AN ABSTRACT OF THE THESIS OF

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Title: Factors That Influence Energy Conservation Alterations in Oregon Households.

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The purpose of this study was to analyze the relative contribution of factors that may influence residential energy conservation behavior. The theoretical framework for this study was Niemeyer's (1982) model of energy adjustment. Niemeyer's model was expanded to include actual energy conservation alteration actions performed. Energy conservation alteration actions were divided into two conceptually different types of conservation alterations: energy curtailment and energy efficiency improvement. Lastly, physical size of the dwelling was added as an exogenous variable.

A longitudinal survey conducted by the Western Regional Agricultural Experiment Station Committee (W-159) in 1981 and 1983 provided the data for this analysis. The longitudinal Oregon data were analyzed for this study. Path analysis provided a method for connecting quantitative estimates to causal effects within the model. To obtain the quantitative estimates, or path coefficients, multiple regressions were performed on weighted data, yielding the standardized regression coefficients, or beta weights.

Frequency distributions were run on unweighted data in order to describe the respondents by sociodemographic and housing-related characteristics. The respondents most often lived in households of two persons which earned an income of \$20,000 through \$24,999. Respondents were characterized by a mean age of 47.9 years and some college. Males (56.0 percent) answered the questionnaire more often than did females (40.7 percent). The median size of the dwellings was in the category of 1,001 square feet through 1,500 square feet.

The following causal paths were supported in the tested model:

$X_{15} = f(X_{13})$,

$X_{14} = f(X_{13}, X_{12}, X_{10}, X_8, X_4, X_3, X_1)$,

$X_{13} = f(X_{10}, X_8, X_6, X_5, X_4)$,

$X_{11} = f(X_{10}, X_6, X_3, X_1)$,

$X_{10} = f(X_8, X_6)$, and

$X_9 = f(X_4, X_3)$,

where:

X_{15} = energy efficiency improvement behavior,

X_{14} = energy curtailment behavior,

X_{13} = propensity for energy efficiency behavior,

X_{12} = propensity for energy curtailment behavior,

X_{11} = compared energy efficiency,

X_{10} = energy conditions of the dwelling,

X_9 = belief in the seriousness of energy problem,

X_8 = dwelling size,

X_7 = perceived influence of energy costs,

X_6 = tenure of dwelling,

X_5 = sex of respondent,

X_4 = age of respondent,

X_3 = education of respondent,

X_2 = household income, and

X_1 = household size.

These findings could increase the effectiveness of energy conservation research and programs implemented by educators, utility personnel, extension agents, and governmental energy planners.

Factors That Influence

Energy Conservation Alterations

in Oregon Households

by

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CHAPTER I

INTRODUCTION

> For the past several years and for the foreseeable future, to the inevitable twin disasters, death and taxes, must be added a third burden, energy problems (Becker and Seligman, 1981:1).

The United States had, until recently, enjoyed an abundance of natural energy-producing resources, resulting in a highly energy-consumptive national lifestyle (Paolucci, 1978; Rudd and Longstreth, 1978). This lifestyle had been based on the premise that resources were abundant and inexpensive, able to be enjoyed for far into the future (Meier, 1956; Paolucci, 1978). In its spiraling increase in energy consumption, this lifestyle has finally placed an unprecedented demand on the world's resources. Now, the inescapable fact of the finiteness of the world's deposits of petroleum and natural gas and the expectation of their depletion within our lifetime has become evident (Lave, 1980; Olsen, 1981).

The energy shortage has affected our economy, foreign relations, the quality of land, air, and water, and our safety (Becker and Seligman, 1981; Folkerts-Landau, 1984; Hannon, 1975; Stern, Black, and Elworth, 1982; Yergin, 1979). Continuing a highly energy-consumptive lifestyle in the face of this shortage would be disastrous

(Rudd and Longstreth, 1978). The Arab oil embargo of 1973-1974 was not only the first real rude awakening to this fact for the American consumer, but also a foretaste of what the results could be if current lifestyle patterns continued.

Since 1973, the rate of growth of world energy consumption had declined sharply, from 5 percent per annum in the years between 1955 and 1973, to 2.7 percent per annum in the years between 1973 and 1980 (Lin, 1984). Lin (1984) attributed this not only to a recession-induced decline in the share of industrial output, but also to conservation efforts. Energy conservation has been widely acclaimed as a principle solution to the energy shortage (Morell, 1981; Olsen, 1981; Seligman and Hutton, 1981; Yergin, 1979). According to Merfeld, energy conservation can be defined as "a reduced consumption of energy compared to a previous level of consumption" (1984:4).

It was estimated as early as 1976 that a reduction of 40 to 50 percent of the energy used in the United States could occur if proper energy conservation measures were implemented (Beck, Doctors, and Hammond, 1980; Becker and Seligman, 1981; Hirst and Carney, 1978; Meier, Wright, and Rosenfeld, 1983; Ross and Williams, 1976; Yergin, 1979). This would have been equivalent to the amount of oil imported into the United States during 1979 (Yergin, 1979). Yet, despite the obvious need for energy conservation, the American public has continued a high level of energy consumption, taking only a few conserving actions (Cornille, Oransky, and Pestle, 1979), and only slowing the rate of growth of energy consumption (Lin, 1984). Olsen (1981) and Seligman and Hutton (1981) have predicted that enormous amounts of energy could be saved without adversely affecting the quality of our lives and Seligman and Hutton (1981) cited the differences in per capita energy use between the United States and Sweden, Switzerland, and France. They protested, "Does anyone wish to maintain seriously that the quality of life in the United States is that much better than in those countries (1981:2)?"

A closer study of energy conserving behavior is obviously important, but energy conservation is not as straightforward as it seems. Seligman and Hutton (1981) contend that human factors are responsible for over 50 percent of the variance in residential energy consumption. The consumption of energy can vary enormously even in identical homes. Differences of a factor of three or more were not uncommon in a study by Socolow (1978). Schipper (1983) found that differences in price, climate, housing stock, heating, bathing, and cooking habits, and engineering technology were related to variations in ownership, lifestyle, and energy use that occur even at roughly similar income levels.

What has motivated people to conserve energy? Logically, it would seem that an awareness and understanding of the energy problem by the consumer would have contributed to a conservation ethic, and therefore been an important factor in energy conservation behavior (Cook and Berrenberg, 1981; Olsen, 1981). However, many researchers have shown that this may not be the case (Anderson and Lipsey, 1978; Cunningham and Lopreato, 1977; Perlman and Warren, 1977; Sears, Tyler, Citrin, and Kinder, 1978). The conservation ethic seems to affect behavior only in how it relates to an individual's personal inconvenience or expense or is perceived as directly relevant to the individual (Becker and Seligman, 1981; Hass et al., 1975; Merfeld, 1984; Olsen, 1981; Sears et al., 1978). "A diffuse sense of obligation is not usually as salient to the individual... as are immediate personal consequences" (Olsen, 1981: 117). The anticipation of negative consequences seems to be the major motivator for energy conservation behavior (Hass, et al., 1975; Sears et al., 1978). More specifically, the negative events anticipated were spending too much money (Cunningham and Lopreato, 1977; Morrison et al., 1978; Olsen, 1981; Peck and Doering, 1976; Perlman and Warren, 1977) and a possible disruption to personal comfort (Becker and Seligman, 1981; Hass et al., 1975; Seligman, et al., 1979).

Niemeyer (1982) developed a path analysis model in her study of the determinants of the propensity to engage in energy-conserving behavior. Morris and Winter's (1981) model of housing adjustment behavior served as the basis for Niemeyer's (1982) model. In Morris and Winter's model, the family was seen as engaging in evaluation of its housing in terms of cultural and family norms. A propensity to engage in adjustment behavior occurred when a family experienced a normative housing deficit that caused a significant reduction in housing satisfaction. If the deficit was salient, housing satisfaction was low, and the propensity to engage in adjustment behavior appeared. The propensity to reduce the deficit caused adjustment behavior through: 1) alteration of the current dwelling, or 2) moving to a different dwelling.

Niemeyer (1982) postulated that, if the family's housing fails to meet the family's norms for energy efficiency, a deficit exists. If the energy deficit is salient, dissatisfaction occurs, and a propensity to engage in energy-saving adjustment behavior results.

Of the factors that affected the occurrence of energy deficits, Niemeyer looked at resource constraints and predisposition constraints. Morris and Winter defined constraints as "...factors that restrict a family's ability to engage in housing adjustment behavior" (1978:80). Resource constraints were those factors that restricted a family's ability to engage in adjustment behavior. The resource constraints included in Niemeyer's model were age of head of household, education of head, sex of head, home ownership, household size, household income, and subjective economic constraints. (Subjective economic constraints measure whether the respondent felt energy costs for the dwelling were a problem.) Predisposition constraints were factors that restricted the household's skills and motivation to engage in housing adjustment behavior. Niemeyer included the following predisposition constraints in her model: optimism, flexibility, control, responsibility, expectation of tensions, and expectation of solutions.

Niemeyer found that resource constraints were the key explanation to the number of energy saving characteristics present in the dwelling, and that satisfaction with the energy condition of the home was dependent on the presence of those characteristics. Further, Niemeyer found that the main barriers to the propensity or intent to save energy through dwelling alterations were also the resource constraints. Households with fewer resources were less likely to have such a propensity. Niemeyer's (1982) model stopped at the "intention" stage, or with the propensity for conservation behavior. She asserted, "...it can be assumed that the propensity or intent to engage in energy conserving adjustment serves as a measure of energy adjustment behavior" (1982:35).

When considering an individual's intention to perform a specific act in a specific situation, the consistency rate is seen to be extremely high (Ajzen and Fishbein, 1975; Fishbein, 1967; Wicker, 1969). However DeFleur and Westie (1963) argued that the expressed intention to act and the action itself constitute separate universes of response, and Olsen (1981) pointed out, "...an intention to act is not identical to actual behavior, and in the realm of energy conservation, the old adage about the pavement on the road to hell may have considerable validity" (Olsen, 1981:119). Did those consumers with a propensity to conserve energy actually follow through with their intentions? And if so, what types of conservation behavior did they take, and how did their sociodemographic and housing-related characteristics affect the type of behavior, if at all? Knowing the conservation actions and behaviors practiced by consumers who intend to conserve could increase the effectiveness of energy conservation research and programs implemented by educators, utility personnel, extension agents, and governmental energy planners.

Statement of Purpose

The purpose of this study was to analyze the relative contribution of factors that may influence residential energy conservation behavior.

Objective

To accomplish the purpose, this study will:

Investigate the relationships among:

1) exogenous variables (i.e.: household size, income of respondent, education of respondent, age of respondent, sex of respondent, tenure of dwelling, perceived influence of energy costs, and physical size of dwelling),
2) belief in the existence and seriousness of the energy problem,
3) energy conditions of dwelling,
4) compared energy efficiency of the dwelling,
5) the propensity for conservation alterations (energy curtailment and energy efficiency improvement), and
6) conservation alteration actions (curtailment conservation behavior and efficiency improvement conservation behavior).

Limitations

This study was limited in the following ways:

1) The sample was drawn from telephone directories, introducing possible socio-economic bias.

2) The energy conservation actions reported were limited to those on the questionnaire.

Definition of Terms

Belief in the energy problem: "...degree to which the respondent believes in the existence and seriousness of the energy problem" (Niemeyer and Morris, 1982:4).

Compared energy efficiency: The comparison of the energy efficiency of one's dwelling to the energy efficiency of other, similar dwellings.

Endogenous variables: "...developing from within; originating internally" (Webster's New World Dictionary, 1966:479). Used in path analysis models: "Endogenous variables are those dependent and intervening variables in the model which are causally determined by other variables and are depicted in path diagrams with paths leading into themselves" (Schumm, Southerly, and Figley, 1980: 252).

Energy conditions: "...existing energy-saving features of the dwelling" (Niemeyer, personal communication, February, 1985).

Energy efficiency improvement behaviors: "...usually involve one-time purchase decisions; there is a financial expense and the potential of future monetary savings, but no loss of the amenities energy produces" (Stern, et al., 1982:2).

Energy curtailment behaviors: "...usually must be repeated or continual (sic) to achieve maximum energy savings; they rarely cost money but they do involve a loss of amenities" (Stern et al., 1982:2).

Energy norms: A set of rules or ideals regarding energy-related behavior and energy conditions of the home.

Energy satisfaction: "...level of fulfillment or contentment with existing energy-saving features of the dwelling" (Niemeyer, personal communication, February, 1985).

Exogenous variables: "...developing from without; originating externally" (Webster's New World Dictionary, 1966:510). Used in path analysis models: "Exogenous variables are those independent variables which are merely correlated with one another but which can have causal influence on the endogenous variables. No attempt is made to explain how the exogenous variables came to be determined." (Schumm, et al., 1980: 252).

Family norms: "A set of rules or ideals for behavior and conditions arising from within the family itself; the family's standards with respect to its own behavior and conditions; the way things 'ought' to be as perceived by the family itself" (Morris and Winter, 1978:40).

Norms: Culturally derived criteria by which housing is judged (Morris and Winter, 1978:5) can be "...written or clearly defined rules, regulations, or codes to which members of the system are required to conform . . . (and/or) unwritten, generally accepted rules for behavior or conditions" (Morris and Winter, 1978:40).

Propensity for conservation alterations: the inclination or tendency to make changes or improvements within or on a dwelling to increase energy efficiency. Includes both propensity for energy curtailment and propensity for energy efficiency improvement.

Resource constraints: "Human and non-human [factors]...that restrict the family's ability to adjust housing for purposes of energy efficiency, and the ability to perceive deficits, as well as the energy conditions of the existing dwelling, and belief in the energy problem" (Niemeyer, personal communication, February, 1985).

CHAPTER II

REVIEW OF LITERATURE

Niemeyer (1982) developed and tested an energy adjustment model theoretically based on Morris and Winter's (1981) housing adjustment model. For the present study, the proposed "model of energy conservation alterations" was based on Niemeyer's tested model. The present study's model of energy conservation alteration and its variables will discussed.

Morris and Winter's Model of Housing Adjustment

The model of housing adjustment is an attitude/behavior model related to family housing (Morris and Winter, 1981). Morris and Winter (1981) maintained that families engage in an ongoing process of housing according to certain culturally derived criteria known as norms. If a family experienced a salient deficit according to these norms, residential dissatisfaction would occur. Once the dissatisfaction became great enough, the family would engage in housing adjustment or adaptation behavior (see Figure 1). Adjustment behavior covered the more routine changes, such as changing the use of a room in the house, or moving to a new residence within the same labor or housing market. Adaptation covered less routine changes, such as limiting family size or sending a grandparent to a nursing home to obtain an extra bedroom.

If, due to no available modes of adjustment or adaptation, housing norms were not met, pathology could occur, resulting in the

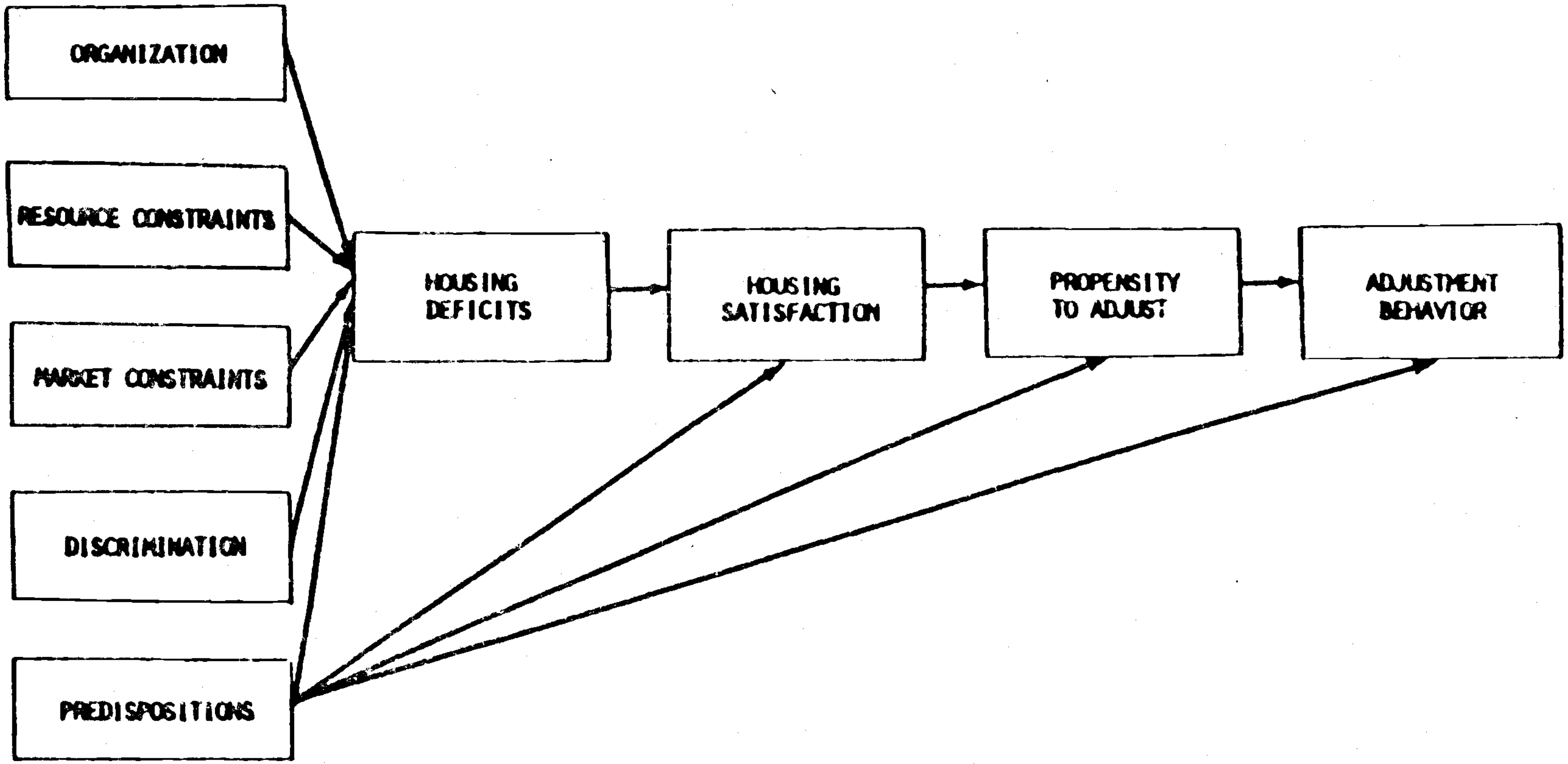


Figure 1. Morris and Winter's model of housing adjustment (1981).

severe disruption or even destruction of the family. Pathology could take the form of antisocial behavior, extremely low levels of social or economic wellbeing, physiological illness, or psychological illness (Morris and Winter, 1978:9).

Constraints were those factors that restricted a family's ability to engage in adjustment behavior. Adjustment behavior was divided into: 1) residential mobility, moving to a different dwelling within the same labor or housing market, and 2) residential alteration, family activities that changed the dwelling to fit current norms.

Niemeyer's Model of Energy Adjustment

Niemeyer (1982) postulated that if family housing failed to meet energy efficiency norms, familial dissatisfaction occurred, and when the dissatisfaction became great enough, the propensity to engage in energy saving behavior (see Figure 2) occurred. Of the factors that affected occurrence of energy deficits, Niemeyer looked at what she termed "resource constraints" (those constraints that restricted the household's ability to engage in adjustment behavior), and predisposition constraints (those that restricted the household's skill and motivation to engage in adjustment behavior).

Niemeyer's Tested Model

In her interviews with the heads of households, the heads' spouse, or in some cases, both of 198 Iowa households, she found that

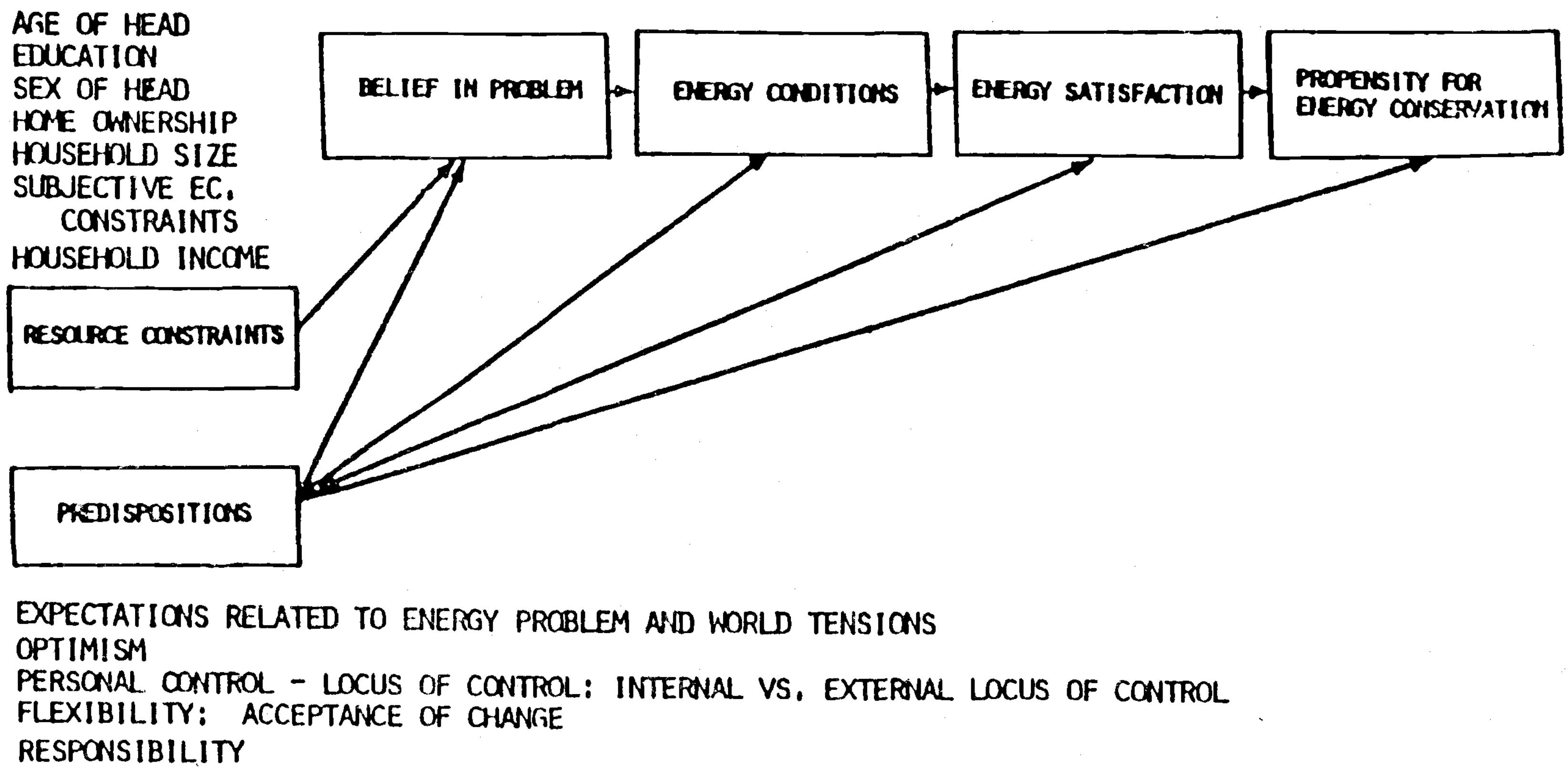


Figure 2. Niemeyer's model of energy adjustment (1982).

resource constraints were the major factors in the number of existing energy-saving features in the dwelling (see Figure 3). Satisfaction with the energy characteristics of the dwelling was found to be mainly determined by the presence of those characteristics. However the presence of resource constraints reduced satisfaction below the level expected on the basis of energy characteristics alone.

The most important factor in the propensity to move to save energy was dissatisfaction with energy conditions. The propensity to move was influenced equally by resource limitations and attitudinal predispositions.

Resource constraints as a group were the key explanation to the propensity to alter the dwelling. Attitudinal constraints played almost no role in propensity to alter the dwelling. Dissatisfaction with the energy efficiency of the dwelling was a significant determinant of the propensity to save energy, but this relationship was weaker than the relationship between resource constraints and the propensity to save energy.

Niemeyer concluded that programs that had the effect of removing the effect of resource constraints to energy saving behavior should be adopted. She also concluded that programs that had the aim of changing predispositions should not be suggested.

In summary, based on Morris and Winter's (1981) model of housing adjustment, Niemeyer (1982) tested a model of energy adjustment. She looked at resource constraints and predisposition constraints, and their relationships with belief in the energy problem, energy conditions of a home, satisfaction with those energy conditions, and the

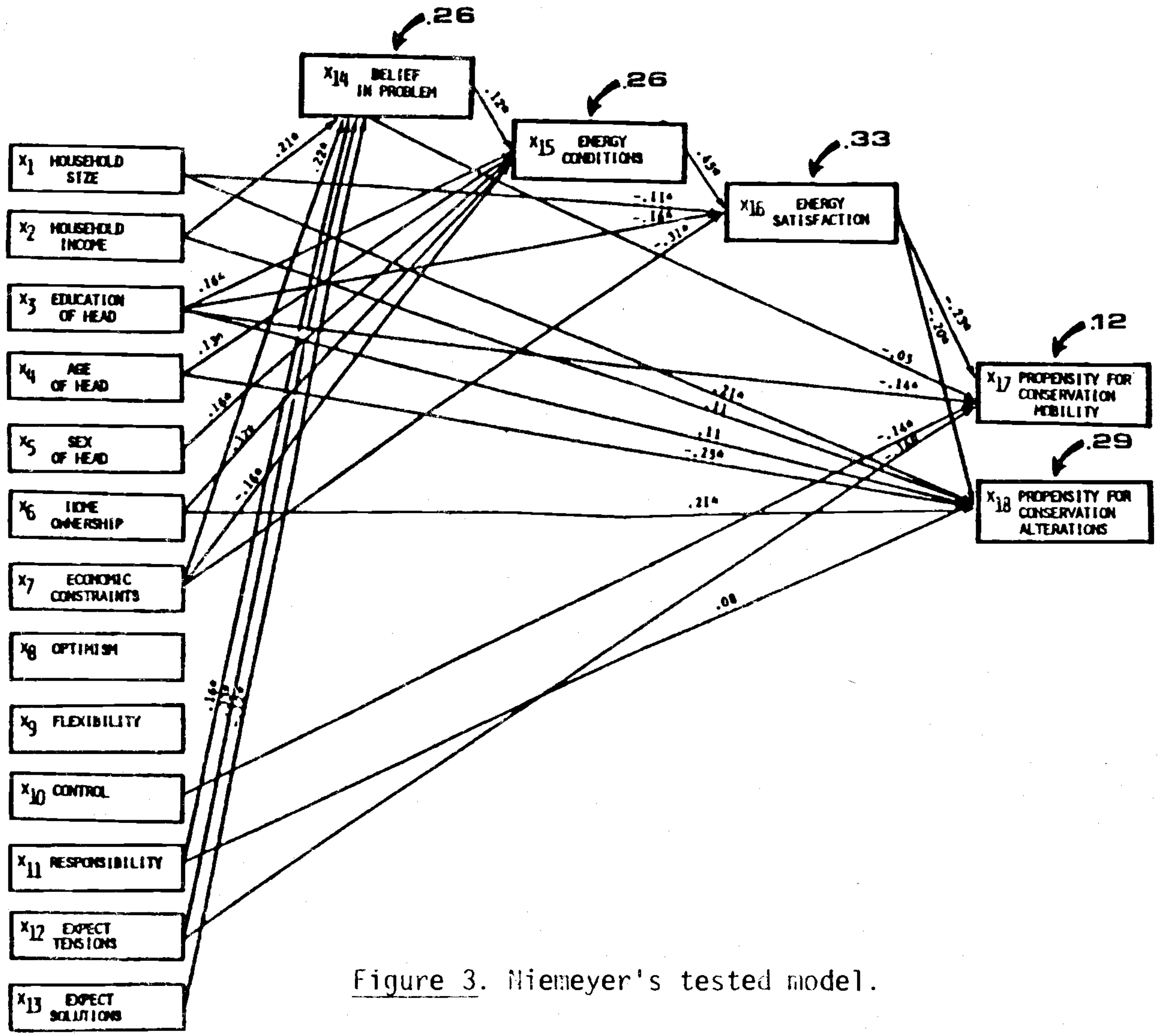


Figure 3. Niemeyer's tested model.

propensity for energy conservation. Niemeyer concluded that programs that remove the effects of resource costraints to energy saving behavior should be most highly recommended.

Proposed Model of Energy Conservation Alterations

The theoretical framework for this study was Niemeyer's (1982) model of energy adjustment. The model has been expanded to include actual energy conservation alteration behaviors performed (see Figure 4). This variable has been subdivided into two conceptually different types of conservation alterations: energy curtailment and energy efficiency improvement. In addition, the variable entitled propensity for conservation alterations has been divided into the propensity for the same two types of conservation alterations. Lastly, physical size of the dwelling has been added as a variable under the exogenous variables (those variables originating from outside the model: Niemeyer's (1982) "resource constraints").

No research study was found which included all the variables in the manner which was hypothesized in Figure four. However, many of the studies reviewed contained one or more of these variables in some manner. The following discussion explains the variables in the hypothesized model based on researchers' previous findings and conclusions regarding their relationships.

Exogenous Variables

Household Size

The number of people in the household was a main determinant of

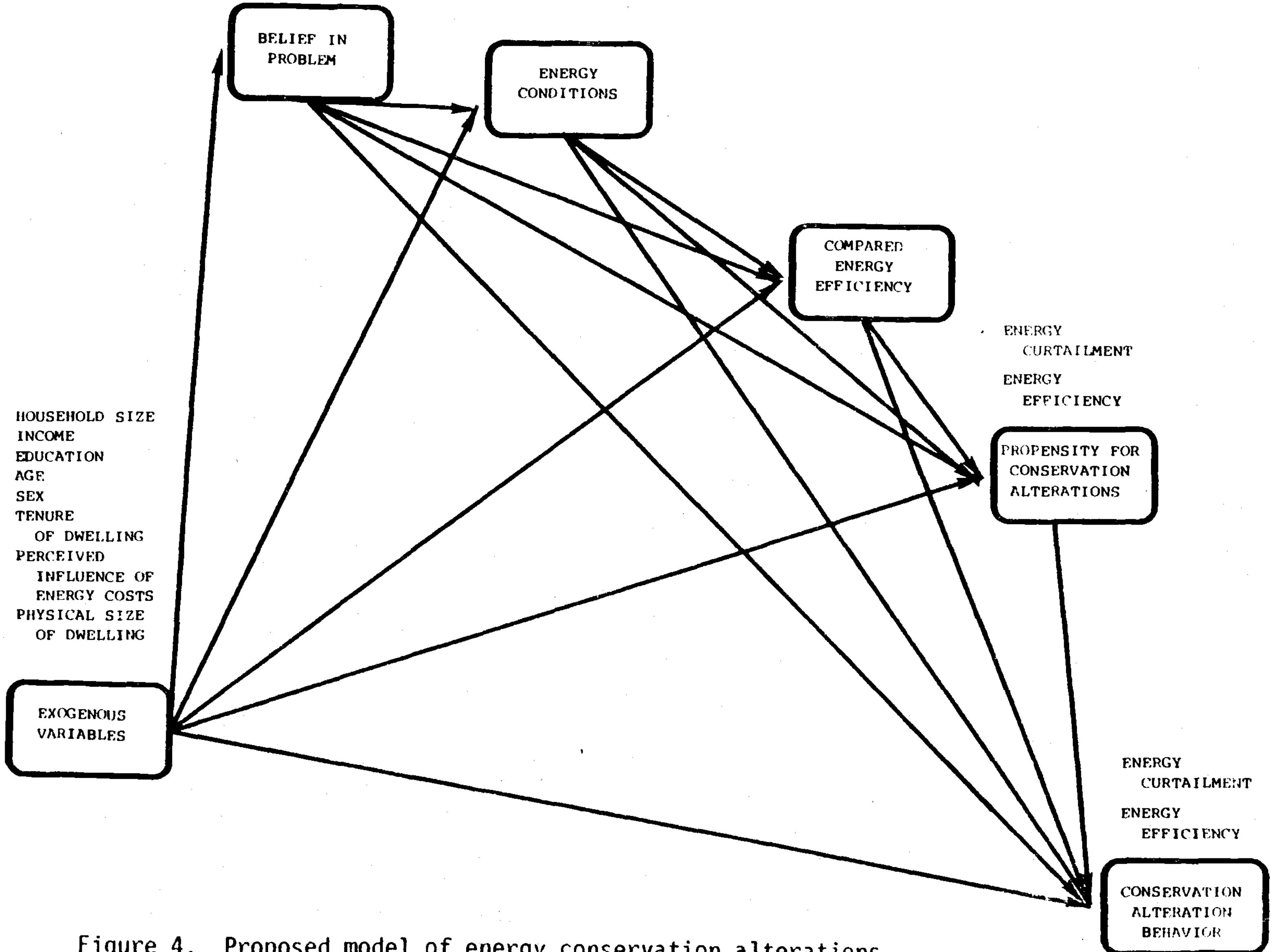


Figure 4. Proposed model of energy conservation alterations.

the amount of energy used (Cramer et al., 1983; Levy, 1973; Morrison et al., 1978). Cramer et al. (1983) analyzed the summer electricity-usage patterns of consumers in single family detached homes in a hot, dry climate and found that for each adult within a household electricity consumption rose by 347 kilowatt-hours and for each child over age 2, 236 kilowatt hours. They found that the size of the family was positively correlated to the number of appliances owned and used, but not to the cooling load (use of air conditioner or cooler) incurred by the family.

Cohen (1976) concluded that one-third of the variation in household gas and electricity consumption was explained by factors which included the size of household and use within the household to which fuels were put (Niemeyer, 1982:30). Morrison et al. (1978) found that large families in the middle-life cycle used more energy than younger or older families. Marganus (1984) found that the size of families was the second best predictor in explaining the amount of money spent on energy.

However, Herendeen and Tanaka (1976) found energy use per household was not influenced by size, with the exception of single-person households. Gladhart (1977) found that when specific measures of the dwelling (ie: number of doors and windows, insulation, number of rooms heated, etc.) and family type (ie: whether children exist in family, age of wife, whether husband tries to conserve energy) were introduced, the influence of family size on energy consumption was eliminated.

In summary, most researchers viewed the number of people in the household as an important determinant in the amount and way energy was used, with an increase in people accounting for greater use. Several researchers, however, found opposite results. Specific measures of the dwelling and family type eliminated influence of family size on consumption (Gladhart, 1977), and single person dwellings were the only type of dwelling where energy consumption was found to vary significantly from other household sizes (Herendeen and Tanaka, 1976).

Income

Newman and Day (1975) and Cunningham and Lopreato (1977) called income the strongest single determinant of energy consumption. Newman and Day (1975) further stated that it was one of the best predictors of willingness to practice energy conservation. As income rose, so did the amount of energy used in a dwelling (Bultena, 1976; Maraganus, 1984; Newman and Day, 1975). Marganus (1984) found that even when the size of the house was accounted for, high income households paid more for energy. Higher income families had more appliances, had larger homes, and used more electricity (Cramer et al., 1983; Marganus, 1984).

Low-income groups used less energy but spent proportionately more of their income on energy (Katz and Morgan, 1983; Newman and Day, 1975). Newman and Day (1975) estimated that energy costs in proportion to income were almost four times greater for the poor than for the middle or upper class. Brazzel and Hunter (1979) found that those who spent a great portion of their disposable income on energy were low-income groups, residents of black households, and female-headed households.

Tienda and Aborampah (1981) found that low-income families were less able to mitigate the impact of the energy crisis. For example, they were less able to invest in retrofitting their homes even when loans or tax credits were available. Cramer et al. (1983) pointed out that the poor had low energy consumption because they could not afford to consume more, not because they wanted to use less. The majority of low-income households could not afford even the minor, out of pocket expenditures for energy efficiency improvements (Eichner and Morris, 1984; Katz and Morgan, 1983). Housing stock occupied by low-income residents was generally not energy efficient, was older, and was frequently in need of repair (Katz and Morgan, 1983).

However, Perlman and Warren (1977) found higher socio-economic groups were more likely to adopt energy conservation practices and support energy conservation policies. Dillman, Rosa, and Dillman (1983) found that while the poor cut back in their energy use, it was the wealthy who invested financially in home energy conservation.

Yet, Wilk and Wilhite (1983) found strictly economic motivations were rarely encountered during their study on household energy decision-making. Instead, vague cultural values such as "savings," "reducing waste," making the house "tight," and having an "independent" lifestyle were what motivated energy conservation efforts. The type of energy conservation efforts were often those which were marginally effective, but highly salient to visitors within the home. This study, however, was limited to middle-income households.

In summary, most researchers agreed that income was one of the strongest predictors of the amount of energy consumed, and the willingness to engage in energy conservation. Housing occupied by low-income families was usually not energy efficient, and such families could not afford to improve this situation. While low income families tended to use less energy than high income families, they spent more of their disposable income on energy costs. Low income families used less energy because they could not afford to use more, not because they wanted to use less.

Education

At first, the results of studies regarding the effect of education on energy conservation behavior seemed to be contradictory. Olsen (1981) asserted that the education level of a consumer was the best single predictor of belief in the seriousness of the energy crisis. Education level was positively associated with attitudes toward energy conservation (Barnaby and Reizenstein, 1975; Bultena, 1976; Curtin, 1976; Zuiches, 1976), and the adoption of conservation measures (Gottlieb and Matre, 1976). In a study by Houston Power and Light, it was found that those most concerned with energy issues were more educated, younger, and earned higher incomes than those less concerned with energy issues (Gilly and Gelb, 1978). Those who had a tendency to request energy audits of their dwelling were highly educated, earned high incomes, and were under 65 years of age (Katz and Morgan, 1983).

However, those with higher education levels did not seem to follow through on their energy convictions. Murray et al. (1974) found no positive correlation between educational level and adoption of energy conservation measures, and Heberlein and Warriner (1980) found education level negatively associated with energy conservation. Cramer et al. (1983) found the effect of education was such that the more schooling the consumer had, the larger that consumer's dwelling was, and the more likely there was air conditioning in that dwelling, necessitating the use of more electricity. Granite (1978) found that well-educated, upper-income consumers tended not to incorporate energy conserving aspects in home remodeling.

A consumer's lack of access to information did not necessarily mean the consumer used more energy (Cramer et al., 1983). The less-educated, low-income, minority and ethnic groups used the least amount of energy (Cunningham and Lopreato, 1977) and well educated, higher-income, large families in the middle stage of the life cycle, living in large homes used the most energy (Morrison et al., 1978).

In summary, the effect of education on energy conservation beliefs and behavior was mixed. Researchers reported that education level was positively related to attitudes toward the energy problem, however education level was also positively related to energy consumption, and negatively related to actual energy conservation behavior. This was because well-educated consumers tended to have higher incomes and thus more energy-consumptive dwellings, while less-educated consumers tended to have lower incomes, and thus could not afford high energy consumptive behavior.

Age

The age of a consumer had a definite impact on the consumer's attitudes and beliefs toward energy conservation. According to Eichner and Morris (1984), age was a constraint on energy conservation behavior, as older families were less adaptive and therefore less open to new energy conserving behavior. Conversely, in Talazyk and Omura's (1975) study, the elderly reported less attitudinal resistance to energy conservation, and Curtin (1976) and Lopreato, Meriwether, Cunningham, and Brondel (1976) found middle-aged people tended to be concerned about reducing energy.

This diversified view of the effect of age on energy conservation beliefs was explained by Wilk and Wilhite (1983). They suggested that, to retirees, the house became a major source of security and comfort. In their study, they found some older people who viewed change in dwelling structure and household management as upsetting, and other older people who made their home as energy efficient as possible in their quest for security.

The age of a consumer also had a definite impact on the amount of energy consumed in a household. The presence of a person 65 or older in a household was a predictor for less energy consumption, compared to a household with no one over 65 (Bloom, 1975; Cramer et al., 1983). Marganus (1984) found opposite results in his study.

However, his population description was households with heads 65 or older with a spouse and with dependents, which assured at least three people in the household. Bloom's (1975) and Cramer et al.'s studies did not control for household size.

Cramer et al. (1983), in their study of the determinants of summer electricity used in single family dwellings, found that within a household, each adult consumed 347 kilowatt-hours, each child over age 2 consumed 236 kilowatt-hours, and infants used almost as much electricity as children over age 2, consuming 209 kilowatt-hours. Cramer et al. (1983) also found that only people under age 3 and over age 65 had no impact on the amount of appliances, concluding that the very young and the old had no special consumption patterns.

Age was a factor in the energy efficiency of the dwelling, and the type of adjustments being made (Brandt and Guthrie, 1984). The poor and elderly were the least likely of all demographic groups to install conservation measures (Katz and Morgan, 1983). The elderly often used energy to maintain well being (Royce and Iams, 1982) and were less likely to perform conservation actions if such actions were seen to affect their health and/or comfort (Junk, 1982). Eichner and Morris (1984) postulated that older residents may have had health problems that prevented them from being able to maintain their homes as energy conserving. The amount of physical labor demanded, as well as capital investment, was related to increased conservation behavior (Jarmul, 1980). Leonard-Barton (1981) found the presence of someone who could do household repairs was one of the best predictors of the adoption of energy conservation modifications in the home.

The dwellings the elderly lived in were often older and in need of repairs that contributed to high energy bills (Walden and Meeks, 1982). Often the elderly were more poorly situated, economically, than other populations and spent a higher portion of their disposable income on energy, (Katz and Morgan, 1983; Marganus, 1984; Warriner, 1981). Gottlieb and Matre (1976) found younger people tended to be more energy conserving, while older people were less so.

People who were future-oriented and planful were more likely to engage in energy conservation behavior (Feldman, Awad, and Williams, 1983). The elderly, perceiving lower benefits from expenditures on durable goods, such as housing, were less likely to make capital housing expenditures (Walden and Meeks, 1982). However, Tyler, Lovingood, Bowen, and Tyler (1982) found that households with senior citizens were more apt to be in sound condition than households without senior citizens.

In summary, researchers' results were mixed with regard to the impact age has on energy consumption. The elderly were shown to be both more open and more resistant to energy conservation behavior, and both more conserving and more consumptive of energy. Their homes were found to be both energy efficient and energy inefficient.

<u>Sex</u>

There were no consistent differences between men and women's attitudes toward the energy problem (Niemeyer, 1982; Olsen, 1981), but there seemed to be a difference in energy consumption patterns.

While female-headed households spent a significantly higher percentage of their disposable income on energy than male-headed households, the energy expenditures of households headed by males were significantly higher than those of households headed by females (Brazzel and Hunter, 1979). This was due to the fact that over one-half of all low-income households were female-headed (Newman and Day, 1975; Perlman and Warren, 1977), and as was mentioned before, low-income groups spent more of their income on energy (Katz and Morgan, 1983; Newman and Day, 1975). Females were also less likely to be homeowners, and more likely to live in smaller, lower market housing (Morris and Winter, 1978), both factors which were major determinants for the absence of energy-conserving features (Tyler et al., 1982).

In their study of Michigan families, Morrison et al. (1978) surveyed male/female self perception of ability to substitute human energy for fossil fuel energy, and used gardening as one example. Both males and females perceived themselves as capable of gardening, but the wives felt they had more time to do so than the husbands did. Yet, Duncan and Newman (1976) found females were less likely to fulfill their plans for housing adjustment.

As was mentioned before, Leonard-Barton (1981) found the presence of someone who could do household repairs was one of the best predictors of the adoption of energy modification in the home. Studies in sex-typed standards had shown that females and males grew up learning different skills and behaviors (Howe, 1979; Kagan, 1964; Koblinsky, Cruse, and Sugawara, 1978). The main theoretical perspective used to explain the male/ female division of labor was the wife's responsibility for "feminine" tasks and the husband's responsibility for "masculine" tasks (Abdel-Ghany and Nickols, 1983; Glazer, 1983; Nickols and Metzen, 1978). Males tended to assume responsibility for, and performed most of the household repairs (Lovingood and Firebaugh, 1978; Nickols and Metzen, 1978). In a study of family time use, it was found that urban Oregon wives spent an average of 5.1 hours per week in maintenance of home, yard, car, and pets (this is aside from housecleaning), and urban Oregon husbands spent 7.1 hours per week in maintenance of home, yard, car and pets (Virginia Agricultural Experiment Station, 1981).

Niemeyer (1982) found male-headed households had homes with more energy conserving features, while Tyler et al. (1982) found the energy condition of the home was independent of sex. This difference in findings could possibly arise from the difference in focus of the two studies. Niemeyer concentrated on the number of energy-conserving features within a dwelling, while Tyler et al. judged that the energy condition of a home was sound if it did not have broken windows, was well-maintained, and if the floors and roof were solid.

In summary, while male/female attitudes toward the energy problem did not seem to be different, actual energy consumption patterns were different. Female-headed households tended to use less energy, spent a larger portion of their disposable income on energy, and were less likely to fulfill plans for housing adjustments than male-headed households. This was possibly due to females' lower average income than males, and females' lack of taught ability to do household repairs rather than an inherent attribute of sex.

Tenure of Dwelling

Housing tenure has been shown to have a considerable impact on the energy efficiency of dwellings and the types of adjustments that have been made (Brandt and Guthrie, 1984; Buck, 1982; Eichner and Morris, 1984; Schipper, 1983; Stern et al., 1982; Tyler et al., 1982).

Buck (1982) found renters were less likely to live in energy efficient houses and made less energy conserving adjustments than owners. Tyler et al. (1982) concluded that low-income tenants could not afford to retrofit their dwellings for energy efficiency, and so relied on their landlords. Eichner and Morris (1984) found that owners had more energy-conserving features in their dwellings and saw renters as less able than owners to alter their dwelling for energy efficiency. Tienda and Aborampah (1981) reported that ownership status was one of the most important physical/structural characteristics that determined household energy consumption levels, more so than socio-economic and family factors. Schipper (1983), too, counted home ownership as a major influence above income. He found great variations in home ownership, lifestyle and energy intensity even at roughly similar income levels.

Stern et al. (1982) found renting a home was a severe constraint on major efficiency investment, and appeared to be a serious constraint even on low cost improvements. In their study of influences on Massachusetts household energy consumption, they found that between 1974 and 1978, owners saved more than five times as much energy through major efficiency improvements as did renters. Between 1979 and 1981, the ratio was nearly three to one, and even with low-cost energy efficiency measures, the owners saved significantly more energy than renters. They concluded:

> Why don't renters conserve more energy? One answer is that they have a strong constraint against major investment in efficiency, because the fruits of their investment would go to the landlord. Even curtailment is structurally constrained for many renters when their apartments lack independent temperature controls. Another probable factor is that renters often don't pay directly for the heat in an apartment. This leads to a classic collectives action problem... (also) rental units tend to be smaller than houses and thus have fewer "spare" rooms that can be left unheated to cut energy costs" (1982:21).

In summary, home owners were found to be more likely to live in energy efficient dwellings and make more energy conserving adjustments than were renters. This was because low income tenants cannot afford to retrofit their dwellings to be energy efficient. Even for tenants who were not low income and could afford energy conserving adjustments, there was rarely the incentive, as the cost benefits would go to the landlord.

Perceived Influence of Energy Costs

The economic constraints put upon a household by energy costs determined the amount of energy consumed (Cramer et al., 1983) and the type of energy conservation measures taken. Dillman et al. (1983) in their research, "Lifestyle and Home Energy Conservation in the United States: The Poor Accept Lifestyle Cutbacks While the Wealthy Invest in Conservation," found that those consumers who cut back on their lifestyle due to energy costs also conserved energy through energy conservation measures not requiring monetary expenditures, while those who did not need to cut back on their lifestyle invested in energy conservation actions, such as home retrofitting.

Using a similar scale to Dillman et al.'s "lifestyle cutback," Marganus (1984) found that rising energy costs had an adverse effect on how people felt about their quality of life, and that since lower income groups used a higher percentage of their income on energy, they were the group that felt their well being most affected. This group also spent significantly less on home energy purchases (Katz and Morgan, 1983; Marganus, 1984).

Darley and Beniger (1981) claimed it was not only the current cost of energy, but the rapid change in cost that contributed so much dissatisfaction in the field of energy conservation. As an example, they pointed out the argument put forth by some analysts to raise the price of energy in order to shock consumers into conserving.

Stern et al. (1982) suggested that many consumers were reaching the limits of feasible energy curtailments in the home and that further price increases could put severe economic constraints upon households. They offered possible consumer choices: lowering temperatures to levels that threaten health or sacrificing equally important non-energy amenities (1982).

In summary, the economic constraints perceived by a household due to energy costs influenced the amount of energy consumed and the type of energy conservation measures taken. Those households who did not feel constrained by energy costs tended to be higher income households, investing in energy conservation measures. Those households who felt constrained by energy costs tended to be low income households and used lifestyle cutbacks to conserve energy, tending also to feel their well-being affected. It has been noted that it was the rapid change in cost of energy as well as the actual cost of energy that contributed to energy-related dissatisfaction.

Physical Size of Dwelling

Niemeyer's (1982) path analysis model did not include physical size of dwelling. However, many researchers indicated this was a predictor of energy use in the home.

In a model that predicted total cost of energy used in the home, (Marganus, 1984) the best predictor of money spent on energy was the size of a home. He found that the size of a house accounted for over 21 percent of the variance in the cost of energy consumed, with larger homes using more energy than smaller homes.

Tienda and Aborampah (1981) reported that the physical/structural features of a family's dwelling were more important in determining energy consumption levels than socio-economic and family factors. Morrison et al. (1978) found in their study of Michigan families that the third most important predictor for energy consumption was the number of rooms in the dwelling unit.

The importance of physical size was primarily due to space heating and cooling, which accounted for approximately 60 percent of the residential energy consumed (Darley and Beniger, 1981; Dillman et al., 1983). Closing off rooms from the rest of the home in order to avoid heating/cooling them was the most frequently used home adjustment taken in Dillman et al.'s (1983) study.

After implementing an energy conservation education program called "The Infrared Heat Loss Evaluation Study," Morrison et al. (1978) found that the infrared heat loss analysis was considered the most useful information of the program. In a follow-up study, they found a third of the families were interested in attic insulation, and that 27 percent of the families had planned or completed the insulation.

Families that tended to live in smaller dwellings also tended to be low-income families (Cramer et al., 1983; Tyler et al., 1982). Low income families were more likely to live in rental units (Buck, 1982; Tyler et al., 1982) which were often smaller and attached to other residences, thus reducing the heating load (Stern et al., 1982). Families with higher incomes tended to have larger houses and more appliances (Cramer et al., 1983). Schipper (1983) found that "... increases in dwelling area and equipment ownership (central heat, running hot water, and major appliances) due to higher incomes, account for the increases (4-8%/annum) in residential energy use through 1973 and the remaining growth in the late 1970's" (1983:3).

In summary, Niemeyer's (1982) path analysis model did not include the physical size of the dwelling as a resource constraint, however, researchers had often noted this as a predictor of energy consumption in the home. As size of dwelling increased, so did energy consumption, possibly because of increased space heating/

cooling. It had also been noted that while higher income families had larger homes, they also had more appliances.

Energy Conservation-Related Beliefs

Many consumers were of the opinion that there was no energy crisis, or if there was, it could be solved by tighter industry regulation and more research and development (Rudd and Longstreth, 1978). However, individual behavior, and not just engineering technologies, affected energy consumption (Becker and Seligman, 1981).

Approximately half of all Americans believed that the energy problem was real and serious (Gottlieb and Matre, 1976; Lopreato and Meriwether, 1976; Milstein, 1978; Murray et al., 1974; Rappoport and Labaw, 1976; Perlman and Warren, 1977; Zuiches, 1976), with over a fourth of the American public believing it may be serious (Olsen, 1981). This left about one-fourth of the American public uninformed or unconvinced of the existence of an energy crisis (Olsen, 1981). In the study of energy consumption of Michigan families, Morrison et al. (1978) found that while families' "ecoconsciousness" grew between 1974 and 1976, about 50 percent of each year's sample believed in a current energy problem.

More recently, in a study of ten western U.S. states, Guthrie and Brandt (1983) found that respondents with energy-efficient dwellings significantly felt the energy problem not to be serious or to only be somewhat serious. Respondents with energy inefficient dwellings felt the problem was serious or very serious. Guthrie and Brandt pointed out that this could be because consumers with energy inefficient dwellings were more likely to feel the impact of increasing energy prices and, therefore, were more conscious of the U.S. energy problem.

The people most likely to be concerned about, or believe in, the seriousness of the energy problem were younger, earned higher incomes (or had a higher socioeconomic status) (Gilly and Gelb, 1978; Olsen, 1981; Wilk and Wilhite, 1983) and were more educated than those who were unconcerned about or did not believe in the seriousness of the energy problem (Gilly and Gelb, 1978; Merfeld, 1984; Olsen, 1981; Wilk and Wilhite, 1983).

In Morrison et al.'s (1978) study, wives tended to believe in the energy crisis more than their husbands did. In Merfeld's (1984) study, females were more likely to believe in the energy problem than males. Urban residents believed in the seriousness of the energy problem more so than rural residents (Guthrie and Jones, 1982; Morrison et al., 1978).

Not only did a majority of Americans believe in the seriousness of the energy crisis, but there seemed to be some indication of an even stronger belief in a serious future energy problem, or a more serious future energy problem than currently existed (Morrison et al., 1978; Olsen, 1981; Warkov, 1978). The number of such believers has been found to be increasing (Olsen, 1981).

Milstein (1978) conducted a survey in 1976 and 1977 that inquired more specifically into the belief of the energy problem. He found that almost 60 percent of the respondents realized at least one of the following: demand was greater than supply, natural resources were being used up, energy was being used wastefully, and U.S. depended on foreign oil supply.

In summary, while there seemed to be some doubt regarding the existence of an energy problem in the mid to late 1970's, the number of consumers who believed in the seriousness of a current or future energy problem was on the rise. Those who most likely believed in, or were concerned about, the energy problem, tended to be younger, earned higher incomes, were more educated, were female, and lived in urban areas.

Does support for conservation policies and/or a belief in the energy problem influence a consumer's conservation actions? Logically, it would seem that an awareness and an understanding of the energy problem by consumers is an important factor in energy conservation (Cook and Berrenberg, 1981; Olsen, 1981). However, the results of several studies have shown this might not be the case. In studies by Anderson and Lipsey, 1978; Cunningham and Lopreato, 1977; Perlman and Warren, 1977; and Sears et al., 1978, no significant relationship between general energy attitudes and reported conservation action was found.

Verhallen and van Raaij (1981) found that positive attitudes toward energy conservation were poor predictors of energy conservation behavior. Instead, using the lifestyle of the household members as a major factor in household energy usage, they were able to explain 61 percent of the energy-use variance.

Wicker (1969) suggests a model whereby "latent process variables," which includes personal and situational factors, are considered. When latent process variables are taken into account, greater attitude-behavior consistency occurs. Fishbein (1967) maintains that behavior toward a given object is a function of many variables, of which attitude is only one, and a minor one at that. Situational or individual difference variables may completely determine behavior (Fishbein, 1967).

More recent research suggests that a specific and strong attitude can be predictive of behavior (Fishbein and Ajzen, 1975; Heberlein and Warriner, 1980). Darley and Beniger (1981) maintained that there is an attitudinal compatability between a commitment to a particular way of life (voluntary lifestyle simplicity) and the adoption of household innovations to save energy.

Cornille et al. (1979) assert that the response of continuing high energy-consumptive behavior patterns in the face of an energy shortage was the first stage in reacting to a crisis. Shock and denial of the crisis motivated a behavior pattern that only slightly differed from old behavior. Even when consumers believed in the energy problem and believed energy conservation was a viable and important step to take, their behavior did not always follow their attitude (Olsen, 1981). It isn't until the family realizes that new coping skills are necessary that the family is free to change.

In summary, most researchers have shown that the relationship between general energy attitudes and reported conservation action is extremely tenuous. This is consistent with general attitude-behavior theory. More recent attitude-behavior research has shown that specific and strong attitudes can be predictive of behavior. Cornille et al. (1979) asserts that continuing high consumptive behavior in the face of an energy shortage is just the first stage in reacting to a crisis, thus, time lag is important when examining behavior.

Energy Conditions

Verhallen and van Raaij (1981) found housing characteristics explained 24 percent of home energy use variance. Tienda and Aborampah (1981) reported that the physical/structural characteristics of family dwellings were more important than the socio-economic and family factors in determining energy consumption levels. Morrison and Gladhart (1976) concluded that lower energy consumption was related to the amount of insulation in the ceiling and walls of a dwelling, and that the more rooms there were in a dwelling unit, the more energy the family used. In Cramer et al.'s (1983) study of summer electricity use, the number of appliances and the presence of air conditioners was strongly and significantly ($p<.01$) related to electricity use. In a study of energy conserving retrofits added to a recently-built row house, Sinden (1978) reported a two-thirds reduction in heating energy requirements after the retrofits had been added.

Not only did the energy-related characteristics of a dwelling affect energy consumption, but they were also related to energy beliefs and concerns. Guthrie and Brandt (1983) found the energy condition of the home had a strong impact on respondents' belief in the energy problem and on what type of energy policies were acceptable. In their study, energy efficient dwelling respondents more often opposed or strongly opposed incentive policies, were less likely to consider the U.S. energy problem serious, and were more likely to feel the U.S. should depend on increased energy production to solve the U.S. energy problem. Respondents in energy inefficient dwellings more often opposed or strongly opposed two out of three of the mandatory policies.

Beck's (1984) study focused on the relationship between energy related behaviors prior to and following structural modifications of the dwelling. Although the relationships were found to have no statistical significance ($p \leq .05$) when tested by the t-tests and a one-way analysis of variance, mean behavior change scores identified patterns of behavior change following structural modifications.

Beck found consumers decreased energy conservation behavior when they added four energy-related structural modifications: wood-burning stoves, weatherstripping/caulking, storm doors, and fireplace glass doors. However, energy conservation behavior increased when five other structural modifications were added: ceiling insulation, floor insulation, double panes/storm windows, insulated window coverings, clock set-back thermostats. Beck suggested from these findings that the relationship between energy-related structural modifications and energy conservation behavior was greater for specific features (1984). Beck also found that energy conservation behavior decreased for those who did not add specific structural features to their dwellings.

Porter (1982) studied the structural modification/energy conservation behavior relationship from the opposite direction and found that as the number of energy conservation behaviors increased, so did the number of housing structure modifications. Cramer et al. (1983) found that people who expressed greater ecological concern had fewer appliances and lived in smaller houses.

Brandt and Guthrie (1984) found that age played a role in the energy efficiency of the house and in the types of energy adjustments made. More homes occupied by the elderly had double panes or storm windows, good weather-stripping and caulking, storm doors, and clock set-back thermostats, while more homes occupied by the non-elderly had glass doors on fireplaces and evaporative coolers. Brandt and Guthrie also found that the elderly did not set their thermostats at or below 65 degrees F in the winter or above 78 degrees F in the summer. Niemeyer (1982) found that the education level of the head of the household, the age of head, homeownership, and male heads of households all positively related to the energy conditions of the home.

In summary, energy-related conditions in a home determined energy consumption and affected concerns and beliefs related to energy. The addition of energy conservation modifications to a dwelling was found to be related to energy behavior patterns within the home. Age, education level, homeownership and sex of head of household were all found to be related to energy conditions of the home.

Compared Energy Efficiency

In Morris and Winter's (1981) model of housing adjustment, housing adjustment behavior occurred as a response to low levels of satisfaction with housing or neighborhood. They maintain that the theoretically most probable cause of reported satisfaction is a measure of the extent to which unmet needs exist. The concept of unmet needs is based on actual conditions compared to what "ought to be", derived from the conditions of others.

Oliver (1979) observed that Morris and Winter's (1978) description of housing satisfaction, upon which Neimeyer (1982) based her definition of energy satisfaction, was a typical example of the concept of how satisfaction decisions resulted from comparative processes.

> In fact, it is almost axiomatic that (dis)satisfied individuals have drawn (un)favorable comparisons between their present state of nature and some alternative, perceived as also available to them. This alternative need not be rational or realistic; it serves only to provide a basis for making a satisfaction judgment (1979:2).

Niemeyer (1982) found that the greater the level of satisfaction with the energy efficiency of the dwelling, the less the propensity to engage in energy-conserving adjustment behavior. She also found larger households were less likely to be satisfied with the energy efficiency of the home, and offered the following factors as possible explanations: (1) the omission of the measure of crowding variable, (2) larger families may have given up some degree of quality to obtain a sufficient amount of space, and (3) omission of the measure of the amount of energy consumed and energy expenditures which may be related to the size of the household and the activities within (1982: 74, 76). In addition, Niemeyer found that respondents in households with heads having higher education levels and respondents who viewed the cost of energy and utilities as a problem were less likely to be satisfied with the energy conditions of their dwelling than households with heads having lower education levels and respondents who did not view energy costs as a problem. Darley and Beniger (1981) concurred with the concept that dissatisfaction with existing state motivated innovations and further claimed that it could be the knowledge of the existence of an innovation that caused dissatisfaction with the old, previously tolerated state.

In summary, satisfaction decisions are made based on comparative processes, and the greater the level of satisfaction with the energy efficiency of a dwelling, the less there was a propensity to engage in energy conserving behavior. Larger households, households with heads having higher education, and households where energy costs were seen to be a problem were less likely to be satisfied with the energy conditions of the household.

Propensity for Conservation Alterations

In Niemeyer's (1982) Model of Energy Adjustment, the propensity for conservation alterations is not further categorized into propensity for different types of conservation alterations. For the purpose of this study however, the propensity for conservation alterations has been divided into two variables: the propensity for energy curtailment and the propensity for energy efficiency.

Propensity for Energy Curtailment Behavior and Energy Efficiency Improvement Behavior

The classification of energy conservation behavior varied from study to study. Eichner and Morris (1984) classified household energy conservation behavior according to its effect on the health of the dwelling's inhabitants. Makela (1983) classified household energy actions by the priority in which households placed their implementation. Most researchers, however, included or based their classification on a financial aspect (Cramer et al., 1983; Dillman et al., 1983; Feldman et al., 1983; Katz and Morgan, 1983; Schipper, 1983; Stern et al., 1982.) This was not surprising, as income and energy prices had been found to be strongly related to energy consumption and conservation (Cramer et al., 1983).

Dillman et al. (1983) found that as a result of higher energy prices consumers reported making energy-related cutbacks to their life-style. The greatest cutbacks were for driving a car, money put into savings, and leisure expenditures. The least cuts were made in areas of necessities, i.e.: groceries, housing, health care, and education. They also found that enduring energy conservation actions, or those actions which required the investment of money, were being taken by people who had money to invest and were taking those actions as an alternative to cutting back their lifestyle.

Although not basing her classification on a financial aspect, Beck (1984) also differentiated between structural modifications and behavioral practices in energy conservation. Structural modifications included weatherstripping/caulking, wood-burning stove, ceiling insulation, double panes/windows, and storm doors. Energy conservation behaviors included opening or closing window coverings, closing off rooms, reducing water heater temperature, setting the thermostat less in winter and more in summer, and changing use of rooms.

Becker and Seligman (1981) and Yergin (1979) also divided energy conservation actions into similar classifications. They termed their classifications "technological improvements in energy efficiency" (i.e.: plugging warm air leaks, adding insulation, tuning the furnace, and improving windows) and "energy abstinence," the curtailment of energy use (Becker and Seligman, 1981:2).

Stern et al. (1982) based their research on a conceptual distinction between two classes of energy conservation actions. Using both a behavioral and financial aspect to divide the actions, they divided energy conservation into "energy efficiency" and "energy curtailment." Behaviorally, energy efficiency improvement usually involved one-time purchase decisions. There was an initial financial expense, with the potential of future monetary savings, but no loss of the amenities energy produces. Energy efficiency measures included insulating walls, adding double panes or storm windows, adding active solar heating, and using glass doors on fireplaces.

The second class of behavior, energy curtailment, depended on decreasing the use of existing capital equipment. Behaviorally, energy curtailment usually involved repeated or continued responses to achieve maximum energy savings. They rarely involved financial expense, but they did not involve a loss of the amenities energy produces. Energy curtailment measures included driving less, lowering room temperatures in winter and letting them rise in summer, and using home appliances less.

In summary, most energy studies that classified energy conservation did so in one of two ways, by either basing it on some financial aspect or by some behavioral aspect. On the whole, these two methods roughly divided energy conservation into the same actions. Behavioral divisions tended to be divided into: 1) one-time-only, installation-types, and 2) constant, lifestyle-changes. These corresponded to the financial division of 1) financial investment, and 2) no financial investment. Stern et al. (1982) used both a financial and behavioral aspect to divide energy conservation actions in their study.

Energy Conservation Alteration Behavior

Morris and Winter (1978) hypothesized that the propensity to adjust housing was a cause of subsequent housing adjustment behavior. Niemeyer (1982) claimed that the propensity, or intent to engage in energy conservation, served as a measure of energy adjustment behavior, as both were specific.

DeFleur and Westie (1963) argued that the expressed intention to act and the action itself constitute separate universes of response. Lewin (1951) asserted that unforeseen events such as chance meetings, accidents, and illnesses could interfere between what might otherwise have been a predictable relationship between cognitive variables and overt behavior. This was particularly true, he pointed out, when the overt behaviors occurred outside the laboratory. Campbell (1963) concurred, citing that the inconsistency between verbal behavior and overt behavior in many studies was caused by their different situational thresholds.

Fishbein (1967) reported that only when considering an individual's intention to perform a specific act in a specific situation did near perfect correlations between behavioral intentions and behavior result. In a 1969 study of student's participation as subjects in a psychology experiment, Wicker confirmed this, finding that consistency was greater when the attitude object and the overt behavior were both highly specific (Wicker, 1969).

In a later study, Ajzen and Fishbein (1975) reported that the prediction of behavioral intentions was a necessary as well as a sufficient condition for the prediction of overt behavior. They did point out, however, that this relationship did not unconditionally hold; the more general the statement of intention, and the longer the time interval between statement of intention and actual behavior, the lower the correlation will be.

Energy Curtailment Behavior and Energy Efficiency Improvement Behavior

Niemeyer's (1982) model stopped at the propensity for conservation alterations, asserting the superfluousness of measuring the actual conservation alteration behavior. The present study, however, added actual energy conservation alteration behavior and divided this behavior into curtailment and efficiency, the same divisions that this model used for propensity for conservation alteration.

In summary, many factors affected the uncertainty of the intention-behavior link. The more specific the intention and action, and the shorter the time between the two, the higher was the consistency between them. While Niemeyer (1982) claimed that the intention to conserve energy was a measure of energy conservation, the present study will add actual energy conservation behavior as a variable to her model.

CHAPTER III

METHODOLOGY

Introduction

The primary purpose of this study was to analyze the relative contribution of factors that may influence energy conservation alteration behavior. A longitudinal survey conducted by the Western Regional Agricultural Experiment Station Committee (W-159) provided the data for this analysis. Ten western states (Arizona, California, Colorado, Idaho, Montana, Nevada, Oregon, Utah, Washington, Wyoming) and Pennsylvania participated in the first year (1981) of this project, entitled "Consequences of Energy Conservation Policies for Western Region Households." In 1983, all the original states except Montana and California participated in the project. For the present study, the longitudinal Oregon data were analyzed.

Research Design

Following the procedure outlined in Mail and Telephone Surveys: The Total Design Method (Dillman, 1978), the regional research committee developed mail questionnaires. The Total Design Method was chosen because of its capability to gather information from large samples at relatively low cost, in a standardized procedure in all participating states.

Description of the Questionnaire

Based on previous research, the regional research committee developed the questionnaire, pilot tested and refined first draft, and made final revisions. In the spring of 1981 and 1983 questionnaires (Appendices A and B) were mailed on the same days in participating states. It was not considered necessary to pilot-test the 1983 questionnaire due to the fact that only minor changes had been made to the 1981 questionnaire. These changes were made in order to make questions clearer to respondents and to assist in the coding of the data for analysis.

For the present study, certain questions were selected from the questionnaire. These questions dealt with the exogenous variables, belief in the energy problem, energy conditions of the dwelling, respondents' comparison of the energy efficiency of their dwelling, their intention or propensity to engage in conservation alterations, and the actual conservation actions they performed.

Sample Selection

A stratified random sample of 50 percent rural residents and 50 percent urban residents was drawn for each state. As Oregon was 40 percent rural and 60 percent urban (Paulus, 1981) when the questionnaires were first mailed, the rural population was slightly over-sampled.

Telephone directories were used as the sampling frame. A computer-generated randon list of 1500 sets of numbers detailed the directory number, page number, and subject number by which the sample households were chosen. The sample was generated of households without titles, i.e. Mr., Mrs. Half the questionnaires were then mailed with the request that a female householder complete it, and half were mailed with the request that a male householder do the questionnaire's completion.

An adequate sample size for Oregon was estimated at approximately 850 respondents, and in 1981, 1503 questionnaires were mailed out to return that number. Of those, 834 were returned. In 1983, 1375 questionnaires were mailed. Of these, 834 were the original respondents. For the present study, 573 questionaires were usable from the original 834 respondents.

Data Collection

The Total Design Method has a very definite method for data collection (Dillman, 1978). The two principles of the method are personalizing the letter of introduction that accompanies the questionnaire and following up all non-respondents.

The first mailing occurred on March 9, 1981. Of 1503 questionnaires, 753 were sent to rural households and 750 to urban households. Accompanying each questionnaire was an introductory letter (Appendix C) stressing the importance of the respondent's participation, hand signed by the principal investigator, using blue ink.

In 1983, the questionnaires were first mailed out on February 15, and were sent to the respondents of the 1981 questionnaire plus additional randomly selected Oregon households. In both 1981 and 1983, letters and return envelopes were postmarked with regular stamps to avoid the appearance of business mail. The introductory letters in the 1983 mailing (Appendices D and E) differed somewhat from the introductory letter in the 1981 mailing. This was done in order to make the letter more applicable to the sample. Letters that could not be delivered were checked for possible error in addressing, and then remailed.

One week after the first mailing, on March 16, 1981, and February 22, 1983, a preprinted, hand-signed postcard was sent out (Appendices F and G). This postcard thanked those who had returned the questionnaire and was a friendly reminder for those who hadn't.

The second follow-up was a slightly more urging letter sent two weeks later, on March 30, 1981 (Appendix H) and March 7, 1983 (Appendix I). Included was a second questionnaire in case the first had been lost.

The Total Design Method called for a third follow-up by telephone or by certified mail. In 1981, Oregon decided not to do a third follow-up due to cost and because the response rate was deemed sufficient. In 1983, a third follow-up was conducted by telephone (Appendix J) following the design's systematic telephone procedure (Appendix K).

Of the total 1503 questionnaires mailed in 1981, 834 usable were returned. From this sample, 573 usable questionnaires were returned in 1983.

Measurement

The variables included in the theoretical model (see Figure 4, Chapter 2) were measured by either single measure or composite measure techniques. The single item measurement technique used one question or indicator to measure the variable. The composite measurement technique was used to build a summary score, scale or index to measure variables.

Single item measures were used to measure exogenous variables (household size, income, education, age, sex, tenure of dwelling, perceived influence of energy costs, and physical size of dwelling), belief in the energy problem, and compared energy efficiency. Composite measures were constructed to measure energy conditions, the propensity to engage in energy conservation alteration (propensity for energy curtailment, and propensity for energy efficiency improvement), and energy conservation alteration behavior (energy curtailment behavior, and energy efficiency improvement behavior). Data from the 1981 questionnaire were used to construct the exogenous variables, belief in the energy problem, energy conditions, compared energy efficiency, propensity for energy curtailment, and propensity for energy efficiency improvement. Data from the 1983 questionnaire were used to construct the two energy alteration behavior variables, energy curtailment behavior and energy efficiency improvement behavior.

Exogenous Variables

Household Size

The household size variable was measured by the total number of persons who lived in the household (Question 30 on the 1981 questionnaire).

Household Income

The household income variable measured total family income before taxes (Question 36 on the 1981 questionnaire).

Education

Education of respondent measured level of education from "no formal education" through "a graduate degree" (Question 34 on the 1981 questionnaire).

Age

Age of respondent measured the respondent's age in years (Question 30; 1 on the 1981 questionnaire).

Sex

Sex of respondent was a dichotomous variable (Question 30; 1 on the 1981 questionnaire). Females were coded as "1," and males as "-1."

Tenure of Dwelling

Tenure of dwelling was a dichotomous variable (Question 17; 1-3 on the 1981 questionnaire). Renters were coded as "1" and owners as "-1".

Perceived Influence of Energy Costs

The perceived influence of energy costs measured how the respondent felt the changes in energy costs affected him/her (Question 9 on the 1981 questionnaire).

Physical Size of Dwelling

The physical size of the dwelling was measured by the respondent's estimate of the square footage of the dwelling and was categorized in increments of 500 square feet (Question 18 on the 1981 questionnaire).

Endogenous Variables

Belief in the Energy Problem

Belief in the energy problem measured how serious the respondent believed the energy problem to be (Question 1 on the 1981 questionnaire).

Energy Conditions

A composite measure was used to measure the number of energy-saving features in the dwelling. The composite measure was based on a summed scale combining the "existed" and "added" energy-saving features in Question 10 on the 1981 questionnaire.

Compared Energy Efficiency

Compared energy efficiency was measured by the respondent's rating of the dwelling compared with similar dwellings as "a lot less energy efficient" to "a lot more energy efficient" (Question 23 on the 1981 questionnaire).

Propensity to Engage in Energy Conservation Alterations

Propensity for energy curtailment. The measurement for propensity for energy curtailment was the number of energy curtailment measures the respondent planned to do within two years (Question 14; A-F on the 1981 questionnaire).

Propensity for energy efficiency improvement. The measurement for propensity for energy efficiency improvement was the number of energy efficiency improvement measures the respondent planned to add within two years (Question 10 on the 1981 questionnaire).

Energy Conservation Alteration Behavior

Energy curtailment behavior. The measurement for energy curtailment behavior was the number of energy curtailment measures the respondent marked "this is done now" on the 1983 questionnaire (Question 14; A-F on the 1983 questionnaire).

Energy efficiency improvement behavior. The measurement for energy efficiency behavior was the number of energy efficiency measures the respondent marked "Installed or added since March 1981" on the 1983 questionnaire (Question 6 on the 1983 questionnaire).

Statistical Analyses

Description of the Sample

Frequency distributions were run on unweighted data from the 1981 data in order to describe the respondents by socio-demographic and housing-related characteristics.

Path Analysis

Path analysis procedures are used to discover causal relationships and to decompose and interpret linear, additive, asymmetric relationships among variables. Wolfle (1966) maintained that the greatest advantage of using path analysis is that it requires one to think about cause, particularly systems of intercausal connections, providing an explicit link between theoretical ideas about what cuases what, and estimates of causal impact. Schumm, et al. reported:

> The popularity of path analysis probably derives from the potential advantages it offers over conventional multiple regression techniques. Multiple regression allows the analyst to separate spurious (joint) effects due to common correlation among independent variables from the direct effects of the independent variables. Path analysis permits the clarification of joint, direct, and indirect effects, the latter effects operating through variables specified as intervening between independent variables and dependent variable. Consequently, path analysis may often be more appropriate for testing some of the more complicated theoretical models that have been advanced recently in family studies...(1980: 251).

The Justification of the Use of Path Analysis in This Study

The reason for the use of path analysis as the statistical procedure in this study is three-fold. First, path analysis is a commonly used and popularly published procedure throughout the social sciences, including family studies (Alwin and Hauser, 1975; Schumm, et al., 1980) (see for example, Bayer, 1969; Estep, Burt, and

Milligan, 1977; Godwin, and Carroll, forthcoming; Miller, 1976; Rosen and Granbois, 1983) and most especially housing studies (see for example: Eichner and Morris, 1984; Gladhart, 1984; Morris, Crull, and Winter, 1976; Morris and Winter, 1978; Morris, Winter, and Sward, 1984; Niemeyer, 1982). Those within housing studies view path analysis as a valid and acceptable statistical procedure (Morris, personal communication, August 22, 1985).

Secondly, the models derived from Morris and Winter's model of housing adjustment (1978) have all been analyzed and derived through the path analysis procedure. Path analysis was originally chosen by Morris and Winter (1978) because of its main advantage; that of providing a method whereby the linear relationships among a set of specific variables could be decomposed and interpreted (Morris, personal communication, August 22, 1985). In order to be able to compare results and allow for consistent generation of new models in the recently researched area of housing adjustment, the consistent use of the path analysis procedure has been used.

At the time of this research, the only study found in which a different statistical procedure was used on a housing adjustment model derived from Morris and Winter's (1978) model of housing adjustment was a comparative study being completed by Menken. In her study, she compared Morris and Winter's (1978) model of housing adjustment through probit analysis and regression. Few significant differences have been found, and further information on the exact nature of these differences will be presented at the October 1985 meeting of the American Housing Educator Association in Ames, Iowa (Menken, personal communication, August 22, 1985).

The third reason for the use of path analysis was that it was chosen as the appropriate method for analyzing the data involved in order to achieve the purpose of this study. According to Andrews, Klem, Davidson, O'Malley, and Rodgers (1981) in "A Guide for Selecting Statistical Techniques for Analyzing Social Science Data," path analysis is the only statistical method for analyzing data if: (1) a distinction is made between dependent and independent variables, (2) there is more than one dependent variable and more than one independent variable, (3) relationships among the variables are to be treated as additive, (4) the dependent and independent variables are to be treated as interval, (5) relationships are to be treated as linear, (6) the analyst includes at least one intervening variable, and (7) the analysis does not include a latent (unmeasured) variable.

Pfaffenberger (1979) summarized from Heise's (1969) paper six crucial assumptions that must be made by the researcher and his data for the proper use of path analysis. The following will address each assumption and discuss how well the current study meets them.

1) In the structural system of variaables, change in one variable is always a linear function of changes in other variables. The proposed model to be tested (see Figure 4) fulfills this criterion. All dependent variables in the model are hypothesized as being changed linearly as a result of a change in the independent variables.

2) There is one-way causation. The proposed model to be tested (see

Figure 4) is recursive; there are no feedback loops or reciprocal causations indicated.

3) There is a clearly defined causal system. The basis for the causal system has been clearly established (see Chapter II) in the current study.

4) Dependent variables are uncorrelated with each other. This is only assumed for the dependent variables that are not hypothesized to have a significant relationship between them. In the current study, there are only two sets of variables that have no hypothesized bivariate relationship: between the propensity for energy curtailment and the propensity for energy efficiency, and between energy curtailment behavior and energy efficiency behavior. As hypothesized in the model (see Figure 4) it is assumed they are not intercorrelated. This is supported by the Pearson correlation (see Appendix M) where it is shown that the correlation between propensity for energy curtailment behavior and propensity for energy efficiency behavior is .1210, and the correlation between energy curtailment and energy efficiency improvement behaviors is .1078.

5) A higher degree of measurement reliability and validity. According to Neale and Liebert (1980) content validity for a questionnaire is reached if the questionnaire measures the dimension(s) it was developed to measure. The questions utilized in the measurement of the variables in the current study met this objective. Content validation of the questionnaire was based on a comprehensive coverage of the important areas related to the topic being studied and is a

subjective and judgmental determination (Beck, 1984). The questionnaire used was developed by experts in the fields of housing and home energy (Buck, 1981), and based on their professional judgment, the content of the questionnaire is assumed to be valid (Beck, 1984).

Construct validity was a major concern in the development of the questionnaire (Tripple, 1982). Reviewed and revised, the instrument was pretested with persons of varying backgrounds in age, education and housing situations, then revised by experts in a variety of fields before being refined for use on the 1981 questionnaire.

6) The usual multivariate regression assumptions must be met by the data. Pfaffenberger states that this leads to a host of assumptions that are rarely, if ever, completely satisfied in applications of path analysis to behavioral research data. Care was taken in the current research to minimize problems arising from this situation. For example, two dichotomous variables are in the model as exogenous variables. Schumm, et al., (1980) say the use of dichotomous variables in path analysis is of concern only if they are dependent variables, and even then they can be used in the model for theoretical requirements. Pfeffenberger (1979) points out a 1970 study by Boyle, where it was concluded that "the dangers of assuming equal intervals is not great and suggests the use of the dummy variable technique as a way of improving sociological measurement" (1979:279).

<u>Description of the Path Analysis Procedure</u>

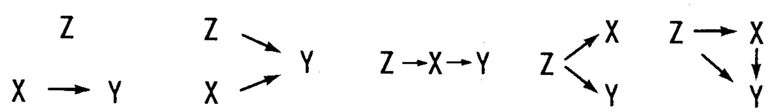
In this section, the following topics will be discussed: the assumptions to be made when using path analysis, mistakes to avoid when using path analysis, obtaining the path coefficients, and the hypotheses inherent in the path analysis procedure.

Assumptions. There are two general assumptions to be made when using path analysis. The first assumption is that of causal ordering. Based on previous models and/or previous research, the direction of the order of the variables within the hypothesized model is established. Nie, Hull, Jenkens, Steinbrenner, and Bent defined causal ordering in this manner:

> Given a pair of variables X_i and X_j, one establishes a weak order $X_i \geq X_j$ if it is assumed or known that X_i may (or may not) affect X_j, but that X_j cannot affect X_i. (We will use the symbol $\geq$ to designate a weak causal order as defined above. This symbol should not be taken to mean "equal to or greater than.") Notice that this assumption does not require X_i to be a cause of X_j. Although causal ordering is not always unequivocal, the assumption of weak order is tenable in a wide variety of research situations. For example, relationships between relatively unalterable attributes of individuals (such as sex and race) and attitudinal or behavioral variables (such as liberalism and voting), and relationships between variables with definite time order, usually involve fairly clear causal ordering (1975:384-5).

Schumm et al. (1980) called the assumption of causal order the most critical assumption the researcher must meet, and stated, "The application of path analysis to areas of only limited or moderate theoretical development has been severely criticized..." (1980:252). In this study, the order of the variables in the proposed model to be tested have been previously tested and analyzed (see Chapter II), most specifically in Morris and Winter's (1978, 1981) model of housing adjustment and Niemeyer's (1982) model of energy adjustment. Schumm et al. (1980) commended Morris, Crull, and Winter for providing theoretical/logical and empirical support for each causal relationship within their 1976 model of housing adjustment.

The second general assumption to be made with the use of path analysis is that the model is causally closed. The model is seen as a small, exclusive universe, with all variables working in synchronization. Nie et al. explained causal closure through a series of causally closed models. The concept of causal closure is explained through the causally closed and non-causally closed relationships that can exist within each model:

> Given a bivariate covariation between say X and Y, and a known weak causal ordering, say, X $\geq$ Y, the observed covariation between X and Y may be due (1) soley to the causal dependence of Y of X, (2) to their mutual dependence on some outside variable(s), or (3) to the combination of (1) and (2). A simplified example of possible causal structures underlying a covariation is presented...(:)
>
> 
>
>
> (a) (b) (c) (d) (e)
>
> In (a) Z is not causally connected to either X or Y; in (b), Z is a cause of Y but not of X; in (c), Z is a cause of both X and Y, but the effect of Z on Y is completely contained in X or mediated by X. In the diagrams (a), (b), and (c), the two-variable subsystems of X and Y are all causally closed to outside influence with respect to their covariation. In (e), the covariation between X and Y is partly due to the causal dependence of Y on X and partly due to their direct sharing of a common cause. In (d), the

> covariation between X and Y is totally due to their direct common dependence on an outside cause. In the latter two instances, therefore, we may say that the covariation between X and Y is not closed to outside influence (1975:385).

Thus, in path analysis, certain endogenous variables are represented to be completely dependent on the others as linear functions. The exogenous variables are assumed to be given. They may be intercorrelated, but an explanation of their intercorrelation is not undertaken (Duncan, 1966), assuming their cause comes from outside the model (hence the term "exogenous") (Wolfle, 1977).

For all dependent variables, there is an extra variable assumed but not indicated in the model. This extra variable does not have an explicit name; it can be called the "disturbance," "residual," or "error." This extra variable represents all other sources of variation not explained by the independent variables, such as explicit variables not included in the model, deviations from linearity, random errors, etc. (Wolfle, 1977).

Mistakes to Avoid. One mistake to avoid in the regression procedures is the elimination of a variable that is statistically insignificant (Schumm, et al., 1980). Because the model is seen as a set of variables working together, the omission of one variable can change the paths within the model.

> Omission of an important variable will cause the regression/path coefficients (parameters) to be incorrectly estimated...inclusion of an unimportant variable will bias only the estimates of parameter variance, reducing the sensitivity of tests of statistical significance of the parameters, but not affecting the parameter estimates themselves. Therefore, in the planning of a

> study which will use either regression or path analysis it is best to include all those variables that can be justified as possibly relevant to the study either theoretically or empirically (Schumm, et al., 1980:252).

Another mistake to avoid is the addition of various variables in an attempt to increase the R^2.

> A preoccupation with increasing the R^2 may lead researchers into "fishing expeditions" in which variables are added to the model regardless of whether they make theoretical sense. Models that appear to have good theoretical support are useful even if they prove to be empirically weak (Schumm et al., 1980:256).

In this research the only exogenous variable to be added was physical size of the dwelling. Two endogenous variables were added: energy curtailment behavior and energy efficiency behavior. These are actual behaviors performed and, as such, form a link with Morris and Winter's (1978) theory of housing adjustment.

Obtaining the Path Coefficients. To obtain the quantitative estimates, or the path coefficients, multiple regressions are performed. These coefficients are alternatively termed standardized regression coefficients, or beta weights (Wolfle, 1977). Beta weights indicate how much change a unit of change in one of the independent variables will produce in the dependent variable, given that the other variables are controlled. Variables with beta weights not meeting the criterion ($p \leq .05$) are rejected.

> In general, given n variables with the weak order $X_n \leq \ldots \leq X_2 \leq X_1$, estimation of all the path coefficients will require (n-1) lower-order variables as the dependent variable in succession and all of its higher-order variables as predictors (Nie, et al., 1975:386).

Each endogenous variable (in this research: belief in the energy problem, energy conditions, compared energy efficiency, propensity to engage in energy conservation alterations, energy conservation behavior) served as a dependent variable in separate regression equations.

Hypotheses in Path Analysis. A proposed path analysis model to be tested serves as the researcher's set of hypotheses about various relationships among variables which are related to and account for the variance of a select number of endogenous variables (Schumm, et al., 1980). In this study, the proposed path analysis model of energy adjustment serves as the set of hypotheses. However, as with other studies in the housing adjustment field (Eichner and Morris, 1984; Niemeyer, 1982) this study offers informal predications of significant ($p \leq .05$) paths within the tested model, termed "research hypotheses." These hypotheses outline the possible significant paths and their possible signs between variables in the tested model, based on previous research. The research hypotheses for this study are:

H1) Belief in the seriousness of the energy problem will be:

a) positively related to household income,

b) positively related to perceived influence of energy costs, and

c) positively related to the physical size of the dwelling.

H2) Energy conditions of the dwelling will be:

a) positively related to education level,

b) positively related to age,

c) negatively related to females,

d) positively related to males,

e) positively related to owners,

f) negatively related to renters,

g) negatively related to perceived influence of energy costs,

h) positively related to physical size of the dwelling, and

i) positively related to belief in the seriousness of the energy problem.

H3) Compared energy efficiency will be:

a) negatively related to household size,

b) negatively related to education level,

c) negatively related to perceived influence of energy costs, and

d) positively related to energy conditions.

H4) Propensity for energy curtailment behavior will be:

a) positively related to household size,

b) positively related to household income,

c) positively related to education level,

d) negatively related to age,

e) negatively related to owners,

f) positively related to renters, and

g) negatively related to compared energy efficiency.

H5) Propensity for energy improvement behavior will be:

a) positively related to household size,

b) positively related to household income,

c) positively related to education level,

d) negatively related to age,

e) positively related to owners,

f) negatively related to renters, and

g) negatively related to compared energy efficiency.

H6) Energy curtailment behavior will be:

a) negatively related to income,

b) negatively related to age,

c) negatively related to owners,

d) positively related to renters,

e) positively related to perceived influence of energy costs,

f) positively related to physical size of the dwelling,

g) negatively related to energy conditions of the dwelling,

h) negatively related to compared energy efficiency, and

i) positively related to the propensity for energy curtailment behavior.

H7) Energy efficiency improvement behavior will be:

a) positively related to income,

b) negatively related to age,

c) positively related to owners,

d) negatively related to renters,

e) negatively related to energy conditions of the dwelling,

f) negatively related to compared energy efficiency, and

g) positively related to the propensity for energy efficiency improvement behavior.

The bases for the predictions of which paths would be significant in the tested model and their signs is summarized in Table 1. Schumm et al. (1980) state such predictions are "derived from both the extant empirical literature, other theoretical formulations, and the scientist's best hunches." The significant paths in Niemeyer's (1982) model of energy adjustment helped form the basis for all relevant hypotheses in this study. Other studies in extant literature directly or indirectly supported these paths. For the predicted relationships which include at least one variable not in Niemeyer's (1982) model, support for the predicted significant paths was found in two ways: (1) through studies revealing a direct bivariate relationship and (2) through a relationship traced through two or more studies. Any differences between Niemeyer's (1982) model of energy adjustment and this study's model can be due to sample differences, the different year of variable measurement, division of an existent variable, a different measurement of one variable, and the addition of three new variables (Schumm et al., 1980).

Table 1

Bases for the Predictions of Significant[d] Paths in Tested Model

	Belief in the Problem		Energy Conditions		Compared Energy Efficiency		Prop. for Energy Curtailment		Prop. for Energy Efficiency		Energy Curtailment Behavior		Energy Efficiency Behavior	
	hypoth.	basis	hypoth.	basis	hypoth.	basis	hypoth.	basis	hypoth.	basis	hypoth.	basis	hypoth.	basis
Household size					-	a c	+	a c	+	a c				
Household income	+	abc					+	abc	+	abc	-	bc	+	bc
Education			+	abc	-	a c	+	ab	+	ab				
Age			+	abc			-	abc	-	abc	-	bc	-	bc
Sex female/male			-/+	abc										
Tenure owners/rent.			+/-	abc			-/+	abc	+/-	abc	-/+	bc	+/-	bc
Perceived influence	+	abc	-	ab	-	abc					+	bc		
Dwelling size	+	c	+	bc							+	bc		
Belief			+	abc										
Conditions					+	a c					-	bc	-	bc
Compared efficiency							-	ab	-	ab	-	bc	-	bc
Prop. energy curtailment											+	bc		
Prop. energy efficiency													+	bc

a significant ($p \leq .05$) pathway in Niemeyer's (1982) model of energy adjustment.
b one or more studies with a direct bivariate relationship.
c an indirect relationship through two or more studies.
d ($p \leq .05$)

CHAPTER IV

FINDINGS

The sample profile, path analysis model, hypotheses findings, and proposed new model will be discussed in this chapter. Statistical analyses for this study were conducted at the Milne Computer Center at Oregon State University, Corvallis, Oregon.

Sample Profile

The respondents are described according to two categories: sociodemographic variables and housing-related characteristics. Unweighted variable data are used to present the profile.

Sociodemographic Characteristics

The five sociodemographic variables used to describe the sample are household size, household income, education of respondents, age of respondents, and sex of respondents.

Household Size

The mode (35.4 percent) and the median number of people within the household was two. The majority (51.5 percent) of the households contained one or two persons (see Table 2).

Household Income

Respondents were asked to indicate their total family income before taxes by selecting one of nine categories. The mode (15.5

percent) and the median were in the category of $20,000 through $24,999 (see Table 3).

Education of Respondents

Respondents were asked to indicate their level of education by selecting one of nine categories that spanned "no formal education" to "a graduate degree." The mode (26.9 percent) and the median were in the category of "some college" (see Table 4).

Age of Respondents

The age of respondents ranged from 20 years through 92 years. The mean age was 47.9 years and the median age was 47.2 years (see Table 5).

Sex of Respondents

Although 50 percent of the questionnaires were mailed to female household heads and 50 percent to male household heads, the sex distribution in the returned questionnaires was unequal. Of the returned questionnaires, 40.7 percent were returned by female heads of households and 56.0 percent by male heads of household, with 3.3 percent of the respondents not indicating their sex (see Table 6).

Housing-Related Characteristics

The two housing-related characteristics used for this study were tenure of dwelling and physical size of dwelling.

Table 2

Household Size[a]

Number of People In Household	Absolute Frequency n	Relative Frequency %
1	92	16.1
2	203	35.4
3	97	16.9
4	105	18.3
5	51	8.9
6	20	3.5
7	1	.2
8	2	.3
9	1	.2
10	1	.2
11	1	.2
Total	573	100.0

[a]Analysis computed on unweighted data.

Table 3

Household Income[a]

Gross Family Income	Absolute Frequency n	Relative Frequency %
Less than $5,000	24	4.2
$5,000 - $9,999	61	10.6
$10,000 - $14,999	64	11.2
$15,000 - $19,999	86	15.0
$20,000 - $24,999	89	15.5
$25,000 - $29,999	64	11.2
$30,000 - $39,999	77	13.4
$40,000 - $49,999	32	5.6
$50,000 or more	37	6.5
No response	39	6.8
Total	573	100.0

[a]Analysis computed on unweighted data.

Table 4

Education of Respondent[a]

Educational Level	Absolute Frequency n	Relative Frequency %
No formal education	2	.3
Grade school	28	4.9
Some high school	56	9.8
High school graduate	125	21.8
Trade school	31	5.4
Some college	154	26.9
College graduate	72	12.6
Some graduate work	39	6.8
A graduate degree	45	7.9
No response	21	3.7
Total	573	100.1[b]

[a]Analysis computed on unweighted data.
[b]Percentage does not equal 100.0 due to rounding.

Table 5

Age of Respondent[a]

Mean	47.9
Median	47.2
Range	20-92
Standard deviation	16.011
Variance	256.368
Standard error	.686
Valid cases	544
Missing cases	29

[a]Analysis computed on unweighted data.

Tenure of Dwelling

Respondents were asked to indicate whether they owned or rented the home in which they lived. Only 10.6 percent of the respondents rented their dwelling, with 87.6 percent owning their dwelling (see Table 7).

Physical Size of Dwelling

Respondents were asked to indicate the square footage of their home by selecting one of six categories. Both the mode (33.2 percent) and the median were in the category of 1,001 through 1,500 square feet (see Table 8).

Path Analysis Model

The analysis was a causal model with six categories of variables: (1) energy conservation behavior alteration (which included energy curtailment behavior and energy efficiency improvement behavior), (2) propensity to conserve energy (which included propensity for energy curtailment behavior and propensity for energy efficiency behavior), (3) compared energy efficiency of the dwelling, (4) energy conditions, (5) belief in the seriousness of the energy problem, and (6) the exogenous variables (which included household size, income, education, age, sex, tenure of dwelling, perceived influence of energy costs on respondent, and dwelling size). Each of the endogenous variables (first five categories) were analyzed as dependent variables on the independent variables, with propensity to

Table 6

Sex of Respondent[a]

Sex	Absolute Frequency n	Relative Frequency %
Female	233	40.7
Male	321	56.0
No response	19	3.3
Total	573	100.0

[a]Analysis computed on unweighted data.

Table 7

Tenure of Dwelling[a]

Tenure	Absolute Frequency n	Relative Frequency %
Rented	61	10.6
Owned	502	87.6
Other or no response	10	1.8
Total	573	100.0

[a]Analysis computed on unweighted data.

Table 8

Physical Size of Dwelling[a]

Square Footage of Residence	Absolute Frequency n	Relative Frequency %
Less than 500 square feet	11	1.9
501 - 1,000 square feet	109	19.0
1,001 - 1,500 square feet	190	33.2
1,501 - 2,000 square feet	139	24.3
2,001 - 2,500 square feet	58	10.1
Over 2,500 square feet	49	8.6
No response	17	3.0
Total	573	100.1[b]

[a]Analysis computed on unweighted data.

[b]Percentage does not equal 100.0 due to rounding.

conserve energy, compared energy efficiency, energy conditions, and belief in the seriousness of the energy problem acting as independent variables for the endogenous variables further along the causal path.

According to the model to be tested, energy efficiency improvement behavior (X_{15}) and energy curtailment behavior (X_{14}) were caused by the propensity for energy efficiency improvement (X_{13}) and propensity for energy curtailment (X_{12}), which in turn were caused by compared energy efficiency (X_{11}). Compared energy efficiency was caused by the energy conditions of the dwelling (X_{10}), which was hypothesized to be caused by belief in the energy problem (X_9). The exogenous variables (X_8 through X_1) were related to belief in the energy problem.

The full model was written:

$$X_{15} = f\,(X_{13}, X_{12}, X_{11}, X_{10}, \ldots\ldots\ldots\ldots X_1),$$
$$X_{14} = f\,(X_{13}, X_{12}, X_{11}, X_{10}, \ldots\ldots\ldots\ldots X_1),$$
$$X_{13} = f\,(X_{11}, X_{10}, X_9, X_8, \ldots\ldots\ldots\ldots X_1),$$
$$X_{12} = f\,(X_{11}, X_{10}, X_9, X_8, \ldots\ldots\ldots\ldots X_1),$$
$$X_{11} = f\,(X_{10}, X_9, X_8, X_7, \ldots\ldots\ldots\ldots X_1),$$
$$X_{10} = f\,(X_9, X_8, X_7, X_6, \ldots\ldots\ldots\ldots X_1),$$
$$X_9 = f\,(X_8, X_7, X_6, X_5, \ldots\ldots\ldots\ldots X_1),$$

where:

X_{15} = energy efficiency improvement behavior,

X_{14} = energy curtailment behavior,

X_{13} = propensity for energy efficiency improvement behavior,

X_{12} = propensity for energy curtailment behavior,

X_{11} = compared energy efficiency,

X_{10} = energy conditions of the dwelling,

X_9 = belief in the seriousness of the energy problem,

X_8 = dwelling size,

X_7 = perceived influence of energy costs,

X_6 = tenure of dwelling,

X_5 = sex of respondent,

X_4 = age of respondent,

X_3 = education of respondent,

X_2 = household income, and

X_1 = household size.

Belief in the Energy Problem

The results of the analysis of belief in the energy problem regressed on the exogenous variables are given in Table 9. Five percent of the variability of belief in the energy problem can be explained by these variables. Of the eight paths, two were statistically significant. Education ($p = .018$) and age ($p = .016$) were significant determinants of belief in the energy problem (see Figure 5).

Exogenous Variables

Respondents with a higher level of education were more likely to believe in the seriousness of the energy problem ($B = .12$). In addition, younger respondents were more likely to believe in the seriousness of the energy problem than older respondents ($B = -.13$).

Table 9

Results of the Analysis of Belief in the Seriousness of the Energy Problem[a]

Variable	Significance	Standardized Beta Weights
Household size	.277	-.06
Household income	.891	-.01
Education of respondent	.018	.12*
Age of respondent	.016	-.13*
Sex of respondent	.222	.06
Tenure of dwelling	.452	.04
Perceived influence of energy costs	.097	.08
Physical size of dwelling	.843	.01

[a]Multiple regression analysis computed on weighted data.
*$p \leq .05$

Table 10

Results of the Analysis of the Energy Conditions of the Dwelling[a]

Variable	Significance	Standardized Beta Weights
Household size	.110	.08
Household income	.147	.07
Education of respondent	.068	-.08
Age of respondent	.070	.09
Sex of respondent	.128	.06
Tenure of dwelling	.000	-.40*
Perceived influence of energy costs	.667	-.02
Physical size of dwelling	.012	.13*
Belief in problem	.872	-.01

[a]Multiple regression analysis computed on weighted data.
*$p \leq .05$

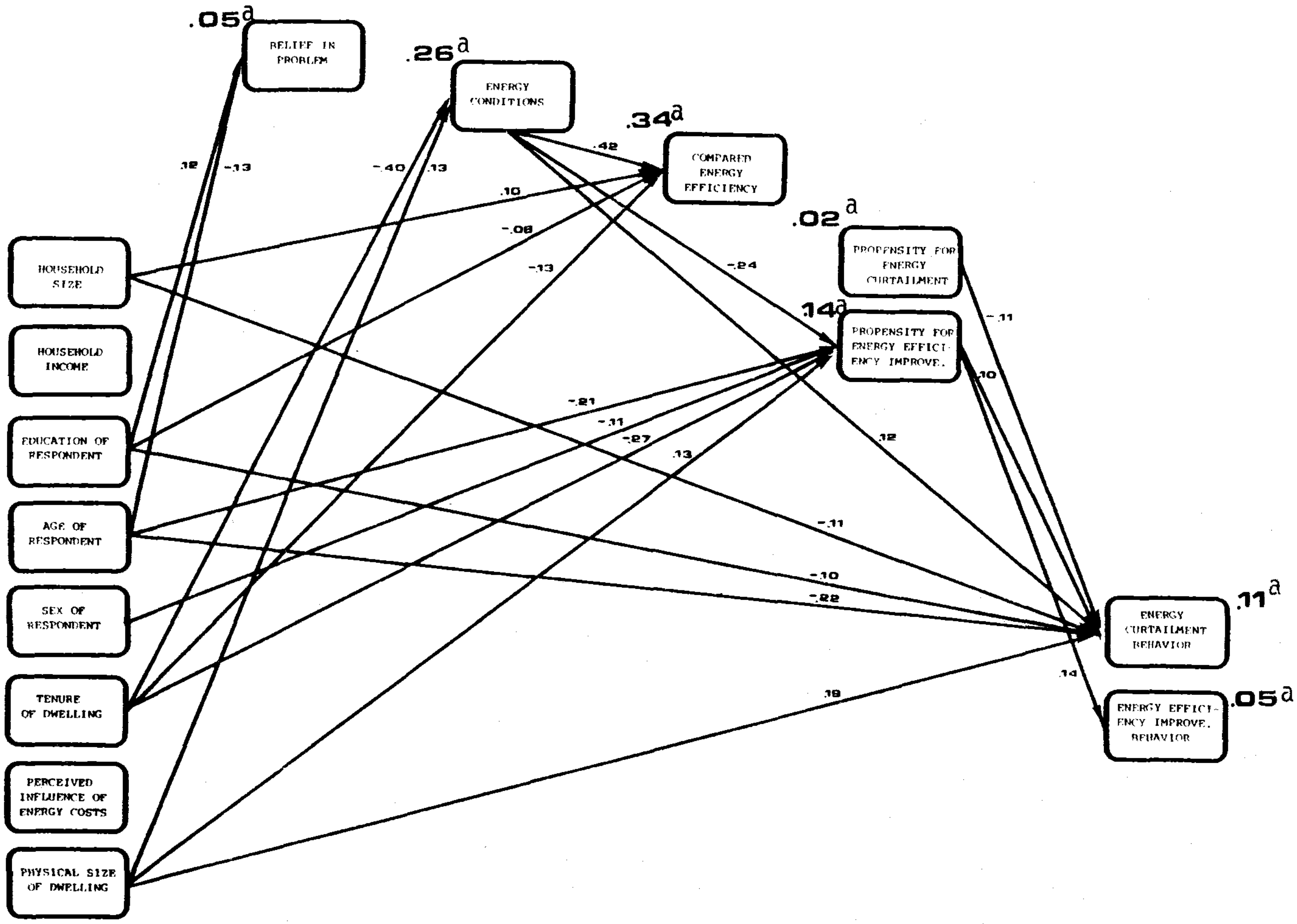


Figure 5. Tested path analysis model.
$^{a}R^2$

Energy Conditions

The results of the analysis of the energy conditions of the dwelling regressed on the exogenous variables and one endogenous variable, belief in the energy problem, are given in Table 10. Twenty-six percent of the variability of energy conditions can be explained by these variables. Two paths were statistically significant. Tenure of the dwelling ($p = .000$) and dwelling size ($p = .012$) were significant determinants of the energy conditions of the home (see Figure 5).

Exogenous Variables

The strongest determinant of the energy conditions of the dwelling was tenure ($B = -.40$). Homeowners had more energy-saving features in their dwellings than did renters. Also, families with larger dwellings tended to have more energy-saving features in their homes than did families with smaller dwellings ($p = .13$).

Compared Energy Efficiency

The analysis, as shown in Table 11, was performed with compared energy efficiency regressed on the exogenous variables and two endogenous variables, belief in the energy problem and energy conditions. Thirty-four percent of the variability of compared energy efficiency can be explained by these variables. Four of the paths were statistically significant. Household size ($p = .021$), education of respondent ($p = .050$), tenure of dwelling ($p = .003$), and energy conditions (p = .000) were significant determinants of compared energy efficiency (see Figure 5).

Exogenous Variables

The more people there were in a household, the higher the respondent rated the energy efficiency of the home relative to other, similar homes (B = .10). The higher the level of education of the respondent, the lower the respondent rated the energy efficiency (B = -.08). The tenure of the dwelling also had a direct relationship with the compared energy efficiency. Homeowners tended to rate the energy efficiency of their dwellings higher than did renters (B = -.13).

Endogenous Variables

The strongest determinant of compared energy efficiency was the energy conditions of the dwelling. Respondents living in households with more energy-saving features tended to rate the energy conditions of their home higher (B = .42).

Propensity for Energy Curtailment

The results of the analysis of propensity for energy curtailment regressed on the exogenous variables and three endogenous variables, belief in the energy problem, energy conditions, and compared energy efficiency, are given in Table 12. While two percent of the variability of the propensity for energy curtailment can be explained by these variables, no paths were statistically significant.

Table 11

Results of the Analysis of Compared Energy Efficiency[a]

Variable	Significance	Standardized Beta Weights
Household size	.021	.10*
Household income	.055	.09
Education of respondent	.050	-.08*
Age of respondent	.068	.08
Sex of respondent	.602	-.02
Tenure of dwelling	.003	-.13*
Perceived influence of energy costs	.978	.00
Physical size of dwelling	.345	.05
Belief in problem	.080	.07
Energy conditions	.000	.42*

[a]Multiple regression analysis computed on weighted data.
*$p \leq .05$

Table 12

Results of the Analysis of Propensity for Energy Curtailment[a]

Variable	Significance	Standardized Beta Weights
Household size	.164	.08
Household income	.362	.05
Education of respondent	.411	.04
Age of respondent	.480	.04
Sex of respondent	.932	.00
Tenure of dwelling	.911	.00
Perceived influence of energy costs	.836	-.01
Physical size of dwelling	.679	-.02
Belief in problem	.533	.03
Energy conditions	.174	.08
Compared energy efficiency	.128	-.09

[a]Multiple regression analysis computed on weighted data.
*$p \leq .05$

No variable in the hypothesized model was a significant determinant of the propensity for energy curtailment (see Figure 5).

Propensity for Energy Efficiency Improvement

Five paths in the analysis of the propensity for energy efficiency improvement regressed on the exogenous variables and three endogenous variables, belief in the energy problem, energy conditions, and compared energy efficiency, were significant (see Table 13). Fourteen percent of the variability in the propensity for energy efficiency improvement can be explained by these variables. Age of respondent ($p = .000$), sex of respondent ($p = .015$), tenure of dwelling ($p = .000$), dwelling size ($p = .023$), and energy conditions ($p = .000$) were significant determinants of the propensity for energy efficiency improvement (see Figure 5).

Exogenous Variables

Age and tenure were fairly equal determinants of the propensity for energy efficiency. The older the respondent, the less likely was his/her propensity for energy efficiency ($B = -.21$). Homeowners were more likely to plan energy efficiency improvements than renters ($B = -.27$). The sex of the respondents ($B = -.11$) and the size of the dwelling ($B = .13$) were lesser determinants of the propensity for energy efficiency but still statistically significant factors. Males and respondents living in larger dwellings intended to add more energy efficiency improvements more so than did females and respondents living in smaller dwellings.

Endogenous Variables

The energy condition of the dwelling was the major determinant of a respondent's propensity for energy efficiency improvement. The more energy-saving features a dwelling had, the less the respondent had a tendency to plan for energy efficiency improvements (B = -.24).

Energy Curtailment Behavior

The results of the analysis of energy curtailment behavior regressed on the exogenous variables and four endogenous variables, belief in the energy problem, energy conditions, compared energy efficiency, and the propensity for energy conservation, is shown in Table 14. Eleven percent of the variability of energy curtailment behavior can be explained by these variables. Seven variables were statistically significant determinants of energy curtailment behavior. Household size (p = .032), education (p = .040), age (p = -.22), physical size of dwelling (p = .19), energy conditions (p = .12), propensity for energy curtailment (p = .015), and propensity for energy efficiency improvement (p = .044) were significant determinants of energy curtailment behavior (see Figure 5).

Exogenous Variables

The major determinant of energy curtailment behavior was age (B = -.22). The younger the respondent, the more likely was the household to engage in energy curtailment behavior. The size of the dwelling was almost as strong a determinant of energy curtailment

Table 13

Results of the Analysis of Propensity for Energy Efficiency Improvement[a]

Variables	Significance	Standardized Beta Weights
Household size	.604	-.03
Household income	.621	-.03
Education of respondent	.281	.05
Age of respondent	.000	-.21*
Sex of respondent	.015	-.11*
Tenure of dwelling	.000	-.27*
Perceived influence of energy costs	.868	.01
Physical size of dwelling	.023	.13*
Belief in problem	.280	.05
Energy conditions	.000	-.24*
Compared energy efficiency	.899	.01

[a]Multiple regression analysis computed on weighted data.
*$p \leq .05$

Table 14

Results of the Analysis of Energy Curtailment Behavior[a]

Variables	Significance	Standardized Beta Weights
Household size	.032	-.11*
Household income	.513	-.04
Education of respondent	.040	-.10*
Age of respondent	.000	-.22*
Sex of respondent	.920	.00
Tenure of dwelling	.974	.00
Perceived influence of energy costs	.688	-.02
Physical size of dwelling	.001	.19*
Belief in problem	.437	.04
Energy conditions	.038	.12*
Compared energy efficiency	.694	.02
Propensity for energy curtailment	.015	-.11*
Propensity for energy efficiency	.044	.10*

[a]Multiple regression analysis computed on weighted data.
*$p \leq .05$

behavior as age (B = .19). The larger the dwelling, the more likely was the household to engage in energy curtailment behavior. Household size (B = -.11) and the educational level of the respondent (B = -.10) were about equal in their relationship with energy curtailment behavior. Smaller households and respondents with a lower level of education tended to engage in energy curtailment behavior more so than did larger households and respondents with a higher level of education.

Endogenous Variables

As the number of energy-saving features in the home increased, so did the number of energy curtailment behaviors within that household (B = .12). Both the propensity for energy curtailment (B = -.11) and the propensity for energy efficiency (B = .10) were significant determinants of energy curtailment behavior. However, the higher the level of the propensity for energy curtailment, the less were energy curtailment behaviors actually performed. In contrast, the higher the propensity for energy efficiency, the more the energy curtailment behaviors actually were performed.

Energy Efficiency Improvement Behavior

Table 15 shows the results of the analysis of energy efficiency improvement behavior regressed on the exogenous variables and four endogenous variables, belief in the energy problem, energy

Table 15

Results of the Analysis of Energy Efficiency Improvement Behavior[a]

Variables	Significance	Standardized Beta Weights
Household size	.607	-.03
Household income	.148	.08
Education of respondent	.706	.01
Age of respondent	.243	-.06
Sex of respondent	.537	.03
Tenure of dwelling	.622	-.03
Perceived influence of energy costs	.132	-.07
Physical size of dwelling	.649	.03
Belief in problem	.938	.00
Energy conditions	.458	.05
Compared energy efficiency	.517	-.04
Propensity for energy curtailment	.412	.04
Propensity for energy efficiency	.005	.14*

[a]Multiple regression analysis computed on weighted data.
*$p \leq .05$

conditions, compared energy efficiency, and the propensity for energy conservation behavior. Five percent of the variability of energy efficiency improvement behavior can be explained by these variables. Only one of the paths was statistically significant. The propensity for energy efficiency improvement ($p = .005$) was a significant determinant of energy efficiency improvement behavior (see Figure 5).

Endogenous Variables

The higher the level of propensity for energy efficiency behavior, the more the actual energy efficiency behaviors were performed ($B = .14$).

Hypotheses Findings and Discussion

In the following section, the hypothesized relationships and the resultant significant relationships within the path analysis model will be given. The discussion will address the significant relationships in view of previous research, with possible explanations for the paths.

Belief in the Energy Problem

None of the hypothesized relationships resulting from belief in the seriousness of the energy problem regressed on the exogenous variables were significant in the path analysis model (see Table 16). Belief in the seriousness of the energy problem was hypothesized to be positively related to household income, perceived influence of energy costs, and dwelling size. Instead, belief in the energy

Table 16

Comparison of Hypothesized Relationships to Significant[a] Relationships in the Path Analysis Model

	Belief in the Energy Problem		Energy Conditions		Compared Energy Efficiency		Prop. for Energy Curtailment		Prop. for Energy Efficiency		Energy Curtailment Behavior		Energy Efficiency Behavior	
	hypoth.	model	hypoth.	model	hypoth.	model	hypoth.	model	hypoth.	model	hypoth.	model	hypoth.	model
Household size					-	+	+		+			-		
Household income	+						+		+		-		+	
Education		+	+		-	-	+		+			-		
Age		-	+				-		-	-	-	-	-	
Sex female/male			-/+							-/+				
Tenure owners/rent.			+/-	+/-		+/-	-/+		+/-	+/-	-/+		+/-	
Perceived influence	+		-		-						+			
Dwelling size	+		+	+						+	+	+		
Belief			+											
Conditions					+	+				-	-	+	-	
Compared efficiency							-		-		-		-	
Prop. energy curtailment											+	-		
Prop energy efficiency												+	+	+

[a]$p \leq .05$

\+ A positive relationship between variables

\- A negative relationship between variables problem was found to be significantly related to the education and age of the respondent.

As was reported in Chapter II, those who were more educated and younger were the people most likely to be concerned about or believe in the energy problem than those who were less educated and older. (Gilly and Gelb, 1978; Merfeld, 1984; Olsen, 1981; Wilk and Wilhite, 1983). Thus, the positive relationship between belief in the energy problem and education and the negative relationship between belief in the energy problem and age in this research were supported by previous research. The lack of relationships between the other endogenous variables and belief in the problem was in accordance with many previous studies (Anderson and Lipsey, 1978; Cunningham and Lopreato, 1977; Perlman and Warren, 1977; Sears et al., 1978); where no significant relationships between general energy attitudes and reported conservation action were found.

Energy Conditions

Five of the seven hypothesized relationships resulting from energy conditions regressed on the exogenous variables and one endogenous variable (belief in the energy problem) were not significant in the path analysis model (see Table 16). The hypothesized relationships between energy conditions and education, age, sex, perceived influence of energy costs, and belief were not significant. The two remaining hypothesized relationships, between energy conditions and tenure and dwelling size, were significant.

It was hypothesized and found that owners had dwellings with more energy-saving features than renters. This could be because renters had no incentive to install energy-saving features, as the cost benefits would go to the landlord (Stern et al., 1982). This finding supported Tienda and Aborampah's (1981) and Schipper's (1983) studies, where ownership status was found to be a more important influence than socio-economic factors.

The positive relationship between energy conditions and dwelling size could be similarly explained. As Stern et al. (1982) found, rental units were often smaller. Smaller dwellings tended to have less energy-saving features than did larger dwellings.

Compared Energy Efficiency

Three of the four hypothesized relationships resulting from compared energy efficiency regressed on the exogenous variables and two of the endogenous variables (belief in the energy problem and energy conditions) were significant in the path analysis model (see Table 16). The three significant relationships were between compared energy efficiency and household size, education, and energy conditions. The fourth hypothesized relationship, between compared energy efficiency and perceived influence of energy costs, was not significant.

Compared energy efficiency had a significant relationship with tenure, although this was not an hypothesized path. Owners tended to rate the energy efficiency of their dwellings higher than did renters. This, like the the explanation of the relationships between energy conditions and tenure and dwelling size could be because owners tended to have more energy-saving features in their dwellings than did renters and realized this fact. Indeed, the hypothesized relationship between compared energy efficiency and energy conditions was significant. Those respondents living in dwellings with more energy-saving features tended to rate those dwellings as highly energy efficient.

Compared energy efficiency was positively related to household size in the tested path analysis model. Morris and Winter (1978) maintain that larger families give up some degree of quality, and in evaluating their housing, have lowered their standards. This could be a possible explanation for the higher rating larger families give the energy efficiency of their home.

Compared energy efficiency was hypothesized and found to be negatively related to education. This relationship was hypothesized to be negative based on the results of studies which had shown that those with higher educations tended to have larger homes, use more electricity (Cramer et al., 1983) and not incorporate energy conserving aspects into home remodeling (Granite, 1978). Another reason for this relationship could be that the more education the respondent had, the more information regarding energy-efficiency was available and understandable, leading to an awareness of a wider spectrum of possible energy-saving features for the dwelling.

Propensity for Energy Curtailment

None of the hypothesized relationships resulting from propensity for energy curtailment regressed on the exogenous variables and three endogenous variables, belief in the energy problem, energy conditions, and compared energy efficiency, were significant in the path analysis model (see Table 16). This could be because people did not plan on curtailing their energy use in the future by lifestyle changes. If they needed to curtail their energy use they had already done so. If not, they didn't plan on cutting back their lifestyle in the future.

Propensity for Energy Efficiency Improvement

Two of the six hypothesized relationships resulting from propensity for energy efficiency improvement regressed on the exogenous variables and three endogenous variables (belief in the energy problem, energy conditions and compared energy efficiency) were significant in the path analysis model (see Table 16). These hypothesized relationships were between propensity for energy efficiency improvement and age and tenure. The hypothesized relationships between the propensity for energy efficiency improvement and household size, income, education, and compared energy efficiency were not significant, while the propensity for energy efficiency improvement was significantly related to sex, dwelling size, and energy conditions.

Regarding the variable sex, males tended to plan energy efficiency improvements more so than did females. This could be due to the sex-typed division of labor, where males assume responsibility for and perform most of the household repairs (Lovingood and Firebaugh, 1978; Nickols and Metzen, 1978).

The positive relationship between propensity for energy efficiency improvement and dwelling size is reasonable in view of Marganus' (1984) study. He found larger homes used more energy than smaller homes. It seems logical that families that live in homes that use more energy would be more interested in improving the energy efficiency of their homes. Also, families that live in larger homes tend to be owners rather than renters and, as was mentioned before, owners rather than renters tend to increase the energy efficiency of the home. Indeed, the hypothesized positive relationship between the propensity for energy efficiency and owners is one of the significant paths in the path analysis model.

The relationship between the propensity for energy efficiency and energy conditions of the dwelling was also a significant path, although it was not hypothesized. Owners and those living in homes with a low number of energy-saving features tended to plan to increase the energy-efficiency of their dwellings more so than did renters and those living in homes with a larger number of energy saving features.

The negative relationship between the propensity for energy efficiency and energy conditions supports Morris and Winter's (1978) theory of housing adjustment. The better the housing conditions, the less the household members will plan on changing or improving those conditions. The higher the number of energy-saving features in the home, the less is the tendency for household members to plan on adding energy efficiency improvements.

The last hypothesized path, between the propensity for energy efficiency and age, was significant, supporting Katz and Morgan's (1983) study. The older the respondent, the less likely she/he planned on improving the energy efficiency of her/his dwelling. This could be because (1) the elderly often use energy to maintain well-being and are less likely to perform conservation actions if such actions will affect their health and/or comfort, (2) the physical labor required is prohibitive, (3) the capital investment is prohibitive, and (4) benefits from expenditures on durable goods, such as housing, can be too long term.

Energy Curtailment Behavior

Two of the eight hypothesized relationships resulting from energy curtailment behavior regressed on the exogenous variables and five of the endogenous variables (belief in the energy problem, energy conditions, compared energy efficiency, propensity for energy curtailment and propensity for energy efficiency) were significant in the path analysis model (see Table 16). The two significant relationships were between energy curtailment behavior and age and dwelling size. Household income, tenure, perceived influence of energy costs, and energy efficiency were not significant predictors of energy curtailment.

Three relationships, those between energy curtailment behavior and household size, education, and propensity for energy efficiency, while not hypothesized to be significant, were in the path analysis model. Perhaps the omission of the measure of crowding may have accounted for this. The negative relationship between energy curtailment behavior and education supported previous studies by Heberlein and Warriner (1980) and Murray et al. (1974). The positive relationship between actual energy curtailment behavior and the propensity for energy efficiency improvement was consistent with people planning on improving the energy efficiency of their home. Energy curtailment behavior was ultimately, less expensive and less behavioral effort for the short term.

Although it was hypothesized that there would be a positive relationship between actual energy curtailment behavior and the propensity for energy curtailment, the path was negative. The more a respondent planned on curtailing energy, the less she/he had a tendency to actually curtail energy use. This result could be because of lack of a variable measuring 1981 energy curtailment behavior. Those respondents who planned on curtailing energy may have already been doing so to the best of their ability, and previous researchers have shown that the constant lifestyle-change this form of energy conservation uses can be difficult to maintain over the long term (Cornille et al., 1979; Darley and Beniger, 1981).

The relationship between energy curtailment and energy conditions was significant but also opposite to what was hypothesized. The more energy-saving features a dwelling had, the more actual energy curtailment behaviors were performed. This result could be because of the non-differentiation between "existed" and "added" energy-saving features. If the family had made a commitment to installing energy-saving features in the dwelling, they seem to have carried their commitment over to energy curtailment behavior. Beck (1984) found that certain energy-saving features added to the dwelling had the effect of increasing energy conservation behavior.

The hypothesized relationship between energy curtailment behavior and dwelling size was significant in the path analysis model. As the dwelling size increased, so did the number of energy curtailment behaviors. Previous researchers have shown that as the dwelling size increased, so did the amount of energy consumed (Marganus, 1984; Morrison et al., 1978; Tienda and Aborampah, 1981). As the amount of energy consumed was more for larger homes, those who lived in larger homes might have viewed energy curtailment as both necessary and convenient.

The relationship between energy curtailment behavior and age, hypothesized to be negative, was negative in the path analysis model. Older people had a tendency to conserve energy by energy curtailment less so than did younger people. This could have been because older people used energy to maintain their well-being and were reluctant to curtail their lifestyle if it would negatively affect it. Also, age has been previously found to be a constraint on energy conservation behavior (Eichner and Morris, 1984), older families being less adaptive and less open to new behavior than younger families. The path analysis model supported this finding.

Energy Efficiency Improvement Behavior

One of the hypothesized relationships resulting from energy efficiency improvement behavior regressed on the exogenous variables and five endogenous variables (belief in the energy problem, energy conditions, compared energy efficiency, propensity for energy curtailment, and propensity for energy efficiency) was significant in the path analysis model. The one significant relationship was between energy efficiency improvement and the propensity for energy efficiency improvement. Income, age, tenure, energy conditions, compared energy efficiency, and propensity for energy curtailment were not significant determinants of energy efficiency. According to Fishbein (1967), only when an individual intends to perform a specific act in a specific situation are the chances better that the act will be completed. In this case, those who intended to improve the energy efficiency of their dwelling did tend to follow through on their behavior.

Summary of Model

Pfeffenberger (1979) notes that it was the path diagram that accounted for the interest in the path analysis procedure. He points out that the path diagram enabled a researcher to come to an understanding of the relationships among the functions and variables much easier than through a set of equations. The tested path analysis model in the current study allows for analysis of the relative contribution of factors that influence energy conservation alteration behaviors. The tested model in this research shows that six of the eight exogenous variables had a direct and/or indirect effect on the endogenous variables. (The other two exogenous variables were perhaps not significant direct determinants of the endogenous variables due to measurement inadequacy, the addition or change of the variables in the current research, or their effect being felt indirectly through other exogenous variables.) Two of the exogenous variables (physical size of the dwelling, age of respondent) and one endogenous variable (energy conditions) had both a direct and indirect effect on energy conservation alterations. Of the five intervening variables between the exogenous variables and the energy conservation alteration variables, three (energy conditions, propensity for energy curtailment, and the propensity for energy efficiency) had direct effects on energy conservation alteration behaviors, and of those intervening variables, one (energy conditions) also had an indirect effect. Two intervening variables (belief in the energy problem and compared energy efficiency) were not significant predictors of other endogenous variables.

In summary, the tested model has fulfilled the purpose of this study. The tested model has shown that energy conservation behaviors are influenced by conditions and factors which when analyzed through the path analysis procedure show both indirect and/or direct relationships.

Proposed New Model

From the results of the current path analysis model, a new model was proposed. The differences between this study's path analysis model and the proposed new model include suggestions for different measurements of present variables, the addition of new variables, the elimination of present variables, and the analyses of the relationships among the exogenous variables.

Exogenous Variables

Of the exogenous variables, household income and perceived influence of energy costs were not significant determinants of the endogenous variables. However, their effects, especially that of income, might be felt through tenure and dwelling size, as well as, possibly, household size and education. Therefore, in the new model, a testing of the interrelationships of various exogenous variables might be beneficial. For example, the crowding measurement needed for the possible explanation of path relationships could be determined through the interrelationship of dwelling size and household size (see Figure 6).

Perhaps too, a lessening of the intercorrelation between the exogenous variables can be achieved. Although all exogenous variables (resource constraints) from Niemeyer's (1982) model of energy adjustment were included with one added exogenous variable, perhaps these variables could be tested as to their possible inter-variable paths (in order to keep their distinct socio-demographic differences separate, yet still in the model) or be combined into a composite scale (see Appendix M).

Endogenous Variables

Belief in the Energy Problem

Belief in the energy problem had no significant relationship with any other variable in the path analysis model and did not lead to energy conservation behavior. Morris and Winter's (1981) model, upon which Niemeyer (1982) based her model, did not have this variable (see Figure 1). Even in Niemeyer's tested model, the added variable of belief in the problem was not a strong determinant of energy conditions, the only other endogenous variable to which it was related (see Figure 3). The elimination of this variable in further testing of this path analysis model is recommended (see Figure 6).

Energy Conditions

It might be beneficial to the model to add energy curtailment behaviors currently performed as well as energy-saving features in the dwelling to the measurement of this variable. This would cover both types of energy conservation actions currently performed and could eliminate the lack of significant paths leading to propensity for energy curtailment (see Figure 6).

Compared Energy Efficiency

This variable had no significant relationship with the propensity for energy conservation or energy conservation actions. Yet, previous research had indicated that it was a significant determinant

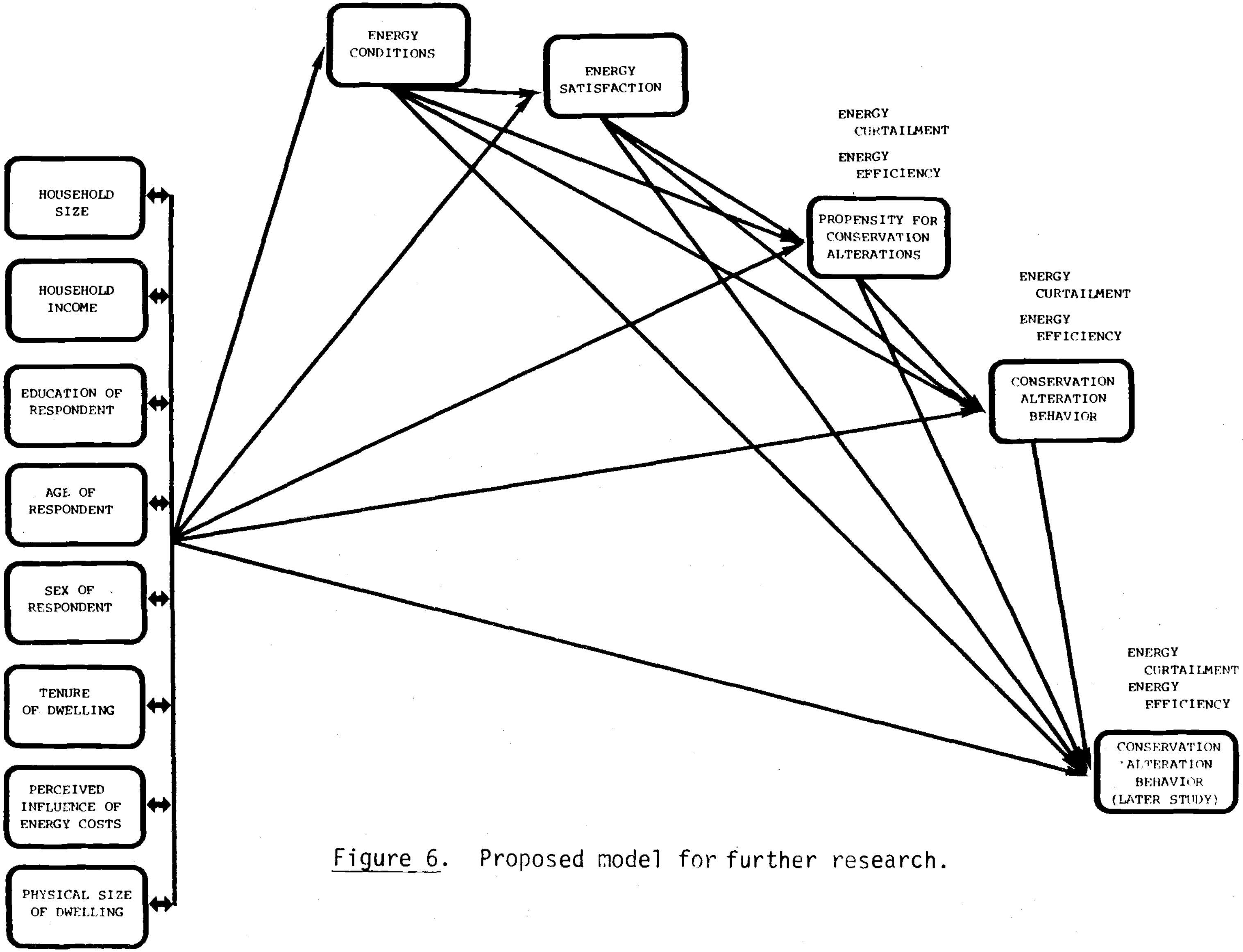


Figure 6. Proposed model for further research.

of these variables. While not significant in this study, it approached significance ($p \leq .055$). In future testing of this path analysis model, it is recommended that the measurement of this variable be different. Instead of measuring the comparison between similar dwellings, a measurement of how satisfied the respondent feels about the energy conditions of the dwelling is recommended (see Figure 6).

Propensity for Energy Curtailment

While no variable was a significant determinant of this variable, dropping this variable is not recommended. Further testing of this model, with the other changes recommended might show propensity for energy curtailment a viable variable in the proposed model (see Figure 6).

Propensity for Energy Efficiency Improvement

There are no recommendations for changing this variable in the path analysis model (see Figure 6). Due to the results of the path analysis, this variable is deemed adequate in both its position within the model, and its measurement.

Energy Curtailment Behavior

There are no recommendations for changing this variable in the path analysis model (see Figure 6). Due to the results of the path analysis, this variable is deemed adequate in both its position within the model, and its measurement.

Energy Efficiency Improvement Behavior

There are no recommendations for changing this variable in the path analysis model (see Figure 6). Due to the results of the path analysis, this variable is deemed adequate in both its position within the model, and its measurement.

A Later Testing of Energy Curtailment Behavior

For further study, a later testing of energy curtailment behavior is recommended. Energy curtailment behavior is a constant lifestyle change, and it would be interesting to see if this behavior can be maintained over the long term (see Figure 6).

A Later Testing of Energy Efficiency Improvement Behavior

Like energy curtailment behavior, another testing of this variable is recommended. Perhaps a longer time period would give the respondents more of a chance to fulfill their energy efficiency improvement plans. It would also be interesting to see which of the energy conservation behaviors, energy curtailment and/or energy efficiency, could be maintained over a longer term than was analyzed in the present model (see Figure 6).

CHAPTER V

SUMMARY, IMPLICATIONS, AND RECOMMENDATIONS

Summary

The purpose of this study was to analyze the relative contribution of factors that may influence residential energy conservation behavior. The theoretical framework for this study was Niemeyer's (1982) model of energy adjustment. Niemeyer's model was expanded to include actual energy conservation alteration actions performed, and this variable, and the variable entitled propensity for conservation alterations, were sub-divided into two conceptually different types of conservation alterations: energy curtailment and energy efficiency improvement. Lastly, physical size of the dwelling was added as a variable under the exogenous variables (see Figure 4, page 18).

Path analysis provided a method for connecting quantitative estimates to causal effects within the model. To obtain the quantitative estimates, or path coefficients, multiple regressions were performed on weighted data, yielding the standardized regression coefficients, or beta weights.

A longitudinal survey conducted by the Western Regional Agricultural Experiment Station Committee (W-159) in 1981 and 1983 provided the data for this analysis. Both the design of the instrument and the mailing procedure followed the Total Design Method developed by Dillman (1978). The longitudinal Oregon data were analyzed for this study.

Frequency distributions were run on unweighted data in order to describe the respondents by sociodemographic and housing-related characteristics. The respondents most often lived in households of two persons which earned an income of $20,000 through $24,999. Respondents were characterized by a mean age of 47.9 years and some college. Males (56.0 percent) answered the questionnaire more often than did females (40.7 percent). The median size of the dwellings was in the category of 1,001 square feet through 1,500 square feet.

The following causal paths were supported in the tested model:

$X_{15} = f(X_{13})$,

$X_{14} = f(X_{13}, X_{12}, X_{10}, X_8, X_4, X_3, X_1)$,

$X_{13} = f(X_{10}, X_8, X_6, X_5, X_4)$,

$X_{11} = f(X_{10}, X_6, X_3, X_1)$,

$X_{10} = f(X_8, X_6)$, and

$X_9 = f(X_4, X_3)$,

where:

X_{15} = energy efficiency improvement behavior,

X_{14} = energy curtailment behavior,

X_{13} = propensity for energy efficiency behavior,

X_{12} = propensity for energy curtailment behavior,

X_{11} = compared energy efficiency,

X_{10} = energy conditions of the dwelling,

X_9 = belief in the seriousness of the energy problem,

X_8 = dwelling size,

X_7 = perceived influence of energy costs,

X_6 = tenure of dwelling,

X_5 = sex of respondent,

X_4 = age of respondent,

X_3 = education of respondent,

X_2 = household income, and

X_1 = household size.

Belief in the Energy Problem

Five percent of the variability of belief in the energy problem can be explained by variables within the model. Two of these, education ($p = .018$) and age ($p = .016$) were significant determinants of belief in the energy problem.

Energy Conditions of the Dwelling

Twenty-six percent of the variability of energy conditions can be explained by variables within the model. Two of these, tenure ($p = .000$) and dwelling size ($p = .012$) were significant determinants of the energy conditions of the home.

Compared Energy Efficiency

Thirty-four percent of the variability of compared energy efficiency can be explained by the variables in the model. Four of these, household size ($p = .021$), education ($p = .050$), tenure ($p = .003$) were significant determinants of compared energy efficiency.

Propensity for Energy Curtailment

Only two percent of the variability of the propensity for energy curtailment can be explained by variables in the model. No variables, however, were significant determinants of the propensity for energy curtailment.

Propensity for Energy Efficiency Improvement

Fourteen percent of the variability of the propensity for energy efficiency improvement can be explained by the variables in the model. Five of these, age ($p = .000$), sex ($p = .015$), tenure ($p = .000$), dwelling size ($p = .023$), and energy conditions ($p = .000$) were significant determinants of the propensity for energy efficiency improvement.

Energy Curtailment Behavior

Eleven percent of the variability of energy curtailment behavior can be explained by variables in the model. Seven of these, household size ($p = .032$), education ($p = .040$), age ($p = .000$), dwelling size ($p = .001$), energy conditions ($p = .038$), propensity for energy curtailment ($p = .015$), and propensity for energy efficiency improvement ($p = .044$) were significant determinants of energy curtailment behavior.

Energy Efficiency Improvement Behavior

Five percent of the variability of energy efficiency improvement behavior can be explained by variables in the model. One of these, the propensity for energy efficiency improvement (p = .005), was a significant determinant of energy efficiency improvement behavior.

Proposed New Model

Based on the results and past research, a new model was proposed (see Figure 6). The main changes to the tested model were: (1) test for interrelationships among exogenous variables, (2) remove belief in the energy problem as a variable, (3) add a measurement of energy curtailment behaviors currently performed to the measurement of energy conditions, (4) change compared energy efficiency to energy satisfaction, and (5) a later testing of the energy conservation behavior of the sample.

Implications

There are three major populations who would be interested in this research. They are: (1) those interested in how this study adds to the theoretical body of knowledge, (2) educators sponsoring energy conservation programs, and (3) energy policy makers.

The first of those interested in how this study adds to the theoretical body of knowledge are those researching energy conservation. This research adds to the consumer energy research field. In a time when energy conservation has been widely acclaimed as a principal solution to the energy shortage, a closer study of energy conserving behavior can be beneficial.

This study will also be of interest to those studying housing, as it is a further refinement of the theory of housing adjustment, a major theory in this field. As a second-generation model from Morris and Winter's (1981) model of housing adjustment, this study's tested path analysis model can be compared to other models generated from the same theory. This study's tested model also allows for further generation of housing models consistent with past housing adjustment models.

However, the tested path analysis model is more than just a tool for interpreting the effects of certain variables on other variables. Because a causal model was used in this study, the implications to be drawn can be very specific with respect to causal effect. Nie et al. stated, "...that the notion of causation implies prediction, but prediction of a particular kind. It implies the notion of possible manipulation" (1975:384). Alwin and Hauser concurred, adding a cautionary note, "In using causal terms it is necessary to specify the model involved" (1975:39). Therefore, in terms of this study's tested path analysis model, this research will be of interest to teachers, utility company personnel and other educators sponsoring energy conservation programs. If the goal of the energy conservation program is to encourage energy conservation behavior, three implications can be drawn from this research.

First, this study highlights constraints to energy conservation behavior. Age, education, household size, dwelling size, and the energy conditions of a home can all constrain a consumer from engaging in energy conservation. Special programs directed toward the elderly, and those with lower educational levels, a larger household size, smaller dwellings, or many energy-saving features in their homes might succeed at overcoming these constraints. In terms of the tested path model, there would be an attempt to directly address lack of conservation due to the effects of one variable upon another.

Second, it has been shown in this study that the intent to conserve energy through energy curtailment does not lead to energy curtailment behavior, while the intent to conserve energy through energy efficiency leads to both energy efficiency and energy curtailment behaviors. Because of this, it is recommended that energy conservation programs that specialize in introducing and teaching energy efficiency methods also introduce energy curtailment methods. Also, such programs can encourage participants to "plan" energy conservation alterations in their homes as a teaching strategy or have participants sign an energy conservation pledge as a way of achieving specification of a plan. In terms of the tested path model, there would be an attempt to increase the possibility of people actuating energy plans given that they already have the propensity to engage in energy conservation alterations.

Third, since belief in the seriousness of the energy problem does not lead to energy conservation behavior, education programs aimed at encouraging energy conservation through belief in the energy problem are not recommended. Such programs would probably not be effective in encouraging consumers to conserve. In terms of the tested path model, there is an acknowledgement that there is no causal path between the belief variable and the energy conservation alteration behavior variables.

Finally, this study will be of interest to local, state, and federal government energy planners. These policy makers base their energy decisions on what they feel would be most effective. Several segments of the population have been shown to have more of a tendency to plan on conserving energy, and actuating those plans. Energy conservation policies directed at these segments of the population might find an already supportive public. Also, policies that help alleviate constraints to energy conservation behavior might be helpful. For example, rebates for the elderly who improve the energy efficiency of their dwelling might help remove the effects of age as a constraint.

Recommendations for Further Research

This study touched on only a few relationships concerning energy conservation. Further research into this field would be beneficial, adding to the understanding of the motivations and constraints of consumers with regard to conserving energy. Some recommendations for further research follow.

1) Several proposed modifications, based on the results of this research, have been made to the tested model (see Figure 6). An analyzation of the new proposed model would add to the theoretical body of knowledge.

2) It has been shown in the present study that certain segments of the population have a tendency not to conserve energy. Research into the effects of special energy conservation programs directed at those segments of the population which have difficulty conserving energy is recommended. Such research would ascertain the effectiveness of such programs.
3) In the present study, data on Oregon households were used. Further research using the data from other states is recommended. This would allow for a representation of a larger population, the opportunity for state by state or regional comparisons, or climatic comparisons.
4) A study of actual energy consumption is recommended in view of this model. A determination of actual energy saved before and after energy conservation behaviors are implemented might be beneficial in determining which energy conservation behaviors are most effective.

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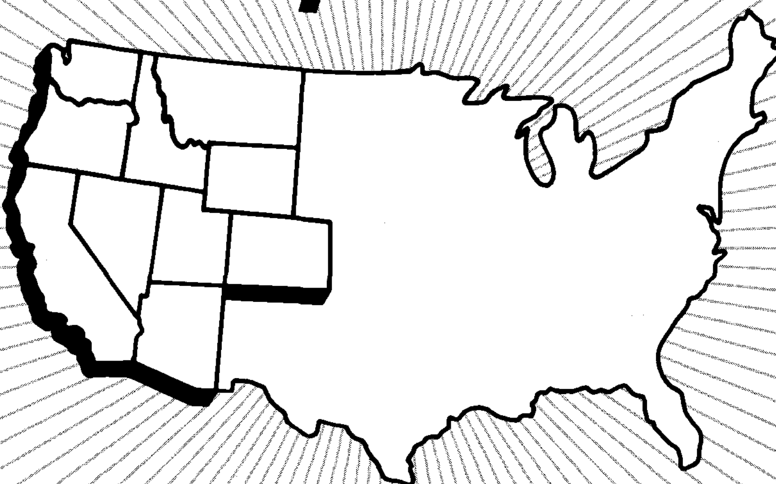
APPENDICES

ENERGY DIRECTIONS: A Western Perspective



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* * A STUDY OF HOME RELATED ENERGY CONCERNS IN TEN WESTERN STATES * *

Your help with this effort is greatly appreciated! Please use the back page to answer any question in more detail. Thank you!

THE BIG PICTURE

Q- 1 Some people feel that energy is a serious national problem, but other people feel it is not. We would like to know your opinion. Do you consider meeting the United States' energy needs during the next ten to twenty years to be: (Please circle number of your opinion.)

1 NOT A SERIOUS PROBLEM
2 A SOMEWHAT SERIOUS PROBLEM
3 A SERIOUS PROBLEM
4 A VERY SERIOUS PROBLEM

Q- 2 One way to meet our future energy needs is to cut back on energy use. Another way is to increase energy production. Which one of the following choices do you feel our country should make in order to meet our future energy needs: (Please circle number of your opinion.)

1 DEPEND ENTIRELY ON CUT-BACKS IN ENERGY USE
2 DEPEND MOSTLY ON CUT-BACKS IN ENERGY USE
3 DEPEND EQUALLY ON CUT-BACKS AND INCREASED ENERGY PRODUCTION
4 DEPEND MOSTLY ON INCREASED ENERGY PRODUCTION
5 DEPEND ENTIRELY ON INCREASED ENERGY PRODUCTION

Q- 3 To what extent do you favor or oppose each of the items listed below as a way of helping to meet our country's future energy needs?

		Please circle your opinion for each item				
A	More use of solar energy.	STRONGLY OPPOSE	OPPOSE	NEUTRAL	FAVOR	STRONGLY FAVOR
B	Reduce energy use in homes.	STRONGLY OPPOSE	OPPOSE	NEUTRAL	FAVOR	STRONGLY FAVOR
C	More use of nuclear power	STRONGLY OPPOSE	OPPOSE	NEUTRAL	FAVOR	STRONGLY FAVOR
D	More use of western coal.	STRONGLY OPPOSE	OPPOSE	NEUTRAL	FAVOR	STRONGLY FAVOR
E	Reduce energy use in business and industries.	STRONGLY OPPOSE	OPPOSE	NEUTRAL	FAVOR	STRONGLY FAVOR
F	More use of oil from western shale. .	STRONGLY OPPOSE	OPPOSE	NEUTRAL	FAVOR	STRONGLY FAVOR
G	Reduce energy use in individual travel.	STRONGLY OPPOSE	OPPOSE	NEUTRAL	FAVOR	STRONGLY FAVOR
H	More oil imports.	STRONGLY OPPOSE	OPPOSE	NEUTRAL	FAVOR	STRONGLY FAVOR
I	More exploration for oil in the U.S.	STRONGLY OPPOSE	OPPOSE	NEUTRAL	FAVOR	STRONGLY FAVOR
J	Reduce energy use by agriculture. . .	STRONGLY OPPOSE	OPPOSE	NEUTRAL	FAVOR	STRONGLY FAVOR
K	More use of wind energy	STRONGLY OPPOSE	OPPOSE	NEUTRAL	FAVOR	STRONGLY FAVOR

ENERGY DIRECTIONS

Q- 4 Here are some actions that might be considered in order to reduce energy use in the United States. Please indicate the extent to which you favor or oppose each of them.

	Please circle your opinion for each item				
A Place higher taxes on gasoline. . . .	STRONGLY OPPOSE	OPPOSE	NEUTRAL	FAVOR	STRONGLY FAVOR
B Require home thermostats to be no higher than 65°F in winter.	STRONGLY OPPOSE	OPPOSE	NEUTRAL	FAVOR	STRONGLY FAVOR
C Require home thermostats to be no lower than 78°F in summer	STRONGLY OPPOSE	OPPOSE	NEUTRAL	FAVOR	STRONGLY FAVOR
D Require everyone's home to pass an energy "audit" (must have adequate insulation, double-pane or storm windows, etc.).	STRONGLY OPPOSE	OPPOSE	NEUTRAL	FAVOR	STRONGLY FAVOR
E Provide larger tax credits for improving home energy efficiency. .	STRONGLY OPPOSE	OPPOSE	NEUTRAL	FAVOR	STRONGLY FAVOR
F Provide larger tax credit for adding home <u>solar</u> heating or cooling .	STRONGLY OPPOSE	OPPOSE	NEUTRAL	FAVOR	STRONGLY FAVOR
G Require utility companies to charge lowest <u>rates</u> to low energy users and highest <u>rates</u> to high users . .	STRONGLY OPPOSE	OPPOSE	NEUTRAL	FAVOR	STRONGLY FAVOR
H Discourage building homes away from towns and cities to lessen travel by car.	STRONGLY OPPOSE	OPPOSE	NEUTRAL	FAVOR	STRONGLY FAVOR
I Change building codes and mortgage requirements to encourage new types of energy-saving housing.	STRONGLY OPPOSE	OPPOSE	NEUTRAL	FAVOR	STRONGLY FAVOR
J Keep 55 MPH speed limit	STRONGLY OPPOSE	OPPOSE	NEUTRAL	FAVOR	STRONGLY FAVOR
K Require better label information on appliances telling how much energy they use.	STRONGLY OPPOSE	OPPOSE	NEUTRAL	FAVOR	STRONGLY FAVOR
L Require utilities to provide regular reports to users on whether energy use is higher or lower than in previous years.	STRONGLY OPPOSE	OPPOSE	NEUTRAL	FAVOR	STRONGLY FAVOR
M Require manufacturers to make appliances that use less energy . .	STRONGLY OPPOSE	OPPOSE	NEUTRAL	FAVOR	STRONGLY FAVOR
N Rely on state instead of federal programs to encourage energy conservation.	STRONGLY OPPOSE	OPPOSE	NEUTRAL	FAVOR	STRONGLY FAVOR

WAYS TO CUT BACK

Q- 5 If the United States faced a crisis and it were essential for every family to voluntarily cut back its energy use, which one of the following would you be more willing to do? (Please circle number of your opinion.)

1 REDUCE WINTER HOME HEATING TO NO HIGHER THAN 65°F AND SUMMER COOLING TO NO LOWER THAN 78°F
2 REDUCE AUTOMOBILE USE BY ABOUT ONE-FOURTH

Q- 6 If our government had to take drastic action to save energy, which one of the following would you be more willing to accept?

1 RATION HOME HEATING FUEL AND ELECTRICITY SO THAT PEOPLE GET ABOUT ONE-FOURTH LESS
2 RATION GASOLINE SO THAT PEOPLE GET ABOUT ONE-FOURTH LESS

Q- 7 If you were asked to reduce your energy consumption during the entire next year by one-fourth--that is, 25 percent less than you now consume--do you feel you could do it?

1 DEFINITELY YES
2 PROBABLY YES
3 I DON'T KNOW
4 PROBABLY NO
5 DEFINITELY NO

Q- 8 Costs for heating fuel, gasoline, and electricity have gone up a great deal in the last few years. To what extent, if at all, have higher energy costs made you cut back on any of the items listed below.

	To what extent have higher energy costs made you cut back? (Please circle your answer.)			
A Groceries.	NONE	A LITTLE	SOME	A LOT
B Meals out.	NONE	A LITTLE	SOME	A LOT
C Driving the car (or other vehicle)	NONE	A LITTLE	SOME	A LOT
D Health care.	NONE	A LITTLE	SOME	A LOT
E Vacations.	NONE	A LITTLE	SOME	A LOT
F Recreation	NONE	A LITTLE	SOME	A LOT
G Education.	NONE	A LITTLE	SOME	A LOT
H Housing (rent, mortgage or upkeep)	NONE	A LITTLE	SOME	A LOT
I Purchase of appliances or furnishings. . . .	NONE	A LITTLE	SOME	A LOT
J Money put in savings	NONE	A LITTLE	SOME	A LOT
K Clothes.	NONE	A LITTLE	SOME	A LOT

Q-9 All things considered, do you feel that changes in the cost of energy in the last five years have made your life: (Please circle number of your answer.)

1 A LOT WORSE THAN IT WAS
2 A LITTLE WORSE THAN IT WAS
3 NO EFFECT
4 A LITTLE BETTER THAN IT WAS
5 A LOT BETTER THAN IT WAS

ENERGY EFFICIENCY AT HOME

Q-10 Listed below are certain energy-saving features that might be added to your home (by you or if you rent, your landlord). For each item, please circle the one best answer:

Energy-saving measures:	Existed When I Moved In	Added Since I Moved In	Plan To Add Within Two Years	Doesn't Exist And No Plans To Add Within Two Years	I Don't Know	Doesn't Apply To My Home
A Double panes or storms on most windows. . . .	EXISTED	ADDED	PLAN	NO	DK	NA
B Good weatherstripping and caulking on most doors and windows. . .	EXISTED	ADDED	PLAN	NO	DK	NA
C More than 4 inches of ceiling insulation . .	EXISTED	ADDED	PLAN	NO	DK	NA
D Insulation in outside walls.	EXISTED	ADDED	PLAN	NO	DK	NA
E Thick floor insulation .	EXISTED	ADDED	PLAN	NO	DK	NA
F Storm doors on all entrances.	EXISTED	ADDED	PLAN	NO	DK	NA
G Clock set-back thermostats.	EXISTED	ADDED	PLAN	NO	DK	NA
H Glass doors on fire-places	EXISTED	ADDED	PLAN	NO	DK	NA
I Wood-burning stove . . .	EXISTED	ADDED	PLAN	NO	DK	NA
J Solar hot-water heater .	EXISTED	ADDED	PLAN	NO	DK	NA
K Solar heating.	EXISTED	ADDED	PLAN	NO	DK	NA
L Evaporative cooler . . .	EXISTED	ADDED	PLAN	NO	DK	NA
M Outdoor window shades. .	EXISTED	ADDED	PLAN	NO	DK	NA
N Insulated window coverings	EXISTED	ADDED	PLAN	NO	DK	NA
O Other: (Please write in) ____________	EXISTED	ADDED	PLAN	NO	DK	NA

Q-11 Thinking about the last three years (1978 --1980), about how much money have you spent to improve the energy efficiency of your home (e.g., weather-stripping, insulation, set-back thermostats, storm doors, solar equipment)? (If none, please put "0.")

$________ YOU SPENT IN 1978

$________ YOU SPENT IN 1979

$________ YOU SPENT IN 1980

Q-12 In order to pay for any energy efficiency improvements made in your home from 1978 to 1980, which did you do: (Please circle all that apply.)

1 SPENT NO MONEY ON ENERGY EFFICIENCY IMPROVEMENTS
2 USED MONEY FROM CURRENT INCOME
3 DELAYED OTHER PURCHASES
4 CUT BACK ON OTHER PURCHASES
5 USED LOAN FROM UTILITY COMPANY
6 USED OTHER LOAN OR CREDIT
7 USED MONEY FROM SAVINGS
8 OTHER (Write in) ____________________

Q-13 In recent years, it has been possible to claim federal and, in some places, state tax benefits for improving the energy efficiency of one's home. Which best describes your awareness of these tax benefits? (Please circle the number of your answer in each column.)

Federal Income Tax Credit (Circle one answer)	State Tax Benefit (Circle one answer)	
1	1	NOT AWARE OF THIS BENEFIT
2	2	AWARE, BUT HAVE MADE NO CLAIM
3	3	AWARE, AND A CLAIM MADE ON 1978, 1979, OR 1980 TAXES
	4	NO TAX BENEFIT IN MY STATE

(If claim made) Would you have probably made these improvements if the tax benefits had not been available?

1 DEFINITELY NO
2 PROBABLY NO
3 PROBABLY YES
4 DEFINITELY YES

Q-14 Here are some other efforts you may or may not be doing to save heating and cooling costs in your home. For each item, tell whether you now do it, or plan to do it in the future.

(Please circle the best answer.)

Energy-saving efforts	This Is Done Now	Don't Do Now, But Plan To Do Within Two Years	Don't Do Now, And No Plans For Future	Doesn't Apply To My Home
A Close off some rooms	NOW	PLAN	NO PLAN	NA
B Have water heater set to 120°F (or less)	NOW	PLAN	NO PLAN	NA
C In winter, set thermostat at 65°F or lower	NOW	PLAN	NO PLAN	NA
D In summer, set thermostat at 78°F or higher	NOW	PLAN	NO PLAN	NA
E Change use of rooms to take advantage of sun-warmed or shaded areas	NOW	PLAN	NO PLAN	NA
F Open and close window coverings to take advantage of sun and temperature differences	NOW	PLAN	NO PLAN	NA
G Home inspected ("audited") for energy efficiency	NOW	PLAN	NO PLAN	NA

Q-15A People have different concerns about housing and make many choices about the housing units in which they live. Here are some statements which express people's concerns about housing. To what extent do you agree or disagree with each statement?

	To what extent do you agree or disagree? (Please circle your answer.) STRONGLY AGREE	AGREE	UNDECIDED	DISAGREE	STRONGLY DISAGREE
A Homeowners are the backbone of our country.	SA	A	U	D	SD
B It is all right to bring up children in apartments.	SA	A	U	D	SD
C Homeownership is one of the best ways to get a tax break	SA	A	U	D	SD
D If I had two school-age children of the same sex, I would prefer that they had separate bedrooms	SA	A	U	D	SD
E It is all right if the value of my home does not keep up with inflation	SA	A	U	D	SD
F People should consider the rate of return on their investment when buying a home. .	SA	A	U	D	SD
G Neighbors should not be expected to take care of each other's property	SA	A	U	D	SD
H People wanting quality in housing construction are limited to custom-built homes. .	SA	A	U	D	SD
I Home improvements should only be done if they add to the resale value of that home.	SA	A	U	D	SD
J A home-buyer should make the largest down payment he/she can.	SA	A	U	D	SD
K Building equity in a home is a good idea. .	SA	A	U	D	SD
L Young people today should consider renting as their permanent housing choice	SA	A	U	D	SD
M The risks involved in buying a home worry me.	SA	A	U	D	SD
N People should live close to the place where they work	SA	A	U	D	SD
O I would prefer not to know the rate of return on my housing investment	SA	A	U	D	SD
P Home-buyers ought to buy detached single-family dwellings.	SA	A	U	D	SD
Q Families with enough income ought to own their own homes	SA	A	U	D	SD
R A home should be kept in good repair to assure resale value	SA	A	U	D	SD
S I would not pay cash for my home even if I could	SA	A	U	D	SD
T The federal government should not give tax breaks for homeownership.	SA	A	U	D	SD
U A person's home is a poor indicator of that person's social status.	SA	A	U	D	SD
V I prefer to live in a neighborhood where people have similar incomes	SA	A	U	D	SD
W A home-buyer should pay cash for a home . .	SA	A	U	D	SD
X The amount of space needed in a home is greater if there are more people in the household	SA	A	U	D	SD

ABOUT YOUR HOME

Q-16 Which of the following best describes the building in which you live? (Please circle number of your answer.)

1 A MOBILE HOME OR TRAILER
(If Yes ____*IN A MOBILE HOME PARK OR SUBDIVISION*
Is It:) ____*ON A LOT YOU OWN*
____*ON A LOT YOU RENT*
2 A ONE-FAMILY HOUSE DETACHED FROM ANY OTHER HOUSE
3 A BUILDING FOR TWO TO FOUR HOUSEHOLDS (FAMILIES)
4 A BUILDING FOR FIVE OR MORE HOUSEHOLDS (FAMILIES)
5 OTHER: (Please describe.)____________________

Q-17 Is the home in which you live:

1 RENTED BY YOU
2 OWNED BY YOU
3 OWNED IN CONDOMINIUM BY YOU
4 OTHER: (Please describe.)____________________

Q-18 Which of these broad categories best describes the number of square feet in your home? Do not include a garage, unfinished basement, or space rented to members of another household. Just your best estimate is fine.

1 LESS THAN 500 SQUARE FEET
2 501 TO 1,000 SQUARE FEET
3 1,001 TO 1,500 SQUARE FEET
4 1,501 TO 2,000 SQUARE FEET
5 2,001 TO 2,500 SQUARE FEET
6 MORE THAN 2,500 SQUARE FEET

Q-19 How many rooms do you have in your home? Please do not count bathrooms, porches, balconies, foyers, halls, half-rooms, or space rented to other households.

_____NUMBER OF ROOMS

Q-20 How many years have you lived in your present home?

_____NUMBER OF YEARS (if less than a year, _____ MONTHS)

Q-21 To the best of your knowledge, about when was your home built? We mean first constructed and not when remodeled, added to, or converted.

1 BEFORE 1940
2 1940 TO 1949
3 1950 TO 1959
4 1960 TO 1969
5 1970 TO 1974
6 1975 OR AFTER → (If known, please put exact year: _____.)

Q-22 How do you feel about the energy efficiency of your present home? (Please circle number of your opinion.)

1 ABOUT AS ENERGY EFFICIENT AS IT CAN BE
2 A LITTLE IMPROVEMENT CAN BE MADE
3 SOME IMPROVEMENT CAN BE MADE
4 A LOT OF IMPROVEMENT CAN BE MADE

HOME ENERGY COSTS

Q-23 Compared to homes similar to yours, do you feel your home is: (Please circle number of your answer.)

1 A LOT LESS ENERGY EFFICIENT
2 SOMEWHAT LESS ENERGY EFFICIENT
3 ABOUT THE SAME
4 SOMEWHAT MORE ENERGY EFFICIENT
5 A LOT MORE ENERGY EFFICIENT

Everyone

Q-24 About how much a month do you pay for rent or house payments? (Include space rent if in mobile home park.)

1 NO PAYMENT OR RENT
2 LESS THAN $100
3 $100 TO $199
4 $200 TO $299
5 $300 TO $399
6 $400 TO $499
7 $500 TO $749
8 $750 TO $999
9 $1,000 OR MORE

Home owners only

What is the value of your home? That is, about how much do you think it would sell for if it were for sale?

1 LESS THAN $25,000
2 $25,000 TO $49,999
3 $50,000 TO $74,999
4 $75,000 TO $99,999
5 $100,000 TO $124,999
6 $125,000 TO $174,999
7 $175,000 TO $249,999
8 MORE THAN $250,000

(Note: If your home is part of a farm or other business, please check here [ ], and answer the questions above and the one below as best you can for the residential part of your property.)

Q-25 Next, we would like to ask about how much energy it took to run your home in 1980. Please answer as best you can. If your bills are handy, they could be very helpful. (If you lived in your home only during part of 1980, please put number of months here: _____.)

Please provide as much of the following as you can. Your best estimate will be fine.

	Your Cost For 1980 (Put "R" if included in rent.)	Approximate Amount Used In 1980
A Electricity	$______ COST	______ KILOWATT HOURS
B Heating oil	$______ COST	______ GALLONS
C Wood	$______ COST	______ CORDS
D Natural gas	$______ COST	______ ______ (Put purchase unit: cubic feet or therms?)
E Other: (e.g., coal, propane, or?) ______	$______ COST	______ ______ (Put purchase unit)

Q-26 Which of the above is your main source of energy for:

__________ WATER HEATER

__________ SPACE HEATING

Finally, we would like to ask a few questions about yourself to help with analysis of the results.

Q-27 Where is your residence located?

_______________ COUNTY

_______________ ZIP CODE

_______________ TOWN OR CITY IN WHICH (OR NEAREST TO) YOUR RESIDENCE IS LOCATED

Is your home: (Please circle.)

1 INSIDE THE CITY LIMITS
2 OUTSIDE THE CITY LIMITS

Q-28 Do you have any of these recreation-related items: (Circle all that you have.)

1 A HEATED SWIMMING POOL, HOT TUB OR JACUZZI
2 A SECOND HOME OR CABIN
3 A MOTOR HOME
4 ANOTHER RECREATIONAL VEHICLE (e.g., CAMPER)
5 NONE OF THE ABOVE

Q-20 Are you: (Please circle number of your answer.)

1 MARRIED
2 DIVORCED
3 WIDOWED
4 SEPARATED
5 NEVER MARRIED

Q-30 Please list everyone who lives in your household by their relationship to you, starting with the adult(s). (Please list as husband, wife, parent, friend, son, daughter, etc.--names aren't necessary.)

		Age (In Years)	Sex (M = Male; F = Female)
1	Yourself		
2			
3			
4			
5			
6			

If more space is needed, please put ages here:

FEMALES ____; ____; ____; ____;

MALES ____; ____; ____; ____

Appendix A

1981 Questionnaire

10

Please answer these questions for yourself and your spouse or other adult living partner (if you have one).

	YOURSELF	SPOUSE OR LIVING PARTNER
Q-31	Are you: 1 EMPLOYED FULL TIME 2 EMPLOYED PART TIME 3 NOT EMPLOYED OUTSIDE THE HOME 4 UNEMPLOYED 5 STUDENT 6 RETIRED	Is he/she: 1 EMPLOYED FULL TIME 2 EMPLOYED PART TIME 3 NOT EMPLOYED OUTSIDE THE HOME 4 UNEMPLOYED 5 STUDENT 6 RETIRED
Q-32	Your usual occupation when employed (or before retirement): __________ TITLE __________ KIND OF WORK __________ TYPE OF COMPANY OR BUSINESS	His/her usual occupation when employed (or before retirement): __________ TITLE __________ KIND OF WORK __________ TYPE OF COMPANY OR BUSINESS
Q-33	(If employed) About how far is it from home to where you work? ______ MILES	(If employed) About how far is it from home to where he/she works? ______ MILES
Q-34	Your highest level of education: 1 NO FORMAL EDUCATION 2 GRADE SCHOOL 3 SOME HIGH SCHOOL 4 HIGH SCHOOL GRADUATE 5 TRADE SCHOOL 6 SOME COLLEGE 7 COLLEGE GRADUATE 8 SOME GRADUATE WORK 9 A GRADUATE DEGREE	His/her highest level of education: 1 NO FORMAL EDUCATION 2 GRADE SCHOOL 3 SOME HIGH SCHOOL 4 HIGH SCHOOL GRADUATE 5 TRADE SCHOOL 6 SOME COLLEGE 7 COLLEGE GRADUATE 8 SOME GRADUATE WORK 9 A GRADUATE DEGREE

Q-35 Some people have many types of investment experiences, and others do not. Which of the following types of investments, if any, have you owned in the last ten years: (Please circle all that apply.)

1 A BUSINESS
2 A HOME
3 OTHER REAL ESTATE THAN YOUR HOME
4 UNITED STATES SAVINGS BONDS
5 PASSBOOK SAVINGS ACCOUNT
6 TIME SAVINGS DEPOSITS
7 MUTUAL FUNDS
8 MUNICIPAL BONDS
9 TREASURY NOTES OR BILLS
10 GOLD OR SILVER COINS
11 STOCKS OR BONDS OF CORPORATIONS
12 MONEY MARKET CERTIFICATE
13 NONE

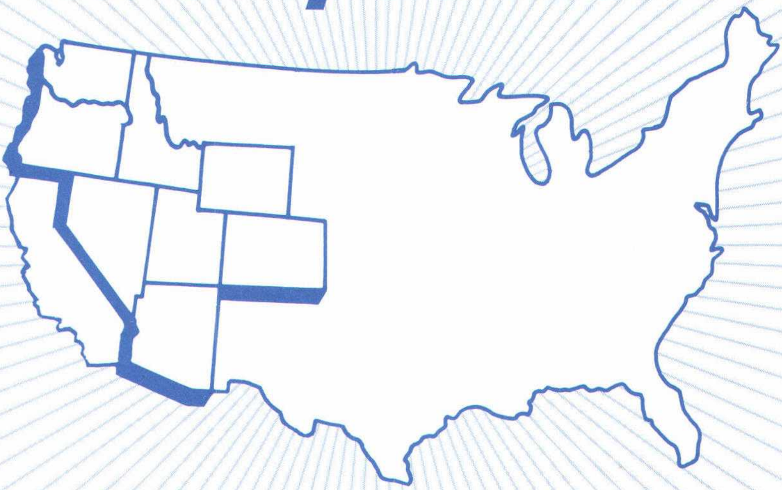
Q-36 Which of these broad categories describes your total family income before taxes in 1980? (Please circle the appropriate category.)

1 LESS THAN $5,000
2 $5,000 TO $9,999
3 $10,000 TO $14,999
4 $15,000 TO $19,999
5 $20,000 TO $24,999
6 $25,000 TO $29,999
7 $30,000 TO $39,999
8 $40,000 TO $49,999
9 $50,000 OR MORE

JOINTLY SPONSORED BY AGRICULTURAL EXPERIMENT STATIONS AT THE UNIV. OF ARIZONA, COLORADO STATE UNIV., UNIV. OF IDAHO, UNIV. OF NEVADA-RENO, OREGON STATE UNIV., UTAH STATE UNIV., WASHINGTON STATE UNIV., UNIV. OF WYOMING

ENERGY DIRECTIONS:

A 1983 Western Perspective



* * A STUDY OF HOME RELATED ENERGY CONCERNS IN EIGHT WESTERN STATES * *

Your help with this effort is greatly appreciated! Please use the back page to answer any question in more detail. Thank you!

THE BIG PICTURE

1

Q- 1 Some people feel that energy is a serious national problem, but other people feel it is not. We would like to know your opinion. Do you consider meeting the United States' energy needs during the next ten to twenty years to be: (Please circle number of your opinion.)

1 NOT A SERIOUS PROBLEM
2 A SOMEWHAT SERIOUS PROBLEM
3 A SERIOUS PROBLEM
4 A VERY SERIOUS PROBLEM

Q- 2 If you were asked to reduce your energy consumption during the entire next year by one-fourth--that is, 25 percent less than you now consume--do you feel you could do it? (Please circle number of your opinion.)

1 DEFINITELY YES
2 PROBABLY YES
3 I DON'T KNOW
4 PROBABLY NO
5 DEFINITELY NO

If YES, how difficult would this be?

1 VERY DIFFICULT
2 SOMEWHAT DIFFICULT
3 NOT DIFFICULT

Q- 3 To what extent do you favor or oppose each of the items listed below as a way of helping to meet our country's future energy needs?

	Please circle your opinion for each item				
A More use of solar energy.	STRONGLY OPPOSE	OPPOSE	NEUTRAL	FAVOR	STRONGLY FAVOR
B Reduce energy use in homes.	STRONGLY OPPOSE	OPPOSE	NEUTRAL	FAVOR	STRONGLY FAVOR
C More use of nuclear power	STRONGLY OPPOSE	OPPOSE	NEUTRAL	FAVOR	STRONGLY FAVOR
D More use of western coal.	STRONGLY OPPOSE	OPPOSE	NEUTRAL	FAVOR	STRONGLY FAVOR
E Reduce energy use in business and industry.	STRONGLY OPPOSE	OPPOSE	NEUTRAL	FAVOR	STRONGLY FAVOR
F More use of oil from western shale. .	STRONGLY OPPOSE	OPPOSE	NEUTRAL	FAVOR	STRONGLY FAVOR
G Reduce energy use in individual travel.	STRONGLY OPPOSE	OPPOSE	NEUTRAL	FAVOR	STRONGLY FAVOR
H More oil imports.	STRONGLY OPPOSE	OPPOSE	NEUTRAL	FAVOR	STRONGLY FAVOR
I More exploration for oil in the U.S.	STRONGLY OPPOSE	OPPOSE	NEUTRAL	FAVOR	STRONGLY FAVOR
J Reduce energy use by agriculture. . .	STRONGLY OPPOSE	OPPOSE	NEUTRAL	FAVOR	STRONGLY FAVOR
K More use of wind energy	STRONGLY OPPOSE	OPPOSE	NEUTRAL	FAVOR	STRONGLY FAVOR
L More use of biomass energy (agricultural residue, animal waste) . . .	STRONGLY OPPOSE	OPPOSE	NEUTRAL	FAVOR	STRONGLY FAVOR
M More use of small hydro-electric power generation.	STRONGLY OPPOSE	OPPOSE	NEUTRAL	FAVOR	STRONGLY FAVOR

ENERGY DIRECTIONS

Q- 4 Here are some actions that might be considered in order to reduce energy use in the United States. Please indicate the extent to which you favor or oppose each of them.

	Please circle your opinion for each item				
A Require home thermostats to be no higher than 65°F in winter	STRONGLY OPPOSE	OPPOSE	NEUTRAL	FAVOR	STRONGLY FAVOR
B Require home thermostats to be no lower than 78°F in summer.	STRONGLY OPPOSE	OPPOSE	NEUTRAL	FAVOR	STRONGLY FAVOR
C Require everyone's home to pass an energy "audit" (must have adequate insulation, double-pane or storm windows, etc.)	STRONGLY OPPOSE	OPPOSE	NEUTRAL	FAVOR	STRONGLY FAVOR
D Provide larger tax credits for improving home energy efficiency . . .	STRONGLY OPPOSE	OPPOSE	NEUTRAL	FAVOR	STRONGLY FAVOR
E Provide larger tax credit for adding home <u>solar</u> heating or cooling. . .	STRONGLY OPPOSE	OPPOSE	NEUTRAL	FAVOR	STRONGLY FAVOR
F Require utility companies to charge lowest <u>rates</u> to low energy users and highest <u>rates</u> to high users. . . .	STRONGLY OPPOSE	OPPOSE	NEUTRAL	FAVOR	STRONGLY FAVOR
G Discourage building homes away from towns and cities to lessen travel by car	STRONGLY OPPOSE	OPPOSE	NEUTRAL	FAVOR	STRONGLY FAVOR
H Change building codes and mortgage requirements to encourage new types of energy-saving housing	STRONGLY OPPOSE	OPPOSE	NEUTRAL	FAVOR	STRONGLY FAVOR
I Require utilities to provide regular reports to users on whether energy use is higher or lower than in previous years	STRONGLY OPPOSE	OPPOSE	NEUTRAL	FAVOR	STRONGLY FAVOR
J Rely on state instead of federal programs to encourage energy conservation	STRONGLY OPPOSE	OPPOSE	NEUTRAL	FAVOR	STRONGLY FAVOR
K Require land developers to have energy plans as part of their developments (e.g., solar orientation on building sites; solar access; landscaping, etc.)	STRONGLY OPPOSE	OPPOSE	NEUTRAL	FAVOR	STRONGLY FAVOR

Q- 5 All things considered, do you feel that changes in the cost of energy in the last five years have made your life: (Please circle number of your opinion.)

1 A LOT WORSE THAN IT WAS
2 A LITTLE WORSE THAN IT WAS
3 NO EFFECT
4 A LITTLE BETTER THAN IT WAS
5 A LOT BETTER THAN IT WAS

ENERGY EFFICIENCY AT HOME

Q- 6 Listed below are certain energy-saving features that might be added to your home (by you or if you rent, your landlord). (For each item, please circle the one best answer.)

Energy-saving measures:	Existed When I Moved In	Installed or Added Before March 1981	Installed or Added Since March 1981	Plan To Add Within Two Years	Doesn't Exist And No Plans To Add Within Two Years	I Don't Know/ Doesn't Apply To My Home
A Double panes or storms on most windows.	EXISTED	ADDED	ADDED	PLAN	NO	DK/NA
B Good weatherstripping and caulking on most doors and windows. . . .	EXISTED	ADDED	ADDED	PLAN	NO	DK/NA
C More than 4 inches of ceiling insulation . . .	EXISTED	ADDED	ADDED	PLAN	NO	DK/NA
D Insulation in outside walls.	EXISTED	ADDED	ADDED	PLAN	NO	DK/NA
E Thick floor insulation . .	EXISTED	ADDED	ADDED	PLAN	NO	DK/NA
F Storm doors on all entrances.	EXISTED	ADDED	ADDED	PLAN	NO	DK/NA
G Clock set-back thermostats.	EXISTED	ADDED	ADDED	PLAN	NO	DK/NA
H Glass doors on fireplaces	EXISTED	ADDED	ADDED	PLAN	NO	DK/NA
I Wood-burning stove	EXISTED	ADDED	ADDED	PLAN	NO	DK/NA
J Solar hot-water heater . .	EXISTED	ADDED	ADDED	PLAN	NO	DK/NA
K Solar heating.	EXISTED	ADDED	ADDED	PLAN	NO	DK/NA
L Evaporative cooler	EXISTED	ADDED	ADDED	PLAN	NO	DK/NA
M Outdoor window shades. . .	EXISTED	ADDED	ADDED	PLAN	NO	DK/NA
N Insulated interior window coverings.	EXISTED	ADDED	ADDED	PLAN	NO	DK/NA
O Other: (Please write in) ______________________	EXISTED	ADDED	ADDED	PLAN	NO	DK/NA

Q- 7 A variety of activities use energy in the home. Considering most homes, please rank each of the following activities 1, 2, 3, or 4, with 1 being the activity that uses the most energy and 4 being the activity that uses the least energy.

_______ WATER HEATING
_______ COOKING
_______ LIGHTING
_______ HOME HEATING/COOLING

Q- 8 To the best of your knowledge, where do you think most of the heat loss occurs in the average home. (Please circle the number of your answer.)

1 THROUGH POORLY FITTED DOORS AND WINDOWS
2 THROUGH POORLY INSULATED FLOORS
3 THROUGH POORLY INSULATED CEILINGS
4 THROUGH POORLY INSULATED EXTERIOR WALLS

Q- 9 Listed below are features that you may have added to change energy use in your home. If you made the changes in 1981 or 1982, please indicate the number of dollars that were spent (before tax credits) for each feature. If added prior to 1981 or does not apply, check the appropriate column.

	Type of Investment:	1981	1982	Added Before 1981	Does Not Apply To My Home
A	Weatherstripping or caulking. . . .	$_____	$_____	_____	_____
B	Insulation.	$_____	$_____	_____	_____
C	Storm doors or storm windows. . . .	$_____	$_____	_____	_____
D	Wood burning stove.	$_____	$_____	_____	_____
E	Solar water heating	$_____	$_____	_____	_____
F	Solar heating	$_____	$_____	_____	_____
G	Insulated interior window treatment	$_____	$_____	_____	_____
H	All other (Please write in) ______________________________ . .	$_____	$_____	_____	_____

Q- 10 In recent years it has been possible to claim a credit on your federal income taxes for money spent to improve the energy efficiency of your home (e.g., adding insulation or buying a solar water heater). Which statement best describes your awareness and use of the federal tax credit? (Please circle the best answer.)

1 NOT AWARE OF THE FEDERAL TAX CREDIT
2 AWARE, BUT MADE NO CLAIM ON 1981 OR 1982 TAX RETURN (or will not)
3 AWARE AND A CLAIM MADE ON 1981 TAX RETURN ONLY
4 AWARE AND A CLAIM HAS BEEN OR WILL BE MADE ON 1982 TAX RETURN ONLY
5 AWARE AND A CLAIM HAS BEEN OR WILL BE MADE ON BOTH 1981 AND 1982 TAX RETURN

Q- 11 (For those making [or will be making] a claim on their 1981 or 1982 tax return.) Think about the expenditures you listed in question #9. How did the availability of the federal tax credit affect your decision to spend money for those purposes? (Please circle the best answer.)

1 THE SAME AMOUNT OF MONEY WOULD HAVE BEEN SPENT EVEN WITHOUT THE FEDERAL TAX CREDIT
2 A LITTLE LESS MONEY WOULD HAVE BEEN SPENT IF THE FEDERAL TAX CREDIT HAD NOT BEEN AVAILABLE
3 MUCH LESS MONEY WOULD HAVE BEEN SPENT IF THE FEDERAL TAX CREDIT HAD NOT BEEN AVAILABLE
4 NONE OF THE MONEY WOULD HAVE BEEN SPENT WITHOUT THE FEDERAL TAX CREDIT
5 DON'T KNOW OR CAN'T REMEMBER

HOUSING SATISFACTION

Q- 12A For each statement below, circle the number that best indicates how you feel on a scale of 1 to 7, with 1 being extremely dissatisfied and 7 being extremely satisfied.

	Please circle your answer						
A In general, how satisfied or dissatisfied are you with your housing?.	1	2	3	4	5	6	7
B How satisfied or dissatisfied are you with the comfort of your house?.	1	2	3	4	5	6	7
C How satisfied or dissatisfied are you with the energy efficiency of your current dwelling?	1	2	3	4	5	6	7

Q- 12B For each statement below, circle the number that best indicates how you feel on a scale of 1 to 7, with 1 being extremely unimportant and 7 being extremely important.

	Please circle your answer						
A How important is it to you to have energy-saving features in your house?.	1	2	3	4	5	6	7
B How important is it to you to have a home that costs you less money for energy?	1	2	3	4	5	6	7
C How important is it for you to have convenience with energy-saving features in your home? (time and effort).	1	2	3	4	5	6	7

Q- 12C Compared to the dollar ($) amount the average Oregon family spends for energy, do you feel you spend: (Please circle number of your opinion.)

1 A LOT LESS MONEY
2 SOMEWHAT LESS MONEY
3 ABOUT AVERAGE
4 SOMEWHAT MORE MONEY
5 A LOT MORE MONEY

Q- 12D Compared to the time and effort the average Oregon family puts into energy conservation, do you feel you spend: (Please circle number of your opinion.)

1 A LOT LESS TIME AND EFFORT
2 SOMEWHAT LESS TIME AND EFFORT
3 ABOUT AVERAGE
4 SOMEWHAT MORE TIME AND EFFORT
5 A LOT MORE TIME AND EFFORT

Q- 12E Conservation can be practiced in many ways. Listed below are some conservation efforts you may or may not be doing. For each item, tell whether this is always, sometimes, or never done now.

	Please circle your answer		
A Recycle newspapers, glass, and tin cans . . .	.ALWAYS	SOMETIMES	NEVER
B Ride a bicycle on errands	.ALWAYS	SOMETIMES	NEVER
C Participate in a car pool/van pool, or ride the bus	.ALWAYS	SOMETIMES	NEVER
D Dry laundry on a clothesline.	.ALWAYS	SOMETIMES	NEVER
E Keep records of home energy usage	.ALWAYS	SOMETIMES	NEVER

Q- 13 The following statements are related to adult attitudes and feelings. They are more about "life in general" than any one specific topic. The best way to answer these statements is as rapidly as you can. Please circle YES or NO to your first reaction to each statement.

YES NO 1. Do you believe that most problems will solve themselves if you just don't fool with them?
YES NO 2. Do you believe that you can stop yourself from catching a cold?
YES NO 3. Are some people just born lucky?
YES NO 4. Are you often blamed for things that just aren't your fault?
YES NO 5. Do you believe that if somebody studies hard enough he/she can pass any subject?
YES NO 6. Do you feel that most of the time it doesn't pay to try hard because things never turn out right anyway?
YES NO 7. Do you feel that if things start out well in the morning that it's going to be a good day no matter what you do?
YES NO 8. Do you feel that most of the time parents listen to what their children have to say?
YES NO 9. Do you believe that wishing can make good things happen?
YES NO 10. Most of the time do you find it hard to change a friend's opinion (mind)?
YES NO 11. Do you think that cheering more than luck helps a team to win?
YES NO 12. Do you believe that parents should allow children to make most of their own decisions?
YES NO 13. Do you feel that when you do something wrong there's very little you can do to make it right?
YES NO 14. Do you believe that most people are just born good at sports?
YES NO 15. Are most of the people your age stronger than you are?
YES NO 16. Do you feel that one of the best ways to handle most problems is just not to think about them?
YES NO 17. Do you feel that you have a lot of choice in deciding who your friends are?
YES NO 18. If you find a four leaf clover do you believe that it might bring you good luck?
YES NO 19. Do you feel that when a person decides to hit you, there's little you can do to stop him or her?
YES NO 20. Have you ever had a good luck charm?
YES NO 21. Do you believe that whether or not people like you depends on how you act?
YES NO 22. Have you felt that when people were mean to you it was usually for no reason at all?
YES NO 23. Most of the time, do you feel that you can change what might happen tomorrow by what you do today?
YES NO 24. Do you believe that when bad things are going to happen they just are going to happen no matter what you try to do to stop them?
YES NO 25. Do you think that people can get their own way if they just keep trying?
YES NO 26. Do you feel that when good things happen they happen because of hard work?
YES NO 27. Do you feel that when somebody wants to be your enemy there's little you can do to change matters?
YES NO 28. Do you feel that it's easy to get friends to do what you want them to?
YES NO 29. Do you usually feel that you have little to say about what you get to eat at home?
YES NO 30. Do you feel that when someone doesn't like you there's little you can do about it?
YES NO 31. Are you the kind of person who believes that planning ahead makes things turn out better?
YES NO 32. Most of the time, do you feel that you have little to say about what your family decides to do?
YES NO 33. Do you think it's better to be smart than to be lucky?

WAYS TO CUT BACK

Q- 14 Here are some other efforts you may or may not be doing to save heating and cooling costs in your home. For each item, tell whether you now do it, or plan to do it in the future.

(Please circle the best answer.)

Energy-saving efforts:	This Is Done Now	Don't Do Now, But Plan To Do Within Two Years	Don't Do Now, And No Plans For Future	I Don't Know or Doesn't Apply To My Home
A Close off some rooms.	NOW	PLAN	NO PLAN	NA
B Have water heater set to 120°F (or less). . .	NOW	PLAN	NO PLAN	NA
C In winter, set thermostat at 65°F or lower. .	NOW	PLAN	NO PLAN	NA
D In summer, set thermostat at 78°F or higher .	NOW	PLAN	NO PLAN	NA
E Change use of rooms to take advantage of sun-warmed or shaded areas	NOW	PLAN	NO PLAN	NA
F Open and close window coverings to take advantage of sun and temperature differences.	NOW	PLAN	NO PLAN	NA
G Home inspected ("audited") for energy efficiency.	NOW	PLAN	NO PLAN	NA

Q- 15 Costs for heating fuel, gasoline, and electricity have gone up a great deal in the last few years. To what extent, if at all, have higher energy costs made you cut back on any of the items listed below.

To what extent have higher energy costs made you cut back? (Please circle your answer.)

A Groceries	NONE	A LITTLE	SOME	A LOT
B Meals out	NONE	A LITTLE	SOME	A LOT
C Driving the car (or other vehicle).	NONE	A LITTLE	SOME	A LOT
D Health care	NONE	A LITTLE	SOME	A LOT
E Vacations	NONE	A LITTLE	SOME	A LOT
F Recreation.	NONE	A LITTLE	SOME	A LOT
G Education	NONE	A LITTLE	SOME	A LOT
H Housing (rent, mortgage or upkeep).	NONE	A LITTLE	SOME	A LOT
I Purchase of appliances or furnishings	NONE	A LITTLE	SOME	A LOT
J Money put in savings.	NONE	A LITTLE	SOME	A LOT
K Clothes	NONE	A LITTLE	SOME	A LOT

Q- 16 What is the main fuel used in your home for: (Please write in the fuel source, i.e., electricity, natural gas, LP gas, fuel oil, etc.)

________________________ WATER HEATING

________________________ HEATING YOUR HOME

ABOUT YOUR HOME

Q- 17 Which of the following best describes your primary residence? (Please circle number of your opinion.)

1 A MOBILE HOME OR TRAILER
2 A ONE-FAMILY HOUSE DETACHED FROM ANY OTHER HOUSE
3 A BUILDING FOR TWO TO FOUR HOUSEHOLDS (FAMILIES)
4 A BUILDING FOR FIVE OR MORE HOUSEHOLDS (FAMILIES)
5 OTHER: (Please describe.)________________________

Q- 18 Is the home in which you live:

1 RENTED BY YOU
2 OWNED BY YOU
3 OWNED IN CONDOMINIUM BY YOU
4 OTHER: (Please describe.)________________________

Q- 19 Which of these broad categories best describes the number of square feet in your home? Do not include a garage, unfinished basement, or space rented to members of another household. Just your best estimate is fine.

1 LESS THAN 500 SQUARE FEET
2 501 TO 1,000 SQUARE FEET
3 1,001 TO 1,500 SQUARE FEET
4 1,501 TO 2,000 SQUARE FEET
5 2,001 TO 2,500 SQUARE FEET
6 MORE THAN 2,500 SQUARE FEET

Q- 20 When did you move into your present home?

______ YEAR MOVED IN (If less than one year, what month?______)

Q- 21 To the best of your knowledge, about when was your home built? We mean first constructed and not when remodeled, added to, or converted.

______ YEAR BUILT

Q- 22 How do you feel about the energy efficiency of your present home: (Please circle number of your opinion.)

1 ABOUT AS ENERGY EFFICIENT AS IT CAN BE
2 A LITTLE IMPROVEMENT CAN BE MADE
3 SOME IMPROVEMENT CAN BE MADE
4 A LOT OF IMPROVEMENT CAN BE MADE

(Note: If your home is part of a farm or other business, please check here ☐, and answer questions 23 and 24 as best you can for the residential part of your property.)

Q- 23 As best as you can remember, how much were your total energy bills in 1982? If your bills or checkbook are handy, they could be helpful.

	1982
1 ELECTRICITY	$________
2 FUEL OIL	$________
3 WOOD (NO. OF CORDS _____)	$________
4 NATURAL GAS	$________
5 OTHER: (e.g., coal, propane, or?)________________	$________

Everyone

Q- 24 About how much a month do you pay for rent or house payments? (Include space rent if in mobile home park.)

1 NO PAYMENT OR RENT
2 LESS THAN $100
3 $100 to $199
4 $200 TO $299
5 $300 TO $399
6 $400 TO $499
7 $500 TO $749
8 $750 TO $999
9 $1,000 OR MORE

Homeowners Only

What is the value of your home? That is, about how much do you think it would sell for if it were for sale?

1 LESS THAN $25,000
2 $25,000 TO $49,999
3 $50,000 TO $74,999
4 $75,000 to $99,999
5 $100,000 TO $124,999
6 $125,000 TO $174,999
7 $175,000 to $249,999
8 MORE THAN $250,000

FINALLY, WE WOULD LIKE TO ASK A FEW QUESTIONS ABOUT YOURSELF TO HELP WITH ANALYSIS OF THE RESULTS.

Q- 25 Where is your residence located?

________________ COUNTY

________________ ZIP CODE

________________ TOWN OR CITY IN WHICH (OR NEAREST TO) YOUR RESIDENCE IS LOCATED

Is your home: (Please circle.)

1 INSIDE THE CITY LIMITS
2 OUTSIDE THE CITY LIMITS

Q- 26 Are you: (Please circle number of your opinion.)

1 MARRIED
2 DIVORCED
3 WIDOWED
4 SEPARATED
5 NEVER MARRIED

Q- 27 Please list everyone who lives in your household by their relationship to you, starting with the adult(s). (Please list as husband, wife, parent, friend, son, daughter, etc.--names are not necessary.)

		Age (In Years)	Sex (M = Male; F = Female)
1	Yourself		
2			
3			
4			

If more space is needed, please put ages here:

FEMALES ____; ____; ____; ____; ____; ____; ____

MALES ____; ____; ____; ____; ____; ____; ____

Appendix B

1983 Questionnaire

Please answer these questions for yourself and your spouse or other adult partner (if you have one).

	YOURSELF	SPOUSE OR PARTNER
Q- 28	Are you primarily: 1 EMPLOYED FULL TIME 2 EMPLOYED PART TIME 3 NOT EMPLOYED OUTSIDE THE HOME 4 UNEMPLOYED 5 RETIRED	Is he/she primarily: 1 EMPLOYED FULL TIME 2 EMPLOYED PART TIME 3 NOT EMPLOYED OUTSIDE THE HOME 4 UNEMPLOYED 5 RETIRED
Q- 29	Your usual occupation when employed (or before retirement): ______________ TITLE ______________ TYPE OF COMPANY OR BUSINESS	His/her usual occupation when employed (or before retirement): ______________ TITLE ______________ TYPE OF COMPANY OR BUSINESS
Q- 30	(If employed) About how far is it from home to where you work: _______ MILES	(If employed) About how far is it from home to where he/she works: _______ MILES
Q- 31	Your highest level of education: 1 0-8 GRADES 2 SOME HIGH SCHOOL 3 HIGH SCHOOL GRADUATE 4 TRADE SCHOOL 5 SOME COLLEGE 6 COLLEGE (4 year) GRADUATE 7 SOME GRADUATE WORK 8 A GRADUATE DEGREE	His/her highest level of education: 1 0-8 GRADES 2 SOME HIGH SCHOOL 3 HIGH SCHOOL GRADUATE 4 TRADE SCHOOL 5 SOME COLLEGE 6 COLLEGE (4 year) GRADUATE 7 SOME GRADUATE WORK 8 A GRADUATE DEGREE

Q- 32 Some people have many types of investment experiences, and others do not. Which of the following types of investments, if any, have you owned in the last ten years: (Please circle all that apply.)

1 A BUSINESS
2 A HOME
3 OTHER REAL ESTATE THAN YOUR HOME
4 UNITED STATES SAVINGS BONDS
5 PASSBOOK SAVINGS ACCOUNT
6 TIME SAVINGS DEPOSITS
7 MUTUAL FUNDS
8 MUNICIPAL BONDS
9 TREASURY NOTES OR BILLS
10 GOLD OR SILVER
11 STOCKS OR BONDS OF CORPORATIONS
12 MONEY MARKETS
13 NONE

Q- 33 Which of these broad categories describes your total family income before taxes in 1982? (Please circle the number of appropriate category.)

1 LESS THAN $5,000
2 $5,000 TO $9,999
3 $10,000 TO $14,999
4 $15,000 TO $19,999
5 $20,000 TO $24,999
6 $25,000 TO $29,999
7 $30,000 TO $39,999
8 $40,000 TO $49,999
9 $50,000 OR MORE

Appendix C

Introductory Letter (1981)

School of Home Economics | Oregon State University | Corvallis, Oregon 97331 (503) 754-3551

March 9, 1981

Costs for heating fuel and electricity continue to go up, and energy shortages seem possible. Yet, little is known about how people are being affected by these concerns. Nor do we know what directions and actions, if any, people want taken. To find out, we need your opinions.

Your household is one of a small number being asked to help. It was chosen in a random sample of Oregon and nine other western states. To truly represent the people throughout the region, it is important that each questionnaire be completed.

An equal number of men and women are being asked to help. In your household we would like to ask that the questionnaire be completed by an adult female if there is one. If not, then an adult male should complete it.

You may be assured of complete confidentiality. You will see an identification number on the front of the questionnaire. This is so your name can be checked off the mailing list when it is returned. Your name will not be placed on the questionnaire or associated with any of the information you provide. We hope you will participate. However, the study is voluntary, and if you do not want to answer, please let us know by returning the blank questionnaire.

We believe it is important that results of this study be brought to the attention of interested people including those concerned with our nation's energy policies. If you would like a summary (it's free), please print "send results" on the back of the return envelope.

I would be most happy to answer any questions you might have. Please write or call. My telephone number is (503)754-3211. Thanks for your help with this important effort.

Cordially,

Suzanne Badenhop
Project Director

Appendix D

Introductory Letter (1983) to New Sample

School of Home Economics
Oregon State University
Corvallis, Oregon 97331
(503) 754-3551

February 15, 1983

Costs for heating fuel and electricity continue to go up, and future energy shortages seem possible. Yet, little is known about how people are being affected by these concerns. Nor do we know what kinds of actions, if any, people want to see taken. To find out, we need your help.

Your household is one of a small number being asked to assist. It was chosen in a random sample of Oregon and seven other western states. To truly represent the experiences of people throughout the region, it is important that each questionnaire be completed.

An equal number of men and women are being asked to help. In your household we would like to ask that the questionnaire be completed by an adult female if there is one. If not, then an adult male should complete it.

You may be assured of complete confidentiality. You will see an identification number on the front of the questionnaire. This is so your name can be checked off the mailing list when it is returned. Your name will never be placed on the questionnaire or associated with any of the information you provide. We hope you will participate. However, the study is voluntary, and if you do not want to answer, please let us know by returning the blank questionnaire.

We believe it is important that results of this study be brought to the attention of people concerned with our nation's energy policies, and other interested people. If you would like a summary (they are free), please write "send results" on the back of the return envelope.

I would be most happy to answer any questions you might have. Please call or write. My telephone number is (503) 754-3211. Thanks for your help with this important effort.

Cordially,

Sue Badenhop
Project Director

SB/mkm
Enclosure

Appendix E

Introductory Letter (1983) to Old Sample

School of Home Econo^ics Oregon State University Corvallis, Oregon 97331 (503) 754-3551

February 15, 1983

Two years ago your household was one of a small number in Oregon and nine other western states asked to assist in a study of home energy concerns by completing the brief questionnaire. We greatly appreciated your participation in that effort.

Since that time, costs for heating fuel and electricity have changed. To better understand how people are being affected by these changes and what kind of actions, if any, people want to see taken, we again are asking for your help. Since your household was in a carefully drawn random sample of the state, it's important to also have your participation in the final part of this study.

It is very important that the person who completed the questionnaire in March 1981 also complete the following questionnaire. If that person no longer lives in your household or is unavailable, then the adult most responsible for housing decisions should complete it.

As before, your answers to this questionnaire are confidential. You will see an identification number on the front of the questionnaire. This is so your name can be checked off the mailing list when it is returned. Your name will never be placed on the questionnaire or associated in any way with the information you provide. We hope you will participate. However, the study is voluntary, and if you do not want to answer, please let us know by simply returning the blank questionnaire.

We believe it is important that the results of this study be brought to the attention of people concerned with state and national energy policies, and other interested people. If you would like a summary (they are free) please write "send results" on the back of the return envelope.

I would be most happy to answer any questions you might have. Please call or write. My telephone number is (503) 754-3211. Thank you very much.

Cordially,

Sue Badenhop
Project Director

Appendix F

Postcard Follow-up (1981)

March 16, 1981

Last week a questionnaire seeking your opinion about energy directions and concerns facing Oregon and other western states was mailed to you. Your household was drawn in a random sample of ten western states.

If you already completed and returned the questionnaire, please accept our sincere thanks. If not, please do so today. Because it has been sent to a small representative sample of people throughout the western United States, it is extremely important that yours be included in the study.

If by some chance you did not receive the questionnaire, or it was misplaced, please call me collect (503) 754-3211, and I will get another one in the mail to you today.

Sincerely,

Sue Badenhop
Project Director

Appendix G

Postcard Follow-up (1983)

February 22, 1983

Last week a questionnaire seeking your opinion about energy directions and concerns facing Oregon and other western states was mailed to you.

If you already completed and returned the questionnaire, please accept our sincere thanks. If not, please do so today. Your household was drawn in a random sample of ten western states. Because it has been sent to a small representative sample of people throughout the western United States, it is extremely important that yours be included in the study.

If by some chance you did not receive the questionnaire, or it was misplaced, please call me collect (503)754-3211, and I will get another one in the mail to you today.

Sincerely,

Signature redacted for privacy.

Sue Badenhop

Project Director

Appendix H

Second Follow-up (1981)

School of Home Economics
Oregon State University
Corvallis, Oregon 97331 (503) 754-3551

March 30, 1981

About three weeks ago I wrote seeking your opinion about some home-related energy issues facing people throughout the western United States. To the best of my knowledge, I have not received your completed questionnaire.

This study has been undertaken as a regional project by ten Agricultural Experiment Stations in the belief that citizens of the western region should be heard in the formation of public policy concerning energy. It is the largest study concerning energy opinion conducted in the western region.

Your name was selected through a scientific sampling process in which every household in Oregon had a chance of being drawn. This means that you represent a large number of Oregon households. In order that the results be truly representative, it is essential that each person return the questionnaire.

In the event that your questionnaire has been mislaid, a replacement is enclosed. Your help is greatly appreciated.

Cordially,

Suzanne Badenhop
Project Director

Enclosure

Appendix I

Second Follow-up (1983)

School of Home Economics
Oregon State University
Corvallis, Oregon 97331
(503) 754-3551

March 7, 1983

About three weeks ago I wrote you seeking your opinion about some home related energy issues facing us. As of today I have not yet received your completed questionnaire.

This study has been undertaken as a regional project by ten Agricultural Experiment Stations in the belief that citizens of the Western Region should be heard in the formation of public policies concerning energy. It is the largest study concerning energy opinions ever conducted in the Western Region.

I am writing to you again because your opinions are very important to the success of this study. Your name was selected through a scientific sampling process in which every household in Oregon had an equal chance of being drawn. In order that the results be truely representative, it is essential that each person in the sample return the questionnaire.

In the event that your questionnaire has been misplaced, a replacement is enclosed.

Your cooperation is greatly appreciated.

Cordially.

Suzanne Badenhop
Project Director

SB/mm
Enclosure

Appendix J

Third Follow-up Telephone Call Form

Third Follow-up Telephone Call Form

ENERGY DIRECTIONS STUDY FOLLOW-UP

Hello. Is this Mr./Mrs. ______________________?

This is ______________________, and I am calling for ~~Washington~~ OREGON State University at ~~Pullman~~ CORVALLIS. Recently, we sent you a questionnaire that asked your opinions about home-related energy issues. This is for a research study in which we are trying to better understand the concerns people have about the costs of energy in their home. We're calling all of the people who should have received a questionnaire to see if they did receive it, and to find out if there are any questions about the study that we could try to answer.

CALL RECORD

DATE	TIME	INTERVIEW	RESULT AND INSTRUCTIONS

NA = No Answer
NH = Not Home
WR = Will Return
REF = Refused To Talk (when, why, etc.)

IC = Interview Completed
PIC = Partially Completed
WN = Wrong Number
DISC = Disconnected

FOLLOW THE ARROWS (circle number of answer)

Do you recall receiving the questionnaire?

1. YES
2. NO

Have you already filled it out and returned it?

1. YES
2. NO

Good: do you remember about when you mailed it back to us?

____________ DATE

Do you still have the questionnaire or has it been lost or thrown away?

1. LOST OR THROWN AWAY
2. STILL HAVE IT

I can get another copy in the mail to you tomorrow morning, but to do that I need to be sure that the address we have for you is correct. (Read address and correct if necessary.)

Can we expect to hear from you soon? We would really appreciate it since we want to get the results out just as soon as possible.

1. WILL RETURN
2. NONCOMMITTAL
3. REFUSAL

EVERYONE:

Do you have any questions about the study which I can try to answer for you? (Provide summary of what they say.)

IF ALREADY RETURNED:

Thank you very much for taking the time to complete the questionnaire. It is an important study, and we really appreciate your help with it.

IF PROMISE OR POSSIBILITY QUESTIONNAIRE WILL BE RETURNED:

We hope to hear from you soon and want you to know that your help is very much appreciated. Also, we will be sending out copies of results that are free to everyone who would like them. If you want a copy, please remember to put your name and address on the return envelope when you return the questionnaire, and we will be sure to send one to you.

FOR CLEAR REFUSALS:

We are sorry that you don't wish to participate in this study, but certainly understand, and we won't contact you again. Thank you very much for talking with us this evening.

Appendix K

Telephone Questioning Procedure

Respondent Number ________

FOLLOW THE ARROWS (Circle Number of Answers)

Call Form (Respondents versus Nonrespondents)

Do you recall receiving the questionnaire

(1) No

I can get another copy in the mail to you tomorrow, but I need to be sure that the address we have for you is correct. (Read address and correct if necessary.)

Yes (2)

Have you already filled it out and returned it?

(3) No

Do you still have the questionnaire or has it been lost or thrown away?

(5) Lost or thrown away

(6) Still have it.

Can we expect to hear from you soon? We would appreciate it since we want to have as many people represented as possible.

(7) Will return

(8) Non-commital

We hope to hear from you soon, and want you to know that your help is appreciated. Also, we will be sending out copies of results that are free. If you want a copy, remember to put your name and address on the return envelope when you return the questionnaire.

(9) Refusal

We are sorry that you do not wish to participate in the entire study, but certainly understand. To help us be sure our findings are complete, would you answer a few short questions now.

Yes (4)

Good: Do you remember about when you mailed it back? DATE ________

Thank you very much for taking the time to complete the questionnaire. It is an important study, and we really appreciate your time with it.

(10) Yes

(Circle the response # or write in reply)

1. (Q-17) Is the home in which you live
   1 RENTED BY YOU
   2 OWNED BY YOU
   3 OWNED IN CONDOMIUM BY YOU
   4 OTHER (Please describe) ________
2. (Q-20) How many years have you lived in your present home? ______ NUMBER OF YEARS (if less than a year, ______ MONTHS)
3. (Q-26) What is your main source of energy for: ________ WATER HEAT ________ SPACE HEAT
4. (Q-11) Thinking about the last year (1980), about how much money did you spend to improve the energy efficiency of you home (e.g., weather-stripping, insulation, set-back thermostats, storm doors, solar equipment)? (if none, please put "0".) $________ 1980 ________ NONE
5. (Q-7) If you were asked to reduce your energy consumption during the entire next year by 1/4—that is 25% less than you now consume—do you feel you could do it?
   1 DEFINITELY
   2 PROBABLY YES
   3 I DON'T KNOW
   4 PROBABLY NO
   5 DEFINITELY NO
6. (Q-1) Some people feel that energy is a serious national problem, but other people feel it is not. We would like to know your opinion. Do you consider meeting the U.S. energy needs during the next 10 to 20 years to be:
   1 NOT A SERIOUS PROBLEM
   2 A SOMEWHAT SERIOUS PROBLEM
   3 SERIOUS PROBLEM
   4 VERY SERIOUS PROBLEM
7. (Q-30) How many people live in your household? ____

No (11)

We will not contact you again. Thank you very much for talking with us this evening.

EVERYONE

Do you have any questions about the study which I can try to answer for you. (Provide summary of what they say. THANK YOU

APPENDIX L

Comparison of Significant Forward Stepwise Regression Coefficients With Significant Standardized Beta Weights for Each Endogenous Variable

For the purpose of comparison, forward stepwise regression equations were performed on the endogenous variables. This is a different regression procedure than that which produced the path coefficients for this study. In a forward stepwise regression procedure, the "best" or strongest determinant from among the independent variables is produced for the dependent variable, then considering that the "best" predictor is included, the next "best" is determined, and so on, until all independent variables have been included. Theoretically, this is a different way of producing coefficients from path analysis. The path analysis procedure views the model to be tested as a whole, with all variables working together in synchronization; therefore, the estimation of a coefficient without considering the effect or existence of the other variables within the model runs counter to the path analysis concept.

However, in order to compare the results of the forward stepwise regression equation with the findings of this study, the significant ($p \leq .05$) determinants of each endogenous variable regressed on the appropriate independent variables in the order of their appearance as "best" predictor have been summarized. The significant ($p \leq .05$) paths of the tested path analysis model in the order of their beta weights have also been summarized.

As noted, there were some differences between the two resultant models. In order to keep to a parallel comparison with older and never housing adjustment models in the housing field and to allow for generation of new models, it is recommended that the path analysis results be used for further study.

Table L-1

Comparison of Significant[a] Forward Stepwise Regression Coefficients with Significant[a] Standardized Beta Weights for Each Endogenous Variable

Variable	Stepwise Regression	P	Entering Coefficient	Path Analysis	P	Beta Weight
Energy Efficiency improve. behavior	Prop. EE	.0002	.160116	Prop. EE	.005	.14
Energy Curtailment Behavior	E. Cond	.0008	.102970	Age	.000	-.22
	Prop. EE	.0037	.140156	Dw. Size	.001	.19
				Prop. EC	.015	-.11
				HH Size	.032	-.11
				E. Cond.	.038	.12
				Educ.	.040	-1.0
				Prop. EE	.044	.10
Propensity for Energy Efficiency improve.	HH Size	.0006	.171980	Tenure	.000	-.27
	E. Cond.	.0246	-.669886	Age	.000	-.21
				E. Cond.	.000	-.24
				Sex	.015	-.11
				Dw. Size	.023	.13
Propensity for Energy Curtail.	HH Size	.0125	.444597			
Compared Energy Efficiency	E. Cond.	.0000	.237077	E. Cond.	.000	.42
	Tenure	.0003	-.256564	Tenure	.003	-.13
	Income	.0047	.875601	HH Size	.021	.10
	HH Size	.0487	.567397	Educ.	.050	-.08
	Age	.0308	.619909			
Energy Conditions	Tenure	.0000	-1.64760	Tenure	.000	-.40
	Dw. Size	.0000	.658663	Dw. Size	.012	.13
Belief	Educ.	.0000	.584477	Age	.016	-.13
				Educ.	.018	.12

APPENDIX M

Correlation Matrix

If two or more independent variables are highly correlated, the problem of multicollinearity arises. Although it is often difficult to assess the impact of multicollinearity (Schumm et al., 1980), the highly interrelated independent variables can lead to substantial differences in the regression coefficients, even to changes in sign.

Nie et al. (1975) reported that multicollinearity can cause problems in three interrelated areas of regression analysis: (1) the coefficients may not be uniquely determined, (2) estimates of the regression coefficients fluctuate from sample to sample, and (3) the greater the intercorrelation of the independent variables, the less the reliability of the coefficients. They suggested two solutions to the problem of multicollinearity: (1) to create a new variable combining the highly intercorrelated variables and use the new combination variable in place of its components and (2) to use only one of the highly intercorrelated variables. Schumm et al. (1980) concurred, yet pointed out the possible use of intercorrelated variables if there was "a great deal of theoretical importance" in their use and in examining which of those variable had the most influence. They pointed out examples of both moderate ($r > .50$) and severe multicollinearity ($r > .75$) in family studies literature and advised caution in the way severely intercorrelated variables were interpreted.

The results of a Pearson correlation of the variables in the tested path analysis model are given in this appendix. Correlations marked with an asterisk were significant at the .05 level. A Pearson correlation matrix was used to summarize the zero-order correlation between two variables into a single number. A zero-order correlation is the relationship between variables exclusvie of other variables. The correlations among the exogenous variables in this study ranged from +/- .0017 to .5383. This would be classified a "moderate" multicollinearity according to Schumm et al. (1980). None of the coefficients was large enough to cause concern. Recommendations for the exogenous variables, however, are given in Chapter IV under "Proposed New Model."

Table M-1

Pearson Correlation Matrix

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	HH Size	-	.2668	.1839*	-.4367*	-.0080	-.0497	.0122	.2916*	.0295	.0782*	.1281	.0787	.1429*	.0534	.0510
2	HH Income		-	.2138	-.1260*	-.0816	-.2070*	.2330*	.5383*	.0566	.2154*	.2356	.0650	.0913*	.0549	.0859
3	Education			-	-.3284*	-.0056	-.0339	.1686*	.1966*	.1979*	.0398	.0486	.1130	.1009*	-.0260	.0903
4	Age				-	-.0733	-.1579*	-.0599	-.0257	-.1326*	.0927*	.0953*	-.0307	-.2082*	-.1739*	-.0969*
5	Sex					-	.0323	.0376	-.0017	.0217	-.0123	-.0312	-.0369	-.1140*	.0180	-.0003
6	Tenure						-	-.0993*	-.2423*	.0514	-.4389*	-.3552*	.0207	-.1469*	-.0506	-.0734
7	Influence							-	.1881*	.0900*	.0712	.0658	.0164	.0642	-.0238	-.0281
8	DW. Size								-	-.0004	.2830*	.2323*	.0433	.1182*	.1554*	.0799
9	Belief									-	-.0411	-.0050	.0599	.0733	.0439	.0575
10	E. Cond.										-	.5187	.0185	-.0953*	.1010*	.0339
11	Comp. EE											-	-.0259	.0184	.0597	-.0111
12	Prop. EC												-	.1210*	-.0448	.0845*
13	Prop. EE													-	.1130*	.1675*
14	E. Curt.														-	.1078*
15	E. Eff.															-

* Significant at the .05 level.

Appendix N

Frequencies

Table N-1

Frequencies for Household Size

Code	Absolute Freq.	Relative Freq. (PCT)	Adjusted Freq. (PCT)	Cum Freq. (PCT)
1	92	16.1	16.1	16.1
2	203	35.4	35.4	51.5
3	97	16.9	16.9	68.4
4	105	18.3	18.3	86.7
5	51	8.9	8.9	95.6
6	20	3.5	3.5	99.1
7	1	.2	.2	99.3
8	2	.3	.3	99.7
10	1	.2	.2	99.8
11	1	.2	.2	100.0
Total	573	100.0	100.0	

Valid Cases 573 Missing Cases 0

Table N-2

Frequencies for Income

Code	Absolute Freq.	Relative Freq. (PCT)	Adjusted Freq. (PCT)	Cum Freq. (PCT)
0	1	.2	100.0	100.0
99	38	6.6	Missing	
	534	93.2	Missing	
Total	573	100.0	100.0	

Valid Cases 1 Missing Cases 572

Table N-3

Frequencies for Education

Code	Absolute Freq.	Relative Freq. (PCT)	Adjusted Freq. (PCT)	Cum Freq. (PCT)
0	2	.3	.4	.4
4	28	4.9	5.1	5.4
10	56	9.8	10.1	15.6
12	125	21.8	22.6	38.2
13	31	5.4	5.6	43.8
14	154	26.9	27.8	71.6
16	72	12.6	13.0	84.6
17	39	6.8	7.1	91.7
19	45	7.9	8.1	99.8
90	1	.2	.2	100.0
99	20	3.5	Missing	
Total	573	100.0	100.0	

Valid Cases 553 Missing Cases 20

Table N-4

Frequencies for Age

Code	Absolute Freq.	Relative Freq. (PCT)	Adjusted Freq. (PCT)	Cum Freq. (PCT)
20	1	.2	.2	.2
21	1	.2	.2	.4
23	12	2.1	2.2	2.6
24	11	1.9	2.0	4.6
25	11	1.9	2.0	6.6
26	10	1.7	1.8	8.5
27	11	1.9	2.0	10.5
28	9	1.6	1.7	12.1
29	12	2.1	2.2	14.3
30	17	3.0	3.1	17.5
31	12	2.1	2.2	19.7
32	14	2.4	2.6	22.2
33	12	2.1	2.2	24.4
34	11	1.9	2.0	26.5
35	11	1.9	2.0	30.5
37	12	2.1	2.2	35.1
38	13	2.3	2.4	35.1
39	13	2.3	2.4	37.5
40	12	2.1	2.2	39.7
41	6	1.0	1.1	40.8

Table N-4 (Cont.)

Code	Absolute Freq.	Relative Freq. (PCT)	Adjusted Freq. (PCT)	Cum Freq. (PCT)
42	2	.3	.4	41.2
43	12	2.1	2.2	43.4
44	15	2.6	2.8	46.1
45	10	1.7	1.8	48.0
46	8	1.4	1.5	49.4
47	3	.5	.6	50.0
48	10	1.7	1.8	51.8
49	8	1.4	1.5	53.3
50	11	1.9	2.0	55.3
51	4	.7	.7	56.1
52	7	1.2	1.3	57.4
53	12	2.1	2.2	59.6
54	12	2.1	2.2	61.8
55	8	1.4	1.5	63.2
56	13	2.3	2.4	65.6
57	13	2.3	2.4	68.0
58	13	2.3	2.4	70.4
59	9	1.6	1.7	72.1
60	12	2.1	2.2	74.3
61	11	1.9	2.0	76.3
62	11	1.9	2.0	78.3

Table N (Cont.)

Code	Absolute Freq.	Relative Freq. (PCT)	Adjusted Freq. (PCT)	Cum Freq. (PCT)
63	11	1.9	2.0	80.3
64	11	1.9	2.0	82.4
65	11	1.9	2.0	84.4
66	7	1.2	1.3	85.7
67	8	1.4	1.5	87.1
68	13	2.3	2.4	89.5
69	4	.7	.7	90.3
70	10	1.7	1.8	92.1
71	8	1.4	1.5	93.6
72	4	.7	.7	94.3
73	4	.7	.7	95.0
74	3	.5	.6	95.6
75	2	.3	.4	96.0
76	3	.5	.6	96.5
77	4	.7	.7	97.2
78	1	.2	.2	97.4
79	1	.2	.2	97.6
80	4	.7	.7	98.3
81	1	.2	.2	98.5
82	2	.3	.4	98.9
83	1	.2	.2	99.1

Table N (Cont.)

Code	Absolute Freq.	Relative Freq. (PCT)	Adjusted Freq. (PCT)	Cum Freq. (PCT)
84	1	.2	.2	99.3
88	1	.2	.2	99.4
89	1	.2	.2	99.6
91	1	.2	.2	99.8
92	1	.2	.2	100.0
99	29	5.1	Missing	
Total	573	100.0	100.0	

Valid Cases 544 Missing Cases 29

Table N-5

Frequencies for Sex

Code	Absolute Freq.	Relative Freq. (PCT)	Adjusted Freq. (PCT)	Cum Freq. (PCT)
1	233	40.7	100.0	100.0
9	19	3.3	Missing	
-1 = 2	321	56.0	Missing	
Total	573	100.0	100.0	

Valid Cases 233 Missing Cases 340

Table N-6

Frequencies for Tenure

Code	Absolute Freq.	Relative Freq. (PCT)	Adjusted Freq. (PCT)	Cum Freq. (PCT)
-1 = 2, 3	502	87.6	89.2	89.2
1	61	10.6	10.8	100.0
9	10	1.7	Missing	
Total	573	100.0	100.0	

Valid Cases 563 Missing Cases 10

Table N-7

Frequencies for Perceived Influence of Energy Costs

Code	Absolute Freq.	Relative Freq. (PCT)	Adjusted Freq. (PCT)	Cum Freq. (PCT)
1	82	14.3	14.7	14.7
2	297	51.8	53.2	67.9
3	151	26.4	27.1	95.0
4	26	4.5	4.7	99.6
5	2	.3	.4	100.0
9	15	2.6	Missing	
Total	573	100.0	100.0	

Valid Cases 558 Missing Cases 15

Table N-8

Frequencies for Physical Size of Home

Code	Absolute Freq.	Relative Freq. (PCT)	Adjusted Freq. (PCT)	Cum Freq. (PCT)
250	11	1.9	2.0	2.0
750	109	19.0	19.6	21.6
1250	190	33.2	34.2	55.8
1750	139	24.3	25.0	80.8
2250	58	10.1	10.4	91.2
2750	49	8.6	8.8	100.0
9	17	3.0	Missing	
Total	573	100.0	100.0	

Valid Cases 556 Missing Cases 17

Table N-9

Frequencies for Belief in the Energy Problem

Code	Absolute Freq.	Relative Freq. (PCT)	Adjusted Freq. (PCT)	Cum Freq. (PCT)
1	15	2.6	2.8	2.8
2	99	17.3	18.2	20.9
3	242	42.2	44.4	65.3
4	189	33.0	34.7	100.0
9	28	4.9	Missing	
Total	573	100.0	100.0	

Valid Cases 545 Missing Cases 28

Table N-10

Frequencies for Energy Conditions

Code	Absolute Freq.	Relative Freq. (PCT)	Adjusted Freq. (PCT)	Cum Freq. (PCT)
0	33	5.8	5.8	5.8
1	29	5.1	5.1	10.8
2	45	7.9	7.9	18.7
3	58	10.1	10.1	28.8
4	91	15.9	15.9	44.7
5	81	14.1	14.1	58.8
6	101	17.6	17.6	76.4
7	70	12.2	12.2	88.7
8	44	7.7	7.7	96.3
9	17	3.0	3.0	99.3
10	4	.7	.7	100.0
Total	573	100.0	100.0	

Valid Cases 573 Missing Cases 0

Table N-11

Frequencies for Compared Energy Efficiency

Code	Absolute Freq.	Relative Freq. (PCT)	Adjusted Freq. (PCT)	Cum Freq. (PCT)
1	25	4.4	4.4	4.4
2	52	9.1	9.2	13.7
3	202	35.3	35.8	49.5
4	206	36.0	36.5	86.0
5	79	13.8	14.0	100.0
9	9	1.6	Missing	
Total	573	100.0	100.0	

Valid Cases 564 Missing Cases 9

Table N-12

Frequencies for Propensity for Energy Curtailment

Code	Absolute Freq.	Relative Freq. (PCT)	Adjusted Freq. (PCT)	Cum Freq. (PCT)
0	469	81.8	81.8	81.8
1	81	14.1	14.1	96.0
2	20	3.5	3.5	99.5
3	1	.2	.2	99.7
4	2	.3	.3	100.0
Total	573	100.0	100.0	

Valid Cases 573 Missing Cases 0

Table N-13

Frequencies for Propensity for Energy Efficiency

Code	Absolute Freq.	Relative Freq. (PCT)	Adjusted Freq. (PCT)	Cum Freq. (PCT)
0	306	53.4	53.4	53.4
1	110	19.2	19.2	72.6
2	67	11.7	11.7	84.3
3	45	7.9	7.9	92.1
4	23	4.0	4.0	96.2
5	10	1.7	1.7	97.9
6	3	.5	.5	98.4
7	5	.9	.9	99.3
8	4	.7	.7	100.0
Total	573	100.0	100.0	

Valid Cases 573 Missing Cases 0

Table N-14

Frequencies for Energy Curtailment Behavior

Code	Absolute Freq.	Relative Freq. (PCT)	Adjusted Freq. (PCT)	Cum Freq. (PCT)
0	32	5.6	5.6	5.6
1	47	8.2	8.2	13.8
2	84	14.7	14.7	28.4
3	155	27.1	27.1	55.5
4	128	22.3	22.3	77.8
5	88	15.4	15.4	93.2
6	39	6.8	6.8	100.0
Total	573	100.0	100.0	

Valid Cases 573 Missing Cases 0

Table N-15

Frequencies for Energy Efficiency Behavior

Code	Absolute Freq.	Relative Freq. (PCT)	Adjusted Freq. (PCT)	Cum Freq. (PCT)
0	369	64.4	64.4	64.4
1	112	19.5	19.5	83.9
2	43	7.5	7.5	91.4
3	22	3.8	3.8	95.3
4	9	1.6	1.6	96.9
5	7	1.2	1.2	98.1
6	6	1.0	1.0	99.1
7	1	.2	.2	99.3
9	3	.5	.5	99.8
10	1	.2	.2	100.0
Total	573	100.0	100.0	

Valid Cases 573 Missing Cases 0