The interpretation of individual variables is straightforward. The coefficients provide information on direction and relative strength of effect. The positive coefficient for number of adult household members indicates that the likelihood of purchasing an imported automobile increases with the number of adults. Dummy variables are interpreted by comparing the coefficient to the value of the omitted category, which is zero by definition. For example, the negative coefficient reported for households headed by individuals who had not graduated from high school indicates they are less likely to purchase imported cars than households headed by high school graduates.

Using all observations in the sample, a 36.6% probability of purchasing an imported automobile was observed for households purchasing new small cars. In order to observe the magnitude of the effect of changes in independent variables on the purchase probability, a representative household was selected. The characteristics of this "representative unit" reflected average or most frequent values for the sample as a whole. Thus, the unit was headed by a high school graduate, and disposed only of domestic stock automobiles in the survey year. The results of probability calculations are reported in Table 2.

TABLE 2. Selected Probability Calculations

Household Type	Probability
Full Sample	.366
Representative Household	.367
Changes to Representative Household:	
Number of adults increased by one	.476
Not a high school graduate	.216
Education beyond high school	.482
Did not dispose of vehicle	.545
Disposed of foreign stock	.920
Disposed of mixed stock	.749

For the representative household, the probability of purchasing an imported rather than domestic small automobile equaled 36.7%. As the number of adult family members is increased by one, the import car purchase probability increased to 47.6%. The import car purchase probability dropped to 21.6% when the household was headed by an individual who had not graduated from high school, and it increased to 48.2% when the household head had education beyond high school. Compared to households disposing of domestic automobile stock, households disposing of imported stock had a much greater import car purchase probability of 92%. Households disposing of mixed automobile stock, and those not disposing of stock also had increased purchase probabilities compared to the representative household.

In conclusion, logit analysis is a useful technique for estimating models containing qualitative or discrete dependent variables. It avoids many of the problems that arise when regression is used. In addition, many of the statistical tests discussed in this paper are similar in concept to those employed in multiple regression analysis.

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MULTINOMIAL LOGIT ANALYSIS

Thesia I. Garner, University of Maryland[1]

ABSTRACT

Multinomial logit analysis is a statistical technique which is used to analyze how a series of explanatory variables influences the underlying probability of an event or choice. For this analysis the dependent variable is discrete and represents more than two unordered alternatives. A multinomial logit model, statistical tests used to evaluate the results of the estimation, and an example are presented.

INTRODUCTION

In recent years there has been a growing interest in the use of qualitative response (QR) models applied to economics. Two factors are related to this recent upsurge in the use of these statistical models. First, many variables examined by economists are either naturally discrete or are recorded discretely such as working or not working. Second, the use of QR models is related to an increased emphasis on the analysis of survey data (1). Many of the responses from survey data are qualitative, e.g., one either buys or does not buy an automobile, or one either votes yes or no in an election. In QR models, also known as quantal, categorical, or discrete models, the dependent or endogenous variables take only discrete values. The main objective in applying QR models is to analyze how a series of explanatory variables influences the underlying probability of a given event or choice. A multinomial model is estimated when the dependent variable represents more than two discrete choices. In this paper a multinomial logit model for unordered alternatives is discussed.

MULTINOMIAL LOGIT MODEL

Multinomial logit estimation is used when the dependent variable represents more than two alternatives and the ordering of the alternatives has no meaning. In addition, the explanatory variables are the characteristics of the individuals selecting the alternatives (5; 10). This is in contrast to the conditional multinomial logit model in which the attributes of the alternatives are also included as determinants of choice probabilities (9). If the objective of the researcher is to relate the characteristics of the individuals to the probabilities of selecting alternatives, then the multinomial logit model is the more appropriate model to use.

[1]Graduate Student, Department of Textiles and Consumer Economics; and Economist, Division of Price and Index Number Research, Bureau of Labor Statistics, Department of Labor, Washington, D. C.

The multinomial logit model provides a means for estimating the probability that an individual will be in one of G mutually exclusive groups given the characteristics of the individual (X_i). The multinomial logit model is specified as follows (2; 11):

$$P_{ih} = \frac{e^{X_i B_h}}{\sum_{g=1}^{G} e^{X_i B_g}} \qquad (1)$$

where

P_{ih} = probability that the i^{th} individual will be in group h,

i = individual observation from the sample of N observations, i=1,...,N,

h = one specific group from among all the groups, h=1,...,G,

X_i = vector of characteristics or explanatory variables relating to the i^{th} individual,

B_h = vector of coefficients for the h^{th} group,

g = value representing each group, g=1,...,G, and

B_g = vector of coefficients for the g=1,...,G.

The X_i's are considered to be observations on nonstochastic variables which are independent of each other. The error terms implicit in the model follow the Weibull probability distribution and are assumed to be independent. Because of the independence assumption, only binary comparisons are involved in the model (7).

Since the probabilities over all alternatives must sum to one, and one of the alternatives must be selected, only (G-1) sets of coefficients B_g are uniquely defined. Thus, normalization is needed. For example, in the case of three mutually exclusive groups, the function can be constrained for the normalization such that $B_1=0$, hence $X_iB_1=0$ for all observations. Two vectors of coefficients are then estimated representing alternatives two and three from the sample of N observations. With three possible outcomes, the following functional forms are estimated:

$$\log(P_2/P_1) = X_i B_2 \qquad (2)$$

$$\log(P_3/P_1) = X_i B_3. \qquad (3)$$

The equations for other comparisons can be derived from equations two and three since

$$\log(P_3/P_2) = \log(P_3/P_1) - \log(P_2/P_1). \quad (4)$$

$$\text{Thus, } \log(P_3/P_2) = X_i(B_3 - B_2). \quad (5)$$

The odds ratio P_2/P_1, P_3/P_1, and P_3/P_2 represent the odds that h=2 rather than h=1, h=3 rather than h=1, and h=3 rather than h=2 respectively. The multinomial logistic model expresses the conditional log of the odds as a linear function of the explanatory variables.

Since the logit equation is non-linear in the coefficients, maximum likelihood estimation (ML) is frequently the preferred statistical technique used to estimate the logit coefficients. This technique ensures that a unique maximum always exists for the logit model (12). In cross-sectional analysis observations are usually obtained independently; therefore, the likelihood of obtaining the given sample is obtained from the product of the probabilities of the individual observations having the outcomes (5). The maximum likelihood estimates are the coefficients which would generate the observed set of data most often. The general approach most frequently used in ML is to maximize the log of the likelihood function instead of the likelihood function itself. The log likelihood (log L) of the model is specified as:

$$\log L = \sum_{i=1}^{N} X_i B_{h(i)} - \sum_{i=1}^{N} \log\left(\sum_{g=1}^{G} e^{X_i B_g} \right) \quad (6)$$

where

h(i) = choice (value of the dependent variable) of the i^{th} individual, and

the other terms are previously defined.

Maximum likelihood estimates are consistent, asymptotically efficient and normally distributed (14). Although ML relies upon large sample properties (due to its asymptotic property), the estimators have been found to maintain their desirable properties when applied to small samples. Thus the results can be used to construct confidence intervals and tests of hypotheses (5; 7).

STATISTICAL TESTS

Several statistical tests can be used to evaluate the results of logit estimations. First, the likelihood ratio statistic is used to test the significance over all the coefficients in the logit model. The statistic is analogous to the F-test in regression. The test statistic is

$$\chi^2 = -2(\log \text{Likelihood}_R - \log \text{Likelihood}_U). \quad (7)$$

The statistic is asymptotically chi-square distributed with the degrees of freedom equal to the number of coefficients set equal to zero. The log likelihood function for the restricted model, represented by R, is obtained when the function is maximized with respect to the intercept only. The log likelihood of the unrestricted model, U, is obtained when the function is maximized with respect to all the coefficient estimates corresponding to the intercept and all explanatory variables. If the calculated chi-square value is greater than the table value at the α significance level, the null hypothesis that the coefficients being tested are equal to zero is rejected (6; 12).

Second, the likelihood ratio index (ρ^2) is a measure of goodness-of-fit for the logit model which is analogous to the R^2 goodness-of-fit statistic in linear regression analysis. The index is a measure of how well the model approximates the observed data. The statistic is calculated as (6; 13):

$$\rho^2 = 1 - \frac{\log \text{Likelihood}_U}{\log \text{Likelihood}_R} . \quad (8)$$

The larger the log likelihood of the unrestricted model compared to the log likelihood of the restricted model, the greater the explanatory power of the independent variables. Values of ρ^2 between 0.2 and 0.4 are considered extremely good fits (6).

Third, asymptotic t-tests are used to determine the significance of individual coefficients. The test statistic is calculated as the ratio of the estimated coefficient to its asymptotic standard error. The degrees of freedom are equal to the number of observations in the sample minus the number of coefficient estimates in the equation. If the calculated t-value is greater than the table value with the specified degrees of freedom, then the null hypothesis that the coefficient is equal to zero is rejected.

Fourth, the existence of two coefficients for each variable in the case of multinomial logit analysis means that the combined significance of the two coefficients estimated for each variable can be tested. The likelihood ratio statistic is again used. The log likelihood function for the restricted model is obtained when the function is maximized with respect to all the variables except the one being examined. Under the null hypothesis the variable has no effect on the relative probabilities. The likelihood ratio statistic is asymptotically chi-square distributed with two degrees of freedom.

Fifth, the likelihood ratio statistic is also used to test the value of subsets of explanatory variables. The restricted model includes all variables except those under investigation. The null hypothesis is that the subset of variables has no effect on the probabilities and should be excluded from the model. The degrees of freedom are equal to the number of coefficients set equal to zero.

Finally, an additional test statistic can be used to determine whether the multinomial logit model specified is superior to a binomial logit model. For this test the multiple alternatives are regrouped into two alternatives, then a binomial logit model is estimated. The log likelihood value from the binomial estimation is then adjusted to account for the constraint that the coefficients for the groups included in the same alter-

native are equal for each explanatory variable (excepting the intercepts). In the work status example which follows, the null hypothesis was that the choice between being retired and not working/not retired was random. The adjusted log likelihood value (L_A) was calculated as follows for the work status model (4):

$$L_A = L_B + n_R(\log n_R) + n_{NW}(\log n_{NW}) - (n_R + n_{NW})\log(n_R + n_{NW}) \quad (9)$$

where

L_A = adjusted log likelihood value based on the constrained three-way model,

L_B = binomial log likelihood value with only two alternatives: working and non-working (the combined retired and not working/not retired alternative),

n_R = number of individuals retired, and

n_{NW} = number of individuals not working/not retired.

The adjustment to the binomial log likelihood value is necessary in order to compare the constrained model based on the binomial specification to the unconstrained multinomial logit mode. The likelihood ratio statistic is

$$\chi^2 = -2\ (\log \text{Likelihood}_A - \log \text{Likelihood}_U). \quad (10)$$

The log likelihood_A (L_A) is the value obtained when the binomial value is adjusted. The number of degrees of freedom are equal to the number of coefficients set equal to zero. If the calculated chi-square value is greater than the table value at the α significance level, the null hypothesis that there is no difference between the binomial and multinomial logit estimations of work status is rejected.

EXAMPLE OF MULTINOMIAL LOGIT ANALYSIS

Multinomial logit analysis was used to examine the relationship between selected socio-demographic characteristics of an individual and his work status (3). The analysis examined the probability of an individual being retired (P_R) as opposed to working (P_W), and the probability of an individual not working/not retired (P_{NW}) as opposed to working. Estimated coefficients, asymptotic standard errors, and tests of significance are presented in Table 1 for four of the original twenty variables included in the model. The coefficient values in column one measure the influence of each variable on the log (P_R/P_W), i.e., the log odds of individuals being retired as opposed to working. Likewise, column three contains the coefficients which measure the impact of each variable on the log (P_{NW}/P_W).

The relationship between the independent variables and the probability of selecting one alternative as opposed to another (e.g., h=R rather than h=W, or h=NW rather than h=W) is investigated by examining the signs of the coefficients. When only dummy variables are included in the logit

TABLE 1. Estimated Coefficients of Work Status Model (n=245).

Selected Variable	log (P_R/P_W) Coefficient 1	log (P_R/P_W) A.S.E.[a] 2	log (P_{NW}/P_W) Coefficient 3	log (P_{NW}/P_W) A.S.E.[a] 4	Chi-Square Statistic[b] 5
Sex (male)					
Female	-1.526*	0.453	-0.804**	0.457	12.282*
Age (55 years and over)					
Less than 35 years	-1.648**	0.931	1.795*	0.775	23.210*
35-44 years	-1.405*	0.612	0.135	0.616	3.482*
45-54 years	-0.808	0.553	0.048	0.614	3.482
Likelihood Ratio Statistic	167.85* > 55.759 all parameters ≠ 0				
Likelihood Ratio Index	0.317				

[a] Asymptotic Standard Error.
[b] Values are for the statistic measuring the combined significance of the two coefficients in that row. Under the null hypothesis each statistic is asymptotically chi-square with 2 degrees of freedom.
* Statistically significant at the 0.05 level.
** Statistically significant at the 0.10 level.

analysis, the signs of the coefficients are interpreted with reference to the omitted category which has a coefficient of zero by definition. A positive coefficient means that an individual with the associated characteristic would be more likely to select the alternative than an individual in the reference group. Unlike regression analysis, the absolute values of the coefficients cannot be compared in logit analysis. It is the relative values that are compared (8).

The likelihood ratio statistic (167.85) indicates that the explanatory variables selected for the model were significant in explaining the relative work status probabilities. The result of the likelihood ratio index indicates that the work status model approximates the observed data extremely well with an index value of 0.317.

Both sex coefficients were negative and were statistically significant based on the results of the asymptotic t-tests. Also, as noted in column five, results of the chi-square test of both sex coefficients proved to be significant. Females were less likely than males to be retired or not working/not retired as opposed to working.

The impact of sex or any other variable on the probability of belonging to a specific work status group was also ascertained by comparing the coefficients in columns one and three. For example

$$\log(P_R/P_{NW}) = \log(P_R/P_W) - \log(P_{NW}/P_W) = X_i(B_R - B_{NW}) \quad (11)$$

where P_R, P_{NW}, and P_W represent the probabilities of being retired, not working/not retired, and working respectively. Thus the estimated coefficients can be subtracted to determine the effect of a variable on the log odds of being retired as opposed to not working/not retired. A comparison of coefficients indicated that females were less likely than males to be retired as opposed to not working/not retired.

Based on the results of the asymptotic t-tests, the relationship between age and the relative work status probabilities indicates that individuals

in the two younger age groups (less than 35 and 35-44) were significantly less likely to be retired as opposed to working than individuals aged 55 and over. The difference between the coefficients in columns one and three also reveals that patients in the youngest age group (less than 35) were less likely to be retired as opposed to not working/not retired than those in the oldest age group (55 and over). The contribution of the set of variables representing age was investigated using the likelihood ratio statistic. The resulting chi-square value of 28.1 with six degrees of freedom was significant at the 0.05 level. Although some of the individual age coefficients were not significant as shown in Table 1, the combined effect of age was significantly related to the relative work status probabilities.

To determine whether the retired and not working/not retired groups could be combined in a non-working alternative one additional test was undertaken. This involved re-estimating the model with the constraint that the coefficients in columns one and three (Table 1) were equal to each other for each explanatory variable (excepting the intercepts). A binomial logit model was estimated with only two alternatives, working and non-working. The binomial value was adjusted to account for the three-way constraint in order to compare the log likelihood values of the binomial and multinomial logit estimations. The resulting chi-square value was 57.89 with 20 degrees of freedom. Thus the null hypothesis that the ratio (P_R/P_{NW}) was a constant and that the explanatory variables only affect the probability of working was rejected at the 0.01 significance level. Therefore, the multinomial model is superior to a binomial model in explaining work status.

A final procedure to evaluate the results of the logit estimation is to calculate the work status probabilities at different levels of the explanatory variables and to note the resulting variations in the probability values. First, estimated coefficients are multiplied by the values representing the characteristics of some 'representative individual'. Next the values of selected variables are altered to determine the change in the probabilities. For this example the 'representative individual' was assumed to be a male aged 35-44. The predicted probability that the 'representative individual' is currently working is 0.275. He is most likely to be not working/not retired (0.490) and is least likely to be retired (0.235). Compared to males with the same representative characteristics, females are nearly twice as likely to work. In addition, females are less likely to be retired (0.094 compared to 0.235). Individuals aged 34 or less have a work probability of 0.091 compared to the representative individual. As age increases from 35-44 years to 55 years of age or over, the probability of being retired increases from 0.235 to 0.577.

In conclusion, multinomial logit analysis is a valuable technique for analyzing factors influencing the probability of a given event or choice. This technique can be used when the dependent variable represents more than two discrete alternatives which are unordered. Logit analysis avoids problems associated with the use of ordinary least squares (OLS) analysis when probability relationships are estimated. These problems include the heteroskedastic nature of the error term which will lead to inefficient parameter estimates, and an OLS regression line that is not necessarily confined to the zero to one interval of the probabilities. In addition, since the dependent variable in a QR model has a restricted range, the OLS assumption of a normally distributed error is violated. Thus, the usual tests of significance do not apply.

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PROBIT AND TOBIT ANALYSIS IN CONSUMER RESEARCH

Jean Kinsey, University of Minnesota[1]

ABSTRACT

Probit analysis is a statistically tractable regression technique when the dependent variable is an all or nothing choice. Tobit analysis is an appropriate regression technique when the data on the dependent variable are continuous but truncated. This paper outlines each of these models and reviews consumer research questions where each is appropriate.

Research questions about consumer behavior or about the effects of consumer policy often involve an explanation of discrete choices or the prediction of a probability. When the possible choices to be explained have only a few discrete alternatives, the data is said to have a discontinuous, qualitative, or limited dependent variable. For example, one may want to explain the probability of a consumer filing a complaint or going bankrupt or returning to college. In a given time period people either do these things or they do not. In the case of going back to college there may exist a choice of going to three or four different types of colleges but going to one generally precludes going to another.

Probit and logit analysis are statistically tractable regression techniques designed to estimate the probability of a particular choice given observable characteristics of the alternatives and attributes of the decision makers. The basic probit technique was discussed as early as 1860 by psychophysicists and was used by biologists throughout the early part of the century to estimate the probability that various life forms would respond to different levels of stimuli [8, pp. 39-41]. Modern statistical techniques for estimating probit began in the early 1930's with two biologists, J. H. Gaddum and C. I. Bliss [8, p. 41]. Economists and other social scientists adopted the probit method in the 1950's; by now it is considered a standard technique. Whether one chooses probit or logit depends somewhat on the assumed distribution and independence of the error terms in the regression equations, but the selection is really quite arbitrary. I suggest that probit is technically simpler, often less expensive to compute, and yields somewhat more useful output than logit.[2]

Research questions involving data from households often involves explaining first the probability of a choice and, secondly, the level of participation once the choice is made. Classic examples of this type of research question are: (a) What is the probability of being in the labor force and if in the labor force, for how many hours, at what wage? (b) What is the probability a consumer will purchase a particular product and if so, how much, at what price? (c) What is the probability a consumer will participate in government backed programs such as food stamps or individual retirement accounts and if so, for how long and at what level of expenditure? These types of questions require estimating the probability of a discrete choice as well as estimating the value of choices measured along a continuum. A two stage estimation process for simultaneous equations involving probit and ordinary least squares (OLS) has been developed to deal with some of these types of questions [15, 16, 11, 2, 28, 29].

Tobit analysis, originally developed by J. Tobin [37], utilizes maximum likelihood estimation on a single equation when a set of continuous observations on a dependent variable is truncated. Tobit produces both the probability of participating in a market or a program and the expected level of the participation. Tobit is not a substitute for probit or logit. It is designed for continuous data on the dependent variable which are not available for some portion of the sample population.

In this paper some of the statistical properties of probit are defined and related to the better known properties of OLS. The method using probit as the first of a two stage estimation technique combined with OLS, is compared with the tobit method. Specific consumer research questions which have utilized probit and tobit will be identified along with suggestions as to how these techniques might be applied to consumer research questions.

PROBIT

When selecting any analytic model there are two bodies of theory which need to be considered. First, the mathematical or statistical theory producing the method must be compatible with the empirical question and the data available. Second, the economic (or other disciplinary) theory defining the problem should be compatible with the analytic method. With regard to probit, the statistical theory involves the basic principles of regression analysis, namely fitting the slope and intercept of a regression line with maximum likelihood estimation. Probit ensures consistent and efficient estimates of the intercept and slope parameters when the probit model is appropriate. Probit is generally appropriate when data on the dependent variable is measured by an all or nothing response and reveals the percentage of persons who respond at different levels of stimuli. Probit

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[1]Associate Professor, Department of Agricultural and Applied Economics. The author wishes to thank Kinley Larnz of the Department of Applied Statistics, and Lung-Fei Lee of the Department of Economics at the University of Minnesota for their helpful comments. They bear no responsibility for existing ambiguities.

[2]Amemiya [3] presents a thorough discussion comparing probit, logit, and discriminate analysis.

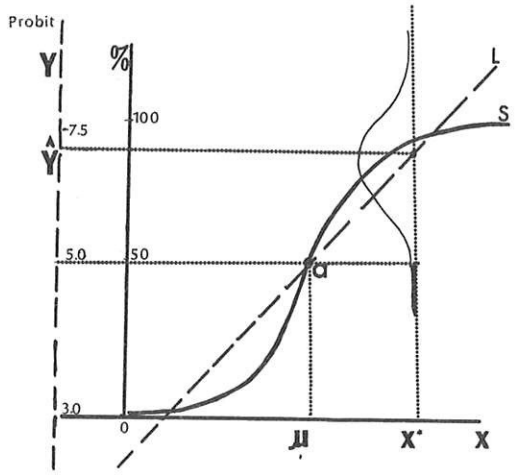
estimates the probability of a response to stimuli where the stimuli are the values of the explanatory variables.

In a simple regression model with one explanatory variable, we have

$$Y = \alpha + \beta X + \varepsilon \tag{1}$$

In a discrete choice model Y is not directly observable but observations on the dependent variable are coded 1 if a response occurs and 0 otherwise.[3] For simplicity of notation, Y = 1 will henceforth be interpreted as observing a positive response on the dependent variable. Observations on X are continuous or discrete and ε is the error term. α and β are the intercept and slope parameters to be estimated.

FIGURE 1. Probit



Assuming the frequency of responses are normally distributed, plotting X against the observed percentage of positive responses produces a sigmoid (S) curve as shown in Figure 1. The probit scale is a simple transformation of the percentage scale such that the relationship between X and the probit scale is a straight line (L). The estimated value of the dependent variable in equation 1 ($\hat{Y}$) is then converted from the probit value to the probability of a positive response for any given level of X by assuming ε is normally distributed about $\hat{Y}$.

$$\text{Prob } (Y = 1) = \text{Prob } (\varepsilon > -\beta X) \tag{2a}$$

$$P = \int_{-\infty}^{\frac{X-\mu}{\sigma}} \frac{1}{\sqrt{2\pi}} \exp\{-\frac{1}{2}\varepsilon^2\}d\varepsilon \tag{2b}$$

where P is the probability of a positive response; $X-\mu/\sigma = \hat{Y}$, and $\varepsilon = (Y - \hat{Y})$. The parameters of the normal distribution, the mean μ and the standard deviation σ, are related to the parameters of the regression equation 1 as follows: $\mu = -\alpha/\beta$ and $\sigma = 1/\beta$. Substituting into equation 1 yields

$$Y = \frac{X-\mu}{\sigma} + \varepsilon \tag{3}$$

The probability of a positive response at the mean value of X (μ) is 50 percent or a value of 5 on the probit scale (point a, Figure 1). For any given value of X, say X*, the probability of a positive response will be measured as the area under the normal distribution curve that lies above 5 on the probit scale, with the mean of the normal distribution at the estimated value of Y, i.e. $(\hat{Y} = X-\mu/\sigma)$. In terms of Figure 1, the probability is measured by all of the area under the bell-shaped curve that is above 50 percent; the part that is not shaded. This transformation of the estimated value of Y on the probit scale to a probability is a fundamental calculation in probit analysis. It assures that probabilities greater than one or less than zero will not be estimated; a problem that exists when applying OLS to an equation with a discrete dependent variable. The maximum likelihood probit also accounts for the frequency nature of the data which gives rise to heteroscedasticity (nonconstant variance of ε) when using OLS.

The level of stimulus which elicits a positive response is commonly referred to as the threshold index level (I*). Respondents are observed to make positive choices (Y = 1) when the value of the index is above I*.

$$I^* \equiv \frac{X-\mu}{\sigma} = \hat{\alpha} + \hat{\beta}X = \hat{Y} \tag{4}$$

where X is the single explanatory variable. Most social and economic research involves several explanatory variables. In that case I* is the linear combination of the observed variables.

$$I^* = \hat{\alpha} + \hat{\beta}_1 X_1 + \hat{\beta}_2 X_2 + \ldots + \hat{\beta}_N X_N \tag{5}$$

The index is exactly like a multivariate regression equation without an error term and can be treated as such in that individual variables can be squared, expressed in logs or interacted without affecting the basic probit calculation. In the multivariate case, equation 2b becomes

$$P = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{I^*} \exp\{\frac{1}{2}\varepsilon^2\}d\varepsilon. \tag{6}$$

I* is assumed to be normally distributed among the sample as a result of factors not included in the explanatory variables. Different persons may respond positively at different levels of the index. The parameters of I* are estimated by maximum likelihood methods where the likelihood function is the product of the probability Y = 1 and the probability Y ≠ 1 at a given index level. The joint probability forms the likelihood function, the log of which is maximized with respect to unknown parameters.

$$L = \prod_{t=1}^{T-n} (P_t)^{y=0} \prod_{t=n+1}^{T} (1-P_t)^{y=1} \tag{7}$$

where T is the number of participants in the sample, n is the number for which y=0. A description of the estimating technique and hypothesis tests can

[3] Y could have values of 1, 2, 3, 4, if four discrete choices were available. For a discussion of multi-response models, see [3].

be found in [8, 29, 37] and any number of manuals for probit computer programs. Briefly note, however, that the standard "t" tests for individual parameter significance apply and the "Adjusted Likelihood Ratio" test is analogous to the R^2 test of OLS for measuring goodness of fit.[4] The marginal change in the probability given a change in value of X_n is measured by $\hat{\beta}_n$ $[1/\sqrt{2\pi}$ exp $-(I^*)^2/2]$ which involves calculating I* at the mean value of each X_n, calculating the number in brackets and multiplying by $\hat{\beta}_n$. The estimated coefficient ($\hat{\beta}_n$) is the marginal change in the index, not the marginal change in the probability.

Having examined in some detail the statistical principles underlying the probit estimate, we will next look briefly at its compatibility with economic theory of consumer behavior.

Utility Theory

Consumers behave so as to maximize their utility subject to a budget constraint. Utility is assumed to increase with the increased acquisition of normal goods and services and/or desirable characteristics of those goods and services. Designating the desirable characteristics of good A by z_i, the utility that the t^{th} person receives from good A is $U_t^A = u_t^A(z_1,\ldots,z_n)$. Converting this into regression notation we have

$$U_t^A = u_t^A(z_i) + \varepsilon_t \tag{9a}$$

$$= \alpha_t + \sum_{i=1}^{n} z_i\beta_{it} + \varepsilon_t \tag{9b}$$

$$Y_t = \alpha_t + Z\beta_t + \varepsilon_t \tag{9c}$$

U_t^A is not directly observable but whether consumer t is satisfied with purchase A can be estimated. One can ask consumers if they are satisfied. One can observe if they purchase good A with characteristics z_i more than once. If characteristics z_i are sufficiently satisfactory, the threshold level of the index (I*) will be reached and a positive response or choice will be made, i.e., $Y_t = 1$.

The probability of a positive and negative response is written as

$$\text{Prob}\ (Y_t = 1|Z) = \text{prob}\ (u_t^A(z_i) > \varepsilon_t) \tag{10a}$$

$$\text{Prob}\ (Y_t = 0|Z) = \text{prob}\ (u_t^A(z_i) < \varepsilon_t) \tag{10b}$$

The average response due to factors not included in the explanatory variables are represented by ε. Since ε is assumed to be randomly and normally distributed, the second part of the (10a) could be read as the probability that the threshold level of utility ($u_t^A(z_i) = I^*$) exceeds the average or expected level of utility. Determining the probability of consumers choosing between two or more products or activities is also theoretically tractable in the probit context. Hausman and Wise [12] provide a model for these cases.

Probit vs. Tobit

Probit is often used as the first of a two-stage estimation procedure with OLS being used in the second stage. This procedure can be applied to a wide range of problems where there is an unobserved (dicotomous) dependent variable that helps to explain the behavior of another dependent variable which is continuous but incomplete. For example, one may observe values for wage rates on a continuum, but only for persons currently in the labor force. Explaining wage rates involves a set of simultaneous equations with the continuous dependent variable explained in part by an unobserved endogenous variable which equals 1 if the person participates in the market and 0 otherwise. The probability of participating in the market may or may not be determined by the same set of exogenous variables as the level of participation, but in the simultaneous model that follows the simplifying assumption that X_1 and X_2 are the same is made.

$$y_1 = \beta_1 X_1 + \psi y_2 - \mu_1 \tag{16a}$$

$$y_2^* = \beta_2 X_2 - \mu_2 \tag{16b}$$

For the example of estimating wage rates, y_1 = wage rate, y_2^* is the estimated probability of being in the labor force, $y_2 = 1$ if y_2^* is greater than the threshold level of the probit index (I*) and 0 otherwise. The error terms, μ_1 and μ_2, are not independent in this case.

For this type of model, probit is used to estimate (16b) over the entire sample which includes both participants and nonparticipants in the labor market. The consistent estimate of $\hat{\beta}_2$ is used to calculate an inverse probability ratio known as the "inverse mills ratio" which is substituted into (16a) for explanatory variable y_2. Consistent estimates of (16a) can then be obtained by OLS [15; 16; 29, pp. 117-138]. If the error terms, μ_1 and μ_2, are independent (16a) can be estimated by OLS straight away, treating y_2 as a dummy variable or by tobit where applicable. However, testing for that independence requires testing the hypothesis that ψ=0 using a standard "t" test of significance. The entire two-stage procedure must be done in order to test the independence of μ_1 and μ_2; there is no good intuitive way to determine the independence a priori.

Many consumer research questions give rise to analytic models similar to equations 16a,b. In order to distinguish those for which two-stage probit is appropriate from those for which tobit might be appropriate, one needs to examine why the observations on y_1 are incomplete. Observations on y_1 are incomplete if one has a censored sample or a truncated sample. Censored samples arise when some portion of the sample being studied does not participate in the activity generating the data for the continuous dependent variable. Conse-

[4] ALR = 1 - [log likelihood at convergence/log likelihood at constant]. Log likelihood at convergence is part of the probit results. Log likelihood at constant = N log (N/T) + (T-N) log (T-N/T) where N is the number of respondents for whom Y=1, T is the total sample, log is the natural log.

quently, observations on y_1 equal zero for all the nonparticipants. In order to explain y_1 consistently for the population, one needs to account for the probability that y_1 will equal zero. That probability can be estimated by equation 16b when observations on the exogenous variables (X) exist over the entire sample (participants and nonparticipants). In this case a censored sample exists.

Censored samples may or may not involve a selection bias. If they do, it means that the nonparticipants have selected not to participate for reasons we cannot observe but which differ systematically from those who do participate. If the unobserved characteristics of these two groups are not randomly and homogeneously distributed across the full sample, μ_1 will be correlated with μ_2 in equations 16a,b, one indicator of the appropriateness of a two-stage model. Systematic differences in unobserved characteristics may exist when participants and nonparticipants have different tastes and preferences, reap different benefits from participation, or systematically face different sets of market prices.[5]

A single equation tobit model is appropriate when the data on y_1 is continuous but truncated at some constant, often at 0. Data on a dependent variable which are truncated at 0 may arise out of either a censored or a truncated sample. With a truncated sample, no observations at all are available on the nonparticipants. Equation 16b, cannot, therefore, be estimated and a single equation model remains which can be estimated by tobit.

Tobit is also appropriate when a censored sample yields a truncated dependent variable. Whether to use two-stage probit or tobit analysis with a censored sample is a somewhat tricky decision. Hopefully, the following examples will shed some light on inevitable ambiguities. With a censored sample of adult women one may want to study wage rates or hours in the labor force. Wages are not observed for non-working women but those women still possess a wage rate; it is simply unknown. Zero is not the wage rate (value of time) for women not in the labor force. Therefore, wage data is not truncated at 0; participation probabilities must be estimated by a separate equation. If one wanted to study hours of labor force participation one could use tobit since zero hours is the observed number of hours worked by those not in the labor force. Data on hours is truncated at zero and the probability of participation as well as the level of participation can be estimated by a single equation with tobit.[6]

Another example is studying the consumption of, say, beef where data is collected from households over a limited time period. Some households will not report eating beef during the survey period; 0 is the observed quantity of beef eaten by some proportion of households. The data on beef quantities is truncated at 0 even if the sample is of the censored type. One might argue this example is more like wages than hours if everyone eats beef sometime and we simply didn't observe a quantity during the sampling period. On the other hand, if one assumes that the costs of entering the beef market are very low and that the probability of being in the beef market is randomly distributed over time, $\mu_1 \equiv \mu_2$ in (16a) and (16b) and the system collapses into a single equation with a truncated dependent variable. For any given study, one needs to carefully examine the nature of the sample, the data and consumer's decision processes in order to define the appropriate empirical model.

Two-stage estimation involving probit and OLS was used by Lewis [28] and by Gronau [11] to analyze wages offered. Douthitt [7] used this technique to study the need for better pre-retirement pension information for married women. Other situations which may call for a simultaneous model are comparing wages of those who migrated with wages of those who did not, wages of those who are specially trained with those who are not, wages for those who are disabled and those who are not. The effect of differences in taste, or health, or location or timing, that are not distributed randomly across the whole sample will yield biased regression estimates when the probability of participation is not accounted for. Selectivity bias may exist when studying occupation, education, home ownership, government program benefits, or consumer redress. Probit provides a simple procedure for including consistent estimates of probability into OLS analysis.

TOBIT

The general tobit model looks very much like equation 1.

$$Y_i = X_i'\beta + \varepsilon_i \qquad (17)$$

where β includes a constant, i=1,...,N observations. Data on Y_i is observed on a continuum only if it is above (or below) a constant. The constant is often designated as 0, but the limiting (constant) value can be any number and it can be either an upper or lower bound [35].

$Y_i = Y_i^*$ if $Y_i^* > C$ for a lower bound.

$Y_i = C$ otherwise

If C=0, the probability that $Y_i=0$ is the probability that $Y_i^* \leq 0$. The tobit model estimates the expected value of Y_i as a function of a set of explanatory variables (X) weighted by the probability that $Y_i > 0$.

The expected value of Y_i equals zero if the estimated value of $X_i'\beta$ ($X_i\hat{\beta} = I$) falls below a critical threshold level of the index I*, just as in probit. The expected value of Y_i equals the difference between the estimated index (I) and the threshold level (I*) when $I > I^*$.

[5] Madalla [29, pp. 257-266] identifies these models as switching regression models that can be estimated by two-stage probit methods.

[6] This assumes there are no fixed costs of entering the labor market or minimum number of hours greater than zero required for entry.

$$E(Y_i) = 0, \text{ if } I < I^* \tag{18a}$$

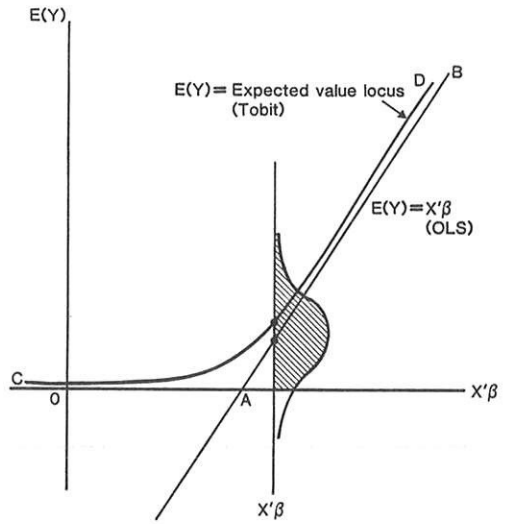
$$E(Y_i) = I - I^* \geq 0, \text{ if } I \geq I^* \tag{18b}$$

The expected value of Y_i given observations on explanatory variables X_i is computed by maximum log likelihood iteration assuming Y_i and, therefore, ε_i are normally distributed, albeit a truncated normal distribution.[7] The probability that $Y_i>0$ given observations on X_i is

$$\text{Prob}\{Y_i > 0 | X_i'\beta\} = F(X'\hat{\beta}/\sigma) = F(Z) \tag{19}$$

where F(Z) is the cumulative normal distribution function defined by equation 6. It equals the area under the normal curve between $-\infty$ and the constant (0) with the mean of the distribution falling at the estimated value of Y_i. In figure 2 it is the shaded area under the normal curve.

FIGURE 2. Tobit



The expected value of Y_i for those who participate in the market is

$$E(\tilde{Y}_i) = E(\tilde{Y}_i | I \geq I^* \text{ or } \varepsilon_i > -X_i'\hat{\beta}) \tag{20a}$$

$$= X_i'\hat{\beta} + \sigma\, f(Z)/F(Z)$$

where $X_i'\hat{\beta}$ is the index, σ is the standard error of the regression equation, f(Z) is the unit normal density function, the derivative of F(Z).

The expected value of Y_i over the entire sample is calculated as the expected value of Y_i for all observations above the limit value, $(E(\tilde{Y}_i))$, times the probability that $Y_i > 0$ designated as (F(Z)).

$$E(Y_i) = E(\tilde{Y}_i)\cdot F(Z) = F(Z)X_i'\hat{\beta} + \sigma f(Z) \tag{20b}$$

[7] Details of the tobit estimators can be found in [4, 23, 29, 33] and a number of manuals for tobit computer programs.

The tobit estimate of $E(Y_i)$ can be seen on figure 2 to curve down towards the limiting value of zero whereas the straight OLS line cuts the horizontal axis yielding estimates of Y_i that are less than zero. The expected value of Y_i is adjusted by the shaded area under the normal curve to account for the probability of participation. $E(Y_i)$ is assumed to be normally distributed about a mean equalling the limiting value and variance σ^2. With a limiting value of zero, $E(Y_i) \sim N(0,\sigma^2)$.[8]

With a truncated sample OLS estimates of β are biased, the bias being represented by $\sigma\, f(Z)/F(Z)$ in equation 20a. This bias decreases with increases with the variance of Y_i [29, p. 168]. Tobit adjusts $\hat{\beta}$ by the estimated bias leading to consistent estimates of $E(Y_i)$.

One advantage of tobit estimates is that the results can be readily decomposed to analyze the change in $E(Y_i)$ given a change in the value of X_i, $[\partial E(Y_i)/\partial X_i]$. The changes can be disaggregated to determine: (1) the change in Y_i due to a change in X_i for those observations above the limit weighted by the probability of $Y_i>0$, and (2) the change in the probability of $Y_i>0$ weighted by $E(\tilde{Y}_i)$.

$$\frac{\partial E(Y_i)}{\partial X_i} = F(Z)\frac{\partial E(\tilde{Y}_i)}{\partial X_i} + E(\tilde{Y}_i)\frac{\partial F(Z)}{\partial X_i} \tag{21}$$

This decomposition has some very useful interpretations. For example, if X_i were income and Y_i were the quantity of some good consumed, say beef, the left-hand side of (21) gives the marginal propensity to consume beef. Multiplying (21) by $\bar{X}_i/E(Y_i)$ converts each term into an elasticity measure, where the left-hand side measures the total income elasticity for beef; that is, the percentage change in the quantity of beef given a 1 percent change in income. The first term on the right-hand side will give the income elasticity for beef among those who are observed currently eating beef and the second term will give the elasticity of the probability of consuming beef with changes in income. The latter is often referred to as the entry/exit elasticity.[9]

Tobit provides a statistically sound and theoretical tractable method of analyzing a wide range of problems in economics and in policy analysis. In consumer related research, tobit has been used to analyze the determinants of credit card accounts [23, 32] to explain shopping time [1] and investment in energy saving durable goods [20]. It can be argued that it is more appropriate than OLS for all demand analysis since consumption is virtually always truncated at zero. It has been used to

[8] The standard tobit model assumes a univariate normal distribution; the normal distribution of (I-I*) or of ε_i is the same for observations where Y=0 and Y>0. Heckman [17], Heckman and Macurdy [18], and Amemiya [2] present modified tobit models that allow for a multivariate normal density function that can be estimated by a single likelihood function.

[9] These calculations are detailed in [24, 33, 34].

study the consumption of food away from home [25], the consumption of dairy products [5, 36], the consumption of beef [19], and food produced by home gardeners [22]. Other types of research questions yielding truncated models include studying food stamps, consumer loans, bankruptcy or the effect of usury laws when one has data only on those who participated in the activity.

Probit analysis, on the other hand, has appeared in recent issues of the Journal of Consumer Affairs, the Journal of Consumer Research, and in prior Proceedings of ACCI conferences analyzing the probability of: women obtaining credit before and after the passage of anti-discrimination laws [39], knowing the legal maximum interest rates on open-end credit [26]; satisfaction with housing [27]; acceptance of mortgage loan applications [21]; insulating homes [9]; using the installment payment option to repay credit card loans [13]; and selecting an innovative (electric) vehicle versus a conventional vehicle [38].

Research that involves consumer economic theory, consumer behavior or consumer policy is very likely to confront data which calls for a qualitative response model in one form or another. The logit, probit, two-stage probit, and tobit models allow one to go beyond simple classification techniques and to be able to explain the determinants of the classification and to predict how future changes in explanatory variables will affect the phenomena being studied. In an excellent survey article in the Journal of Economic Literature, Amemiya wrote, "I believe that qualitative response models are so important in economics that every applied researcher should acquire at least a cursory knowledge of the facts" [3, p. 1484]. This paper has presented, in a very cursory fashion, some facts about probit and tobit analysis. I endorse Amemiya's statement and offer a modification. I believe that qualitative response models are so important in consumer related research that all applied consumer researchers should acquaint themselves with the facts and the conditions under which these models will be useful.

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PREPARING STUDENTS FOR CONSUMER ACTION

Robert J. McEwen, S.J., Boston College[1]

ABSTRACT

This paper discusses methods and problems of introducing students at the undergraduate level to the practicalities of consumer action.

Let me introduce this subject by a quote from an article in the book that Ron Stampfl has out there on sale [1]. Curran Shields, its author, was one of the founding members in the Conference of Consumer Organizations on whose board both Janet and I served. Curran was one of the founding fathers of the Conference of Consumer Organizations. His article discusses college training in the field of consumer affairs. I recommend this to you if you are going into the field in either capacity, either in business corporations or teaching, because he has an excellent insight into what is required for the training of people to get into the business field of consumer affairs. He has some very penetrating observations on the university and college approach to consumer education and consumer affairs.

I'll read you just one paragraph that struck me as very insightful. He said:

> We find among college professors and administrators little desire to train students in methods of consumer activity in the market place generally, and particularly, in consumer complaint handling. The conventional ignorance is that such training belongs in the trade school, not on a college campus. At the same time, we find an inability to train students in the varied subject-matter fields related to consumer activity. We cannot do the latter; we do not want to do the former [1, p. 149].

So there is a real problem of consumer affairs and consumer professional education in the universities; and that's why the placement in universities of consumer departments and consumer programs is such a difficult problem to solve. You can't really get the students exposed to the variety and the range of subject matter competencies that they really need. So, at the undergraduate level, I'll describe to you how I structured our programs. The way to get people involved in consumer action is to get them involved when they're students; and to get them involved when they're students, you get them in the classes. You have to have enough of a variety of subject matters to get them.

[1]Professor of Economics

MY CONSUMER COURSE SEQUENCE

I have structured the consumer program that I run myself at the undergraduate level in four sequences: one semester, the history of the consumer movement and the rationale of the consumer movement, consumer problems in general. Then, consumer legislation, concentrating on specific types of legislative activity in the consumer field. Then, a semester in consumer information and education; and, finally, a semester in the government activity in the consumer field.

In addition to that, I have a small seminar, small being twenty-five as opposed to the other class which runs from sixty to a hundred. This seminar, this semester, is in consumer dispute resolution, consumer complaint handling. I think I've hit upon something which is worth repeating; I'm going to do it again next semester in the seminar in consumer dispute resolution and complaint handling. You should note that complaint handling is probably one of the best ways that you people will get entrance into a corporation. So I've structured these courses to maximize consumer involvement in educational experiences directly affecting either government or business in the market place.

There are two distinctions in this discussion that we ought to keep in mind. By direct action, I mean things like going out and picketing the Better Business Bureau Lunch, or picketing a government agency, or directly taking a survey on the supermarket's observance of unit pricing laws, or item pricing laws--that's the kind of thing I mean by direct action. The other action-oriented approach can be called training for and preparation for action.

I've had to, over the years, make an adaptation to the changing character of the student population. You can detect waves and violent changes in the characteristics of the student bodies. About two or three years ago, I was experiencing a very passive type of student body in very bold contrast to the '70-71 period, when they hardly needed any encouragement--they almost need restraining. So that things I recommended and did with classes those years were different from things I do with classes now. A couple of years ago, there was a diffidence, you almost had to push students out of it; today you can see the difference in everyone of these courses.

PROJECTS

I require an individual project to be submitted by each student and I'll give you a hint of what they are so if you ever get a chance you might imitate them. In the consumer information course, I tell the students that the project has to be a search for sources of information needed by a consumer to

do anything to him.

In other cases I had students in the complaint field working on the performance of the Small Claims Courts. I've assigned each one of them to the Small Claims Court, and they went and sat in on for several days and observed the sequence of cases and how they were handled and wrote an evaluation of that particular court. I used to, I don't know whether you can imitate this in any of your endeavors, but about ten or twelve years ago, I used to encourage them to work in teams if they wanted to, two or three together, on a project that was too big for one individual. In those years, they really put their minds to it and they'd come up with summary results and I'd get a press release written on the findings of the team. I dreamed up the idea that I'd call it "Students Organized For Consumer Action," and, therefore, the report would be a soccer (SOCA) team report. You have to have a Boston accent to appreciate this. We used to release these every few months. Many of these were extremely interesting and many were picked up by local radio and TV stations and, naturally enough, that type of involvement was liked and appreciated by the students who were involved.

Then, I have a technique of requiring them to write a letter to some sort of publication, and get it published. Now I admit that that may have been undue pressure, but it had a good effect. Otherwise, if you just say write a letter, they could write a letter and that would be the end of it. But if I put the requirement in that they have to do it well enough and fast enough to get it published, then there is great pressure. But at any rate, it accomplished something--you ought to see the jubilation when they do get it published.

Another technique is used in the Complaint seminar. You have to report and analyze a complaint handling mechanism, either a department store, government agency, or what. Two students came up and told me, which I had to let them do, they wanted to evalulate the complaint handling mechanism of our own college against which they had gripes. I told them, "Sure, go ahead." They all had the project of writing an evaluation of a complaint handling mechanism, and in the process of doing that, I told them that I wanted them to file, register, and pursue to the end an individual consumer complaint. It didn't have to be in the same field as their project, but it did have to be an individual consumer complaint. I got a big kick out of one of the first girls who reported on her performance. She said, "Well, before I took this class, this had happened to me. I put a card in a bank machine, and I was withdrawing, or asked to withdraw $20, and I only got $10. Nobody would do anything for me. And I just said, "Well, I lost $10." When I took this class and I had to do a complaint, I decided to write a letter. So she wrote a letter to the president of the bank, and she was very happy to find out that he sent her back her $10. So each one of them has to write a report, and report to the rest of us, on an individual complaint that they file and pursue as far as they can go. You'd be surprised to know that out of the 25 students in that seminar, when I asked, "How many of you have ever filed a complaint?" only 3 out of 25 had ever, before we started, had ever filed or pursued a complaint.

Then, another technique that I've used extensively is internships. I've had students intern in the mayor's consumer office in the summer, or for a semester, and act as a complaint handler and I've made them keep a diary every day of what happened, what they did. That kind of experience is very valuable. I've had several of them regularly work in the complaint handling division of the Attorney General's office in the State House. This semester, I've got one of them working with a motor company, in the regional office, working in the complaint handling section of the regional office. I've had them work in other cities in the consumer office. I've had them work in the TV studios. In general, the initiative has to come from the student himself/herself or from a business, some contractor, that I happen to run into who says, "Have you got an intern?" That's the way it works--there is no formal program. Curran Shields, whom I mentioned earlier, and Bill Johnston, who now is running it, had a very structured and elaborate program of placing graduate students in internships all over the country in both government and business. That used to be run out of Arizona, and now it's run out of Oklahoma.

Current Projects

Whenever I could, I would encourage them to do projects that had great current relevance. For instance, the subject of delayed availability of funds at banks--when you put in a check and you have to wait a week, two weeks, three weeks before they let you use the money from the check--is hot right now. So I had four different students do surveys of banks and institutions on that particular subject and then, with their permission, I incorporated the results of their surveys in a testimony before the Senate Banking Committee and told them it was being done. Then, CBS News came up and filmed them going in and out of banks. They were on 15 second appearances on one of the CBS news shows, only because it was something that was hot in the public interest at the moment. But I do encourage them to take surveys and interviews with the results later used either by them or by me in legislative hearings or other kinds of testimony.

In one case I had two girls, who came from very wealthy New York families, who were to appraise how many banks had a consumer on their board of directors. They were enterprising young ladies and they went down to see the president or vice-president and had him fill out this questionnaire. The questionnaire went something like this: Do you have a consumer on your board of directors. Have you considered it? If it wasn't adopted, why not? What would be required for you to have a consumer on the board of directors? Five different questions. One of my friends who was in a bank told me they got the run-around, they got the royal run-around from the bank. Nobody would talk to them, on the record or any other way. They were told to leave the questionnaire we'll get back to

make a rational, sensible choice and then an evaluation of the quantity and quality of the material in each one of the sources that they search out. So, the project is the answer to a question, "Is there available to the average consumer, not to the specialist, enough information of high enough quality to make a sensible choice?" That's the project and each has to pick one himself, or herself, and actually conduct the search and report upon it; and as part of the reporting upon it, I require each one to get up in front of the class and tell the rest of us what they did. Even that requirement is interesting in how it differs from year to year. This year in particular, I've been relatively pleased and amazed by how they took to it; no diffidence, no problem. I've had some problems in the past when some boys and girls would come and say, "I just can't talk in front of a group. Literally, once or twice a year that might happen. I try to talk them out of it; sometimes I do, sometimes I don't. But I very seldom yield on that subject. I say, "Well, you're never going to learn unless you do it; so go ahead." But this year, they have done extremely well on these presentations, so I'm very happy with the current group. So that's the project for information.

The project for legislation is to have them go and trace the history, development and consequences of a piece of legislation. That involves going to the City Council, the State House, or the Congress, if it's a Congressional piece, and finding out where those laws came from, attending hearings if it's a current piece or continuing piece, and attempting to appraise it if it's already passed, attempting to appraise the effect of it. In the government sector, I tell them to evaluate the consumer performance of a government agency, Government Protection Agency, the Food and Drug Administration, a governor's office of consumer affairs, or a mayor's consumer council, or a city consumer office, something like that. They have to evaluate the performance of this government agency as a consumer protector, take its charter, what it was charged with doing, and see whether it does it or not. As you can imagine those are projects pretty close to direct action. PIRG groups, for instance, are always doing evaluations of government agencies in the consumer field.

In the general course in the history of the consumer movement and consumer problems, they're encouraged to pick any one of the consumer issues that they like and develop it. In that course, I tell them to pick an issue and ask the question, "What was the condition of that seller or industry or field before the consumer revolution came on the scene?" And then consider what did the consumer revolution criticize about that industry and how far did it succeed. In other words, how far did it change the industry in the practices. It's a riot because the students always write the companies or agencies involved and one of the questions they ask is "How did your industry change as a result of the Consumer Movement?" It's a riot to hear girls telling a story of how they had written to consumer affairs officers or presidents or vice-presidents of various corporations and they had said, "Will you tell us your appraisal of how your company or industry has changed as a result of the consumer movement"? They got answers back: "What consumer movement?" And the next answer would be, "Not at all." Then it dawned on me that various things were coming out of this question. One was the extent to which these people even knew there was a consumer movement. The second was that they would never admit, if it had changed, that it had changed as a result of the consumer movement. Several answered, and said, "Well, we've changed, but not as a result of the consumer movement." So, you get very interesting sidelights on this thing.

Another interesting sidelight, and distressing in a way, is what happens when the students write to corporations. I instruct them to write very careful letters to corporations and to address them to specific consumer affair officers, if there is one, or to a vice-president. I warn them not to write a letter and say, "I'm writing a paper on the nuclear power industry. Tell me all you know about it." That kind of letter will go in the waste basket. On the other hand, some of the girls have been very smart about things like cosmetics and they pick something out of the advertising and they write a specific letter to the company and say, "I know that you say this. What proof do you have?" It's that specific kind of inquiry that will get an answer. So, I try to steer them away from these broad generalizations that anyone getting says, "He wants me to do all his work for him. He wants me to write his paper for him." You won't get any answers from them. But I am convinced, even now, they're writing to companies and not even getting an answer. I've told several of the corporation people here that I'm distressed at this. You can imagine what a bad impression that's going to make on the student if they say, "I wrote to this corporation and asked how their diet cola compared to the other alleged diet drink the other company made, and they didn't even answer my letter." So, those are the types of projects I get them into. Many times, the action type projects, the ones like checking on products in a supermarket (how many they can find without any unit price stickers on the shelf and what percentage of products in the market don't have the individual item price on them) are more direct; some of the others are library. You can have both types.

Other Actions

Now, I'll give you a few examples of things that you might do. One year, I knew there was a court case coming up in a nearby town, so I took the whole class to the court to stand around the back of the court to hear this case against an auto dealer who was charged with turning back odometers. Well, it was a riot, because everyone in the court looked around. There were about thirty in the class, we were all standing around the back of the courtroom--they were all whispering to each other, "Who are they? What are they doing here? What's the public got a right to be interested to know what's going on here?" So it was a good experience for them to hear how the defendant was a vice-president of the local auto dealership, and he had been charged by the registry agents who had numbers of cases of turned-back odometers. Then they heard the lawyer get up and say the defendant was an upright citizen of the community and you should not

you. Sometimes they did, sometimes they didn't. But there two notable things that came out of that. One was the shock that the girls experienced when they came back and reported to the rest of us that the banks wouldn't tell them anything. They wouldn't give them any information on the subject and they were perplexed. What have the banks got to hide? Why are they treating us this way as if we were asking trade secrets? And the second thing that happened, talking about direct action, student action, one of my acquaintances in that bank told me later that the consternation inside that bank after the girls left the questionnaire was tremendous. They were all scurrying around saying who are they, what are they up to, and what do they want, why are they doing this, who are they representing. So that all of those are approaches to direct action.

Dr. Shields, in his article, stressed that one of the chief requirements that business looks for is initiative and imaginativeness. So I always give them a big speech in the beginning that project reports and the final report itself will be judged on their degree of imaginativeness and inventiveness and ingenuity. This year particularly it caught on and one trio was evaluating information about cereal; they brought cereals into the class, bowls and milk, and they called for volunteers to taste-test the generic versus brand cereals. It was an imaginative approach and they came up with the fact that the brand cereal was identifiable by these three volunteers; they didn't know which one they were eating. The boys, the testers, identified which cereal was which. They all came up approving the brand cereal as tasting better and preferred.

Another technique that I use--I will invite two or three government and business complaint officers to come and address the seminar and give them a first-hand experience of how an actual complaint system runs. It is always a good thing to intersperse an actual example with all the book descriptions of it.

WARNING

Now I just have a postscript to add to you. The one thing I recommend that you avoid with yourself and the students is what I call "paralysis in the name of science." I picked up a consumer marketing journal the other day, and I went through about fifteen articles, each one of them having carefully developed and reported on some kind of a scientific test to decide whether, for instance, unit pricing was used and acceptable and good. They all came out with the same answer: "There's not enough evidence to say that it is good." Almost every one of them was either neutral or negative in the conclusions. That's what I mean by paralysis in the name of science. I caution you against that because that's the death blow to any action position. If you wait until there's absolutely no doubt, the evidence is so overwhelming that only an idiot would be able to say it isn't true, you'll be dead before you take any stance, or any position, or any action. Be particularly careful of it in regard to consumer information items, like labeling, unit pricing, item pricing, etc. I've gone on record time and again when I discuss these things saying these techniques, that are supposedly scientific, trying for example to decide what is the cost benefit ratio of what it costs to put in unit pricing as opposed to what benefits come out of it are frequently defective. They always come out of it saying, "No, it's not worth it. Not enough consumers use it."

Just be very skeptical of those researchers because they neglect one of the things that I stress when I discuss consumer legislation. It is what I call the back-door effect of information requirements. The mere fact that the information is required changes producers' policies and practices, even if the fact of the matter is that ninety percent of consumers don't look at it. But the producer isn't sure whether the percent that's looking at it might be the percent that would refuse to use his product. So there's a back-door change effect in consumer information demands and requirements that all these so-called marketing studies and scientific studies ignore. This is very hard to quantify. You and I may know it's there.

I remember the first year I was associated with the Consumer Information Program in the Department of Transportation--we dreamed up this requirement that all the manufacturers had to test their own automobiles and report to us and to the public how many feet it took them to stop under two or three wet/dry conditions. They did their own testing and they reported; but they were under a threat that if the government tested and found that their results were false that there would be some penalty. But anyway, it was their figures. I remember that first year we put that book out, Ford, all the Fords, were down at the bottom of the list. They were taking 200 feet to stop, whereas others were taking only 60 or 70. Next year, Ford must have knocked heads back in Detroit, or Dearborn, next year Ford was not at the bottom of the list--it had improved the braking system. So the mere fact, even if no consumer ever read that book, and, I'll be honest with you, I'm not sure how many did--maybe a handful--but the mere fact that it is in print, that one of you might find it has an effect on the producers. A competitor might find it and publicize it. So don't ever underestimate the effect of publicity and information disclosures. I'm a firm believer in requiring information disclosures, even if you can't prove that 100% of consumers are going to use that right now. So, at this stage I'll stop and if they have any questions I'll take them.

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CHANGES IN CONSUMER COMPETENCY AND ATTITUDES: DO STUDENT CHARACTERISTICS MAKE A DIFFERENCE?

Mary L. Carsky, The University of Connecticut[1]
Ruth H. Lytton, V. P. I. & S. U.[2]
G.W. McLaughlin, V. P. I. & S. U.[3]

ABSTRACT

The purpose of this study was to assess the change in students' consumer knowledge and attitudes as a result of a consumer education course. Postsecondary consumer education courses appear to effect changes in attitudes and increases in consumer competency. The variables of sex, major, and academic level and their interaction on these changes resulted in relatively high levels of statistical significance, however these variables must be jointly investigated in a way to allow for the non-additive effects of their interaction.

In the Classification of Concepts in Consumer Education, Bannister and Monsma [1] acknowledged a proliferation of definitions of consumer education. To describe this multi-faceted field, they posited the following:

"Consumer education is the process of gaining the knowledge and skills needed in managing consumer resources and taking actions to influence the factors which affect consumer decisions."

Explicit in this definition are changes in the cognitive and behavioral domains as a result of the consumer education process. Is a change in the affective domain implicit in this definition? Can formalized consumer education courses at the secondary and postsecondary levels result in measurable changes in students' consumer knowledge and attitudes? Garman, McLaughlin, McLaughlin, and Eckert in one study focusing on this question noted that "research dealing with postsecondary consumer education is conspicuous by its absence" [8, p. 75]. Therefore the purpose of this study was to assess the change in postsecondary students' consumer knowledge and attitudes as a result of a consumer education course.

Measuring Changes in Consumer Knowledge and Attitudes

"If the 1930's were the formative years for consumer education in America, that educational effort came of age in the 1960's and entered a new phase of maturation" [14, p. 124]. During that maturation phase of the 1970's and into the decade of the eighties, several studies have attempted to ascertain cognitive and affective changes among secondary and postsecondary students as a result of consumer education efforts. The conclusions drawn have been inconsistent. Claar [4] reported that prior completion of a consumer education class did not affect the score received by high school seniors on Beattie's Consumer Information Test (1962) which Claar modified and called the Consumer Education Test. This test covered the areas of money management, credit, insurance, and savings and investments. Age and curriculum significantly affected performance; scores did not differ on the basis of sex, except in the area of savings and investments where the males scored higher. Bibb [3] developed an instrument to measure knowledge of budgeting, installment purchasing and the comparison of prices. No statistically significant difference existed between the test scores of those university freshmen who received high school instruction in the three specific areas and those who did not.

Using a general test of consumer knowledge, the Stanley Test of Consumer Competencies, Forms A and B (1975), Garman [5] conducted a national study to determine the consumer education competencies of prospective teachers from all academic disciplines. The prior completion of one or more consumer education related courses improved scores as compared to those who had not completed such a course. Major area of study affected performance as did sex; males scored significantly higher than females.

Beattie [2] attempted one of the earliest studies to determine if a relationship existed between information about and the attitudes toward personal finance. The Consumer Information Test and the Consumer Attitude Inventory which were developed for the study included the topics of money management, credit, insurance, and savings and investments. A panel of experts provided the "proper direction" of response and scaling for the responses to the Attitude Inventory. Results indicated that little relationship existed between correct knowledge of personal finance and the reported attitudes of the respondents. Beattie further concluded that the teaching of information alone could not result in positive attitudes toward personal finance.

Langrehr [11] used a revised version of the Beattie Consumer Information Test and the Consumer Discontent Scale developed by Lundstrum (1974) in a study designed to compare the differences in consumer economic competency and consumer attitudes toward business. High school students in an economics class and a consumer education class in Illinois participated in the study as did students from an American history class in Alabama. Illinois required consumer education while Alabama did not. Pretest knowledge scores

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[1]Lecturer, on leave
[2]Doctoral student
[3]Associate Director, Office of Planning and Management Analysis

for all students did not differ. The Illinois students did have significantly higher posttest scores, with those students in the consumer education class scoring significantly higher than the other two groups. Significant differences existed between the attitudes expressed about business by the consumer education class students and those in the control class. Pre- and posttest attitude scores varied significantly between the economics and consumer education classes. Students in the consumer education classes expressed the most negative attitude toward business on the pretest, yet in the posttest expressed a more positive attitude than that expressed by the economics students.

Again using the Stanley Test of Consumer Competencies (1975) and a modified version of the Burton Consumer Issue Opinionnaire (1970), Garman [6] measured the change in consumer knowledge and attitudes of two classes of university students taught by different instructors. Class assignments and requirements did not vary. Results indicated that the two groups of students were similar both at the beginning and the end of the class experience. Both groups demonstrated a significant increase in consumer knowledge. Attitudes expressed on the pre- and posttests of the Consumer Issue Opinionnaire "changed dramatically" and generally moved in the direction of those attitudes held by consumer advocates.

This design was modified in a study reported by Garman, McLaughlin, McLaughlin, Eckert [8] which utilized the Stanley Test of Consumer Competencies (1975) and the Lown Consumer Issue Attitude Inventory (1979). University students enrolled in a consumer education course and classes selected as the control participated in the study. Because of a significant difference in the pretest Test of Consumer Competencies scores between the experimental and control groups, gain scores were used to measure differences in consumer knowledge on the pre- and posttest scores. Analysis of the gain scores against zero resulted in a significant increase for the experimental group while the control group showed no significant gain.

Item analysis on the Consumer Issue Attitude Inventory (CIAI) indicated that attitudes expressed on 13 of the 44 statements changed significantly on the posttest measure, with nine of the 13 moving in the direction held by consumer advocates. No significant change in attitudes occurred among the control group. Difference scores on the responses of the experimental and control groups on the six subscales of the CIAI were also analyzed. The difference scores on the subscales Information, Redress, and Public Policy were significantly different for the experimental and control groups. Analysis of these scores against zero revealed a significant change on the subscales Choice and Information; no change from zero occurred for the control group. For all subscales except Safety and Protection, attitudes as measured by the subscale mean moved in the direction held by consumer advocates.

Prior research assessing the change in consumer knowledge and attitudes as a result of a consumer education class yield both consistent and inconsistent results. Claar [4] and Bibb [3] concluded that prior completion of a high school consumer education class did not significantly affect knowledge as demonstrated on their researcher developed instruments. Langrehr [11], on the other hand, reported a significant difference on knowledge scores between economics, consumer education, and control classes, with the consumer education class receiving the highest score. In three different studies using the Stanley Test of Consumer Competencies, Garman [5, 6] and Garman, et. al. [8] reported significant changes in consumer knowledge as a result of a consumer education class. Although using different instruments, Langrehr [11] and Garman [6] and Garman, et. al, [8] each reported a significant change in attitudes among students involved in a consumer education class. High school students in the Langrehr [11] study developed more positive attitudes toward business, while university students involved in the other two studies expressed attitudes more similar to those of consumer advocates.

The researchers involved in these later studies have noted these discrepancies and challenged others to continue to evaluate the immediate and long term effects of consumer education efforts. Is consumer education fulfilling the demands of the Bannister and Monsma [1] definition to actuate change among the cognitive, affective, and behavioral domains? Two studies [4, 5] identified age, sex, and curriculum as possible factors influencing consumer competency, yet no study considered the influence of these factors on changes in attitudes. Research to document the influence of these factors is needed. The question of the direction of attitude change also merits more study. Will a consumer education class always influence students to express attitudes more similar to those of consumer advocates?

The purpose of this study, using a pre-experimental design, was to extend previous research by assessing the change in postsecondary students' consumer knowledge and attitudes as a result of a consumer education course. In addition it was hypothesized that the factors of sex, major, and academic level would not influence these changes. Students enrolled in one large section of a university consumer education course served as the sample for this study thereby eliminating extraneous factors common to other studies which combined multiple course sections with different instructors [6, 7].

Method

This study was conducted at a university in the northeast with an approximate undergraduate enrollment of 12,000. The consumer education class which served as the treatment in this pretest-posttest design is a popular lower division elective course with an average annual enrollment of 1200-1400 students from all academic majors. Students (N=182) enrolled in one section of this course during the 1983 spring semester participated in the study.

Usable data were collected from a total of 156 students (85.7% of 182), since not all students were present for all four data collections. Over half of the respondents were female (56.4%). The sample was equally divided between lower and upper division students. The categories of "arts and sciences," "business," and "other professionals" were used to identify the students' major. Business students represented 26.3% of the sample, while "arts and science" majors represented 34.0%. "Other professionals" defined as home economics, engineering, pharmacy, nursing, and other allied health majors represented 39.1% of the sample. All students in the class were administered the Stanley (1975) Test of Consumer Competency (TCC, Form A and Form B) and the Lown (1979) Consumer Issue Attitude Inventory during regularly scheduled classes in the first and last week of the semester. Form A of the TCC was administered at the beginning of the semester, while Form B was administered at the end of the semester. The Stanley TCC, consisting of 55 multiple choice questions, was developed to assess cognitive consumer knowledge in fourteen areas before and after formal instruction in the subject. The Illinois Guidelines for Consumer Education, secondary and postsecondary consumer education texts were consulted in the development of the instrument. The TCC was normed with over 7,000 Illinois secondary students; reliability based on Kuder-Richardson Formula 20 was estimated to be 0.74.

The Consumer Issue Attitude Inventory (CIAI) developed by Lown (1979) consists of 51 issue statements with a five-point Likert-type scale. The statements represent seven subscales, including Safety and Protection, Choice, Consumer Voice, Information, Redress, Consumer Education and Public Policy. Lown concluded that the CIAI effectively differentiated the attitudes of consumer advocates, business representatives and consumers on consumer issues. The Crombach's alpha estimate for the 51 statements was 0.97. For the purpose of this study the subscale Consumer Education was omitted due to low internal consistency; 44 issue statements comprised the modified instrument [8, 12].

Results

Based upon the pre- and posttest administrations of the Test of Consumer Competencies, the experimental treatment of the consumer education course resulted in cognitive change. A dependent t test revealed that the difference in the pre- and posttest mean scores for the 107 respondents was highly significant ($t = -12.09$, $df = 106$, $p < .001$). The mean score at the beginning of the semester was 31.86 (57.93%) and increased to 36.68 (66.69%) at the end of the semester. The mean gain for the population equalled 4.82 points.

Analysis of variance, with the gain score as the dependent variable, was used to determine if differences in knowledge gained varied with the sex, major, and academic level of the student. Gain score was defined as posttest TCC score minus the pretest TCC score. The analysis of variance revealed a statistically significant main effect, first order interaction, and second order interaction. The results which are reported in Table 1 are interesting, but should be interpreted with caution. The 2 x 3 x 2 design ($N = 107$) resulted in cell sizes which ranged from one to 19 observations per cell. Seven of the twelve cells contained less than ten observations per cell.

The significant second order interaction revealed that a cognitive change as measured by gain score varied with the combined variables of sex, major, and academic level ($F = 5.96$; $df = 2, 95$; $p < .01$). As shown in Figure 1, lower division males in majors identified as "arts and sciences" had a negative gain score of 1.33 points, while lower division males in "other professional" majors had a gain of ten points. At the lower division, females had a lower mean gain than males majoring in "business" or "other professions," while at the upper division the females had higher gain scores than the males.

As shown in Table 1, an F of 3.35 was associated with the significant first order interaction of major and academic level ($df = 2, 95$; $p < .05$). Consistent with the second order interaction, lower division students majoring in "business" or "other professions" had higher mean gain scores than upper division students. Students in majors categorized as "arts and sciences" showed a reverse trend; lower division students had a lower mean gain score on the two administrations of the TCC than the upper division students. Thus it may be observed that the upper division "arts and science" majors and the lower division "business" and "other professions" majors benefited most from the consumer education course.

Whereas academic level in conjunction with sex and major contributed to differences in cognitive consumer understanding as measured by gain scores, the mean differences between academic levels was also significant when summed over all levels of these other independent variables. An F of 5.42 revealed a significant difference in the mean gain scores associated with academic level ($df = 1, 95$; $p < .05$). Lower division students had a mean gain of 5.72 points, while upper division students gained only 3.91 points.

Lown (1979) recommended that the Consumer Issue Attitude Inventory be used in a pretest-posttest design to assess change in the attitudes of students involved in a consumer education course which considered consumer issues. And in fact, the CIAI appears to have been effective in measuring change in attitudes based on this data ($N = 137$). A dependent t test disclosed a significant difference in the summed scores on the six subscales of the pre- and posttest administrations of the CIAI ($t = 3.5$, $df = 136$, $p < .001$). The mean pretest summed score was 153.70 while the mean posttest summed score declined to 149.64. Whereas the experimental treatment of the intervening consumer education instruction may have been expected to change the students' attitudes in the direction of consumer advocates, the attitudes digressed in the opposite direction.

To further analyze the change in expressed attitudes, a mean score on the basis of the five point Likert-type scale was generated for each subscale on the pre- and posttest administrations of the CIAI. Five represented the consumer advocate view, with three a neutral response. A gain score of posttest minus pretest was also calculated. Results appear in Table 2. Negative gain scores indicated that for all subscales except Choice, expressed attitudes digressed in the direction of neutrality.

A series of dependent t tests comparing mean pre- and posttest scores on each subscale revealed a significant change in scores for the subscales Safety and Protection, Information, and Redress. For these three subscales, students' attitudes expressed at the end of the consumer education course were significantly different (lower) than those expressed at the beginning of the course as measured by the CIAI. Results are shown in Table 2.

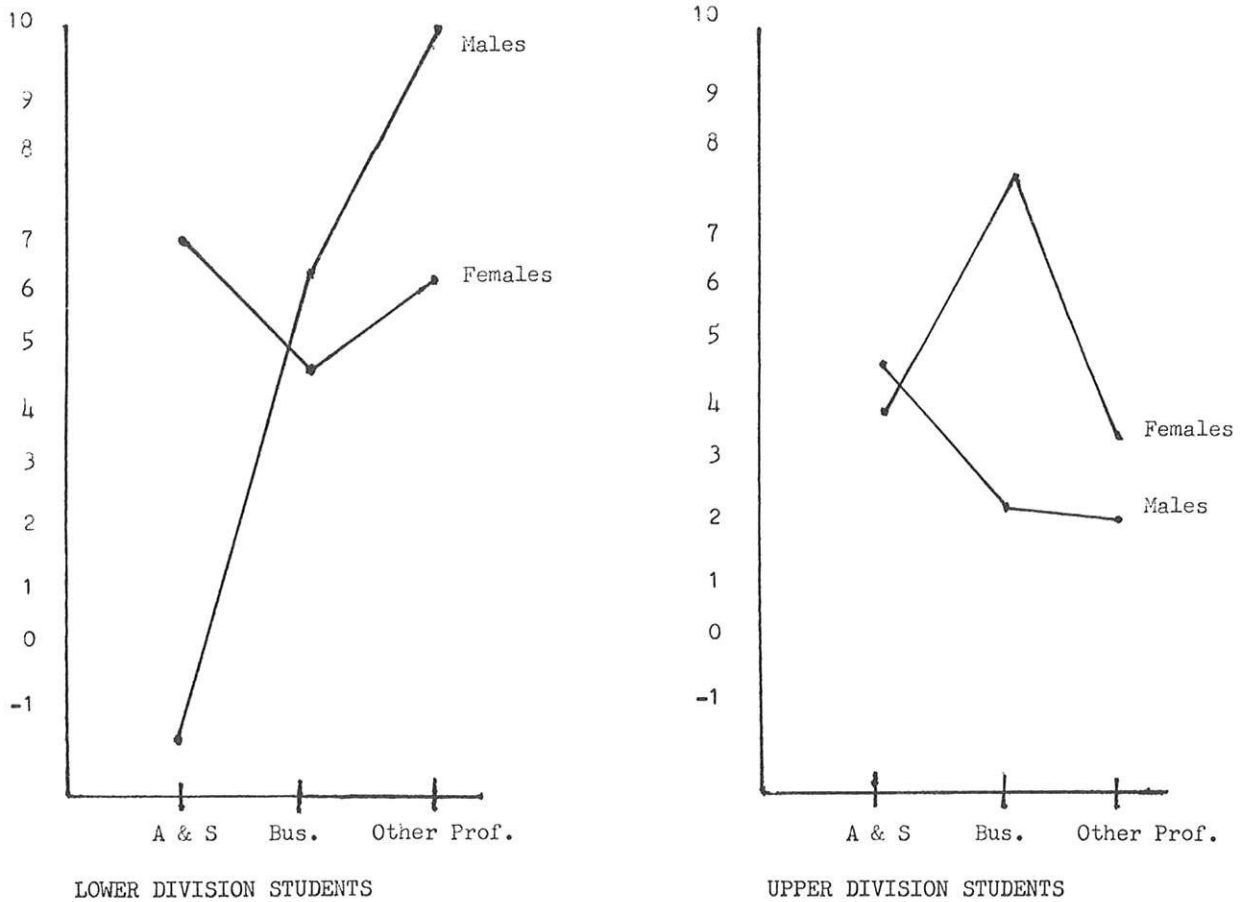
Table 1: Analysis of Variance Summary for TCC Gain Scores by Sex, Major and Academic Levels of Students

Source	SS#	df	MS	F
Sex (A)	0.15	1	0.15	0.01
Major (B)	9.65	2	4.82	0.32
Academic Level (C)	80.79	1	80.79	5.42*
A X B	16.63	2	8.31	0.56
A X C	1.40	1	1.40	0.09
B X C	99.99	2	49.99	3.35*
A X B X C	177.84	2	88.92	5.96*
Error	1416.92	95	14.92	

*p .05

#Sequential

Figure 1: Mean Sample Gain Scores on the TCC for Upper and Lower Division Students



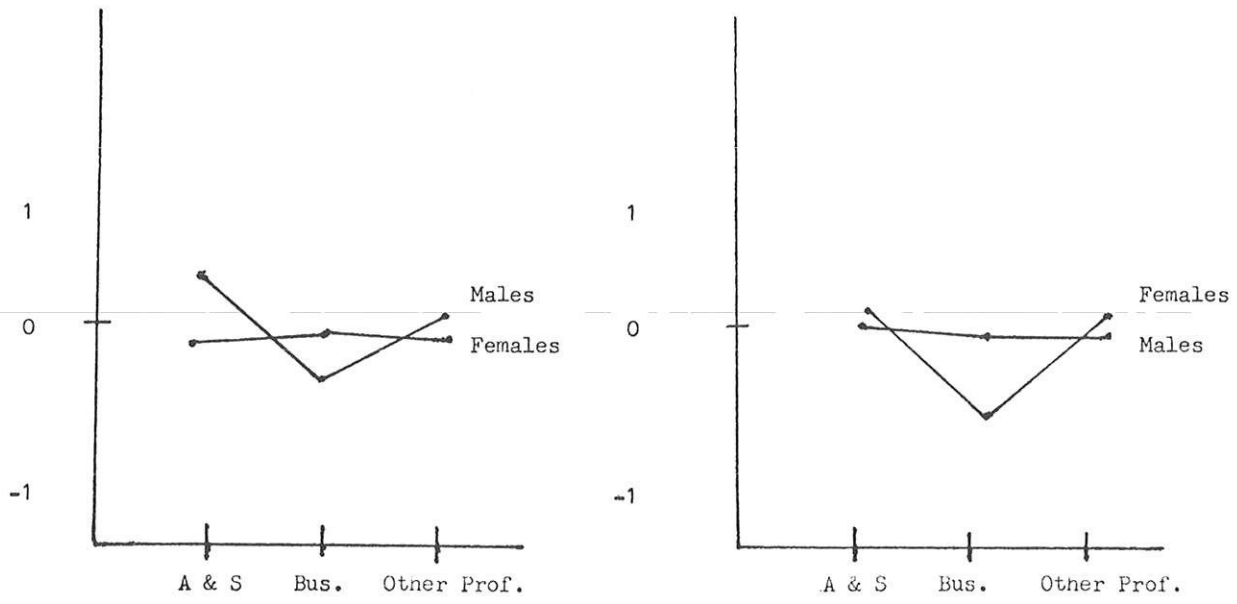
Analysis of variance was used to analyze the effect of the independent variables of sex, major, and academic level on the overall change in expressed attitudes. A gain score of summed posttest CIAI score minus summed pretest CIAI score was calculated. Negative gain scores indicated that expressed attitudes digressed in the direction of neutrality. Results revealed that a statistically significant difference in the gain scores was attributable to the variable of major ($F = 4.08$, $df = 2, 124$; $p < .05$). "Business" majors experienced the largest mean gain score of -12.01 points, indicating a shift in attitudes away from that expected of consumer advocates. The mean summed gain score for "arts and sciences" majors equalled -3.42 points, while "other professionals" experienced the least change in attitudes (-0.85 points). For all students, the gain scores indicated a shift in attitudes to a more neutral response and away from, rather than toward, the consumer advocate response.

Table 2: Descriptive Statistics for CIAI Subscales and t-test on Gain Scores

Subscale	N	Pretest $\bar{X}$	Pretest SD	Posttest $\bar{X}$	Posttest SD	Gain Scores $\bar{X}$	Gain Scores SD	t-test	df
Safety and Protection	139	3.51	0.52	3.35	0.53	-0.17	0.56	-3.54	138***
Choice	139	3.43	0.51	3.45	0.55	0.02	0.55		
Consumer Voice	139	3.53	0.48	3.49	0.50	-0.04	0.53		
Information	138	3.59	0.65	3.42	0.61	-0.17	0.64	-3.13	137**
Redress	138	3.55	0.56	3.42	0.60	-0.13	0.58	-2.63	137**
Public Policy	137	3.33	0.47	3.31	0.49	-0.02	0.54		

*p .05
**p .01
***p .001

Figure 2: Mean Sample Gain Scores on the CIAI Subscale, Safety and Protection for Upper and Lower Division Students



To further analyze the effect of the independent variables on the posttest CIAI scores, a series of analysis of variance procedures using mean subscale gain scores were conducted. Mean subscale gain scores calculated on the basis of the five-point Likert-type scale were used to investigate gains on each subscale. For both pre- and posttests, scores were computed for each subscale and divided by the number of questions included in each subscale. Mean pre- and posttest scores were then subtracted to yield the gain score. The difference in the subscales resulted in a much smaller number than for the total test where gain scores were based on the summed score of the items.

Although attitude changes as measured by pre- and posttest scores on the CIAI differed significantly for three subscales as a result of the independent variables, the results must be interpreted with caution. Statistical significance means that the changes in the dependent variable, gain scores, when considered on the basis of the independent variables of sex, major and academic level, were greater than would have been expected by chance. Substantively, the difference in these gain scores, when considered on the basis of the adjusted five point scale, were considerably less than one point.

A significant second order interaction indicated that change in attitude as measured on the subscale Safety and Protection varied with the interaction of the variables of sex, major, and academic level ($F = 3.11$; $df = 2, 126$; $p < .05$). Lower division females in all three majors expressed changes in attitudes which were very similar as shown by the almost horizontal line in Figure 2. Lower division males majoring in "business" experienced a greater shift in attitudes as measured by the gain scores than did males in the other two majors, or all females. For upper division students, a complete reversal of the pattern occurred. Female "business" majors expressed the strongest shift in attitudes of all upper division students, while upper division males experienced little attitude change. For all students the gain scores as measured by posttest CIAI score minus pretest score was negative, indicating a shift in attitudes to a more neutral response, rather than toward a consumer advocate response.

An F of 5.29 was associated with a significant first order interaction of major and academic level for the subscale Consumer Voice ($df = 1, 126$; $p < .05$). The significant interaction effect indicated that the amount of expressed changed in attitude varied with the interaction of the sex and academic level of the student. Upper division males expressed no change in attitude on this subscale, while lower division males experienced a slight digression toward neutrality. Lower and upper division female students experienced almost equal changes in attitudes in opposite directions. Mean gain score for lower division females equalled -0.21, while for upper division females the mean gain score equalled +0.20. For males and females, lower division students experienced shifts in attitudes in the direction of neutrality, while upper division students' attitudes moved in the direction anticipated of consumer advocates.

This observation supports the significant F of 10.10 which revealed a significant difference in the CIAI mean gain scores on the subscale Consumer Voice associated with academic level ($df = 1, 126$; $p < .01$). Mean gain score for lower division students equalled -0.17, while mean gain score for upper division students equalled +0.10.

Information was the final subscale for which variance in the mean gain scores was associated with the independent variables. An F of 5.20 indicated that change in attitude as measured by the CIAI on this subscale was significantly associated with the sex of the respondent ($df = 1, 126$; $p < .05$). Males expressed no change in attitudes on the subscale Information. A mean gain score for females of -0.27 indicated a digression of expressed attitudes toward neutrality.

Discussion

Prior research to assess changes in consumer knowledge and attitudes as a result of a consumer education course at the secondary or post secondary levels have yielded inconsistent results. This study was designed to further examine changes and to attempt to identify factors related to these changes. Results of this investigation conform to the general pattern which has emerged on the basis of previous studies of postsecondary changes [6, 8]. Postsecondary consumer education courses appear to effect changes in attitudes and increases in consumer competency. But, the attitude change found in the present study was opposite of that previously reported. The effect of the factors of sex, major, and academic level and their interaction on these changes resulted in a relatively high level of statistical significance. However, these observations do not support substantive generalizations.

Two previous studies conducted by Garman [6, 8] found the attitude changes to be consistent with the hypothesis that students completing a consumer education course would possess attitudes more like those of consumer advocates. In this context Garman asked, "if opinions do change, do almost all of them change in a direction in which they are in greater agreement with consumer advocates?" [6, p. 6]. Results of this study indicate an emphatic "No." A significant change in attitudes in the direction opposite of that expected of consumer advocates occurred as a result of the intervening consumer education class. Specifically, scores on five of the six subscales indicated a movement away from the consumer advocate position. Only for the subscale Choice did the students express attitudes anticipated of consumer advocates. Changes in expressed attitudes as measured by gain scores were statistically significant ($p < .01$) for the subscales Safety and Protection, Information, and Redress.

Students' major area of study further explained differences in expressed attitudes. Students majoring in areas identified as "other professionals" expressed attitudes most like those anticipated of consumer advocates, while the attitudes of "business" majors sharply digressed from those expected of consumer advocates. This result is similar to results of earlier studies which compared attitudes of consumers, business representatives, and consumer advocates.

In one of the earliest studies to compare the attitudes of these three groups, Gazda [9] concluded that consumers, business representatives, and consumerists held substantially different attitudes on consumer issues. A national opinion research survey commissioned by the Sentry Insurance Company, titled Consumerism at the Crossroads [10] compared the attitudes of consumers, business representatives, consumer advocates, and government regulators. The survey report concluded that "the business community is sharply out of step with the American people on consumerism issues" (p. v). Differences also existed in the views held by consumers and consumer advocates on some issues.

If the Bannister and Monsma [1] definition implicitly postulates cognitive, affective, and behavioral change as a consequence of consumer education, did this postsecondary educational experience fulfill its objective? Results of this research indicate that a cognitive change, as measured by performance on the Stanley Test of Consumer Competencies, occurred in association with this course. Results also indicate that affective change, as measured by the Lown Consumer Issue Attitude Inventory, occurred in association with this course. No attempt to measure behavioral changes was included in this study. However the level of statistical significance and the magnitude of the cognitive and affective changes as measured by the research instruments would argue that this course did fulfill its objective of consumer education.

The definition does not presuppose a strong consumerism viewpoint for effective marketplace functioning. Consumer education should be reflective of the increased knowledge and awareness necessary to facilitate effective consumer decision making. Results of this study both support and contradict earlier findings. The assessment of cognitive and affective changes resulting from a consumer education course is a complex issue worthy of further investigation.

The results of this study have begun to demonstrate the complexity of the influence of demographic variables on changes in consumer knowledge and attitudes. For example, academic level is a pervasive influence when measuring change in consumer knowledge, however the significance of the other variables comes from their interaction. The conclusion of this study is that the variables of sex, major, and academic level must be investigated not only for their independent effects, but also to allow for the non-additive effects of their interaction. This conclusion is particularly obvious when gain scores are used.

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