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The new Magnuson-Moss Warranty and Federal Trade Commission Improvement Act requires businesses to reappraise their current warranty practices. They now face standards for what a warranty must contain and how easy it is to read. The authors test a model relating consumer socioeconomic characteristics and attitudes to warranty behaviors. The methodological and substantive implications of the findings are explored.

A Linear Covariate Model of Warranty Attitudes and Behaviors

At the present time many companies are concerned with their warranty practices (Kendall and Russ 1975; McGann 1972; Nordstrom and Metzner 1976); others are in the process of modifying or eliminating warranty provisions (Kendall and Russ 1975; McGann 1972). These actions by firms are in part a re-evaluation of the role of warranties in the marketing mix, but also appear to reflect a fear of a more hostile legal environment (Business Week 1976; Feldman 1976; Fisk 1970; Kendall and Russ 1975; Loudenback and Goebel 1974; Udill and Anderson 1968). Despite self-regulatory efforts with respect to warranty provisions and practices by concerned industry and trade organizations, the Magnuson-Moss Warranty and Federal Trade Commission Improvement Act was passed in 1975 (Legislative Analysis 1973; Powell 1976; Rador 1966).

Known as the “Lemon Law,” the Magnuson-Moss Act is considered by both consumerists and industry to be one of the most far-reaching consumer protection bills passed in recent years. For the first time, truly stringent standards were formulated for what a warranty must contain and how easy it is for buyers to understand. Though it is too early to anticipate the impact of the act, speculation has raised some interesting questions.1

What are consumer attitudes toward warranties and toward those business institutions responsible for meeting the warranty conditions? “Attitudes” refers to buyers’ positive or negative orientations toward warranties and the implementation of warranties. It seems likely that warranty attitudes range from positive to neutral.

Written warranties in many cases are used to promote products (Kendall and Russ 1975; Nordstrom and Metzner 1976; Stores 1976). It seems reasonable to expect a relationship between attitudes toward warranties and select consumer behaviors (McGann 1972; McQuade 1972). For example, positive attitudes toward warranties suggest a greater predisposition to search for warranty information. Negative warranty attitudes by consumers, in contrast, imply that these consumers feel that warranties are of no value (McQuade 1972; Pennock and Jaeger 1964; Perry and Perry 1976; Trombita and Wilson 1975). Price and/or quality may be of greater importance, and consumers having warranty attitudes somewhat between “extremely positive” and “extremely negative” may trade off warranty coverage for lower prices. If so, differences in attitudes among consumers toward warranties would

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1Nevertheless, a 1976 study of a sample of warranties suggests that consumers with a tenth grade highschool education should easily understand most warranties (Shuptrine 1976). Readability measures used were the Fog Index and the Dale-Chall Method.

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be a fruitful basis for segmentation (Berens 1976; Kendall and Russ 1975; Udill and Anderson 1968).

Do warranty attitudes differ among consumers? More specifically, do warranty attitude consumer types exist? Analogously, the literature strongly supports the notion of "shopping types," each type with different shopping orientations (Darden and Reynolds 1971; Stone 1954). Marketing and social psychological theory also suggests that discrete groups of consumers have different orientations toward warranties (Darden and Rao 1977; Kendall and Russ 1975). Consumers in different social classes attach different values to shopping tasks (Hollingshead and Redlich 1958) and to the risk involved in purchasing goods (Loudenback and Goebel 1974).

Stone (1954), in his classic study on shopping orientations, finds that some shoppers form strong personal relations with store personnel (personalizing shopper), yet others view shopping as a "distasteful task" to be avoided at all costs. For the same social psychological reasons one might expect some shoppers to enjoy exploring warranty terms with retail store personnel and/or to shop at those stores where warranties are a means of establishing intimate relations with store personnel. "Apathetic shoppers" (Stone 1954) may well emphasize quality to avoid additional shopping or service relations with store personnel. Stone’s "economic shopper" could logically trade-off warranty terms for price discounts or superior quality.

To what extent do warranty attitudes and socio-economic characteristics relate to "projected warranty behaviors?" In this study "projected warranty behaviors" are behaviors that are expected to be instrumental in the purchase decision process and that concern warranties. The following behaviors were selected for investigation.

1. Warranty information search. To what extent does the consumer look for and/or evaluate warranty terms in the decision process?
2. Price responsiveness to extended warranties. It is hypothesized that some consumers are willing to pay higher prices for extended warranty periods. Prior studies suggest that consumer demand for warranties is related to the level of risk that they perceive in the use of the product (McGann 1972). The extent that the consumer is willing to accept a price increase in exchange for extended warranty coverage is probably motivated by the same socio-economic forces as is consumer need for the warranty.
3. Importance of warranty at time of purchase. The very presence of a warranty at time of purchase is considered of importance to some consumers. It represents a sine qua non, but not a sufficient condition for purchase. Despite the pressure of warranty legislation on business, warranty attitudes may have little effect on marketing behavior. The authors hypothesize that only in the case of price/warranty coverage tradeoffs will warranty attitudes relate to consumer behavior. This hypothesis is predicated on the belief that the latter behavior is a more instrumental economic belief, whereas warranty search and warranty importance are part of normal shopping orientations.

STUDY APPROACH

Two hundred and fifty households from a midwest standard metropolitan statistical area were approached to test the hypotheses about warranty attitudes and prospective warranty behaviors. A random systematic sampling plan was developed to select households to be interviewed. A city directory was used to choose respondents systematically from randomly selected areas. If the respondent was not at home or refused to be interviewed, interviewers were requested to replace that household with the one as directly across the street as possible.

Interviewers were MBA students who had received one week of training for the project. Twenty percent of the completed questionnaires were chosen randomly for purposes of control. Survey administrators looked up these respondents in the telephone book, cross-checked addresses, called respondents, and queried each as to how the interviewer handled the assignment. After elimination of incomplete or otherwise unusable questionnaires, 196 were available for analysis.

Instrument Design

The self-administered questionnaire was designed to elicit from respondents: (1) measures of their attitudes toward warranties on heavy duty appliances (e.g., refrigerators, dryers, electric ranges, freezers), (2) measures of their warranty behaviors, and (3) descriptions of their demographic and socioeconomic characteristics. The seven Likert-type warranty attitude scales were developed in prior studies of product warranties. In this study respondents were asked to rate each Likert statement on a six-point agreement scale ranging from definitely agree (1) to definitely disagree (6). Table 1 shows a sample statement for each scale, the number of statements for each scale, the alpha reliability measure for the scales, and the factor loading for the sample statement. Principal axes factor analysis of the statements with orthogonal rotation (varimax rotation) suggests high construct validity for the scales (Overall and Klett 1972). Table 1 also shows that reliability is acceptable for each of the seven warranty attitude scales developed for this study (Cronbach 1951). The operations of the warranty constructs seek to measure attitudes in the following areas: (1) adequacy of dealer performance with respect to warranties, (2) the need for government regulation of warranties, (3) the extent to which the consumer feels the need for warranties is the fault of buyers, (4) the extent to which the consumer feels that buyers are aware of warranty terms, (5) overall value of warranties to the consumer, (6) the consumer’s faith in the actual fulfillment of warranties, and (7)
in general the adequacy of coverage of warranties. On the basis of pretest results these warranty dimensions appear to define the warranty psychological domain of most consumers in the study.

To obtain a measure of warranty information seeking, respondents were asked to rate the following question on a five-point scale ranging from always (coded 1) to hardly ever (coded 5):

> When you purchase a major household appliance do you inquire about the warranty and its details?

The operation of the warranty price responsiveness construct was undertaken by asking respondents to indicate the percentage price increase they would be willing to pay for double the warranty period. Respondents were asked to select from seven choices ranging from no increase (0) to 10% or more (6). The remaining warranty decision behavior (importance of warranty at time of purchase) was measured by asking respondents to rate how important warranty terms were to them at the time of purchase. A seven-point rating scale ranging from least important (1) to most important (7) was used for this purpose.

### Analysis Approach

The first issue in the study is the possibility that there are groups of consumers who have warranty attitudes that are unique to the group. A hierarchical grouping procedure, suggested by Ward (1963) and programmed by Veldman (1967), was used to cluster the respondents into groups based on their profiles of warranty attitudes (see Table 1).

Because hierarchical cluster routines generate many classification solutions, a program called CASORT was used to analyze the more promising ones to determine the most natural and unique grouping of respondents (Darden and Howell 1978). CASORT examines each classification solution with univariate MANOVA F-statistics and an overall MANOVA statistic to ascertain the extent of similarity of warranty attitudes within each group and the extent of dissimilarity among groups for a given classification. These statistics serve as measures of the efficiency of the grouping procedures (in this case HGROUP) and the extent that there are discontinuous and unique groups within the space being investigated (Darden and Howell 1978; Johnson 1972). The solutions were also evaluated with the simulation program of McClain and Rao (CLUSIZ), which makes no distribution assumptions of the clusters. If a feasible classification exists, mean warranty attitude profiles (centroids) can be computed for each group. These mean profiles can be examined and compared to ascertain the uniqueness of each group (Johnson 1972; Overall and Klett 1972; Veldman 1967; Ward 1963).

The next step in the analysis is to ascertain whether warranty attitudes are related to the warranty decision behaviors of shoppers. The model for which parameters must be estimated and tested is that of equation 1.

$$ Y = X\beta + Z\gamma + \epsilon $$

Here Y is an $n \times m_1$ matrix of projected warranty behaviors, X is an $n \times (m_2)$ matrix of warranty attitudes, Z is an $n \times (m_3)$ matrix of socioeconomic and demographic characteristics, and $\epsilon$ is an $n \times (m_1)$ matrix of errors. The columns in the matrices Y, X, Z, and $\epsilon$ are mean-centered to zero. In this research there are three projected warranty behaviors ($m_1$), 196 respondents ($n$), seven warranty attitudes ($m_2$), and four socioeconomic and demographic characteristics ($m_3$). Because past studies have shown that demographic and socioeconomic variables are related to market behaviors (Darden and Perreault 1975; Wind

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### Table 1

**WARRANTY ATTITUDE SCALES**

<table>
<thead>
<tr>
<th>Scale name</th>
<th>Sample statements</th>
<th>Factor loading</th>
<th>No. of statements</th>
<th>Reliability alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Dealer performance</td>
<td>Dealers and retailers purposely avoid repair work covered by warranty</td>
<td>.79</td>
<td>3</td>
<td>.88</td>
</tr>
<tr>
<td>II. Warranty regulation</td>
<td>More government control and regulation are necessary to improve customer service under warranties</td>
<td>.87</td>
<td>2</td>
<td>.59</td>
</tr>
<tr>
<td>III. Consumer fault</td>
<td>Most consumers are negligent in using the appliance*</td>
<td>.83</td>
<td>2</td>
<td>.63</td>
</tr>
<tr>
<td>IV. Consumer knowledge of warranty terms</td>
<td>Most consumers read and hence know what the warranty covers</td>
<td>-.63</td>
<td>2</td>
<td>.46</td>
</tr>
<tr>
<td>V. Value of warranties</td>
<td>Warranties are useless for all practical purposes</td>
<td>.81</td>
<td>3</td>
<td>.85</td>
</tr>
<tr>
<td>VI. Faith in the worth of repairs</td>
<td>Repair work under warranty would be the same quality as repair work paid for*</td>
<td>.73</td>
<td>3</td>
<td>.53</td>
</tr>
<tr>
<td>VII. Adequacy of warranty (coverage)</td>
<td>In general, present warranties offer adequate coverage*</td>
<td>-.74</td>
<td>3</td>
<td>.57</td>
</tr>
</tbody>
</table>

*Reverse scored.
and Denny 1974), the authors believed that the model should provide control for the moderating effects of these variables. Thus \( Z \) is included to control for their effects. In fact, it is hypothesized that socioeconomic characteristics relate to warranty behaviors. If so, they should be of some importance to businesses in formulating warranty policy.

But in step 1 of the analysis, cluster analysis reduces the seven measures of warranty attitudes to a group assignment (see Tables 2 and 3) measure. In addition, sex is a nominal variable. These considerations suggest that a conventional two-factor multivariate analysis of variance (MANOVA) model is more isomorphic to the theory being tested. The general linear model, as conceptualized by Bock and Haggard (1968) and programmed by Cramer (1967), was used in the analysis. Thus equation 1 can be best extended in symbolic form as in equation 2.

\[
Y_{ijk} = \mu + \alpha_j + \beta_k + \gamma Z_{ijk} + \epsilon_{ijk}
\]

In this extended fixed effects model \( Y_{ijk} \) is a 3-element dependent vector variable, for the \( i \)-th respondent, the \( j \)-th warranty attitude groups, and the \( k \)-th sex level. The terms of \( Y_{ijk} \) include: (1) \( \mu \), the grand centroid (vector of expected values of \( Y_{ijk} \)); (2) \( \alpha_j \), the vector of effects due to the \( j \)-th warranty attitude group; \( \beta_k \), the vector of effects due to the \( k \)-th sex level (male, female); (3) the product of \( Z_{ijk} \) (a 3-element vector of covariates for the \( i \)-th respondent, in the \( j \)-th warranty attitude group, and in the \( k \)-th sex level) and \( \gamma \) (a 3 \( \times \) 3 matrix of covariate beta coefficients); and (4) \( \epsilon_{ijk} \), the 3-element error vector for the \( i \)-th respondent, the \( j \)-th warranty attitude group, and the \( k \)-th sex level.

Thus the model assumes that age, education, and income are covariates and hence elements of the vector \( Z_{ijk} \). Equation 3 demonstrates the process of deriving \( \bar{Y}_{ijk} \) from \( Y_{ijk} \), where demographic factors are controlled.

\[
\bar{Y}_{ijk} = Y_{ijk} - \gamma Z_{ijk}
\]

Because sex is included in the model as a fixed effects factor, its effect on warranty behaviors, if any, is also controlled.

\[
Y_{ijk} = \mu + \alpha_j + \beta_k + \epsilon_{ijk}
\]

Equation 4 is the model after adjustment for covariates. Because all variables are mean-centered to zero, \( \mu \) represents the grand mean vector of \( Y_{ijk} \).

**Warranty Attitude Groups**

As already explained, respondents were clustered analyzed within the 7-dimensional warranty attitude space. Table 2 contains the CASORT statistics generated from the two most promising cluster solutions (7-group and 3-group). The 7-group solution is clearly superior. The traditional stress coefficient (Veldman 1967) increases dramatically (62%) when the hierarchical procedure moves from a 7-group to a 6-group solution.\(^4\)

Table 2 also shows that the multivariate correlation of attitude profiles to group assignment is greatest for the 7-group solution (Bock and Haggard 1968). The degree of this correlation (967), along with the high univariate \( F \)-ratios (one is computed among the 7 groups for each of the 7 attitude dimensions), suggests that these groups represent unique and discontinuous warranty attitude types (Cronbach 1951).\(^5\)

**General Warranty Attitudes**

Column 2 of Table 3 contains adjusted grand mean warranty attitude ratings for each of the warranty constructs. In general this profile suggests that consumers in this study are lethargic towards warranties; their average scores are somewhere between "slightly disagree" and "slightly agree." Indeed, the finding that the average respondent indicates faith in the worth

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\(^2\)No interaction between warranty behaviors and sex was assumed in the model. Indeed, theory does not suggest such an interaction. A subsequent test of such a model did not support interaction effects (see Table 4).

\(^3\)Overall and Spiegel (1969) demonstrate three methods to use in estimating main effects in an \( n \)-factor design. Method 1 is used in this study and involves adjusting the \( k \)-th factor for all \( k \)-1 prior factors. Thus the main effects for warranty attitudes are adjusted for sex in Table 4.

\(^4\)Stress in this instance refers to the increase in within-group variation due to combining two groups in moving from a \( k \) to a \( k \)-1 group cluster solution. In most hierarchical cluster approaches the two groups to be combined are chosen in a manner that minimizes the increase in within-group variance for the new group.

\(^5\)These statistics are used to characterize the nature of the groups generated by the cluster solution. They are not intended as approaches to making inferences, because the objective of the procedure is to create significant differences.
of warranties (see construct 6) suggests that warranties are positive promotional tools.

But the discrete nature of the cluster solution suggests that at least some kinds of consumers do not like at least some aspects of warranties. Figure 1 contains clustered profiles after subtraction of each element in the grand mean profile from the same element in each of the group mean profiles. Clearly warranty attitude groups 6 and 7 are most negative toward warranties, whereas groups 4 and 5 have the most positive attitudes. The other three groups present “mixed” feelings toward warranties, each cluster possessing unique combinations of positive and negative predispositions toward different aspects of warranties.

Warranty skeptics—clusters 6 and 7. About 8.2% of the sample were in cluster 6. The mean warranty attitude profile for these consumers (see Table 3) suggests that they feel warranties are useless. They think that more government regulation is needed to make warranties useful. In general, they perceive dealers and retailers as shirking their performance responsibilities and feel that consumers read and understand warranty coverages.

These respondents believe that consumers are not negligent, and that the need for warranties in many cases is not the result of their misuse or abuse of the product. The consumers in this warranty segment also feel that present warranty terms are not adequate, and that repair work under warranty is not equivalent to repairs for which payment must be made.

Respondents in warranty attitude cluster 7 record strong sentiments for warranty regulation by government. However, these respondents (8.3%) express greater faith in the performance of dealers and also indicate that the caliber of repair work under warranty is equivalent to that of paid repairs.

Warranty supporters—groups 4 and 5. Consumers in warranty attitude clusters 4 and 5 are similar in their belief that dealers do not avoid repair work covered by warranty. They feel that warranty regulation by government is sufficient and they see warranties as having value. These respondents in general believe that repair under warranty does receive the same attention as that for which payment is made. They also tend to believe that present warranty coverages are adequate.

Though consumers in both clusters 4 and 5 feel that warranties have value, only those in group 4 believe that consumers are negligent in using appliances under warranty. In addition, only those in warranty cluster 5 perceive consumers being knowledgable about warranty terms. Thus even warranty supporters appear to disagree as to the extent and source of warranty problems. These two groups comprise about 35% of the respondents studied.

Government regulation—groups 2 and 3. Consumers in group 3 are neutral to favorable toward (1) dealer performance, (2) faith in the quality of dealer repairs, and (3) adequacy of warranty coverage. They even feel that consumers are at fault when warranty repairs are needed. Nevertheless, these respondents suggest that consumer knowledge of warranty terms is inadequate, and thus strongly believe that more government regulation is the answer to many warranty problems.

Respondents in group 2 also believe that additional regulation of warranties is necessary. In addition, they believe in general that dealers and retailers purposely avoid repair work covered by warranty when they can do so. Though the members of cluster 3 feel that consumers do not understand warranty terms, clusters 2 and 3 have similar attitudes toward warranties. These two clusters comprise about 35% of the households studied in the random sample.

Consumer knowledge—group 1. This cluster is distinguished by their ambivalence in almost all warranty attitude dimensions. However, though they do not feel that more regulation is necessary, these respondents do not believe that warranty coverage is sufficient in most cases. These
consumers comprise about 13% of the respondents in the sample.

Thus the data from the study support the idea that there are relatively unique warranty attitude types. This 7-category classification is used in equation 4 as a 7-level predictor variable.

**MODEL ANALYSIS**

The analysis of the model (represented by equation 4) tests the null hypothesis of no differences in projected warranty behaviors among the seven warranty attitude groups and between the two sex levels (male and female). As already indicated, the analysis uses a program prepared by Cramer (1967) which computes tests of significance and estimates of the MANOVA effects for factor designs with unequal cell sizes. Such a program is necessary in this study because the levels of one factor (warranty attitude groups) are determined from the use of a classification program and the levels of the second (sex) are those of a blocking factor. In addition, the approach to the program employs the general linear hypothesis which is amenable to the construction of standardized weights from multiple discriminant functions. When used in tandem with the results of a multivariate analysis of variance (Darden and Perreault 1975), these weights are useful for interpretation.

The covariates are introduced into the model to increase in precision the test of the null hypothesis of no differences in warranty behaviors among the levels of the two factors (warranty attitude type and sex). In addition, if the alternative hypothesis is not accepted, the covariates can be examined to determine their contribution to the explanations of the variations in the dependent vector variable (Wind and Denny 1974).

**Test of the Model**

Table 4 contains the MANOVA statistics from the test of the model portraying relationships between warranty attitudes and warranty behaviors (equation 4). The null hypothesis of no difference in warranty behaviors among warranty attitudes is rejected at the .10 level of significance \( P(F \leq 1.53) = .075 \). There is somewhat weak support for the model after control for socioeconomic characteristics.

The data suggest that sex is not related to warranty behaviors at time of purchase \( P(F \leq .78) = .508 \). But the data also demonstrate little interaction effect on warranty behaviors between sex and warranty attitudes (see Table 4). The latter finding adds credibility to the model in equation 4, which does not include an interaction term.

Examination of the univariate F-ratios for each of the warranty behaviors suggests that warranty attitude groups relate to perceived warranty importance at the time of purchase for appliances \( P(F \leq 2.23) = .043 \). The intensity and direction of this relationship are shown by the discriminant analysis loading estimated for "warranty importance at time of purchase." The value of this loading is much larger than that for either "warranty information seeking" or "price for warranty extension" (see Table 4).

Table 5 shows the means for each of the dependent variables after adjustment for the effects of the socioeconomic variables (covariates). All warranty attitude groups—to some extent—feel that warranties are important at the time of purchase. However, those

### Table 4

**MANOVA STATISTICS: TEST OF MODEL RELATING WARRANTY BEHAVIORS TO ATTITUDES AND SEX WITH SOCIOECONOMIC COVARIATES**

<table>
<thead>
<tr>
<th>MANOVA statistics</th>
<th>F-ratio</th>
<th>df.*</th>
<th>Prob ≤</th>
<th>Canonical correlations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Warranty attitude groups (WA)</td>
<td>1.53</td>
<td>18;501</td>
<td>.075</td>
<td>.271</td>
</tr>
<tr>
<td>2. Sex (S)</td>
<td>.78</td>
<td>3;177</td>
<td>.508</td>
<td>.114</td>
</tr>
<tr>
<td>3. Interaction (S × WA)</td>
<td>.53</td>
<td>18;501</td>
<td>.947</td>
<td>.197</td>
</tr>
<tr>
<td><strong>Univariate statistics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Warranty importance</td>
<td>2.23</td>
<td>6;179</td>
<td>.043</td>
<td>- .831</td>
</tr>
<tr>
<td>2. Information seeking</td>
<td>1.72</td>
<td>6;179</td>
<td>.117</td>
<td>- .062</td>
</tr>
<tr>
<td>3. Price for warranty</td>
<td>1.08</td>
<td>6;179</td>
<td>.570</td>
<td>- .052</td>
</tr>
</tbody>
</table>

\*Degrees of freedom for hypothesis and error, respectively.

### Table 5

**COVARIATE ADJUSTED MEANS FOR DEPENDENT VARIABLES BY WARRANTY ATTITUDE GROUP**

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warranty importance</td>
<td>4.07</td>
<td>5.16</td>
<td>5.36</td>
<td>4.83</td>
<td>4.62</td>
<td>4.74</td>
<td>4.82</td>
</tr>
<tr>
<td>Information seeking</td>
<td>2.63</td>
<td>2.37</td>
<td>1.95</td>
<td>1.94</td>
<td>1.88</td>
<td>2.02</td>
<td>2.02</td>
</tr>
<tr>
<td>Price for warranty</td>
<td>1.22</td>
<td>1.83</td>
<td>1.83</td>
<td>2.15</td>
<td>2.06</td>
<td>2.40</td>
<td>2.26</td>
</tr>
</tbody>
</table>

\*For the nature of each attitude group, see the attitude profiles for each in Table 3.
consumers who feel more government regulation is required (groups 2 and 3) are especially adamant in insisting on warranties at the time of purchase of appliances. This finding supports the work of McGann (1972), who found a relation between perceived risk and type of warranty. It suggests that those consumers who demand warranty regulation, and also insist on warranties, perceive great risk in the purchase situation.

In summary, the data in this study only support the hypothesis that warranty attitudes are related to "perceived importance of warranties" at the time of purchase of appliances. This conclusion is reached after control for socioeconomic variables (covariates). Next the possible relationship between the covariates (age, education, and income) and the three warranty behaviors is examined.

SOCIOECONOMIC CHARACTERISTICS AND WARRANTY BEHAVIORS

Table 6 contains multivariate statistics that are useful in testing the null hypothesis that select socioeconomic characteristics (the covariates in equation 4) and warranty behaviors are not related. Included are Hotelling’s canonical correlation coefficient (Overall and Klett 1972), the associated canonical loadings for warranty behaviors, the standardized regression weights from the covariance analysis, and associated F-ratios. Overall, the covariates (age, education, and income) are very significantly related to the warranty behaviors (warranty importance at purchase, warranty information seeking before purchase, and price increase for warranty extension). The findings support the hypothesis that socioeconomic and demographic characteristics influences expected warranty behaviors ($p \leq .027$).

The next issue addressed is the nature of this overall relation. Examination of univariate F-ratios computed for each of the elements in the dependent vector variable — when each element in turn is regressed in the covariate space — demonstrates that only price for warranty extension is clearly related to the covariates ($p \leq .003$). Examination of the canonical loadings for the warranty behaviors substantiates this finding.

To determine how "price increase allowed for warranty extension" relates to socioeconomic characteristics, the standardized partial regression coefficients are enlightening (see Table 6). They show that in this study primarily income ($b_2 = .233$) and secondarily education ($b_3 = .188$) are related positively to price increase for warranty extensions. These findings are consistent with the belief that consumers with higher incomes can afford more services in general and are willing to pay more for extended warranty coverages in particular. These consumers have the discretionary income available to use for overcoming the inconveniences of not being under warranty. Further, those with more education in general have greater incomes and also are better able to assess the alternative costs of not being under warranty.

SOCIOECONOMIC CHARACTERISTICS AND WARRANTY ATTITUDES

Past studies have shown some relation between some socioeconomic and demographic characteristics and attitudes or predispositions (Darden and Trawick 1977). These findings suggest that such characteristics may also be related to membership in warranty attitude groups. Such an assumption seems natural as one suspects that consumers change their attitudes as their economic circumstances evolve — or as they become more educated about the advantages and/or the disadvantages of an attitude referent, such as warranties.

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Table 6

| RELATION OF SOCIOECONOMIC COVARIATES TO WARRANTY BEHAVIORS |
|-----------------------------------|-----------------|-----------------|-----------------|
|                                    | F-ratio | $d.f.*$ | Prob = $^b$ | Canonical $R$ | Canonical loadings | Regression coefficients (dependent variables regressed on covariates) |
| Multivariate statistics$^c$        |         |         |               |                |                  | Age | Education | Income |
| MANOVA                            | 2.12    | 9,431   | .027          | .30            |                   | -.057 | -.024 | .028 |

Univariate statistics

<table>
<thead>
<tr>
<th>Covariate</th>
<th>F-ratio</th>
<th>$d.f.*$</th>
<th>Prob = $^b$</th>
<th>Loadings</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Warranty importance</td>
<td>.18</td>
<td>3,179</td>
<td>.910</td>
<td>.08</td>
</tr>
<tr>
<td>2. Information seeking</td>
<td>1.90</td>
<td>3,179</td>
<td>.130</td>
<td>-.45</td>
</tr>
<tr>
<td>3. Price for warranty</td>
<td>4.78</td>
<td>3,179</td>
<td>.003</td>
<td>.93</td>
</tr>
</tbody>
</table>

$^a$ Degrees of freedom for hypothesis and error, respectively.

$^b$ Indicates the probability that this or a larger value of $F$ will occur in a central $F$-distribution under the null hypothesis with the indicated degrees of freedom.

$^c$ Only one root is significant at the .10 level.
Table 7
RELATION OF WARRANTY ATTITUDES TO SOCIOECONOMIC CHARACTERISTICS

<table>
<thead>
<tr>
<th>Socioeconomic variable</th>
<th>F-ratio</th>
<th>d.f.*</th>
<th>P ≤</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>1.28</td>
<td>6;189</td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>1.70</td>
<td>6;189</td>
<td></td>
</tr>
<tr>
<td>Income</td>
<td>.88</td>
<td>6;189</td>
<td></td>
</tr>
</tbody>
</table>

*Degrees of freedom for hypothesis and error, respectively.

The socioeconomic characteristics of the consumers in this study show no relation to their warranty attitude classification. Table 7 contains F-ratios computed to test the hypothesis that each of the socioeconomic characteristics is independent of warranty attitudes. The striking lack of significance provides compelling evidence of the independence of these two kinds of characteristics. It suggests that warranty attitudes have their genesis in other than sociopsychological factors. The inclusion of warranty attitude group effect and socioeconomic covariates in equation 4 is further justified by their lack of relation to each other.8

THE NEED FOR COVARIATES

The preceding section raises an important issue: why not carry out two separate analyses on warranty behaviors in the first place? The first analysis would test a model with only warranty attitude group effect. The second would focus on the canonical correlation between warranty behaviors and socioeconomic characteristics (the covariates in equation 4). Though the reasoning is expounded in a prior section, the presentation of the results of the first kind of analysis should be instructional. In this case, the model under test is that of equation 4, but without the covariate term (without \( \gamma Z_{jk} \)).

Table 8 contains the MANOVA and univariate F-ratios from such an analysis. Without adjustment for covariates, warranty attitude classification is mistakenly portrayed as being strongly related to projected warranty behaviors. The model under equation 4 (with covariates) suggests only moderate relation—and in particular only moderate relation to warranty importance. The more unified model of equation 4 allows the analyst to “unravel” the effects of different kinds of variables on warranty behaviors. This model suggests strongly that warranty behaviors at time of purchase are influenced more by income and education than by attitude toward warranties and warranty performance.

IMPLICATIONS AND CONCLUSIONS

This study has both methodological and substantive implications for marketing research and marketing management. First, it suggests that appropriate statistical modeling can lead to more accurate inferences about the effects of sets of predictors on multivariate dependent variables. In particular, multivariate analysis of covariance is beginning to be used by marketing researchers who are interested in controlling for distortions due to suppressor and other concomitant variables (Darden and Perreault 1975; Wind and Denny 1974). In general, more sophisticated statistical models, with overall MANOVA and univariate tests of significance, if analyzed properly, can lead to better tests of theory. This improvement usually also results in fewer specification problems in regression (Overall and Klett 1972).

In a substantive sense, the study results give support to the following views.

1. Marketing managers should understand that consumers' attitudes toward warranties bear little relation to their projected warranty behaviors. Instead, socioeconomic characteristics of market segments should be considered in designing product strategies.

Table 8
MANOVA MODEL WITHOUT COVARIATES

<table>
<thead>
<tr>
<th>Variables</th>
<th>F-ratio</th>
<th>d.f.*</th>
<th>P ≤</th>
<th>Canonical R</th>
<th>Loadings</th>
</tr>
</thead>
<tbody>
<tr>
<td>MANOVA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex (S)</td>
<td>2.082</td>
<td>3;180</td>
<td>.104</td>
<td>.183</td>
<td></td>
</tr>
<tr>
<td>Attitudes (A)</td>
<td>1.77</td>
<td>18;510</td>
<td>.026</td>
<td>.29</td>
<td></td>
</tr>
<tr>
<td>Interaction (S × A)</td>
<td>.534</td>
<td>18;510</td>
<td>.942</td>
<td>.20</td>
<td></td>
</tr>
</tbody>
</table>

Univariate statistics

1. Warranty importance: 2.28, 6;182, .038, .53
2. Warranty information seeking: 1.82, 6;182, .097, .39
3. Price for warranty: 1.55, 6;182, .164, -.37

*Degrees of freedom for hypothesis and error, respectively.

*Indicates the probability that this or a larger value of F will occur in a central F-distribution with the indicated degrees of freedom.

8Collinearity among predictors in regression violates a basic assumption of such models. Termed "multicollinearity," the condition leads to less precision in the estimation of regression coefficients (Overall and Klett 1972).
Consumer education and income show strong relationships to projected increases in product price for warranty extension. Some relationship is also suggested between these same variables and warranty information seeking. Thus if the market segment to be addressed is in general better educated and has higher incomes, a strategy involving higher prices with longer (and better) warranties should be more successful. Market segments with lower incomes and less education may prefer lower prices at the cost of less warranty coverage.

2. Though the findings strongly suggest the existence of unique warranty attitude groups, this classification is not promising for segmentation of product markets. The raison d'être for this conclusion is the lack of relationship between the warranty attitude classification and projected warranty behaviors. Though marketers must live with the propinquity of unfavorable attitudes toward warranties, the findings offer no strategy for meeting objections. Marketers can take heart only from the fact that most consumers are indifferent or they are supporters of warranties in their present form. No variable considered in this study seems to relate strongly to warranty attitudes.

3. Warranty attitudes do not appear to relate to the socioeconomic characteristics of the consumers in this study. Though only income, education, sex, and age were studied, the findings suggest that stage in the consumer lifecycle is not important in shaping warranty attitudes. Warranty repair experiences have shown little relation to select warranty attitudes in other studies (Darden and Rao 1977).

Thus three major conclusions are drawn from this study.

1. Seven unique warranty attitude types were found in a sample of consumers selected from a medium-sized SMSA. About 16% of these express predominantly negative attitudes toward warranties (groups 6 and 7 in Table 3). About 35% of the respondents are predisposed to support nearly all aspects of warranty programs as now practiced in business (groups 4 and 5). About 36% are relatively ambivalent on most warranty attitude dimensions (groups 2 and 3), and do feel that some government regulation is needed. Finally, another 13.2% are neutral on all attitude dimensions except the adequacy of warranty coverage (group 1). The latter consumers feel that most appliance warranties have inadequate coverages.

2. The model in equation 2 is strongly supported by the data collected. Moderate support for the model expressed in equation 4 (covariate adjusted) was found. In particular, warranty attitudes seem related to projected warranty behaviors.

3. Strong association between the covariates of equation 2 and projected warranty behaviors was found in the analysis of the data. The data suggest that better educated, higher income consumers are more willing to pay higher prices for longer and better warranties.

APPENDIX

WARRANTY ATTITUDE STATEMENTS

<table>
<thead>
<tr>
<th>Factor 1. Perception of dealers' and retailers' warranty attitudes</th>
<th>Loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Dealers and retailers purposely avoid repair work covered by warranty.</td>
<td>.79</td>
</tr>
<tr>
<td>2. Dealers and retailers unduly delay the repair work covered by warranties.</td>
<td>.79</td>
</tr>
<tr>
<td>3. Dealers and retailers always try to find fault with consumer handling of the appliance.</td>
<td>.84</td>
</tr>
</tbody>
</table>

Factor 2. Governmental regulation and laws

1. More government control and regulation are necessary to improve customer service under warranties. .87
2. Stricter product liability laws should be passed. .78

Factor 3. Consumer treatment of appliances

1. Most consumers are negligent in using the appliance. .83
2. Most consumers do not take proper care of the appliance by reading the operational instructions. .82

Factor 4. Knowledge and comprehension in understanding of warranties

1. Most consumers read and hence know what the warranty covers. -.63
2. Most of the major appliance warranties are written in such a manner as to make them difficult to understand. .45
3. Parts covered by warranty are most likely the parts which last long. .72

Factor 5. Importance of warranties

1. Are useless for all practical purposes. .81
2. Are not intended to be honored. .76
3. Are mere sales gimmicks. .68
Factor 6.  "Blind" faith in worth of warranties
1. Warranties are important considerations in the purchase of major appliances. −.60
2. Most retailers make a conscientious effort to satisfy their customers’ warranty claims. −.45
3. Repair work under warranty would be of the same quality as repair work paid for. .73

Factor 7. Warranty coverage
1. Most retailers and dealers make a conscientious effort to satisfy their customers’ warranty claims. −.54
2. The warranties and service provided by the corporations is greatly improving. −.76
3. In general, present warranties offer adequate coverage. −.74

REFERENCES
Business Week (1976), "Guesswork on Warranties" (July).
Powell, Marcia (1976), "Who's Doing What About Magnuson-Moss (Or, Read the Fine Print First)," Stores (August), 25.