CHAPTER 5

Aggregate Intentions-Purchases Relationship

Introduction

THIS chapter deals with the relation between aggregate buying intentions and aggregate purchases. The main focus is on a comparison of intentions with other predictors of durable goods purchases, such as income, life-cycle status, etc. There is also a preliminary investigation of some possible interactions between buying intentions and other predictors of durable goods purchases.

The basic data are identical to those discussed in Chapters 2, 3, and 4, except that the individual-commodity buying intentions and purchases reported by each household have been combined into crudely weighted aggregates designed to measure intended and actual dollar magnitudes for each household. All commodities except automobiles are assigned equal weights of 1 (= roughly $300 worth of durables); these commodities are: room air conditioner, house air conditioner, carpets and rugs (over $100 worth), clothes dryer, dishwasher, food freezer, furniture (over $100 worth), garbage disposal unit, high-fidelity equipment, home heating system, movie camera, range, refrigerator, television set, and washing machine. Automobile weights are as follows:

	Assigned Weight
Automobile, used	2
Automobile, new	
Under $2,500	4
$2,500–$3,500	5
Over $3,500	6

Some of the unit weights are clearly inappropriate. First, prices paid for house air-conditioning systems, home heating systems, movie cameras, and garbage disposal units are rather different from prices typically paid for the other unit-weight items; for all other items the price ranges of popular models overlap to a considerable degree. Second, it is known that the probabilities associated with responses to an intentions question are not the same for all items, being higher for automobiles, say, than for dishwashers. I did not refine the weights to correct these two known biases, since (1) for the first three items mentioned above, an estimate of average price has little meaning because the range of possible prices is very large; (2) relatively few households either planned to buy or purchased any of the four items; (3) relatively few households purchased those items for which purchase probabilities, given the buying-intentions question, are quite different from the "typical" values. In effect, the gain in accuracy did not seem worth the cost of either adjustment.

The first step was to classify households by the level of aggregate buying intentions. The average level of purchases by households in each of the categories was then computed. The results (Table 23) are shown for several of the intentions questions. Correlations between aggregate buying intentions ($\hat{P}$) and aggregate purchases (P) are also shown; P is measured over the six months subsequent to the survey of intentions.

TABLE 23
BUYING INTENTIONS OF APRIL 1958 COMPARED WITH WEIGHTED AVERAGE PURCHASES, APRIL–OCTOBER 1958

Weighted Number of Buying Intentions, April 1958	*Weighted Average Purchases of Households for Intentions Question*[a]			
	A_1	B_1	C_1	D_1
0	1.30	1.26	1.01	1.14
1	1.82	1.52	1.14	1.30
2	2.06	1.86	1.74	1.62
3	2.83	2.31	1.98	1.80
4	3.11	2.84	2.35	2.04
5	3.46	3.51	2.79	2.57
6	3.76	3.70	3.16	2.55
7	4.04	3.57	3.26	3.32
8	4.36	3.71	3.18	3.54
9 or more	3.38	3.82	3.16	2.77
All households	1.65	1.62	1.63	1.65
REGRESSION STATISTICS ($P = a + b\hat{P}$)[b]				
Square of correlation coefficient (r^2)	.093	.095	.124	.085
Intercept (a)	+1.337	+1.235	+.993	+1.730
Slope coefficient (b)	+.384	+.367	+.317	+.252
Standard error of b	±.020	±.019	±.014	±.014

SOURCE: Basic data from Consumer Purchase Study, NBER.

[a] The intentions questions are: A_1—definite plans within twelve months; B_1—plans within six months; C_1—plans within twelve months (if income is as expected); D_1—plans within twelve months. See Table 1 for a more complete description of the intentions questions.

[b] Data based on individual observations; P = purchases, $\hat{P}$ = buying intentions.

Aggregate Purchases and Buying Intentions

In examining Table 23, one is immediately impressed by the closeness of the buying intentions–purchases relationship, particularly when the data are grouped in order to reduce the random variation inherent in individual behavior. The average value of (aggregate) purchases rises steadily with the level of (aggregate) intentions for all four questions, although average purchases drop off somewhat at very high levels of

intentions.[1] The correlation data also indicate a quite powerful relation between aggregate intentions and purchases, with intentions explaining from 9 to 12 per cent of the variance, depending on the group.[2]

Differences among the variant intentions groups in average purchases, keeping reported intentions constant, are generally consistent with the interpretation of intentions developed in Chapter 3. Average purchases corresponding to any given level of buying intentions are highest in group A_1, next highest in B_1, and lowest in D_1. From the analysis in Chapter 3 it is clear that average probability for intenders in groups A_1 and B_1 must be higher than for intenders in either C_1 or D_1.[3] The probability cut-off points implied by these four questions can be ranked by the fraction of households reporting intentions. On this scale, A_1 intenders would be expected to have a higher cut-off than those in B_1, and similarly for intenders in group C_1 compared to D_1. Thus, the model predicts that purchase probability for intenders in groups A_1, B_1, C_1, and D_1 would rank in that order, and the data on average purchases are consistent with such a prediction.

The regression coefficients are equally consistent with the probability model. These coefficients measure the average difference in purchases among households that differ by unity in the weighted aggregate of intended

[1] Most previous studies of buying intentions in relation to subsequent purchases have simply distinguished between households with and without intentions or purchases, or used ratios of intentions (purchases) to income (see James Tobin, "On the Predictive Value of Consumer Intentions and Attitudes," *Review of Economics and Statistics*, February 1959; Lawrence R. Klein and John B. Lansing, "Decisions to Purchase Consumer Durable Goods," *Journal of Marketing*, October 1955; Eva Mueller, "Effects of Consumer Attitudes on Purchases," *American Economic Review*, December 1957; and Peter De Janosi, "Factors Influencing the Demand for New Automobiles," *Journal of Marketing*, April 1959).

[2] This constitutes a very strong relationship as cross-section results go. By comparison, the results reported by Mueller show the following correlations in a cross-section study, using data from the Survey of Consumer Finances:

Regression Relation	*Squared Correlation Coefficient*
P on income	.032
P on age	.017
P on attitudes	.020
P on intentions	.036

Income explains less than 4 per cent of the variance for this sample, and buying intentions explain roughly the same amount.

[3] The cut-off probability for intenders must be higher in A_1 than in either C_1 or D_1. The intentions question for the former asked about "definite plans to buy within a year," while for groups C_1 and D_1 the questions asked about "plans within a year." The cut-off probability must also be higher for B_1 than for either C_1 or D_1 because the former question asked about "plans within six months."

purchases. According to the model, a given difference in intended purchases should be associated with a larger difference in actual purchases for households in group A_1 than for those in groups B_1, C_1, or D_1, because the purchase probability associated with a reported "intention to buy" is larger in A_1 than elsewhere. More generally, the model predicts that the regression coefficients of intentions will rank in the order A_1, B_1, C_1, D_1; and this prediction corresponds to the observed ranking.

One of the most interesting results in Table 23 is the sizable difference between C_1 and D_1 both in the $(P,\hat{P})$ correlation and in the level of average purchases associated with any given level of intentions. Both groups were asked what seemed to be an identical question about buying intentions, i.e., "Do you plan to buy within the next twelve months or so?" But the intentions question for C_1 contained two additional and specifically contingent parts as well, which asked about intentions if income were to be higher or lower than expected (see Chapter 2). It is quite clear that the purchase probability associated with buying intentions reported on the noncontingent part of variant C—C_1—were affected by the existence of the two contingent parts. The fraction of intenders is lower in C_1 than D_1 for almost every item, and the purchase rates for intenders are higher in C_1.[4] And from Table 23, it is clear that both correlation and regression coefficients are noticeably higher for C_1 than for D_1, and that a given level of intentions is generally associated with larger average purchases in C_1 than in D_1. The above aggregate results accord with my findings in Chapters 2 and 3 for individual-commodity data.

It is also interesting that the correlation between six-month purchases and the intentions question with a six-month time horizon (variant B_1) is not very different from the correlations for A_1 and D_1, both of which asked about intentions over a twelve-month period. The inference seems to be that the time horizon attached to a question about intentions should not be taken as an indicator of the probable date of purchase. A question with a relatively short time horizon seems to serve somewhat the same function as one with a longer horizon but with restrictive specifications about the degree of certainty; that is, asking about "plans within six months" seems to elicit much the same general pattern of intentions and purchases as asking about "definite plans within twelve months." These aggregate data again confirm the results in Chapters 2 and 3, where roughly the same purchase probability was found to be associated with responses to these two questions.

[4] See Chapter 2 above, and my *Consumer Expectations, Plans, and Purchases: A Progress Report*, Occasional Paper 70, New York, NBER, 1959, Chap. 3, Table 9.

Aggregate Purchases and Contingent Buying Intentions

So far, I have discussed the relation between aggregate buying intentions and purchases for alternative intentions variables, obtained from survey questions asked of different samples of households. Supplementary measures of intentions, with lower probability cut-off points, are also available for several of these samples. I now turn to the problem of combining intentions variables such as those in the several parts of A and C in order to achieve the best possible explanation of purchases.

I designate responses to the relatively high-probability part of a multiple intentions question as "standard" intentions, $\hat{P}$. Thus, "definite" buying intentions are standard for the A group; "intentions within twelve months," for the C group. Responses to the relatively low-probability part of the question are designated "contingent" intentions, $\hat{P}_c$. Thus "probable or possible" purchases are contingent for the A group; "intentions if income is higher than expected," for the C group. Groups A, B, and C have both a standard and a contingent intentions variable; group D has only a standard intentions variable (see Chapter 2).

The analysis of individual commodity data in Chapter 3 suggests the undesirability of relating the sum $\hat{P} + \hat{P}_c$ for each household to the sum of purchases (P). This procedure is tantamount to assigning equal weights to both kinds of intentions, and it is known that the purchase probabilities associated with standard intentions are substantially higher than those associated with contingent intentions.[5] If the purchase probabilities are different, the regression coefficients are presumably different also.

The simplest procedure is to estimate coefficients from an equation of the form

$$1.0 \qquad P = b_0 + b_1\hat{P} + b_2\hat{P}_c + u,$$

allowing the data to choose the weights assigned to $\hat{P}$ and $\hat{P}_c$. By so doing it is assumed that both variables are linearly related to purchases and that contingent intentions have the same influence on purchases for every level of standard intentions. Evidence against a linear relationship is not strong, but the assumption of independence between the $(P,\hat{P}_c)$ relation and the level of $\hat{P}$ seems questionable. I have already shown that variables like income and life cycle apparently have a stronger influence on the

[5] This relation holds within any of the groups for which both $\hat{P}$ and $\hat{P}_c$ were obtained, although it does not of course follow that $\hat{P}$ for one group necessarily has a higher cut-off or mean probability than $\hat{P}_c$ for a different group. In fact, the $\hat{P}$ variables in groups A, B, and C all seem to have higher cut-off probabilities than any of the $\hat{P}_c$ variables, but this is due to the particular questions asked.

purchases of nonintenders than of intenders. The probable reasons have been discussed (see Chapters 3 and 4). The logic of the argument suggests that the influence of contingent intentions may well be stronger when standard intentions are zero or relatively small than when they are relatively large. If so, coefficients for the buying intentions variables should be estimated from equations like these:

$$2.0 \qquad P = b_0 + b_1\hat{P} + b_2\hat{P}_c + b_3\hat{P}\hat{P}_c + u,$$

or

$$3.0 \qquad P = b_0 + b_1\hat{P} + b_2\hat{P}_c + b_3Z\hat{P}_c + u,$$

where $Z = 1$ when $\hat{P} = 0$
$Z = 0$ when $\hat{P} > 0$

Both these equations permit the relation between contingent intentions and purchases to vary with the level of standard intentions. In equation 2.0 the slope coefficient of $\hat{P}_c$ is $b_2 + \hat{P}b_3$; since b_3 is expected to be negative, the entire expression is at a maximum when $\hat{P}$ is zero. As $\hat{P}$ increases the expression becomes steadily smaller, presumably becoming negative at some point. In equation 3.0, the regression coefficient of $\hat{P}_c$ is $b_2 + Zb_3$; hence there are two different slopes for the $(\hat{P}_c,P)$ relation, depending on whether the value of Z is unity or zero. Since b_3 is expected to be positive, the coefficient of $\hat{P}_c$ will be larger when $\hat{P}$ is zero than when it is not.

One rather straightforward empirical test of the general notion that contingent intentions are more closely associated with purchases when standard intentions are zero involves the computation of separate regressions for households with zero and nonzero values of $\hat{P}$. Using the A group, the following results are obtained:

For the entire sample,

$$1.1 \qquad P = 1.081 + .390\hat{P} + .117\hat{P}_c,\ R^2 = .110$$
$$(.020) \quad (.014)$$

For households with $\hat{P} > 0$,

$$1.2 \qquad P = 1.327 + .351\hat{P} + .072\hat{P}_c,\ R^2 = .090$$
$$(.010) \quad (.009)$$

For households with $\hat{P} = 0$,

$$1.3 \qquad P = 1.012 + .138\hat{P}_c,\ R^2 = .031$$
$$(.016)$$

The coefficient of $\hat{P}_c$ differs in the predicted direction, being about

twice as large when $\hat{P} = 0$ than when $\hat{P} > 0$. Contingent intentions explain about 3 per cent of the variance in purchases when standard intentions are zero, compared to an incremental explained variance of around 2 per cent for households with nonzero standard intentions.

TABLE 24

SELECTED RELATIONS AMONG DURABLE GOODS BUYING INTENTIONS AND PURCHASES

	Net Regression Coefficients			
	DOLLAR SCALES			
Group A	$\hat{P}$	$\hat{P}_c$	$\hat{P}\hat{P}_c$	r^2 or R^2
$P = f(\hat{P})$	+.394[a]			.089
$P = f(\hat{P},\hat{P}_c)$	+.397[a]	+.095[a]		.101
$P = f(\hat{P},\hat{P}_c,\hat{P}\hat{P}_c)$	+.566[a]	+.155[a]	−.095[a]	.117
Group C				
$P = f(\hat{P})$	+.378[a]			.148
$P = f(\hat{P},\hat{P}_c)$	+.387[a]	+.081[a]		.152
$P = f(\hat{P},\hat{P}_c,\hat{P}\hat{P}_c)$	+.446[a]	+.128[a]	−.031[a]	.156
	DICHOTOMOUS SCALES			
Group A	$\hat{P}$	$\hat{P}_c$	$Z\hat{P}_c$[b]	r^2 or R^2
$P = f(\hat{P})$	+.243[a]			.057
$P = f(\hat{P},\hat{P}_c)$	+.233[a]	+.170[a]		.082
$P = f(\hat{P},\hat{P}_c,Z\hat{P}_c)$	+.401[a]	+.017	+.229[a]	.092
Group C				
$P = f(\hat{P})$	+.218[a]			.046
$P = f(\hat{P},\hat{P}_c)$	+.218[a]	+.055		.048
$P = f(\hat{P},\hat{P}_c,Z\hat{P}_c)$	+.230[a]	+.050	+.016	.048

SOURCE: Basic data from Consumer Purchase Study, NBER.

NOTE: The data cover only husband-wife households with the head between twenty-five and thirty-four years old. P represents durable goods purchases. In Group A, $\hat{P}$ represents definite intentions to buy within a year; $\hat{P}_c$, probable or possible intentions to buy within a year; and $N = 852$. In Group C, $\hat{P}$ represents intentions to buy within a year if income is as expected; $\hat{P}_c$, intentions to buy within a year if income is 10 to 15 per cent higher than expected; and $N = 815$. For further explanation, see accompanying text.

[a] Significantly different from zero at 0.05 level, using t test.

[b] $Z = 1$ when $\hat{P} = 0$; otherwise, $Z = 0$.

The results obtained from equations 2.0 and 3.0 are shown above. To make the test somewhat more rigorous I have stratified the sample by life-cycle status; the regressions in Table 24 are based on observations that include only husband-wife households with the head between twenty-five and thirty-four years old. Four sets of coefficients are shown. The top panel contains regression coefficients obtained by fitting equation 2.0 to the data for groups A and C; all variables (P, $\hat{P}$, and $\hat{P}_c$) are the usual weighted aggregates designed to represent dollar scales. The lower panel shows regression coefficients obtained by fitting equation 3.0 to the data

for the same groups. For these regressions the variables are scaled dichotomously; that is, P, $\hat{P}$, and $\hat{P}_c$ take on values of either zero or one depending on whether or not the household reported any standard or contingent intentions or purchased any durable good.[6] The coefficients are computed in a stepwise manner; variables are added one at a time and the regression recomputed. We can thus observe the effect on the coefficient of $\hat{P}$ of adding $\hat{P}_c$, or the effect on the coefficient of $\hat{P}_c$ of introducing interaction.

The empirical results conform rather well to theoretical expectations. Interpreting the regression coefficients in the upper panel as the probability of purchasing one unit of durables if one unit of intentions is reported, it appears that $\hat{P}$ is associated with roughly four times the probability of purchasing as $\hat{P}_c$. The coefficients of both $\hat{P}$ and $\hat{P}_c$ are highly significant net of each other, and the cross-product interaction $\hat{P}\hat{P}_c$ adds significantly to an explanation of the variance in purchases and has the predicted negative sign in both groups. Thus, the purchase probabilities associated with $\hat{P}_c$ depend on the value of $\hat{P}$, and vice versa. When $\hat{P}$ is zero the purchase probabilities associated with $\hat{P}_c$ are 0.155 and 0.128 for the A and C intentions questions, respectively. In group A, when the value of $\hat{P}$ is equal to approximately two units, the probability associated with $\hat{P}_c$ falls to zero; the coefficient of $\hat{P}_c$ for the C group falls to zero when $\hat{P}$ is about four units. The coefficients of $\hat{P}$ behave similarly, being highest when $\hat{P}_c$ is zero and gradually diminishing as $\hat{P}_c$ rises.

The regression coefficients of $\hat{P}$ and $\hat{P}_c$ in the lower panel, where the scaling is dichotomous, measure the probability of purchasing one or more durables when the respondent reports one or more intentions. In the A group the respective probabilities for $\hat{P}$ and $\hat{P}_c$ are both highly significant and not much different in size. For the C group, however, $\hat{P}_c$ appears to be almost unrelated to purchases, while $\hat{P}$ is highly significant and about the same size as in the A group. This is not surprising. Both $\hat{P}$ and $\hat{P}_c$ have relatively high cut-off probabilities (for individual commodities) in the A group. As a consequence, substantial numbers of households reported neither standard nor contingent buying intentions for any of the items, and their $\hat{P}$ and $\hat{P}_c$ are therefore zero when dichotomous scaling is used. These households are much less apt to purchase than the others. On the other hand the probability cut-off (for individual items) is very low for the $\hat{P}_c$ variant in group C, while the cut-off for the $\hat{P}$ variant in this

[6] Since regressions for group B show much the same results as those for group C, they are not shown. A measure of $\hat{P}_c$ cannot be obtained for variant D, since it contains only a high-probability intentions variable.

group is not very different from the cut-off point for the $\hat{P}_c$ variant in group A (see Chapter 3). Practically all group C households reported contingent intentions to buy at least one item, and $\hat{P}_c$ has a value of one for these households when dichotomous scaling is used. As a consequence, the dichotomous $\hat{P}_c$ variable in group C has almost no variance. Further, the behavior of households reporting some contingent buying intentions ($\hat{P}_c$) differs little from that of those reporting none, and is apt to reflect variations in the interpretation of the question rather than real differences in *ex ante* purchase probability.

The interaction term in the lower panel ($Z\hat{P}_c$, where $Z = 1$ when $\hat{P} = 0$, $Z = 0$, when $\hat{P} > 0$) is significant only for the A group, although it has the expected sign in group C as well. Before $Z\hat{P}_c$ is added to the regression in the A group, $\hat{P}_c$ appears to have as strong an association with P as does $\hat{P}$. When $Z\hat{P}_c$ is added the influence of $\hat{P}_c$ disappears almost entirely, indicating that contingent intentions are associated with purchases, net of standard intentions, only for those households that do not report standard intentions, i.e., with $\hat{P} = 0$. The inclusion of $Z\hat{P}_c$ also causes a substantial increase in the coefficient of $\hat{P}$, suggesting that the net effect of $\hat{P}$ on P will be underestimated unless account can be taken of the differential influence of $\hat{P}_c$ on P.

On the whole, the results provide support at the aggregate level for several of the propositions advanced earlier. The regression coefficients for both standard ($\hat{P}$) and contingent ($\hat{P}_c$) intentions to buy all behave in accord with the probability model. The coefficients of the $\hat{P}$ and $\hat{P}_c$ variables are higher in group A than in group C, and the coefficient of $\hat{P}$ is substantially higher than that of $\hat{P}_c$ within both groups. There is convincing evidence that the probability scale represented by the $\hat{P}$ variable is noticeably improved by the refinement embodied in $\hat{P}_c$, since $\hat{P}_c$ makes a highly significant contribution to the explanation of purchases provided by standard intentions to buy. Further, there is strong evidence that the usefulness of this refinement varies with the value of $\hat{P}$; $\hat{P}_c$ is of maximum usefulness when $\hat{P}$ is zero, becoming less important as $\hat{P}$ increases. The common-sense interpretation of these results is as follows: We can tell quite a bit about differences in the dollar amount of actual purchases among households from data on the dollar amount of prospective purchases. Ability to predict differences in purchases is enhanced if the dollar amount of contingent prospective purchases is also known, but it is enhanced much more for households that reported "none" for the standard intentions category. The basic reason appears to be variation among households in the probabilities implicitly attached to survey questions about buying

intentions. Such variation will mean that households reporting "none" when asked about their intentions to buy, that is, households classed as nonintenders, comprise two quite different groups of people. On the one hand, there are those with the "average" interpretation of the intentions question and a relatively low probability of purchase. On the other hand, there are those who have a relatively high probability of purchase but assign an even higher cut-off probability to the intentions question. As a consequence, there is a relatively large variance in actual (but unobserved) purchase probabilities for those reporting zero standard intentions, and these probabilities are apparently correlated with responses to questions about more contingent or less certain future purchases.

Intentions as a Proxy for Other Variables

It is clear enough from these data that aggregate buying intentions are very strongly associated with aggregate purchases. It does not necessarily follow, however, that intentions help to explain differences in purchase behavior among households after allowing for the influence of common factors. Variables such as family income, stage of the life-cycle, expectations and attitudes, etc., are related to both durable goods purchases and to durable goods buying intentions. The aggregate relationship observed above may therefore be a consequence of the fact that young-married, optimistic, or high-income consumers buy relatively many durable goods and report relatively many buying intentions. If so, the appropriate predictor of purchases is not buying intentions but some combination of family income, stage of the life cycle, degree of optimism, etc.

Similarly, it is possible that the aggregate intentions-purchases correlation is dominated by the close association between automobile-buying intentions and automobile purchases, or by the close association between house-buying intentions and housing purchases. Automobile intentions and purchases comprise roughly half the weighted aggregate value of durable goods intentions and purchases. And while the above measures of aggregate intentions and purchases do not include houses, intentions and purchases for household durables like refrigerators, dishwashers, furniture, etc., are known to be closely related to house-buying intentions and housing purchases. Thus it is necessary to find out whether the strong aggregate correlations observed above represent real phenomena or simply reflect factors that exert a common influence on both purchases and buying intentions.

TABLE 25

WEIGHTED AVERAGE NUMBER OF BUYING INTENTIONS AND PURCHASES WITHIN INCOME AND LIFE-CYCLE CLASSES

	HUSBAND-WIFE HOUSEHOLDS WITH HEAD							
	Under 35		*35–44*		*45–64*		*Over 65*	
INCOME CLASS	Buying Intentions	Purchases	Buying Intentions	Purchases	Buying Intentions	Purchases	Buying Intentions	Purchases
			SAMPLE B					
Under $5,000	0.95	1.52	0.67[a]	1.16[a]	0.86[a]	1.16[a]		
$5,000–$9,999	1.03	1.59	0.90	1.42	0.80	1.33	0.51[a]	0.86[a]
$10,000 or more	1.39	2.16	1.34	2.02	1.33	1.98		
			SAMPLE C					
Under $5,000	1.80	1.57	1.47[a]	1.00[a]	1.24[a]	1.26[a]		
$5,000–$9,999	1.89	1.60	1.81	1.38	1.48	1.34	1.52[a]	1.21[a]
$10,000 or more	2.74	2.26	2.56	2.02	2.51	1.96		

SOURCE: Basic data from Consumer Purchase Study, NBER.

[a] Less than 100 households in cell.

INCOME AND LIFE-CYCLE STATUS

In Table 25 I present mean (aggregate) purchases and buying intentions for two of the variant groups within several income (Y) and life-cycle (L) classes. Since the data show that intentions and purchases are similarly related to both variables, the high $P,\hat{P}$ correlations observed may be due wholly or mainly to the common influence of Y and/or L.

The most conclusive test would involve fitting the data to the following equation:

$$4.0 \qquad P = b_0 + b_1\hat{P} + b_2Y + b_3L + b_4(Y,L) + u$$

where P = aggregate purchases of durables
$\hat{P}$ = aggregate intentions to buy durables
Y = family income
L = family life-cycle status
Y,L = interactions between Y and L

If the coefficient of $\hat{P}$ were to become statistically nonsignificant when Y and L were held constant, it would be concluded that the observed simple correlation between P and $\hat{P}$ was due wholly to the common influence of Y and L. This test cannot be used, because the data for family income or life-cycle status are available only in class intervals; that is, it is known only whether family income is between, say, $5,000 and $7,500 per year, or whether the household head is between twenty-five and thirty years of age. Given this limitation, the best available test consists of a comparison

of the proportion of total within-class variance in purchases that is explained by buying intentions with the proportion that might conceivably be explained by a combination of family income and life-cycle status. The first proportion can be computed directly; the second can be approximated if we can estimate (1) the true slope of the within-class regressions between P and both Y and L and (2) the true within-class variance of P, Y, and L. I designate b_{yp} and b_{ap} as the slopes of the regressions between (Y,P) and (L,P) respectively; M_{yy}, M_{aa}, and M_{pp} as the variances of income, life cycle, and purchases, respectively; and M_{yp}, M_{ap}, etc., as the respective covariances. The within-class correlations between purchases and income (r_{yp}) and between purchases and life-cycle status (r_{ap}) can be written

$$r_{yp} = \sqrt{\frac{M^2_{yp}}{M_{yy}M_{pp}}}$$

$$r_{ap} = \sqrt{\frac{M^2_{ap}}{M_{aa}M_{pp}}}$$

Since $M_{yp} = M_{yy}b_{yp}$, and $M_{ap} = M_{aa}b_{ap}$, it follows that

$$r_{yp} = \sqrt{\frac{M_{yy}b^2_{yp}}{M_{pp}}}$$

and

$$r_{ap} = \sqrt{\frac{M_{aa}b^2_{ap}}{M_{pp}}}$$

Thus it is necessary to estimate M_{pp}, M_{yy}, M_{aa}, b_{yp}, and b_{ap}. The required variances cannot be computed directly from the data (except for M_{pp}), since only class intervals are available; but they can readily be estimated if it can be assumed that the within-class distribution of Y and L is rectangular.[7] From the proportions of households in the various income and life-cycle classes, I judge that the distribution of both Y and L is approximately rectangular for the group of husband-wife households with the head between thirty-five and forty-five years of age and with family income between $5,000 and $10,000 per year. The slopes of the Y,P and L,P regressions within this class can be fairly well approximated from data on average purchases by households in this and the two adjacent classifications.[8]

Let us err on the side of caution and accept relatively high estimates for the within-class slopes; for b_{yp} let us accept 0.0001 as the true slope; and

[7] A rectangular distribution simply implies that observations are spaced equally between the beginning and end points of the class; hence the mean is the class midpoint, and the variance depends on the width of the class interval.

[8] Table 25 shows that the average purchases of households in the three income classes

for b_{ap}, 0.020. Using values for M_{pp} calculated directly from the data and estimating M_{yy} and M_{aa} on the basis of an assumed rectangular distribution within the specified group, I calculate that family income cannot explain more than 0.6 per cent of the within-class variance in purchases; a similar computation indicates that life-cycle status (age, in this case) cannot explain more than 0.1 per cent of the within-class variance in purchases. These estimates of maximum explained variance in P attributable to Y and L are almost precisely the same for samples B and C, since the computed variance in purchases (the only possible source of difference, given the procedure) is almost identical (3.46 compared to 3.49). On the other hand, buying intentions explain almost 14 per cent of the variance in purchases for the relevant B sample, over 18 per cent for the relevant C sample. Hence, I conclude that the strong correlations observed between buying intentions and purchases cannot be due to the joint influence of Y or L on both, since the maximum proportion of the variance in purchases explained by the combined influence of Y and L cannot begin to account for the proportion of variance explained by intentions to buy. This conclusion would not be altered if similar computations were performed on groups of households in other income or life-cycle classes, or if all income and life-cycle classes had been combined so that the variance of Y and L took on its maximum value (see below, Chapter 7).[9]

INTENTIONS TO BUY HOUSES OR AUTOMOBILES

One further explanation of the close relation observed between aggregate buying intentions and aggregate purchases requires examination. It is

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indicated are as follows:

	Class 1: Under $5,000	*Class 2: $5,000–$9,999*	*Class 3: $10,000 and Over*
Sample B	1.16	1.42	2.02
Sample C	1.00	1.38	2.02

If the mean incomes for households within these three classes are, respectively, $3,750, $7,500, and $15,000, the slope of the income-purchases regression between income classes 1 and 2 in sample B would be 1.42 − 1.16 ÷ $7,500 − $3,750, or 0.26 ÷ 3,750, or roughly 0.00006; the regression slope would be 1.38 − 1.00 ÷ $7,500 − $3,750, or roughly 0.00010 for sample C. A similar computation indicates that the income-purchases regression would have a slope of roughly 0.00008 between income classes 2 and 3 in both samples. If the regression slope *within* income class 2 is the same as these between-class slopes, I would estimate the within-class slope as roughly 0.00008. A comparable procedure would yield estimates of the within-class slope for the age-purchases regression.

[9] The extent of the difference in variance explained by Y,L and buying intentions would not generally be as great, because the proportion of variance explained by

possible that the aggregate $P,\hat{P}$ relation is dominated either by the relation between intentions to buy and actual purchases of automobiles, or between intentions to buy and actual purchases of housing. Automobiles are a significant part of the aggregates for both intentions and purchases, amounting to roughly half of each. It would not be surprising if survey questions about intentions (or purchase probability) were much more accurate predictors of spending behavior for relatively high-unit-cost commodities than for others. If so, the intentions-purchases relationship would be appreciably less close for durables other than automobiles, since the observed aggregate relationship would be dominated by the automobile component.[10] Similarly, it may be that the relationship between aggregate intentions to buy and aggregate purchases of household durables comes about wholly or in part because people planning to buy (and buying) houses report relatively many intentions and make relatively many purchases. If so, the appropriate predictor is not durable goods buying intentions but house buying intentions.

These possibilities are easily tested by stratification. The sample was split by three alternative criteria: (1) a household either reports intentions to buy an automobile or does not; (2) a household either reports intentions to buy some household durable or does not; (3) a household either reports intentions to buy a house or does not. Aggregate intentions and purchases ($\hat{P},P$) were divided into intentions and purchases with respect to all household durables ($\hat{P}_h,P_h$) and to automobiles ($\hat{P}_a,P_a$). The following correlations were then computed for the indicated classification:

Intend to buy a car:

5.1 $$P_h = b_0 + b_1\hat{P}_h$$

5.2 $$P_a = b_0 + b_1\hat{P}_a$$

5.3 $$P = b_0 + b_1\hat{P}$$

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intentions is typically lower in other groups than in the two examined above. Using the classifications of Table 25, there are ten income-life-cycle groups in both the B and C samples. The distribution of these twenty groups, by proportion of variance in purchases explained by intentions to buy, is as follows:

Proportion of M_{pp} explained by $\hat{P}$ (per cent)	0–4.9	5–9.9	10–14.9	15 and over	Total
Number of groups in each class	4	6	7	3	20

Further, as noted above, the variance attributable to Y and/or L would be somewhat higher if the analysis had been carried out on all income and life-cycle classes combined.

[10] There is some evidence that buying intentions do not improve time series predictions of household durables, although they do improve predictions for automobiles (see Arthur Okun, "The Value of Anticipations Data in Forecasting National Product," *The Quality and Economic Significance of Anticipations Data*, Princeton for NBER, 1960).

Do not intend to buy a car:

5.4 $$P_h = b_0 + b_1\hat{P}_h$$

5.5 $$P_a = b_0 + b_1\hat{P}_a$$

5.6 $$P = b_0 + b_1\hat{P}$$

Continuing, there are six similar correlations, 6.1–6.6, for those intending (not intending) to buy some household durable; six more, 7.1–7.6, for those intending (not intending) to buy a house; and three, 8.1–8.3, for the entire sample.

TABLE 26

RELATIONSHIPS BETWEEN BUYING INTENTIONS AND PURCHASES OF HOUSEHOLD DURABLES AND OF AUTOMOBILES

Subgroup	Sample Size	*Square of Correlation Coefficient Relating Intentions to Buy and Purchases of* Household Durables[a]	Automobiles[b]	Total Durables[c]
Intend to buy auto	382	.094	.082	.064
Do not intend to buy auto	3,216	.122	[d]	.040
Intend to buy some household durable	1,391	.101	.102	.087
Do not intend to buy any household durable	2,207	[d]	.105	.079
Intend to buy house	260	.128	.120	.108
Do not intend to buy house	3,338	.088	.101	.085
Entire sample	3,598	.118	.102	.094

SOURCE: Basic data from Consumer Purchase Study, NBER.

NOTE: The respondents are those in group B, intentions question B_1 (see Chapter 2). All regression coefficients are more than three times their standard errors.

[a] The regression equation is: $P_h = a + b\hat{P}_h$.

[b] The regression equation is: $P_a = a + b\hat{P}_a$.

[c] The regression equation is: $P = a + b\hat{P}$.

[d] Correlation coefficient necessarily zero because the independent variable (intentions to buy) is zero for all households.

If the durables of very large unit cost (autos and housing) have a dominant influence on the aggregate $P,\hat{P}$ relationship, equations 5.1 and 5.4 ought to have significantly lower correlations than 6.2 and 6.5; 7.4 ought to have a significantly lower correlation than either 7.1, 7.2, or 7.5; and 8.1, a significantly lower correlation than 8.2. In sum:

$$r_{5.1},\ r_{5.4} < r_{6.2},\ r_{6.5}$$

$$r_{7.4} < r_{7.1},\ r_{7.2},\ r_{7.5}$$

$$r_{8.1} < r_{8.2}$$

Table 26 tabulates the relevant correlation and regression coefficients.

These data give scant indication that the aggregate $P,\hat{P}$ correlation is attributable to the indirect influence of either automobile or housing

intentions and purchases. The correlation between P_h and $\hat{P}_h$ is just as strong as that between P_a and $\hat{P}_a$, and it makes no appreciable difference to either correlation whether the household intended to purchase only household durables, only an automobile, or both. The $P,\hat{P}$ correlations seem somewhat stronger for *both* household durables and autos if the household also reported plans to buy a house, but the differences are well within the limits of sampling variability. In terms of the set of tests specified above, the predicted differences show up in direction more than half the time, but they are not very large and none are statistically significant. I conclude that there is no evidence to suggest that the observed relation between aggregate buying intentions and aggregate purchases is due either to the direct or indirect dominance of the aggregates by durables of relatively large unit cost.

Some Analytical Considerations

These results confirm the explanatory power of the buying-intentions variable in an incontrovertible manner. Why should buying intentions be so much more strongly associated with purchases than are variables such as income and life-cycle stage? To get at the answer to this question, consider the nature of the buying intentions variable compared to other variables that are associated with household behavior; also, consider the nature of the cross-section data used to discover, verify, or quantify these relationships.

The factors customarily used to explain household behavior are essentially designed to explain average or aggregate behavior. For example, no one would expect that *all* households with annual incomes between $4,000 and $5,000 will buy fewer durable goods than *all* households with annual incomes between $10,000 and $15,000. Similarly, not every household in the "low average purchase" category of variables such as life cycle, assets, debts, age and condition of the stock of durables, expected income, etc., is expected to buy less than every household in the "high average purchase" category. Yet for reasons having to do with utility maximization, average purchases for a sample of households are expected to be strongly related to variables like these.

One of the reasons for expecting systematic patterns in average behavior but considerable variation among individuals is that most of the variables relevant to individual behavior are not ordinarily measured. One household will buy because, given its structure of wants, an income increase permits it to carry a greater debt-repayment burden, and it has recourse to temporary financial help if the payment becomes burdensome.

Another, with an identical want structure, may not buy if income were to rise because it deems the increase too uncertain and regards the use of temporary financial assistance in the event of trouble as undesirable. A third with the same want structure and an income increase will not buy because it hopes to receive the item from a close friend or relative when the latter redecorates—and so on, ad infinitum.

The number of possible combinations of factors and interactions among factors that add up to a given probability of purchasing X during the next Y months is obviously very great. Probably one could, in principle, measure and analyze all or most of these factors, but surely everyone would agree that such a goal is not now in sight and may never be reached or even approximated. Further, explanation of all these idiosyncratic combinations is not necessary for accurate predictions of aggregate behavior. But a survey of intentions to buy goes a long way toward isolating precisely those combinations of specific circumstances that result in the vast variety of causal relationships underlying individual purchase decisions. For this reason buying intentions are an extremely powerful tool for the analysis of differences in purchases among households.

Buying intentions are, indeed, a rather unusual variable in the empirical analysis of purchases. The object of such analysis is to quantify the influence of variables that are significantly associated with purchases, so that movements in these variables may be used to predict changes in purchases. Income, income prospects, age, stock of durables, etc., can be said to reflect either present or prospective ability to pay for durable goods or the structure of preferences for them. But buying intentions surely measure (directly) neither ability nor need, now or in the future. Rather, they reflect each household's judgment about the probability of purchase in the near future, given the weight attached by the household to ability to pay now and in the future along with need now and in the future. Thus, buying intentions obviously encompass factors that have already entered the household's own calculating apparatus.

It thus seems plausible that intentions to buy would contribute substantially to an explanation of purchases in the analysis of cross-section data. What is not so clear, perhaps, is why anything *else* contributes, given the above interpretation.[11] The explanation lies partly in the

[11] It is obvious, of course, that variables reflecting unforeseen alterations in household circumstances should contribute substantially to the explanation of purchases. (See Okun, "Forecasting National Product"; and Juster, *Consumer Expectations;* Juster, "Prediction and Consumer Buying Intentions," *American Economic Review*, May 1960; Juster, "The Predictive Value of Consumers Union Spending-Intentions Data," *The Quality and Economic Significance of Anticipations Data.*

variation in subjective probability among households that report that they intend or do not intend to purchase during some specified period, as discussed earlier. It seems self-evident that the cut-off probability attached to such a statement varies from respondent to respondent, although practically nothing is known empirically about this problem. Moreover, some households must give impressionistic responses that are essentially unrelated to reality. Others may attach no operational meaning to words like "plan" or "intend" and simply report no intentions regardless of circumstances. It follows that variables like income, assets, age, etc., will show some relationship to purchases for the sample as a whole, net of buying intentions, because subjective purchase probability is not measured with enough precision by the intentions question.

Let us suppose that the above analysis is correct, and that intentions to buy show a strong empirical relation to subsequent purchases (in cross sections) because they isolate sets of favorable or unfavorable circumstances that are essentially idiosyncratic to individual households. It follows that intentions may not be as useful, in a relative sense, for predicting changes over time as in predicting differences among households at the same point in time.[12] Further, buying intentions may be useful for time series predictions largely because they not only measure the influence of factors specific to individual households, but also reflect the impact of factors or combinations of factors that affect many households in the same way at the same time. Wholly idiosyncratic circumstances are randomly distributed among the population at every point in time; the buying intentions that reflect these circumstances would thus be invariant over time. Therefore, some proportion—perhaps a substantial one—of the cross-section variance explained by intentions to buy probably reflects the influence of factors that are uninteresting if one is concerned with time series predictions.

[12] Buying intentions may still be the most important single variable for analyzing time series changes. But its advantages over alternative variables would not be so great as it seems to be in the cross-section data.