reduction in the dispersion of the four regressions, but still leaves some important differences. The major difference in the slopes is that the regression is more steeply sloped for 1901 than for the later years; the regressions for 1917–19 and 1935–36 have roughly the same slope, and the regression for 1941, a mildly flatter slope.[5] We have seen that *k* does not differ systematically for these different studies. Consequently, on our hypothesis these differences imply a lower value of P_y in 1901 than in the later years and moderately lower values in 1917–19 and 1935–36 than in 1941. Our estimates of P_y from the consumption-income regressions, recorded in the final column of Table 1, are .75 for 1901, .86 and .82 for 1917–19 and 1935–36 respectively, and .87

[4] Brady and Friedman, "Savings and the Income Distribution," p. 261.

[5] Brady and Friedman plot the savings ratio against the logarithm of the income ratio rather than the income ratio itself. However, if at any value of the income ratio, the slope with respect to the logarithm is steeper for one curve than for another, so is the slope with respect to the arithmetic value.

for 1941. It should be emphasized that this is largely an illustration of the effects of differences in the value of P_y on the slopes of relations of Type R, rather than self-contained independent evidence relevant to discriminating between the two hypotheses. The reason is, of course, that the relation between the slopes of the two types of regressions is purely arithmetic and we have derived these estimates of P_y from the slopes of regressions of Type A. To discriminate between the two hypotheses would require independent evidence on the value of P_y for the four studies.

Some independent evidence is obtained by adding to the chart just considered a corresponding regression for farm families in 1935–36. Such a regression is decidedly steeper than the regressions for urban families both for the same year and for the other years.[6] On our hypothesis, this implies a lower value of P_y for farm families. And there is surely ample independent evidence, both qualitative and quantitative,[7] that P_y is lower for farm than for urban families.

2. *Relative Income Status Measured by Percentile Position in the Income Distribution*

In order to relate percentile position in any simple fashion to the variables that our hypothesis suggests are crucial, it is necessary to specify something about the form of the income distribution. Let us suppose that all income distributions are normal distributions, so that each is completely described by its mean and standard deviation.[8] Any measured income can be written as

$$y = \bar{y} + g\sigma_y, \tag{6.3}$$

where $\bar{y}$, as before, designates the mean income of the group, σ_y is the standard deviation of income, and g is the deviation of income from the mean income in standard deviation units. For a normal distribution, the value of g uniquely determines the percentile position and conversely, so we can replace percentile position by g. Substituting (6.3) in (6.2), we have

$$\frac{c}{y} = kP_y + k(1 - P_y)\cdot\frac{\bar{y}}{\bar{y} + g\sigma_y} = kP_y + k(1 - P_y)\frac{1}{1 + vg}, \tag{6.4}$$

where v is the coefficient of variation of measured income, or $\sigma_y/\bar{y}$.

[6] Brady and Friedman do not plot this regression because they use the percentile measure of relative income status in comparing farm and nonfarm families. The above statement is based on a rough calculation from their Table 1, *ibid.*, p. 253.

[7] See below, Chap. VII, sec. 2 and 3.

[8] It is closer to the empirical evidence on the shape of income distributions to suppose that the logarithm of income rather than income itself is normally distributed. However, the major result is the same whichever assumption is made, so there is no loss in generality and some gain in ease of exposition in assuming absolute incomes normally distributed.

There are now three parameters that must be the same for different groups in order to render the relations of Type R the same, namely, k, P_y, and v.

In this variant, it is no longer true that the relative income hypothesis gives the same result as the absolute income hypothesis for groups with the same mean income. If the relations of Type A were the same for a set of such groups, relations of Type R, as defined by (6.4), would not be, unless the standard deviation of income were also the same for the different groups. The relation between the absolute and relative income hypotheses is therefore more complicated for this variant. If we consider only the linear part of the relations of Type R, or—what comes to the same thing—only the height and slope at the mean income, only two parameters are involved as can be seen by replacing $1/(1 + vg)$ in (6.4) by the first two terms of its Taylor's expansion around $g = 0$. This gives

$$(6.5) \qquad \frac{c}{y} = kP_v + k(1 - P_v)(1 - vg) = k - k(1 - P_v)vg\,.$$

Relations like (6.5) will be identical for different groups provided that k and $(1 - P_v)v$ are identical; so any combinations of P_v and v that keep $(1 - P_y)v$ the same will do.[9] I have been able to construct no simple interpretation of this particular combination or P_v and v,[10] so perhaps the best procedure is to consider the effects of changes in P_v and v separately, while recognizing that these can offset one another. Changes in k and P_v have the same effect on relations of Type R as for the first variant of relative income. The higher k, the higher the relation at all values of g; since it is higher by a constant percentage rather than absolute amount, the absolute value of the slope is also higher by the same percentage, so the relation is steeper (relative to the axis of g or of percentile position[11]). The higher P_v, the smaller the

[9] On the logarithmic alternative, we have

$$(6.3)' \qquad Y = \bar{Y} + G\sigma_Y\,.$$

Substituting in (6.2)′,

$$(6.4)' \qquad C - Y = K - (1 - P_v)\sigma_Y G\,.$$

The logarithmic standard deviation, σ_Y, is an estimate of the coefficient of variation for arithmetic data and, like the latter, is a pure number unaffected, for example, by doubling every income. Consequently, (6.4)′ yields more directly and elegantly the same result as (6.5).

[10] It can be expressed in various ways in terms of the standard deviations of the permanent and transitory components, but no one seems particularly illuminating. Thus:

$$(1 - P_y)v = \left(1 - \frac{\sigma_p^2}{\sigma_y^2}\right)\frac{\sigma_y}{\bar{y}} = \frac{\sigma_t^2}{\sigma_y^2}\cdot\frac{\sigma_y}{\bar{y}} = \left(\frac{\sigma_t}{\sigma_y}\right)\left(\frac{\sigma_t}{\bar{y}}\right).$$

[11] Note that, for a given g, a change in k, v, or P_y affects the slope with respect to the percentile or the logarithm of the percentile in the same direction as the slope with respect to g.

absolute value of the slope, and hence the flatter the relation at any given value of g, and conversely. Like changes in P_y, changes in v affect only the slope, not the height at the mean income ($g = 0$). The higher v, the larger in absolute value is the slope at the mean income, and so the steeper the relation.[12]

The interpretation of these results in terms of our hypothesis is essentially the same as for the first variant. The difference is that a given value of g corresponds to the same relative income for different groups only if v is the same, which is the reason why v enters into the picture. If v is greater for one group than for another, the same value of g means a higher ratio of measured income to average income for the one group than for the other, which in turn would, of itself, imply a lower consumption ratio. In order to offset this effect, given the same ratio of average consumption to average income for the two groups, a larger part of the deviation of measured income from the mean must be accounted for by the permanent component; i.e., P_y must be higher. So the effect of a higher v can be offset by a higher P_y.

Once again, some of the material presented by Brady and Friedman serves to illustrate these effects. They found, for example, that the savings ratio rose more rapidly with percentile position for farmers than for nonfarmers, and that it was generally higher except for low incomes.[13] The difference in height presumably reflects mostly the difference in k. The difference in k also affects the slope but by itself would produce a difference in slope the reverse of that observed, so it must be more than counterbalanced by differences in $v(1 - P_y)$. According to the estimates in Table 4 of Chapter IV, there is little difference in v between farm and nonfarm groups. Consequently, the

[12] It should be noted that the statements about the effects of changes in k and P_y apply both to the linear approximation described by (6.5) and to the original version, (6.4), while the statement about v applies only to the former, which is why "at the mean income" is included in the above sentence.

To demonstrate these statements, differentiate (6.4) with respect to g. This gives

$$\frac{d(c/y)}{dg} = -k(1 - P_y)\frac{v}{(1 + gv)^2}.$$

For given g and v, the absolute value of the righthand side clearly increases as P_y decreases and as k increases. To determine its behavior with respect to v, differentiate the final ratio (call it z) with respect to v. This gives

$$\frac{dz}{dv} = \frac{1 - gv}{(1 + gv)^3}.$$

For g zero or negative, $dz/dv > 0$, so long as $1 + gv > 0$, as, by the definition of g, it will be for positive incomes. For g positive, $dz/dv > 0$ for $v < 1/g$, equal to zero when $v = 1/g$, and less than zero for $v > 1/g$. Thus, at or below the mean income, the relation at each value of g becomes steeper, the larger is v. Above the mean income, the relation at each value of g at first becomes steeper as v increases, then flatter, and the value of v at which it starts to become flatter is smaller, the larger is g.

[13] Brady and Friedman, *op. cit.*, pp. 253 and 262.

substantial difference between them in P_y is again presumably the explanation. The lower value of P_y for farmers than for nonfarmers produces a steeper relation of Type R for them. Again, this is partly only an illustration of the algebraic connection among the relations of various types; it is partly, also, however, evidence in favor of our hypothesis, insofar as there is independent evidence on the relative values of P_y for farm and nonfarm families.

Another example from Brady and Friedman is a chart plotting the savings ratio against percentile position for all nonfarm white families and for Negro families in New York, Columbus, Atlanta, middle-size cities in the South, small cities in the South, and villages in the South, all based on the 1935–36 study.[14] According to their chart, the savings ratio for white families is generally above that for Negro families, at least for percentile positions above 50, and rises more rapidly with income for percentile positions in the immediate neighborhood above 50, and less clearly for higher percentile positions. Unfortunately, the chart contains only one point for a percentile below 50 for each group, so there is little evidence for this region. The relations for the different Negro groups are extremely erratic, giving evidence of considerable variation as a result of sampling fluctuations, so that fine comparisons are impossible. About the only generalization that seems justified is that the relations for the villages and small cities are flatter than the others.

From Tables 4 and 7 of Chapter IV, it will be seen that v is higher for all nonfarm families (white plus Negro) than for Negro families in four of the six communities. P_y as estimated by the elasticity of consumption with respect to measured income, is lower also for four of the six communities though the four communities involved are not the same for both v and P_y. These differences would account for the steeper slope of the Type R relation for white families. As Table 7 shows, v is decidedly lower for Negro families in the small cities and villages of the South than in the other communities, and P_y decidedly higher; both would contribute to the observed flatter relations for these groups.[15]

Duesenberry plots a more detailed chart for New York Negro and white families and for Columbus Negro and white families. Any differences between the relations for Negro and white families in each city separately is too small to be detected in view of rather substantial erratic movements. The difference between the two cities is rather

[14] *Ibid.*, p. 264.

[15] The value of $v(1 - P_y)$ is .140 for all nonfarm families; .056, .122, .166, .101, .031, and .035 for Negro families in New York, Columbus, Atlanta, middle-size cities in the South, small cities in the South, and villages in the South, respectively.

clearer: the savings ratio is generally higher for Columbus than for New York and changes more with percentile position. The higher savings ratio for Columbus presumably reflects a lower value of k; the steeper relation for Columbus, a substantially lower value of P_v without much difference in v (see Table 7).[16]

3. *The Basis for the Relative Income Hypothesis*

We have been interpreting the relative income hypothesis in terms of our own hypothesis and thus have been emphasizing relative measured income as an index of relative permanent income. But it should be noted that considerations of a very different sort recommended the relative income hypothesis to its originators. They were led to emphasize relative income on emulative and imitative grounds. Consumer units, they argued, derived their standards of consumption partly from their neighbors; a unit at any given absolute income level will spend more on consumption in a community in which this income is a relatively low income than in a community in which it is a relatively high income, partly because it must spend more to keep up with the Joneses, partly because it will have more opportunity to observe superior goods and so will be tempted by what Duesenberry calls the "demonstration" effect.[17]

This argument in effect regards measured income as permanent income; it reconciles the observed stability of the average propensity to consume over time with the tendency for the propensity to decline with income at any one time by allowing for the effect of a rise in average income on the relative income that corresponds to any given absolute income. It rationalizes the cross-section decline in the propensity with income on the usual grounds; to quote Duesenberry, "At (relatively) low incomes the desires for present consumption outweigh considerations of the future to such an extent that little or no saving occurs. At higher levels the pressure for increased current consumption is sufficiently reduced to permit some attention to the future."[18] As is shown in Chapter II, this analysis is, to say the least, most unsatisfactory on a purely theoretical level.

These very different theoretical bases for attaching significance to the relative income hypothesis lead to quite different predictions, and it is by the conformity of these predictions to experience that we can choose between them. If relative income is important because of

[16] The value $v(1 - P_v)$ is .086 and .056 for New York whites and Negroes, respectively; .131 and .122 for Columbus whites and Negroes.

[17] Duesenberry gives the most explicit and extensive rationalization of the relative income hypothesis along these lines. See Duesenberry, *Income, Saving, and the Theory of Consumer Behavior*, particularly Chap. III.

[18] *Ibid.*, pp. 37–38.

emulation, there is no reason why it should not have the same effect among farm families as among nonfarm families; or, in any event, something additional would have to be introduced into the hypothesis, and the hypothesis in this way made more complex, to explain why it should have a different effect. If relative income is important because of the demonstration effect, again there is no reason why its effect should differ for farm and nonfarm families. True, the demonstration might be less ubiquitous and urgent, and this might account for higher savings on the farm, but this difference would presumably be the same at all relative income levels so there is no reason why it should affect the slope of a relation of Type R. On the other hand, if relative measured income is important as an index of the ratio of permanent income to average income, there is every reason why it should have a different effect for farm and nonfarm families. Since relative measured income status is more unstable on farms than in the city, a given difference in relative measured income corresponds on the average to a smaller difference in relative permanent income status. The fact that the observed relations of Type R differ for farm and nonfarm families and differ in the direction implied by the permanent income hypothesis is therefore evidence for it and against the emulative or demonstrative interpretation of the significance of relative income.

Similarly, emulative and imitative grounds give no reason to expect systematic differences between relations of Type R for different years, for cities of different size, or for consumer units of different race. On our hypothesis, such differences are to be expected whenever these groups differ in respect of specified characteristics of the income distribution. We have seen above that the observed differences in the relations of Type R among such groups seem to conform with the implications of our hypothesis. However, this evidence is incomplete and indirect. One relevant characteristic of the income distribution, namely, P_y, has not been observed directly but inferred from consumption behavior, and this inference is justified only if our hypothesis is accepted, so to some extent we have begged the crucial question. To complete this evidence we must demonstrate independently, as we shall in the next chapter, that P_y as inferred from consumption behavior is an estimate of P_y computed from income data. This done, the comparisons in question do become relevant evidence in favor of our hypothesis and against the emulative or demonstrative interpretation of the significance of relative income.

The permanent income hypothesis seems to me superior to the relative income hypothesis on three grounds: first, it has a simpler and more attractive theoretical basis in that it uses the same constructs to account for cross-section and temporal results, whereas the relative income hypothesis introduces very different considerations to account for the declining ratio of consumption to measured income in budget study regressions of consumption on income and for the constant ratio of aggregate consumption to aggregate income over long spans of time; second, it is more fruitful, in that it predicts a wider range of characteristics of observed consumption behavior; and finally, the evidence that we have cited seems to fit it somewhat better. In respect of the third point, however, this evidence is by no means sufficient to justify a firm rejection of the relative income hypothesis. It is much to be desired that a fuller test be made of the two hypotheses.

As with change in income, it should be emphasized here too that acceptance of the permanent income hypothesis does not imply rejection of relative income as a meaningful and relevant variable. The permanent income hypothesis explains why relative income is meaningful and relevant, and under what circumstances conversion of relations of Type *A* into relations of Type *R* can be expected to replace heterogeneity with homogeneity and under what circumstances it cannot be expected to do so.

4. *The Relative versus the Absolute Income Hypotheses*

The writers who have suggested the relative income hypothesis have offered empirical evidence—much of which we have referred to in the preceding sections of this chapter and in earlier chapters—in support of their contention that the relative income hypothesis interprets existing data better than the absolute income hypothesis. This evidence, while by no means conclusive, is certainly persuasive. In light of it, I am inclined to interpret the deficiencies of the relative income hypothesis recorded in the preceding sections as meaning only that the permanent income hypothesis is superior to the relative income hypothesis and as in no way contradicting the view that the relative income hypothesis is superior to the absolute income hypothesis. However, as noted in Chapter I, James Tobin has examined the compatibility of the absolute and relative income hypothesis with a number of pieces of empirical evidence and has reached a different conclusion. Although he regards the import of the evidence he examines as mixed, he concludes that on the whole it supports a somewhat modified absolute income hypothesis rather better than it does the relative income hypothesis. His analysis deserves examination in some detail both because of its intrinsic interest, and in order to see whether the discrepancies he finds between the evidence and the relative income hypothesis constitute evidence against the permanent income hypothesis as well, or can be explained by it.

Tobin examines four pieces of evidence bearing on the relative acceptability of the two hypotheses: budget data (1) for two samples of families over a period of three consecutive years, (2) on the savings patterns of Negroes and whites, and (3) on consumption-income relations in different cities, and (4) time series data on the ratio of aggregate savings to aggregate income. He concludes that items (1) and (3) favor the absolute income hypothesis, items (2) and (4) the relative income hypothesis. To resolve the conflict, Tobin suggests modifying the absolute income hypothesis by introducing the amount of financial resources other than income as an additional variable affecting consumption. He presents some indirect evidence to show that this modified hypothesis fits item (2) at least as well as the relative income hypothesis, and may also fit item (4). Tobin's modified hypothesis is in the spirit of our hypothesis, though not identical with it.

We have already examined items (2) and (4) in considerable detail.[19] Both for this reason and because Tobin's case for the absolute income hypothesis, even in its modified form, rests primarily on items (1) and (3), we need consider further only these two items.

a. CONTINUOUS BUDGET DATA

These data are for two samples of farm families in Illinois, Iowa, and Minnesota for which budget records are available for the three years 1940–1942.[20] One set of budgets was collected by the Farm Security Administration from families who had incurred loans from the FSA to purchase farms—these are the data we used in Chapter IV in our analysis of the effect of change in income; the other, by agricultural experiment stations, or extension services. Tobin presents a detailed analysis of the first sample and states that the second yields similar results.

The average income of the FSA sample rose sharply from 1940 to 1942—by nearly 75 per cent in money terms, and by 37 per cent in real terms; yet this rise was only half as large as the contemporaneous rise in real per capita farm income for the United States as a whole. Average consumption expenditures of the group rose also, but by less than 15 per cent in real terms so that the ratio of consumption to income fell rather sharply. This result is clearly consistent with the absolute income hypothesis, in the sense that budget studies show consumption to be a lower percentage of income, the higher the income. It is inconsistent with the relative income hypothesis. If the relevant income distribution is regarded as that of the sample itself,

[19] See above, pp. 79–85, 116–124.
[20] Willard W. Cochrane and Mary D. Grigg, *op. cit.*

the relative position of the group as a whole obviously remained unchanged, so that the ratio of consumption to income should have been unchanged also. If the relevant income distribution is for farmers as a whole, this group fell in relative position, which should imply a rise, not a fall, in the ratio of consumption to income.

Tobin plots the ratio of consumption to income for different income classes and different years against the corresponding (a) absolute real income and (b) ratio of income to the mean income of the group as a whole. Plotted against (a), the consumption ratios for the three years fall on a single well-defined curve, with little scatter about it. Plotted against (b), the consumption ratios define three curves, one for each year; the consumption ratio is lower for a given relative income, the later the year.

Two considerations are important in judging the weight to be attached to this evidence. In the first place, the sample analyzed is highly special, as is to be expected from its method of selection. Average consumption is only 53 per cent of average income in 1940, 48 per cent in 1941, and 43 per cent in 1942. These ratios of consumption are drastically lower than the ratios generally observed for farm families, or than the corresponding estimates for farmers as a whole in the corresponding years, yet the average income of the sample is not greatly different from the average income of all farm families in the corresponding states.[21] In view of the difficulties in measuring both income and consumption expenditures for farmers, these abnormal ratios raise doubts about the accuracy of the data.

In the second place, the two respects in which the FSA sample appears to contradict the relative income hypothesis—the behavior of the consumption-income ratio for the sample as a whole, and the behavior of this ratio for different income classes—are really only one: the second is the first in disguise. The correlation between measured consumption and measured income is very low so that the regression of consumption on income is very flat—on our hypothesis, P_y is rather small, in the neighborhood of .3 to .5.[22] The negative relation for any one year between the ratio of consumption to income and absolute real income that shows up on Tobin's Figure 1 is mainly the result of dividing almost constant consumption expenditures by successively higher incomes; it is only slightly flatter than the rectangular hyperbola that would be produced by strictly constant expenditures. Average real consumption rises only mildly—by 12 per cent—over the three year period. The corresponding rectangular

[21] See Reid, "Effect of Income Concept upon Expenditure Curves of Farm Families," p. 154.

[22] *Ibid.*, pp. 154, 165–166. See also Chap. VII below for direct evidence on P_y.

hyperbolae for the three years would differ only by the same amount, and three slightly flatter curves intersecting these hyperbolae successively farther to the right (because of the rise in average real income) would differ even less. Their essential coincidence in Tobin's figure therefore reflects primarily the small change in average consumption plus the low correlation between consumption and income. When the consumption ratios are plotted against relative incomes, curves only slightly flatter than rectangular hyperbolae are again produced, but this time the difference in the level of the rectangular hyperbolae is given by the difference in the ratio of average consumption to average income, which is about 20 per cent, and there is no offset, since the conversion to relative incomes places the mean of all three samples at the same point on the horizontal axis (namely 100), so the flatter curves intersect the hyperbolae one above the other.

While these qualifications lessen the weight that can be assigned to the evidence of the FSA sample, they by no means justify disregarding that evidence. As far as it goes, it speaks for the absolute income hypothesis and against the relative income hypothesis, at least in the variant in which income position is measured by the ratio of the income of the unit to the mean income of the group to which it belongs. We saw in section 1 above that this hypothesis gives the same results as the permanent income hypothesis if (1) k and P_y are the same for the different groups compared, and (2) the mean transitory components of income and consumption are zero for each group considered. There seems no reason to suppose that (1) is not reasonably well satisfied for the three years: on our hypothesis, differences in (1) would produce differences in the slope of the regression of consumption or the consumption ratio on income or relative income, yet the regressions for the three years show no sizable differences in slope. There is, on the other hand, good reason to suppose that point (2) is seriously in error: the mean transitory component of income was almost certainly positive in 1941 and 1942, and of consumption, almost certainly negative in 1942. Both 1941 and 1942 were years of abnormal prosperity, and by 1942 wartime shortages of goods were making themselves felt.

These effects are in the right direction to explain the differences in consumption ratios. Are they of the right magnitude? A rough test can be made with the help of Figure 13. Let us assume that this Figure is correctly described by the permanent income hypothesis so that the points on it can be regarded as generated from the central heavy line by the addition of transitory components of income and consumption. In order to estimate the mean transitory component of income in 1940, 1941, and 1942, let us further set the mean transitory component of consumption in these three years equal to zero. This is clearly implausible, particularly for 1942, but makes little difference to the final result since the effect of setting this component equal to zero when it might more plausibly be regarded as negative is to make the resulting estimate of the mean transitory component of income too large. But these errors are offsetting, since a negative mean transitory component of consumption has roughly the same effect as a positive mean transitory component of income. On these assumptions, we can estimate from Figure 13 the ratio of measured income to permanent income, the estimates being 1.00, 1.04, and 1.25 for 1940, 1941, and 1942, respectively.[23] These estimates are for the nation as a whole. Let us suppose them to hold also for the FSA sample. If we multiply them by the observed ratios of consumption to measured income, which, we may recall, were .53, .48, and .43 for the three years, the resulting figures are estimates of the ratio of permanent consumption to permanent income, and it is these ratios that should remain the same on our hypothesis. The numerical estimates obtained in this way are .53, .50, and .54 for 1940, 1941, and 1942, respectively. These are certainly enough alike to justify regarding the evidence for the FSA families as consistent with our hypothesis, albeit in a somewhat more sophisticated version than that in which it yields the same results as the relative income hypothesis.

b. GEOGRAPHICAL BUDGET COMPARISONS

For each of six communities,[24] Tobin compares two regressions: the regression of the ratio of consumption to income on percentile position in the income distribution computed by Duesenberry from Consumer Purchases Study data for 1935–36 for native-white non-relief families;[25] and the regression of the ratio of consumption to income on absolute income computed by Mendershausen from the same data,[26] corrected for estimated intercity differences in cost of living. He selects four values of the percentile position (1.0, 3.4, 30.2,

[23] From (5.2),

$$\frac{c_p^*}{y^*} = k^* \frac{y_p^*}{y}.$$

Replace c_p^* by c^* and write r for the observed ratio of consumption to income. It then follows from (5.2) that

$$\frac{y^*}{y_p^*} = \frac{k^*}{r}.$$

In Figure 13, we set $k^* = .8875$. r is equal to .886 in 1940, to .853 in 1941, and to .712 in 1942.

[24] Columbus, Providence, Denver, Chicago, Omaha, and the merged cities, Butte and Pueblo.

[25] *Op. cit.*, p. 54.

[26] Horst Mendershausen, "Differences in Family Saving," pp. 122–137.

and 90.2). For each value he determines the consumption ratio for Denver from the percentile regression, and the value of real income for which the absolute income regression for Denver gives the same consumption ratio (the matching real incomes are $9,800, $5,000, $2,380, and $1,470). For each value of the percentile position he computes the consumption ratios for each of the six cities from the percentile regressions, and the coefficient of variation of these six values. Similarly, for each real income value, he computes the consumption ratio for each of the six cities from the absolute income regressions, and the coefficient of variation of these six values. For each of the four points, the coefficient of variation of the percentile estimates exceeds substantially the coefficient of variation of the absolute income estimates. Tobin concludes that the consumption ratio is more homogeneous among cities for a given absolute income than for a given percentile position, and hence that this evidence favors the absolute income hypothesis.

This evidence does not, however, justify this conclusion, both because the evidence is poorly suited to provide a test of the two hypotheses and because the statistical analysis is inadequate. An alternative analysis of these and similar data leads to results that are much less clear cut.

As was noted in section 2 above, the absolute and relative income hypotheses yield divergent results for different groups of families only if the groups differ in the distribution of income, so that the same percentile point corresponds to different values of real income. It so happens that the six groups of consumer units Tobin compares differ little in average real income; the largest average real income is only 20 per cent above the smallest, the next to the largest only 10 per cent above the next to the smallest.[27] While the groups differ in the dispersion of the distributions about the mean, inspection of the data suggests that these differences, too, are moderate. All in all, therefore this set of communities is a most unsatisfactory set on the basis of which to test the two hypotheses. The difference in results that could be expected from the two hypotheses for communities so homogeneous as these is small enough to be easily swamped by extraneous factors affecting the comparison.

Such extraneous factors are clearly present, thanks not only to chance variation and observational error, but also to differences in

[27] These statements are based on mean incomes for native-white nonrelief families taken from U.S. Bureau of Labor Statistics, Bulletins 642, 644, 645, 646, deflated by cost of living in different cities as given by Mendershausen (*ibid.*). Duesenberry excluded some of the lower income classes (those for which an average of less than forty-eight full weeks of employment was reported) in computing his regressions, so these statements may not apply in detail to his figures. But the error can hardly be large.

the statistical procedures used by Duesenberry and Mendershausen. In consequence, the computed coefficients of variation reflect both whatever "real" differences there may be among the regressions for the different cities, and what may be regarded as sampling errors in the estimates of the parameters of the computed regressions. Tobin does not attempt to separate out these two sources of variation, or to test whether the coefficients of variation are larger than could readily be accounted for by sampling error alone. Supplementary calculations for the percentile regressions indicate that the coefficients of variation for them are roughly twice the value that could be expected on the average from chance alone, a difference somewhat greater than can readily be attributed to chance.[28]

There are at least three reasons why the sampling error of the percentile regressions might be expected to exceed the sampling error

[28] Duesenberry gives the standard deviations of his parameters. From these and other data that he gives it is possible to compute for each city for each percentile point the variance of the ordinate of the regression. The square root of the mean of these variances for the six cities is an estimate of the standard deviations to be expected by chance alone. The standard deviations computed in this way compare with the observed standard deviations as follows:

Percentile Point	*Estimated Theoretical Standard Deviation*	*Observed Standard Deviation*
1.0	2.3	4.6
3.4	1.4	3.3
30.2	1.4	2.7
90.2	2.2	3.5

The observed standard deviations given in this table are larger than those used by Tobin, because they were computed by dividing the sum of squares by 5, the number of degrees of freedom, whereas Tobin divided the sum of squares by 6, the number of observations.

If the estimated theoretical standard deviation is accepted as strictly correct, the significance of the difference between the observed and theoretical standard deviations can be readily tested, since the ratio of 5 times the observed variance to the theoretical variance is then distributed as χ^2 with 5 degrees of freedom. By this test, the observed variances are significantly larger than the theoretical variances, the probabilities that the observed χ^2 would be exceeded by chance varying from slightly less than .05 to less than .001. Of course, not all four comparisons are independent. The regressions being compared have two parameters, so only two independent comparisons are possible. A direct test of the differences among the parameters would be both more straightforward and statistically more efficient.

It should be noted that the procedure used for deriving the theoretical standard deviations is an approximation on a number of scores. It is noteworthy that the observed standard deviations, though higher, follow the pattern of the theoretical standard deviations.

Similar calculations were not made for Mendershausen's regressions because they would have required extensive recomputations from the original data.

of the absolute income regressions: first, the percentile regressions contain only two parameters, the absolute income regressions, three; second, the estimated percentile position is subject to a source of sampling error that does not affect the estimated real income since it depends on the frequency distribution of the sample incomes, which is only an estimate of the distribution in the community as a whole; third, Duesenberry excluded some of the lower income classes (those for which an average of less than forty-eight full weeks of employment was reported), whereas Mendershausen computed his regressions from all the data.[29]

This expectation is confirmed by the results. The correlation coefficients reported by Duesenberry for his regressions for the six communities tend to be lower than those reported by Mendershausen. The mean variance (square of the standard deviation) of the observations about the regressions computed from these correlation coefficients is roughly 2.6 times as large for the percentile as for the absolute income regressions.[30] The mean variance among communities computed from Tobin's four sets of figures is 2.3 times as large for the percentile as for the absolute income regressions.[31] It looks very much as if the whole of the difference between the coefficients of variation for the two hypotheses simply reflects Duesenberry's lower correlation coefficients. These lower correlation coefficients might themselves be interpreted as evidence that the percentile hypothesis fits the data less well than the real income hypothesis. But this evidence is for each

[29] It should be noted that Duesenberry's exclusion of these classes, while perhaps called for by the rationalization he presents for the relative income hypothesis, is not justified by the permanent income hypothesis.

[30] The square of the coefficient of correlation (r^2) is the fraction of the total variance accounted for by the regression; unity minus r^2 is the fraction not accounted for. The average value of $1 - r^2$ is .103 for Duesenberry's regressions; .040 for Mendershausen's. Note that this method of averaging implicitly weights the variances about the regressions by the reciprocal of the total variance.

One ambiguity of this comparison is that Duesenberry does not state explicitly whether he computed his correlation coefficients from the mean values for income classes or from the original observations. The former tends to yield a higher coefficient than the latter. I have assumed, on the basis of internal evidence, that he did the former, as Mendershausen explicitly states he did.

[31] The variances were computed for each level of income or percentile point; the four resulting percentile variances averaged and divided by the average of the four resulting real income variances. These averages are an unweighted average of the variances, not a weighted average, as for the ratio of 2.6 just cited. The average ratio of the percentile variance to the real income variance is 3.0. This ratio is not strictly comparable with the ratio of the variances of observations about the regressions. For any given regression, the variance of the ordinate of the regression for a given value of the abscissa is proportional to the variance about the regression. The proportionality factor, however, will in general vary from one type of regression to another, as well as from one value of the abscissa to another on the same regression. For Mendershausen's regressions, I cannot compute these proportionality factors on the basis of his published figures. I see no reason to expect that adjustment for this defect would substantially alter the results.

community separately; it does not reflect differences among communities. More important, the different statistical procedures used in calculating the percentile and absolute income regressions render highly dubious any such interpretation of the lower correlation coefficients.

Tobin's analysis of these data is not only incomplete but also statistically inefficient. Tobin gives ordinates of the regressions for four selected points; he could equally well have done so for forty; but such a multiplication of points would add no new information. Knowledge of the ordinates of a percentile regression for any two points, and of an absolute income regression for any three, permits the calculation of the ordinates for all other points, since the percentile regressions have two parameters, and absolute income regressions, three. At most, therefore, three independent comparisons among the regressions are possible.

Much of the difficulty of interpreting Tobin's results arises, as noted above, from differences between Duesenberry's and Mendershausen's computations other than the difference between the absolute income and the relative income hypothesis: their use of different forms of regression equations, different kinds of independent variables, and slightly different bodies of data to estimate the regressions. These can all be eliminated by using Mendershausen's regressions alone to test whether the absolute or relative income hypothesis gives estimates that vary less from city to city. By a simple transformation, Mendershausen's regressions can be written so that they express the ratio of consumption to income as a function of either (a) absolute real income or (b) the ratio of the income of a consumer unit to the average income of the community.[32] The latter is a variant of the relative income hypothesis, though not the percentile variant used by Duesenberry. It can be seen whether the parameters differ more when the regressions are written in form (a) or in form (b). There are three parameters in the regression used by Mendershausen. However, one is the same for both forms of the regression, so differences can appear in only two.

[32] Mendershausen fits regressions of the form $s' = a + by + c(1/y)$, where s' is the ratio of saving to measured income, y is total family income, and a, b, and c, statistically estimated parameters. Following Tobin, let k be the ratio of the cost of living in Columbus to the cost of living in the city in question. The parameters of the absolute real income regression are then a, b/k, and kc, obtained by making the transformation $y' = ky$, where y' is "real" income as defined by Tobin. A regression in terms of relative income is obtained by making the transformation $y'' = y/\bar{y}$ where y'' is relative income and $\bar{y}$, average total family income in the city in question. The parameters of the relative income regression are then a, $b\bar{y}$, $c/\bar{y}$. The ratio of consumption to income is unity minus s', so the parameters of the relation described at the head of Table 16 are related to a, b, and c by $\alpha = 1 - a$, $\beta = -b$, $\gamma = -c$.

Table 16 summarizes the results of comparisons along these lines for the six communities compared by Tobin, ten communities including these six for which estimates of intercity differences in cost of living are available, 20 communities including these 10 for which Mendershausen reports regressions for white families,[33] four communities for which he reports regressions for Negro families, and

TABLE 16

Comparison of Relative and Absolute Income Hypotheses for Different Groups of Communities, 1935–1936

Comparison based on parameters of regression:

$$c' = \alpha + \beta y + \gamma \frac{1}{y},$$

where

c' = ratio of measured consumption to measured income,
y = alternatively, absolute nominal income (measured income in nominal units), absolute real income (measured income deflated for cost of living differences), relative income (ratio of measured income to mean income of group), and
Coefficient of variation = standard deviation divided by mean.

	Coefficient of Variation of Estimates of:						
	β			γ			*Coefficient of Variation of Mean Income*
	Absolute Income			*Absolute Income*			
Groups Compared	*Nominal*	*Real*	*Relative Income*	*Nominal*	*Real*	*Relative Income*	
White families in:							
6 communities	.33	.32	.32	.20	.18	.23	.04
10 communities	.53	.51	.54	.33	.30	.35	.11
20 communities	.71		.71	.38		.40	.13
Negro families in 4 communities	.23		.34	.79		.72	.35
White families in 20 communities and Negro families in 4 communities	.74		.64	.53		.49	.24

Source:
All estimates are based on parameters reported by Horst Mendershausen, "Differences in Family Saving between Cities of Different Size and Location, Whites and Negroes," *Review of Economic Statistics*, XXII (August, 1940), pp. 122–37. Cost of living also taken from Mendershausen. Mean incomes are from Department of Labor, B.L.S. Bulletins Nos. 642–647 and Department of Agriculture, B.H.E., Miscellaneous Publications 339, 345.

[33] This count refers to the individual communities. Mendershausen also reports regressions for combinations of these communities. I have made no use of these.

finally, all 24 groups for which he reports regressions. Except for the six and ten communities, the comparison must be made for an inferior variant of the absolute income hypothesis, namely, one in which no allowance is made for price differences. The comparisons in the first two lines of the table show that correction for price differences systematically reduces the divergence among the parameters. However, the effect is moderate and we can allow for it qualitatively in making the remaining comparisons; as a result, the gain from broadening the scope of comparison seems clearly greater than the loss from being unable to make direct corrections for prices.

For each of the three sets of white families, the absolute real income hypothesis seems either equal or superior to the relative income hypothesis for both of the parameters, if for the third set we may judge from the nominal income results. The differences are small and may well be within the range of sampling errors, and the comparisons are not independent since the several sets have communities in common; yet the results are consistent and agree with Tobin's original finding. For the Negro families, the parameters give conflicting results; for one parameter, the absolute income hypothesis is superior; for the other, inferior. Finally, for all groups, the relative income hypothesis gives better results for both parameters; conceivably, these would be reversed if cost of living corrections could be made, but it seems hardly likely.

The reason for the much better showing of the relative income hypothesis in the last two comparisons is suggested by the final column of the Table, which gives measures of the dispersion of mean incomes in the different communities. This dispersion is markedly wider in the last two comparisons than in the first three; in these, there is considerably more of a difference in mean incomes to produce differences among absolute income regressions of the kind predicted by the relative income hypothesis. In the first three comparisons, as already noted, there is so little difference in mean incomes that there is hardly anything for the relative income hypothesis to do. The fact that the performance of the relative income hypothesis improves relative to that of the absolute income hypothesis as the dispersion of mean incomes increases must be regarded as evidence in favor of the relative income hypothesis.

The comparisons that are summarized in Table 16 are not themselves fully satisfactory because they deal with each parameter separately; they do not allow for the possibility that the differences in the parameters may either offset or reinforce one another.[34] In work done

[34] I am indebted to James Tobin for calling my attention to this deficiency of these tests arising from their neglect of the interaction between the parameters.

since the publication of the article under discussion, Tobin has made some comparisons that allow for this possibility. However, these are only for the six and the ten communities, which is why I have included the less satisfactory comparisons in Table 16. Tobin subjected the data to an analysis of variance by computing the sum of squared deviations about a regression of Mendershausen's form fitted to the data for each city separately—the corresponding mean square, entered in column (2) of Table 17, is the same for the two hypotheses since, as

TABLE 17

Comparison of Relative and Absolute Income Hypotheses Based on Analysis of Variance for Two Groups of Communities, 1935–1936

Groups Compared (1)	*Variance Estimated from Deviations*: *From Separate Regressions* (2)	*Between Cities on*: *Absolute Hypothesis* (3)	*Relative Hypothesis* (4)	*Ratio of Variance between Cities to Variance from Regressions*: *Absolute* (5)	*Relative* (6)
White families in					
6 cities	.046	.213	.478	4.7	10.5
10 cities	.067	.498	.555	7.4	8.2

Source: Unpublished computations by James Tobin kindly made available to me.

noted earlier, for any one community a relation of Type *R* is simply a transformation of a relation of Type *A* and yields the same predictions of the consumption ratio. He then fitted regressions of the same form to the data for all the cities combined, using absolute real income in one case and relative income in the other as his independent variable. The sum of squared deviations about this regression reflects the effect of differences both within and between cities; the excess of this sum over the sum of squares about the separate regressions is attributable to differences between cities. The corresponding mean squares are entered in columns (3) and (4). These are markedly larger than the variance within cities as is shown by the ratios in the final two columns, all of which are much larger than the ratio that could plausibly be expected to arise from chance.[35] On this evidence, neither the absolute nor the relative income hypothesis can be regarded as accounting satisfactorily for the differences between cities; factors accounted for by neither must be at work to produce differences of this size between cities.

[35] The .01 value of F for the number of degrees of freedom involved is approximately 2.4 for the six communities and 1.9 for the ten communities.

The mean square between cities is more than twice as large for the relative as the absolute income hypothesis for the six communities; about 10 per cent larger, for the ten communities. Unfortunately, there seems no simple way to determine the probability that such a difference would arise by chance; I conjecture that the difference for the six communities is larger than can readily be attributed to chance, and for the ten communities almost certainly small enough to be readily accounted for in this way.[36] This difference in results for the two sets of communities can again be explained by the difference in dispersion of mean incomes. According to Table 16, the dispersion, though small for both sets of communities, is nearly three times as large for the ten communities as for the six. Again, therefore, the relative income hypothesis shows up better when there is more scope for it to operate. It seems not unlikely that if this comparison could be extended to a more heterogeneous set of communities, the result would be, as in Table 16, to reverse the relative size of the mean squares between cities.

It may be that the significant differences between cities left unaccounted for by either the absolute or relative income hypothesis can be accounted for, at least in part, by our hypothesis, that is, by differences in P_y or in the numerical value of k which reflect differences in its determinants. However, I have been unable to uncover any independent evidence on these magnitudes that would enable us to determine whether this is so.

C. SUMMARY EVALUATION OF EVIDENCE

Our re-examination of Tobin's evidence suggests that it is much less favorable to the absolute income hypothesis and more favorable to the relative income hypothesis than he regarded it. Of the four pieces of evidence Tobin examines in some detail, two are admittedly more favorable to the simple relative income hypothesis than to the simple absolute income hypothesis. The remaining two, on which Tobin rests his case, can be regarded as speaking with a rather weak voice for the absolute income hypothesis. But for one, the FSA sample, the reason seems to be that transitory components of income and expenditure were introduced by World War II. For the other, the comparison among communities, the reason seems to be that the two

[36] If the mean squares between cities for the relative and absolute income hypotheses were statistically independent estimates, their ratio would have the F distribution, and the probability of exceeding the observed ratio by chance would be a trifle over 5 per cent for the six communities, well over 20 per cent for the ten communities. However, the two estimates are not statistically independent, since they are computed from the same degrees of freedom. I conjecture that their interdependence is such as to make large F's less likely to arise from chance, but I cannot demonstrate that this is so.

hypotheses are compared under conditions that give little scope to the forces emphasized by the relative income hypothesis. As these conditions are expanded to cover a wider range of variation in average income, the performance of the relative income hypothesis improves relative to that of the absolute income hypothesis, so that this piece of evidence can equally be regarded as favoring the relative income hypothesis. All in all, therefore, I see little justification for rejecting, on the basis of this evidence, the prior conclusion that the relative income hypothesis is superior to the absolute income hypothesis.

One of the apparent failures of the relative income hypothesis is, as already implied, readily accounted for on the permanent income hypothesis and therefore is another piece of evidence for the latter as compared with either of the other hypotheses. With respect to differences among communities, we have no evidence whether they can or cannot be accounted for by the permanent income hypothesis.