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STUDY OF AUTOMOBILE MARKET DYNAMICS
Volume II - Analysis

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16. Abstract

To determine the effects of alternative energy conservation policies on total sales of new cars and upon the distribution by size-class and origin (foreign vs. domestic), in-depth interviews were administered to seven hundred recent new-car buyers. Extensive income and demographic data were collected from the respondents along with information on the characteristics and patterns of use of currently owned vehicles. Four policy options (no change, gasoline taxes, excise taxes proportional to fuel consumption, and regulation of fuel economy) were explained to the respondents. For each policy option, respondents indicated how they thought their automobile purchases for the 1976-1980 time period would be affected in terms of vehicle size, origin, timing of purchase, etc.

Volume II describes the work in providing statistical inputs to a computer model by examining the effects of various options on the number of automobiles sold; the distribution of sales among small, medium and large cars; the distribution between automobiles of foreign and domestic manufacturers; and the gross revenue resulting from the automobile sales.

Volume I of this report describes the scenarios for each of the policy options, presents the survey findings, and estimates their applications on government policies.

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PREFACE

This report was prepared by the staff of Arthur D. Little, Inc., for ıe U.S. Department of Transportation (DOT), Transportation Systems Center [SC), Transportation Energy Efficiency Program (TEEP). The objective of ıe study was to develop alternative scenarios to reduce the amount of ısoline used, and to determine the effects of these alternatives on the ıtional economy, specifically, the total sales of new cars.

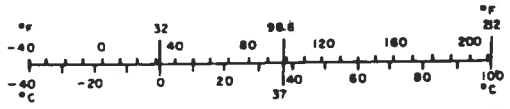
The authors wish to thank Marjorie D. Jensen, Katherine Neill and ła Doane of Arthur D. Little, Inc., and Joseph Adler of Bee Angell and ssociates, Inc., for their assistance in preparing this report. The ıthors also wish to acknowledge the assistance of John K. Pollard of the ransportation Systems Center, the Technical Monitor of the contract, for ıs assistance and contributions.

Approximate Conversions to Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
in	inches	2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
		AREA		
in^2	square inches	6.5	square centimeters	cm^2
ft^2	square feet	0.09	square meters	m^2
yd^2	square yards	0.8	square meters	m^2
mi^2	square miles	2.6	square kilometers	km^2
	acres	0.4	hectares	ha
		MASS (weight)		
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
		VOLUME		
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft^3	cubic feet	0.03	cubic meters	m^3
yd^3	cubic yards	0.76	cubic meters	m^3
		TEMPERATURE (exact)		
	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
		AREA		
cm^2	square centimeters	0.16	square inches	in^2
m^2	square meters	1.2	square yards	yd^2
km^2	square kilometers	0.4	square miles	mi^2
ha	hectares (10,000 m^2)	2.5	acres	
		MASS (weight)		
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
		VOLUME		
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m^3	cubic meters	35	cubic feet	ft^3
m^3	cubic meters	1.3	cubic yards	yd^3
		TEMPERATURE (exact)		
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F



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1. INTRODUCTION

1.1 PURPOSE

This report describes our work in Task 5 (Final Test of Consumer Responses) of the Study of Automobile Market Dynamics. The study as a whole examines some options which the Federal Government might institute in order to reduce the amount of gasoline used by passenger automobiles during 1976-1980. We examined effects of the options on:

The number of automobiles sold;

The distribution of sales among small, medium and large cars;

The distribution between automobiles of foreign and domestic manufacturers; and

The gross revenues resulting from these automobile sales.

The substantive purpose of Task 5 was to provide data to shed light on these questions and to provide statistical inputs to a computer model.

1.2 RELATIONSHIP OF TASK 5 TO OTHER TASKS IN THIS STUDY

In Task 1, Definition of Critical Vehicle Parameters, we examined technological changes in vehicles, which would significantly reduce their gasoline expenditures. We identified those which would be available for mass production by 1980 and which would also have an effect on consumer purchasing decisions. We identified the costs to consumers of the automobile technological changes. Some preliminary estimates of effects of the government options were made. A report was submitted to the Transportation Systems Center (TSC). Task 1 formed part of the basis for our scenarios.

We also issued a report to TSC on the outputs of Task 2, Initial Formulation of Policy Implementation Scenarios. The report begins with a brief tutorial on the automotive industry. Then each scenario is developed and discussed in detail. The discussions describe the societal, economic, technological, and regulatory conditions of the scenarios, then outline their presumed effects on the government, on manufacturers and, finally, on consumers.

Our Task 2 thinking through of the scenarios and their ramifications and implications enabled us to express the scenarios in Task 3 in a form that was meaningful to and understandable by consumers. It also produced hypotheses about changes in consumer automobile buying and use, contingent upon the actualization of the scenarios, to look for in the depth survey embodied in Task 5.

In Task 4, Reformulation of Implementation Scenarios, we examined whether any of the scenarios appeared to produce adverse effects on the automotive industry and whether or not changes should be made for Task 5.

The scenarios for Task 5 were revised very little from their Task 3 format. The interview protocol was simplified somewhat to make it easier for both interviewers and respondents to focus their attention on the subject matter of the various scenarios.

Using depth interviews administered to over 700 people, we pursued topics similar to those addressed in Task 3. Our analyses were similar to those of Task 3.

Task 5 provided the backdrop for Task 6, Description of Automobile Market Dynamics, in which we synthesized and integrated our findings and conclusions from all previous tasks. Thus, this Task 5 Report is attached to our final report.

2. SUMMARY OF RESULTS

2.1 PROCEDURAL FINDINGS

In general, the in-depth interview went well. Respondents indicated a high level of interest and understanding of the issues, and, in general, their answers showed logical and consistent patterns in the findings. Some interviewer and response problems were found and noted in Chapter 3 below, but these in no way compromise the findings delineated in Chapters 4 and 5.

Our modified method of respondent selection and the use of a small incentive gift made the selection process much more efficient than was true in Task 3.

A modified version of the model developed in Task 3 served to forecast numbers of and revenues from automobiles sold from 1976 to 1980.

2.2 MAJOR RESEARCH FINDINGS

The various scenarios result in new car sales distributions that differ from one another.

Sales of small and medium size cars increase at the expense of large cars. This is most notable in the Gas Tax scenario.

The scenarios result in increased sales of foreign cars and decreased sales of domestic cars, compared to the "As Is" condition. This is particularly noticeable under the Gas Tax scenario.

.3 PERSPECTIVE

believe that these self-reported changes in behavior must be terpreted in light of history and in light of the people affected by vernment sanctions/penalties associated with the size of car purchased the cost of operating a car. The Task 6 report considers these and her factors in greater detail.

Historically, consumers have been slow in changing long-established behaviors, even with economic incentives. For example, the cost of electricity has increased substantially over the past few years and "brown outs," in some areas, have become quite frequent in peak load periods. Yet the much touted "response" to these situations turns out to be commercial (e.g., company and institutional) interests controlling costs and reducing electricity consumption (or stabilizing consumption) rather than a consumer response.

Under the "As Is" condition, those owning small cars were least loyal to their size class in the car they expected to buy next. Larger car owners were most loyal. Getting people to switch to a small car is apparently only half the battle. Getting them to maintain this size preference is the other half.

Car size loyalty, in all scenarios, is high. Reasons for this loyalty are similar to reasons for buying the car size. Clearly, people are making car choices based on criteria which are important to them and which are reflected by the size of the car they buy. This leads us to believe that with no intervention, either from the economic climate or government actions, these preferences will change only very slowly over time.

New car buyers are predominantly from the higher income groups. Multiple car owners (70% of our sample) are even more likely to be economically advantaged. These owners are most likely to have the luxury of choice in the expenditure of disposable income and are most able to accommodate increased costs of car ownership/operation.

Respondents who were planning their next purchase in 1979 or 1980 were more likely to switch their purchase intentions in response to each scenario than were those planning their next purchase earlier than 1979. Although this is logical for escalating scenarios, such as the Gas Tax and the Excise Tax, it is not logical for the Base Case scenario, nor for small car purchase intenders under the Excise Tax and Regulation scenarios. We suspect that the further away the anticipated purchase is, the less salient are the changes and the less realistic are the reported behaviors. We believe that the self-reported responses of those planning to buy a car in the near future are more accurate than those not contemplating a new car purchase for several years.

Task 5 respondents were less affected by the scenarios than were Task 3 respondents. We suspect that this is an indication that public anxiety about the availability and increased cost of gasoline continues to diminish. We would expect the same diminishing effect over time to any change instituted by the Government.

3. METHODOLOGY

3.1 SAMPLE DESIGN

The sample design used in Task 3 was modified in Task 5 in light of Task 3 experience. In Task 3 we were concerned that all respondents be within six months of a car purchase, having just bought one, or planning to buy one in the next six months. This criterion was deemed essential to provide respondents for whom car purchase decisions are salient, and whose answers might be considered more reliable than answers from respondents whose car purchase is more distant in time.

In Task 3, telephone screening was carried out to select respondents. Numbers were selected using a modified random digit dialing technique, with one referral permitted from each contact who did not qualify due to lack of recent or planned car purchase. Respondents were selected to meet the following criteria:

Decision makers in the car purchase;

Car purchase made with past six months or planning to purchase within next six months; and

Car purchased or to be purchased to meet the size category quota established.

This procedure proved too costly in terms of screening to find qualified respondents; furthermore, analysis of Task 3 showed that we should add still another criterion, which might compound the screening problems.

Therefore, a new selection procedure was employed in Task 5. We obtained names and addresses of purchasers of new cars within the six months immediately prior to the interview from R. L. Polk & Company's lists of automobile registrations. A quota was established to provide an adequate base of respondents with cars of each size category being considered. These names were then screened to obtain respondents who met the following criteria for the Task 5 interview:

Decision maker in the car purchase;

Purchase of a new 1976 model car (purchased in January 1976 or February 1976); and

Intend purchase of another new car before 1981.

In Task 5, note that the criteria specified new car, not new or used car, as in Task 3. This was undertaken because the focus of our study is new car sales in the period 1976-1980, and used car purchases were not relevant to our new car sales projections.

Furthermore, in Task 5 we employed the technique of offering respondents an incentive to participate. In this case, the incentive was a set of Bicentennial coins (a monetary value of $1.00). This was undertaken to combat the unusually high refusal rate encountered in Task 3, due to the length of the in-home interview and the anonymity of the client.

Regional considerations were made to include areas with different transportation situations. Seven metropolitan areas were selected for interviewing in Task 5: Atlanta, Buffalo, Chicago, Denver, Indianapolis, Los Angeles and New Orleans. This gave a geographic spread and a city size range, as well as including areas with and without well-developed public transportation.

A total of 705 in-depth interviews were completed in Task 5. The total number of respondents is divided by metropolitan area as follows:

Atlanta	91	Indianapolis	62
Buffalo	95	Los Angeles	115
Chicago	123	New Orleans	83
Denver	136		

For both Tasks 3 and 5, ADL developed a comprehensive list of automobile brands, both domestic and foreign, organized into ten size categories. (This list is shown in Appendix A.) The categories were established to reflect not only body and engine size, but also performance, styling and luxury features reflected in the price of the car. This list was the basis for the screening quota, as well as for definition of car size selection during the interview itself. The quota given to each metropolitan area was as follows:

Quota I:	Small	Categories 1-4:	33
Quota II:	Midsize	Categories 5-6:	33
Quota III:	Large	Category 7:	34

3.2 CONDUCT OF THE IN-DEPTH INTERVIEWS

To assure coverage of all the necessary factual information in this in-depth interview, the interview guide from Task 3 was modified. In Task 5, we covered the following topics:

1. The "reference car": that new car which will be purchased between June 1976 and 1981.

2. The "replaced car": that car which would be replaced by the reference car.

3. A second car owned by household.

4. The various scenarios proposed in the research contract as refined by Task 4 of this study.

5. Background information about the respondent's household.

6. Estimated and observed odometer readings.

This questionnaire was developed and pretested by ADL, and modified where necessary as the pretest indicated. This draft was approved by the client and submitted to our subcontractor, Bee Angell and Associates, Inc., in Chicago, for field supervision and execution.

Telephone screening identified the qualified respondents, and appointments were made with those willing to participate in the hour-long interview in their homes.

.3 SCENARIOS TESTED

s a result of Task 2, five energy policy "scenarios" were developed in ask 3. These scenarios presented actions which might be taken at the overnmental level and some hypothetical responses by auto manufacturers. hese scenarios were then drafted in language which could be understood y the uninitiated respondents. One scenario from Task 2, stipulating tax rebate of $100 to each adult whether a driver or not, was deemed nappropriate for testing in the survey, since the income effect of $100 as too insignificant for reliable measurement. Thus, four scenarios ere tested for respondents' reactions in Task 3, and modified in Task 4. ne four scenarios were rotated in their order of presentation to the espondents. This was done to minimize any imbalance created by the der effect of reacting most actively to the first situation presented.

iese scenarios are described below, quoted from the Task 5 survey istrument itself, to illustrate the facts presented and the language d manner of their presentation. The scenarios are described in more tail in the Appendix to Volume I of this report.

3.1. Base Case

this case, we have the situation where:

Gasoline costs 60¢ a gallon;

Mileage has improved two-three miles per gallon in all cars sold in the United States; and

Car prices will increase $200-300 per car.

3.2. Gasoline Tax Case

this case, we have a gasoline tax situation. It would work like this:

Gasoline is 60¢ a gallon. By January 1, 1977, 10¢ is added to the cost of a gallon of gasoline, making it cost 70¢ a gallon. One year later, another 10¢ is added, so gas would cost 80¢. A year later, January, 1979, another 10¢ tax and gas would cost 90¢ a gallon. By January, 1980, when another 10¢ tax is on, gas would cost $1.00 a gallon.

Manufacturers improve miles per gallon in all cars and new car prices will increase $200-300 per car. Ignore any inflation--pretend these are today's prices.

.3. Excise Tax Case

this case, we have an excise tax situation. It would work like this:

In 1976 and 1977 there would be no excise tax in effect. Then in 1978, new luxury cars have a one-time lump sum excise tax of $100 in addition to the price of the car. Note that these taxes are not paid each year, just at the time of purchasing a new car. Note also that the tax is added to the price of the car and must be paid in one sum to the Government, not financed with the car payments.

Not all new cars would have this excise tax--it would be placed only on the "gas guzzlers." Cars getting fewer miles per gallon would have a high excise tax, while those that get more miles per gallon would have a low tax, or even no tax at all.

The chart shows how the taxes will go up each year and how there are more cars included in the tax. By 1981 luxury cars have a tax of $600, and even the intermediate cars will have a tax, although it is $100, smaller than taxes on other cars. Notice

how the compacts and subcompacts have no excise tax. even in 1981. Their gas mileage is high enough to escape the excise tax. The 1981 tax program would remain in force.

Manufacturers will improve miles per gallon in all cars, and new car prices will increase $200-300 per car. Ignore any inflation as time passes--pretend these are today's prices. Gas will cost 60¢ a gallon.

DESCRIPTION OF THE "EXCISE TAX CASE"

	1976	1977	1978	1979	1980	1981 and Beyond
Subcompact	0	0	0	0	0	0
Sports/Specialty	0	0	0	0	0	0
Subcompact A	0	0	0	0	0	0
Subcompact B	0	0	0	0	0	0
Compact A	0	0	0	0	0	0
Compact B	0	0	0	0	0	0
Intermediate	0	0	0	0	$100	$100
Standard A	0	0	0	$100	200	300
Standard B	0	0	0	100	200	300
Luxury	0	0	$100	300	500	600

.3.4. The Regulation Case

n this case we have a situation where Congress requires manufacturers to chieve a sales-weighted average of cars with miles per gallon higher than as been true in the past. If they cannot do this through improved echnology, they must do so by limiting the sales of larger cars which get ewer miles to the gallon. Larger cars could only be sold as enough naller cars are sold. If not enough new small cars are sold, the dealer annot sell more larger cars, and would have to tell some interested arge car buyers that he was "out of quota." He would be able to sell ore large cars after more small cars have been sold.

: the same time, gas costs 60¢ a gallon, and new car prices will increase !00-300 per car.

.4 CAUTIONS/OBSERVATIONS

.4.1. Cell Size

espite the reasonably large sample size of over 700 respondents, everal factors have combined to produce, in several cases, cell sizes hat are extremely small. This has occurred because the 705 espondents we interviewed were unevenly divided as to the size of car hey expected to purchase next and the year when they expected to ırchase their next new car. Furthermore, in each scenario the major- :y elected to purchase a car of the same size and the same origin e.g., foreign/domestic), leaving few people in any cell which pertains) size, manufacture and year. An example is given below. Appendix C ıows the cell sizes for all cases and years by size and foreign/)mestic origin.

Total respondents:	705
Number intending to buy a small car:	150
Number intending to buy a small car in 1976:	10
Number originally intending to buy a small car who intend to buy a small car in Gas Tax case in 1976:	9

r this reason, we disaggregated foreign/domestic from the size matrices prevent further diminution of cell sizes. Nonetheless, when one rson makes a change, this can represent as much as a 10% switching ctor in our matrices.

.2. Postponement

stponement of purchase is, we believe, understated in earlier years in ch scenario and overstated in later years. In part, this is due to our estion wording and skip pattern; in part, this is due to our time ıme of interest. The "no car" category is a postponement phenomenon l should not be considered as a permanent drop out of the marketplace. would feel more comfortable with our projections if we were able to ermine the year in which a postponer would then purchase a new car g., a 1976 postponer would buy in 1978 instead). Our data do not ow us to do this. We feel that 1976 and 1977 sales should be lower n projected; 1979 and 1980 should be higher (because of 1976, 1977 1978 postponers showing up in later years to offset, at least tially, the postponers in 1979 and 1980).

3.4.3. Errors

The questionnaire is sufficiently complex as to make accurate completion difficult. Respondents are asked about cars up to ten separate times--sometimes about the same car, sometimes about different cars. We have a "quota car," a "reference car" (the car that will be bought next), a "replacement car" (the car that this new car will replace--and it may well be the quota car), a car choice for each of the four scenarios, and each car presently owned.

To compound the confusion which this questioning may create, respondents are categorized as to whether their choice of car in each scenario is larger than, smaller than, or the same size as the reference car. Their perception of changing the size of their car may not fit with DOT's perception of switching, due to DOT's aggregation of sizes. For example, someone switching from a category 4 car to a category 2 car may consider himself having "changed sizes," but by DOT standards, this is still a "small" car.

The responses must therefore be interpreted in light of these complexities.

3.4.4. Impact Analysis

Studies to assess the potential impact of events ideally should be studied over time and under varying economic climates to assess whether or not the impact of an action lessens over time. For example, the recent swing back to larger cars, without a substantial drop in the cost of gasoline, may well indicate "acceptance" of the present gasoline prices.

In addition, a large enough and precise enough sample should be drawn so that the characteristics of "switchers," if they differ significantly, can be related to the U.S. population and thus projections can be weighted to those groups, using Census data.

Without these indicators, our projections are rough approximations at best. A much more sophisticated, dynamic model is needed in order to be definitive about the precise impacts of the various scenarios; this model is dependent upon a larger, longer-term study, with more data points to include in the evolution of sales patterns.

What these data do, however, is to show the relative impacts of the various scenarios. Their value lies in a comparison of self-reported impacts to determine which scenarios are most likely to encourage the switch to smaller cars.

4. RESEARCH FINDINGS

4.1 CHARACTERISTICS OF RESPONDENT HOUSEHOLDS

Table 1 summarizes the characteristics of respondent households. Since it is well known that car ownership and income are positively related,[1] we would expect any sample of new car purchasers to be skewed toward higher income, higher education and multiple car households. Our data confirm this expectation. However, a comparison with the U.S. News & Work Report's new car buyers[2] indicates our sample somewhat under-represents lower-income buyers.

Two thirds of the respondents were male; their ages were well distributed across the age groupings. The vast majority of households were one-family households in suburban locations. The majority of households contained two adult members, both drivers, and half had no children under 18. Two-car households were most prevalent, although one household in five had three or more cars. In over half of the households, two or more members were gainfully employed.

In this and other sections of the report, results are analyzed by three size classes: I - Small, II - Midsize, III - Large, as defined by TSC:

I - Small = 4-passenger, roominess index 254-261

II - Midsize = 5-passenger, roominess index 262-274

III - Large = 6-passenger, roominess index 275-294

As a group, those who had just purchased a small car were apt to be better educated and younger; they were more likely to have both adults working. They were less likely to be a one-car family. Table 2 gives demographics by quota car size.

---

1. See the Bureau of Census' Current Population Reports, 1973 data. Also see U.S. News & World Report, "The Buyers of New 1974 Automobiles, 1975," which indicated that 83% of new car buyers are in the upper income half of the U.S. population; for multiple car owner new buyers, the figure is 91%.

2. Op. cit.

TABLE 1. DEMOGRAPHIC CHARACTERISTICS

	Our Sample	U.S. News[1] New Car Buyers	U.S. Census[2] All Households
ture of Household			
One family	95%	-	-
One family plus unrelated individuals	1	-	-
Unrelated individuals	3	-	-
Other	1	-	-
usehold Income			
Under $10,000	10%	15%	36%
$10,000-14,999	18	23	24
$15,000-24,999	29	37	28
$25,000 or more	34	24	11
Refused	10	-	-
usehold Employment			
No one employed	7%	-	-
1 person employed	41	-	-
2 people employed	35	-	-
3 people employed	11	-	-
4 or more people employed	5	-	-
ne Location			
Urban	25%	-	-
Suburban	71	-	-
Rural	3	-	-
: Ownership			
1 car	29%	36%	55%
2 cars	48	41	)
3 or more cars	22	23	) 28

[1] U.S. News & World Report, "The Buyers of New 1974 Automobiles, 1975."
[2] Bureau of Census' Current Population Reports, 1974 data.

TABLE 1. DEMOGRAPHIC CHARACTERISTICS

	Our Sample	U.S. News[1] New Car Buyers	U.S. Census[2] All Households
Nature of Household			
One family	95%	-	-
One family plus unrelated individuals	1	-	-
Unrelated individuals	3	-	-
Other	1	-	-
Household Income			
Under $10,000	10%	15%	36%
$10,000-14,999	18	23	24
$15,000-24,999	29	37	28
$25,000 or more	34	24	11
Refused	10	-	-
Household Employment			
No one employed	7%	-	-
1 person employed	41	-	-
2 people employed	35	-	-
3 people employed	11	-	-
4 or more people employed	5	-	-
Home Location			
Urban	25%	-	-
Suburban	71	-	-
Rural	3	-	-
Car Ownership			
1 car	29%	36%	55%
2 cars	48	41	) 28
3 or more cars	22	23	)

1. U.S. News & World Report, "The Buyers of New 1974 Automobiles, 1975."
2. Bureau of Census' Current Population Reports, 1974 data.

TABLE 1. DEMOGRAPHIC CHARACTERISTICS (CONTINUED)

	Our Sample	U.S. News New Car Buyers	U.S. Census All Households
Drivers			
1 driver	16%	-	-
2 drivers	55	-	-
3 drivers	18	-	-
4 or more drivers	11	-	-
Number of Household Members Age 18 or More			
1	10%	-	-
2	59	-	-
3	19	-	-
4 or more	12	-	-
Number of Household Members Under Age 18			
0	50%	-	-
1	20	-	-
2	19	-	-
3 or more	11	-	-
Regular Users of Public Transportation			
No users	84%	-	-
1 or more users	14	-	-
Respondent Age			
Teens	1%	-	-
Twenties	25	-	-
Thirties	23	-	-
Forties	21	-	-
Fifties	17	-	-
Sixties or more	12	-	-

TABLE 1. DEMOGRAPHIC CHARACTERISTICS (CONTINUED)

	Our Sample	U.S. News New Car Buyers	U.S. Census All Households
Respondent Education			
High school incomplete	10%	) 32%(3)	37%
High school complete	31	)	34
1-3 years college	27	24	13
4+ years college	32	30	16
Respondent Sex			
Male	66%	-	-
Female	34	-	-

3. Education of household head.

TABLE 2. DEMOGRAPHIC CHARACTERISTICS BY QUOTA CAR SIZE

	Small	Medium	Large
Nature of Household			
One family	93%	96%	95%
One family plus unrelated individuals	1	1	2
Other	6	3	3
Household Income			
Under $10,000	10%	13%	6%
$10,000-14,999	17	20	16
$15,000-24,999	34	29	24
$25,000-34,999	21	23	24
$35,000 or more	11	7	15
Household Employment			
No one employed	3%	9%	9%
1 person employed	36	44	43
2 people employed	41	32	32
3 or more people employed	20	14	15
Home Location			
Urban	20%	32%	24%
Suburban	73	67	72
Rural	6	1	3
Car Ownership			
1 car	22%	35%	30%
2 cars	51	43	51
3 or more cars	27	21	19
Number of Drivers			
1 driver	13%	21%	15%
2 drivers	55	51	57
3 drivers	21	16	16
4 or more drivers	11	12	11

TABLE 2. DEMOGRAPHIC CHARACTERISTICS BY QUOTA CAR SIZE (CONTINUED)

	Small	Medium	Large
Number of Household Members Age 18 or More			
1	8%	12%	11%
2	58	57	61
3	22	19	17
4 or more	12	11	11
Number of Household Members Under Age 18			
0	48%	49%	52%
1	24	21	14
2	16	19	21
3 or more	11	2	11
Regular Users of Public Transportation			
0	88%	83%	82%
1 or more	10	16	17
Respondent Age			
Twenties or less	40%	25%	14%
Thirties	23	19	28
Forties	18	23	22
Fifties or more	19	32	36
Respondent Education			
High school incomplete	9%	11%	11%
High school complete	23	34	35
1-3 years college	25	25	29
4+ years college	42	29	24

4.2 ODOMETER READINGS

In order to develop background information for a study it expected to carry out, TSC asked us to add a section on odometer readings to the depth interview. In this section, we asked respondents to estimate the odometer reading for each auto owned by the household. The interviewer then visually ascertained the actual odometer reading. Six months from the time these interviews were carried out, all respondents will be contacted again to determine their automobile's odometer readings at that time. This will provide indications of the mileage put on cars of different sizes, owned by families of various characteristics, etc.

In this instance, we were interested primarily in the ability of respondents to estimate their odometer reading accurately, and in the ability of interviewers to obtain the needed information. As seen below, about three-quarters of the respondents were able to estimate the readings accurately, within ten percent of the actual. This was true whether the auto in question was the first (or only) one in the household, the second, or the third.

Car	Estimate Within 10% of Actual		Estimate off by More than 10%		One or Both Readings not Obtained	
	n	%	n	%	n	%
1 (n=705)	529	75	129	18	47	7
2 (n=500)	369	74	80	16	51	10
3 (n=158)	115	73	25	16	18	11

In about one tenth of the cases, the interviewer was not able to obtain an estimate or an actual reading during the visit. This inability increased with the number of cars in the family. We may surmise that the more cars in the household, the more likely it was that one of them was not at the family's residence at the time of the interview.

There were 104 cases (out of 705), or 15% of the households, in which one or more of the estimates or actual readings was not obtained.

4.3 REFERENCE CAR DATA

Although the emphasis of the interview concerned reactions to each of the four scenarios, information was also collected on the car which would be purchased next. This car was used as the "reference car" throughout the interview.

Table 3 illustrates the size of both the "quota car" (the car just purchased) and the "reference car" (the car that will be purchased next) in our sample. The quota car incidence is not meant to be reflective of car sales by size category because a sample was drawn by establishing quotas for small, medium, and large size categories. For the car models included in each size class, refer to Appendix A.

TABLE 3. SIZE OF QUOTA AND REFERENCE CARS

	Quota Car (Just Purchased)		Reference Car (Next Purchase)	
	No.	%	No.	%
Small				
1. Subsubcompact	79	11	50	7
2. Sports/specialty	19	3	30	4
3. Subcompact A	101	14	59	8
4. Subcompact B	37	5	11	2
	236	33%	150	21%
Midsize				
5. Compact A	145	21	94	13
6. Compact B	83	12	88	13
	228	33%	182	26%
Large				
7. Intermediate	119	17	154	22
8. Standard A	32	4	52	7
9. Standard B	60	9	79	11
0. Luxury	30	4	63	9
	241	34%	348	49%
Other				
Truck/van	-	-	30	3
Don't know	-	-	5	1
			35	4%

As a group, small reference car purchasers share many of the demographic characteristics as small quota car owners: better educated, younger and both adults working.

As Table 4 indicates, those who had just purchased a small car as the quota car were least likely to be planning on the same size of car for their next purchase. These figures must be viewed in light of what car will be replaced next, however. As can be seen in Table 4, small (quota) car owners were also least likely to be replacing their quota car (e.g., 1976 car) next.

Let us look, in Table 5, at those instances where the respondent intends to replace the quota car next, and see the kind of car which will replace it. We see that in these instances, those who have just bought a new small car are most likely to replace it with one of the same size.

But examination of Table 6 shows us the situation for all the cars that will be replaced in the Next five years under the "As Is" condition (not just those which constituted the reference cars). Under the "As Is" condition--e.g., without any planned interference in the buying process--74% of the households plan to remain loyal to their size class, 15% plan to switch to a smaller size car, and 9% plan to switch to a larger size car. The relationships shown here corroborate the ones in Table 4, namely that small car owners are least likely to replace their small cars with ones of the same size, and large car owners most likely to do so.

TABLE 4. SIZE LOYALTY BETWEEN QUOTA AND REFERENCE CARS

	Quota Car (Car Just Bought)		
	Small	Medium	Large
Reference Car (Car Purchased Next)			
Small	49%	9%	7%
Medium	16	57	6
Large	35	32	86
Other (van/truck)	-	2	1
	100%	100%	100%
Percent Replacing Their 1976 Car (i.e., Quota Car) Next	43%	60%	65%

TABLE 5. SIZE LOYALTY BETWEEN QUOTA AND REFERENCE CARS, WHEN QUOTA CAR IS NEXT ONE TO BE REPLACED

Size of Quota Car Which Will Be Replaced		Size of Reference Car		
		Small	Medium	Larger
Small	(n=81)	89%	5%	6%
Medium	(n=108)	11	84	5
Large	(n=200)	8	15	77

TABLE 6. LOYALTY TO SIZE CATEGORY UNDER "AS IS" CONDITION

Car That Will Be Replaced	Reference Car			
	Small	Medium	Large	Used Car, Undecided
Small (n=155)	62%	16%	18%	4%
Medium (n=164)	5	67	24	4
Large (n=303)	7	10	81	2

Table 7 gives characteristics of the reference car by car size. Foreign cars are expected to comprise over half the small reference cars, but only 4% of the large reference cars. Small cars are more likely to be associated with commuting and are expected to travel the furthest; large cars are more likely to be associated with vacations and trips. The reasons for purchase are clearly differentiated by car size. While MPG is predominant for small cars, almost half of the large car buyers emphasize comfort. Economical operations is second in importance for small cars, while "the right size for my family" is second in importance for large and a close third (after "good gas mileage") for midsize cars.

4.4 "AS IS" CONDITION

Table 8 summarizes some of the descriptive information about both the reference car and the car it will replace: model size, origin, condition at purchase, model year of car, miles per gallon, mileage, use and reasons for selecting. Note that for many recent buyers, the next car replaced is the one just bought--the quota car. The prime replacement years will be 1978, 1979 and 1980. On the average, it will be 3.6 years before the next car is bought. The replacement car is slightly more apt to be foreign. Mileage is expected to be improved, even when there is no anticipation of purchasing a smaller sized car. Respondents also anticipate increased mileage driven in the first year on their next cars, over mileage driven in the past year on the car their next car will replace, despite no anticipated changes in the primary use of the car. This is consistent with statistics indicating that a new car is driven more miles in its first year than in subsequent years. Note also that the average number of miles driven is quite high, as would be expected, since heavy drivers would be apt to trade their cars in more frequently. Although virtually the same reasons obtain for selecting the reference car as existed for the car that will be replaced, price has declined as a major reason.

4.5 WHY RESPONDENTS SWITCHED UNDER THE SCENARIOS

Chapter 5 details the impacts of each of the scenarios. Appendix D contains tables delineating switching patterns in terms of car size and car origin, and gives the average purchase postponement as well. As these tables indicate, the Gas Tax case produces the greatest switching to small cars and to foreign cars. It also is most likely to encourage postponement of purchase for small car purchasers. The Excise Tax is most likely to encourage postponement of purchase for medium and large car purchasers.

As mentioned above, we collapsed our original ten size categories of cars into three for the analyses. Obviously, the more categories used in the analysis, the greater the probability that respondents would switch from one to another. We generated Table 9 in order to see how much more switching to another size category would appear, if we were to use the original 10 categories. The biggest difference due to categorization

TABLE 7. CHARACTERISTICS OF REFERENCE CARS, BY SIZE OF REFERENCE CAR

	Reference Car		
	Small	Medium	Large
Origin			
Foreign	54%	22%	4%
Domestic	46	78	96
Average Years to Purchase	3.53	3.69	3.57
Average Miles Per Gallon	25.05	21.01	16.86
Average Yearly Miles Travelled	15,300	13,480	14,180
Use			
Business	13%	18%	15%
Commuting	61	53	47
Family errands	31	31	36
Vacations/trips	12	11	24
Other	3	3	3
Reasons for Selecting			
Comfortable	8%	34%	49%
Right size	28	37	37
Like its looks	29	36	30
Good gas mileage	55	38	15
Doesn't cost too much to run	43	25	11
Holds the road	18	20	21
Right price range	28	20	15
Experience	14	14	24

TABLE 8. CHARACTERISTICS OF REFERENCE CAR AND CAR IT WILL REPLACE

	Car Reference Car Will Replace*	Reference Car (Next Purchase)
n =	632	705
Model		
Sedan	88%	85%
Wagon	10	11
Van/truck	1	3
No answer/don't know	1	1
Size		
Small	25%	21%
Medium	26	26
Large	48	49
Other	1	3
No answer	-	1
Origin		
Foreign	16%	20%
Domestic	84	80

χ^2: 3.77, df 2, .05 level of significance = 3.84

Condition at Purchase		
New	91%	100%**
Used	9	-

*For 73 households, or 10% of the sample, the car will be an addition to their car stock and will not replace a present car.

**To qualify for inclusion in our sample, the next car to be purchased had to be purchased new.

TABLE 8. CHARACTERISTICS OF REFERENCE CAR AND CAR IT WILL REPLACE (CONTINUED)

	Car Reference Car Will Replace	Reference Car (Next Purchase)
Model Year of Car		
Don't know	-	1%
1981+	-	7
1980	-	26
1979	-	24
1978	-	24
1977	-	14
1976	62%	4
1975	6	-
1974	6	-
1973	6	-
1972	5	-
1971	4	-
1970	3	-
1969	2	-
1968	2	-
1967 or earlier	3	-
Miles Per Gallon		
9 or less	3%	2%
10-12	16	9
13-16	34	23
17-20	24	29
21-25	12	20
26-30	6	9
31-35	3	5
36 or more	1	3
Don't know	1	1
Average:	17.4	20.4

χ^2: 55.0; df:4; signficant at the <.001 level.

TABLE 8. CHARACTERISTICS OF REFERENCE CAR AND CAR IT WILL REPLACE (CONTINUED)

	Car Reference Car Will Replace	Reference Car (Next Purchase)
Miles Driven[1]		
< 8,001	30%	17%
8,001-10,000	21	19
10,001-15,000	29	35
15,001-20,000	12	16
20,001-50,000	7	11
50,001+	< 1	1
Don't know	1	< 1
χ^2: 35.09; df: 3; significant at the <.001 level.		
Use		
Business	16%	15%
Commuting	51	52
Family errands	33	34
Vacations/trips	15	18
Other	3	3
Don't know	1	-
Reasons for Selecting		
Comfortable	32%	36%
Right size	39	35
Like its looks	29	31
Good gas mileage	28	30
Doesn't cost too much to run	24	22
Holds the road	17	20
Right price range*	25	19
*χ^2: 9.08; df: 1; significant at the .01 level.		

[1] For replaced car, miles driven over the last 12 months; for the reference car, miles expected to be driven during the first 12 months.

shows up for the Gasoline Tax scenario, where 6.6% fewer respondents maintained their choice within each of ten size classes, than was the case where only three size classes were used. A large majority of that 6.6% is accounted for in switching to a smaller category, which an additional 5.5% of the respondents would appear to do with a ten-category, than with a three-category, system. Other differences are smaller, typically around 3% or less. Because finer categorization would not have produced very different estimates, and especially because it would have reduced cell sizes significantly (and thus subjected results to far greater random variation) we have consistently displayed analyses based on the three-category system.

TABLE 9. SWITCHING BEHAVIOR, COMPARING THREE VS. TEN CATEGORIES

	Base Case		Gas Tax		Excise Tax		Regulation	
	Three	Ten	Three	Ten	Three	Ten	Three	Ten
	657	658	619	626	648	651	626	632
Percent switching to:								
Smaller	2.6	3.8	19.9	25.5	8.8	11.5	8.5	11.1
Same	96.3	94.5	79.8	73.2	90.3	87.0	90.7	87.8
Larger	1.1	1.7	0.3	1.3	0.9	1.5	0.8	1.1

We asked respondents why they maintained their size preferences and why they switched to another size category or to a foreign or domestic car. Reasons for maintaining a size preference do vary by the reference car size, as can be seen in Table 10. Those who intended to purchase small cars overwhelmingly cited economical operations; almost two-thirds of medium car intended purchasers did likewise, but only one in five large car intended purchasers gave that reason. Large car intended purchasers were concerned with the size and comfort of the car. Size, interestingly, is the second most important reason given by both medium and small car intended purchasers. Safety was one of the top four reasons for large car intended purchasers, but was negligible for others. These reasons are compatible with the reasons given for selecting the reference car. (See Section 4.3.)

Why did some respondents change their choices? Those switching to foreign cars considered them more economical, as having better miles per gallon, and as being safer and better engineered. Table 11 gives their ranking for each scenario.

TABLE 10. REASONS FOR MAINTAINING SIZE PREFERENCE THROUGHOUT

Reasons	Total	Reference Car		
		Small	Medium	Large
Economical to operate	50%	83%	64%	20%
Prefer the size	50	34	54	59
Comfort	38	15	35	56
Meets needs	27	25	17	30
Handling	26	30	30	22
Safe	8	3	11	24

TABLE 11. REASONS FOR SWITCHING TO A FOREIGN CAR

Reasons	Scenario			
	Base (n=4)	Gas (n=45)	Excise (n=12)	Regulation (n=10)
Foreign is more economical	1	2	1	1
Foreign has better MPG	2	1	3	2
Foreign has better safety engineering	2	3	2	2

We analyzed the data, as shown in Table 12, to see if those who switch from domestic to foreign in the Gas Tax scenario have other reasons for selecting a car than is true for the total sample, as shown in Table 7. The Gasoline Tax Scenario was chosen because more respondents switched under it than under any other scenario. It is difficult to assess the validity of differences between the subgroup and the total sample, because of the small sample sizes involved in the former. However, comparisons of Tables 7 and 12 give the following impressions:

TABLE 12. REASONS FOR SELECTING AMONG SWITCHERS FROM DOMESTIC TO FOREIGN UNDER GASOLINE TAX SCENARIO

	Reference Car		
Reasons for Selecting	Small n=7	Medium n=12	Large n=24
Comfortable	14%	58%	63%
Right Size	57	25	42
Like Its Looks	43	25	25
Good Gas Mileage	29	42	8
Doesn't Cost Too Much To Run	-	25	4
Holds the Road	29	8	38
Right Price Range	43	33	4
Experience	-	17	25

Among those who planned to buy a small car next, more switchers to foreign autos (57%) selected their original reference car because it is the right size than is true (28%) of all those who planned to buy a small car next. But smaller proportions of the switchers offered good gas mileage (29% vs. 55% for all small auto purchase intenders) and "doesn't cost too much to run" (none, compared to 43%) as reasons for intending to buy a small car. Thus, switchers from a domestic car to a (presumably small) foreign car, if higher gasoline taxes are instituted, are a very unusual subset of small car buyers; they seem to care more about size (interior dimensions) and less about operating costs than do other small car buyers.

Among those who would switch from a medium-sized domestic car to a foreign car, the proportions who buy the car for comfort (58%) were considerably higher than among all medium-sized auto intenders (34%).

Finally, among those stating an original intention to buy a large domestic car, those who switched to a foreign car under the Gasoline Tax scenario were more frequently interested in a car that holds the road (38% vs. 21%).

Looking for reasons for selection which are consistently higher or lower (regardless of amount) for all three reference car groups, we find that this was true only for "Comfortable."

Reasons for switching to smaller cars were cryptic and not especially revealing--as expected, people indicated the intervention posed had caused them to switch. Table 13 gives the rankings of reasons for each scenario.

Table 14 shows the results of an analysis to see if the use planned for the reference car was related to the propensity to change to a different car size in the scenarios. A few weak relationships, as follows, were found:

> Respondents who intend to use their cars for errands are slightly more likely than those intending to use their cars for other pruposes to switch to smaller cars under the Base Case.
>
> People who intend to use their cars for vacations are somewhat less likely to switch to smaller cars under the Gasoline Tax Case.
>
> When a respondent intends to use an auto for business purposes, he/she is more likely to buy the same size of car, and slightly less likely to buy a smaller car or postpone purchase, under the Excise Tax Case.

As will be seen in Chapter 5, below, small-car sales are forecast to grow from 1975 to 1979 under the Gasoline Tax Case, but to remain on a plateau from 1979 to 1980. This "tailing off" of an effect seemed worthwhile investigating. We are able to explain it, in part, because of the intentions expressed by the six people who originally planned to buy a small car in 1979 or 1980, who switched to another intention under the Gasoline Tax Scenario. Five of them said that they would postpone their auto purchase until after 1980, and one said he would switch to a larger car because of the improved gas mileage forecast for these under that scenario. Compared to other years in our time frame, six out of 78 people originally planning to buy a small car who switched to another option under the Gasoline Tax Scenario is an unusually high proportion.

Finally, we tested whether the prevailing price of gasoline in the sites where we interviewed was related to the propensity to switch to a smaller car under the Gasoline Tax scenario. Table 15 shows the results. There is a weak inverse relationship between gasoline price and that propensity, with New Orleans a distinct exception to the trend. That is, the least amount of switching to smaller cars tends to occur in cities where gasoline prices are highest. Possibly, more people have already switched to small cars in those cities, and the saturation point for that market is being approached. Another explanation, not necessarily independent of

TABLE 13. REASONS FOR SWITCHING TO A SMALLER CAR

Reasons	Scenario			
	Base (n=28)	Gas (n=167)	Excise (n=80)	Regulation (n=72)
Rise in gas price/increased cost of operation	1	1	-	-
Smaller car is more economical	1	3	-	-
Need for better gas mileage	2	2	-	-
Wouldn't pay additional tax for size of car	-	-	1	-
Excise tax is discriminatory/ unfair/penalizing	-	-	2	-
Save money/avoid paying tax	-	-	3	-
Time/trouble of Quota System inconvenient	-	-	-	1
No delay with smaller car	-	-	-	2
Increased cost of car/operation	-	-	-	3

TABLE 14. SWITCHING BEHAVIOR, BY USE OF CAR

	Total n=705	Business n=109	Commuting n=351	Errands n-185	Vacations n=46	Other n=14
Base Case						
Same	88%	93%	88%	86%	90%	100%
Larger	2	-	2	2	-	-
Smaller	3	3	3	5	4	-
No Car	3	-	4	4	-	-
No Answer	4	4	3	3	6	-
Gas Tax						
Same	65	66	65	64	70	64
Larger	1	-	1	2	-	-
Smaller	23	26	22	23	17	36
No Car	8	5	9	9	7	-
No Answer	3	4	3	3	7	-
Excise Tax						
Same	80	86	80	78	78	86
Larger	1	1	2	1	-	-
Smaller	11	9	11	11	11	14
No Car	4	-	4	6	4	-
No Answer	4	4	3	3	7	-
Regulation						
Same	79	81	79	76	80	93
Larger	1	-	2	1	-	-
Smaller	10	9	11	11	11	7
No Car	7	6	7	10	3	-
No Answer	3	3	3	3	6	-

TABLE 15. EFFECT OF GASOLINE PRICES ON SWITCHING IN GASOLINE TAX CASE

n Gas Tax	City						
	Atlanta	Buffalo	Chicago	Denver	Indianapolis	Los Angeles	New Orleans
Will buy:							
Smaller	24%	21%	17%	18%	19%	21%	16%
Same	63	66	74	64	74	77	78
Larger	0	0	2	1	0	0	0
No or Other	13	13	7	17	7	2	6
oline Price:	58.9¢	60.9¢	61.5¢	61.9¢	59.9¢	60.9¢	59.9¢

the first, is that of constant elasticity of demand: the proportion of people influenced to switch to small cars is a function of the percentage, not the absolute, increase in gasoline prices. Clearly, this percentage will be smaller where the present price is higher. It is interesting to note that switches to larger cars are mentioned only in the two cities with the highest prevailing gasoline prices, both above the 60¢ per gallon described for 1976 in the scenario.