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Abridgment

Factors Affecting Willingness to Conserve Gasoline

Catherine E. Meyers

This paper explores the role of travel behavior, demographics, and attitudes toward energy conservation to explain consumer willingness to conserve gasoline. Data from a telephone survey of 500 New York households were analyzed on several measures of willingness to conserve by using a statistical analysis procedure called automatic interaction detection. It was found that willingness to conserve gasoline is generally independent of demographics, travel behavior, and other attitudes toward energy. The factors of mild importance included residence location (New York City residents were more willing to conserve) and attitudes toward use of energy in the United States. Generally, those New Yorkers most willing to conserve were those who had (a) the least to lose if gasoline were curtailed, (b) the most flexibility in current travel behavior, and (c) the most additional service options available. A brief review of other recent surveys shows that the public is consistently receptive to policy that encourages gasoline conservation by increasing travel options and offering incentives for their use. Punitive or restrictive measures are met with strong disfavor. Based on the results of this and other studies, policy suggestions include increased perception of travel options and their true costs, increased transit services, and stabilized fares.

In the spring and summer of 1979, reduced availability and rapid price increases of gasoline disrupted the mobility-oriented American life-style. More than 50 percent of the petroleum consumed in the United States is used by the transportation sector; half of that is used by cars. Obviously, conservation in this sector would contribute significantly to improving the future outlook of our energy situation. If we are to make headway, we must understand how to encourage consumers to conserve gasoline. The purpose of this study is to determine which factors (including travel behavior, demographics, and attitudes toward energy) can be used to predict willingness of travelers to conserve gasoline. A complete description of the analysis and conclusions can be found elsewhere (1).

Numerous surveys and polls have been conducted in recent years concerning Americans' views of energy use and conservation. The National Assessment of Education Progress conducted a nationwide survey of 26- to 34-year-olds in the summer of 1977 (2). More than 90 percent of those surveyed believed that energy and gasoline shortages would be serious problems at some time in the future. The large majority stated that they take energy into consideration when they purchase a car or home, travel to work, and vote (level of education was the most significant variable highlighting differences between groups). Similarly, a statewide poll in Wisconsin conducted in June 1977 (3) showed education to be the only significant differentiating factor: Level of education and awareness of energy issues were directly correlated. Although energy was the most frequently mentioned problem that confronts the state, less than one person in five believed energy shortages would become a permanent feature of American life.

The New York State Department of Transportation conducted a public opinion survey on energy and transportation in the fall of 1977 (4). Almost three-quarters of New York's residents thought that the energy problem was at least fairly serious. The most favored proposal

for cutting gasoline use was encouragement of transit use within cities and between cities. The approaches that increase travel options and offer incentives for saving energy were greatly preferred over forced or travel-restrictive programs.

A nationwide poll conducted for the U.S. Department of Transportation (DOT) in 1978 (5, 6) showed the most favored proposals for reducing gasoline consumption to be as follows:

1. Enforcement of 88-km/h (55-mph) speed limit,
2. Allocation of funds to improve transit, and
3. Encouragement of carpooling.

The least acceptable proposals were gasoline rationing, increased gasoline tax, and restriction of downtown parking. The most frequently cited advantages of commuting by automobile were speed, convenience, and flexibility. Rapid, steep price increases (like those that occurred in the winter of 1973-1974 and spring and summer of 1979) tend to slow down gasoline consumption, whereas gradual, incremental increases do not. Almost all of the changes occurred in discretionary travel and very little in commuting habits. A February 1979 Gallup poll (7) showed that Americans believed energy to be the nation's third-most-important problem, after inflation and foreign policy. (In February 1973, energy did not rank on the list of top 15 problems.) Gasoline rationing that would require a one-quarter reduction in driving was opposed 52 percent to 40 percent; 8 percent had no opinion. Only one-third expected a repetition of the long gasoline lines of 1973-1974. Not quite one-half of the respondents indicated that they were making an effort to save energy in the transportation sector.

In March 1979, 70 percent of those polled by Associated Press-NBC News (8) believed the imminent gasoline shortages were a hoax designed by the major oil companies to force higher prices. This figure dropped by only 5 percent in June (9), even after severe shortages were evident. A survey conducted by the New York Times (10) in May 1979 showed that changes occurred in summer vacation plans in the face of reduced gasoline availability and increased prices. Such changes included shorter automobile trips (particularly those that exceeded a tankful of gasoline), increased use of public transportation, and an increase in travel and lodging reservations.

STUDY DESIGN

The data for this study were collected by the 1977 public opinion survey (4). The data consist of a random telephone survey of 500 households in New York selected in multistage fashion from four geographic strata: New York City, large metropolitan areas, small metropolitan areas, and rural areas. Within strata, sampling is proportional to population.

The question used to derive attitudes toward gasoline conservation consists of 13 proposals to conserve gasoline and was as follows:

Do you agree or disagree with each of the following ways to encourage New Yorkers to cut gasoline use?

1. Law limiting new car size.
2. Tax on new big cars.
3. Enforce 88-km/h (55-mph) speed limit.
4. Increase gasoline prices through taxes.
5. Ration gasoline to families, with certain exemptions.
6. Commuter and parking taxes.
7. Incentives for carpooling.
8. Rebate for buyers of little cars.
9. Encourage people to plan trips better.
10. Encourage people to shop closer to home.
11. Encourage people to shop less frequently.
12. Improve traffic flow on city streets.
13. Build more superhighways.

An answer of agree = 1, neutral = 2, and disagree = 3.

Index = Σ responses/13 range = 1.00-3.00

Consolidation of the 13 responses into one average score yields an attitude index toward gasoline conservation that is used as the dependent variable to be explained by predictor variables.

A statistical grouping procedure known as automatic interaction detector (AID) was used for the analysis. The technique has recently seen much application in transportation planning (1, 11-13). AID produces a series of mutually exclusive binary splits that maximize the between sum of squares (BSS) and minimize the total sum of squares (TSS) between each successive pair. The process continues until no more splits can be made in accord with the given criteria for significance. The BSS for each split divided by the TSS of the sample equals the percentage of variation explained by a split. The BSS and TSS for each split are summed to yield the total amount of variation explained. This statistic, analogous to R^2, defines the power of AID to predict the dependent variable with the given independent variables.

Three series of tests were made, each using the same dependent variable (mean index). The first uses demographics and behavioral data as the predictors (note that the first five listed are the best predictors):

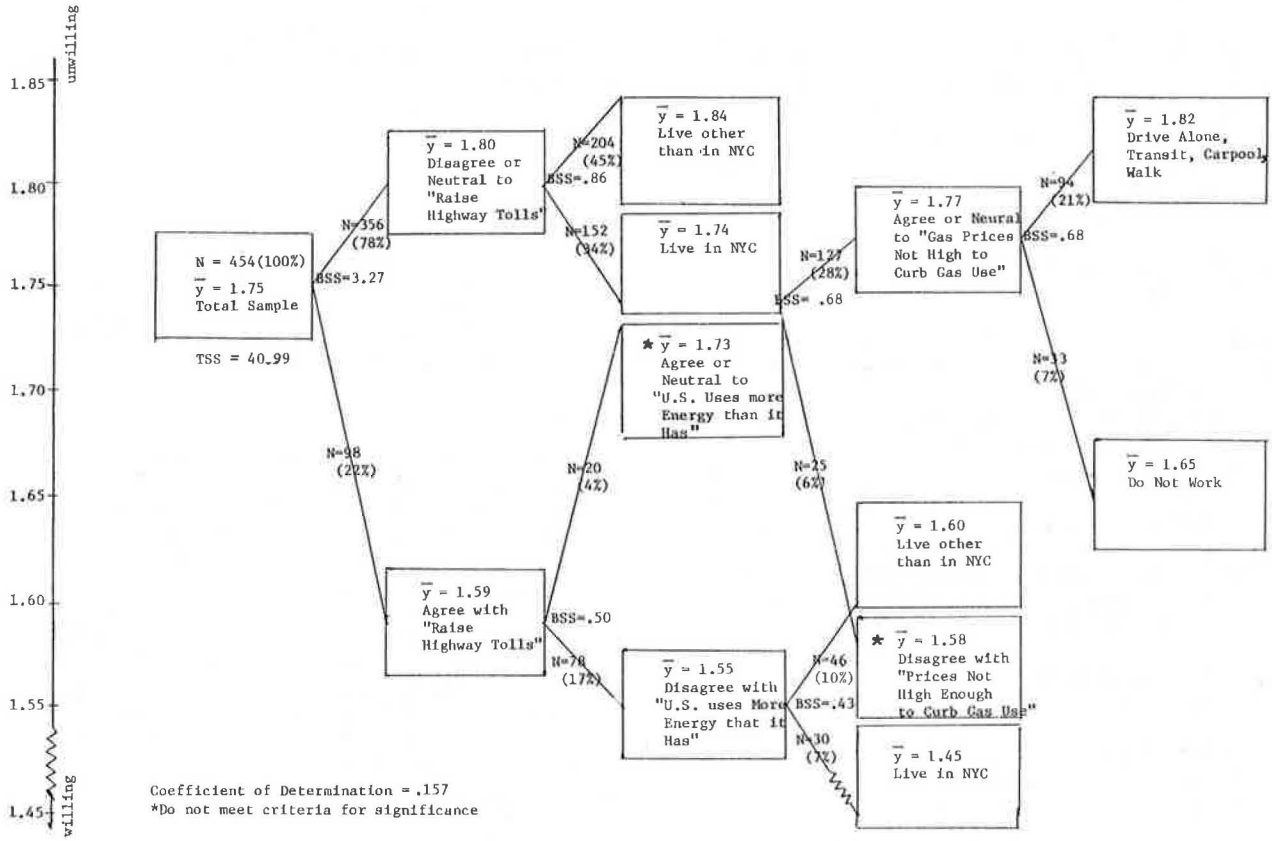
1. Stratum (New York City, large urban, small urban, or rural),
2. Mode to work of principal wage earner,
3. Family size,
4. Number of work or school trips made by members of household yesterday,
5. Number of cars per household,
6. Distance from home to work,
7. Number of shopping or recreation trips made by members of household yesterday,
8. Number of personal business trips made by members of household yesterday,
9. Age of respondent, and
10. Sex of respondent.

A second test uses attitude information toward other aspects of energy as the predictors (note that all but 6c and 6d are the best predictors):

1. Belief in energy crisis,
2. Price of gasoline,
3. "United States uses more energy than we have,"
4. Where should New York conserve energy,
5. How should we encourage transit use within cities, and
6. How should we encourage transit use between cities: (a) higher automobile tolls, (b) lower train and bus fares, (c) higher air passenger tax, or (d) tax break to companies that urge public transportation for business travel.

A third AID analysis was also performed by using the best of both sets of predictors (the first five in the first list and all but 6c and 6d in the second list), meaning those predictors in the first two tests that explained the most variation of the sample data.

Figure 1. Analysis of best behavioral and attitude factors influencing willingness to conserve gasoline.



RESULTS

Overall AID results are shown in Figure 1. In none of these tests were the predictor variables under consideration able to explain more than 15 percent of the variation in attitude toward willingness to conserve gasoline. The results show clearly that willingness to conserve gasoline is apparently independent of many primary demographic, behavioral, and attitudinal descriptors. This result is disconcerting since it suggests that clearly defined consumer segments are not identifiable; therefore, the task of encouraging conservation will not be easy.

The best of behavioral and attitude variables (Figure 1) show that those most agreeable to gasoline conservation were those who feel that raising automobile tolls will encourage gasoline conservation and disagreed that excess U.S. consumption has caused the energy crisis. Those who live outside of New York City and do not agree with raising highway tolls are least willing to conserve.

Location

All our tests showed New York City residents to be more agreeable to gasoline conservation than residents of the rest of the state. This is reasonable since New York City has greater availability of existing transit options and averages fewer cars per household than do other areas of the state. Less dependence on private automobile means New York City residents would incur fewer disruptions of current life-style if gasoline conservation policies are enacted.

Work Travel

The general tendency separates those households whose members work (regardless of mode of travel) from those households that make no work trips; the latter are more agreeable to gasoline conservation. Absence of the daily work trip means that the proportion of discretionary travel is much higher. Discretionary travel lends itself to greater flexibility in timing and ordering of activities that require travel, which increases the probability of finding suitable travel options.

Raise Highway Automobile Tolls

The most significant attitude factor was response to a proposal to raise highway automobile tolls to encourage energy savings between cities. Those who agree with the statement are more agreeable to gasoline conservation than those who are neutral or disagree. Apparently, those who agree view increased travel cost as a tradeoff for retaining travel independence. Furthermore, they may not encounter tolls regularly and would then be insensitive to policy actions.

Awareness of Energy Problem

Not surprisingly, those who did not believe an energy problem exists are least agreeable to conserving gasoline. Although the number of disbelievers is small (N = 24), this observation was congruent with the literature and supports the view that perception of the energy situation as a problem is one underlying factor that contributes to an attitude agreeable to energy conservation.

Lowering Train and Bus Fares

Those who are most agreeable to gasoline conservation find reduced fares to be an incentive for transit use between cities but exclude them as an incentive for transit use within cities. Obviously, situational factors require consideration here. The impact of lowering fares between cities would be primarily on discretionary travel. Lowering fares within cities is intended to attract the daily work trip.

SUMMARY AND POLICY IMPLICATIONS

Willingness to conserve gasoline is generally independent of demographics, patterns of travel behavior, and other attitudes toward energy. Only 15 percent of the variation in willingness to conserve gasoline could be explained in any of the tests made. Those New Yorkers who have options available to them, whose travel behavior patterns are flexible, and who currently consume relatively low amounts of gasoline are most agreeable to gasoline conservation. The public favors policies that increase travel-restrictive and punitive measures. No matter what their potential, policies cannot be effective unless they have public support.

Three component parts interact to effectively increase travel options:

1. Increased service availability,
2. Increased cost availability, and
3. Increased perception of travel options.

The daily commute to work and holiday travel are two separate issues. The daily work trip is nondiscretionary; any changes in services or costs have a high potential impact on daily activity patterns. Vacation travel can be adjusted to accommodate any service or monetary limitations.

With respect to increased services, it is obvious that, unless services are available, they will not be used. Of particular importance is transit service. Planners need to give careful consideration to travel patterns, possible additional or revised transit routes, and increased frequency. Since speed and convenience are often cited as advantages for driving alone, express transit services from areas of high population density, such as apartment complexes, to central business districts must also be considered. Park-and-ride lots located at large shopping malls would minimize required capital investment and provide needed services in some communities. Better transit services between cities, connected to convenient local transit services from depots, would make intercity transit a more attractive alternative for long-distance travel.

Concerning awareness of energy matters, much more can be done to provide practical knowledge about gasoline conservation. Emphasis on conservation in school curriculum is a long-term approach. Fair treatment of energy issues by news media, publicity of available travel options by the advertising and travel industry, and dissemination of information on available options should all be used to provide the public with a better-founded perspective on energy matters for basing travel decisions.

Our studies show that the policies most favored by the public to promote savings in gasoline consumption are those that increase the alternatives for gasoline conservation. Options must be available before they can be chosen. But it is evident that gasoline conservation will not be effectively promoted by any single approach; therefore, an array of travel options is needed. Presentation should be made in such a way that several advantages are perceived (i.e., monetary savings, speed, convenience, and safety). By such means, willingness to conserve gasoline can be increased and gasoline use reduced.

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