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ENERGY CONSERVATION

RESEARCH AND DEVELOPMENT OF ENERGY-EFFICIENT APPLIANCE MOTOR-COMPRESSORS

FINAL REPORT

VOLUME II—MARKET EVALUATION

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for
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300 Phillipi Road
Columbus, Ohio 43228

December 1980

Work performed for

OAK RIDGE NATIONAL LABORATORY

Operated by

UNION CARBIDE CORPORATION

for the

U. S. DEPARTMENT OF ENERGY

Office of Buildings and Community Systems

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ABSTRACT

The Columbus Products Company, a Division of The White Consolidated Industries, has been under contract with Union Carbide Corporation, a prime contractor to the U. S. Department of Energy, for the development of a highly efficient compressor for refrigerators, freezers and room air conditioners. The project included the following major elements:

- Experimental development of highly efficient compressors
- Building and testing of prototypes
- Potential market study
- Formulation of a detailed program plan for a field test

An important goal of the program was that the efficient compressors ultimately reach commercialization. The prototype refrigerator compressors attained an energy efficient ratio in excess of 5 BTU per WHR. The improvement in operating efficiency, over those which were in production at the inception of the project, is on the order of 44%. In the case of motor-compressors for use in room air conditioners, the best prototype sample to be constructed and tested ran with an energy efficiency ratio of 9.5 BTU per WHR, a 19% improvement.

The purpose of the investigation into the potential market was to gain a better understanding into the process consumers use to decide which model of refrigerator/freezer or room air conditioner to buy. The overall conclusion was that consumers were willing to spend a considerable amount on energy savings once they were made aware of the appliance's operating costs and provided with a strategy for incorporating these costs into an investment decision.

An informative presentation by sales personnel was the most important influence on the customer's response. The pay-back period concept was shown to be a valid quantitative mechanism for predicting customer response.

A field test plan for the primary purpose of verifying reliability is outlined. The construction of about 1300 refrigerators with the high efficiency compressor is recommended. A major portion of these will be sold through the White-Westinghouse distributors. Arrangements will be made to monitor the performance of the refrigerators from a reliability standpoint for a period of three years after installation.

PREFACE

This report describes a market study which was carried out by a team of graduate students from the Carnegie-Mellon University Graduate School of Industrial Administration working under the guidance of two professors. The work was carried out under a subcontract from the Columbus Products Company, a division of the White Consolidated Industries. The market study was part of a compressor development program carried out by Columbus Products and Oak Ridge National Laboratory operated by Union Carbide Corporation Nuclear Division for the U. S. Department of Energy. The program involved the development of highly energy efficient compressors for refrigerators/freezers and room air conditioners.

The complete project report series consists of three volumes. Volume I, the Executive Summary Report, presents an overview of the accomplishments and findings of the entire program. The Potential Market Evaluation is shown in this volume, Volume II. A comprehensive discussion of the technical accomplishments of the project and the recommendation for the field test plan are contained in Volume III.

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The market study was accomplished by a team of second year graduate students from the Carnegie-Mellon University Graduate School of Industrial Administration working under the guidance of Dr. Richard Staelin, Associate Dean and Dr. Robert P. Redinger, Assistant Professor. The student Marketing Project team members were: Trudy Alcott, Chris DeLara, Dan Heilman, Tom King, Alan Mink, Stephanie Levy, Dan Macleod and John Polena. Ms. Janet K. Felmeth, of the White-Westinghouse Appliance Company was the Project Marketing Advisor. Drs. Staelin and Redinger wrote the Market Study Report.

The Columbus Products Company Engineering Team consisted of Mr. Roger W. Smith and Mr. Marc G. Middleton. Mr. Parker W. MacCarthy was the Program Consultant. Mr. Lloyd B. Wilson of the Athens Products Company designed and supervised construction of the efficient hermetic motors. Mr. Richard T. Nelson was the Program Manager.

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Section 1

Executive Summary

I. Overview

The purpose of this study was to gain a better understanding of the process consumers use to decide which model of a major appliance to buy. More specifically, we were interested in determining (a) the importance of the model's initial price and future operating costs in the consumer's choice process and (b) how these factors were incorporated into the model selection decision. Knowing the importance of price and operating cost enables us to estimate the consumer's perceived dollar value of purchasing an appliance which offers smaller future operating costs. Knowing how these factors are incorporated into the model decision enables us to design market strategies which acknowledge that marketing mix variables (such as promotion) have an impact on this price-operating cost tradeoff.

Our initial hypothesis was that when a consumer was confronted with the choice between an energy efficient appliance that had a higher purchase price and an otherwise identical appliance that was less energy efficient but lower priced, the consumer would view the energy savings--price increase tradeoff as an investment decision. In other words consumers would view the extra initial costs as an investment in future savings. This viewpoint was "confirmed" by an exploratory experiment which asked consumers to verbalize how they chose among a set of hypothetical refrigerators with different initial prices and operating costs. From these verbalizations it was determined that many consumers used a payback criterion whereby they would choose the energy efficient appliance if the increase in initial price was recouped in future operating cost savings within an acceptable period of time. This acceptable period of time is called a person's payback.

Based on these preliminary results, a field study of 337 respondents was undertaken to estimate the distribution of acceptable payback periods for two energy consuming appliances, air conditioners and refrigerator-freezers. The payback distributions were then used to estimate the percent of consumers (i.e., market shares) who would select the energy efficient appliances for a range of price increases and operating cost savings. Following the field study, 123 consumers participated in a simulated shopping experiment to (a) see if the results of the field survey would hold in a more realistic shopping environment and (b) determine the effects of several market variables on the demand for energy efficiency.

II. Overall Findings

In the absence of energy information, most consumers will not opt for more expensive, energy conserving appliances. We estimate that under today's marketing conditions the market share for an energy efficient refrigerator (i.e., one which saves $10 to $20 per year in energy costs) priced about 8.5 percent more than a comparable energy consuming model would be about 40 percent. Market shares for other appliances would depend in part on the extra initial cost and potential future savings.

Providing more information to consumers about the operating costs of appliances may actually decrease the demand for energy efficient appliances. Said another way, when consumers are made more aware of the high costs of running an appliance and they don't know how to evaluate the operating cost information into a payback type investment decision they tend to cut back on the amount they are willing to spend initially on the product. The net effect of this behavior is to decrease the demand for higher priced appliances (which tend to be the energy efficient appliances).

Consumers who, in addition to being provided with operating costs, also know or are shown how to tradeoff first costs (e.g., purchase price) with future operating costs are more likely to buy energy efficient

appliances than those who are just provided with information on operating costs. Thus, teaching consumer's how to use available operating cost information will increase demand for energy efficient appliances.

Approximately 50 percent of those consumers who "bought" energy efficient appliances did so with a fixed budget constraint in mind. Consequently, instead of treating the extra cost of the energy savings package as an investment, (i.e., trading future savings for first costs), they selected the energy savings and in turn chose not to purchase some other product attribute (e.g., glass shelves, fancy trim, etc.). In this way they were able to keep the purchase price about the same.

Once consumers were (a) made aware of the appliance's operating costs and (b) provided a strategy for incorporating these costs into an investment decision, they were willing to spend a considerable amount on energy savings packages. More specifically their behavior was consistent with a model of consumers having payback periods of about 4 to 6 years. This is two to three times longer than the payback period industry believes is necessary for an appliance to gain market acceptance.

Energy efficiency can be sold to almost everyone. Although there are some differences between identifiable market segments with respect to their willingness to buy energy efficient appliances, there is also a great dispersion of behavior within these identifiable groups.

III. Marketing Conclusions

Based upon the above facts the following strategic conclusions can be drawn.

Promotion

- Government energy labels, in the absence of anything else may actually decrease the demand for energy efficient appliances because they only state operating costs without providing a mechanism by which consumers can use these costs in the decision making process.

- Companies who plan to use print and broadcast advertisements utilizing energy efficiency appeals that emphasize the appliance's operating cost should also include an explanation of how to incorporate these costs into the decision making process. The concept of payback seems to be an efficient way of accomplishing this because it is easy to explain and easy to understand. Without this explanation the cost information may actually decrease peoples' demand since the awareness of higher operating costs tends to cause them to cut back on their willingness to spend much money in the beginning. Since energy saving appliances cost more, the operating cost information shifts demand away from these higher priced models.

- Mass media promotional material should be geared to the entire population of appliance buyers since there is a considerable dispersion of behavior within identifiable market segments.

- Salespeople are the most effective in showing people how to make the price cost tradeoff because they can tailor their communication message to each individual consumer. In our experiment almost 90 percent of all our consumers bought an energy efficient refrigerator when the salesperson was instructed to help the consumer make this tradeoff.

- Sellers interested in marketing more energy efficient appliances should be less concerned with the initial price differential and more concerned about whether or not the salesperson will push the new product. Consequently, the retail prices of energy efficient appliances should be increased sufficiently to support a creative commission scheme which provides attractive commissions to sales people for selling energy efficient models.

Product

- Energy features will sell best on standard models. This is due to the fact that many consumers do not view the purchase of energy efficient appliances as an investment decision; instead they seem to

have a budget constraint and trade energy savings for other product attributes. This will mean that there may be a shift in overall demand from higher priced to lower priced models (excluding the cost of the energy package), for sellers who supplement their product offerings to include energy efficient models.

Price

- Market shares for energy efficient appliances will be a function of their paybacks. Assuming that the only difference between two models are their prices and operating costs, (i.e., these are the only two factors to consider) and that there is no energy sales push, we project the following market shares as a function of payback.

Appliance's Payback Period*	Market Potential	
	Refrigerators	Air Conditioners
over 10 years	43.2%	38.8%
over 6 years	55.8	48.5
over 5 years	61.3	53.2
over 4 years	66.1	58.6
over 3 years	73.5	66.1
over 2 years	80.9	72.2
over 1 year	92.3	83.8

*This refers to the number of years of cost savings to recover the initial price increase.

IV. The Field Experiment

The field experiment consisted of a survey of 337 people in four cities; San Francisco, California; Athens, Tennessee; Edison, New Jersey and Burlington, Massachusetts. The survey provided information about the demographic characteristics of each consumer, about their energy related attitudes and behavior, three direct measures of their payback period, and the preference ordering for twenty different hypothetical models of either refrigerators or air conditioners. The preference ordering was used to infer how people make tradeoffs between initial price and operating costs.

Each subject was asked to rank order from most preferred to least preferred a set of 20 hypothetical models of either refrigerators or air conditioners. The appliances varied by price, annual operating costs, and two other attributes (for refrigerators they were the presence or absence of an ice maker and reversible doors, for air conditioners they were the length of the warranty and the type of muffler). The subjects were told to arrange the model descriptions sequentially in the order in which they would buy them (i.e., the most preferred on top and least preferred on bottom). These rank order data were analyzed using conjoint analysis to estimate each subject's perceived values of price, operating costs, and the other two appliance features. Conjoint analysis of the rank order preferences yielded estimates of the importance of initial price, operating costs and the other two features for each individual which, when combined in an additive fashion, best reproduced that individual's observed preference rankings of the appliances. These relative importance weights of price and operating costs were then used to calculate each person's implicit payback, i.e., the maximum period of time that individual would be willing to wait before the initial investment was recouped by the savings in operating costs.

Another goal of the study was to measure the impact of different types of information on the relative importance subjects placed on price and operating costs. Three types of information were presented. One third of the sample received a control message which contained no information on energy consumption, one third received the same control message plus information on the average annual operating costs for five major appliances based on the utility rates for their areas and one third received the control message, the cost information, and a brief description of how to use this information to calculate paybacks.

Results

- Based on the importance weights inferred from the preference ranking task, the average consumer acted as if they would purchase an appliance if it had a payback of 7.9 years or less.

- The derived paybacks calculated by means of conjoint analysis were used to predict consumers' choices on a new set of preference data. In all, a little over 75 percent of the time a person's selection of one product over another could be correctly predicted based just upon the person's inferred payback.

- The three direct measures of payback obtained from the questionnaire yielded highly inconsistent estimates of market share. First, the non-response rate of the three measures averaged about 15% indicating that people had trouble with these questions. Second, the responses of those people who did respond were highly unreliable, i.e., the correlations between the three measures were very low indicating considerable inconsistency within each respondent. Third, although the average population payback for each measure was fairly similar, the distributions of paybacks across each measure were very dissimilar.

- Using the implicit payback inferred from the ranking task, the different factors of the experiment and the demographic data supplied by each individual, the following facts were determined.

  a) On the average, people are willing to accept longer paybacks as the price of the appliance increases.

  b) An individual's implicit payback is a function of his/her demographic characteristics. Older people, singles, females, laborers, and less educated people tend to have longer implicit paybacks. However, the variation of the paybacks within each identifiable segment is very large.

c) Average implicit payback periods were longer for consumers who lived in areas with lower utility rates. Conversely consumers with higher rates (who presumably are more likely to be conscious of energy consumption) required shorter paybacks.

d) Providing people with information about the actual annual operating costs of major appliances (i.e., making them more aware of the cost of energy) increased the tendency for people to have shorter paybacks. This finding is consistent with the finding reported directly above.

e) When people were shown annual operating costs of appliances and were also given a method for utilizing this information in the decision process (i.e., they were told how to calculate paybacks) the average payback increased over the group just made aware of operating costs.

f) Merely raising consumers' awareness of energy costs will not lead to the purchase of more energy efficient appliances. It is also necessary to provide a mechanism for consumers to incorporate this information into an investment decision.

V. The Lab Experiment

The primary goals of the lab experiment were twofold: (1) to test the validity of the implicit payback model used in the field study in a task more nearly similar to the actual shopping environment, and (2) to determine the effects of three market variables (government energy labels, energy promotional material, and energy sales pushes) on how people use payback and consequently on the demand for energy efficient appliances. The experiment was a simulated shopping task where 123 people from the Pittsburgh area were asked to "buy" a refrigerator in a controlled showroom setting. The shopping task was divided into four sections. First, the consumers were given information about

refrigerators (one half were given energy promotional material, the other half information on other product attributes). After studying the material, they completed a pre-shopping questionnaire that determined whether or not the respondents read the advertisements and also got the respondents thinking about the size of refrigerator they needed and the price they were willing to pay for a new one. They then were led to the shopping area where they browsed among the available refrigerator models for about 10 minutes and were then assisted by a trained salesperson to select one of 12 different models. For half of the subjects, the salesperson was instructed to "sell" the consumer on buying an energy efficient model. For the other half, the salesperson attempted to get the consumer to buy a model with more expensive features. At the end of the shopping task subjects were asked to designate the refrigerator they liked the best and then the model they would buy if they had to actually pay for it. In the next section the subjects were either asked to (a) provide a preference ordering for a set of 12 hypothetical refrigerators (similar to the task in the field experiment) or (b) to describe the things they were thinking of while they reviewed the shopping task by viewing themselves on videotape. The experiment concluded by having all respondents complete a final questionnaire. Finally, it should be noted that three fourths of the subjects shopped for refrigerators which prominently displayed "government energy labels" that gave the refrigerator's annual operating costs.

In all, there were four separate experimental groups. Group 1 had no special promotion or labels and the salesperson pushed a luxury model. Group 2 had the government energy labels, read energy promotional material, and the salespeople pushed the luxury models. Group 3 had the government labels, read promotional material featuring product attributes other than energy, and the salespeople pushed the energy efficient models. Group 4 had the government

labels, read the energy promotional material and the salespeople pushed the energy efficient models.

Results

- The direct measures of payback asked on the final questionnaire for the lab study yielded results very similar to those found in the field study, i.e., they provided poor estimates of market share because there was little consistency of responses within an individual.

- The results of the lab preference ordering task in general duplicate the results of the field preference ordering task. More specifically, the market share predictions from the two methods were similar.

- Although there was great similarity of results on payback between the two studies, there are several difficulties in using the results (i.e., the implicit paybacks) as an exact predictor of what will occur in the marketplace. This is due to the following:

  a) Initial price and operating expenses (both of which are captured by payback) are only two attributes used by the consumers to select refrigerators. Thus, other factors influence the actual market shares.

  b) In particular, when the salesperson is introduced into the environment the market share estimates based on a payback model are not at all consistent with the observed market shares. This is because the salesperson can greatly affect the consumer's choice.

  c) For about half the consumers, the payback choice model does not seem to be consistent with their observed purchase behavior. Instead of trading off initial price with future operating costs, they treated the energy package analogous to other product features such as special trim, glass shelves, etc.

Consequently, the traded off a specific feature with the extra cost of the energy package. In other words, they operated consistent with the choice model that has consumers trading off between all product attributes (energy savings being one) under a fixed budget constraint.

Providing only operating cost information to the consumers with no good strategy on how to use this information seems to cause consumers to act as if they require quicker paybacks. Thus, it was noted that

a) Paybacks derived from the lab preference ordering task were lower for group 2 (i.e., labels, with a promotion featuring operating costs but not payback) than in either the control condition (group 1) or the two sales push conditions (groups 3 and 4), and

b) Paybacks estimated from the actual choices in the shopping task were lower in groups 2 than any of the other groups.

The experimental treatments across groups were successful in that

a) Everyone in the energy sales push condition included at least one energy efficient model among their top three choices. This compared to about 65% for the other two groups.

b) Eighty percent of the people in the energy promotion condition mentioned energy as important in the pre-shopping questionnaire, versus 24% in the non-energy promotion condition.

c) Seventy-eight percent of the people in the government label condition recalled seeing energy labels versus 37% in the non-label condition (in all conditions there were other energy labels beside the government energy labels).

- The effects of the salespeople on the choice decision clearly dominates all other factors, i.e., the other marketing variables, implied paybacks, and other attributes of the refrigerators.

  a) Ninety-six percent of the people "bought" energy in the energy sales push condition, compared to about 45 percent of the non-energy push groups.

  b) Thirty-seven percent of the people selected an energy efficient model for each of their top three choices in the energy sales push condition compared to 5 percent for the other two groups.

  c) Salespersons also influenced choice in the non-energy push treatments. Seventy-two percent of the people within these conditions bought the model pushed by the salesperson.

- For those consumers who traded energy for other product features,

  a) Sixty-eight percent bought the standard instead of deluxe features when the opted to pay for the extra expense of the energy package, while

  b) Forty-one percent traded down in size, i.e., they bought an 18 cubic foot model instead of a 21 cubic foot model so as to stay within their budget constraint.

- The subjects reported that the salesperson did not have much influence on their choice of refrigerators, even though the salesperson seemed to dominate the results of the experiment.

- There is a very low correlation between what the consumer said was important to him/her after the experiment and what the salesperson reported he/she thought was important to the consumer.

Section 2

Overview of the Study

Refrigerator-freezers and room air conditioners represent two of the highest users on an annual basis of electricity of all household appliances and have a substantial impact on the household's annual electric bill. One might expect that this, coupled with rapidly escalating utility costs and government labeling programs would increase consumers' awareness of these annual operating costs which should then impact on their purchase decision when buying these "high user" items. Consequently, apriori expectations and ideological expectations might lead one to forecast a rather substantial demand for more energy efficient appliances.

The empirical market place evidence as to the success of energy efficient appliances is quite limited. Hausman (1979) presents results which show that consumers are willing to pay more for air conditioners with high EER ratings. He estimates the implied discount rate for these purchases at between 15 and 25 percent (a payback of between 4 and 6 years). Somewhat in contrast, announcements of sales data appearing in the popular press indicate that "energy savings" does not sell unless the feature has a very quick payback (i.e., one to three years). However, no comprehensive study of current sales data exists. Moreoever, the informational environment concerning energy usage present in the market place is in a state of flux.

Since there are conflicting findings and little understanding of how consumers decide on how to choose between initial price and operating cost differences, there is great uncertainty about the market potential for any energy efficient appliance. Consequently there is a need to study how consumers approach the decision process and to determine those factors which seem to affect the outcome of such a process. Only then can an intelligent decision

be made on whether or not a particular energy saving feature will have a large enough demand to merit its development. Moreover, based on this understanding of how consumers choose among brands with different initial prices and operating costs, it is possible to design comprehensive marketing strategies which will maximize the chances of successful market introduction.

The primary purpose of this study is to understand the purchase decision process for major appliances so that consumer market demand for energy efficient refrigerator-freezers and room air conditioners across a range of prices and annual operating costs can be estimated. This objective places some important limitations on the results. First, the market is limited exclusively to the consumer market excluding both the industrial/business segment and the landlord/pre-equipped new housing segment of the total markets. Additionally the consumer market can be subdivided into new purchasers and replacement purchases.[1] This study does not attempt to distinguish between the two groups, since the decision examined is limited to the purchase choice and ignores the consumer's decision to enter the market. An interesting question that remains unaddressed is the number of people who would enter the appliance market for early replacement because of increased energy efficiency and rising energy costs.

Another possible limitation is that the results of this study pertain specifically to the refrigerator-freezer and room air conditioners markets and are derived for each independent of the other. The extent to which the results are similar, however, will be construed to imply that the results are not a function of the type of appliance and hence are generalizable across appliances. However, it should be noted that this agreement is merely an

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[1] According to a 1979 Appliance Manufacturer's survey, 59% of major appliances and 40% of home comfort purchases were replacement purchases.

indication, not substantial evidence, of the generalizability of the results.

Finally, the stated objective leads to several important questions that are addressed by this study. The first, most direct, interpretation of the objective is to determine how much more consumers are willing to pay up front for deferred cost savings when purchasing a refrigerator or room air conditioner. Answering this question requires a method of displaying the results. One such method is a series of curves which show the proportion of consumers who would opt for the higher priced but more efficient appliance across a range of different percentage improvements in operating efficiencies and price differentials. An alternative approach is to determine the percentage of the market that would opt for the energy efficient model for each price increment cost saving combination. This latter interpretation unidimensionalizes the problem to one of determining the distribution of consumers across payback periods, where payback is the amount of time (without discounting) it would take to recoup the initial investment (in increased price) through operating cost savings realized in later years. For example, if an individual had a payback of 2.5 years, he would be willing to purchase any energy efficient appliance if the savings in operating costs after 2.5 years was greater than the price differential between the energy efficient and an otherwise comparable model. The above two interpretations are in fact comparable in that either can be derived from the other.

In arriving at estimates of the market potential for any given energy efficient appliance, it should be noted that the above results are conditional on holding all other factors constant. In other words, only the relationship between cost savings and price increases is considered, i.e., it is assumed that consumer's only trade cost savings for price. In fact appliances are multi-attributed (price and operating costs being only two such attributes).

Since consumers may be willing to trade cost savings for other attributes such as size, deluxe features, noise of use, etc., a second question that must be considered is the extent to which consumers will trade energy savings for features other than price.

The prior questions deal with a "what-if-you-were-to-buy-an-appliance-today" approach, independent of the market forces that would or could be marshalled to "sell" energy efficiency. A third question addressed in this study is what effects the various market forces would have on the consumers' tendencies to choose energy efficient appliances. These forces include both business generated (e.g., advertising, point of purchase displays, and sales person's pitches) and government generated (educational programs and mandatory energy labeling) factors.

The last major consideration is the impact of governmental imposed minimum efficiency requirements on consumer's choice. Specifically, when minimum standards go into effect, the percentage cost savings of further efficiencies will be substantially reduced from what they will be now. Under these circumstances will the consumers still be willing to trade for further efficiences?

A two part study has been undertaken to answer these questions. The first, a market survey in four selected cities, resulted in multiple indices (both self-reported and derived) of consumers' willingness to trade energy efficiency for price. The survey involved a self administered questionnaire and a task wherein the subjects provided preference rankings of 20 appliances that varied on four dimensions two of which were price and operating costs. Thus, these results are of the what-if variety (i.e., they try to project what would happen <u>if</u> the consumer were to buy a new appliance). The second study involved a simulated shopping experiment in which people actually shopped for refrigerators. An attempt was made to determine the model they would most

likely buy if they were to actually pay for their choice at the time of the experiment. The experiment has two advantages over the survey: it more closely approximates the actual purchase process and it enables a determination of the influence of different market environments on the decision.

Section 3

Discussion of the Price-Cost Trade-Off

I. Summary

In this section we first discuss our conceptualization of how consumers make a choice between two appliances; the first costs more initially but saves more later in operating costs, the second is priced less but costs more to operate. In developing the model of the price-cost trade-off we assume that each consumer has an implicit payback period, and that the consumer chooses between two appliances based on this implicit payback. More specifically, if the increase in price is recouped by reductions in operating costs in a period less than the person's payback then the consumer will purchase the more efficient appliance, otherwise the consumer will opt for the lower priced brand.

In order to measure each consumer's implicit payback we develop a theoretical model of how consumers evaluate and choose between brands. We assume that each person determines the total worth of each brand and then chooses the brand with the highest total worth. Since total worth is derived by adding up the worth of each component it is necessary to model how the consumer values each component. For example, we assume that brands with lower prices would have a higher total worth than those with higher prices, <u>all other things being held equal</u>. Similarily if a consumer values an icemaker on a refrigerator, any refrigerator having this feature would have a greater total worth if it had this feature versus not having the feature (assuming the price is the same for both refrigerators).

Based on our model of choice we show that it is possible to measure a person's implicit payback. More specifically we show a person's payback is the ratio of changes in total worth brought about by a small change in the attribute,

operating costs, to changes in total worth brought by a small change in the attribute, price. Restated, implicit payback can be determined once it is known how much a person values a small decrease in initial price relative to a small decrease in annual operating costs.

Finally, we briefly discuss a method for estimating the parameters of the consumer choice model. This method, often referred to as conjoint analysis, uses preference data obtained at the individual level. These data are normally obtained by asking an individual to rank order a number of products which vary on a number of dimensions. The conjoint analysis technique uses this rank ordered data to determine the set of parameter estimates which best reproduce the observed preference order data of the individual.

II. Price-Cost Trade-off

There are at least two ways consumers can make the initial price, operating cost trade-off between two appliances. In the first, consumers are rational business persons who view the incremental price difference of the energy efficient appliance as an investment which lowers their future operating costs. Consequently, these decision-makers calculate the cash stream associated with the energy efficient investment and subsequent savings, discount this stream at some appropriate rate and then decide whether or not the investment is justified based on a criterion such as net present value or return on investment.

Although this method is theoretically sound, it does not necessarily represent the actual thought process most consumers normally go through when making an investment. More often than not consumers use simple heuristics in making purchase (investment) decisions. Although these heuristics vary from individual to individual, it has been found (Slovic, 1972) that consumers generally base their decisions on readily available information and establish

decision rules which require little transformation of the data available at the time of decision. For example if the information is given in terms of product life cycle costings, consumers will normally favor the product with the lowest life cycle cost (versus say the product with the highest internal rate of return) Likewise, if EER's are given for a set of air conditioners, consumers will tend to make decisions by comparing the EER ratings for each brand. Consequently before any generalized decision rules can be formulated it is necessary to specify the types of information that the consumer encounters during the decision process.

Currently the FTC is requiring that most appliances be sold with a label specifing the annual average operating cost of the appliance. (This is in constrast to say EER or product life cycle cost.) Thus, the attention of this study is limited to how consumers trade-off between initial price and annual operating costs.

Once we decided on the informational environment, our next step was to interview a number of consumers and ask them to verbalize how they would choose between a set of appliances with different annual operating costs and initial prices. Although each individual used a slightly different approach, the strategy that best describes how consumers selected between the two appliances was for the consumer to subtract the annual operating costs of the two appliances and then divide this difference into the difference in prices to determine the number of years required to pay back the investment. If the payback was felt to be short enough, the consumer selected the more expensive, but energy efficient appliance; otherwise the cheaper model was chosen.

The above description led us to model consumers as trading off between price and cost through a payback calculation. This payback was compared to some internal standard as to how quickly they should recoup their investment in order

to decide if they should purchase the energy-efficient appliance. The internal payback cut off point will be referred to as a person's implicit payback period.[2]

Two things should be noted about the use of this heuristic as the model of how consumers make trade-offs between initial price and operating costs. First, although many of our pre-test consumers mentioned this strategy as a means of choosing between two different appliances, not all consumers seemed to be using this strategy. Consequently, we caution the reader to view the payback model as an easy description of the process instead of one which represents how all consumers actually choose between two appliances that have different prices and operating costs. In other words, it is hoped that the model will be useful in predicting choice even though it may not accurately capture the actual decision process of consumers.

A second aspect of this model is that the payback heuristic is best used in choosing between two different appliances. If consumers are asked to choose between three or more appliances, use of the payback heuristic requires a sequential decision rule or the selection of one of the appliances as a base. For example, assume that the consumer must choose one of the four appliances listed in Table 3-1. Also assume that the consumer has an implicit payback period of 4.5 years. If the consumer uses A as the base, any of the three more expensive appliances are acceptable since they all have paybacks of less than 4.5 years. If the consumer does not use a sequential rule but instead selects the brand with the lowest of the three paybacks based on a comparison with A, then brand B would be the one selected. However, if the consumer were to sequentially choose from B, C, or D, using first B

[2]The reader should note that this payback period is equivalent to one over the discount rate if it is assumed that the product has an infinite life and the stream of savings is constant over the period.

TABLE 3-1

Example of Payback Calculations

Appliance	Price	Annual Cost
A	100	100
B	200	50
C	300	25
D	400	10

Base Appliance	Payback Relative to Base Appliance			
	A	B	C	D
A	1	2	2.7	3.3
B		1	4	5
C			1	6.3
D				1

as a base and then C, appliance C would be chosen since C has a payback (relative to B) of less than 4.5 years. Thus, it is important to know if consumers use sequential rules. If they do, then their choice will be uniquely determined. However if they just chose the brand with the lowest payback the identity of the base brand makes a difference in which brand is selected.

This ambiguity led us to develop a measure of payback which was independent of the base or comparison brand. In order to devise such a measure it was necessary to postulate a conceptual model of how consumers rate and select among brands with different levels of attributes.

III. Conceptual Model of the Choice Process

Conceptually it is possible to treat initial price and operating cost in the same manner as any other product attribute. Assume that the influence of each product attribute acts additively and the sum of these influences determines the product's total worth. Then the total worth of product i, u_i, can be written as

$$u_i = f_1(p_i) + f_2(c_i) + f_3(x_i), \tag{1}$$

where

$f_1(p_i)$ represents some function of price for brand i,

$f_2(c_i)$ represents some function of operating cost for brand i,

$f_3(x_i)$ represents some function of the aggregate effects of all other product attributes for brand i.

Equation (1) should not be thought of as how consumers actually decide on the total worth of a product but instead as an "as-if" representation of this process. In other words, consumers probably do not calculate the partial effect of each attribute (e.g., $f_1(p_i)$, $f_2(c_i)$, etc.) and then sum these effects to arrive at an overall evaluation for a brand. However there is substantial

empirical evidence that suggests that (1) captures the dynamics of the purchase decision process well enough to accurately predict future choices (Green and Scrinivasan, 1978). Consequently, even though there is little indication that consumers use (1) as a means for determining the total worth of a product, this conceptualization is a rich enough formulation to be useful in assessing the influences of each of the product's attributes on its total worth.

The next step in developing a payback measure for each individual is to further specify the functional forms of $f_1(p_i)$ and $f_2(c_i)$. General economic theory predicts a monotonically decreasing function for both f_1 and f_2, i.e., the total worth decreases as price and operating cost increase. Figure 3-2 indicates three general forms which met the criterion of a decreasing function. One functional form which is flexible enough to represent these three different general forms is

$$u = aZ + bZ^2 \tag{2}$$

where Z is the value of the attribute (i.e., price, cost, etc.), the coefficient a is constrained to be negative and the ratio $-a/2b$ of the coefficients is required to be greater than the largest permissable value of Z.[3]

Using (2) to represent $f_1(p_i)$ and $f_2(c_i)$ yields

$$u_i = a_1p_i + b_1p_i^2 + a_2c_i + b_2c_i^2 + f_3(x_i) \tag{3}$$

Equation (3) allows the calculation of a person's internal payback period. This is done by noting that a person's internal payback is the

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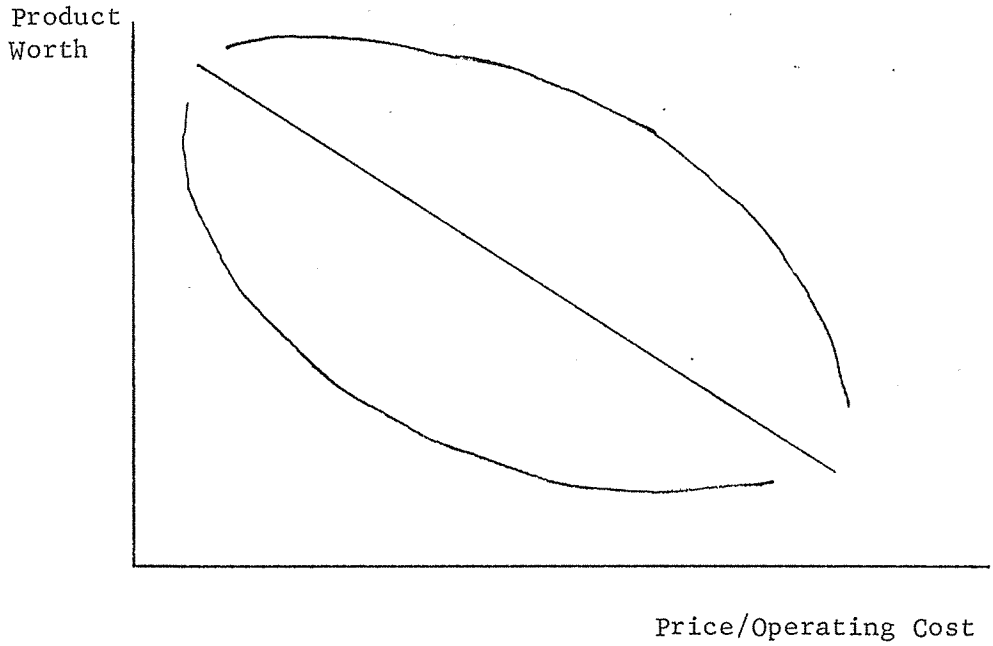
[3]This latter restriction guarantees that the function does not increase over the relevant range.

Table 3-2

Product Worth as a Function of
Price or Operating Costs



repayment time for the more expensive product which makes the person indifferent between purchasing either of the two products. In other words a person's internal payback, assuming (3), can be found by determing how many years operating costs may be reduced to leave the total worth of the product the same after the price is increased. This is equivalent to finding the ratio of the slopes of $f_1(p_i)$ and $f_2(c_i)$.

More specifically, assuming (3), a small increase in initial price results in a decrease in total worth of $a_1 + 2b_1p_i$ units.[4] Likewise a small decrease in operating costs results in an increase of $a_2 + 2b_2c_i$ units. Consequently, if a person has a payback period of t years, he should be indifferent between buying a standard appliance priced at p_i dollars and costing c_i dollars to operate and an energy efficient appliance costing $t(a_1 + 2b_1p_i)$ dollars more initially but saving $(a_2 + 2b_2c_i)$ each year in operating costs. In other words:

$$t = \frac{a_2 + 2b_2c_i}{a_1 + 2b_1p_i} \tag{4}$$

IV. Methodology for Measuring Payback

Equation (4) indicates that a person's implicit payback can be calculated if the parameters a_1, a_2, b_1 and b_2 are known. One way of estimating a person's parameters is try to infer them from a series of choice decisions. More specifically, equation (1) is assumed to represent how a person determines the total worth of product i. Moreover, it is assumed that a person will select brand i over brand j if and only if the total worth of i is greater than the total worth of j. If a person is asked to make a series of

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[4] The more mathematically oriented reader will note this is the first partial derivative of u_i with respect to p_i.

choices between pairs of brands, then there will be one set of parameters which best fits the data (i.e., best predicts which brand in each of the pairs the person selected). The actual estimation procedure used to obtain estimates of a_1, a_2, b_1 and b_2 is called conjoint analysis. Interested readers are referred to Green and Wind (1974) for a detailed discussion of the technique.

It should be noted that the conjoint analysis method makes a number of assumptions about a consumers decision process. First it assumes that consumers are able to aggregate the influences of all attributes to come up with the total worth of a product. Second it assumes that consumers will always choose between two brands by selecting the brand with the highest total worth. Although neither of these assumption are heroic, in terms of assumptions often made about consumer choice, there is considerable empirical evidence that consumers do not actually choose between products using these decision rules (Slovic 1972, Wright 1974, Payne 1976). However, as mentioned previously, numerous studies have shown that the parameters estimated by conjoint analysis adequately capture the trade-offs consumers go through and thus can be used to predict future consumer choices. Moreover, it is possible to test the robustness of the model and the derived estimates by predicting future choices. This "validation" of the model is shown in a later section.

Section 4

Overview of the Field Study

I. Introduction

In the previous section we discussed a model of how consumers go about making a price-cost trade-off. The basic feature of this model was a person's implicit payback (i.e., that payback above which a person would not purchase the more expensive but more energy efficient appliance). In order to estimate each consumer's implicit payback and in general "validate" the payback model we conducted a field study which revolved around having consumers express their preference for a set of appliances differing on a number of different attributes. These preference data, along with attitudinal data for each individual collected during the study, were used to answer questions such as:

1) How long are people, in general, willing to wait before the extra cost is recouped through energy savings?
2) How useful is the concept of payback in describing how consumers actually choose between different brands of an appliance?
3) What segments of the market are most likely to buy energy efficient appliances?
4) What are the effects of educating consumers about a) operating costs and b) the concept of payback as a method of deciding between models of an appliance.

The outline of this section is as follows. First we give a description of the different phases of the filed study. We then discuss the specific sample drawn and the limitations of the study.

II. Description of the Field Study

The field study was conducted in four phases. In each phase respondents were processed in groups ranging in size from 10 to 25. In the first phase

the respondents were given a brief introduction to the study. This introduction included a statement that members of Carnegie-Mellon University were interested in determining how and why consumers selected different models of air conditioners (A/C) and refrigerators (R-F). They were also told the study would take about 30 minutes, that there were no right or wrong answers and that their replies could not be traced back to them since they did not have to identify themselves. This latter information was given in hopes of decreasing the non-response to specific questions.

In the second phase the respondents were given product class literature (i.e., A/C or R-F) to read. This literature was introduced by saying that most people read some information about the product class before they buy a major appliance. In fact there were three different advertisments. (See Figures 1, 2, and 3 in Appendix A). Each advertisement contained some general product information. Advertisement 2, in addition to the information contained in advertisement 1, contained the average annual operating costs of a number of appliances. Advertisement 3 not only included that cost information, but also contained a brief description of how to trade-off between two appliances having different initial prices and operating costs. The heuristic suggested for making this trade-off was payback.

In the third phase, respondents were given a stack of 20 cards, each of which contained a description of a particular product within the product class they were assigned. (See Figure 4 in Appendix A for an example.) Each product was described by 4 attributes, two of which were initial price and annual operating cost. The other two attributes were selected through pretests to be factors important in the decision process, but ones which consumers were willing in general to do without if the prices were increased moderately. These latter two attributes for R-F's were the type of doors (i.e., reversible

versus standard doors) and presence or absence of an icemaker. For A/C these featurs were the type of muffler (extra quiet or standard) and the length of warranty (one year or five years).

Four possible price levels and four operating cost levels were used for each product class.[5] Since there were two levels for the other two attributes, there were $4^2 \cdot 2^2 = 64$ different possible types of appliances for each product class. Sixteen of the 64 possible appliance types were included in the study. The selection of these sixteen was made to guarantee that the design was an orthogonal, enabling efficient estimates of all main effects. Four additional products were included for use as a "hold out" sample. (See Table 1 thru 8 in Appendix A for a listing of the descriptions chosen.)

After a brief explanation of how to interpret the cards, each respondent was asked to look through the 20 descriptions and pick out the appliances in the order they would choose them if they were in the market for an appliance. More specifically they were asked to rank order the cards so that the first card represented the appliance they most preferred, the second card represented the second most preferred card, etc.

In the forth phase respondents were given a questionnaire to fill out. This questionnaire was used to determine the following types of information:

1) demographic characteristics,
2) previous purchase experience,
3) knowledge about energy consumption, and
4) attitudes about energy consumption.

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[5] Operating costs varied according to the city sampled. The operating costs were set to reflect the utility rates for the given city. The four price levels were the same for all people in the sample. The result of these manipulations is that people in cities with lower utility rates were facing longer paybacks. This is fairly realistic since appliance prices are generally set independant of the city in which they are marketed.

After the respondents completed this form, they were thanked and then dismissed. Since there was no deception and the possibility existed that respondents might talk to others who had not yet completed the study, there was no debriefing. Total time for the four phases took no longer than 30 minutes.

III. Subjects

Subjects for the study were drawn from the staffs of four plants across the country. Selection of cities was made to insure a variation in utility rates. In each plant sampled, the company sanctioned the overall goal of the study. However, only employees who wanted to participate in the study did so. In San Francisco and Edison, New Jersey, respondents were given time off to complete the study. In Athens, Tennessee, and Burlington, Massachusetts employees were paid overtime for taking part in the study.

Although the sample should be viewed as a convenience sample, it is the authors' opinion that the sample results can be extrapolated beyond the sample population. It is hard to imagine how being employed by one of the companies sampled would be related to the respondents propensity to trade-off between initial price and operating cost of an appliance.[6] The only major segment of the adult buying population not included in the sample were non-working spouses, since by definition all respondents were employed. A detailed breakdown of respondent characteristics is presented in Table 4-1 and as can be seen there is a good spread with respect to each variable.

IV. Limitations of Study

There are two major limitations associated with the methodology of this

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[6]Three of the companies sampled were part of the White Consolidated family. However, employees were told only that Carnegie-Mellon was running the study. Thus, no incentive was present for the respondents to alter their ranking in any was to "please" the Columbus Products Division.

TABLE 4-1

Breakdown of Sample
on Selected Demographics
(Percentage)

Income	Total Sample	San Francisco	Athens	Edison	Burlington
Under 10,000	14.6	13	18.6	12.8	11.7
10,001 - 15,000	30.8	20.8	33.6	28.2	41.7
15,001 - 20,000	19.2	15.6	21.2	19.2	20.0
20,001 - 25,000	17.4	16.9	20.4	19.2	10.0
over 25,000	18.0	33.8	6.2	20.5	16.7
Education					
Less than High School	12.5	2.6	23.1	11.3	6.6
High School, Vocational	37.2	23.1	44.4	33.8	45.9
Some College	28.9	35.9	22.2	30.0	31.1
College Degree or Better	21.4	38.5	10.3	25.0	16.4
Occupation					
Skilled & Unskilled Labor	45.1	1.3	80.3	34.6	47.5
Technical	17.8	16.7	12.8	25.9	18.0
Managerial	11.3	28.2	2.6	8.6	9.8
Sales/Clerical	25.2	53.8	4.3	28.4	24.6

TABLE 4-1 continued

	Total Sample	San Francisco	Athens	Edison	Burlington
Age					
19-24	23.3	20.5	20.7	27.2	26.7
25-30	18.5	20.5	16.4	16.0	23.3
31-40	23.3	28.2	25.0	27.2	8.3
41-50	19.1	17.9	21.6	19.8	15.0
over 50	15.8	12.8	16.4	9.9	26.7
Sex					
Male	46.3	41.0	28.2	51.9	80.3
Female	53.7	59.0	71.8	48.1	19.7
Marital					
Single	40.5	48.7	34.2	42.5	39.3
Married	59.5	51.3	65.8	57.5	60.7
Treatment					
Advertisement 1	32.9	34.6	33.3	30.9	32.8
Advertisement 2	34.4	34.6	34.2	34.6	34.4
Advertisement 3	32.6	23.6	32.5	34.6	32.8

TABLE 4-1 continued

	Total Sample	San Francisco	Athens	Edison	Burlington
Conservation Index*					
Not Energy Conscious	21.4	15.5	25.4	24.6	17.2
Moderately Energy Conscious	47.4	39.4	43.9	50.8	60.3
Strongly Energy Conscious	31.2	45.1	30.7	24.6	22.4
Appliance					
Refrigerator	63.2	55.4	62.4	79.0	54.1
Air Conditioner	36.8	44.9	37.6	21.0	45.9
Sample Size	304	71	114	65	58

* Using the coding suggested by Project Payback

study. First, a fairly large percent of the respondents (about 9 percent) were unable to complete the card sorting task in the allocated time. Another 24 percent ordered the cards such that there were a large number of "irrational" rank orders (e.g., a higher priced but otherwise identical appliance was preferred to a lower priced appliance).[7] Although it is possible to argue that this high percentage was caused by respondents not paying enough attention to the task we attribute this percentage to the fact that not all consumers have the cognitive ability to make "rational" trade-offs between products when there are more than two attributes. Consequently the trade-off analysis derived from the card sorting task most likely is not applicable to this segment of the buying population.

The second major limitation of the study concerns the external validity of the results. Sorting 20 cards is a different task than actually buying one of 20 different appliances in a dealer's showroom where there are influences such as the identity of the brand name, and the opinions of the salesperson. Nevertheless, Green and Scrinvasan (1978) report that the results obtained from this type of trade-off analysis usually are capable of successfully identifying the magnitude of the influences of each of the product attributes. Thus, even though the finds based on the field study should not be generalized to predict choice of appliances in more complex situations they should be useful in modeling how people trade-off between initial price and operating

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[7] In all 337 respondents were asked to sort the cards. Twenty nine of these respondents were excluded from the sample because they did complete the task or they listed one model more than once. Of the 308 respondents who provided usable responses 224 or 73 percent were able to produce rank orders which did not violate the 28 consistency checks (i.e., ranking a lower priced but otherwise identical product ahead of the higher priced model) more than 20 percent of the time. All respondents completing the card sorting task were included in all subsequent analysis although the degree to which they could do the task was sometimes used when interpreting the results.

cost. In other words the results may not be applicable to predicting if consumer A will choose appliance 1 over appliance 2 in the marketplace but they should be useful in identifying the relative influences of initial price and annual operating costs for each consumer and consequently each consumer's implicit internal payback period.[8]

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[8] Without sounding too repetitious, we remind the reader that consumers may not have an implicit payback period. However hopefully this measure is useful in predicting how consumers make price-cost trade-offs.

Section 5

Results of the Field Experiment

I. Summary

In this section we will show that it is not possible to measure reliably a person's implicit payback through direct questioning. However a more indirect method using conjoint analysis produces results which accurately predict a person's trade-off between price and cost over 75 percent of the time. These facts have two major implications. First since many consumers can't consistently give an estimate of their payback period through direct questioning it is highly unlikely that they use this concept to trade off price and future costs. However, the implicit paybacks obtained through the indirect measurement technique do accurately predict consumers' choices on a new set of alternatives. This provides some indication that the concept of payback is useful for predicting what consumers will do if faced with similar trade-offs.

This section also displays results which indicate that people with longer implicit paybacks (i.e., those more likely to buy energy efficient appliances) tend to be older, have less formal education and lower status jobs (laborers and technicians versus professional managers), although these relationships show considerable variation (i.e., within each market segment there is considerable dispersion). We take this to infer that there are no easy identifiers of persons who will be willing to buy energy efficient appliances with long paybacks.

Next we show the percentage of the market that would prefer the energy efficient appliance if all other factors are held equal. Although this percentage varies slightly depending on the price levels of the appliances, the general result is that about 80 percent of the consumers sampled would opt for an energy efficient appliance if the payback were 1 year. This percentage

falls to about 50 percent if the payback is 5 years and less than 40 percent if the payback is 10 years.

We then discuss why our payback results are not consistent with the rule of thumb commonly used by most appliance manufactures which posits that energy efficient appliances will not sell unless they have a payback of less than two years. Our basic argument revolves around the difference in the information environment between our experiment and the "real world". More specifically, operating costs were available to the respondents in our experiment but were not commonly available in the market place. This implies that current marketplace sales data are not useful in estimating a person's implicit payback because the consumer normally can not make the trade-off even if they wanted to since the cost data are not readily available for them to use.

Finally we present results which provide some insights into how changes in the informational environment may alter peoples implicit paybacks. We show that when people are given promotional material which alerts them to operating costs for an appliance, some consumers seem to pay more attention to operating costs during the model selection process. This attention has the effect of lengthening the person's implicit payback. Other consumers alerted to these product operating costs tend to place more emphasis on initial price by favoring cheaper models. This had the effect of lowering a person's implicit payback. The net effect of these two different reactions decreased average payback for the sample. Thus, information which alerted consumers to the fact that appliances cost a substantial amount to operate actually caused a decrease in the market potential for energy efficient appliances.

II. Determination of Payback

One of the major goals of the analysis was to measure each respondent's

implicit (if not explicit) payback and then determine what factors were associated with a person having a short or long payback.

Since this payback measure was central to the study, it was decided to estimate a person's payback using a number of different methods. The most obvious method was to ask each respondent directly. This was done by asking each respondent three different questions about payback. These questions were interspersed throughout the questionnaire completed by the respondents during the last phase of the filed study. The first measure (ANNUAL) was based on a question concerned with how much an energy efficient appliance would have to save annually to justify a $150.00 initial price increase. This response was divided into $150.00 to estimate the person's payback. The second measure (INITIAL) was based on the amount the respondent said he/she would be willing to pay extra for an appliance that would save $10.00 per year. The amount specified divided by $10.00 yielded a second measure of payback. A third measure (PAYBACK) was obtained by directly asking the respondent to specify their payback after providing them with an example of the payback concept. The example was varied across the sample so that approximately one third saw an example of a three year payback, one third a five year payback and one third a sixteen year payback. The results of these three measures are shown in Table 5-1.

Three things should be noted from this table. First, each of the measures show considerable variation across the sample. In other words not everyone reported having the same payback. Second, the three measures were not consistent across people. Thus, for example, the mean for the direct measure, INITIAL, is greater than the other two direct measures. Moreover, the distribution of responses is different for all three measures. Finally the averages derived from the three forms of the PAYBACK question show that the wording of

TABLE 5-1

Market Shares for Different Paybacks as Determined

By Three Different Questions

	ANNUAL	INITIAL	PAYBACK 3 year	PAYBACK 5 year	PAYBACK 16 year
2 years or over	93%	90%	90%	93%	95%
3 years " "	82	81	72	84	89
4 years " "	63	79	53	68	80
5 years " "	54	42	32	39	47
6 years " "	33	40	21	25	40
10 years " "	5	9	3	1	7
average*	5.4 years	6.7 years	5.2 years	5.6 years	6.8 years
Non-Response to question	15%	21%	10%	12%	11%

*All paybacks over 15 years were recorded as 15 years.

the question influenced the respondents' answers. Specifically the larger the payback used in the example was, the higher the derived average payback.

Another aspect of the three questions is the degree to which they yield the same implicit payback for a given individual. This degree of association is often referred to as reliability and can be estimated by calculating the correlations between the three measures. Low correlations imply poor reliability, high correlations the reverse. As can be seen from Table 5-2 the three questions tend not to give the same implicit payback for the same individual i.e., the questions do not appear to be reliable measures of the person's implicit payback.

It is interesting to compare our results with those reported in the April 1978 issue of Appliance Manufacturer. These latter results were obtained by asking consumers to specify the expected payoff time for an energy efficient appliance that cost a) less than $10 more, b), $10 or 25 more, c) $25-50 more and d) greater than $50 more. The resulting responses, which are displayed in Table 5-3 are considerably different from any of the results obtained from our direct questions. Moreover similar to our results they indicate that a substantial (34 to 46 percent) segment of the population could not answer a direct question on payback.

We take the above results to indicate that payback is a concept that is not used by most consumers in making a purchase decision. We take this position because a) there was no consistent reponse to our three different questions, b) the responses seemed to be influenced by the wording of the questions, and c) many consumers are not able to answer a direct question on payback. This lack of consistency implies that if one is to obtain a reliable measure of a person's implicit payback, it is necessary to devise a measurement technique that does not require the respondent to directly specify his/her

TABLE 5-2

Correlations Between
The Three Director Measures of Payback

	INITIAL	PAYBACK
ANNUAL	.21	.23
INITIAL		.22

TABLE 5-3

Expected Paybacks

Expected Payback Time for added cost	For an extra cost of Less than 10	10-25	25-50	50 or more
2 years or more	33%	61%	86%	87%
3 years or over	20%	45%	70%	79%
4 years or over	14%	24%	53%	68%
5 years or over	12%	17%	40%	59%
6 years or over	5%	6%	24%	37%
Mean	2.0 years	2.8	4.0	5.3
Non response rate	34%	35%	43%	46%

Source: Appliance Manufacturer, 1977 NFO Consumer Study.

payback. A technique which surmounts the direct measurement problems was described in section 3. This technique only assumes that consumers can consistently choose between different brands using a price-cost decision rule which is accurately captured by the payback rule.

The implied paybacks derived from the conjoint analysis estimates are displayed in Table 5-4. Again, as with the prior estimation methods, we note a dispersion of paybacks across individuals. Thus, approximately 28 percent of the individuals indicated by their choices among the 20 different brands an implicit payback of less than 3 years while about 37 percent gave preferences in a manner consistent with paybacks of 10 years or more.

There are at least three questions related to these conjoint analysis results. First, since the results for the direct measures were found to be so unreliable, it is important to estimate the usefulness of the indirectly obtained measure. One way of doing this is to use the implicit payback estimate from the conjoint analysis to predict how each individual would make price-cost trade-offs for appliance pairs not used in the estimation procedure. As mentioned previously there were 4 appliances in the set of 20 cards which were not part of the orthogonal design. Using these four models it was possible to form nine new pairs of choices where one model in the pair was from the "hold out" sample and one model was from the original 16 models used to estimate the implicit payback. Each model in the pair was identical except in price and operation cost. Consequently for these nine model pair choices the only decision the consumer had to make was whether the higher initial price was worth the annual cost savings. Using the person's implicit payback it was possible to predict which of the two models in the pair the subject would rank highest. The results of this analysis indicate the implicit payback correctly predicted the person's choice by

TABLE 5-4

Market Shares for Different Paybacks
as Determined by Conjoint Analysis

	Advertisement Treatment			
	1	2	3	Total
2 years or over	84%	70%	79%	78%
3 years or over	80%	64%	71%	72%
4 years or over	70%	57%	68%	65%
5 years or over	66%	49%	63%	59%
6 years or over	59%	44%	60%	54%
10 years or over	41%	31%	41%	37%
Average years	8.5	6.9	8.3	7.9
Non-response percent	8	11	4	7

a figure significantly above chance although below the "upper bound" of 88 percent which represents the average number of times the respondents made the rational decision to select the lower priced but otherwise identical appliance.

This brings up a secondary issue, namely, what factors seem to influence the accuracy of this prediction. To address this issue we ran a regression using as the dependent measure whether or not we successfully predicted the person's choice. The independent measures were of two general types. The first attempted to capture how well people understood the ranking task. The measures used to capture this idea were a) the percentage of time a person preferred the lower priced model when all other attributes were identical (RATIONAL) and b) the variation of implicit paybacks (VAR) derived using equation (4) across a range of costs and prices. High values of RATIONAL and low values of VAR were taken to indicate a person understood the card sorting task and used a consistent implicit payback in determining the rankings of the appliances.

The second general type of variable used in the analysis was constructed to capture the divergence of the person's implicit payback from the payback associated with the two appliances making up the pair. Logically one would expect more prediction errors when the person's implicit payback was close to the payback associated with the particular choice.[9] The variable (DIFF) used to capture this idea was the absolute difference between the person's implied payback and the payback associated with the pair.

The results of the regression are shown in Table 5-5. Although the basic

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[9] An individual's implicit payback is really his indifference point--that point at which the total worth of the two alternatives is equal. Making predictions close to this indifference point should be more difficult than predicting choices farther from this point.

TABLE 5-5

Estimated Influences
on the Ability to Predict
"Hold Out" Choices Using Payback

Dependent Variable

0 predicted choice correctly

1 predicted choice incorrectly

Independent Variables	Regression Coefficient	Beta Coefficient	t-value
Rational	-.00375	-.133	7.0
VAR	+.00128	+.029	1.4
DIFF	-.0031	-.102	5.3

hypotheses were confirmed--the implicit payback was more likely to predict the correct choice (i.e., the dependent variable approaches zero) a) when the person understood the card sorting task (a negative sign on RATIONAL and a positive sign on VAR) and b) when the implicit and actual paybacks were further apart versus close together, the regression coefficients indicate that the probability of predicting the correct choice is not significantly changed over the range of these variables. Thus for example, the probability of predicting the correct choice is only .031 more when the pair has a payback difference of 10.1 years compared to one where the difference is .1 years.

A second major question is the identity of individuals with long paybacks since these persons seems to constitute the best market for energy efficient appliances. In order to address this question a series of regressions were run with the estimated implicit payback as the dependent variable and the various levels of a demographic variable as the independent variables. As can be seen from the results shown in Table 5-6, persons with lower education tended to have longer paybacks, as did older consumers, females, and single respondents. Also consumers who lived in areas with lower utility costs had longer paybacks. This latter finding is somewhat ambiguous, however, since respondents in the lower energy area faced choices which on the average had longer paybacks. Consequently even though these consumers exhibited behavior consistent with having longer implicit paybacks, the percentage of consumers in each city who opted for the energy efficient appliances was almost identical. This finding is in accord with our assertion that payback is not the heuristic used by most consumers, since if this heuristic were used, the identity of the city would not be associated with the respondents' implicit paybacks. Instead, it seems that consumers tended to key in on the <u>relative difference</u> in operating costs. This type of decision strategy (i.e., deciding

TABLE 5-6

Effects of Different Levels

of Factors on Implicit Payback

Promotional Treatment*	Average Payback
Group 1	8.61
Group 2	6.83
Group 3	8.42
Age*	
Less than 25	6.34
25-30	7.47
30-40	8.46
40-50	7.93
51 plus	10.15
Identity of Sex*	
Male	7.09
Female	8.83
Marital Status*	
Single	8.51
Married	7.12
City Location*	
Athens (2¢ kilowatt hr.)	9.31
Edison (4¢ " "	6.91
San Francisco (4.6¢ "	7.20
Burlington(6¢ " "	7.52
Income*	
Less than $10,000	7.69
10,001 - 15,000	7.93
15,001 - 20,000	8.57
20,001 - 25,000	8.18
Over 25,000	7.29
Education*	
Less than High School	11.10
High School or Vocational Degree	8.36
Some College	7.21
College Degree or Better	6.89
Ocupation*	
Skilled or Unskilled Labor	9.18
Technical	7.42
Managerial	6.63
Sales/Clerical	6.87

*Differences between levels significant at the .05 level.

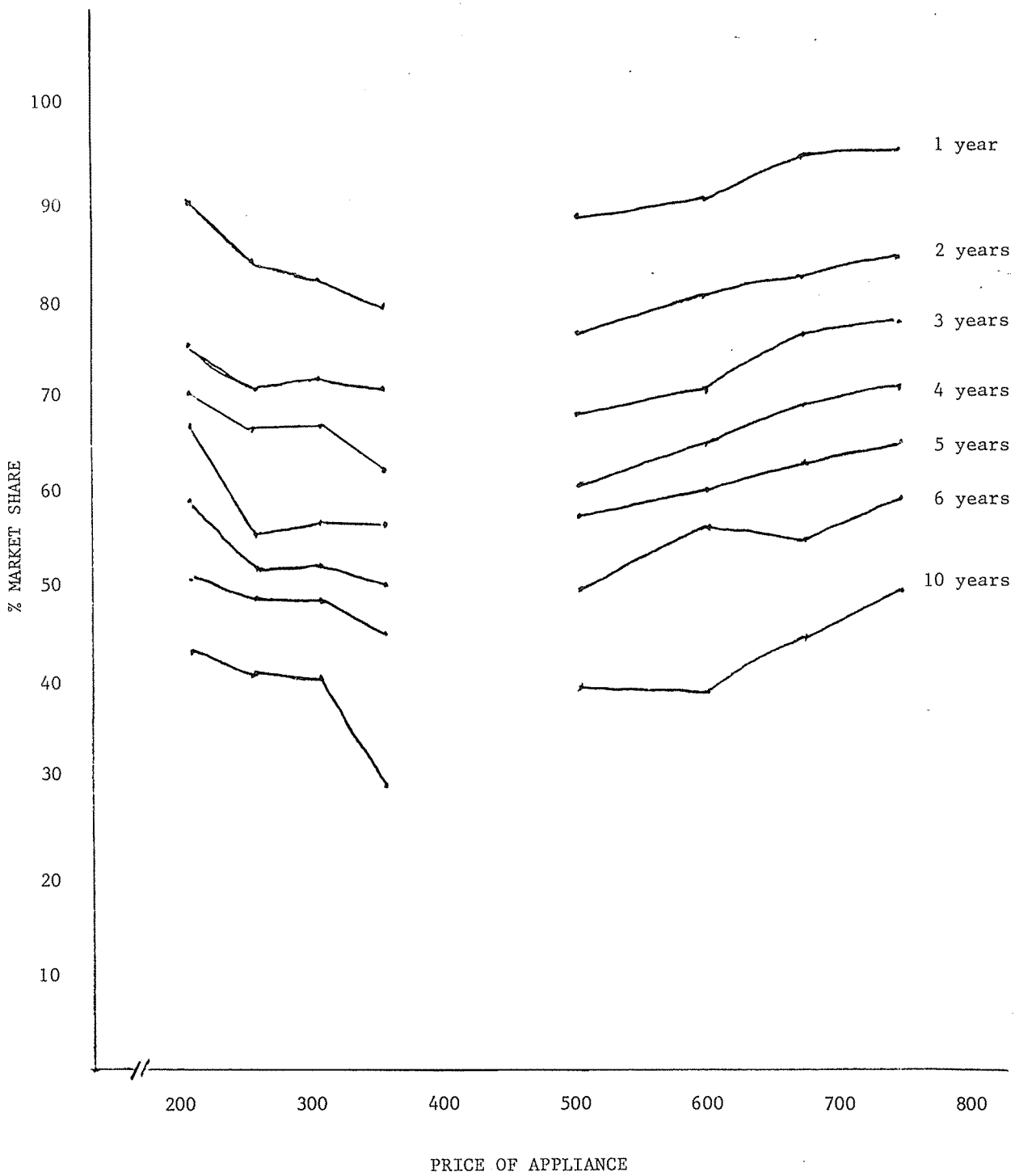
between alternatives by comparing relative differences within a specific attribute has been previously observed by Russo (1975). Finally, there seemed to be no significant relationship between payback and household income.

The above segmentation results are in agreement with those reported by Appliance Manufacturer (1978). They reported that paybacks were lower for higher income families (although differences were not major), younger consumers and individuals with higher education. Thus, even though our measure of implicit payback differs in magnitude from theirs, the association between payback and specific demographics is similar.

In summary, the results given some indication that the best target market for energy efficient appliances (holding the payback of the applicance fixed) is older, less educated consumers, with single respondents and males also tending to have longer implicit paybacks. However, the mean difference in payback between the different levels for these groups is usually small and the variation within the groups is large. Thus, the overriding conclusion is that it is not possible to identify consumers with distinctively longer paybacks using standard demographic variables.

The third factor to consider is the actual market projections for an appliance with a given payback. Figure 5-7 shows the percentages of our sample that have implicit payback periods of longer than 1, 2, 3, 4, 5, and 10 years, as a function of the price of the appliance. Thus, for example, for an appliance costing about $600 and having a payback of one year or better, we estimate just over 90 percent of our sample would choose the energy efficient appliance over the less expensive and less efficient model. If the payback were to increase to 3 years, our estimate of the market share for the higher efficiency model would decrease to 73 percent. A payback of 10 years would attract only 37 percent of the sample.

Figure 5-7


100
90
80
70
60
50
40
30
20
10
% MARKET SHARE
1 year
2 years
3 years
4 years
5 years
6 years
10 years
200
300
400
500
600
700
800
PRICE OF APPLIANCE

Two things should be noted from Figure 1. First, the market shares for a given payback seem to increase slightly for higher priced products. Second, about 50 to 60 percent of consumers would buy energy efficient appliances even if the appliance had a payback of 5 years. This estimate of market share is considerably higher than the conventional wisdom of most brand managers who believe that appliances must have a payback of one to three years if they are to sell.

There are a couple of reasons for this discrepancy. First, the results in Figure 5-6 are applicable only when all other factors are held equal. This is never the case in the "real world". Thus, for example, the results of Figure 5-6 imply that about 55 percent of the sample (which hopefully is representative of the population at large) would opt for a more energy efficient appliance with a five year payback only if the choices differed on price and cost with all other factors identical.

A second major reason for the discrepancy is the difference in the informational environments of the task and the market place. In the card sorting task all respondents were given data on the operating costs for each appliance. Consequently they were able to make trade-offs between this attribute and price. In constrast, operating costs for appliances were not readily available to consumers choosing between brands in the market place. Thus, even if consumers wanted to make a trade-off between these two attributes, the lack of cost information could easily preclude them from making such a decision. Also consumers, when making a decision tend to ignore factors which are not readily available and give substantial weight to factors which are concrete (i.e., readily available). Since price is always available, it is not surprising that we note the empirical fact that consumers normally select the lower priced appliance, which is also less efficient.

It should be pointed out that the informational environment in the market place has been modified in the recent past. The new FTC appliance labeling law requires operating cost information to be displayed on each appliance in a form similar to that used in the card sorting task, i.e., annual operating costs. Thus, the results of Figure 5-6 may represent a long run market share standard that will be approached as more consumers become aware of operating costs.

This premise of how new information will affect behavior was tested to a limited degree in the field. As described earlier, we experimentally manipulated the pre-decision making informational environment of our respondents. About one third of our sample received promotional materials which made no special mention of operating costs, one third were given promotional materials which included average operating costs for a number of appliances and the last one third received materials which include these operating costs as well as an example of how to use payback as a method of making the price-cost trade-off. The first treatment was intended to simulate the current information environment. The second and third was intended to simulate an environment where factors such as operating costs and paybacks are more commonly communicated.

It was our belief that promotional material in the future would tend to make people more aware of operating costs and thus pay more attention to this attribute during the card sorting task. This increased attention would result in their putting more weight on the operating cost attribute and consequently lengthen their implicit payback. Said another way, it was our prior belief that more information on operating costs would lead respondents to have a longer implicit payback. This is in agreement with our previous conjectures that the new FTC energy labeling rule will result in increased sales for appliances with longer paybacks.

In order to test out this belief we compared the paybacks for the three different groups. The results are shown in Table 5-4. Two points can be made from these results. First, the average payback differs significantly between the groups with group 2 showing the smallest average payback. Second, the distribution of responses between the groups was not affected by the different informational environment after adjusting for mean shifts. Thus, in group 1, we note that 84 percent of the sample had implied paybacks less than 2 years and 41 percent greater than 10 years. These figures were 79 percent and 41 respectively for group 3. Group 2's distribution produces similar results after noting that the distribution is shifted by approximately 10 percent in each category.

These results given some insights into how consumers react when they become more attentive to operating costs as stated earlier, reaction would have consumers pay more attention to operating costs and consequently consider this attribute more positively while making a purchase decision leading them to put more weight on operating costs and thus increasing their implicit paybacks. A second possible reaction also assumes consumers pay more attention to operating costs. However, in this instance this information causes them to key in on how much money the appliance will cost to operate in the long run. Consequently instead of paying more attention to <u>operating costs</u>, they concentrate on <u>initial price</u>. As a result they would tend to choose the cheaper model so that they have enough money later on to pay their utility bills. In economic parlance this is referred to as an income effect. The net result of this effect is to decrease their implicit payback.

We note a mean shift toward shorter paybacks for group 2 (versus group 1). This is in accord with the hypothesis that consumers tend to pay more attention to initial price when they are alerted to the fact that appliances will

cost a considerable amount to operate. When information is given on how to trade off the operating cost information with the price information consumers tend to pay more attention to the operating cost. As a result the average implicit payback for group 3 is larger than for group 2. Coincidentally, the average payback for groups 1 and 3 were almost identical.

A final check of our result can be obtained by comparing our estimates to those reported by Hausman (1979). In his study he estimated the implicit average discount rate for a sample of 65 households purchasing air conditioners to be between 15 and 25 percent which when based on an infinite appliance life corresponds to paybacks of 6 2/3 years and 4 years respectively. These figures are lower than our implicit measure but higher than the one to three year figure often mentioned in the trade. Also, unlike our respondents who were given actual operating costs, Hausman's sample were only given EER ratings (which do not transform directly into annual energy consumption costs). Consequently, it is not surprising that Hausman estimated smaller paybacks since most consumers did not know how to transform EER's into energy savings (and thus likely ignored the EER ratings in making their decisions).[9]

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[9] An individual's implicit payback is really his indifference point--that point at which the total worth of the two alternatives is equal. Making predictions close to this indifference point should be more difficult than predicting choices farther from this point.

Section 6

Overview of the Lab Experiment

I. Introduction

The purpose of the lab experiment was to validate the results obtained in the field study: (a) to see if the method of payback (or in general, any investment decision), which provided the basis for the field study, is actually used in a purchase decision task; (b) to see if the market shares for energy efficiency estimated from the preference rakings would accurately predict the market shares obtained in a more realistic choice situation; and (c) to estimate the effects of market variables on the consumer's decision process and on the market shares of energy efficient appliances.

While the measure of payback may be a good "as-if" model of how consumers trade-off between an increased price and operating cost savings, it probably does not depict the actual process most consumers use when making a product decision that includes these two factors among its aspects. However, it is possible to test the adequacy of payback as a model of choice. If, in the process of selecting an appliance, a consumer makes an investment-type decision when comparing price differences with operating cost differences, then this comparison should be independent[10] of normal market forces except those that would facilitate the price-cost trade-off. Thus, if an investment type decision is made, product characteristics such as features or color or size should have no impact on or be affect by the decision to buy energy efficiency, while market forces which may provide information to the consumer regarding operating costs (e.g., government labels, advertising, sales people) should increase (in the aggregate) consumer's use of an investment type decision.

[10] Independence here would indicate that the assumption of "everything else being equal" necessary for deriving implied payback's is in fact a reasonable assumption.

Additionally, if the energy decision is independent of other product characteristics and if consumers can always choose between otherwise identical models (one being more energy efficient), the investment decision should occur after the specific model with attendent features is selected.

If, on the other hand, payback is merely an "as-if" model of the decision process, the stability of the findings of the field study are suspect over both time and changes in the market place. That is, the findings of an average payback in the population of seven years, or a finding of 80% of the population with an implicit payback of two years or more, would only hold for the conditions during which the estimates were made. In this case changes in the conditions could result in changes in the estimates and an attempt to predict even the direction of changes in these estimates would be impossible.

We originally proposed a model of the product decision process where the consumer considers the product as a bundle of benefits, price and operating costs being two such attributes. We then postulated that the consumer would trade-off price and cost via payback. An alternative model would have the consumer, when making a decision, trade-off energy efficiency among all characteristics. That is, rather than viewing energy-efficiency as an investment to be traded against price, he may hold price constant and trade energy for deluxe features or size or some other product characteristic. As with the previous model of choice the importance of energy-efficiency relative to other product characteristics can be estimated, and under controlled conditions, the effects of market forces on this "importance" determined.

To reiterate, the purpose of the lab experiment was twofold. The first was to "validate" the results of the field experiment by determining if the concept of payback is useful in representing the decision outcomes in a more realistic setting. Secondly, the lab experiment enabled us to estimate the

effects of three market forces on the role of energy-efficiency in the decision process, these being energy labels, special promotional material, and salespersons' push of energy efficiency.

II. Description of the Lab Experiment

The lab experiment consisted of a simulated shopping task where consumers went through the process of "buying" a new refrigerator. The experiment took place in the showroom of the corporate offices of White-Westinghouse April 10, 11, and 12, 1979, between 8:00 AM and 5:00 PM.

The Sample. A convenience sample was obtained from 3 civic/social groups in Pittsburgh and from the Blawnox plant offices of White Consolidated. The subjects were contacted several weeks prior to the experiment by a representative of White-Westinghouse and asked to participate in a simulated shopping task so that White-Westinghouse could better understand what was important to the consumer when they bought a refrigerator. The employees of Blawnox received time off from work and the members of the civic groups were nominally compensated for participating in the study.

As is frequently the case with convenience samples, our sample is not representative of the population as a whole or refrigerator buyers as a subpopulation with respect to socio-economic and demographic characteristics (Table 6-1). Our sample tended to be older and wealthier with more white collar workers than the population as a whole. The results we obtained, therefore, are not generalizable to the extent that these characteristics affect the decision process.

The Task. The lab experiment consisted of five separate activities: (1) reading promotional material about refrigerators, (2) shopping for a refrigerator, (3) preference ranking of 12 refrigerators depicted on cards somewhat akin to the card sorting in the field study, (4) providing

TABLE 6-1

Demographic Characteristics of the Lab Experiment by Treatment[1]

		Refrigerator Buying Population	Total Sample	Treatment Cells 1	2	3	4	Follow-up Treatment Cards	Video
SEX:	Female	62%	68%	72	57	68	75	67	69
	Male	38%	32	28	43	32	23	33	31
MARITAL STATUS:	Married	68%	85	72	83	89	93	83	88
	Single	32%	15	28	17	11	6	17	12
AGE:	Less than 25	13%	4.9	7	3	4	7	3	6
	25-30	16%	4.9	14	4	3	0	7	3
	31-40	15%	10.7	14	3	14	14	7	14
	41-50	15%	24.6	27	23	14	33	21	28
	51-60	18%	49.2	38	63	60	33	7	5
	over 60	23%	5.7	0	6	4	13	7	5
INCOME:	Less than 10,000	33%	8.1	14	0	7	12	10	5
	10,001-15,000	18%	17.1	7	23	22	16	17	17
	15,001-20,000	12%	22.8	28	26	14	23	17	14
	20,001-25,000	14%	17.1	14	20	21	13	15	21
	over 25,000	18%	30.1	37	28	29	26	27	36
	No response		4.8	0	3	7	10	4	7
EDUCATION:	High school or less	58%	44.7	38	51	25	61	47	40
	Vo tech	3%	9.8	10	3	21	7	10	10
	Some college	20%	27.6	28	29	32	23	30	24
	College grad	19%	17.9	24	17	22	9	13	26
OCCUPATION:	Retired	Not available	4.1	0	0	14	3	4	5
	Housewife	16%	43.1	31	37	36	68	48	33
	Professional/Technical	27%	21.9	21	26	21	19	20	26
	Managerial	16%	8.1	3	20	0	6	5	14
	Sales	13%	22.7	38	17	29	3	23	22
	Laborer	27%	0	0	0	0	0	0	0
	Total		100%	24	28	23	25	66	34

TABLE 6-1 continued

		Refrigerator Buying Population	Total Sample	Showroom and Costs A 1979	A 1981	B 1979	B 1981	Electric Rate[2] Quoted 2¢	4¢	6¢
SEX:	Female	62%	68%	75	61	61	71	57	81	61
	Male	38%	32	25	39	35	29	43	19	39
MARITAL STATUS:	Married	68%	85	91	85	82	81	83	97	86
	Single	32%	15	9	15	18	19	17	3	14
AGE:	Less than 25	13%	4.9	0	8	9	3	6	3	4
	25-30	16%	4.9	3	11	0	6	4	0	4
	31-40	15%	10.7	3	11	18	10	14	6	7
	41-50	15%	24.7	28	11	24	32	14	32	28
	51-60	18%	49.2	59	50	39	48	50	55	50
	over 60	23%	5.7	6	8	9	0	12	4	7
INCOME:	Less than 10,000	33%	8.1	3	8	17	3	12	3	4
	10,001-15,000	18%	17.1	12	15	21	19	20	23	14
	15,001-20,000	12%	22.8	25	27	15	26	23	19	21
	20,001-25,000	14%	17.1	19	19	15	16	17	23	18
	over 25,000	18%	30.1	37	23	29	29	20	32	32
	No response		4.8	3	8	3	7	8	0	11
EDUCATION:	High school or less	58%	44.7	53	31	38	55	49	48	39
	Vo tech	3%	9.8	3	19	12	6	11	7	11
	Some college	20%	27.6	28	19	32	29	31	20	36
	College grad	19%	17.9	16	31	18	10	9	25	14
OCCUPATION:	Retired	Not available	4.1	0	11	6	0	3	3	10
	Housewife	16%	43.1	53	27	41	48	31	68	40
	Professional/Technical	27%	21.9	16	31	18	10	9	25	14
	Managerial	16%	8.1	12	12	0	10	9	3	18
	Sales	13%	22.7	19	23	24	26	29	7	14
	Laborer	27%	0	0	0	0	0	0	0	0
	Total		100%	26	21	28	25	28	25	23

[1] Figures are percent of each treatment of that characteristic

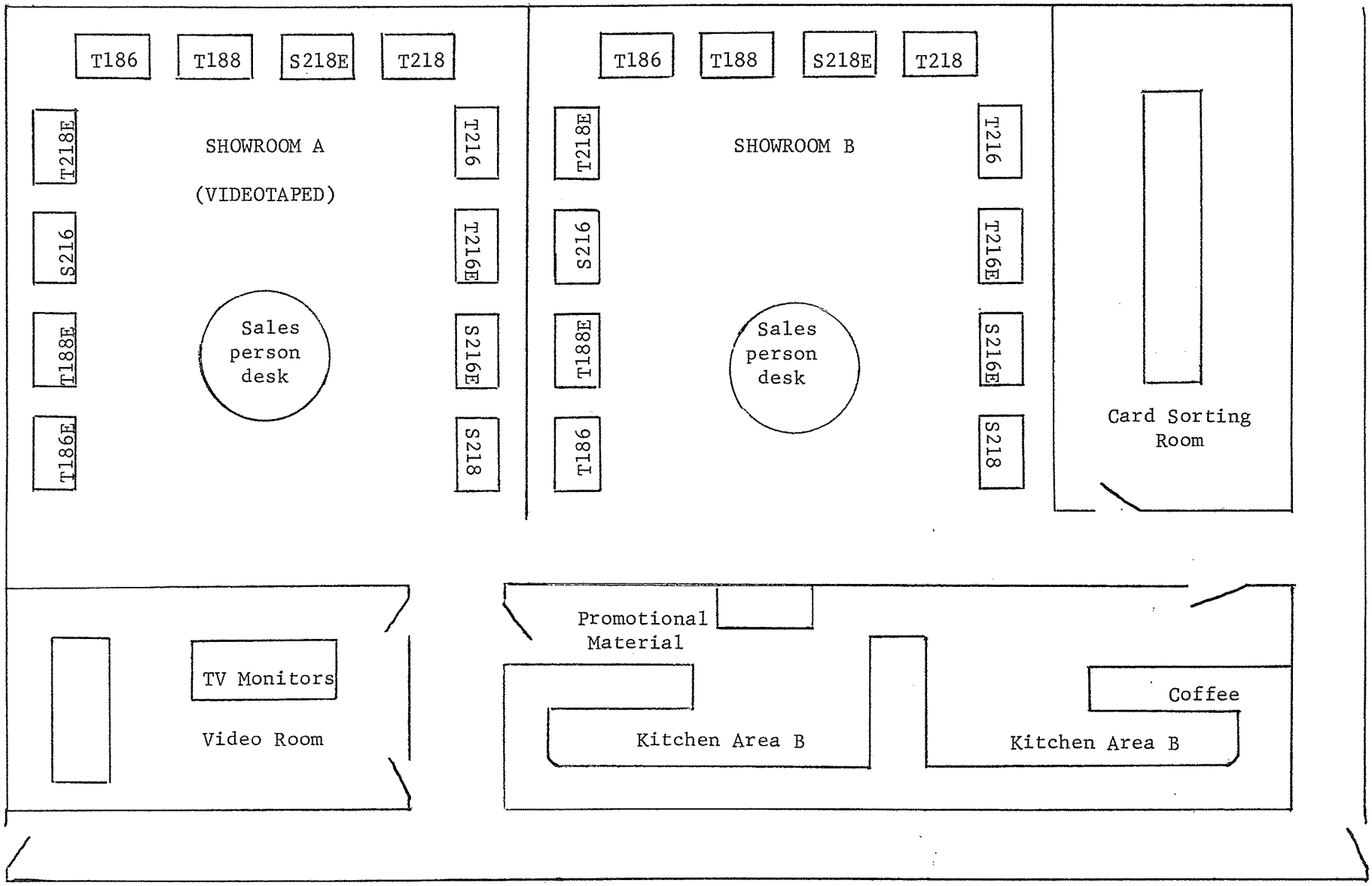
[2] Electric rates were only quoted for Cells, 2, 3 and 4 of the experimental design

"post-purchase" protocols while watching a TV replay of themselves shopping, and (5) completing a final questionnaire. All subjects read some promotional materials, shopped for a refrigerator and completed the final questionnaire. About one half of the subjects provided preference rankings of the cards while the remaining subjects provided "post-purchase" protocols. The total experiment took between 45 and 70 minutes to complete. The activities took place in four different rooms (Figure 6-2) so that a continuous flow of subjects (every 15 minutes) could be maintained. The subjects generally came to the showroom in groups of 5 to 10 and since the shopping was done individually (or as a couple for several husband-wife pairs) there was frequently a delay before each subject could begin the shopping task. This time was spent in Kitchen area A where coffee and doughnuts were provided. The kitchen areas were equipped with deluxe appliances that the subjects could examine. The subjects were given name tags at this time and then addressed by their first name throughout the experiment. Two or three customers at a time were taken to Kitchen area B where an introduction was read to them which briefly described the task and reiterated that the purpose was to determine what people consider when buying new refrigerators. They were also informed at this time that some respondents would be video taped and they may get to see themselves on TV at the conclusion of the shopping task.

Then, they were told that since most consumers gather some information prior to going to the store, they were to read a series of ads (Appendix B, Figures 1 and 2) prior to shopping for a refrigerator. They were given as much time as they wanted to read the ads and in general they spent about 5 to 10 minutes doing so. When they had finished, the ads were collected and they completed a pre-shopping questionnaire (Appendix B, Figure 3) which was used (a) as a manipulation check for the ad treatment, and (b) to force them to

Figure 6-2

LABORATORY EXPERIMENT FLOORPLAN



think about what they expected to pay for a new refrigerator and what size they were interested in prior to the shopping task.

Upon completion of the pre-shopping questionnaire the subjects were taken into either showroom A or B and told to browse around and that a salesperson would be with them shortly. In many instances when they entered the showroom there was another customer already being waited on by a salesperson. After some period of time (5 to 15 minutes) a salesperson would approach the respondent offering help, where-upon the actual sales process began. The shopping task culminated with the salesperson asking them to state (a) which refrigerator they liked best (b) which one they would actually buy were they to lay out the hard cash, and (c) their second and third choices if the one they would buy was not available. The subjects were then taken to either the video room or the card sorting room for the conclusion of the experiment and the salesperson completed the salesperson's questionnaire (Appendix B, Figure 4) for that respondents.

Those customers who were taken to the card sorting room were given 12 cards (Appendix B, Figures 5 and 6) with pictures of the same refrigerators as in the showroom along with prices and annual operating costs and were asked to rank order the cards in the order in which they would buy them, with the one most likely to be bought on top. After finishing this task, they completed the final questionnaire (Appendix B, Figure 7), where given a small token of appreciation, and were told they were free to leave (or to wait in Kitchen area A until their groups was ready to go).

The subjects who were taken to the video room sat down in front of a TV monitor and watched themselves shopping. Almost everyone had forgotten completely about the possibility of being video taped, so even though they were forewarned, we assume that videotaping did not alter their shopping process. While they were watching the replay of the shopping task they were asked to

describe what they were doing and what they were thinking during each part of the task as it appeared on the screen. This "prompted protocol" was dubbed over the video part of the tape for later transcription and analysis. As with the card sorting task, these people finished by completing the follow-up questionnaire. They were also given a token of appreciation and were free to leave or return to Kitchen area A.

III. The Experimental Design

An indication of the predictive validity and generalizability of the field experiment can be obtained by having the consumers "buy" a refrigerator in a controlled shopping task where the prices and costs are manipulated to vary paybacks. However, to estimate the effects of different variables on the energy decision process, a somewhat more complex experimental design was incorporated into the study. In addition to price and cost variations, refrigerator variables including size, model features, and location of freezer, and market variables including government energy labels, promotional material, and the influence of the salesperson were introduced into the experiment and often manipulated.

Apart from validating the field study findings, the major focus of the lab experiment was to determine the effects of 3 market variables -- energy labels, energy information, and energy sales push -- on the decision to "buy" energy. Due to cost and time constraints, a full factorial experiment to test all main and interaction effects was impossible, so four treatment cells were selectively chosen so as to provide the most relevant information. Cell I was a control group to typify the conditions if the energy models were available but with no other market impetus. This group then provides baseline measures for the other treatment cells. Because government labeling will become mandatory in 1980, the remaining three treatment conditions all had government labels on the upper right corner of each refrigerator. The labels (Appendix B, Figure 8) were

bright yellow and conformed to the requirements stipulated in the FTC's energy labeling TRR (FTC, 1978). In cells II, III and IV the labels were used to differentiate energy and non-energy models, while in cell I, this difference was communicated via the salesperson on request (that is, in cell I, when a customer asked why two seemingly identical refrigerators had different prices, the salesperson would explain that one was more enery efficient - 25% more for 1979 conditions, 15% more for 1981 conditions.

To assess the effects of promotional material on the energy decision, customers in cells I and III were given promotional material (Appendix B, Figure 1) emphasizing traditional characteristics, while those in cells II and IV were given promotional material that included an energy-efficiency push (Appendix B, Figure 2). Both packets had two identical ads and each had a mockup reprint from Consumer Reports. This material was presented as being representative of the type of material they might obtain were they actually to engage in buying a refrigerator.

The last major aspect of the experiment was the inclusion of the salesperson into the shopping task. The sales people participating in this experiment consisted of a salesperson from an appliance store in Pittsburgh and two members of White-Westinghouse's marketing staff with product experience. For half of the customers (those in cells I and II) the sales people were directed to push product characteristics such as deluxe features or freezer location. That is, they were to try to get the people to trade up in price. For the customers in cells III and IV the salespeople were instructed to "sell" energy --to convince the customers to buy the energy efficient model of whatever type of refrigerator the customer seemed most likely to buy, i.e., again to get them to trade up in price. The treatment manipulations for each of these four cells are summarized in Table 6-3.

TABLE 6-3

Experimental Design for the Major Manipulations

Cell	# of Respondents*	Treatment Conditions: Government Energy Labels	Energy Advertisements	Energy Sales +Push
I	26	NO	NO	NO
II	33	YES	YES	NO
III	28	YES	NO	YES
IV	33	YES	YES	YES

* Two respondents did not fall into any of the cells and were eliminated from the analysis

The task facing each customer was to "buy" a refrigerator from among a set of 12 alternatives, which in fact consisted of six pairs, each pair identical except for differences in stated operating costs. The six models varied by size (18 or 21 cubic feet), location of freezer (top mount for both 18 and 21 cubic foot models or side by side with 21 cubic foot model only) and type of features (standard features--wire shelves, etc.--or deluxe features--glass shelves, etc.). A complete listing of the models is presented in Table 6-4 along with the prices and costs associated with each.

As technology improves and government standards go into effect, additional percentage savings due to further improvements in energy efficiency are likely to decrease. This will result in longer paybacks for the more energy efficient models in the future. To estimate the effects of these increased paybacks on demand for energy efficiency (in addition to conditions as they currently exist) two separate showrooms (A and B) were used and customers were randomly assigned to each. The rooms had identical display layouts and differed only in the prices and operating costs associated with each model. Showroom A was designed to reflect today's environment, Showroom B to reflect the environment in 1981. The prices in room A were set using a product line pricing strategy to reflect current prices. The prices of the energy models were also set to reflect cost increases due to increased energy efficiency. Slight adjustments were made to allow for different paybacks across models. In showroom B, prices were set to reflect 1981 conditions. Consequently, the non-energy model in room B corresponds to the energy model of room A (note in Table 6-4, the price of T188E in room A corresponds to the price of T188 in room B), and the prices of the 1981 energy models were set to reflect price increases due to energy efficiency above and beyond 1981 standards. In other words, the 1979 energy models were used to depict the 1981 non-energy models since these models approximate the

TABLE 6-4

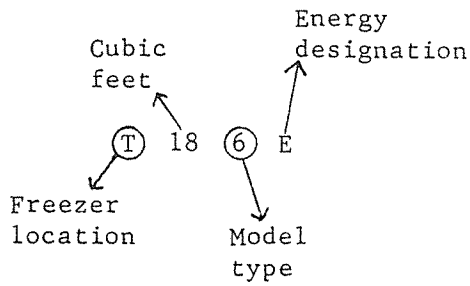
PRICES AND COSTS OF REFRIGERATORS

Showroom A				Showroom B			
Model**	Price	1979* Cost	1981* Cost	Model	Price	1979* Cost	1981* Cost
T186E	570	47	41	T186E	610	47	41
T188E	660	51	43	T188E	680	51	43
S216	780	80	62	S216	810	80	62
T218E	690	60	47	T218E	740	60	47
T186	550	69	47	T186	570	69	47
T188	620	71	49	T188	660	71	49
S218E	920	65	50	S218E	950	65	50
T218	660	78	60	T218	690	78	60
T216	590	74	57	T216	640	74	57
T216E	640	58	44	T216E	665	58	44
S216E	810	62	49	S216E	890	62	49
S218	840	83	65	S218	920	83	65

* 1979 Costs were used in room A for the 1st half of the experiment, and in room B in the last half. 1981 costs were used in room B in the 1st half and room A in the last half.
Costs are listed at national average of 4.1¢ per kilowatt-hour.

** Model codes are:

T: Top mount freezer
S: Side by side freezer
18: 18 cubic feet
21: 21 cubic feet
6: Standard model
8: Deluxe model
E: Energy efficient



federal minimum standards.

Originally, the annual operating costs of room A were set to represent 1979 reality. The non-energy model operating costs were calculated by using the national average electric rate of 4.1¢ per kilowatt-hour used by each model. The cost for the energy models were calculated at a 25% savings and then adjustments were made to yield a variety of paybacks across models. The final cost savings ranged from 21 to 32 percent. In room B, the operating costs were originally set to reflect 1981 conditions. This was accomplished by determining minimum government standards and then setting costs at slightly below that. The costs of the energy models were then calculated at about a 20% reduction in costs. Again final adjustments were made to allow a variety of paybacks. Halfway through the experiment, the costs were switched between the two rooms so as to provide a wider range of paybacks within each model pair, (Table 6-5). It should also be noted that the prices and costs are such that paybacks can be computed for almost every energy/non-energy pair. However, analysis is focused on only the directly comparable pairs (e.g., T186-T186E).

Finally, because payback is a function of electric utility rates, one third of the people in the label conditions were told that Pittsburgh's rate was 4¢ which is close to the national average, one third were told that Pittsburgh's rates were 2¢ per kilowatt-hour, and one third, 6¢ per kilowatt-hour. For the people in the 4¢ treatment, the relevant operating costs would be those depicted by the large numbers on the labels, while the relevant costs for the other two groups were presented in the table on the lower half of the label.

The final manipulation was in the data collection process where about half of the people performed a card sorting task and the other half gave verbal protocols while watching themselves shop on videotape. An attempt was made to

TABLE 6-5

Payback by Model Type

Model Pair	Room A Payback (years)** 1979 Operating Costs	Room A Payback (years)** 1981 Operating Costs	Room B Payback (years)** 1979 Operating Costs	Room B Payback (years)** 1981 Operating Costs
T186E-T186	.9	3.3	1.8	6.7
T188E-T188	2.0	6.7	1.0	3.3
T216E-T216	3.1	3.8	1.6	1.9
T218E-T218	1.7	2.3	2.8	3.8
S216E-S216	1.7	2.3	4.4	6.2
S218E-S218	4.4	5.3	1.7	2.0
T188E-T216*	3.0	5.0	1.7	2.9
T186*	6.1	27.5	6.1	27.5
T216E-T188*	1.5	4.0	0.4	1.0
T186*	8.2	30.0	8.6	31.7
T218E-T216*	7.1	10.0	7.1	10.0
T188*	6.4	35.0	7.3	40.0
T186*	15.6	--	18.9	--
S216E-T218*	9.4	13.6	12.5	18.2
T216*	18.3	27.5	20.8	31.3
T188*	21.1	--	25.6	--
T186*	37.1	--	45.7	--
S218E-S216*	9.3	11.7	9.3	11.7
T218*	20.0	26.0	20.0	26.0
T216*	36.7	47.1	34.4	44.3
T188*	50.0	--	48.3	--
T186*	92.5	--	95.0	--

* Although these pairs are not identical except for price and operating costs, they do represent comparisons whereby "payback" is applicable (i.e., price differences maybe recouped by operating costs).

** The paybacks are computed using an operating cost of 4¢ per kilowatt hour. Paybacks in the 2¢ condition would be twice as long and in the 6¢ condition would be half as long.

balance all these additional experimental manipulations across cells (Table 6-6). The socioeconomic demographic characteristics broken down by treatment are presented in Table 6-1.

TABLE 6-6

Number of Respondents for Each Secondary Treatment

Broken Down by Cell

	Electric Rate Quoted			Follow-up Treatment	
Cell	2¢	4¢	6¢	Video	Cards
I	NA	NA	NA	8	21
II	9	12	14	13	22
III	12	10	7	11	17
IV	14	6	10	10	21

	Salesperson			Price/Cost Conditions	
Cell	A	B	C	1979	1981
I	18	6	5	16	13
II	15	15	5	19	16
III	12	11	5	15	13
IV	11	10	10	16	15

Section 7

Results of the Lab Study

I. Summary

The goals of the lab study were twofold: to validate the results of the field study in a setting that more nearly approximated the actual choice task, and to determine the effects of different market variables on the demand for energy efficiency. The generalizability of the field study is tested by (1) estimating the distribution of paybacks using three different techniques: direct questioning, a card sorting task, and actual choice in the shopping task and comparing them with the distribution of paybacks obtained in the field; and (2) by seeing how well the payback predicts actual choice in the shopping task. The results demonstrate that the direct questioning method of determining paybacks yield highly unreliable estimates while the derived methods from the card sorting task (which differs from the field study task) is consistent with the conjoint measurements results of the field study. However, the field study paybacks are shown to over-estimate the actual market shares obtained in the shopping task when no other marketing variables are introduced. When other marketing variables are present, the derived paybacks do not at all predict the obtained market shares for energy efficiency. In fact, the results indicate the payback does not even seem to be a relevant criterion.

The second goal of the lab study was to determine the effects of government labels, energy promotional material, and salespeople pushing energy on the choice of energy efficiency. In general advertising did not seem to have much effect on energy demand. However, information about costs of operation (when presented without the sales push) tended to decrease the average payback period indicating a decline in demand for energy. Finally, salespeople are shown to dominate the situation, being able to convince nearly everyone to buy energy.

This occured in spite of the fact that the customers, after the shopping task, stated that the salesperson had very little influence on their decision. The last major finding discussed is that the customers tended to be of two types: those who treated energy efficiency as an investment decision and those who treated it as just another feature.

II. Results: Validation of the Field Study

There are two aspects of the lab study that address the results of the field study. The first is whether or not the estimated distribution of paybacks across the population will predict aggregate choices in a buying situation. That is, do the field estimates of payback have predictive validity? The second aspect is whether or not people tend to actually use a payback decision rule in the shopping task.

Paybacks derived from direct measures. The same three direct measures of payback used in the field study were asked in the follow-up questionnaire after the shopping task. As in the field study, if people actually had a payback decision rule a high degree of similarity between the measures should be obtained. The results coincide closely with those obtained in the field experiment. The average payback periods for the three measures were relatively similar (.7 years apart), but the underlying frequency distributions (Table 7-1A) were quite disparate. A χ^2 test of homogeneity between the three measures produced a highly significant test statistics of 46.7, ($\chi^2 = .005$, R = 28.3), implying that each measure will yield substantially different predictions of market share for any payback period.

A major difference from the field study is that all but two of the respondents were able to answer the direct measures of payback. This response rate can be due to either (a) sample characteristic differences or (b) "having gone through the shopping task". The latter seems more likely, especially since the

TABLE 7-1

A. Distribution of Paybacks using Direct Measures (Entire Sample)

Payback Period	Measures: Initial (Cum. %)*	Annual (Cum. %)*	Payback (Cum. %)*
Over 10 years	19.7 **	11.8 **	— **
Over 6 years	36.1	41.3	36.6
Over 5 years	62.3	54	67.5
Over 4 years	75.4	65.1	78.1
Over 3 years	86.1	80.5	93.5
Over 2 years	88.6	90.7	95.9
0-2 years	100.0	100.0	100.0
Average Payback***	6.45 years	5.71 years	5.71 years
% Non Response	1%	4%	0%

* Using cumulative percentages means each figure can be interpreted as the estimated market share.

** Sample size of 123.

*** All paybacks over 15 years were recorded as 15 years.

B. Reliability of Direct Measures (Entire Sample)

	Annual	Payback
Initial	.0735	-.0502
Annual		.0536

TABLE 7-1 continued

C. Distribution of Paybacks using Direct Measures (Cells 3 and 4)

	Measures		
	Initial (Cum. %)*	Annual (Cum. %)*	Payback (Cum. %)*
over 10 years	17.2**	10.2**	-- **
over 6 years	41.4	47.5	44.1
over 5 years	62.0	56.0	66.2
over 4 years	74.1	67.9	76.3
over 3 years	86.2	84.9	94.9
over 2 years	86.2	93.2	94.9
0-2 years	100.0	100.0	100.0
Average Payback**	6.34 years	7.41 years	6.12 years
% Non Response	2%	2%	0%

* Using cumulative percentages means each figure can be interpreted as the estimated market share.

** Sample size of 61.

*** All paybacks over 15 years were recorded as 15 years.

D. Reliability of Direct Measures (Cells 3 and 4)

	Annual	Payback
Initial	.0735	-.0502
Annual		.0536

subjects in cells III and IV were frequently led through payback type calculations by the salespeople. Consequently if anyone actually were to use a payback rule in answering the direct questions, it should be the subjects in these cells. However, the results for cells III and IV (Table 7-1C) are similar to those of the entire sample (i.e., similar means but dissimilar distributions for the three measures.)

Finally, if an individual uses an implicit payback rule the paybacks derived from the three measures should be very similar. This consistency of response within individuals (reliability) is estimated from the correlations between the three measures. Low correlations imply poor reliability; high correlations, the reverse. Similar to the findings of the field study, the direct measures do not yield reliable estimates of a person's implicit payback (Table 7-1B) although the results for the subjects in cells III and IV (Table 7-1D) are somewhat more consistent than the sample as a whole.

The overriding conclusion is that although the direct measures of payback provide market shares estimates that behave properly (i.e., go down as paybacks goes up), the measures are not reliable (the people do not seem to be using payback when answering the direct questions) even under the most likely conditions (cells III and IV). However, people who have gone through the shopping process and compared prices with operating costs are more likely to be comfortable with the idea of payback and can in fact learn to calculate paybacks even though they may not have an implicit payback rule.

Paybacks derived from rank order preferences. After the shopping task eighty-one respondents performed a card sorting task where they rank order (in terms of buying preferences) twelve cards depicting the twelve refrigerators displayed in the showroom. The twelve refrigerators depicted on these cards (Appendix B, Figure 6) differed from the showroom refrigerators by price and

operating costs only. As estimate of each individual's implicit payback can be made by examining his preference for each identical pair. For example, if the consumer rank ordered the T188 model above the T188E model, his implicit payback must be lower than 2 years, while had he preferred the energy efficient model, his implicit payback should be greater than 2 years. The payback associated with each pair in the card sorting task is presented in Table 7-2. An individual is assigned as implicit payback that maximizes the number of correct predictions of his preference for each pair of refrigerators. An inconsistency (reversal) in the estimated payback would occur when the individual preferred an energy efficient model of a pair with a payback longer than the payback of a pair for which he preferred the non-energy model. Since there are 6 pairs, 3 "reversals" is the most possible using this classification scheme. For example, an individual who rank ordered (preferred) the T216E, T218E, T188E, S216E, T186, and S218E models ahead of their counterparts would be classified as having a payback of 2.12-3.0 years with 1 reversal. Of the 81 respondents who ranked the cards, 60.5% yielded payback estimates that were completely consistent with the data and another 27% had only 1 reversal (Table 7-3B) which provides some degree of confidence in the estimate paybacks. Aggregating across individuals, market share estimates are obtained (Table 7-3A) which, for the entire sample, are very similar to those predicted by the field study demonstrating the predictive validity of the field study to a different card sorting task.

Paybacks derived from the simulated purchase selections. Each model in the showroom has an identical but energy efficient twin so inferences about an individual's implicit payback can be made from his selection. If an individual bought an energy efficient model the payback associated with that model pair represents a lower bound on the implicit payback (i.e., it must be at least

TABLE 7-2

Paybacks for the Card Sorting Task

Model Pair	Payback
T216 - T216E	1 Year
T218 - T218E	1.33 Years
T188 - T188E	2 Years
S216 - S216E	2.12 Years
T186 - T186E	3 Years
S218 - S218E	4 Years

TABLE 7-3

A. Market Share Predictions from the Field Study

Payback Period	Field Study Market Share Predictions*	Lab Study Card Sorting Market Share**
Over 10 years	43.2%	
Over 6 years	55.8%	
Over 5 years	61.3%	
Over 4 years	66.1%	61.6%
Over 3 years	73.5%	80.8%
Over 2 years	80.9%	90.4%
Over 1 year	92.3%	94.5%

* Based on the average across prices for refrigerators

** Based on a sample size of 73 respondents. Eight of the respondents could not be classified. The maximum possible payback was four years.

B. Reversals in the Payback Classification in the Card Sorting Task

# of Reversals*	% of Respondents
0	60.5%
1	27.2%
2**	4.9%
3**	7.4%

* A maximum of three reversals was possible

** The six respondents with 3 reversals and two of the respondents with 2 reversals constitute the 10% unclassified in 6-7A.

that long), while if the individual bought the non-energy model the payback of the model pair would represent an upper bound on the individual's implicit payback estimates of market shares for payback periods are determined (Table 7-4B). The conservative estimate is found by assigning an implicit payback equal to the lower bound whenever possible and equal to the class below the upper bound otherwise. The ultra conservative estimate assigns all upperbound people to the lowest payback group. In addition to the entire sample results are presented for cell II because the people in that cell had the relevant cost information but did not get the energy sales push and hence should correspond more nearly with the card sorting task. Paybacks derived from the field study overestimate payback market shares inferred from the model selected in the shopping task, especially for the longer payback periods.

The process of determining payback market shares was repeated using all three choices in the shopping process (Tables 7-4C and D). This results in identifying the lower bound for 12 additional people, but did not alter the market share estimates much. Hence, paybacks derived from conjoint measurement seem to overestimate paybacks derived from actual choice selection. However, it should be noted that the discrepancy between the two sets of market share estimates could be due almost entirely to the conservative method of estimating paybacks which assigned implicit paybacks equal to the lower bounds.

Perhaps the most pertinent finding from deriving paybacks from the choice process is that all but 9 of the subjects made selections that were consistent with a model of payback, and 4 of those 9 subjects were in cell I where payback calculations were difficult because of the lack of actual operating cost information. Subjects were asked to select the top 3 refrigerators they would be most likely to buy but not all subjects did. If a person only chose 1 refrigerator, then there is no chance he could be classified as inconsistent

Table 7-4

A. Distribution of Limits of Paybacks Derived from Model Purchased

	Cell II		Entire Sample	
Payback	Lower Bound[1]	Upper Bound[2]	Lower Bound[1]	Upper Bound[2]
< 1 year	1	1	1	2
1-2 years	5	2	27	8
2-3 years	5	6	23	12
3-4 years	5	3	15	7
4-5 years	0	1	4	2
5-6 years	0	0	5	2
6 + years	1	4	10	5

[1]These people chose the energy efficient model. Hence the payback of the pair chosen represents a lower limit on their implicit payback

[2]These people chose the non-energy efficient model. Hence the payback of the pair chosen represents an upper limit on their implicit payback.

B. Market Shares Estimated from the Paybacks Associated with the Model Selected

	Field Study Market Share Predictions	Slightly Conservative*		Ultra Conservative**	
		Cell II	Entire Sample	Cell II	Entire Sample
over 1 year	92.3%	87.9%	91.1%	45.5%	68.3%
over 2 years	80.9%	54.5%	59.3%	30.3%	46.3%
over 3 years	73.5%	30.3%	35.0%	15.2%	27.6%
over 4 years	66.1%	15.2%	21.1%	3.0%	15.4%
over 5 years	61.3%	15.2%	16.3%	3.0%	12.2%
over 6 years	55.8%	3.0%	8.1%	3.0%	8.1%

* Paybacks are equal to the lower bound where available. People with upper bound estimates only were assigned to the payback period immediately below their upper bound.

**Paybacks are equal to the lower bound where available. People with upper bound estimates only were assigned to the lowest payback period.

TABLE 7-4 continued

C. Distribution of Limits of Paybacks Derived from the three Models Selected in the Shopping Task

	# of Respondents[3]			
	Cell II		Entire Sample	
Payback	Lower Bound[1]	Upper Bound[2]	Lower Bound[1]	Upper Bound[2]
< 1 year	2	6	3	8
1-2 years	3	1	14	7
2-3 years	4	2	20	6
3-4 years	9	3	19	5
4-5 years	0		11	
5-6 years	0		5	
6 + years	2		16	

[1]These people chose the energy efficient model. Hence the payback of the pair chosen represents a lower limit on their implicit payback.

[2]These people chose the non-energy efficient model. Hence the payback of the pair chosen represents an upper limit on their implicit payback.

[3]Nine of the 123 subjects made choices that were inconsistent with a payback model.

D. Market Shares Estimated from the Paybacks Associated with the top three Choices in the Shopping Task

		Slightly Conservative*		Ultra Conservative**	
Payback	Field Study Market Share Predictions	Cell II	Entire Sample	Cell II	Entire Sample
over 1 year	92.3	74.2	84.6	58.1	74.7
over 2 years	80.9	58.1	66.7	48.4	62.3
over 3 years	73.5	45.0	46.7	35.5	44.4
over 4 years	66.1	6.5	28.4	6.5	28.4
over 5 years	61.3	6.5	18.6	6.5	18.6
over 6 years	55.8	6.5	13.9	6.5	13.9

with a payback model. If he selected 2 different models (differences here do not include energy differences), then there is a 25% chance (by random selection) that he would be inconsistent with a payback model, and if he selected 3 different models there is a 50% chance (with random selections) that he would be inconsistent with a payback model. Thus, the expected number of people classified as inconsistent with a payback model (by chance alone) can be calculated from

$$E(\# \text{ of inconsistencies}) = \frac{M_1}{N}(0) + \frac{M_2}{N}(.25) + \frac{M_3}{N}(.5)$$

where M_1, M_2 and M_3 are the number of respondents selecting 1, 2 or 3 different refrigerators respectively and N is the total sample size. As can be seen in Table 7-5, respondents in the label conditions acted more consistently with the payback model than respondents without the labels or than can be expected from change alone. This does not imply that people use a payback decision rule but that when presented with the cost information are more likely to behave in a manner that is consistent with a payback model.

Payback and market share. The last and most crucial test of the field study results is whether or not they will predict actual choices (in this case market shares) obtained in the choice task. Since each model has an identical but energy efficient twin and since the paybacks vary across models, treatments and showrooms, market share estimates can be obtained for various payback levels by looking at the percentage of people who "bought energy" at each payback level. Again, the results for cell II are presented separately since it had the cost labels but no sales push. The market share estimates for cell II (Table 7-6) almost behave as payback estimates should (i.e., go down as payback increases) but the field study predictions overestimate market shares

TABLE 7-5

Percentage of Respondents Selecting Products in a Manner Inconsistent with a Payback Model

	Cell I	Cells II, III & IV
Expected Percentage Inconsistent (P_E)	25%	29.5%
Actual Percentage Inconsistent (P_A)	13.8%	5.3%
H_0: $P_E = P_A$	$z = 1.517$	$z = 5.145$
	$\alpha = .1286$	$\alpha = .000$
H_0: $P_{A_I} = P_{A_2}$	$z = 2.088$	
	$\alpha = .0366$	

TABLE 7-6

Market Shares derived from the Choices in the Shopping Task

	Field Study Market Share Predictions	Lab Study Market Shares (Cell II)	Lab Study Market Shares Entire Sample
over 1 year	92.3%	71.4%	77.1%
over 2 years	80.9%	45.5%	65.7%
over 3 years	73.5%	57.1%	68.2%
over 4 years	66.1%	---	66.7%
over 5 years	61.3%	---	71.4%
over 6 years	55.8%	20.0%	66.7%

across the board. This discrepancy may be due to a small sample size (i.e., total subjects in cell II divided up into 4 payback groups); however, the market share estimates for the entire sample do not even seem to follow the payback pattern. Again for the longer payback periods, the field study predictions overestimate actual market shares.

We can draw several conclusions from these results. First, the concept of payback may provide a good description of the aggregate behavior in the market place when annual operating costs are introduced into the shopping task via the government energy labels. When presented with this cost information people at least made choices that were consistent with a payback decision model. However, the estimates derived from the conjoint measurements task overestimate the market shares at each level of payback. Finally, when other factors are introduced into the market place (especially the salesperson's push of energy efficiency) payback does not seem to provide a good indication of the choices people will make. This lack of ability of the conjoint results to accurately predict market shares can be attributed to both a) the difference in decision making people go through when providing rank order preferences and actually shopping, and b) to differences in the information environments in the two situations.

III. Results: Experimental Manipulations

Because the shopping task was a simulated task and customers did not actually purchase the refrigerator they selected, there was some concern that they would trade-up or buy a more expensive model than if they were actually buying one. To help reduce this tendency to trade up, customers were first asked which model they liked best and then they were asked which model they would buy if they really had to pay for it. This precaution seemed to work in that 82% of the people selected a deluxe model as the one they like best while

only 69% actually purchased a deluxe model (Table 7-7). However, there still seemed to be some trading-up based on a comparison of market shares with the actual market shares of each model refrigerator (Table 7-8). Additionally, prior to the shopping task people expected to pay $650 on average for a refrigerator and the average price actually paid was $740. This price differential could be due to either a misperception of the actual market price of refrigerators, to trading-up in the experimental situation, or to both.

Of the three major manipulations (labels, advertisements, and sales push) only the salesperson had a significant affect on the consumers probability of purchasing energy (Table 7-9) and that effect was dramatic. The chance that the customer would buy energy increased from 48% to over 96% when the salesperson was pushing energy. Although the effects of both advertising and government labels are not significant, it is interesting to note that the inclusion of the government labels tended to reduce the probability that the consumer would buy energy. This is consistent with an income effect hypotheses that merely providing people with cost information may tend to require them to have a shorter payback or to not spend extra money on energy savings because the need the money to pay for operating costs. This is also similar to the findings of the field study which showed that merely providing cost information to the consumers tended to reduce their implicit payback. Similarly, the ads tended to increase the probability of buying energy which is consistent with a persuasive communication hypotheses that would convince people buying energy is beneficial to them.

It is important to note that even though the effects of the ads and labels on energy choice were not significant, the manipulations did in fact work. Twice as many subjects in the label conditions recalled energy labels being present as in the non-label condition,[11] and nearly three times as many

[11] There were additional energy labels other than the government label present in all conditions.

TABLE 7-7

PERCENT SELECTING SPECIFIC TYPE OF MODEL
FOR THE DIFFERENT TREATMENTS

Treatment	Model XX8 Was Best	Model XX6 Was Chosen
I	93%	19%
II	75%	27%
III	82%	32%
IV	81%	45%

Model XX8 has extra features

Model XX6 was the lower priced model

TABLE 7-8

Choice of Models

By Treatment

Treatment	186	188	T216	T218	S216	S218
I	4	8	1	7	1	9
II	5	10	2	7	3	9
III	3	4	2	5	3	11
IV	6	9	3	5	3	5
Total	18	31	8	24	10	34
Percent of Total	14%	25%	6%	19%	8%	27%
Actual Market Share	38%	13%	18%	11%	12%	9%
Percent Bought Features Within A Model	64%			76%		77%
Actual Sales Within Model	25%			37%		41%

TABLE 7-9

Treatment Effects on the Purchase of Energy Efficiency

Treatment	Coefficient	t-statistic
(constant)	.4827	
Sales push	.4820	4.72
Energy ad	.1106	1.025
Government label	-.1076	0.720

subjects knew the operating costs of the refrigerator they bought (Table 7-10) even though this percentage is still low. Approximately 80% of the people who saw the energy ads listed energy on the pre-shopping questionnaire as one of their concerns when buying a refrigerator while only 24% mentioned it in the non-energy ad conditions (Table 7-11). Thus, the lack of effects of the labels and ads on energy choice can not be attributed to the manipulations not working.

The effect of the salesperson on the choice process is even more dramatic if the first 3 choices are examined (Table 7-12). After the customer selected the refrigerator he would buy, he was asked what his second and third choices would be if the specific model selected had not been available. When energy was pushed, everyone included at least 1 energy model among their first 3 choices, while 30% in the non-energy salespush conditions did not include an energy model. Further, about 37% of the subjects in the energy condition selected an energy efficient model for each of the three choices while only 5% of the subjects in all treatments did not think the salesperson had much influence in their choice and additionally, there are low correlations between the attributes the customers thought were important to them and the importance the salesperson ascribed to the customers (Table 7-13).

The final question to be addressed is whether the consumer seems to use payback and make an investment decision or whether he seems to treat energy efficiency as just another feature to be traded-off against any other feature. If people followed a payback decision rule in this shopping task, they would first have to decide on the type of refrigerator they wanted and then they would have to decide whether the energy efficient model was worth the extra cost. This decision strategy is also consistent with the approach the salespeople used to the consumers in cells III and IV on energy efficiency i.e., they would identify the most preferred model and then get them to invest in energy.

TABLE 7-10

Influence of Government ENERGY GUIDE Labels

Treatment	Looked at Labels	Mentioned Energy Labels*	Knew Energy Costs
I	N.A.	.37	.03
II	.44	.64	.11
III	.36	.79	.18
IV	.68	.71	.10

*There were other energy labels besides the government label.

TABLE 7-11

Influence of Advertising Which Stresses Energy

Treatment	Mentioned Word "Energy"	Mentioned Specific Aspects of Cost Operation
I	.27	.03
II	.72	.03
III	.21	.00
IV	.87	.03

TABLE 7-12

PERCENT CHOOSING SPECIFIC MODEL

Treatment	Energy Refrigerator "Best"	Energy Model First Choice If Buying	First, Second Third Choices Energy Models	First & Second Choices Energy Models	First & Third Choices Energy Models	First, Second and Third Choices Non-energy Models	Sample Size
Today's Conditions (i.e., nothing special)	36%	42%	7%	7%	4%	32%	28
Special Energy Advertising*	58%	48%	3%	6%	14%	28%	36
Special Energy Sales Push*	93%	86%	39%	25%	14%	0%	28
Special Energy Advertising* and Sales Push	97%	94%	35%	39%	23%	0%	31

*Energy Labels Present on Refrigerators

TABLE 7-13
AVERAGE IMPORTANCE RATINGS OF REFRIGERATOR CHARACTERISTICS

	Feature	Customer	Salesperson	Correlation
1.*	Size	6.366	6.041 (1)**	.31
2.	Low energy consumption	6.041	5.000 (4)	.28
3.	Availability of wheels	5.837	2.447 (14)	.13
4.	Energy saver switch	5.797	4.049 (7)	.21
5.	Number or type of shelves	5.683	5.585 (2)	.13
6.	Freezer location	5.610	5.358 (3)	.18
7.	Type of insulation	5.593	3.195 (12)	.08
8.	Low cost of repair	5.244	2.146 (15)	.12
9.	Textured doors	5.008	3.390 (9)	.12
10.	Chilled meat keeper	4.959	4.309 (5)	.06
11.	Color	4.894	3.236 (11)	.04
12.	Multiple temperature settings	4.789	1.821 (17)	-.02
13.	Low purchase price	4.325	4.171 (6)	.38
14.	See through pans	4.244	1.756 (18)	.11
15.	Location of condenser	3.878	1.512 (19)	.12
16.	Point of purchase displays	3.585	1.927 (16)	.03
17.	Icemaker availability	3.431	2.675 (13)	.33
	Energy labels (when present)		3.293 (10)	
	Customer's previous experience		3.894 (8)	

* Customer's rank order average importance

** Salespersons' rank order average importance

Fifty percent of the subjects who bought energy in cells III and IV bought the model the salesperson pushed, but more importantly, 50% traded down, that is, they bought an energy efficient model which was less expensive than the model salesperson was pushing (Table 7-14). They traded efficiency for size, or deluxe features. As a base of comparison, 72% of the subjects in cells I and II bought the model the salesperson was pushing.

Another way of looking at this is to compare first and second choices (Table 7-15) for the consumers. Note that in cells III and IV, features were most likely things given up in the second choice of those who bought energy, and even 40% of the people were willing to trade on size. Again, we take these figures to indicate that a large percentage of people were not considering energy efficiency as a cost savings, but rather as another feature which would be taken into consideration under a budget constraint.

A third approach is to compare the consumers' first three choices. Each individual can be classified as following a payback rule when his first two choices are the same except for energy and as following a feature decision when the first two choices differ on both energy and features or just features. As shown in Table 7-16, the effect of salespeople pushing energy was to get people to behave as if energy were a feature for which it was important enough to give up other attributes, rather than to treat energy as an investment to be traded against price.

Table 7-17 summarizes the effects of the energy sales push. The figures associated with cells I and II represent a base level for each category we would expect without the influence of the salesperson. The differences between cells I and II with III and IV represent the effects of the salespeople. Seventy percent of the people in cells I and II bought the model the salesperson was pushing. Of these 58 percent (.42/.72) did not buy energy which

TABLE 7-14

Comparison of the Model Pushed Versus the Model Bought for Energy Buyers

Cell	Bought the Model Pushed	Traded Down on Features
I and II	84%	16%
III and IV	50%	50%

TABLE 7-15

Comparison of Trading across Cells

	Treatment			
	I	II	III	IV
% Bought energy	48%	49%	86%	97%
Attribute most likely given up				
Energy (+)	57%*	100%*	22%*	27%*
Features	83%	12%	63%	68%
Size	17%	0	42%	41%
Freezer	0	0	5%	18%
% Didn't buy energy	52%	51%	14%	3%
Attribute most likely given up				
Energy(-)	42%*	44%*	75%*	100%*
Features	85%	20%	50%	0
Size	14%	29%	0%	0
Freezer	0	40%	25%	0

* Percentages do not add to 100 because people could trade on more than one attribute.

TABLE 7-16

Payback Decision versus Feature Decision

	Cells I & II		Cells III & IV	
Did not consider energy among 1st three three choices	31%		0%	
Considered energy	69%		100%	
Of those who considered energy				
Classified as payback decision	75%		25%	
Bought energy		70%		86%
Bought non-energy		30%		14%
Classified as feature decision	25%		75%	
Bought energy		60%		93%
Bought non-energy		40%		7%

TABLE 7-17

Effects of Energy Sales Push

I. As a base 72% of the people in cells 1 and 2 choose the model pushed by the salesperson

II.

Cell	Bought Non Energy Model		Bought Energy Model		Bought More Expensive Model	Bought Less Expensive Model	
I & II	42%	39%	35%	23%	7%	16%	18%
III & IV	3%		58%		5%	34%	

represents the potential pool of people capable of being switched by the salesperson (ie.., the salesperson correctly identified the model the person wanted and the person did not opt for energy on his own). The salesperson sold 93% (.39/.42) of this pool on energy. Of these, about half (23%) bought the same model the salesperson was pushing which is consistent with an investment decision approach. The other half (18%) bought a less expensive model which is consistent with the hypothesis that people treat energy efficiency as any other attribute.

Section 8

Marketing Implications

The results of the two studies taken together provide strong support for further development of energy efficient appliances. In this section we discuss the implications of these finds in terms of designing a comprehensive marketing program. The outline of this section is as follows. First we review our model of how consumers make the purchase decision for an energy efficient appliance. Then, based on this model, we discuss three different elements of a marketing program, i.e., product design, pricing strategy and promotional environment.

I. The Consumer

Before giving specific recommendations for marketing strategy, it is useful to restate our general conception of how consumers view energy efficiency when buying an appliance. The most general statement about this conception is that there is no one model which reflects how consumers actually go about deciding whether or not to spend more money to buy an energy efficient appliance. However, for a substantial portion of the population, it is possible to predict if consumers will choose energy efficiency by knowing the consumer's implicit payback period. In other words, most consumers make their choice using a strategy which is adequately captured by the payback concept.

Even though the payback model is successful in predicting choice, it does not appear to describe the actual choice process for many consumers. Many of these consumers are not so much worried about payback as whether or not the appliance is energy efficient (i.e., the presence or absence of the attribute is important, not the length of the payback). Thus, even though these consumers' choice behavior of selecting between appliances with identical attributes except for price and operating costs is consistent with having an

infinite implicit payback (or at least a long implicit payback) their general market place behavior in choosing between a diverse set of appliances will differ from those using a payback heuristic approach in that instead of trading off price with operating costs, they will trade off energy savings with features other than price (i.e., say, energy versus glass shelves or an ice-maker). This means that these consumers do not view energy efficiency as an investment but instead as a feature.

A finding consistent in both studies is that the concept of payback is not a familiar one to many consumers. We noted that about 30 percent of our sample population did not answer questions requiring them to think of the trade off between price and cost in terms of payback, and those who answered the questions did not, in general, give consistent answers. Thus, in the subsequent discussion it should be noted that payback is useful in predicting choice but not necessary in describing the process by which consumers actually make the choice.

II. The Product

As mentioned in the section on the laboratory study there seems to be a tendency for some consumers to view energy "as a feature". Consequently, they trade off the energy feature with other features in order to stay within their budget constraint. This implies that the energy feature will sell best on standard models (versus models loaded with features). This also implies that appliance manufacturers may see a shift in demand for the higher priced features models to the lower priced standard models if energy efficiency is added to their product line. Thus, the total amount spent on the appliance will not increase substantially even though the energy feature will cost more. Instead there will be a shift from features such as ice-makers or glass shelves to energy efficiency.

III. Promotion

In both studies consumers provided with information concerned just with annual operation costs for a series of appliances exhibited lower paybacks than those consumers who were also provided with information on how to efficiently trade off operating costs with initial price. This findings of lower payback is consistent with the hypotheses that consumers in the first group, after becoming aware of the fact that appliances cost a significant amount to operate, attempted to reduce the amount they spent initially so that they could later afford to pay the high energy costs. They did this by purchasing a low priced appliance which adequately met their needs. In contrast consumers who were also educated to view the extra cost as an investment were less likely to place such an emphasis on low initial price. This latter result is consistent with the hypothesis that information on how to make the price-cost trade-off leads to higher implicit paybacks.

The above implies that appliance manufacturers should be careful in designing the type of message they use in their advertisements and promotional material. Telling consumers about energy costs without helping them with how to use this information to trade off between initial price and operating costs may have the net effect of decreasing versus increasing sales of energy efficient appliances. Consequently, promotional material should include information which shows consumers how to view the extra costs as an investment for reducing future costs. Payback would seem to be one good way for showing this trade off.

Another form of "promotional" material used in the studies was the government labels. These labels also provide information on operating costs. Although the lab study was not designed specifically to estimate the effects of the labels, the results again indicate that operating cost information had

a small (and insignificant) negative effect on consumers' propensity to buy energy efficient appliances. Thus, it does not appear that the presence of labels will have any major effect on expanding the market for energy efficient appliances unless this information is supplemented with information on how to use the information to trade off price differences. One source which is capable of providing such strategy information is the retail store sales personnel.

One of the most significant findings was the fact that the salesperson had such a large influence on the purchase decision to buy energy efficient appliances. We attribute this influence in part to the fact that the salesperson often showed the consumer how to trade energy savings and price. This was especially true when the labels were one each appliance. Consequently if manufacturers want to push the sales of their more efficient appliances, they must enlist the cooperation of the retail store salesforce. This enlistment will probably require some education about how to sell energy efficiency (i.e., make the price-cost trade-off) as well as financial incentives (spiffs) for taking the time to show the consumers how to make the trade-off.

In summary, the most important type of information in terms of getting consumers to buy energy efficiency seems to be the price-cost trade-off strategy and the most important source is the salesperson. Informational material from advertisements and/or labels which just feature operating costs has a much smaller effect and one which is in the wrong direction. If information on operation costs is to be provided via these latter sources, it should be supplemented with an example on how to trade off this information with differences in initial price.

IV. Price

The data from both studies indicate that there is a substantial segment

of the population willing to pay more for energy efficient appliances. Estimates of the proportion of consumers who will buy the energy efficient models varies according to the marketing mix variables, i.e., advertising strategy, salesperson's approach, etc. However, we believe that holding all things equal, approximately 50 to 60 percent of the population will opt for the the more efficient appliance if the payback is 5 years or less and this percentage can be substantially increased if the retail sales personnel push this feature. Since the influence of the salesperson is strong, any pricing strategy should provide enough profit margin to allow for special incentives for the salesperson.

Without knowing costs, it is hard to make specific recommendations on pricing. However, we would strongly suggest a higher price (say one which produces a 5 year payback) with enough profit margin for a substantial spiff versus a lower payback (say 3 years) with no extra margin for special spiffs.[12]

V. Market Segmentation

Although there are some associations between demographic variables and consumers with longer implicit paybacks, the variation within each market segment is great. Consequently it doesn't seem possible to design a media package targeted for specific types of consumers. In other words, although older, less educated consumers tend to have longer implicit paybacks, there are large numbers of well educated, younger consumers who also have long paybacks. Thus a mass media campaign aimed at the general public is probably just as efficient as one which is more specifically designed for specific target audiences.

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[12] If the standard appliance costs $70 per year to operate and the energy savings are 20 percent per year, then an increase in payback of two years would result in a price increase of $28 (i.e., $70 * .2 x 2 = $28). Without knowing much about commission rates for appliances, we believe this extra $28 would be more than enough financial incentive to push the higher priced model.

Appendix A

The Field Experiment

Figure 1-A: The Control Ad

(Suggestions from the Refrigerator Manufacturers Association)

FACTORS TO CONSIDER WHEN BUYING A REFRIGERATOR/FREEZER

1. Refrigerator / freezers now come in many options. You should look over all the options and pick the package which best meets your needs. Current options available on most of today's refrigerators include:

Adjustable Shelves

Automatic Defroster

Plenty of Colors

Meat Keeper

Ice Maker

Juice Dispenser

Automatic Door Closer

Foamed Insulation

Food Storage Bin

Textured Doors

Concealed Wheels

Energy Saver

2. Dealer service and manufacturer reputation are two important considerations in your choice of new or used appliances.

3. The amount of energy an appliance uses can also be an important factor in selecting a new appliance. With increasing utility rates, energy costs for all appliances are becoming more significant.

4. There is more to owning a new refrigerator/freezer than the amount you pay for it. When deciding on replacing an old refrigerator or when comparing two refrigerators, you should be aware that some refrigerators have lower operating costs even though they may cost more money initially.

5. Don't be in a rush to buy. Take your time and carefully consider all the factors that are important to you. If you do, you'll be able to find a refrigerator that you'll be happy with for as long as you own it.

Figure 1-B: The Control Ad

(Suggestions from the Air Conditioner Manufacturers Association)

FACTORS TO CONSIDER WHEN BUYING A ROOM AIR CONDITIONER

1. Room air conditioners now come in many options. You should look over all the options and pick the package which best meets your needs. Current options available on most of today's air conditioners include:

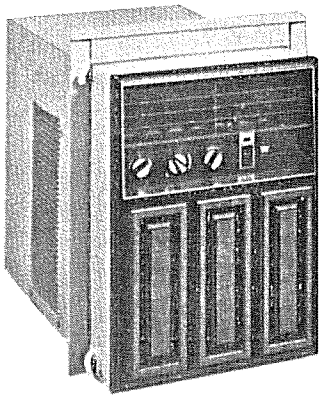
6,000 BTU to 15,000 BTU

Adjustable Thermostat

Whisper Quiet Muffler

Directional Louvres

Multiple Speed Fan



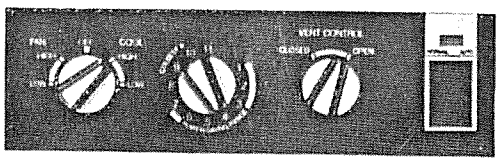
Walnut-Grain Cabinet

Window/Wall Models

Extended Warranty

Quick Installation Kit

Energy Saver



2. Dealer service and manufacturer reputation are two important considerations in your choice of new or used appliances.

3. The amount of energy an appliance uses can also be an important factor in selecting a new appliance. With increasing utility rates, energy costs for all appliances are becoming more significant.

4. There is more to owning a new room air conditioner than the amount you pay for it. When deciding on replacing an old air conditioner or when comparing two new air conditioners, you should be aware that some air conditioners have lower operating costs even though they may cost more money initially.

5. Don't be in a rush to buy. Take your time and carefully consider all the factors that are important to you. If you do, you'll be able to find an air conditioner that you'll be happy with for as long as you own it.

Figure 2-A: The Information Cost Ad

(Suggestions from the Refrigerator Manufacturers Association)

FACTORS TO CONSIDER WHEN BUYING A REFRIGERATOR/FREEZER

1. Refrigerator/freezers now come in many options. You should look over all the options and pick the package which best meets your needs. Current options available on most of today's refrigerators include:

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Automatic Defroster

Plenty of Colors

Meat Keeper

Ice Maker

Juice Dispenser

Automatic Door Closer

Foamed Insulation

Food Storage Bin

Textured Doors

Concealed Wheels

Energy Saver

2. Dealer service and manufacturer reputation are two important considerations in your choice of new or used appliances.

3. The amount of energy an appliance uses can also be an important factor in selecting a new appliance. With increasing utility rates, energy costs for all appliances are becoming more significant. For example, in Burlington, average annual costs are:

Refrigerator/Freezer	$136.75	Household Lighting	$32.15
Room Air Conditioner	62.30	Electric Range	52.85
Color Television	29.70		

4. There is more to owning a new refrigerator/freezer than the amount you pay for it. When deciding on replacing an old refrigerator or when comparing two refrigerators, you should be aware that some refrigerators have lower operating costs even though they may cost more money initially.

5. Don't be in a rush to buy. Take your time and carefully consider all the factors that are important to you. If you do, you'll be able to find a refrigerator that you'll be happy with for as long as you own it.

Figure 2-B: The Information Cost Ad

(Suggestions from the Air Conditioner Manufacturers Association)

FACTORS TO CONSIDER WHEN BUYING A ROOM AIR CONDITIONER

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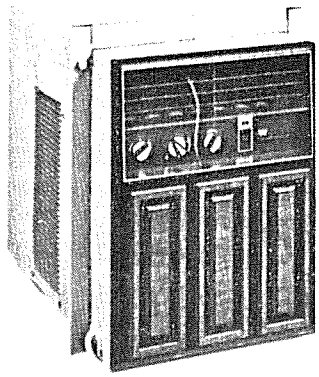


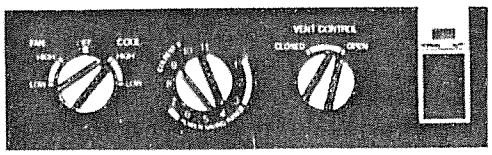
Walnut-Grain Cabinet

Window/Wall Models

Extended Warranty

Quick Installation Kit

Energy Saver



2. Dealer service and manufacturer reputation are two important considerations in your choice of new or used appliances.

3. The amount of energy an appliance uses can also be an important factor in selecting a new appliance. With increasing utility rates, energy costs for all appliances are becoming more significant. For example, in Burlington, average annual costs are:

Room Air Conditioner	$62.30	Household Lighting	$32.15
Refrigerator/Freezer	136.75	Electric Range	52.85
Color Television	29.70		

4. There is more to owning a new room air conditioner than the amount you pay for it. When deciding on replacing an old air conditioner or when comparing two new air conditioners, you should be aware that some air conditioners have lower operating costs even though they may cost more money initially.

5. Don't be in a rush to buy. Take your time and carefully consider all the factors that are important to you. If you do, you'll be able to find an air conditioner that you'll be happy with for as long as you own it.

Figure 3-A: The Payback Ad

(Suggestions from the Refrigerator Manufacturers Association)

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Adjustable Shelves

Automatic Defroster

Plenty of Colors

Meat Keeper

Ice Maker

Juice Dispenser

Automatic Door Closer

Foamed Insulation

Food Storage Bin

Textured Doors

Concealed Wheels

Energy Saver

2. Dealer service and manufacturer reputation are two important considerations in your choice of new or used appliances.

3. The amount of energy an appliance uses can also be an important factor in selecting a new appliance. With increasing utility rates, energy costs for all appliances are becoming more significant. For example, in Burlington, average annual costs are:

Refrigerator/Freezer	$136.75	Household Lighting	$32.15
Room Air Conditioner	62.30	Electric Range	52.85
Color Television	29.70		

4. There is more to owning a new refrigerator/freezer than the amount you pay for it. When deciding on replacing an old refrigerator or when comparing two refrigerators, you should be aware that some refrigerators have lower operating costs even though they may cost more money initially. For example, a refrigerator which costs $50 more but saves $10/year in energy will pay for the difference in price in 5 years.

5. Don't be in a rush to buy. Take your time and carefully consider all the factors that are important to you. If you do, you'll be able to find a refrigerator that you'll be happy with for as long as you own it.

Figure 3-B: The Payback Ad

(Suggestions from the Air Conditioner Manufacturers Association)

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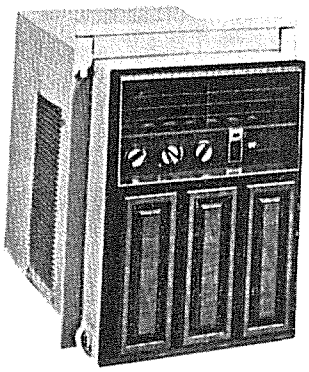

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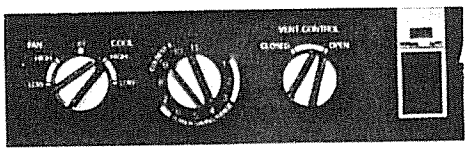

2. Dealer service and manufacturer reputation are two important considerations in your choice of new or used appliances.

3. The amount of energy an appliance uses can also be an important factor in selecting a new appliance. With increasing utility rates, energy costs for all appliances are becoming more significant. For example, in Burlington, average annual costs are:

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4. There is more to owning a new room air conditioner than the amount you pay for it. When deciding on replacing an old air conditioner or when comparing two new air conditioners, you should be aware that some air conditioners have lower operating costs even though they may cost more money initially. For example, an air conditioner which costs $50 more but saves $10/year in energy will pay for the difference in price in 5 years.

5. Don't be in a rush to buy. Take your time and carefully consider all the factors that are important to you. If you do, you'll be able to find an air conditioner that you'll be happy with for as long as you own it.

Figure 4

Example of Cards for the Rank Order Preference Task

in the Field Experiment

REFRIGERATOR/FREEZER MODEL A

SIZE: 17.5 CUBIC FEET PRICE: $ 500

ACCESSORIES: CONCEALED WHEELS
REVERSIBLE DOORS
AUTOMATIC DEFROST
ALL COLORS AVAILABLE
FULLY ADJUSTABLE SHELVES

APPROXIMATE ANNUAL COST OF OPERATION: $ 45.05

REFRIGERATOR/FREEZER MODEL B

SIZE: 17.5 CUBIC FEET PRICE: $ 550

ACCESSORIES: CONCEALED WHEELS
STANDARD DOORS
AUTOMATIC DEFROST
ALL COLORS AVAILABLE
FULLY ADJUSTABLE SHELVES

APPROXIMATE ANNUAL COST OF OPERATION: $ 63.05

REFRIGERATOR/FREEZER MODEL C

SIZE: 17.5 CUBIC FEET PRICE: $ 600

ACCESSORIES: CONCEALED WHEELS
STANDARD DOORS
MANUAL DEFROST
ALL COLORS AVAILABLE
FULLY ADJUSTABLE SHELVES

APPROXIMATE ANNUAL COST OF OPERATION: $ 76.55

REFRIGERATOR/FREEZER MODEL E

SIZE: 17.5 CUBIC FEET PRICE: $ 500

ACCESSORIES: CONCEALED WHEELS
REVERSIBLE DOORS
MANUAL DEFROST
ALL COLORS AVAILABLE
FULLY ADJUSTABLE SHELVES

APPROXIMATE ANNUAL COST OF OPERATION: $ 45.05

REFRIGERATOR/FREEZER MODEL D

SIZE: 17.5 CUBIC FEET PRICE: $ 650

ACCESSORIES: CONCEALED WHEELS
REVERSIBLE DOORS
MANUAL DEFROST
ALL COLORS AVAILABLE
FULLY ADJUSTABLE SHELVES

APPROXIMATE ANNUAL COST OF OPERATION: $ 90.05

REFRIGERATOR/FREEZER MODEL F

SIZE: 17.5 CUBIC FEET PRICE: $ 500

ACCESSORIES: CONCEALED WHEELS
STANDARD DOORS
MANUAL DEFROST
ALL COLORS AVAILABLE
FULLY ADJUSTABLE SHELVES

APPROXIMATE ANNUAL COST OF OPERATION: $ 63.05

REFRIGERATOR/FREEZER MODEL G

SIZE: 17.5 CUBIC FEET PRICE: $ 550

ACCESSORIES: CONCEALED WHEELS
REVERSIBLE DOORS
MANUAL DEFROST
ALL COLORS AVAILABLE
FULLY ADJUSTABLE SHELVES

APPROXIMATE ANNUAL COST OF OPERATION: $ 45.05

REFRIGERATOR/FREEZER MODEL H

SIZE: 17.5 CUBIC FEET PRICE: $ 600

ACCESSORIES: CONCEALED WHEELS
REVERSIBLE DOORS
AUTOMATIC DEFROST
ALL COLORS AVAILABLE
FULLY ADJUSTABLE SHELVES

APPROXIMATE ANNUAL COST OF OPERATION: $ 90.05

REFRIGERATOR/FREEZER MODEL J

SIZE: 17.5 CUBIC FEET PRICE: $ 550

ACCESSORIES: CONCEALED WHEELS
STANDARD DOORS
MANUAL DEFROST
ALL COLORS AVAILABLE
FULLY ADJUSTABLE SHELVES

APPROXIMATE ANNUAL COST OF OPERATION: $ 63.05

REFRIGERATOR/FREEZER MODEL I

SIZE: 17.5 CUBIC FEET PRICE: $ 650

ACCESSORIES: CONCEALED WHEELS
STANDARD DOORS
AUTOMATIC DEFROST
ALL COLORS AVAILABLE
FULLY ADJUSTABLE SHELVES

APPROXIMATE ANNUAL COST OF OPERATION: $ 76.55

REFRIGERATOR/FREEZER MODEL K

SIZE: 17.5 CUBIC FEET PRICE: $ 500

ACCESSORIES: CONCEALED WHEELS
STANDARD DOORS
MANUAL DEFROST
ALL COLORS AVAILABLE
FULLY ADJUSTABLE SHELVES

APPROXIMATE ANNUAL COST OF OPERATION: $ 76.55

REFRIGERATOR/FREEZER MODEL L

SIZE: 17.5 CUBIC FEET PRICE: $ 550

ACCESSORIES: CONCEALED WHEELS
REVERSIBLE DOORS
MANUAL DEFROST
ALL COLORS AVAILABLE
FULLY ADJUSTABLE SHELVES

APPROXIMATE ANNUAL COST OF OPERATION: $ 90.05

REFRIGERATOR/FREEZER MODEL M

SIZE: 17.5 CUBIC FEET PRICE: $ 600

ACCESSORIES: CONCEALED WHEELS
REVERSIBLE DOORS
AUTOMATIC DEFROST
ALL COLORS AVAILABLE
FULLY ADJUSTABLE SHELVES

APPROXIMATE ANNUAL COST OF OPERATION: $ 45.05

REFRIGERATOR/FREEZER MODEL N

SIZE: 17.5 CUBIC FEET PRICE: $ 650

ACCESSORIES: CONCEALED WHEELS
STANDARD DOORS
AUTOMATIC DEFROST
ALL COLORS AVAILABLE
FULLY ADJUSTABLE SHELVES

APPROXIMATE ANNUAL COST OF OPERATION: $ 63.05

REFRIGERATOR/FREEZER MODEL O

SIZE: 17.5 CUBIC FEET PRICE: $ 600

ACCESSORIES: CONCEALED WHEELS
STANDARD DOORS
AUTOMATIC DEFROST
ALL COLORS AVAILABLE
FULLY ADJUSTABLE SHELVES

APPROXIMATE ANNUAL COST OF OPERATION: $ 76.55

REFRIGERATOR/FREEZER MODEL P

SIZE: 17.5 CUBIC FEET PRICE: $ 500

ACCESSORIES: CONCEALED WHEELS
REVERSIBLE DOORS
AUTOMATIC DEFROST
ALL COLORS AVAILABLE
FULLY ADJUSTABLE SHELVES

APPROXIMATE ANNUAL COST OF OPERATION: $ 90.05

REFRIGERATOR/FREEZER MODEL Q

SIZE: 17.5 CUBIC FEET PRICE: $ 550

ACCESSORIES: CONCEALED WHEELS
STANDARD DOORS
AUTOMATIC DEFROST
ALL COLORS AVAILABLE
FULLY ADJUSTABLE SHELVES

APPROXIMATE ANNUAL COST OF OPERATION: $ 76.55

REFRIGERATOR/FREEZER MODEL R

SIZE: 17.5 CUBIC FEET PRICE: $ 600

ACCESSORIES: CONCEALED WHEELS
STANDARD DOORS
MANUAL DEFROST
ALL COLORS AVAILABLE
FULLY ADJUSTABLE SHELVES

APPROXIMATE ANNUAL COST OF OPERATION: $ 63.05

REFRIGERATOR/FREEZER MODEL S

SIZE: 17.5 CUBIC FEET PRICE: $ 650

ACCESSORIES: CONCEALED WHEELS
REVERSIBLE DOORS
MANUAL DEFROST
ALL COLORS AVAILABLE
FULLY ADJUSTABLE SHELVES

APPROXIMATE ANNUAL COST OF OPERATION: $ 45.05

REFRIGERATOR/FREEZER MODEL T

SIZE: 17.5 CUBIC FEET PRICE: $ 650

ACCESSORIES: CONCEALED WHEELS
REVERSIBLE DOORS
AUTOMATIC DEFROST
ALL COLORS AVAILABLE
FULLY ADJUSTABLE SHELVES

APPROXIMATE ANNUAL COST OF OPERATION: $ 90.05

TABLE A-1

Experimental Design--San Francisco, California

Refrigerators

Model	Price	Cost	Feature 1[a]	Feature 2[b]
A	750	90	S	I
B	575	70	R	NI
C	600	70	S	NI
D	750	55	R	NI
E	600	55	S	NI
F	575	115	S	I
G	750	115	R	NI
H	675	90	S	I
I	1050	55	R	I
J	500	115	S	NI
K	850	70	R	NI
L	600	90	R	I
M	550	115	S	NI
N	500	90	S	NI
O	500	70	R	I
P	575	55	S	I
Q	600	115	R	I
R	500	55	R	*
S	575	90	R	NI
T	750	70	S	I

a) Standard doors (A) versus Reversible Doors (D)

b) Ice maker (I) versus No ice maker (NI)

Air Conditioners

Model	Price	Cost	Feature 1[c]	Feature 2[d]
A	350	30	S	5
B	280	25	Q	1
C	300	25	S	1
D	350	15	Q	1
E	300	15	S	1
F	280	50	S	5
G	350	50	Q	1
H	325	30	S	5
I	450	15	Q	5
J	200	50	S	1
K	400	25	Q	1
L	300	30	Q	5
M	240	50	S	1
N	200	30	S	1
O	200	25	Q	5
P	280	15	S	5
Q	300	50	Q	5
R	200	15	Q	5
S	280	30	Q	1
T	350	25	S	5

c) Standard muffler (S) versus Whisper quiet Muffler (Q)

d) 1-year warranty (1) versus 5-year warranty (5)

TABLE A-2

Experimental Design--Athens, Tennessee

Refrigerators

Model	Price	Cost	Feature 1[a]	Feature 2[b]
A	750	50	R	NI
B	575	35	R	I
C	600	35	S	NI
D	750	30	S	NI
E	600	30	S	I
F	575	60	S	I
G	750	60	R	I
H	675	50	S	I
I	1050	30	R	I
J	500	60	S	NI
K	850	35	R	NI
L	600	50	R	I
M	550	60	S	NI
N	500	50	S	I
O	500	35	R	NI
P	575	30	R	NI
Q	600	60	R	NI
R	500	30	R	I
S	575	50	S	NI
T	750	35	S	I

a) Standard doors (A) versus Reversible doors (D)

b) Ice maker (I) versus No ice maker (NI)

Air Conditioners

Model	Price	Cost	Feature 1[c]	Feature 2[d]
A	350	25	Q	1
B	280	10	Q	5
C	300	10	S	1
D	350	5	S	1
E	300	5	S	5
F	280	35	S	5
G	350	35	Q	5
H	325	25	S	5
I	450	5	Q	5
J	200	35	S	1
K	400	10	Q	1
L	300	25	Q	5
M	240	35	S	1
N	200	25	S	5
O	200	10	Q	1
P	280	5	Q	1
Q	300	35	Q	1
R	200	5	Q	5
S	280	25	S	1
T	350	10	S	5

c) Standard muffler (S) versus Whisper quiet muffler (Q)

d) 1-year warranty (1) versus 5-year warranty (5)

Table A-3

Experimental Design--Burlington, Massachusetts

Refrigerators

Model	Price	Cost	Feature 1[a]	Feature 2[b]
A	750	110	R	NI
B	575	80	R	I
C	600	80	S	NI
D	750	65	S	NI
E	600	65	S	I
F	575	135	S	I
G	750	135	R	I
H	675	110	S	I
I	1050	65	R	I
J	500	135	S	NI
K	850	80	R	NI
L	600	110	R	I
M	550	135	S	NI
N	500	110	S	I
O	500	80	R	NI
P	575	65	R	NI
Q	600	135	R	NI
R	500	65	R	I
S	575	110	S	NI
T	750	80	S	I

a) Standard doors (A) versus Reversible doors (D)

b) Ice maker (I) versus No ice maker (NI)

Air Conditioners

Model	Price	Cost	Feature 1[c]	Feature 2[d]
A	350	40	Q	1
B	280	35	Q	5
C	300	35	S	1
D	350	25	S	1
E	300	25	S	5
F	280	60	S	5
G	350	60	Q	5
H	325	40	S	5
I	450	25	Q	5
J	200	60	S	1
k	400	35	Q	1
L	300	40	Q	5
M	240	60	S	1
N	200	40	S	5
O	700	35	Q	1
P	280	25	Q	1
Q	300	60	Q	1
R	200	25	Q	5
S	280	40	S	1
T	350	35	S	5

c) Standard muffler (S) versus Whisper quiet muffler (Q)

d) 1-year warranty (1) versus 5-year warranty (5)

TABLE A-4

Experimental Design--Edison, New Jersey

Refrigerator					Air Conditioner				
Model	Price	Cost	Feature 1[a]	Feature 2[b]	Model	Price	Cost	Feature 1[c]	Feature 2[d]
A	150	65	R	NI	A	350	25	Q	1
B	575	50	R	I	B	280	20	Q	5
C	600	50	S	NI	C	300	20	S	1
D	750	40	S	NI	D	350	10	S	1
E	600	40	S	I	E	300	10	S	5
F	575	95	S	I	F	280	45	S	5
G	750	95	R	I	G	350	45	Q	5
H	675	65	S	I	H	325	25	S	5
I	1050	40	R	I	I	450	10	Q	5
J	500	95	S	NI	J	200	45	S	1
K	850	50	R	NI	K	400	20	Q	1
L	600	65	R	I	L	300	25	Q	5
M	550	95	S	NI	M	240	45	S	1
N	500	65	S	I	N	200	25	S	5
O	500	50	R	NI	O	200	20	Q	1
P	575	40	R	NI	P	280	10	Q	1
Q	600	95	R	NI	Q	300	45	Q	1
R	500	40	R	I	R	200	10	Q	5
S	575	65	S	NI	S	280	25	S	1
T	750	50	S	I	T	350	20	S	5

a) Standard doors (A) versus Reversible doors (d)

b) Ice maker (I) versus No ice maker (NI)

c) Standard muffler (S) versus Whisper quiet muffler (Q)

d) 1-year warranty (1) versus 5-year warranty (5)

Appendix B

Lab Experiment Instruments

FIGURE 1A

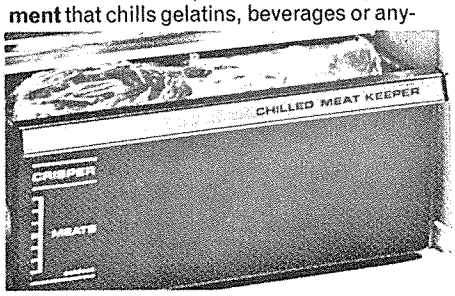
"White-Westinghouse put everything into this refrigerator but the kitchen sink. And with ice and water in the door, they almost did that." Pearl Bailey

THE WHITE-WESTINGHOUSE DELUXE 24.5 CUBIC FOOT REFRIGERATOR HAS EVERYTHING YOU EXPECT A GREAT REFRIGERATOR TO HAVE. AND A COUPLE OF EXTRAS YOU DON'T EXPECT.

Take the automatic **Ice and Water Dispensers.** One delivers all the ice cubes you need for a glass or a party automatically. The other puts chilled water right at your fingertips. But that's just the beginning.

There are "leather-look" **textured steel doors** that help hide fingerprints and small scratches... **tempered glass Cantilevered Shelves** that are as easy to clean and adjust as they are beautiful... a **Chilled Meat Keeper** that has its own special supply of circulating cold air to help keep fresh meats fresher longer.

There's even a separate **Chill Compartment** that chills gelatins, beverages or anything you want quickly and makes quick-cool desserts a snap. Just place the see-through door in its down position and "chilling" begins immediately. Slide the door up and chilling stops, leaving you with extra food storage space.



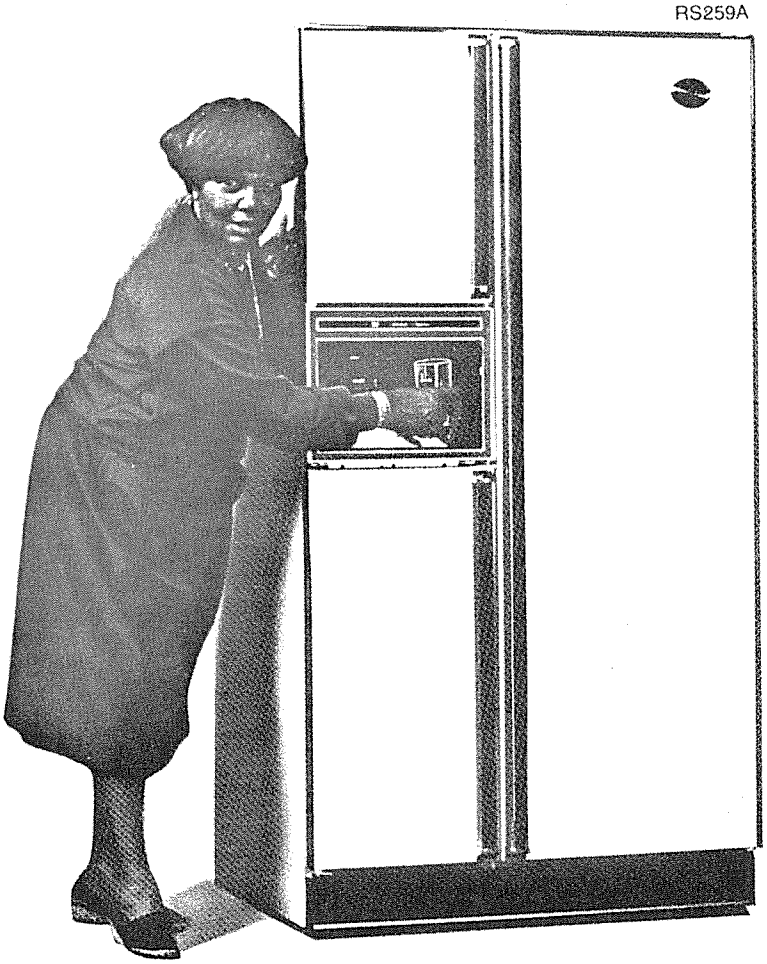
And don't forget the **frost-free 8.7 cubic foot freezer space.** Plenty of room for all the essentials, plus a lot of goodies.

All White-Westinghouse products are backed by NATIONWIDE SURE SERVICE* with thousands of factory trained service technicians for prompt, professional service anywhere you live or move in the U.S.

*For warranty information see your White-Westinghouse dealer.

SO REMEMBER, IF YOU HAVEN'T LOOKED AT WHITE-WESTINGHOUSE, YOU HAVEN'T LOOKED.

RS259A



White-Westinghouse

One of the White Consolidated Industries WCI

930 Ft. Duquesne Blvd., Pittsburgh, PA 15222

FIGURE 1B

Check Out The Design II.

The first refrigerator to combine complete flexibility with dramatic energy savings. And it's priced to move profitably.

Ice-maker, of course. It's the most popular option.

Controls up front instead of behind the mayonnaise.

A better butter compartment. Deep enough to take big round tubs.

Five clean, bright colors available with fingerprint-hiding textured-steel doors.

Revolutionary energy-saving design means dramatic savings on electric bills.

5½"-deep doors. Deep enough for six-packs and pickle jars.

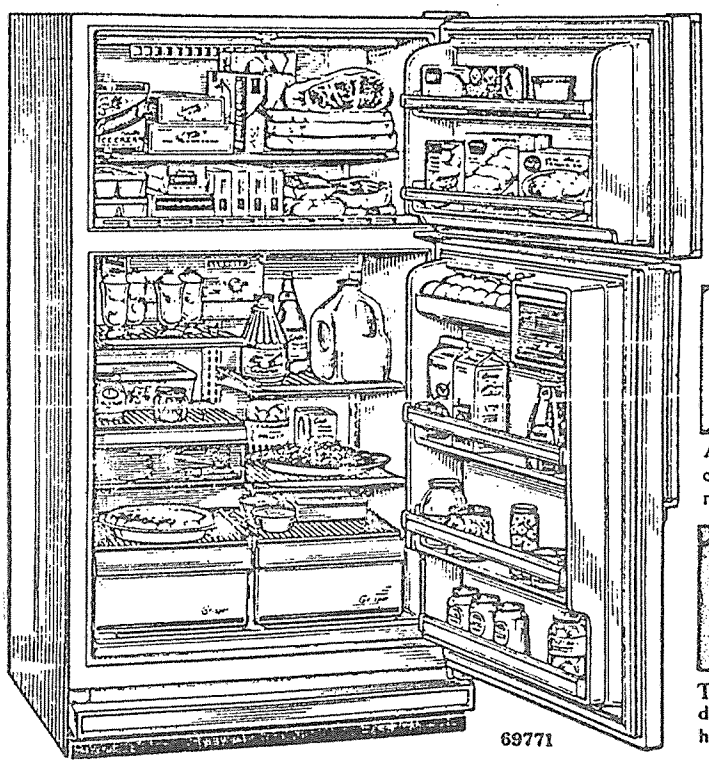
Built-in flexibility from the freezer space to the doors.

Check out this Design II value

FIGURE 1C

SAVE $50 ON HIGH EFFICIENCY FROSTLESS REFRIGERATOR-FREEZER

Uses 16% Less Energy Than Our Standard Models with Comparable Capacity

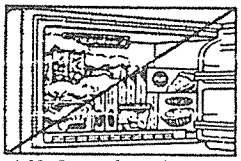


Family-sized 17.0 cu. ft. model

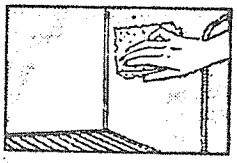
Regular $569.95

519.95

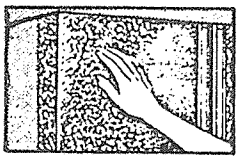
12.27 cu. ft. fresh food section with Deli Drawer. 3 adjustable half-width shelves. Lighted 4.75 cu. ft. freezer. Power Miser feature helps save energy. Save now!



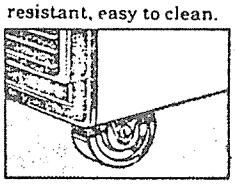
All-frostless! Frost can't form so there's no messy defrosting chores.



Porcelain-on-steel interior is durable, rust-resistant, easy to clean.



Textured steel finish door with leather-look helps hide fingerprints.



Four rollers make it easy moving to clean behind refrigerator.

FIGURE 1D

CONSUMER REPORTS TAKES YOU: INSIDE A TYPICAL REFRIGERATOR

Listed in the picture below are several features available when you buy a refrigerator. In addition to these you might want to consider:

- Temperature uniformity: Both sections of a refrigerator are likely to have warm spots - usually on door shelves or in corners.
- No frost: A no-frost refrigerator is apt to go into its automatic defrost cycle at least once a day. When that happens, the upper rear part of the freezer will warm up a bit. The temperature rise probably won't last as long as half an hour, so it shouldn't affect the storage life of most foods. But temperature-sensitive items such as ice cream may last longer if stored lower down.
- In a power failure: If fairly full, the freezer section of any tested model should provide acceptable food storage for about eight hours without power.

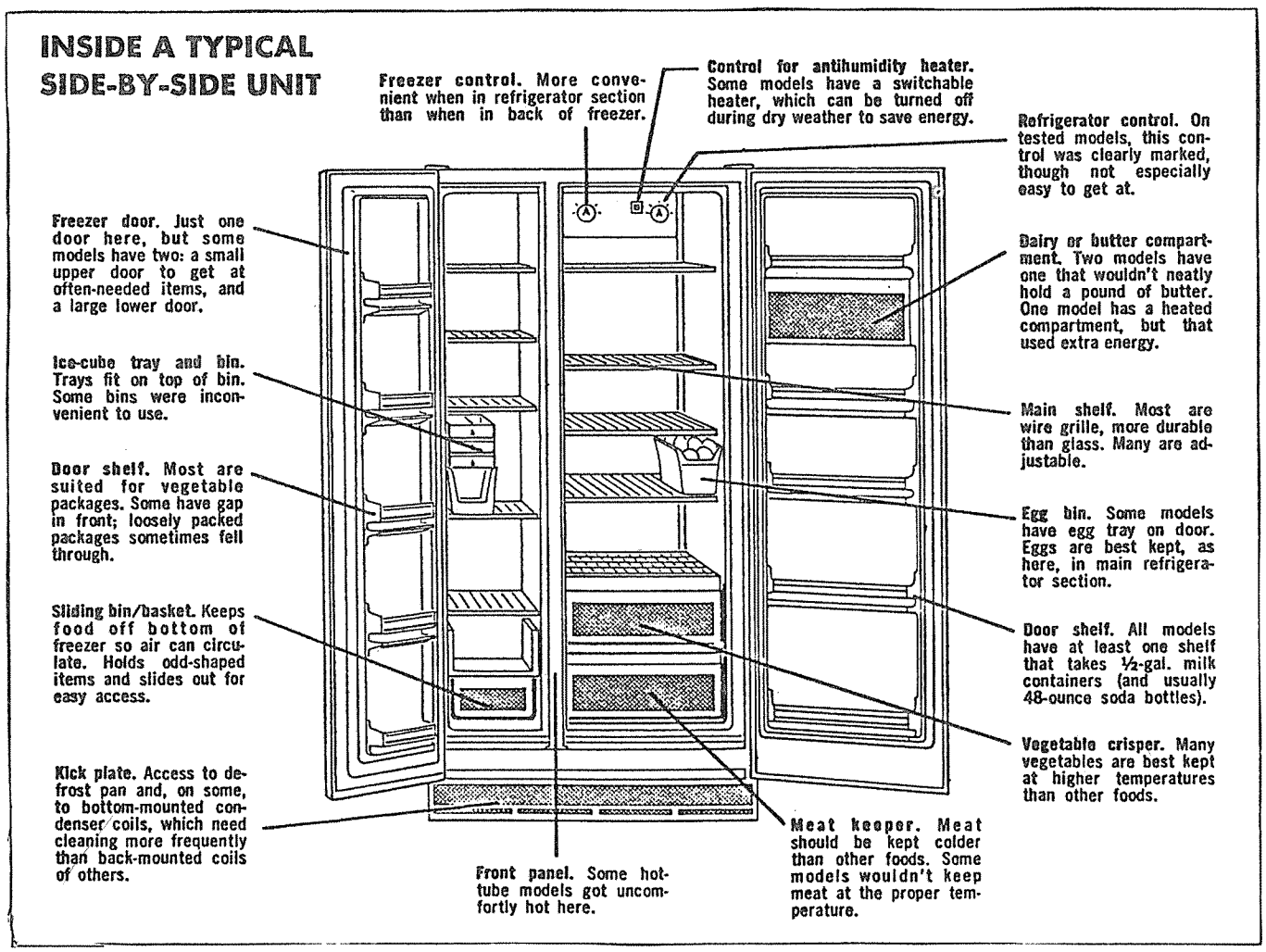


FIGURE 2A

"White-Westinghouse put everything into this refrigerator but the kitchen sink. And with ice and water in the door, they almost did that." Pearl Bailey

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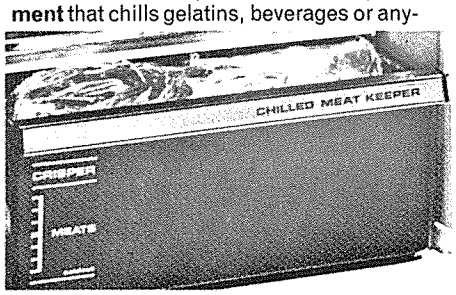
Take the automatic **Ice and Water Dispensers.** One delivers all the ice cubes you need for a glass or a party automatically. The other puts chilled water right at your fingertips. But that's just the beginning.

There are "leather-look" **textured steel doors** that help hide fingerprints and small scratches... **tempered glass Cantilevered Shelves** that are as easy to clean and adjust as they are beautiful... a **Chilled Meat Keeper** that has its own special supply of circulating cold air to help keep fresh meats fresher longer.

There's even a separate **Chill Compartment** that chills gelatins, beverages or anything you want quickly and makes quick-cool desserts a snap. Just place the see-through door in its down position and "chilling" begins immediately. Slide the door up and chilling stops, leaving you with extra food storage space.



And don't forget the **frost-free 8.7 cubic foot freezer space.** Plenty of room for all the essentials, plus a lot of goodies.

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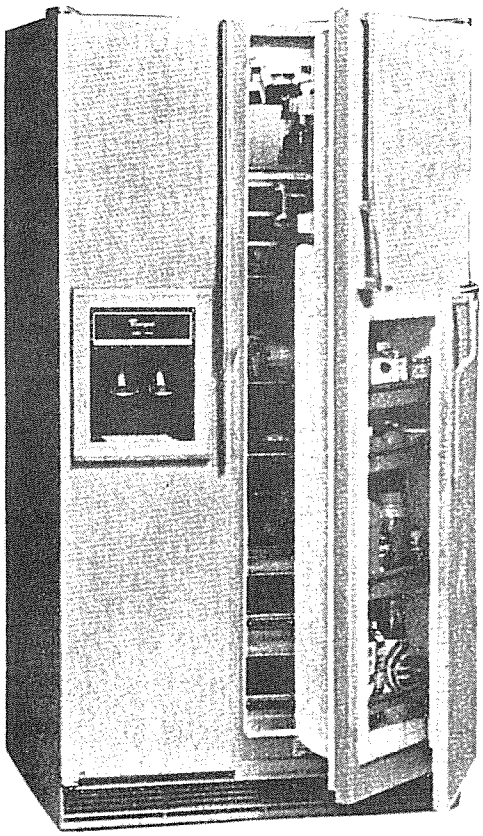
FIGURE 2B

The Best Part About This Refrigerator Is What You Don't See



To help you cut your electricity bill (and save money!) WHITE-WESTINGHOUSE has developed these energy-efficient features for their refrigerators:

--- Energy Saver Switch

--- Separate temperature controls for each section of the refrigerator

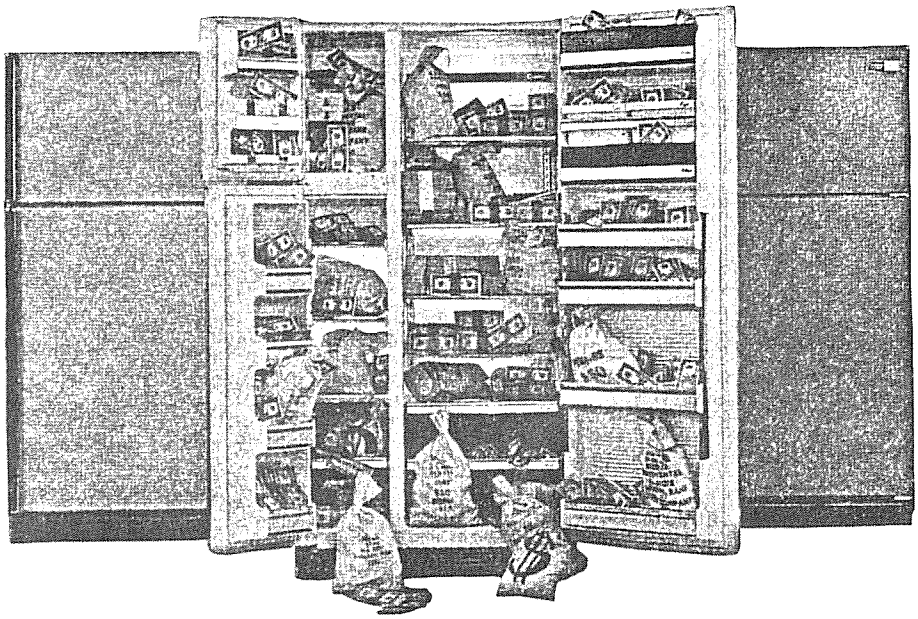
--- "Super-Efficient Foamed-in-Place" Insulation Keeps cold in, heat out

--- High Efficiency Refrigeration Compressor reduces electric usage up to 25%

FIGURE 2C

White-Westinghouse

"*Presents*"



The Refrigerator That Pays For Itself

WHITE-WESTINGHOUSE is concerned about the energy crunch and about your electric bill. That's why we've built into our refrigerators energy-efficient features* that are unsurpassed by other manufacturers. Compare energy costs and save.

* Energy Saver Switch
* Separate Temperature Controls
* "Super-Efficient Foaming-in-Place" Insulation
* High Efficienty Regriferation Compressor

Our energy efficient models can make a difference in your electric bill.

TYPICAL YEARLY SAVINGS IN DIFFERENT CITIES*

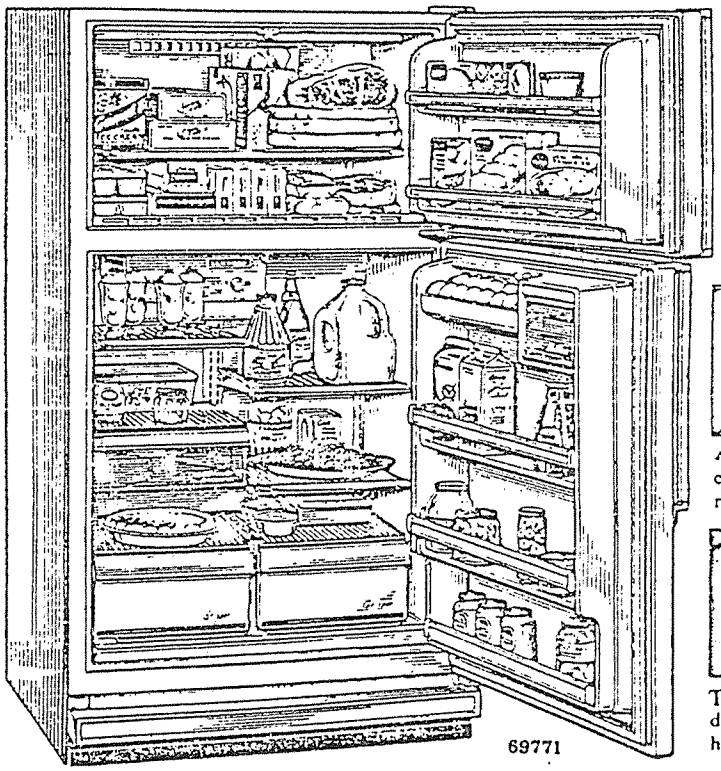
	Annual Electric Cost		Annual Savings
	Std. Refrigerator	W-West.	
Boston	$124	$ 80	$ 44
New York	135	88	47
Pittsburgh	101	66	35
Atlanta	81	53	28
San Francisco	112	73	39
Seattle	54	35	19

*Based on 18 cu. ft. frost free refrigerator/freezers

FIGURE 2D

SAVE $50 ON HIGH EFFICIENCY FROSTLESS REFRIGERATOR-FREEZER

Uses 16% Less Energy Than Our Standard Models with Comparable Capacity



Family-sized 17.0 cu. ft. model

Regular
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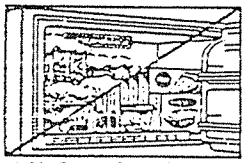
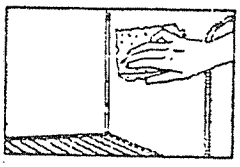
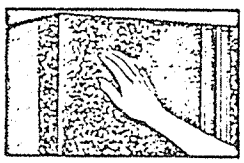
12.27 cu. ft. fresh food section with Deli Drawer. 3 adjustable half-width shelves. Lighted 4.75 cu. ft. freezer. Power Miser feature helps save energy. Save now!



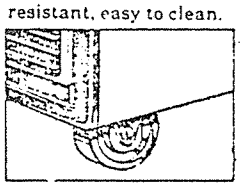
All-frostless! Frost can't form so there's no messy defrosting chores.



Porcelain-on-steel interior is durable, rust-resistant, easy to clean.



Textured steel finish door with leather-look helps hide fingerprints.



Four rollers make it easy moving to clean behind refrigerator.

FIGURE 2E

(Reprint from Consumer Reports)

REFRIGERATORS AND ENERGY: What is the real cost of owning a refrigerator

Buying a refrigerator-freezer that works well at minimum energy cost has a double payoff --- reduction of demand on the nation's dwindling energy reserves and a saving on your electric bill.

Luckily for consumers, manufacturers of refrigerators are concentrating on producing energy-saving models for 1979 as power conservation and effective utilization of the country's energy-related natural resources play an important role in the nation's future. Looking ahead to the not-too-distant future, when home-owners and apartment tenants might be financially responsible for their individual energy usage, these energy efficient appliances should prove to be a boon.

The total cost of owning a refrigerator is more than just the price you pay for it. Even at todays utility rates, the amount you pay over the life of the refrigerator for the electricity it uses can be as much as 4 to 5 times more than the initial purchase price.

Thus, in addition to the size and features of the unit, the length of the warranty and the availability of servicing, the defrost system, the energy consumption rating, the type and amount of insulation, and especially an awareness of the applicances total life cycles cost are vitally important considerations in purchasing a new or used refrigerator/freezer.

Will you have to pay more for a high-efficiency unit than for a comparable standard one? Probably. Should you buy the high-efficiency unit anyway? Definitely. When CU shoppers surveyed prices last summer, the high-efficiency models commanded premiums that averaged from $40 to $80 over the same models in their standard version. Even if the premium were as high as $100, you'd break even in less than 4 years at an electricity rate of 4¢ per kilowatt hour and in less than 2 years at the rate of 6.6¢ per kilowatt hour.

FIGURE 3

PRE-SHOPPING QUESTIONNAIRE

For Office Use Only

Customer ID # ____ ____ ____ Cell ____ PB ____ 1-5

1. If someone in your household were to buy a refrigerator, who would make the decision on which brand to buy 6

____ 1. myself
____ 2. my spouse
____ 3. my spouse and I would make the decision jointly
____ 4. some other person

2. How many refrigerators have you ever purchased? (Please Circle) 7

0 1 2 3 4 or more

(If NONE, please skip to question 3)

3. When did you buy your last refrigerator? _____ years ago 8

4. You have just looked through the material on refrigerators. We would like you to jot down all the things that you remember from the advertisements and other promotional or discriptive material. 9 ____ 10 ____ 11 ____ 12 ____ 13 ____ 14 ____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

5. What size refrigerator do you now use?

1. ____ 14 cubic foot 3. ____ 18 cubic foot 5. ____ other
2. ____ 16 cubic foot 4. ____ 21 cubic foot 6. ____ don't know

6. What is the maximum amount you would be willing to pay for a new refrigerator?

1. ____ $500 3. ____ $600 5. ____ $700 7. ____ $800 9. ____ $900
2. ____ $550 4. ____ $650 6. ____ $750 8. ____ $850 10. ____ $1000

FIGURE 4

SALESPERSON QUESTIONNAIRE

For Office Use Only

Customer ID # ____ ____ ____

1-5 dup

1. First, which model did you like the best, and remember it does not have to be the one you would buy although it may be? _____ 7-8 ____

2. Now, which model would you be most likely to buy, if you were buying a new refrigerator today? _____ 9-10 ____

3. And the second most likely model you would buy? _____ 11-12 ____

4. And the third most likely model you would buy? _____ 13-14 ____

THANK YOU. YOU MAY NOW GO BACK TO THE KITCHEN WHERE THEY HAVE A FEW MORE QUESTIONS THEY WOULD LIKE YOU TO ANSWER.

5. What model were you pushing for this consumer? _____ 15-16 ____

6. Please indicate how important the following refrigerator factors seemed to be to this customer (Please Circle):

		Not at all Important						Very Important	
____ 1.	Low purchase price	1	2	3	4	5	6	7	17
____ 2.	Low cost of repair	1	2	3	4	5	6	7	18
____ 3.	Size	1	2	3	4	5	6	7	19
____ 4.	Color	1	2	3	4	5	6	7	20
____ 5.	Freezer location	1	2	3	4	5	6	7	21
____ 6.	Low annual energy consumption	1	2	3	4	5	6	7	22
____ 7.	Number/type of shelves	1	2	3	4	5	6	7	23
____ 8.	Chilled meat keeper availability	1	2	3	4	5	6	7	24
____ 9.	Number of Temperature settings	1	2	3	4	5	6	7	25
____ 10.	Textured Front Doors	1	2	3	4	5	6	7	26
____ 11.	Availability of Energy saver switch	1	2	3	4	5	6	7	27
____ 12.	Type of insulation	1	2	3	4	5	6	7	28
____ 13.	Icemaker availability	1	2	3	4	5	6	7	29
____ 14.	Availability of wheels	1	2	3	4	5	6	7	30
____ 15.	Availability of see-through pans	1	2	3	4	5	6	7	31
____ 16.	Location of condenser	1	2	3	4	5	6	7	32
____ 17.	Point of purchase displays	1	2	3	4	5	6	7	33
____ 18.	Energy labels (if applicable)	1	2	3	4	5	6	7	34
____ 19.	Previous experience with a refrigerator	1	2	3	4	5	6	7	35
____ 20.	Other: _____	1	2	3	4	5	6	7	36

For Office Use Only

7. Now, please put a checkmark in the space to the left of the three features that you think were the most important to this customer in chosing the model selected. 37-38 ____ 38-40 ____ 41-42 ____

8. Did this customer seem to read the energy labels? . . . . . ____ 1. Yes ____ 2. No 43

9. (IF YOU PUSHED ENERGY ANSWER THIS QUESTION)

Apart from the labels, did the consumer ask any energy-related questions before you began to talk about energy? ____ 1. Yes ____ 2. No 44

If YES, What was asked? _____ 45 ____

_____ 46 ____

_____ 47 ____

10. (IF YOU DID NOT PUSH ENERGY ANSWER THIS QUESTION)

Apart from the labels, did the consumer ask any questions that were energy related? ____ 1. Yes ____ 2. No 48

If YES, What was asked? _____ 49 ____

_____ 50 ____

_____ 51 ____

11. Given that the customer entered the shopping task with some preconceptions, how successful do you feel you were in changing his/her mind?

Not Successful at all 1 2 3 4 5 Very Successful 52

12. If you were in a real sales setting and had more time, how much more influence do you feel you could have had over this customer's decision?

No more at all 1 2 3 4 5 A lot more 53

Salesperson's Initials ____ ____ 54 ____

FIGURE 5

PREFERENCE RANKINGS

Customer ID # _____ _____ _____

After you have finished ranking the cards of your preferences (with the most preferred model on the top, the second most preferred next, and so forth, with the last card being the model you would least likely buy) we would like you to write in the model letters in the spaces provided on this page.

1. _____ Model I would most likely buy
2. _____ Model I would be next most likely to buy
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____ Model I would be least likely to buy

FIGURE 6A

Prices and costs of the 12

Refrigerators in the Card Sorting Task

Model	Price	Cost	Payback	Model	Price	Cost	Payback
T186	550	106	3	T218	700	175	1.3
T186E	580	96		T218E	760	130	
T188	610	119	2	S216	740	164	2.1
T188E	650	99		S216E	810	131	
T216	630	155	1	S218	820	175	4
T216E	680	105		S218E	900	155	

Figure 6B

E

Model RT186A 18.2 cu. ft. Capacity

- 30" Wide, 64¾" High
- 4.81 cu. ft. Freezer Section
- Optional Automatic Ice Maker
- Quick Freeze Ice Compartment and Two Trays
- Full-Width Freezer Interior Shelf
- 13.42 cu. ft. Fresh Food Capacity
- Heavy Duty Cantilevered Adjustable Shelves
- Big Capacity Fresh Storage, Crisper and Meat Pans
- Adjustable Glide-Out Rollers
- Reversible Textured Doors with Burled Walnut Handles and Door Stops
- Foamed-in-Place Insulation

PRICE: $550.00

COST OF OPERATING PER YEAR $106.00

F

Model RT186A 18.2 cu. ft. Capacity

- 30" Wide, 64¾" High
- 4.81 cu. ft. Freezer Section
- Optional Automatic Ice Maker
- Quick Freeze Ice Compartment and Two Trays
- Full-Width Freezer Interior Shelf
- 13.42 cu. ft. Fresh Food Capacity
- Heavy Duty Cantilevered Adjustable Shelves
- Big Capacity Fresh Storage, Crisper and Meat Pans
- Adjustable Glide-Out Rollers
- Reversible Textured Doors with Burled Walnut Handles and Door Stops
- Foamed-in-Place Insulation

PRICE: $580.00

COST OF OPERATING PER YEAR: $ 96.00

FIGURE 6B (continued)

D

Model RT188A 18.2 cu. ft. Capacity

- 30" Wide, 64¾" High
- 4.81 cu. ft. Freezer Section
- Optional Automatic Ice Maker
- Quick Freeze Ice Compartment and Two Trays
- 13.38 cu. ft. Fresh Food Capacity
- Tempered Glass Cantilevered Adjustable Shelves
- See thru Fresh Storage and Crisper Pans
- Chilled Meat Keeper Compartment
- Adjustable Lift-Off Handi-Bins
- Adjustable Glide-Out Rollers
- Reversible Textured Doors with Full-Length Burled Walnut Handles and Door Stops
- Foamed-in-Place Insulation

PRICE: $610.00

COST OF OPERATING PER YEAR: $119.00

H

Model RT188A 18.2 cu. ft. Capacity

- 30" Wide, 64¾" High
- 4.81 cu. ft. Freezer Section
- Optional Automatic Ice Maker
- Quick Freeze Ice Compartment and Two Trays
- 13.38 cu. ft. Fresh Food Capacity
- Tempered Glass Cantilevered Adjustable Shelves
- See thru Fresh Storage and Crisper Pans
- Chilled Meat Keeper Compartment
- Adjustable Lift-Off Handi-Bins
- Adjustable Glide-Out Rollers
- Reversible Textured Doors with Full-Length Burled Walnut Handles and Door Stops
- Foamed-in-Place Insulation

PRICE: $650.00

COST OF OPERATING PER YEAR: $ 99.00

FIGURE 6B (continued)

B

Model RT216A 20.9 cu. ft. Capacity

- 33" Wide, 66¼" High
- 6.64 cu. ft. Freezer Section
- Optional Automatic Ice Maker
- Quick Freeze Ice Compartment and Two Trays
- Full-Width Freezer Interior Shelf
- 14.13 cu. ft. Fresh Food Capacity
- Heavy Duty Cantilevered Adjustable Shelves
- Big Capacity Fresh Storage, Crisper and Meat Pans
- Adjustable Glide-Out Rollers
- Reversible Textured Doors with Burled Walnut Handles and Door Stops
- Foamed-in-Place Insulation

PRICE: $630.00

COST OF OPERATING PER YEAR: $155.00

G

Model RT216A 20.9 cu. ft. Capacity

- 33" Wide, 66¼" High
- 6.64 cu. ft. Freezer Section
- Optional Automatic Ice Maker
- Quick Freeze Ice Compartment and Two Trays
- Full-Width Freezer Interior Shelf
- 14.13 cu. ft. Fresh Food Capacity
- Heavy Duty Cantilevered Adjustable Shelves
- Big Capacity Fresh Storage, Crisper and Meat Pans
- Adjustable Glide-Out Rollers
- Reversible Textured Doors with Burled Walnut Handles and Door Stops
- Foamed-in-Place Insulation

PRICE: $680.00

COST OF OPERATING PER YEAR $105.00

FIGURE 6B (continued)

C

Model RT218A 20.9 cu. ft. capacity

- 33" Wide, 66¼" High
- 6.64 cu. ft. Freezer Section
- Optional Automatic Ice Maker
- Quick Freeze Ice Compartment and Two Trays
- 14.13 cu. ft. Fresh Food Capacity
- Tempered Glass Cantilevered Adjustable Shelves
- Chilled Meat Keeper Compartment
- See thru Fresh Storage Pan and Crisper
- Adjustable Lift-Off Handi-Bins on Refrigerator and Freezer Doors
- Reversible Textured Doors with Full-Length Burled Walnut Handles and Door Stops
- Adjustable Glide-Out Rollers
- Foamed-in-Place Insulation

PRICE: $700.00

COST OF OPERATING PER YEAR: $175.00

A

Model RT218A 20.9 cu. ft. capacity

- 33" Wide, 66¼" High
- 6.64 cu. ft. Freezer Section
- Optional Automatic Ice Maker
- Quick Freeze Ice Compartment and Two Trays
- 14.13 cu. ft. Fresh Food Capacity
- Tempered Glass Cantilevered Adjustable Shelves
- Chilled Meat Keeper Compartment
- See thru Fresh Storage Pan and Crisper
- Adjustable Lift-Off Handi-Bins on Refrigerator and Freezer Doors
- Reversible Textured Doors with Full-Length Burled Walnut Handles and Door Stops
- Adjustable Glide-Out Rollers
- Foamed-in-Place Insulation

PRICE: $760.00

COST OF OPERATING PER YEAR: $130.00

FIGURE 6B (continued)

L

Model RS216A 21.1 cu. ft. Capacity

- 33" wide, 64½" high
- 8.2 cu. ft. Freezer Section
- 2 Ice Cube Trays and Server
- Optional Automatic Ice Maker
- 12.86 cu. ft. Fresh Food Capacity
- Chilled Meat Keeper Compartment
- Heavy Duty Cantilevered Adjustable Shelves
- Adjustable Glide-Out Rollers
- Automatic Door Stops and Closers
- Textured Doors with Burled Walnut Full-Length Handles

PRICE: $740.00

COST OF OPERATING PER YEAR: $164.00

I

Model RS216A 21.1 cu. ft. Capacity

- 33" wide, 64½" high
- 8.2 cu. ft. Freezer Section
- 2 Ice Cube Trays and Server
- Optional Automatic Ice Maker
- 12.86 cu. ft. Fresh Food Capacity
- Chilled Meat Keeper Compartment
- Heavy Duty Cantilevered Adjustable Shelves
- Adjustable Glide-Out Rollers
- Automatic Door Stops and Closers
- Textured Doors with Burled Walnut Full-Length Handles

PRICE: $810.00

COST OF OPERATING PER YEAR: $131.00

FIGURE 6B (continued)

K

Model RS218A 21.0 cu. ft. Capacity

- 33" wide, 64½" high
- 8.2 cu. ft. Freezer Section
- Third Door Freezer Convenience
- 2 Ice Cube Trays and Server
- Optional Automatic Ice Maker
- 12.86 cu. ft. Fresh Food Capacity
- Chilled Meat Keeper Compartment
- See thru Crisper
- Tempered Glass Cantilevered Adjustable Shelves
- Adjustable Glide-Out Rollers
- Automatic Door Stops and Closers
- Textured Doors with Burled Walnut Full-Length Handles

PRICE: $820.00

COST OF OPERATING PER YEAR: $175.00

J

Model RS218A 21.0 cu. ft. Capacity

- 33" wide, 64½" high
- 8.2 cu. ft. Freezer Section
- Third Door Freezer Convenience
- 2 Ice Cube Trays and Server
- Optional Automatic Ice Maker
- 12.86 cu. ft. Fresh Food Capacity
- Chilled Meat Keeper Compartment
- See thru Crisper
- Tempered Glass Cantilevered Adjustable Shelves
- Adjustable Glide-Out Rollers
- Automatic Door Stops and Closers
- Textured Doors with Burled Walnut Full-Length Handles

PRICE: $900.00

COST OF OPERATING PER YEAR: $155.00

FIGURE 7
FOLLOW-UP QUESTIONNAIRE

For Office Use Only

Customer ID # ____ ____ ____

First we would like to ask you a few questions about the "shopping" task you just completed.

1. What things about the refrigerator were the most important to you when you made your decision? 15 ____ 16 ____ 17 ____ 18 ____ 19 ____ 20 ____

_____

_____

_____

_____

2. How much influence do you feel the salesperson had on your choice of refrigerator to buy? 21

____ 1. No influence at all
____ 2. Very little influence
____ 3. Some influence
____ 4. A lot of influence
____ 6. The salesperson was the only influence

3. Please describe briefly any of the signs, stickers, or labels you can remember seeing on or around the refrigerators. 22 ____ 23 ____ 24 ____

_____

_____

_____

_____

Next we would like to ask you just a couple of questions about yourself. These will only be used to draw conclusions about the general characteristics of the population and will in no way be used to identify anyone.

4. How old are you? _____ years 25

5. What is your sex? 1. ____ Male 2. ____ Female 26

6. What is your marital status? 1. ____ Single 2. ____ Married 27

7. How many members are there in your household? _____ 28

FIGURE 7 (continued)

For Office Use Only

8. What is your annual household income?

1. _____ Under $5000
2. _____ $5000-10,000
3. _____ $10,000-15,000
4. _____ $15,000-20,000
5. _____ $20,000-25,000
6. _____ $25,000 or more

29

9. Which one of the following best describes your education?

1. _____ Some grade school
2. _____ Some high school
3. _____ High school graduate
4. _____ Technical/vocational school
5. _____ Some college
6. _____ College graduate
7. _____ Some graduate work
8. _____ Graduate or professional degree

30

10. Which one of the following best describes your occupation?

1. _____ Retired
2. _____ Laborer
3. _____ Housewife
4. _____ Service worker
5. _____ Professional, technical
6. _____ Managerial, official, proprietor
7. _____ Sales or clerical worker
8. _____ Craftsman or foreman

31

11. In one sentence or less, please describe your occupation.

_____ 32 ____

_____

12. Please indicate on the scale below, how important each of the following refrigerator features were in the choice you made today. (Please circle)

	Not at all Important						Very Important	
a. Low purchase price	1	2	3	4	5	6	7	33
b. Low cost of repair	1	2	3	4	5	6	7	34
c. Size	1	2	3	4	5	6	7	35
d. Color	1	2	3	4	5	6	7	36
e. Freezer location	1	2	3	4	5	6	7	37
f. Low annual energy consumption . . .	1	2	3	4	5	6	7	38
g. Number/type of shelves	1	2	3	4	5	6	7	39
h. Chilled meat keeper availability .	1	2	3	4	5	6	7	40
i. Number of temperature settings . .	1	2	3	4	5	6	7	41

FIGURE 7 (continued)

	Not at all Important						Very Important	For Office Use Only
j. Textured front doors	1	2	3	4	5	6	7	42
k. Energy saver switch availability .	1	2	3	4	5	6	7	43
l. Type of insulation	1	2	3	4	5	6	7	44
m. Ice-maker availability	1	2	3	4	5	6	7	45
n. Availability of wheels	1	2	3	4	5	6	7	46
o. Availability of see-through pans .	1	2	3	4	5	6	7	47
p. Location of condenser	1	2	3	4	5	6	7	48
q. Point of purchase displays	1	2	3	4	5	6	7	49

13. About how much per year do you think it costs you to run an average size (18 cubic feet) refrigerator/freezer?

about _____ dollars per year 50,51,52

(round to nearest dollar)

14. About how much per year to you think it would cost you to run the refrigerator/freezer you just selected?

about _____ dollars per year 53,54,55

15. Most people have noticed that the costs of natural gas, fuel oil, gasoline for cars, and electricity have been increasing substantially over the last several years. Have you taken any steps to help reduce the amount of money you spend on gasoline (for your car)?

1. _____ Yes 2. _____ No 56

If Yes, what have you done? _____ 57,58

_____

16. Have you taken any steps to help reduce the amount of money you spend on electricity?

1. _____ Yes 2. _____ No 59

If Yes, what have you done? _____ 60,61

_____

17. Have you taken any steps to help reduce the amount of money you spend for heating/cooling your house?

1. _____ Yes 2. _____ No 62

If Yes, what have you done? _____ 63,64

_____

FIGURE 7 (continued)

For Office Use Only

18. What kinds of energy saving features are available on new models of regrigerator/freezers? 65 ____

_____

_____

_____

19. Electrical energy rates vary across the country. For example the rates in New York are about three times as high as out in Seattle. These rates are normally stated in cents per killowatt hour. Which rate do you think best reflects the rate you are being charged in Pittsburgh. 66

1. _____ 2¢ per kilowatt hour
2. _____ 4¢ per kilowatt hour
3. _____ 6¢ per kilowatt hour
4. _____ 8¢ per kilowatt hour
5. _____ Have no idea but I think it is higher than the national average.
6. _____ Have no idea but I think it is lower than the national average.
7. _____ Have no idea but I think it is near the national average.
8. _____ I just have no idea.

20. Assume you are going to buy a new appliance. You are considering two different models that are exactly the same except one will save you $10 a year in reduced energy costs. How much more would you be willing to pay for the model that would save you $10 a year?

_____ Dollars 67,68,69

21. What is your feeling about the severity of the energy crisis that has occurred over the last couple of years? 70

1. _____ The problem is very critical.
2. _____ There is some degree of a shortage, but the U.S. can and is developing enough new sources, so there is no need for panic.
3. _____ There is no energy shortage; it has been "created" by the oil companies so that they can charge higher prices.

22. How much ability do you think you have for contributing personally to the solution of the energy problem? Please check the number of the statement that best represents your feelings. 71

9. _____ There is no energy problem; it has been created by the oil companies so that they can charge higher prices.
1. _____ I can do a great deal.
2. _____ I can do something.
3. _____ I can do very little.
4. _____ I can do nothing.

FIGURE 7 (continued)

23. Assume you were going to buy a new major appliance. You are considering two different models that are exactly the same except one is energy efficient and will save you money by lowering your utility bills. If the energy saving appliance costs $150 more than the other one, how much would it have to save yearly in your electric bill before you would consider buying it over the other model?

It would have to save _____ dollars per year in energy costs before I would consider buying it. 72,72,74

24. Some people say that with the cost of energy going up all the time, it is better to buy appliances which cost more to begin with, but which save more energy, and consequently more money over the life of the product. Others say that you should buy cheaper appliances because you'll never save enough energy to make up for the extra price of an appliance designed to be more energy-efficient. Which is closer to your opinion?

1. _____ I would buy more expensive appliances that save energy 75

2. _____ I would buy cheaper appliances because the original cost cannot be recouped.

9. _____ I don't know.

25. How do you think energy conservation measures will affect your standard of living?

1. _____ My standard of living will go up. 76

2. _____ My standard of living will stay the same.

3. _____ My standard of living will go down.

4. _____ I don't know.

26. How much extra would you be willing to pay to buy appliances that conserve energy and cost less to operate due to lower energy use?

1. _____ Nothing extra 77

2. _____ 5-10 percent more

3. _____ 10-15 percent more

4. _____ 15-20 percent more

5. _____ 20-30 percent more

6. _____ 30-40 percent more

7. _____ 40 percent or more

8. _____ I'm not sure

FIGURE 7 (continued)

27. Some manufacturers are now advertising their major appliances as energy saving. More often than not, these appliances cost more initially. However, they usually save you money by reducing your annual utility bills. For example, an appliance might cost $50 more but save $10 per year in electricity. Thus, the energy saving features would pay for themselves in 5 years (i.e., 50/10=5). Assume that you were going to buy a major appliance and had selected the model you wanted. The salesman then tells you that you can get exactly the same model that is energy efficient for an extra $100. How fast would you expect the energy features to pay back the extra $100? (Please circle the maximum number of years you would be willing to go before the extra initial cost was paid for by the energy savings.) 78,79

years to	0	1	2	3	4	5	6	7	8	9	
pay back	10	11	12	13	14	15	16	17	18	19	80,(1)

FIGURE 8

SAMPLE ENERGY LABEL*

White·Westinghouse
Refrigerator-Freezer
Model(s) RS 216
Capacity: 21 Cubic Feet
Type of Defrost: Full Automatic

ENERGYGUIDE

Estimates on the scale are based on a national average electric rate of 4.1¢ per kilowatt hour.

Only models with 20.5 to 22.4 cubic feet are compared in the scale.

Model with lowest energy cost $44

$80

Model with highest energy cost $ 126

THIS MODEL

Estimated yearly energy cost

This energy cost is based on U.S. Government standard tests.

How much will this model cost you to run yearly?

		Yearly cost
		Yearly cost shown below
Cost per kilowatt hour	2¢	$ 39
	4¢	$ 78
	6¢	$ 117
	8¢	$ 156
	10¢	$ 195
	12¢	$ 234

Ask your salesperson or local utility for the energy rate (cost per kilowatt hour) in your area. Your cost will vary depending on your local energy rate.

Important

Removal of this label before consumer purchase is a violation of federal law (42 U.S.C. 6302).

(Part No. 371026)

* These labels were according to the FTC labelling TRR and accurately depicted current or proposed energy costs.