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STUDY OF AUTOMOBILE MARKET DYNAMICS
Volume I - Description

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

Volume II of this report analyzes information derived from consumer responses to the procedures established in Volume I.

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PREFACE

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

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

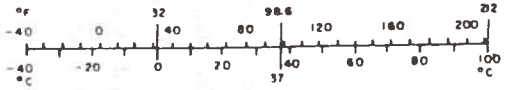
METRIC CONVERSION FACTORS

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)		
°F	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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EXECUTIVE SUMMARY

INTRODUCTION

The automobile industry generates a major portion of Gross National Product and employment; its indirect economic and social effects are even more significant and pervasive. The life styles of almost all Americans are based on the automobile. The move to the suburbs, which began around public inter-urban rail transportation, was accelerated by the auto, whose use, interacting with the costs of land and needs for parking, helped reshape shopping and commuting travel patterns.

Because of the automobile's complex interweaving with many aspects of our life style and economy, careful testing and reflection are needed, before attempting to choose government policies which will improve auto efficiency and thus reduce energy consumption. We have carefully tested and reflected on three separate options open to the federal government. The methods, findings. conclusions and implications are presented in these volumes.

METHOD

In early 1976, a national sample of new car buyers were asked which car they would buy, in each of five possible future "scenarios": "As Is" (no change from present); "Base Case" (slight rise in gasoline prices and new car prices); "Gas Tax" (gasoline rising to $1.00 a gallon by 1980); "Excise Tax" (taxes of $100 to $500 on less energy-efficient cars by 1980); and "Regulation" (with sales of less energy-efficient cars limited so as to achieve a stipulated sales-weighted fuel-economy average).

We developed switching matrices, showing the proportion of those who presently plan to buy cars of given size and origin (foreign or domestic manufacture) who said they would switch to cars of different sizes or origins, or not buy any car, under a given scenario. These switching matrices were applied to estimates of "As Is" new car sales, resulting in estimates of the distribution of new car sales for 1976-80 for each scenario, by size classes and by origin. Our results are useful in allowing comparisons among the effects of the government options tested.

In this study, automobiles were assigned to small, medium, and large size classes as an imperfect shorthand for their energy efficiencies.

FINDINGS AND CONCLUSIONS

A large majority of the respondents indicated that they would buy the same size of car that they presently plan to buy, in other scenarios. At most a third of those who presently plan to buy a large car would shift to a smaller auto. These findings are shown below.

Percent Who Would Buy Same Size Car as Presently Planned

Scenario	All Buyers	Large Car Buyers	Small Car Buyers
"As Is"	100	100	100
Base Case	93	93	94
Excise Tax	86	80	96
Regulation	83	76	96
Gasoline Tax	73	65	92

The impacts of such behavior on relative market shares are summarized in Table 1.* We see that the largest relative share changes in large and small autos occurs in the Gas Tax scenario. The smallest change is under the Excise Tax; the Regulation condition shows results between those of the other two scenarios. Market share of medium-sized cars (compacts) is greater than in the "As Is" condition in all three scenarios.

We believe that the market share of foreign cars, which increases most in the Gas Tax situation, is overstated in all scenarios. This is because respondents, when considering small cars, have relatively few domestic models to choose from and thus tended to mention a foreign model. We consider it likely that American manufacturers will increase their share of the smaller car market as they introduce new small models in 1978-1980.

Policy formation on fuel efficiency must consider social and economic items beyond those we tested directly. Some considerations relevant to the alternatives being considered are discussed below.

*Based on material shown graphically in Figures 1 and 2 in Chapter V. To illustrate the computation of the indices, small cars--subsubcompacts, sports cars, and subcompacts--hold 30.6% of the market share under the "As Is" condition, but 33.6% under the Excise Tax condition. The ratio, 33.6/30.6, is 110.

TABLE 1. RELATIVE MARKET SHARE INDICES OF NEW CARS BY SCENARIO

(Cumulative Sales 1976 through 1980; Index "As Is"=10,000)

			Scenario		
Size	As Is	Base Case	Excise Tax	Regulation	Gas Tax
Small	100	101	110	113	130
Medium	100	102	113	112	107
Large	100	98	87	85	77
Origin					
Foreign	100	102	112[a]	111[a]	128[a]
Domestic	100	99	97[b]	98[b]	94[b]

a. Probably overestimates. See text.

b. Probably underestimates. See text.

CONSIDERATIONS RELEVANT TO ALL GOVERNMENT STRATEGIES BASED ON INCREASING THE MARKET SHARE OF GASOLINE-EFFICIENT AUTOMOBILES

Any government policy must take into account inertia in the new car market. Inertia exists because:

Proposed government policies emphasize economic stimuli on consumers, but many non-economic variables also affect their choices of new cars.

New car buyers are more affluent and less affected by economic considerations than most people.

Risk avoidance and expressions of personality, social status, and values are also potent influences in choice of auto.

The trade-in policies of dealers encourage brand- and size-loyalty.

Policies aimed at new car buying affect the flow of cars into the auto population. Changes in flow will take 8-10 years to modify fully the total auto stock.

Changes in the new car market affect the used car market immediately as well as in future years. Reducing the market share of large new cars will tend to penalize large, low-income families whose needs are best served by a single large used car.

Increasing the market share of small cars will not necessarily result in commensurate decreases in total consumption of gasoline by the new car population, because of multiple car ownership and multiple trip purposes.

A sizable proportion of new cars is sold to fleet buyers. Because they appear more immediately influenced by economic considerations than consumers, government actions incorporating economic incentives are likely to have more immediate effects on increasing the market share of smaller cars, than would be estimated from effects on consumers alone.

CONSIDERATIONS RELEVANT TO THE GOVERNMENT OPTIONS INVESTIGATED

The gasoline tax would impose inflationary effects on the economy and consumers. Unless countermeasures (e.g., a rebate to all drivers) are taken, it would tend to be somewhat regressive. On the other hand, it would be superior to the other options considered here in that it would affect the behavior of all new car buyers (by discouraging their use of mpg-decreasing accessories)--not merely that of buyers contemplating purchase of cars subject to the excise tax or fuel economy regulation. Furthermore, it would provide an incentive to all drivers to reduce vehicle use.

The excise tax on new cars concentrates economic disincentives precisely at the cars with lower mpg, but has the least effect of the policy alternatives we considered. It also has a serious secondary effect of increasing the market value of large used cars, which disproportionately increases the costs of used cars to the less affluent. If an excise tax were implemented, people could be expected to spend less on selected accessories, to lessen or offset the impact of the tax, which is imposed at the time of purchase.

The regulation case has become law. Automobile manufacturers appear to be able to meet its sales weighted average criterion through technology improvements and weight reduction, rather than by shifting the size distribution of their products (rationing the less fuel-efficient models). This appears to have the minimal unfavorable secondary effects on used cars and/or the less affluent who are dependent on them, while also increasing fuel efficiency. To the extent that manufacturers have to ration according to size, there are unfavorable secondary consequences similar to those of the other two alternatives considered. Rationing

by size would also tend to lower margins on small cars (which dealers would have to try very hard to sell in the mandated quantities) and increase margins in large cars (which would become artificially scarce, and for which the demand is relatively unelastic).

RECOMMENDED FUTURE RESEARCH EFFORTS

The study raised questions capable of being answered by further research. We recommend the following further investigations of automobile marketing dynamics.

A study of automobile fleet buyers: numbers of new cars sold to them and the effect of government action on fleet buying.

The used car market: how big, how price-sensitive, and how much affected by government actions impinging directly on new cars?

Longitudinal study of car buyer behavior: how and why do given families change their car choices over time--with respect to new vs. used, size, and domestic vs. foreign autcs?

Study of multiple-car owners and complementary car buying: how does a multiple-car family allocate functions among its cars, and how does this affect purchasing behavior?

A study of purchases of vans, pick-ups, and recreational vehicles: why are they bought, what is the future market, and how will it be affected by government action?

1. INTRODUCTION

1.1 PURPOSE

This report is the summation and integration of the study of automobile market dynamics and the culmination of Task 6 of this study. The survey findings and their implications for government policy are presented in context.

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 and beyond.

1.2 RELATIONSHIP OF TASK 6 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 affect 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 and then outline their presumed effects on the government, on manufacturers, and finally on consumers. Task 2 results are included in the Appendices.

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 in-depth survey embodied in Task 5.

In Task 4, Reformulation of Implementation Scenarios, we examined if 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 more than 700 people, we pursued topics similar to those addressed in Task 3. Our analyses were similar to those of Task 3. (The Task 5 Report constitutes Volume II of this report)

We examined effects of the scenario 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.

Task 6 builds upon and adds to the results of the previous tasks.

1.3 CONTEXT OF THIS STUDY

This study is part of a broad range of efforts by the United States Government to examine ways to reduce the consumption of energy resources by automobiles. The reader should be aware of its limits and where it fits into the broader context.

The study focused on three options the Government might take to channel demand for automobiles into the buying of more energy-efficient and/or smaller automobiles: (1) increases in the gasoline sales tax; (2) imposition of an excise tax on the sale of lower MPG vehicles; and (3) government regulation of passenger car sales to ensure a high sales-weighted average number of miles-per-gallon obtained from new cars sold. The options were considered singly and not in combination.

The conclusion of Task 5 dealt only with sales of new automobiles, without explicit examination of the used car market. The study dealt only with passenger vehicles. The time frame examined, 1976-1980, was in the mid-range; long-range effects are not considered, although effects on new automobile flows within that time will persist in the stocks extant for the next ten or so years. We took into account technological changes likely to take place during the time frame. We did not examine the costs and feasibility of contributing to the solution of the problem through increased use of public transportation or increased reliance on car pools. We concentrated on individuals, not fleets, buying new cars; however, available evidence indicates that fleet owners buy a substantial portion of new cars.

1.4 PLAN OF THIS REPORT

Within this clearly set context, the next chapter summarizes our findings. Succeeding chapters provide perspective on automobile buyers and the place of the automobile in their lives; on the automobile industry and its marketing; and on the policy implications of our study findings and conclusions. The Appendice provides a report of the selected policy implementation Scenarios.

2. TUTORIAL ON THE AUTOMOBILE FLEET

Before considering any of the dynamics of the automobile industry, it is essential to recognize the size of the automobile fleet and its growth during the past 10 years. Knowledge of the number of cars being driven gives perspective to the problem of creating widespread change by one "stroke of the pen" to implement a new energy policy. Even if the new cars sold were dramatically more efficient, it would be 10 or more years before the entire fleet reflected these changes. Many cars being driven today have none of the safety engineering or gas economy features of the '70's, having been manufactured in the 1960's.

In the last decade, the U.S. passenger auto fleet has increased 30%, from 71.3 million cars on the road in 1966 to 95.2 million in 1975. In general, this increase has been a steady 3-4% a year, as can be seen in Table 2 below.

TABLE 2. NUMBER OF CARS REGISTERED IN U.S., BY YEAR

YEAR	NUMBER (Millions)
1966	71.3
1967	73.0
1968	75.4
1969	78.5
1970	80.4
1971	83.1
1972	86.4
1973	89.8
1974	92.6
1975	95.2

SOURCE: Automotive News Market Data Book, 1976

This increase in cars on the road represents an increase in the number and also an increase in the percentage of households owning more than one car. Table 3 shows this trend.

TABLE 3. AUTO OWNERSHIP BY YEAR (%)

No. Cars/Household	1965	1966	1967	1968	1969	1970	1971	1972	1973
None	21.0	21.2	21.4	21.6	20.4	20.0	20.0	20.5	18.5
One	54.8	53.8	53.5	51.3	50.6	50.3	50.2	49.3	47.6
Two	24.2	25.0	25.1	23.2	24.8	24.6	25.0	24.6	28.5
Three				3.9	4.2	4.7	4.8	5.6	5.4

SOURCE: U.S. Dept. of Commerce, Bureau of the Census, Current Population Reports, "Consumer Buying Indicators," Series P-65; A Guide to Consumer Markets 1975/1976, The Conference Board, Inc., 1975, p. 198.

New cars, whose number has fluctuated substantially over the past 10 years, have typically represented about 11-12% of the total fleet in any given year, as can be seen in Table 4; however, they have dropped to only 8.6% in 1975. This was due to the recession, to an increase in new car prices, and to the retention of older cars.

TABLE 4. NEW CAR REGISTRATION AS % OF TOTAL FLEET, BY YEAR

YEAR	NUMBER NEW CARS REGISTERED	% OF TOTAL REGISTERED FLEET
1966	9,008,488	12.6%
1967	8,357,421	11.5
1968	9,403,862	12.5
1969	9,446,524	12.0
1970	8,388,204	10.4
1971	9,830,626	11.8
1972	10,487,794	12.1
1973	11,350,995	12.6
1974	8,701,094	9.4
1975	8,261,840	8.6

SOURCE: Automotive News Almanac issues

Two basic changes in the total car fleet have been taking place over the past decade. A gradual trend toward small cars can be observed (see Table 5), coupled with a dramatic increase in imports, whose share of market in 1975 was 2.5 times that of a decade ago. As can be seen, imports represented 18% of all new cars registered in 1975.

TABLE 5. U.S. NEW CAR REGISTRATIONS BY GENERAL MARKET CLASSES, 1966-1975 (% of total markets)

YEAR	HIGH PRICE	MED. PRICE	REG. SIZE	INT. SIZE	COMPACT SIZE	SUB-COM. SIZE	SPECIALTY SPORTS TYPE	FOREIGN
1966	2.8	17.9	30.4	23.6	8.4	-	9.4	7.3
1967	2.9	17.8	28.6	21.8	6.7	-	12.8	9.3
1968	2.6	17.0	27.0	24.0	7.1	-	11.7	10.5
1969	2.9	16.8	25.9	22.2	9.8	-	11.1	11.2
1970	2.3	13.7	22.5	21.0	10.0	1.6	10.3	14.7
1971	2.7	15.2	20.8	18.1	12.1	7.4	8.6	15.1
1972	2.6	14.8	19.2	19.3	13.1	8.2	8.1	14.6
1973	2.6	12.8	15.9	19.1	14.7	9.4	10.3	15.1
1974	2.7	9.1	12.5	18.8	17.6	9.1	14.4	15.7
1975	3.0	8.3	8.8	15.6	14.2	8.1	23.6	18.3

SOURCE: Ward's Automotive Yearbook, 1975 and 1976; Jack Faucett Associates, Inc., Factors Influencing Automobile Ownership, Travel and Gasoline Consumption, an interim report to Federal Energy Administration and the Task Force on the Automobile Beyond 1980, Marketing and Mobility Panel, June 23, 1975, P. 21; Automotive News Almanac issues.

Consumers in large numbers have continued to load up their cars with accessories. The typical new car sold in 1975 had a V-8 engine, automatic transmission, power steering and brakes, air conditioning, a vinyl roof, tinted glass, fancy hubcaps, and some music system (AM and/or FM radio or a tape player).[1]

---

[1] 1975 Automobile Facts & Figures, Motor Vehicle Manufacturer's Association of the United States, p. 19.

As car models became bigger and heavier and as safety and emissions features were added, average fleet fuel economy declined from 14.00 mpg in 1966 to 13.49 in 1974, a decline of 3.6% (despite greater numbers of high mpg imports and smaller sized cars). But lately, the average mileage per gallon for new cars, as measured by EPA, increased from 13.9 in model year 1974, to 15.6 for model year 1975, to 17.6 for model year 1976, according to Automotive News, September 9, 1975. Table 6 shows the fuel economy figures.

TABLE 6. AVERAGE FUEL ECONOMY FOR AUTO FLEET AND NEW CARS (mpg)

YEAR	FLEET AVERAGE FUEL ECONOMY[1]	NEW CAR FUEL ECONOMY[2]
1966	14.00	12.95
1967	13.93	12.86
1968	13.79	12.44
1969	13.63	12.21
1970	13.57	12.51
1971	13.57	12.21
1972	13.49	12.03
1973	13.10	11.67
1974	13.49	13.9
1975	N.A.[3]	15.6
1976	N.A.[3]	17.6

[1] Calendar year basis

[2] Model year basis

[3] Not available

SOURCE: Jack Faucett Associates, Inc., Factors Influencing Automobile Ownership, Travel and Gasoline Consumption, an interim report to Federal Energy Administration and the Task Force on the Automobile Beyond 1980, Marketing and Mobility Panel, June 23, 1975; U.S. Federal Highway Administration, Highway Statistics, 1975.

We were unable to obtain data by year on the average age of cars scrapped but we have estimated the figures (see Table 7) from data on cars in operation each year. For several reasons the data are far from conclusive: used cars sold outside the U.S. (the export of used cars is a substantial business) will be considered "scrapped", as will cars temporarily put on blocks or otherwise not registered (this may have happened, for example, in 1973-74, when gasoline availability was of such concern); increasing new car sales can over-weight the data; and the amount of swing possible from year to year is slight, so the figures are relatively insensitive to changes (for example, a total postponement of car purchases in any given year would change the average by less than 1.0). The average age of a car scrapped, however, is estimated to be about 10 years.

TABLE 7. AVERAGE AGE OF CARS TAKEN OUT OF OPERATION, BY YEAR

YEAR	AVERAGE AGE
1966	10.9
1967	10.4
1968	10.8
1969	10.6
1970	9.8
1971	10.3
1972	9.9
1973	9.6
1974	9.9
1975	N.A.

SOURCE: ADL estimates from data on cars in operation by year, from 1965-1974 as recorded in 1974/1975 Automobile Facts & Figures, Motor Vehicle Manufacturer's Association of the United States, Inc., p. 28.

As might be expected with increased population and increased multi-car ownership, automobile travel has increased by 34% over the last decade, from 745 billion miles to 995.5 billion miles. The growth of automobile travel reversed in 1974 from its average 5% growth to -2% (see Table 8).

TABLE 8. TOTAL U.S. AUTOMOBILE TRAVEL

YEAR	BILLIONS OF VEHICLE MILES
1966	744.8
1967	766.5
1968	805.7
1969	849.6
1970	890.8
1971	939.1
1972	986.4
1973	1016.9
1974	995.5
1975	N.A.

SOURCE: U.S. Deparment of Transportation, Federal Highway Administration, Highway Statistics

Increases in automobile travel and decreases in fuel economy of the total fleet have led to increased gasoline consumption, as can be seen in Table 9. As expected, because of the cumulative effects of these two factors, gasoline consumption has increased by 74% in the last decade, growing 5% a year. 1974 shows a decline, in response to the energy crisis of 1973-74.

TABLE 9. AUTOMOBILE GASOLINE CONSUMPTION

YEAR	BILLIONS OF GALLONS CONSUMED
1966	53.2
1967	55.0
1968	58.4
1969	62.3
1970	65.6
1971	69.2
1972	73.1
1973	77.6
1974	73.8

SOURCE: U.S. Department of Transportation, Federal Highway Administration, Highway Statistics

3. PERSPECTIVE ON NEW CAR BUYERS

3.1 FACTORS AFFECTING CAR CHOICES

3.1.1 A Complex of Needs and Wants

The automobile is well entrenched in the U.S. life style. In fact, it is safe to say that most households which do not own at least one car are most likely subjects of severe or unusual economic circumstances or physical incapacities. Even poor households can often justify the need for a car when it is their only access to work and shopping. Only in areas like New York City are there substantial exceptions to this observation. There, car ownership poses such severe problems of traffic, parking, insurance, etc., that cars are less convenient than public transportation.

Automobiles are a relatively recent addition to our transportation alternatives. Trolleys and trains were the principal means of transportation until the mass-produced automobile was available in a nondepression peacetime economy. The trolleys and trains were responsible for the beginnings of our "urban sprawl" and "flight to the suburbs." The freeways came later, after the trend was clearly under way.

While urban sprawl created a need for a convenient means of transportation in and about the cities and their suburbs, it is not the only factor leading to today's love affair with the car. With rising disposable income, our society has turned to more and varied leisure activities which require transportation of some form, sometimes using specialized vehicles. Today we see newly emerging life styles which explain the increases in sales of recreational vehicles, vans, pickups, four-wheel drive vehicles, mini-stationwagons, subsubcompacts, and personal luxury vehicles. These cars are more than means of getting from place to place; they represent a way of getting there in a certain "style". The cars of the future may need to be even more versatile than today's choices to cope with the continuing trend of diverse needs and wants. Perhaps we will see more "snap-on bodies", attaching various seating or cargo configurations to a basic frame.

The analysis of car choice becomes still more complicated in light of the continuing trend of households toward owning more than one car. The "family car" may be supplemented by a "commuter car" and the "teenager's car", with a completely different set of expectations for each car. Cars become complementary to each other in filling the family's total transportation needs; subsequent purchases are made in this context. For example, if the stationwagon can last another year, then I can afford a new commuting car this year. But if the wagon's "had it," then I'll get a used commuting car.

Transportation requirements are mingled with other attitudes toward car ownership in the selection of a particular make and model car. Although it is a piece of durable goods, the car has traditionally been treated as a style item which is replaced every few years for a newer, more stylish model. Style has been one of the key determinants in car selection, because of buyers' use of their cars as reflections of themselves, their tastes and their statuses. The big American cars reflect the value typically placed on size in this country. "Bigger is better" is the accepted norm. Thus, "bigger" and "better" and "more expensive" and "more luxurious" have found their way into the desirable features of cars as signs of the personal success of their owners. Luxurious cars are sometimes a "vent" of expression for those unable to afford luxurious homes or vacations, particularly for some buyers of used luxury cars. The price of a used luxury car may be more than the price of a new smaller car, but the status features of luxury cars are often valued more highly than the advantages of owning a new car.

However, the rules of the game are subtly shifting. Government emphasis on health and safety in automobiles has been largely resisted by American car buyers, but these factors are nevertheless creeping into the scene. Safety belts and emissions standards were regarded as "unsexy", so they required forced compliance for consumer acceptance. Indeed, buyers are still figuring out ways to get around the "unsexy" features--sitting on buckled seat belts, removing PCV valves, and so on.

The OPEC-inspired energy crisis, with its rapidly increased price, and its temporarily decreased availability, of gasoline, stimulated an existing trend toward a cost-conscious approach to the automobile, particularly in cost of operation. However, like the attitudes toward safety safety and emissions, old behaviors die hard, and many people continue to prefer the large, heavy, inefficient cars. The preference for these cars may continue even if policies are implemented which impose heavy economic constraints on owners of large cars. These owners may simply employ various trade-offs, forgoing less visible signs of status and luxury (giving up a series ticket, cutting vacations in length, etc.), in order to keep the luxury car. In some cases, the need for a large car may be great enough to require more earnest trade-offs (the large family having to make do with fewer new clothes, for example).

In summary, efforts to cut back in size or number of automobiles or to improve automobile safety are meeting head-to-head with a number of well entrenched consumer needs and wants: the life style involving diverse transportation needs for work, family errands and leisure, as well as attitudes toward the size and luxury of automobiles .

To make matters worse, demographic trends will exacerbate these needs and wants. Specifically, population will increase by about 1.6% a year, with a greater portion of individuals between the ages of 25 and 34. These are years when both individuals and families typically have enough discretionary income that they can carry out a considerable amount of travel and recreation activities.

Discretionary income is rising as education and income increase and as more married women enter the labor force. These women also add to the commuter needs. If Mom and Dad each need commuter cars, teenagers "needing" cars for their activities may also increase in number.

People will have more leisure time, due to continuing trends of: increasing allotments of vacations and holidays (a gain of about 50 hours a year during the 1960s); four-day forty-hour weeks (unknown before 1969, but now covering more than a million workers) and longer life after retirement (up from 6 years for the male who was 20 years old in 1950 to 7-1/2 years for the one who reached that age in 1960). Continuation of these trends will increase the use of transportation in the pursuit of leisure-time activities. Also related is the trend of increased sales of campers, pick-up trucks, and vans. We may see an increased rental of large vehicles for vacations, in situations where a family has only small vehicles for its use during the remainder of the year.

We expect that the trend of migration of industry, population, and retail sales to the suburbs will continue. Increasingly large numbers of suburbanites will work in the suburbs (not necessarily the suburb in which they live) rather than in the city. Unless public transportation in the suburbs improves markedly or car-pooling arrangements become more common, there will be increasing needs for passenger cars and increases in vehicle miles traveled.

3.1.2 Psychological Barriers to Changing Choices

In car buying, there are several types of barriers to choice changes. Some of these barriers relate to the psychological forces affecting buyers, and some relate to the characteristics and dynamics of automobile marketing by dealers.

Among the psychological factors are the fears of risk and of change. To the extent that buyers can reduce risk by purchasing a "known" product, it is difficult to sell the new and "unknown" product. Change from the known to the unknown product is risky, so buyers typically feel more comfortable making repeat purchases than they do in deviating from their past decisions. A large car buyer may be uncomfortable psychologically in considering a smaller car because of the risks involved: maybe it won't be roomy enough for my family, maybe it won't be as safe, maybe it won't be as reliable, maybe..., maybe..., maybe....

3.1.3 Barriers Inherent in Automobile Marketing Practices

For the most part, new car purshases are accompanied by the trade-in of the buyer's used car. This practice brings to bear several economic factors which complicate the purchase decision and tend to inhibit change

of brand or change of car size. Dealers give the greatest trade-in value to cars of the same brand as the new cars being sold, for several reasons. They do not have the trained mechanics, tools, or manuals to put other makes and models into salable shape. Even if they did, such "ugly ducklings" on their used-car lots are hard to sell, since customers question what was wrong with the off-brand car that made its previous owner switch to a different brand; prospective used-car buyers are unlikely to seek cars of Brand A in the used-car lot of a Brand B dealer. For all these reasons, dealers sell "off brand" cars to other dealers, specializing in those brands, at wholesale prices. Therefore, they give lower trade-in values on them than on "own-brand" automobiles. Thus, the shopper saves money by buying a car of the same brand as his or her last car. Furthermore, trade-in values are greater when the shoppers buy cars of the same or larger size. This practice discourages trading down in size.

Even when no trade-in is contemplated, the dealer affects the choice of car purchased. Because buyers are excited and anxious to drive their new cars, or need them immediately, 70% to 80% of all cars are bought off the lot each year , rather than being specially ordered. This tendency encourages dealers to stock cars which offer the greatest profits--those cars with options and higher sticker prices.

3.2 THE PROFILE OF NEW CAR BUYERS

The profile of new car buyers is discouraging in terms of the potential impact of governmental policies on purchasing behavior. Just as our Task 5 survey shows an unwillingness to switch to smaller cars and just as life style patterns support the status quo, the data indicate that those most-hoped-for switches from larger cars will be those most difficult to bring about.

In any given year, fewer than one out of eight U.S. households take control of a new car.[1] This is a smaller portion than those who buy a used car (one out of every five U.S. households). The new-car households differ significantly from the U.S. population in several demographic characteristics. Table 10 illustrates that, compared with all U.S. households, new car buyers are more likely to:

have higher incomes

have more years of education

[1] U.S. Dept. of Commerce, Bureau of Census, "Selected Data from the 1973 and 1974 Survey of Purchases and Ownership," July 1976.

TABLE 10. CHARACTERISTICS OF NEW CAR BUYERS AND THE U.S. POPULATION, 1974

	New Car Buyers[1] (n=2,3556)[6]	U.S. Population[2]
Sex of Registered Owner*[3,5]		
Male	73%	48%
Female	27	52
Marital Status of Registered Owner*[3]		
Single	18%	12%
Married	73	70
Widowed, Divorced, Separated	9	18
Age of Buyer*[3]		
Less than 25	19%	18%
25-34	26	20
35-44	17	16
45-54	20	17
55+	18	29
Age of Household Head*		
Less than 25	10%	8%
25-34	24	20
35-44	18	17
45-54	25	19
55+	23	36
Education of Household Head*		
Less than high school graduate	14%	37%
High school graduate	32	34
1-3 years college	24	13
College graduate or beyond	30	16
Household Income*		
Less than $10,000	15%	36%
$10,000-14,999	23	24
$15,000-24,999	38	28
$25,000 or more	24	11
Automobile Ownership*		
1 car	36%	58%[4]
2 or more cars	64	42

1 "The Buyers of New 1974 Automobiles," U.S. News and World Report, 1975.
2 Census of Population, U.S. Department of Commerce.
4 Proportion of those age 18 or more in "U.S. Population" column.
5 Among car-owning households.
6 The source did not specify how jointly owned autos were classified. n is sample size.
* Differences are statistically significant at the .05 level.

be younger

be single

own their own homes

own more than one car

be male

Some of these characteristics are typically linked to each other: income and education, for example. Education, youth, and singles are similarly related, but they do not tie in with higher income. The higher income more likely relates to home ownership and to multiple-car ownership.

Characteristics of new-car households are exceedingly difficult to interpret, because a majority of new-car buyers own more than one car.

It is quite likely that a new car buyer also owns a used car, so his or her "personal statistics" would appear among both "used car owners" and "new car owners". Similarly, such buyers might qualify as large and small car owners, as well as foreign and domestic owners. Thus, any comparisons between car buyers of different categories of cars requires much intuitive interpretation on the reader's part.

Two primary observations should not be overlooked in considering the impact of energy policies on new car buyers:

1. In sheer numbers, they are few enough that any policy aimed at new car buyers would not have a wide household impact in the first year. Policies aimed solely at new car buyers leave a large majority of households untouched, except where there are ramifications affecting used car buyers as well. (Section 5.1 of this report discusses this subject.)

2. Those households which buy new cars tend to be least susceptible to economic constraints, because of their affluence. Whether as young singles or as more affluent families owning several cars, new car buyers tend to have more discretionary income to spend on cars; they are able to make trade-offs in their life styles to escape the economic constraints which might be placed on the purchase of a new car.

Table 11 illustrates some trends which have been taking shape over the past ten years. These trends are generally in the "less likely to be constrained" direction. Compared with buyers in 1964, buyers in 1974* are more likely to:

have higher education and incomes. Although Table 11 shows current dollars, adjustment to constant dollars shows the median income of 1974 new car buyers is more than 12% above that of 1964 new car buyers.

be younger.

own more than one car (indeed, 23% own three or more cars).

add to the household's car stock by not trading in or selling a car on the purchase of a new one.

keep their cars longer before selling them or trading them in.

If these trends continue--and there is every reason to think they will--economic constraints may cause some shifts in car buying behavior, but not many. Our affluent new car buyers can continue to postpone purchases or make life style trade-offs in discretionary income.

Energy policies explored in our Task 5 survey scenarios were designed to motivate buyers to buy smaller cars then they had in the past. This is a difficult proposition to consider, because the decision to buy a particular size car is complicated by different perceptions of what role the car will play for the buyer. Table 12 illustrates demographic and purchasing characteristics of new car buyers by the size of car purchased. Several patterns emerge:

Small size cars stand out among college graduates, two-car households, and homeowners.

Medium size cars are especially appealing to women buyers, singles, and one- or two-car households.

Large cars are selected by married household heads, who are generally older than buyers of other sizes and whose incomes are higher.

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*Data for years between 1964 and 1974, not shown in Table 11, show that the trends are consistent in the intervening years.

TABLE 11. TRENDS IN NEW CAR BUYERS, CHARACTERISTICS, 1964 AND 1974[1]

	1964 (n=2,762)	1974 (n=2,355)
Sex of Registered Owner*		
Male	86%	73%
Female	14%	27%
Marital Status of Registered Owner*		
Single	13%	18%
Married	83	73
Widowed, Divorced, Separated	4	9
Age of Buyer*		
Under 25	10%[2]	19%
25-34	20	26
35-44	24	17
45-54	24	20
55 or more	22	19
Median age	43 years	38 years
Buyer*		
Head of household	86%	74%
Other than head	14	26
Size of Household*		
1 person	6%	10%
2 persons	29	30
3 persons	21	32
4 persons	21	21
5 persons	13	11
6 or more people	10	8
Median number	3.7 persons	3.5 persons
Age of Household Head*		
Less than 25	4%	10%
25-34	20	24
35-44	27	18
45-54	26	25
55 or more	23	23
Median age	45 years	44 years

[1] "The Buyers of New 1974 Automobiles," Ibid.
[2] 1965--not available prior to this date.
* Differences are statistically significant at the .05 level.

TABLE 11. TRENDS IN NEW CAR BUYERS, CHARACTERISTICS, 1964 AND 1974, (CONTINUED)

	1964 (n=2,762)	1974 (n=2,355)
Education of Household Head*		
Less than high school graduate	20%	14%
High school graduate	33	32
1-3 years college	19	24
College graduate or beyond	28	30
Household Income (Current Dollars)*		
Less than $5,000	7%	2%
$5,000-7,499	22	5
$7,500-9,999	21	8
$10,000-14,999	29	23
$15,000-24,999	14	38
$25,000-49,999	5	20
$50,000 or more	2	4
Median income	$10,000	$17,900
Automobile Ownership*		
1 car	51%	36%
2 cars	39	41
3 or more cars	10	23
Car Trade-in*		
Traded in/sold car	88%	77%
Did not trade in/sell car	12	23
Median months trade-in was owned		
Number of months	33.8	38.8

* Differences are statistically significant at the .05 level.

TABLE 12. CHARACTERISTICS OF NEW CAR BUYERS, BY NEW CAR SIZE, 1974[1]

	Small	Medium	Large
Sex of Registered Owner*			
Male	72%	64%	80%
Female	28	36	20
Marital Status of Registered Owner*			
Single	26%	30%	10%
Married	65	60	82
Widowed, Divorced, Separated	9	10	8
Age of Buyer*			
Under 25	27%	31%	8%
25-34	34	24	23
35-44	16	12	20
45-54	14	17	23
55 or more	9	16	26
Median age	32 years	34 years	44 years
Household Status*			
Head	72%	65%	80%
Other than head	28	35	20
Size of Household			
1 person	12%	13%	8%
2 persons	28	28	34
3 persons	21	20	21
4 persons	21	22	19
5 persons	10	9	11
6 or more persons	7	8	7
Median number	3.4 persons	3.5 persons	3.4 persons
Age of Household Head*			
Under 25	15%	13%	5%
25-34	31	21	21
35-44	18	15	19
45-54	22	28	26
55 or more	14	23	29
Median age	36 years	44 years	47 years

[1] "The Buyers of New 1974 Augomobiles," Ibid.
* Differences are statistically significant.

TABLE 12. CHARACTERISTICS OF NEW CAR BUYERS, BY NEW CAR SIZE, 1974, (CONTINUED)

	Small	Medium	Large
Education of Household Head*			
Less than high school graduate	9%	16%	14%
High school graduate	25	33	33
1-3 years college	25	23	25
College graduate or beyond	41	28	28
Household Income			
Less than $5,000	2%	4%	2%
$5,000-7,499	6	6	3
$7,500-9,999	8	10	6
$10,000-14,999	25	23	18
$15,000-24,999	35	33	36
$25,000-49,999	21	19	27
$50,000 or more	3	5	8
Median income	$17,100	$17,100	$21,800
Automobile Ownership*			
1 car	31%	35%	23%
2 cars	45	38	41
3 or more cars	24	27	36
Home Ownership*			
Own	65%	69%	81%
Rent	35	31	19
Median Value of Home	$36,400	$32,700	$37,800
Number of Months Traded Car Owned	33.6	39.0	37.3
New Car vs. Trade-in*			
Same	23%	25%	42%
Larger	17	30	44
Smaller	60	45	14
Attitude Toward Price Paid*			
Overpriced	44%	41%	37%
Fairly priced	51	52	55
Underpriced	1	1	1
No opinion	4	6	7

* Differences are statistically significant.

TABLE 12. CHARACTERISTICS OF NEW CAR BUYERS, BY NEW CAR SIZE, 1974, (CONTINUED)

	Small	Medium	Large
How Impt. Was Energy Crisis as Reason*			
Most important	14%	14%	3%
Important, but not most important	49	44	27
Entered into, but not really impt.	18	23	28
No importance at all	8	19	42
Reasons for Trading Down[1]			
Better gas mileage*	87%	67%	41%
More economical to operate*	73	60	39
Don't need power of large car*	53	47	32
Felt better value for money*	32	18	32
Reasons for Trading Up[1]			
Wanted roomier interior*	57%	48%	48%
Felt better value for money	32	32	36
Wanted more powerful engine*	25	44	12
Larger cars are more protective if accident*	19	38	40
Had more optional equipment*	22	32	38
Most Impt. Reasons for Selecting[1]			
Good gas mileage*	72%	48%	20%
Economy of operation*	70	47	18
Performance, handling, roadability*	67	61	69
Quality of workmanship*	61	52	61
Interior roominess and comfort*	27	31	55
Reputation for quality construction*	49	41	52

* Differences are statistically significant at the .05 level.

[1] Multiple responses in three categories lead to percentage totals of more than 100%.

Small car buyers emphasize economic decisions. They are most responsive to gas mileage, economy of operations, and the energy crisis. They are also the least satisfied with the price paid.

These findings tend to indicate that, in general, economic constraints might have the greatest impact just where they are least desired: on the small car market. These two-car owners might buy a used second car instead of a new small car or they are the buyers who have already demonstrated "we care" about mileage and the energy crisis; they will drive their small cars longer, if necessary.

Medium size cars are bought for a variety of reasons, some of which could be affected by economic constraints. Note that 30% of these buyers have traded up to a larger car, in spite of the energy crisis a year before. These buyers presumably need room for passengers and cargo, so they have made other economic decisions to balance their increased car costs. Forty-five percent bought a medium size car as a trade down from a larger car, generally for economic reasons. It would be interesting to know how many of these are multiple car households with another car--large size--in the garage to use for "big car needs".

Large size car buyers seek performance, quality of workmanship, and roominess; they can afford to pay for it. Indeed, a majority believe their car was "fairly priced". Eight-six percent of the large car buyers in 1974 were buying the same size or larger car than they had owned before. Obviously, roominess and comfort are strongly felt needs that can overcome cost constraints.

These data are confounded, however, by the size categories used by DOT, which aggregate sales of small luxury cars, economy cars, and sporty cars into one "small" category. Obviously, since vast differences occur in the reasons for buying these different types of cars, so should different degrees of economic impact.

For example, within the category generally referred to as subcompact, domestic subcompact buyers are less likely to be college-eduated, whereas the majority of those buying imported subcompact cars are college graduates. In the medium-sized category, those buying specialty cars are twice as likely to be single than those buying compact cars. Within the large car category, those purchasing high-priced specialty cars are, on the average, 39 years old, while purchasers of high-priced standard cars average 50 years of age. In statistical terms, the within-cell variability appears to be as great as between-cell variability.

A look at the foreign-domestic issue indicates that considerable movement toward foreign cars occurs in response to constraints such as the energy crisis. Table 13 highlights some of the characteristics of foreign car buyers.

TABLE 13. FOREIGN CAR VS. ALL NEW CAR BUYERS

	New Foreign Car Buyers[1]	All Buyers[1]
Sex of Registered Owner		
Male	71%	73%
Female	29	27
Marital Status of Registered Owner*		
Single	27%	18%
Married	63	73
Widowed, Divorced, Separated	10	9
Age of Buyer*		
Under 25	25%	18%
25-34	35	26
35-44	16	17
45-54	15	20
55 or older	9	19
Median age	32 years	38 years
Buyer		
Household head	73%	74%
Other than head	27	26
Size of Household		
1 person	13%	10%
2 persons	30	30
3 persons	20	20
4 persons	20	21
5 persons	9	11
6 or more persons	7	8
Median number	3.3 persons	3.5 persons
Age of Household Head*		
Under 25	15%	10%
25-34	32	24
35-44	17	18
45-54	22	25
55 or older	14	23
Median age	37 years	44 years

[1]"The Buyers of New 1974 Automobiles," Ibid.
*Differences are statistically significant.

TABLE 13. FOREIGN CAR VS. ALL NEW CAR BUYERS (CONTINUED)

	New Foreign Car Buyers	All Buyers
Education of Household Head*		
Less than high school graduate	8%	14%
High school graduate	22	32
1-3 years of college	25	24
College graduate or beyond	45	30
Household Income		
Less than $5,000	1%	2%
$5,000-7,499	5	5
$7,500-9,999	7	8
$10,000-14,999	24	23
$15,000-24,999	37	37
$25,000-49,999	22	20
$50,000 or more	4	4
Median income	$18,200	$17,900
Home Ownership*		
Own	64%	73%
Rent	34	27
Market Value of Home*		
Less than $15,000	8%	7%
$15,000-19,999	5	10
$20,000-24,-99	10	10
$25,000-29,999	12	13
$30,000-39,999	23	23
$40,000-49,999	14	16
$50,000-74,999	20	14
$75,000-99,999	5	4
$100,000 or more	3	3
Median value	$37,000	$34,000
Automobile Ownership*		
1 car	31%	36%
2 cars	45	41
3 or more cars	24	23
Car Trade-In*		
Traded in/sold car	71%	77%
Did not trade in/sell car	29	23

* Differences are statistically significant.

TABLE 13. FOREIGN CAR VS. ALL NEW CAR BUYERS (CONTINUED)

	New Foreign Car Buyers	All Buyers
Median Months Trade-In Was Owned		
Number of months	34.4	38.8
Origin of Car Traded*		
Foreign	40%	13%
Domestic	60	87
Size of New Car vs. Trade-In*		
Same size	24%	32%
Larger	18	35
Smaller	58	33
Importance of Energy Crisis in Decision*		
Most important factor	14%	11%
Important, but not most important	49	39
Entered into decision, but not really important	19	24
No importance at all	18	26
Reasons for Trading Down[1]		
Better gas mileage*	84%	68%
More economical to operate*	68	59
Don't need power of large car*	52	47
Very Important Reasons for Selecting*[1]		
Performance, handling, roadability	71%	64%
Good gas mileage	71	43
Economy of operation	69	40
Quality of workmanship	66	56
Quality of construction	55	47

[1] "The Buyers of New 1974 Automobiles," Ibid.
* Differences are statistically significant.

It appears that foreign car buyers do differ in their outlook toward cars, so they can be segmented demographically to some extent. Caution must be urged here, however, since the category of foreign cars encompasses a diversity of cars--from the expensive cars like the Rolls Royce to "economy" cars like the Honda Civic, from the sedan-type cars to the sports or sporty cars. To assume similar reasons for buying these diverse cars would be naive.

A greater proportion of singles buys foreign cars; thus, the buyers and household heads tend to be younger. They are also better educated. Although less likely to be homeowners, those that do own homes have homes with a higher median value.

New foreign car buyers are less likely to have traded in or sold a car; when they do, foreign cars represent only 40% of the trade-ins or sales, and the trend is to trade down to a smaller car. They are more likely to be multiple car owners. Although economic reasons were more important to them in their decisions to purchase their new cars, performance, workmanship, and construction were also more important in their decisions. The energy crisis did play an important part in their decision processes.

It is difficult to project into the future this behavior vis-à-vis foreign car purchases because of changes likely to occur in domestic cars. In recent years, buyers have generally perceived that foreign cars offered more value in terms of good styling and gas mileage than could be found in small domestic cars. In many respects, they were right: domestic small cars tended to be junior versions of the large cars, with better gas mileage achieved at the expense of passenger comfort and engine power.

Their foreign counterparts were roomier and somewhat more "zippy" to drive, with even better gas mileage. Technology and time are closing this gap between foreign and domestic cars. Domestic small cars have escaped the mold of their "senior" large cars and are beginning to achieve many of the same features found in foreign small cars: boxy shape for roomier interiors, safety features, etc. This trend will continue, so that many of the advantages that foreign cars had over domestic cars in the 1960's and early 1970's will no longer be true by the late 1970's. Domestic small cars will have a better chance of holding their own.

3.3 FLEET PURCHASES OF NEW CARS

One portion of new car sales has rapidly responded to economic constraints: sales to fleets of four or more cars. Table 14 indicates the rapid shift to smaller cars in the last five years.

TABLE 14. THE DISTRIBUTION OF FLEET CARS BY SIZE

Size	1972	1973	1974	1975	1976
Subcompact	--%	--%	--%	3%	1%
Compact	2	1	2	19	31
Intermediate	38	49	58	72	61
Standard	60	50	39	5	6

SOURCE: Automotive News Market Data Book, 1976, from the National Association of Fleet Administrators.

This distribution shows that the full size car has virtually ceased to be a factor in this market, having been eclipsed by smaller cars. Even the intermediate appears to have peaked in favor of compacts.

We do not have precise data on the number of cars affected by fleet purchasing. Sources in the automotive industry calculate that between 17% and 23% of all new cars are sold to fleets owning four or more cars. The National Association of Fleet Administrators cites 1,036,143 new cars registered to fleets in 1974, and 950,141 in 1975; these figures account for only 12% of total new car registrations. However, it is likely that as many as half of the fleet cars are traded in before they are a year old, with the same registration being placed on a second new car during the same model year. Thus, 12% of the registrations might mean 18% of the model year's sales after trade-ins are counted accurately. The table below shows NAFA's breakdown of fleet registrations:

TABLE 15. NEW CARS REGISTRATIONS TO FLEETS OF 4 OR MORE CARS

	1974	1975
Commercial (corporate)	178,096	149,754
Rental & Leasing	749,640	707,324
Government	108,407	93,063
TOTAL	1,036,143	950,141

SOURCE: Automotive News Market Data Book, 1976, from the National Association of Fleet Administrators.

4. PERSPECTIVE ON CHANGE IN THE AUTOMOBILE INDUSTRY

4.1 DYNAMICS OF NEW AND USED CAR SALES

Any policy aimed at new car sales will have a far reaching impact on used car sales. Because of the dynamics of new and used car sales, the impact is likely to be more serious on used car sales than it is on new car sales. For at least two reasons it would be naive to ignore the impact on used car sales:

1. More used cars than new cars are sold in any year.

2. Those buyers in the used car market are typically less affluent and younger than their new car counterparts; they are less able to make trade-offs with discretionary income.

Table 16 illustrates the characteristics of used car purchasers. Few data are available on used car sales, because many transactions go unrecorded or their records are not collected by a central source.

At least two distinct groups can be identified in the used car marketplace: (1) those whose economic circumstances and/or credit rating constrain the amount of capital available for the purchase of a car to the point where the much lower capital cost of a used car presents the only viable alternative, and (2) those who make a trade-off of a used car to purchase the extras--in terms of price range or options--they could otherwise not afford. An example of this latter group is someone buying a <u>used</u> Cadillac or Mercedes: the capital cost for this type of used car is equal to or greater than the capital cost of a lower priced <u>new</u> car (e.g., a Chevrolet or a Toyota).

Used car buyers "have it coming from both sides." On the one hand, their economic condition tends to limit their car-purchasing options and, in some cases, they are forced to buy a car because of the collapse of a present car. On the other hand. the availability of the cars in the market is constrained by forces beyond their control...the vagaries of the new car market. To the extent that new cars are maintained longer before being sold or traded, used car buyers have older stock to choose from; when prices increase on new cars, prices of used cars also tend to increase; when new car sales are low in a given year, the normal "trade-in" or sale is not made and thus the used car market may be thin--both reducing the choice for used car buyers <u>and</u> inflating the prices of those cars available.

Table 17 clearly shows the relationship of used car prices to new car prices. As new car prices have increased, so have used car prices; the "magic number" seems to be 31-32% of the new car price. Used car prices were relatively higher in 1973, for several reasons. Many large

TABLE 16. CHARACTERISTICS OF USED CAR PURCHASERS, 1973

	Used Car Purchasing Household[1]	New Car Households[1]	U.S. Households[1]
Household Income*			
Under $3,000	6%	4%	13%
$3,000-5,000	9	4	12
$5,000-7,500	15	10	14
$7,500-10,000	15	10	12
$10,000-15,000	27	25	23
$15,000-20,000	14	20	13
$20,000-25,000	7	10	6
$25,000 and over	7	16	7
Age of Household Head*			
Under 25	16%	10%	9%
25-24	25	22	20
35-44	23	20	18
45-54	19	22	10
55-64	12	16	17
65 and over	5	10	19
Region*			
Northeast	18%	22%	23%
North Central	29	29	27
South	35	33	32
West	18	16	18
Race*			
White	92%	94%	90%
Black	8	6	10

[1] Source: Department of Transportation.
* Differences are statistically significant at the .05 level.

cars were traded in for smaller cars--a situation which increased the supply and sale of large used cars relative to small used cars. The higher prices of the greater number of used cars tended to increase the average price of used cars. New cars tended to be smaller, with lower average prices. At the same time, there were also political efforts made to keep the price of new domestic cars as low as possible (President Nixon's "jawboning", higher excise taxes on foreign cars, etc.) which kept the lid on the average price of new cars.

TABLE 17. AVERAGE PRICE PAID FOR NEW & USED CARS, BY YEAR

Year	New Car	Used Car	Used as % of New
1968	$2,936	$ 919	31%
1969	3,021	952	32
1970	3,025	960	32
1971	3,294	1,017	31
1972	3,372	1,054	31
1973	3,496	1,288	37

SOURCE: Automotive News Market Data Book, 1976.

4.2 DYNAMICS IN AUTOMOBILE MARKETING

It has been shown that economic constraints are tricky to impose on consumers: the right people are hard to affect while the wrong people are easy to affect. However, the dynamics of automobile marketing indicate that some changes can be brought about through marketing tactics.

Auto manufacturers place heavy emphasis on all forms of media advertising. The four domestic manufacturers spent $375 million in 1974 for such advertising.[1]

The predominant thrust of such advertising is to create images of cars for the consumers and to try to accelerate purchase by pushing such factors as sex appeal, carefree living, status and prestige, or fun/challenging driving. Recently, MPG has been heavily emphasized in car ads--the 1976 ads in particular--together with the theme of not "sacrificing" to obtain good MPG.[2]

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1 Automotive News Market Data Book, 1976.

2 An Aspen advertisement noted the car's small size, with the ride of a full-sized car and good gas mileage. "For a small wagon at a small price, it's unbelievable." Automotive News Market Data Book, 1976, p. 98.

The GM ads for the sized-down 1977 "standard" size cars go even further, pushing scarce resources, engineering, and "no sacrifice of interior roominess" to meet objectives.

Traditionally, however, advertising has been considered appropriate to establish and maintain brand preference, to accelerate purchase or turnover, and to enhance image or product positioning. It has been unable to be persuasive in turning around a negative trend (e.g., the Corvair, once Nader had pursued it vigorously) or changing basic beliefs.

The inability to reverse strong consumer preferences through advertising causes manufacturers to carry out thorough consumer research. They have three primary objectives in this research:

> To maintain and update information on consumer preferences and priorities in such matters as styling, handling, comfort, roominess, etc.
>
> To obtain information on consumer preferences and trade-offs on features (e.g., body size, sedan vs. coupe vs. wagon, engine size, etc.)
>
> To get specific reactions to new product prototypes.

But we wonder...is the consumer sovereign? Can the new car buyer influence the choices available to him or her? Consumer research is done, and then what? Is the consumer's voice really heard? Well, yes...and no.

Yes, in the sense that competition offers many car styles from which to choose. And yes, as evidenced by the eclipse of some unpopular models (remember the Edsel?). And yes, in the ability to order custom cars with individual option packages, as well as the recent tendency of Detroit to offer subcompacts, after consumers showed increasing interest in small foreign cars.

But no, in several crucial respects, the consumer cannot be sovereign. The nature of the automobile manufacturing process is such that the consumer's voice cannot be reckoned with in the short run. The lead time necessary for technological changes is substantial, and the complicated economic decisions for production of a certain size or model lead to a high degree of inflexibility in supply.

4.2.1 Lead Time Necessary for Changes

The process of making major technological changes in the auto industry--e.g., changes which require substantial retooling/changes in the assembly processes, such as those for a new engine--is a lengthy one. From prototype to a finished mass-produced product can take four to five years; research on the product prior to the prototype can take one to two years.

These types of changes are relatively infrequent because of the investment of time and resources required; they are usually undertaken to improve the functioning of the car (rather than to affect image).

The second type of change undertaken in a product line is a change in the configuration of the car--e.g., the bumper, inner fender liners, and so on. These changes require a lead time of up to four years; they are undertaken about every two to four years.

Cosmetic changes, the most frequently made, involve the least lead time--about two years. These are the predominant changes associated with the "annual model changes" (which are somewhat less substantial now than in the '60's). The kinds of changes which occur involve the positioning and shape of lights, the type of trim, outer fenders, and so on.

Thus, it can be seen that major technological changes must be considered in an extended time frame. For example, General Motors began in early 1974 to plan and execute the shortened "standard" chassis which are now coming out on the 1977 model cars. The research to pursue this course had, of course, occurred prior to that time.

4.2.2 Limitations on Responsiveness of Supply to Consumer Demand

Automobile manufacturers have relied on assembly line mass production and the resulting economies of large-scale manufacturing. The most efficient and economic line is a line dedicated to a body or chassis. Except where volume warrants it, all brands with the same chassis are produced concurrently on the line (e.g., Ford, Lincoln, Mercury). Some lines do mix body sizes, but this practice is less common and the lines are often slower--i.e., less efficient.

Changes in the demand for various car sizes can thus have a greater impact on the manufacturer than is first apparent. First, the permanency of the trend must be assessed. If it appears to be long term, an assessment of assembly line changes must be made--is the increased volume in one size sufficient to require another line dedicated to this size? Is the decreased volume in the other size(s) sufficient to make those lines uneconomical and is sufficient capacity available on another line of the same size to warrant the shutdown of a line?

Traditionally, the allocation to dealers of the assembly line production of cars has been on the basis of an "allocation" formula, based on the previous sales record of each dealer--in its crudest form, on the total number of cars sold; in more sophisticated forms, on the number of cars sold within the car class in question. The dealer has the choice to refuse his allocation on any given car line, but this refusal, because it reduces the cars in that line, will negatively affect his subsequent allocation for that line. The dealer, of course, specifies the configuration of each car received--either a "sold order"--an order placed by a customer--or a car to be sold off the showroom or lot.

The dealer traditionally seeks loopholes to avoid restrictive allocation for cars in short supply; these attempts are then countered by manufacturers to keep the allocation as fair and equitable as possible. In the past, for example, "sold" orders were filled before allocations were established so dealers were placing "sold" orders that were actually lot or showroom cars. A more recent loophole has been the identification of cars as "lease" cars. This stratagem, which avoids the allocation and allows the dealer to take depreciation on inventory as well, is compounded by a recent trend for banks to act as leasing agents instead of lenders for new car purchasers.

The manufacturer also has means for attempting to control the sales price of cars ordered for those cars in short supply. For example, "hot car" orders with many options/extras may be given priority over economy or stripped versions of the same car. A Dun's Review article on the VW Rabbit illustrates the point: "...and now Rabbits are not only in short supply, those that are available are so option-loaded that they carry price tags of nearly $5,000."[1]

In executing the car purchase, the dealer limits in some ways the consumer's sovereignty. Marketing practices have evolved which capitalize on some buyer emotions, as well as economic factors, to limit the consumers' choices. The economic factors include the values given for the trade-in (greater values for trade-ins if same brand and same or larger size is being purchased) and any "deals" which accompany the sale. The emotional factors include the fact that consumers do not want to wait. Between 70% and 80% of all cars are bought off the lot. To a certain extent, then, cars in short supply can be "loaded with options;" they will sell because of the demand for them. Cases have also occurred, most notably the last of the Eldorado convertibles, where demand is so great that consumers will pay over the list price to obtain them. When faced with an out-of-stock situation, many consumers will switch rather than wait. This situation occurred in August, 1972, when large car stocks, because of an unforeseen surge in sales, were depleted and more small cars sold as a result.

4.3 THE MAGNITUDE OF THE AUTO INDUSTRY

Any change in the automobile industry, even a "drop in the bucket," can cause a flood somewhere in some other U. S. industry. The sheer magnitude of the industry compels reflection on all the ramifications of introducing changes in new car sales.

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[1] "The Great Rabbit Hunt," Dun's Review, September 1976, p. 50.

The manufacturing, wholesaling, retailing, and servicing automotive businesses alone accounted for $230 billion in sales and 4 million employees in 1972.[1] Add to these figures highway construction/maintenance and those segments of the steel, iron, rubber, and petroleum industries which are a direct function of automobile demand, and the figures jump to $383 billion in sales and 5 million employees. It can be seen that the impact of changes in the automotive industry on GNP can be substantial.

Taxes that are auto-related are also substantial. State taxes and license fees total some $13 billion; federal excise taxes alone amount to some $6 billion, for a total of $19 billion.[2]

In 1974, the entire domestic industry, including the manufacture of trucks and buses, consumed:[3]

59%	of the synthetic rubber consumption
63%	of lead consumption
46%	of malleable iron consumption
33%	of zinc consumption
17%	of steel consumption
13%	of aluminum consumption
8%	of copper consumption
1%	of cotton consumption

What does all this mean in terms of energy policy implementation? A great deal. If energy policies encourage lighter weight vehicles--imagine the impact on the lead industry. If cars are smaller, requiring less iron and steel in the frame--imagine the impact on the iron and steel industry.

The price of automobiles is somewhat related to the prices of these types of products, but not to a large degree. The cost of raw materials accounts for less than 30%[4] of the list price of an auto. The other 70% is accounted for by labor costs, overhead, marketing expenses, and dealer margins. Therefore, a policy to reduce the weight of automobiles could cause reverberations in the steel industry and in the price of steel, but not substantially decrease the price of cars.

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1 1975 Automobile Facts & Figures, Motor Vehicle Manufacturer's Association of the United States, p. 54.

2 Ibid., p. 65

3 1976 Automobile Facts & Figures, Motor Vehicle Manufacturer's Association of the United States, p. 87.

4 Based on information developed by ADL's clients in the automotive industry.

These suggestions do not mean to imply that policies should not be made to affect the auto industry; they note that reverberations of any policy's impact could be greater in other industries than in the automotive industry.

5. FINDINGS, CONCLUSIONS, AND IMPLICATIONS

5.1 INTRODUCTION

In this chapter, we show our key findings and conclusions, and discuss some of their implications and other matters for the government's consideration as it determines policy on the best methods, among those considered in this study, for reducing gasoline use by automobiles. (Note that we tested only three out of the many possible options, and that we tested them singly not in combination.) We describe the methods used in this study, present our findings and conclusions, and discuss some implications of <u>any</u> policy that reduces gasoline consumption by shifting new car sales toward small automobiles. We then discuss each option and the implications of implementing it. We believe that the implications should be considered, in all their complexity, before any policy is decided upon.

The automobile industry accounts for a major portion of Gross National Product and employment. It uses up large portions of the domestic production of certain materials. The life-style of most Americans is based on the automobile. Its use has led to the growth of the suburbs, the decline of public transportation, and the shaping of shopping, commuting and travel patterns which reflect Americans' great geographical mobility. For these reasons, it is important to look at the implications of each government option not only in terms of the effects explicitly studied in Task 5 of this study, but also in terms of other significant effects.

5.2 METHOD

During the course of an in-depth personal interview, 700 new car buyers were asked what car they would buy next in each of five possible future "scenarios": the "As Is" scenario (no change from present); the "Base Case" scenario (slight rise in gas prices and new car prices); the "Gas Tax" scenario (gas rising to $1.00 a gallon by 1980); the "Excise Tax" scenario (taxes of $100 to $500 on less energy-efficient cars by 1980); and the "Regulation" scenario (with sales of less energy-efficient cars limited so as to achieve a stipulated sales-weighted fuel-economy average). The last three scenarios exemplify the three government options tested.

We developed <u>switching matrices</u>, showing the proportion of buyers, under the "As Is" condition, of cars of given size and origin (foreign or domestic manufacture) who said they would switch to cars of different sizes or origins, or not buy any car, under a given scenario. These switching matrices were then applied to estimates of "As Is" new car sales, by year, size, and origin. This resulted in estimates of the distribution of new car sales for 1976-80 for each scenario by size

classes and by origin. Forecasting total new car sales is a risky undertaking, subject to the vagaries of the economy, consumer confidence, etc. We caution the reader to attend primarily to comparisons among the scenarios in the material below. This is consonant with the primary purpose of this study, to allow comparisons to be made among the effects of the government options tested, as exemplified by the scenarios.

We also estimated the effects of the options on auto manufacturers' dollar grosses, and included our estimates in the Task 5 Report, Volume II of this report. We have not included the estimates in this report, because we are concerned about the assumptions that underlie them. First, new small cars sold have been heavily loaded with options, so that their total price approaches that of a medium and large cars more closely than is true of the base list prices used in this calculation. Second, in situations like those of our scenarios, with generally increasing popularity of small cars and lessened popularity of larger cars, manufacturers probably will raise the prices of the former, gradually and acceptably, to help offset decreasing gross revenues from decreased sales of higher priced larger cars. We expect that manufacturers will be able to make these adjustments with sufficient accuracy and efficiency so that the difference in gross revenues among the various scenarios is smaller than indicated by the estimates in Task 5.

In classifying cars, we originally used ten size classes, based on roominess index (interior dimensions) and mileage. We then combined these categories into "small," "medium," and "large" size classes, maintaining the use of the roominess index, to keep this study consistent with other studies carried out by the government. The composition of each class is as follows:

Small (subsubcompacts, sports, subcompacts)	Subsubcompact (e.g., Chevette) Sports/Specialty (e.g., Corvette) Subcompact A (e.g., Pinto) Subcompact B (e.g., Mustang II)
Medium (compacts)	Compact A (e.g., Aspen) Compact B (e.g., Granada)
Large (intermediates, standards, and luxury)	Standard A (e.g., Chevrolet) Standard B (e.g., Chrysler) Luxury (e.g., Continental)

Unfortunately, although considerable inverse correlation exists between car size and mpg attained, considerable variance also occurs with respect to mpg within size classes. For example, in the "large" class, the Dodge Coronet has EPA ratings of 21 mpg (highway) and 17 mpg overall; in the same class is a Cadillac with ratings of 15 and 12 mpg, respectively. The Nova averages ratings of 19 and 15 mpg, respectively, while another car in the "medium" size category, the Lancia Beta, achieves 29 and 21 mpg, respectively. Thus, we use "small cars" as a kind of imperfect shorthand expression for "cars with high mpg"; and "large cars" for those with low mpg.

5.3 FINDINGS AND CONCLUSIONS

In each of the four scenarios involving changed circumstances for the future, a large majority of the respondents indicated that they would buy the same size car that they plan to buy in the "As Is" future. These findings are shown in Table 18.

TABLE 18. PERCENT WHO WOULD BUY SAME SIZE CAR AS PRESENTLY PLANNED

Scenario	All Buyers	Large Car Buyers	Small Car Buyers
"As Is" (Present Plan)	100	100	100
Base Case	93	93	94
Excise Tax	86	80	96
Regulation	83	76	96
Gasoline Tax	73	65	92

Almost three-quarters of consumers reported that they would buy the same size car under the Gasoline Tax Option; about seven-eighths that they would do so under the Excise Tax and Regulation Options. Among those who presently plan to buy a large car, about two-thirds reported that they would maintain their choice under the gasoline tax scenario; for the regulation and excise tax scenarios, respectively, the analogous numbers are three-quarters and four-fifths. Since the intent of the scenarios is to attract buyers to small cars, we are not surprised to find that size loyalty of their buyers is between 92% and 96%. Inertia at the 93%-94% level for the Base Case (almost the same in its circumstances as the "As Is" scenario) is also not surprising.

Figure 1 shows our estimates, under each scenario, of new car market shares for 1976-80, as divided among cars of different sizes, and Figure 2 does the same for foreign and domestic cars. In Figure 1, the scenarios are ordered in terms of the market share for small cars; in Figure 2, in terms of the market share for foreign automobiles.

In the scenarios based on government action, sales of small and medium-size cars increase at the expense of large cars. This effect is most notable in the Gas Tax scenario. The government-action scenarios result in increased sales of foreign cars and decreased sales of domestic cars, compared with the "As Is" condition, particularly in the Gas Tax scenario. On page 44, we discuss why we believe that Figure 2 overestimates foreign car market shares in the government-option scenarios.

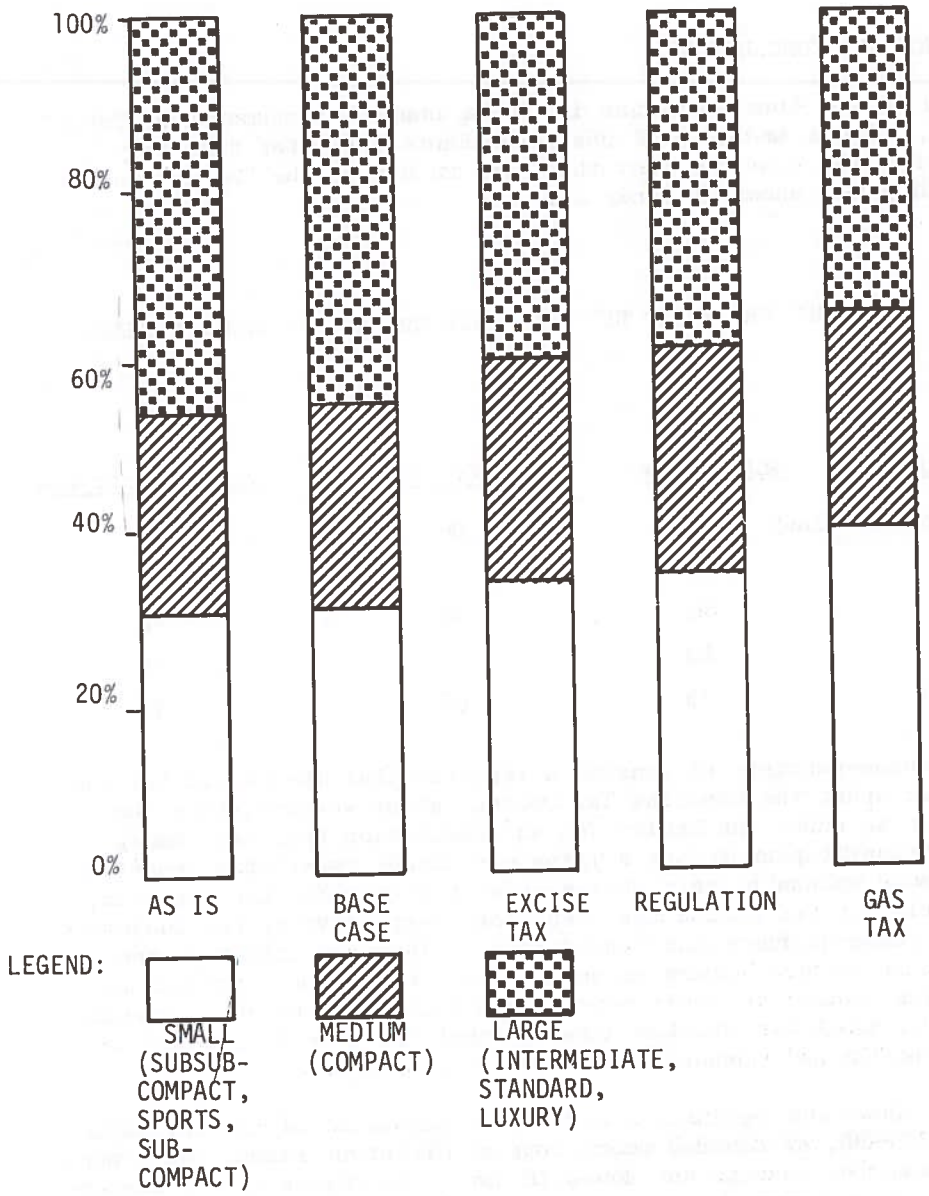
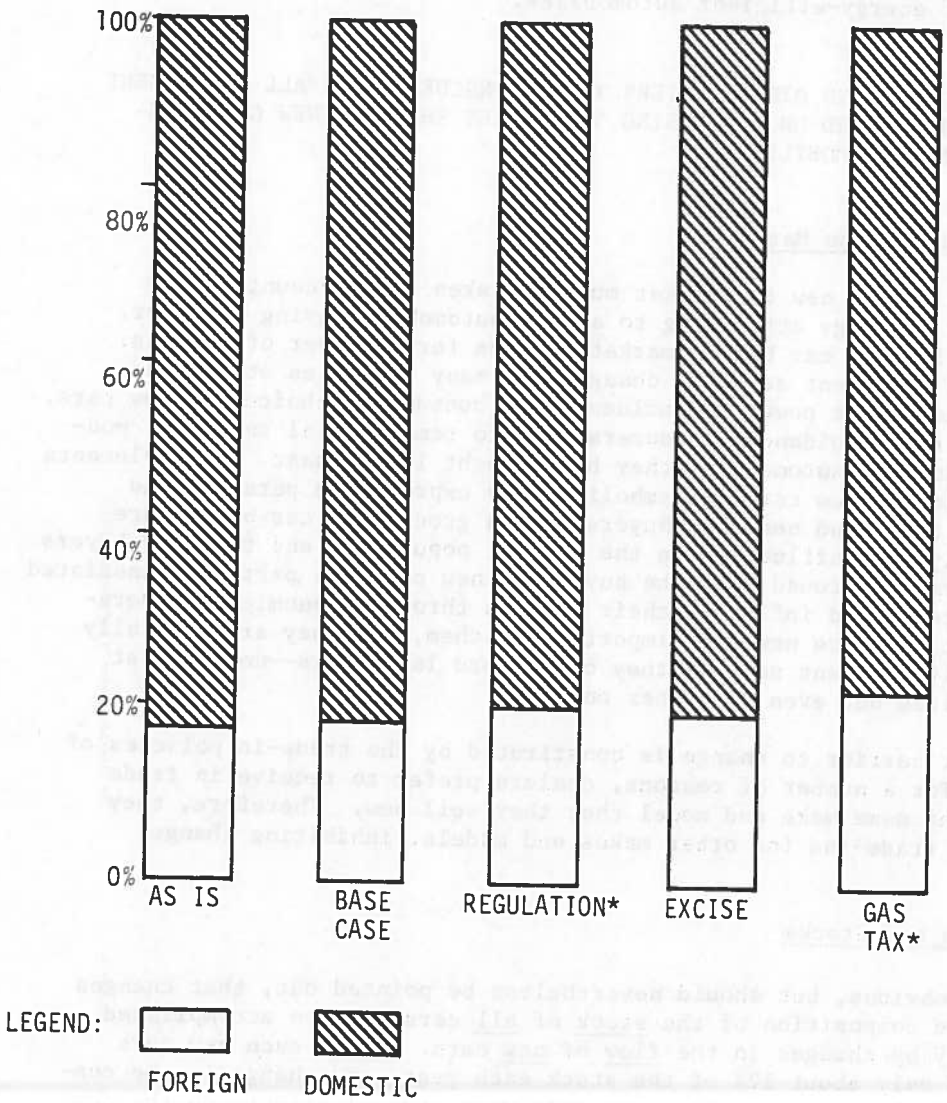


FIGURE 1. ESTIMATES OF MARKET SHAPES FOR EACH SCENARIO, NEW CARS SOLD IN 1976-1980, BY AUTOMOBILE SIZE.



*Probably overestimates market share to foreign cars.

FIGURE 2. ESTIMATES OF MARKET SHARES FOR EACH SCENARIO, NEW CARS SOLD IN 1976-1980, BY FOREIGN OR DOMESTIC MANURACTURE.

The remaining sections of this chapter will discuss some background which aids understanding of these results, and some of their implications. We will begin with a discussion of some likely effects of, and constraints upon the efficacy of, any government actions to save gasoline by encouraging use of energy-efficient automobiles.

5.4 IMPLICATIONS AND OTHER MATTERS TO BE CONSIDERED FOR ALL GOVERNMENT STRATEGIES BASED ON INCREASING THE MARKET SHARE OF NEW GASOLINE-EFFICIENT AUTOMOBILES

5.4.1 Inertia in the Market

Inertia in the new car market must be taken into account in any governmment strategy attempting to affect automobile buying behavior. Inertia in the new car buying market happens for a number of reasons. The options represent economic changes but many variables other than economic ones exert powerful influences on consumers' choices of new cars. Because of risk-avoidance, consumers tend to remain loyal to makes, models, and sizes of automobiles they have bought in the past. Many elements in the choice of new car are symbolic; they express the personal and social attitudes and needs of buyers. As a group, new car buyers are considerably more affluent than the general population and than the buyers of used cars. We found that the buyers of new cars are partially insulated against attempts to influence their choices through economic considerations. Not only are new cars important to them, but they are typically sufficiently affluent so that they can afford large cars--not only at present prices but even at higher ones.

Another barrier to change is constituted by the trade-in policies of dealers. For a number of reasons, dealers prefer to receive in trade autos of the same make and model that they sell new. Therefore, they give lower trade-ins for other makes and models, inhibiting change.

5.4.2 Flows and Stocks

It is obvious, but should nevertheless be pointed out, that changes in the size composition of the stock of all cars will be accomplished very slowly by changes in the flow of new cars. Since such new cars constitute only about 12% of the stock each year, any change in the composition of the new cars will have only very gradual effects on the composition of the total stock. Change will take 8-10 years to show its full effect.

5.4.3 Effects on Buyers of Used Cars

Any policy which changes the characteristics or the size distribution of new cars will have impacts on the used car market some years later. Because people continue to desire large used cars, the decreased supply will drive up their prices, to the detriment of the less affluent who constitute a market for them. Large used cars are and will be associated with the less affluent through a complex of circumstances (stated in over-simplified fashion):

Less affluent people buy used cars;

Younger couples and families are less affluent;

The number of young families will continue to increase for some time;

The less affluent can afford only one car per family;

Therefore, they buy one car which can perform all the functions they desire of it. This means that the one car will serve, among other functions, as a vehicle for travel, outings, vacations, etc., for the whole family; and

Thus, they tend to buy one large used car.

It is also possible, however, that the factors, such as an increase in gasoline tax, which drive down the market for large new cars in the short term will similarly reduce desire for large used cars. In this case, price rises for large used cars will be small.

5.4.4 Effects on Total Energy Consumption not Linear

It is easy to assume in a static model of the automobile market, an inverse linear relationship between the proportion of small cars in the total stock and the amount of gasoline used. While such a linear inverse relationship would exist in a static world, it does not in a dynamic situation. First (in both types of models), size classes are not homogeneous with respect to mpg. Second, a family which added a small rather than large new car to its existing stock of one small car may find that a given load for a given set of destinations, which might have fit into one large car, will instead need to be distributed between two small cars. The additional mileage in this particular situation may offset to some extent the improved miles per gallon in the small car.

Similarly, if the initial purchase price of large cars is much more than that of small cars, a given family may decide to buy two small cars instead of one large car. Again, this purchase may so increase the number of miles put on the two small cars bought, compared to the one large car that would have been bought, that gasoline savings are minimal, non-existent, or negative.

5.4.5 Fleet Buyers

We have estimated above that between a sixth and a quarter of new automobiles are purchased in fleets. In some unknown but significant portion of these sales (to government, companies which provide autos to employees, and auto rental agencies), the individual driver has no choice (or at best very limited choice) about the vehicle which he drives. Thus, steps aimed only at individual consumers who buy new automobiles will cover considerably less than the entire new car market. Economic considerations (such as exemplified in the options investigated), not overwhelmingly important to consumers, are more likely to affect fleet buyers. Thus, any government action which increases the cost of purchase or operation of large vehicles in order to make small vehicles more attractive will have greater effects in shaping the size distribution of all new cars bought than would be estimated by its effects on consumers alone. It is not clear whether the differential effects of the various scenarios will be different for consumers and for fleet buyers. Some fleet buyers will take into account the salability of their vehicles after they have finished with them--i.e., the price they can get for them from consumers. Thus, they will try to second-guess consumer reactions to any government actions.

5.5 IMPLICATIONS OF AND MATTERS TO BE CONSIDERED IN IMPLEMENTING THE GASOLINE TAX OPTION

5.5.1 Scenario Description

To review the scenario briefly: manufacturers would improve miles per gallon obtained in all cars and new car prices would increase $200 to $300 per car over 1976 amounts. (This element is constant to all except the "As Is" scenario; it will not be mentioned again in descriptions of the other scenarios.) Gasoline begins at 60 cents a gallon in 1976. In each year through 1980, 10 cents federal gasoline tax is added, ending in gasoline costing $1.00 a gallon (in 1976 constant dollars) in 1980.

5.5.2 Results Found in Task 5

The gasoline tax scenario shows the highest number of new small cars bought between 1976 and 1980, (as indicated by consumers' reports of their response to the scenario). Conversely, the scenario shows the lowest number, among the options tested, of new large cars sold. The self-reports of consumers indicate fewer new automobiles sold than under the other two scenarios.

Among the scenarios, the gasoline tax scenario shows the highest unit sales of new automobiles of foreign manufacture and the lowest sales of new domestic automobiles. Our judgment validates this relative finding, but we believe that the shift to foreign cars in all scenarios will be less extreme than indicated in our Task 5 report. Some consumers responding to our depth interviews indicated that they would switch from large cars to foreign non-large (medium and small) cars under various scenarios because many considered (in early 1976), that, if one wishes to buy a non-large car, foreign cars get better mileage, are of higher quality, and have better repair records than American cars. A number of factors make it likely, in our judgment, that in the future consumers considering a non-large car will be less likely to turn unquestioningly to foreign cars. First among these factors is the recent availability of subcompacts and sub-subcompacts of American origin (such as the Pinto and Chevette). Second is the recent production of American cars which produce good mileage by holding down external dimensions and weight, without sacrificing interior roominess. Such vehicles cost somewhat more to produce than the more gasoline-profligate models. Only recently have American manufacturers become convinced that consumers are willing to pay the purchase price premium. Finally, non-large cars with foreign brand names, e.g., Volvo and Volkswagen, are beginning to be manufactured in the United States. Thus, we see cars of American manufacture gaining ground in their share of the non-large car market.

5.5.3 Other Matters for Consideration

A number of other implications of the gasoline tax scenario, though not covered in our depth interview, are worthy of note.

The gasoline tax would impose inflationary effects on all aspects of the economy and all consumers. Increased prices of gasoline would increase the prices of all goods and services transported by automobile or truck. Thus, all consumers would pay higher prices for most goods and for those services which involve transportation, in order that a minority of consumers would shift their choice of automobiles from large to small.

Further, the increased gasoline tax falls particularly heavily on the less affluent; the additional tax paid would constitute a greater part of their income. Thus, the gasoline tax option imposes relatively heavy burdens on the less affluent--and some burden on all drivers and consumers--in order to induce an affluent minority to shift from large to small cars. This leaves the equity of the gasoline tax option in question, unless countermeasures are taken. We understand from DOT's Transportation Systems Center that the gasoline tax, if adopted, would almost surely be combined with a rebate scheme. (We did not mention the rebate when describing the scenario to respondents, in order to keep it as simple as possible.) For example, a flat rebate would be given to all citizens over 18, or all drivers. Since the less affluent drive their personal vehicles fewer miles per year, and since the standard rebate would be equivalent to larger portions of their income, compared

to that of the more affluent, this rebate would be progressive. However, the less affluent would "feel the pinch" temporarily more than the more affluent, because all drivers would be out-of-pocket for the gas tax for a year or more, and the discount rate of the poor is higher than that of the more affluent.

In addition to changing the choice of automobile size, the gasoline tax option would have an initial effect of decreasing the number of Vehicle Miles Traveled (VMT). Our Task 1 report shows some estimates of the relationship between gasoline price and VMT. We found in our Task 1 Report, however, that a kind of accommodation takes place when gasoline prices go up. Short term effects--lowering VMT--dissipate as automobile owners become used to the new high prices of gasoline. We do not know the extent to which the self-reports of the consumers who participated in our depth interviews reflect the initial effect rather than the ultimate accommodation phenomena.

Under the gasoline tax scenario, consumers are likely to be more sensitive to the effects of accessories on miles-per-gallon attained in a given make and model of auto. Use of air-conditioners and sales of other accessories which reduce mpg are likely to decrease. Thus, we have another secondary effect conserving gasoline, independent of a probable decrease in VMT.

5.6 IMPLICATIONS OF AND MATTERS TO BE CONSIDERED IN IMPLEMENTING THE EXCISE TAX OPTION

5.6.1 Scenario Description

Under this option, one-time lump-sum excise taxes, payable at the time of purchasing a new car, would be imposed on larger vehicles, beginning with 1978. Here again, we used size classes that reflect (imperfectly) excise tax distinctions based on mpg attained. The taxes for a luxury vehicle would be set at $100 for 1978, rising in successive increments to $600 for 1981 and beyond. Excise taxes for standard vehicles would be imposed, beginning with $100 for 1979 and rising to $300 by 1981 and beyond. Finally, an excise tax of $100 per intermediate car would begin in 1980 and continue unchanged thereafter. Gasoline costs 60¢ a gallon.

5.6.2 Results Found in Task 5

Of the three government-option scenarios, the excise tax has the second highest number of new small cars sold, as estimated from consumer reactions in the depth interviews. The number of large new cars estimated to be sold under this scenario is the highest among the three scenarios. The number of cases of postponement or omission of purchase

is lowest, and the estimated total sales highest. Of the three government option scenarios, the excise tax shows the second highest sales of foreign automobiles and the highest sales of domestically manufactured automobiles.

5.6.3 Other Matters to Be Considered

The excise tax has a clear advantage over the gasoline tax, in that it concentrates the economic disincentive precisely at the automobiles with lower mpg. However, fleet owners and people who charge off auto costs as business expenses may be able to reduce this disincentive by charging off a one-time excise tax payment on their income taxes as a business expense.

Since the excise tax is imposed at the time of automobile purchase, it might reduce the propensity of consumers to buy accessories in order to keep down total costs at time of purchase. (This is likely to affect particularly those who pay cash for cars.) Insofar as these accessories (such as air conditioning) bring about fewer miles per gallon, this secondary effect will be in line with the goal of conserving gasoline. Reduced propensity to buy accessories may induce dealers and manufacturers to reduce their margin in the short run, in order to maintain sales volume of autos on the lot which are heavily loaded with such options.

5.7 IMPLICATIONS OF AND MATTERS TO BE CONSIDERED IN IMPLEMENTING THE REGULATION OPTION

5.7.1 Scenario Description

The situation in this scenario is similar to one which has, in fact, been legislated. Congress requires manufacturers to achieve a sales-weighted average of new cars with miles per gallon higher than has been true in the past. The target mpg increases over time. If they cannot meet the target through improved technology, they must do so by limiting the sales of larger cars which get fewer miles to the gallon. Larger cars would only be sold as enough smaller cars are sold. If not enough new small cars were sold, a dealer could not sell more larger cars and would have to tell some interested large-car buyers that he was "out of quota." He would be able to sell more large cars only after more small cars had been sold. Gasoline costs 60¢ a gallon. In the depth interviews, consumers were questioned about what they would do if a dealer told them he was "out of quota" for large cars.

One factor in the legislation was not pointed out to the respondents in the depth interviews, again to keep the scenario simple. If manufacturers do not meet the sales-weighted average target through technological improvements or increasing the sales of more gasoline-efficient autos, they can avoid contravention of the law by paying a fine. If a given manufacturer does the last, he will pass through the higher costs by increasing the price of the automobile. The price increase would be very small for automobiles like the Rolls Royce, the manufacturers of which are the ones most likely to take the route of paying the fine.

5.7.2 Results Found in Task 5

Self-reports of consumers in response to the regulation scenario yield results quite similar to those for the exicse tax. Slightly fewer small cars are sold under this scenario than for the excise tax; more large cars are sold. With respect, however, to postponements and decisions not to buy a car, many more were found in the self reports for the regulation case than for the excise tax case. In fact, postponements and reports of "no buying" were only slightly less frequent for the regulation case than for the gasoline tax case. For the regulation case, estimated sales of foreign cars are less than those estimated for either the gasoline tax or excise tax case. However, the estimate of domestic units sold is between that for the other two cases.

5.7.3 Other Matters to Be Considered

Our estimates of effects of the regulation case were made without knowledge of what the quotas for large cars would be. The estimates do tell us, however, what would happen if the quotas were set relatively low. In this case, slightly fewer people would switch to small cars than for the excise tax case and considerably fewer than for the gasoline tax case. Many more would postpone or not purchase at all under the regulation case than under the excise tax case. Similar numbers would do this in the regulation case as in the gasoline-tax case.

It appears that even a low quota on large cars would have effects which are less desired than those estimated for the excise tax option. In addition, the regulation option arouses antagonism from some sectors of industry and the population, as constituting government interference in the play of free market forces.

The automobile manufacturers have been able to meet the requirements of the regulation law by increasing mpg on their new products. General Motors, the leader in this respect, has done so by cutting weight and exterior dimensions on its standard sized cars, ("large," in our typology) without any great sacrifice of interior roominess. Thus, the primary change so far has been in terms of mpg attained within a car size class, rather than in the distribution of new autos sold among size classes.

If the manufacturers' responses were limited to increasing the proportion of small cars among those manufactured each year, it would change their relationship with dealers. Manufacturers would supervise dealers' sales much more closely to assure that the quota of small cars would be sold. Manufacturers would supply their relatively small stock of large automobiles to dealers who sell relatively large numbers of small automobiles. (Manufacturers have historically used "hot selling" cars as rewards for dealers.) Manufacturers' and dealers' margins on large cars would probably increase perceptibly. At the same time, margins on small cars might decrease. Finally, dealers' relations with consumers would change: consumers who were very interested in buying large cars would pay more for them--possibly some of it "under the table"--than they do now. All of this change has been avoided by the way in which manufacturers have met the demands of Government regulation of new car fleet average miles per gallon.

The previous paragraph mentions the possibility of cross-subsidization (margins on small cars decrease, while margins on large autos increase). Cross-subsidization would turn the effects of the regulation case more towards those of the excise tax case.

To the extent that manufacturers go the route of paying fines and passing costs through to consumers, the results of the regulation case would be even more like those for the excise tax case. Particularly, we believe, the number of postponements of purchases would decrease to a level similar to that for the excise tax case.

In summary, <u>if</u> manufacturers diverge from the path of improving fleet mpg through technology, the results of the regulation case are likely to be somewhat like those of the excise tax case. But present indications are that the manufacturers will remain on the technology path.

6. FUTURE RESEARCH

This study has answered a number of questions concerning its major objectives. It has also opened up others. In this chapter, we suggest and describe briefly some additional research projects which we believe are merited in order to investigate further the dynamics of the automobile market and relate them to steps the federal government can take to reduce gasoline consumption.

6.1 AUTOMOBILES IN FLEETS

6.1.1 Background and Objectives

In this study, we found that a substantial number of new cars are bought by fleet buyers. These include federal and municipal government agencies, automobile rental agencies, and companies which provide automobiles to their employees. Technically speaking, "fleets" also include other organizations which buy more than four cars a year and, for example, lease them to the general public. The ambiguity of what is meant by a "fleet" causes difficulty in ascertaining how many new cars are bought by fleet buyers. We chose in the present study to exclude the last group from our definition of "fleet" because, in cases where individuals lease cars, it is the individuals rather than the fleet buyers who make the decision about which kind of car to lease. In this study, we have made some tentative initial efforts to identify the number of cars bought annually by fleet buyers, according to our definition. We believe, however, that considerably greater efforts are necessary in order to produce accurate estimates--not only for the most recent year, but also for some historical period.

Thus, the first research objective is to ascertain, with a fair degree of accuracy, the numbers of new cars that have been bought annually by fleet buyers (using the restrictive definition) and the composition of those cars in terms of size and domestic/foreign manufacture. We believe that accomplishing this and the other research objectives cited below is important to the federal government, since fleet buyers make up a substantial portion of the sales of new cars, by any estimate, so they must be accounted for in considering various government options.

The second research objective is to estimate the "as is" projection in fleet buying, both in numbers and in composition. This is, of course, parallel to the effort in this study to estimate the "as is" sales and composition of all new cars sold; it needs to be carried out for the same reasons.

The third research objective is to estimate the effect of various government options on sales to fleet buyers. Evidence cited in this study

shows that fleet buyers are more sensitive to economic considerations than individual buyers. However, the evidence is insufficient for inferences about the response of fleet buyers to various new government options.

6.1.2 Methods

A study of fleet buyers would probably do well to start with the annual study produced by the Hertz Corporation. Thorough understanding of the data in it will be necessary in order to identify fleet buyers fitting the restricted definition above. Probably anyone studying fleet buyers by the restricted definition would need to return to the raw data used initially by the Hertz Corporation.

Analysis of R.L. Polk data, supplemented by interviews with some organizations identified as fleet buyers, would probably allow efficient sorting of the ostensible fleet buyers into those which do and which do not fit our restricted definition.

Interviews with a sample of fleet buyers corresponding to our restricted definition--much along the lines of the interviews with individual buyers in this study--would probably indicate well the effects of the government options on fleet purchasing behavior. The fact that the federal government accounts for a considerable percentage of fleet buying would, we believe, simplify the work in two ways:

(1) A relatively small number of interviews would account for a relatively large number of the fleet purchases.

(2) Federal government agencies purchasing automobiles would presumably be more sensitive to the energy-saving objectives of the federal government than would private agencies; their responses to energy-saving policies would be more easily predictable.

In terms of some of the options, researchers would need to check the possibility of differential treatment of government purchasers. For example, if an excise tax were imposed, would the General Services Administration (GSA) pay taxes to the United States Treasury on cars which the GSA purchases, or is the government exempt from paying taxes to itself?

6.2 THE USED-CAR MARKET

6.2.1 Background and Objectives

We concluded in the study that the effects of implementing government options which directly affect the purchases of new cars will inevitably be reflected in the used car market. We also showed that buyers

in the used car market are demographically different from new car buyers: used car buyers generally have lower income and less education. It seemed to us that final determinations and choices among government options cannot be based simply upon their effects in the new car market; they must also take into account effects on the people who buy used cars. Thus, it seemed an important objective to trace effects through to the used car market.

Some questions to be answered include:

How many used cars are sold each year?

What is the relationship between used car price and the original price of the car?

What is the relationship between used car price and the current price for a new car of the same make and model?

How sensitive is the used car market to used car prices? In other words, what proportion of prospective buyers are driven out of the market as prices of used cars increase?

How much of a burden is the lack of a car to those who are forced out of the used car market?

How is the used car market affected by increases in the price of gasoline?

How much of an excise tax on new cars is likely to be passed on to the second and later buyers of the same car?

How do people decide whether to buy a new or a used car?

6.2.2 Method

Much of the information on the size and composition of the used car market could probably best be obtained from a national survey of car buyers, asking them about the cars (both new and used) they have bought and sold in, for example, the last five years. We believe that this method would be superior to either of two other options:

(1) A survey of dealers of automobiles, both new and used. The major disadvantage to this method is that there appear to be a very large number of used car dealers, including many small companies and even some not officially registered as dealers. Further, a certain unknown portion of used cars are sold privately.

(2) An analysis of data in the possession of each state Department or Registry of Motor Vehicles. In this horrendously large undertaking, it is not clear how appropriate the records would be for our purposes. Also, it is doubtful that we would be able to obtain data from all states, since some states do not make their records available to R. L. Polk.

Interviews with car buyers and sellers will ascertain why they chose to buy and sell at a given time and what factors affected the prices they were willing to pay or accept. Comments on the interviews can also substantiate and possibly shed more light on the demographic differences between new car buyers and used car buyers and how consumers decide whether to buy a new or a used car.

Analyses of the monthly reports on used car prices put out by the National Automobile Dealers Association and some other organizations can be correlated with information on new car prices, as shown in Consumer Reports and other publications.

6.3 LONGITUDINAL STUDY OF BUYER BEHAVIOR

6.3.1 Background and Objectives

At present, our descriptive statistics show changes over time in the composition (e.g., by size) of new cars sold. It is difficult to ascertain from these gross statistics what happens at the micro level of an individual family. For example, have certain older families remained in the large car market? Is the increase in buying small cars only due to people buying cars for the first time? We believe that such information would be useful to better understanding of automobile market dynamics.

Some questions to be answered include:

How do automobile owners select cars throughout the stages in their family life cycle?

How do people decide to increase or decrease the number of cars in the household?

How does increasing income relate to the choice of car(s)?

How does change in residence (apartment to house, city to suburb, etc.) relate to the choice of car(s)?

6.3.2 Method

A national probability sample, interviewed about its car buying and trading-in behavior over time, would provide the data to answer this question.

6.4 MULTIPLE-CAR OWNERS AND COMPLEMENTARY CAR BUYING

6.4.1 Background and Objectives

We have noted above that the research design of this study reveals the truth, but not the whole truth. That is, we found that the choice of a given new car is to some extent contingent upon the other cars already owned by multiple-car owners. For example, a given individual may have bought a large station wagon in 1976, the time frame for our study, because the buyer was then in the market to replace a similar vehicle. When we asked about the next car to be bought, the buyer may have indicated a small sedan, similarly replacing another of his vehicles which falls due for replacement in 1979. We believe it will be of further value to understanding of automobile market dynamics to comprehend these complementarities by focusing on multiple-car owners and how they choose the allocation of various functions among their automobiles.

Some questions to be answered include:

> How and why does the family decide to buy a second or third car?
>
> Are cars used by a family interchangeably or for unique and special uses, such as commuting, family errands?
>
> What happens to older cars: traded in or "hand me down?" Why?
>
> Could two small cars do the work of one large car? Or one large car do the work of two?
>
> What is the larger car's primary cargo requirement: children, pets, luggage/gear, or what?
>
> The interaction considerations in car choices: the new/used, large/small, inexpensive/expensive trade-offs made between car 1 and car 2.

6.4.2 Method

To accomplish this objective, a similar set of interviews of multiple-car owners and their allocations of functions, as these affect their buying decisions, would be necessary.

6.5 PURCHASE OF VANS, PICK-UP TRUCKS, AND RECREATIONAL VEHICLES (RVs)

6.5.1 Background and Objectives

We have seen that vans, pick-up trucks, and RVs are increasing their share of the total new car market. Such vehicles produce lower miles per gallon than other vehicles. We believe it would be a useful objective to attempt to forecast the market for vans, pick-up trucks, and RVs, to find out why people buy them, and then to find out how the implementation of the various government options will affect this buying behavior.

6.5.2 Method

First, data which we believe can be found in Automotive News can be used to indicate the present sales of vans, pick-up trucks, and RVs and the five-year trends. From these data, estimates can be made of these vehicles' shares of the future sales of new cars. Estimates of their sales and forecasts may be obtained from the automobile manufacturers.

Given these data, researchers can then interview previous and prospective van, pickup-truck, and RV buyers, in much the same way that buyers of other cars were interviewed in this study, in order to ascertain the possible effects of government policies and programs on their future buying intentions.

APPENDICES A THROUGH K COMPRISE
REPORT ON TASK 2

APPENDIX A BACKGROUND

The automobile is a unique consumer durable. Next to a house, it represents, over time, the most important investment most people make. It has become so much a part of the American life style that it is considered a necessity. Although it is a durable, it has traditionally been purchased like a consumable--as a style item which is replaced every few years for a newer, more stylish model. Because of this phenomenon, the used-car market has been large and successful in itself (unlike the resale market for most other durables, which are nearly worn out when new ones are bought), and those unable to afford new cars have constituted a large proportion of the used-car buyers, particularly for lower-priced autos.

The last decade has seen some changes and confusion in the marketplace as growing regulation of cars (emissions and safety controls) and growing costs of ownership and operation have begun to challenge many of the beliefs surrounding the automobile.

In America as nowhere else, there is a deeply entrenched set of beliefs about technology and about bigness. The technological mythology suggests that all problems and issues can be solved by technology: if we can put a man on the moon, we can solve economic problems, etc. Food problems from overpopulation and overindustrialization can be "solved" by technology (the Green Revolution, for example). Depletion of resources can be solved by technology.

Americans also value bigness. We have been reared in the belief that "big business" and its efficiency allow us low-priced goods (relative to smaller industrial nations). We have been brought up on the theory

of economics of scale in business. We have internalized this value of bigness into our consumption patterns. The wealthy "earn" the right to big houses, big cars, large plots of land, and so on. Thus, a measure of personal success is to have possessions which are bigger than what someone else has. Thus bigger and better and more expensive and more luxurious have been built into our value systems.

But subtly the rules of the game are shifting. Government emphasis over the past few years has been on two areas: health (emissions) and safety. Americans have largely resisted these attempts to "unsex" the automobile, with the result that more ways of forcing compliance have been instituted (the seat belt going from optional to mandatory to buzzer to interlock and back to mandatory).

The OPEC-inspired energy crisis, with its rapidly increased price of gasoline and its temporarily decreased availability of gasoline, gave impetus to a previously incipient trend--a more cost-conscious approach to the automobile, particularly in cost of operation. However, as with safety and emissions, old behaviors die hard, and many people continue to prefer the large, heavy, inefficient cars. The government is now considering the impact of various regulations or controls on car-purchasing behavior.

APPENDIX B THE INDUSTRY

B.1 INTRODUCTION

A brief look at the automobile industry is worthwhile.

The manufacture, wholesale, retail, and service automotive businesses alone account for $230 billion in sales and 4 million employees.[1] Add to these figures highway construction/maintenance and segments of the steel, iron, rubber, and petroleum industries which are a direct function of automobile demand, and it can be seen that the impact of changes in the automotive industry on GNP can be substantial.

Taxes that are auto-related are also substantial. State taxes and license fees total some $13 billion; federal excise taxes alone amount to some $6 billion, for a total of $19 billion.[2]

In the last decade, the U.S. passenger auto fleet has increased 32%, from 66.7 million cars on the road in 1966 to 88.3 million in 1974. In general, this increase has been a steady 3-4% a year, as can be seen in Table B-1.

TABLE B-1 NUMBER OF CARS REGISTERED IN U.S., BY YEAR

YEAR	NUMBER (millions)
1974	88.3
1973	84.0
1972	81.4
1971	78.4
1970	76.0
1969	73.9
1968	70.9
1967	68.8
1966	66.7

Source: Automotive News, 1975 Almanac Issue

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1 1973/74 Automobile Facts & Figures, Motor Vehicle Manufacturers' Association of the United States, Inc., p. 52.

2 Ibid., p. 59.

The number of cars on the road has been increasing more rapidly than the population, as more and more households have experienced multiple-car ownership. The average household owns a car. About one household out of five does not own a car; one out of three owns two or more cars. See Table B-2.

TABLE B-2 AUTO OWNERSHIP BY YEAR

No. Cars/Household	1972	1971	1970	1969	1968	1967	1966	1965
None	20.5	20.0	20.0	20.4	21.6	21.4	21.2	21.0
One	49.3	50.2	50.3	50.6	51.3	53.5	53.8	54.8
Two	24.6	25.0	24.6	24.8	23.2	25.1	25.0	24.2
Three	5.6	4.8	4.7	4.2	3.9			

Source: U.S. Dept. of Commerce, Bureau of the Census, Current Population Reports, "Consumer Buying Indicators," Series P-65.

New cars, whose number has fluctuated substantially over the past ten years, have typically represented about 9-10% of the total fleet in any given year, as can be seen in Table B-3.

TABLE B-3 NEW CAR REGISTRATIONS AS % OF TOTAL FLEET, BY YEAR

YEAR	NUMBER REGISTERED	% OF TOTAL FLEET
1974	8,701,094	9.9
1973	11,350,995	11.5
1972	10,487,794	10.6
1971	9,830,626	10.0
1970	8,388,204	8.5
1969	9,446,524	9.5
1968	9,403,862	9.4
1967	8,357,421	8.4
1966	9,008,488	9.0
1965	9,313,912	9.3

Source: Automotive News Almanac issues

Two basic changes have been taking place over the past decade, however. A gradual trend toward smaller cars can be observed (see Table B-4), coupled with a dramatic increase in imports, whose share of the market in 1974 was 1.5 times that of a decade ago. As can be seen, imports represented 16% of all new cars registered in 1974.

TABLE B-4 U.S. NEW CAR REGISTRATIONS BY GENERAL MARKET CLASSES, 1966-74 (% OF TOTAL MARKET)

YEAR	HIGH PRICE	MED. PRICE	REG. SIZE	INT. SIZE	COMPACT SIZE	SUB-COM. SIZE	SPECIALTY SPORTS TYPE	FOREIGN
1974	2.7	9.1	12.5	18.8	17.6	9.1	14.4	15.7
1973	2.6	12.8	15.9	19.1	14.7	9.4	10.3	15.1
1972	2.6	14.8	19.2	19.3	13.1	8.2	8.1	14.6
1971	2.7	15.2	20.8	18.1	12.1	7.4	8.6	15.1
1970	2.3	13.7	22.5	21.0	10.0	1.6	10.3	14.7
1969	2.9	16.8	25.9	22.2	9.8	-	11.1	11.2
1968	2.6	17.0	27.0	24.0	7.1	-	11.7	10.5
1967	2.9	17.8	28.6	21.8	6.7	-	12.8	9.3
1966	2.8	17.9	30.4	23.6	8.4	-	9.4	7.3

Sources: Wards Automotive Yearbook, 1975; Jack Faucett Associates, Inc., Factors Influencing Automobile Ownership, Travel and Gasoline Consumption, an interim report to Federal Energy Administration and the Task Force on the Automobile Beyond 1980, Marketing and Mobility Panel, June 23, 1975, p. 21; Automotive News Almanac issues. See Appendix I for definitions of categories.

Consumers in large numbers have continued to load up their cars with accessories. The average new car sold has a V-8 engine, automatic transmission, power steering and brakes, air conditioning, a vinyl roof, tinted glass, fancy hubcaps, and some music system (AM and/or FM radio or tape player).[1]

[1] Ibid., p. 23.

As car models became bigger and heavier, and as safety and emissions features were added, average fleet fuel economy declined from 14.07 mpg in 1965 to 13.10 in 1973, a 7% decline (despite increasing high-mpg imports and the growth in smaller sized cars). But lately, pressure from the government has had an effect on the manufacturers, so that the average mileage per gallon for new cars, as measured by EPA, increased from 13.9 in model year 1974, to 15.6 for model year 1975, to 17.6 for model year 1976, according to Automotive News, September 9, 1975. Table B-5 shows the fuel-economy figures.

TABLE B-5 AVERAGE FUEL ECONOMY FOR AUTO FLEET AND NEW CARS (MPG)

YEAR	AVERAGE FLEET FUEL ECONOMY[1]	NEW CAR FUEL ECONOMY[2]
1974	N.A.[3]	N.A.
1973	13.10	11.67
1972	13.49	12.03
1971	13.57	12.21
1970	13.57	12.51
1969	13.63	12.21
1968	13.79	12.44
1967	13.93	12.86
1966	14.00	12.95
1965	14.07	12.98

[1] Calendar-year basis

[2] Model-year basis

[3] Not available

Source: Jack Faucett Associates, Inc., Factors Influencing Automobile Ownership, Travel and Gasoline Consumption, an interim report to Federal Energy Administration and the Task Force on the Automobile Beyond 1980, Marketing and Mobility Panel, June 23, 1975.

We were unable to obtain data on the average age of cars scrapped by year, but have estimated the figures (see Table B-6) from data on cars in operation each year. The data are far from conclusive, for several reasons: used cars sold outside the U.S. (the export of used cars is a substantial business) will

be considered "scrapped," as will cars temporarily put on blocks or otherwise not registered (this may have happened, for example, in 1973, when gasoline availability was of such concern); increasing new car sales can over-weight the data; and the amount of swing possible from year to year is slight, so the figures are relatively insensitive to changes (for example, a total postponement of car purchases in any given year would change the average by less than 1.0). The average age of a car scrapped, however, is around 10 years.

TABLE B-6 AVERAGE AGE OF CARS TAKEN OUT OF OPERATION, BY YEAR

YEAR	AVERAGE AGE
1974	N.A.
1973	9.6
1972	9.9
1971	10.3
1970	9.8
1969	10.6
1968	10.8
1967	10.4
1966	10.9
1965	10.6

Source: ADL estimates from data on cars in operation by year, from 1964-1973 as recorded in 1973/1974 Automobile Facts & Figures, Motor Vehicle Manufacturers' Association of the United States, Inc., p. 26.

As might be expected with increased population and increased multi-car ownership, automobile travel has increased by 44% over the last decade, from 706 billion miles to 1,017 billion. The growth of automobile travel slowed somewhat in 1973 from its average 5% growth to 3%. See Table B-7.

TABLE B-7 TOTAL U.S. AUTOMOBILE TRAVEL

YEAR	BILLIONS OF VEHICLE MILES
1974	N.A.
1973	1016.9
1972	986.4
1971	939.1
1970	890.8
1969	849.6
1968	805.7
1967	766.5
1966	744.8
1965	706.4

Source: U.S. Department of Transportation, Federal Highway Administration, Highway Statistics

Increases in automobile travel and decreases in fuel fleet economy have led to increased consumption of gasoline, as can be seen in Table B-8. As expected, because of the cumulative effects of these two factors, gasoline consumption has increased by 55% in the last decade, growing 5% a year.

TABLE B-8 AUTOMOBILE GASOLINE CONSUMPTION

YEAR	MILLIONS OF GALLONS CONSUMED
1974	N.A.
1973	77,619
1972	73,121
1971	69,213
1970	65,649
1969	62,325
1968	58,413
1967	55,007
1966	53,220
1965	50,206

Source: U.S. Department of Transportation, Federal Highway Administration, Highway Statistics

Auto and tax characteristics in this scenario form a baseline for those other scenarios.

B.2 GASOLINE TAX INCREASE WITH A REBATE

The following schedule of increases per gallon is added to the baseline price of 75¢:

July 1, 1976	5¢ over January 1976 price
January 1, 1977	10¢ over January 1976 price
January 1, 1978	15¢ over January 1976 price
January 1, 1979	20¢ over January 1976 price

The monies thus collected are returned to the public in the form of an equal rebate to every U.S. citizen over age 17. The amount of gasoline each individual buys does not affect his/her rebate.

In this scenario, consumers will be told that they will get a rebate. The purpose of this scenario is to test the hypothesis that a substantial portion of them will interpret the rebate as paying them back for their gasoline tax expenditure, and their reactions to scenario B will be different from their response to scenario C.

B.3 GASOLINE TAX INCREASE WITHOUT A REBATE

Same as B, except that a rebate is not assumed.

B.4 NEW CAR EXCISE TAXES FOR GAS GUZZLERS

The taxes will be those described in Table 7 of the Task 1 Report. See Table C-1.

APPENDIX C REGULATION

Five basic regulation scenarios are presented in Appendices D through H. These scenarios are briefly described below. Note that the mpg figures we will be using in all instances are EPA ratings. Since these are not actual road tests but dynamometer tests, they overstate mileage by, one group suggests, 20%.[1] Thus, although relative improvements in consumption of gasoline can be noted, it is misleading to apply the mpg figure directly to actual gallons of gasoline consumed or to calculate the actual gallons "saved" without correcting for the realities of mileage actually obtainable by U.S. drivers on U.S. highways.

C.1 BASELINE

Manufacturers gradually raise the sales-weighted average fuel economy of new cars to about 19 mpg by the 1980 model year. In January 1976, the federal gasoline tax will be raised 2¢ per gallon over its 1975 value. Further, decontrol of gasoline prices is expected to add 10¢ to the cost per gallon. Thus, the gasoline price throughout our time period of 1976-1980 will be 75¢ per gallon in 1975 constant dollars. All the money amounts in all scenarios will be constant 1975 dollars. See Table C-1.

Further, the baseline scenario will take into account changes for the sake of safety expected during the time frame. It is expected that safety regulations will focus on small cars (four or fewer occupants). We will not attempt to communicate to respondents the changes made, but the prices for small cars will reflect retail price increases arising from safety improvements in small cars:

> Beginning with 1978 model year, add $100.
>
> For the 1980 model year, add another $300, a total of $400 above the 1976 price.

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1 "Overkill in the great fuel economy war," Car & Driver, September, 1975, p. 12.

TABLE C-1 ASSUMED AMOUNTS OF TAXES

MPG	1978	1979	1980	1981
<13	$800	1,000	1,200	1,400
13-14	400	500	700	800
15-16	100	300	500	600
17-18	0	100	200	300
19-20	0	0	100	100
21+	0	0	0	0

The excise tax is not deductible from federal income taxes, consistent with federal policy.

C.2 REGULATIONS

Auto manufacturers are required to achieve specified sales-weighted mpg standards. This standard, for each year, will be 2 mpg higher than that in the Base Case (scenario A). Foreign manufacture is not included in a domestic manufacturer's sales. It is considered to be anything with less than 75% value added in the U.S.

APPENDIX D BASE CASE SCENARIO

In this and following scenarios we will first present the assumed conditions of the scenario, then estimate impacts on the government, manufacturers and consumers.

D.1 ASSUMED CONDITIONS

Gasoline will be 75¢ per gallon. Safety regulations in the subcompact and subsubcompact cars, including those of foreign manufacture, will affect their prices (we will use a $100 increase in 1978 and a $300 increase in 1980). We assume voluntary manufacturer sales-weighted mpg averages (based on EPA tests) as given below.

	MODEL YEAR				
	1976	1977	1978	1979	1980
Sales-weighted mpg	15	16	17	18	19

D.2 EFFECT ON GOVERNMENT

Our judgment is that the present administrative structure and procedures would be adequate for monitoring the conditions under this scenario. We expect that administration of the voluntary standards can be handled as EPA presently handles emissions--overseeing the four domestic manufacturers to see how well they are meeting the voluntary standards.

D.3 EFFECT ON MANUFACTURERS

We anticipate that the manufacturers will have basically four actions they can take to meet the guidelines: 1) they can stop manufacturing the standard car, 2) they can in effect "ration" large cars by price changes, 3) they can introduce new cars, particularly at the subcompact end of the line, and 4) they can improve the mileage of present lines by making them lighter, more efficient (in engine operation), and smaller (in exterior space).

We suspect that in fact, a combination of these actions will occur. Chrysler has already announced they are dropping some of their large cars.[1] Chevrolet has already introduced a new subsubcompact (the Chevette); mileage on 1976 cars is supposed to be somewhat improved over 1975, as noted below.

A look at present sales-weighted mpg averages is in order. According to EPA figures, production-weighted averages for each of the four manufacturers are as shown in Table D-1.

TABLE D-1 EPA MILEAGE FIGURES[2]

	1974	1975	1976
GMC	12.0	15.4	16.6
Ford	14.2	13.6	17.3
Chrysler	13.7	15.5	16.4
AMC	16.4	19.0	18.3
U.S. AVERAGE	13.2	14.6	16.4
U.S. (FOREIGN) AVG.	13.9	15.6	17.6

Note that all manufacturers will meet the 1976 and 1977 voluntary guidelines, that Ford has met the 1978 guideline, and AMC the 1979 guideline, in the 1976 model year.

The changes we feel will be made to meet the voluntary standards are given by year, in Table D-2. These changes combine activities of all four U.S. major manufacturers, but exclude foreign imports.

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1. This may just be the Imperial, or it may include others.
2. Automotive News, September 29, 1975. Because of a shift in the base for calculating mpg from use of the city cycle only (as was done for 1975 and 1974 model years) to use of a combined city/highway cycle, data shown here for these years may be slightly different from those shown previously by EPA.

TABLE D-2. POTENTIAL CHANGES IN AUTOMOBILES, 1976-1980

POTENTIAL CHANGES	1976	1977	1978	1979	1980
New Car Lines[1]					
Subsubcompact	x		x		x
Modified Car Lines[2]					
Luxury					
Standard		x	x		
Intermediate			?		
Compact				x	
Dropped Car Lines[3]					
Luxury	x				
Standard	?	?			
Intermediate		?	?		
Compact					
Price Increases					
Luxury		x	x		
Standard		x	x		
Intermediate			?		
Compact					
Subcompact			x		x
Subsubcompact			x		x
Modifications[4]					
Weight	x	x	x	x	x
Exterior size		x	x	x	?
Engine mods.[5]					x
New engine[6]		x	x		
Transmission	x				
Aerodynamics					

1 A new line called subsubcompact, with totally new car lines. Although not much different in size, it will have greater mpg and will be competing with the imports (particularly the "Rabbit") for handling and economy. Consumers will see it as a new line.

2 Although the size of these lines will change, the same names will be attached to the models, so they will look the same (but newly styled) to consumers and will still be classed as standard, intermediate, compact, etc.

3 Car lines not modified but dropped entirely from the line.

4 Changes which may be made, either for the modification of the car line, or during the model changeover, which will improve car fuel economy.

5 Changes not noticeable to consumers--e.g. "lean burn" engines.

6 Engines which appear new to consumers--e.g. the diesel engine; rotary/Wankel engines, etc.

In 1976, the 1976 model year Chevette will have been introduced--a subsubcompact which is expected to have about a 32 mpg-rating. Chrysler has indicated that it may drop its Imperial and other large cars in 1976 (or 1977); all cars are expected to be somewhat lighter. The 5-speed manual transmission is also likely to be widely offered.

In 1977 the standard (large) car will probably be modified, to be lighter and smaller (close to the present intermediate size car). We expect that prices will be increased on the standard cars--we will use a 10% increase--to cover part of the costs of retooling. We suspect that luxury car prices may well increase--we will assume by 5%--so the cost of a luxury car will remain greater than the cost of the "new" standard. The present intermediate car, which would now be close to the "new" standard in size, may well be dropped. Diesels are expected to make their appearance in 1977 as options on selected cars (e.g. the Cadillac Seville and other high-priced cars). For the purposes of this scenario, we judge that this option would add $1,000 to the cost of the car.

If the intermediate is not dropped in 1977, we expect it will be modified for both weight and size in 1978, and the price increased around 10% to cover part of the costs. The standard line modifications begun in 1977 are expected to be completed in 1978, and price increases on the "new" standard and the luxury cars, as noted above, will probably be made as well. We expect that another new subsubcompact will be introduced. In 1978, safety regulations on subcompacts and subsubcompacts are expected to increase prices on these cars by $100. We suspect that diesels will be more widely available as an option in 1978 on the "full-sized" cars. In 1979 we judge that modifications will be made to the compact cars, which will affect their weight and exterior size. We feel that the costs for retooling will, wherever possible, be absorbed by the manufacturers (as with their normal model-changeover costs) so that these smaller cars will be more attractive to purchasers when compared with larger cars; thus, we have not estimated a price increase for this line.

In 1980, we expect the introduction of a new subsubconpact car based on already-existing engine technology. We suspect that this car would be closer to the present-day European models than previous cars--more boxy, lighter weight, and with a somewhat more efficient front-drive engine. This new car should therefore have greater fuel economy--like 35 mpg. Price increases for subcompacts and subsubcompacts, covering retooling for improved safety, have been mentioned above.

D.4 EXPECTED EFFECT ON CONSUMERS[1]

In a given year, consumers basically have a number of options relating to car purchase, car travel, and car driving. As Figure D-1 shows, they can decide to purchase a car--this purchase may be an accelerated purchase or a delayed purchase vis-a-vis normal patterns and it may be the same type of car, a larger car, or a smaller car then they presently own. Or they can decide not to purchase a car; they can decide to sell their present car (either as a trade-in or not) or to keep their present car.

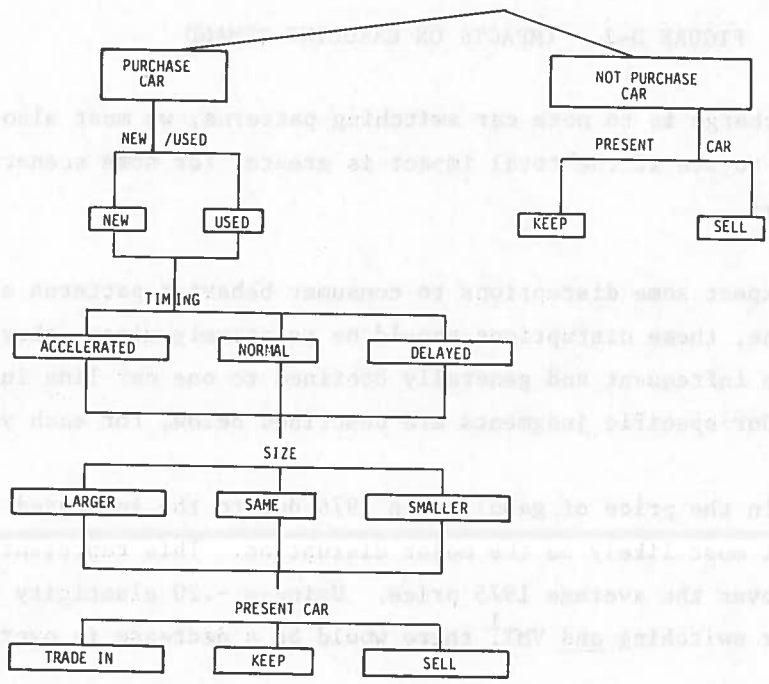

FIGURE D-1. CAR PURCHASE DECISIONS

[1] To be tested in survey work.

They can drive more, the same, or fewer miles; they can increase, decrease, or maintain their "normal" speed. All these decisions affect gasoline demand, as can be seen in Figure D-2.

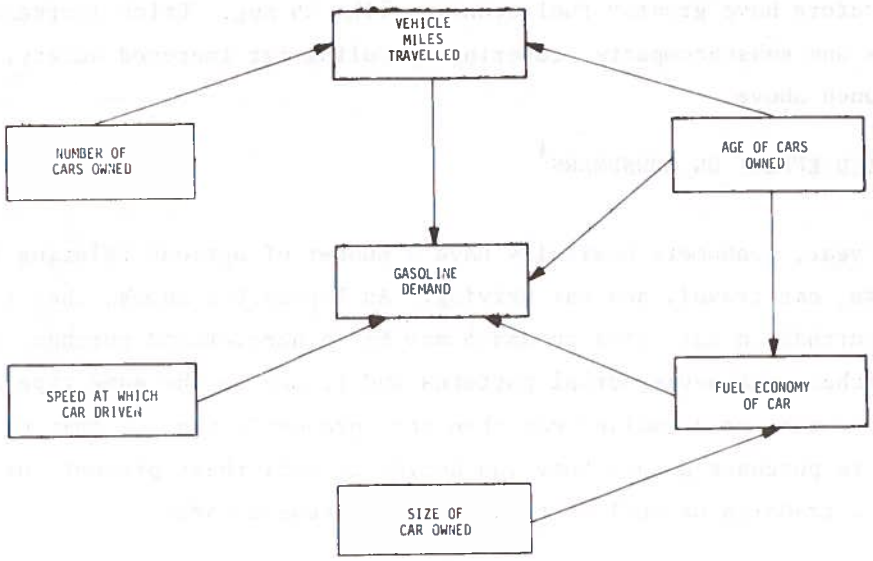

FIGURE D-2. IMPACTS ON GASOLINE DEMAND

Although our charge is to note car switching patterns, we must also note other changes to see if the total impact is greater for some scenarios than for others.

Although we expect some disruptions to consumer behavior patterns as a result of scenario one, these disruptions should be relatively minor--they are expected to be infrequent and generally confined to one car line in any given year. Our specific judgments are described below, for each year.

The increase in the price of gasoline in 1976 due to the increased tax and decontrol will most likely be the major disruption. This represents a 25% increase over the average 1975 price. Using a -.20 elasticity for new car sales, car switching and VMT,[1] there would be a decrease in overall sales

[1] See Task 1 report, Impact of Vehicle Changes on Consumers, p. 15-16.

of new cars by 5%. Of large car buyers, 5% can be expected to trade down, and VMT will decrease by 5%. However, we believe that some other factors offset these figures. The introduction of a subsubcompact will shift market shares; the improved mileage of 1976 cars will probably offset some of the switching behavior that would otherwise occur; also, many of the Chrysler large car buyers may well remain loyal to Chrysler and either postpone purchase or trade down in the absence of a large car. Table D-3 shows any estimates of the expected impact and net effects of changes on share of market, new car sales, vehicle miles travelled, and driving speed.

For 1976, we estimate that the 5% decline in new car sales as a result of gasoline price increases will be offset by the introduction of the subsubcompact and by the improved fuel economy obtainable in 1976 models, so that "normal" growth can be expected. We do, however, estimate a decline in the historical 5% annual growth in VMT. We will follow the National Transportation Report in estimating 2.8%. We also expect a 5% switch from standard-size cars to smaller cars.[1]

We believe that by 1977 consumers will have adjusted to the increased price of gasoline, so we will not assume any impacts from it. We judge that reaction to increased prices on some of the large cars will be mixed. Since the new cars will have improved fuel economy, we do not feel that the -1.0% elasticity of new car sales and switching will prevail, particularly with the diesel engine option that we expect will be available. Also, the whole line will not be affected until 1978. We estimate that luxury cars will experience a 2% decrease in sales and a 2% postponement of purchase due to price increases. We do not believe that postponement of purchase or switching will be significant factors with standard size cars, however. We believe that a 1% switching or postponement will occur, not accounting for any change in the intermediate cars. If, on the other hand, the intermediate line is dropped, we expect that its share of the market would be distributed as follows: 30% to low-priced standard,

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[1] Where market shares are reallocated, we have assigned them in accordance with substitutability matrices used in the auto industry.

TABLE D-3 NET CHANGES IN MARKET SHARE, NEW CAR SALES, VMT, AND GASOLINE CONSUMPTION, 1976-1980, BASE CASE SCENARIO

EXPECTED CHANGES		1976[1]	1977[2]	1978[3]	1979[4]	1980[5]
New Car Sales		+4%[6]	+4%	+4%	+4%	+4%
Market Share	(1974 Share)*					
Luxury**	3.6%	-.2%	-.2%	-.1%	No Chg.	No Chg.
High Standard	10.0	-.4%	-.1%	-.1%	"	"
Low Standard	12.3	-.4%	No Chg.	-.1%	"	"
Intermediate	24.4	+.7%	No Chg.	-.1%	"	"
Compact	24.4	+.3%	No Chg.	+.1%	+.2%	+5.4%
Subcompact	8.9	-1.5%	-.8%	-.5%	-.2%	-1.5%
Subsubcompact	16.0	+1.5%	+1.1%	+.8%	No Chg.	-3.9%
Vehicle Miles Trvld.		No Chg.	+2.8%	+2.8%	+2.8%	+2.8%
Speed		No Change	No Change	No Change	No Change	No Change

Source: ADL judgments

1 Compared to 1975

2 Compared to 1976

3 Compared to 1977

4 Compared to 1978

5 Compared to 1979

6 Based on annual increase in new car sales needed to go from $8.7 million in 1974 to $12 million in 1980.

* From Faucett Assoc., Factors Influencing Automobile Ownership, Travel and Gasoline Consumption, p. 22. Adds to 99.6 in original. In this table and similar ones, we have used 1974 as the base, because 1975 data are not available.

** Appendix K shows cars belonging to each size class.

10% of high-priced standard and 60% to compacts. The change in shares would then be as follows:

	Alternative 1977 Shares						
	Luxury	High Std.	Low Std.	Inter.	Comp.	Subc.	Subsubc.
Change from 1976	-.2%	+2.4%	+7.5%	-25.1%	+15.1%	-.8%	+1.1%

Assuming intermediates have been retained and are modified, several cross-effects can be expected in 1978. We can expect a further decrease in luxury cars due to a 2% postponement of sales plus 2% switching to other models; we believe also that 1% of high standard purchasers will postpone purchase and 1% will switch to less expensive cars. In addition, higher prices on modified intermediates can be expected to impact on sales and switches--we estimate a 2% postponement and switch (since improved fuel economy should mitigate against the -1.0 elasticity). A 3% price increase in the subcompact category (assuming an average $3,000 price) should create a 3% decline in sales, including postponement. The growth in the subsubcompact category expected due to a new introduction is lessened by the 4% price increase (assuming an average $2,500 price).

If the intermediate category is dropped in 1978, redistribution of market share is estimated below:

	Alternative 1978 Shares						
	Luxury	High Std.	Low Std.	Inter.	Comp.	Subc.	Subsubc.
Change from 1977	-.1%	+2.4%	+7.4%	-25%	+15.1%	-.5%	+.8%

The only changes we expect in 1979 market share are in the compact and subcompact categories. The modifications of the compact line to achieve improved fuel economy without an increased price will, we judge, cause some upward switching from the subcompact category.

We estimate that in 1980, a $300 safety-related price increase on subcompacts and subsubcompacts will move more purchasers from these categories to compacts. The price of the subcompact would then exceed the price of a compact (assumed at $3200) by $200, and the price of the subsubcompact would equal the price of the compact. Thus, although the 10% price increases would normally be expected to result in 10% postponement, 10% switching behavior, we believe that at least 25% would switch to the compact from subcompacts and at least 20% would switch from subsubcompacts.

APPENDIX E. SCENARIO 2: GASOLINE TAX PLUS REBATE

E.1 ASSUMED CONDITIONS

Increases per gallon over the January, 1976 price of 75¢ per gallon, due to taxation:

Date	Increase
July 1, 1976	5¢
January 1, 1977	10¢
January 1, 1978	15¢
January 1, 1979	20¢

Monies thus collected will be returned in the form of an equal rebate to every U.S. citizen over age 17. For the purposes of consumer testing, we will use a figure of $100 as a rebate for every U.S. adult.

E.2 EXPECTED EFFECT ON GOVERNMENT

The rebate condition would, we believe, require a whole new government administrative unit to collect the revenues attributable to the surtax, to locate all U.S. adults, and to send the rebate to these individuals. The tax is levied at the pump on both gasoline and diesel fuel. However, as has occurred in Sweden, diesel-engine owners can then buy heating fuel, add a lubricant, and avoid the tax. This and other issues, in our opinion, need to be addressed. The surtax on gasoline and diesel has a substantial inflationary effect, since companies relying on truck deliveries and distribution will be forced to raise prices to cover increased costs. If commercial vehicles are to be taxed, the question arises as to whether or not those funds are included in the rebate to individuals. These questions need careful consideration.

E.3 ANTICIPATED EFFECT ON MANUFACTURERS

In our judgment, the tax increase will not affect changes in auto characteristics posited in scenario One, where improvements begin at the large-size end of the line. See Table D-2 for a summary of those changes.

E.4 EXPECTED EFFECTS ON CONSUMERS

The increased price of gasoline is expected to create a price effect. Based on the elasticities developed in Task 1,[1] without any cross-impacts, the effects of these increases are given in Table E-1.

TABLE E-1 EFFECTS OF GASOLINE TAX

Date	% Increase Over Previous Price	% Change in VMT	% Change in New Car Sales	% Car Switching
July 1, 1976	7%	-1.4%	-1.4%	1.4% switch from lg. size
January 1, 1977	6%	-1.2%	-1.2%	1.2% " " " "
January 1, 1978	6%	-1.2%	-1.2%	1.2% " " " "
January 1, 1979	6%	-1.2%	-1.2%	1.2% " " " "

The rebate would, we believe, create an income effect which, although slight, will result in increased gasoline consumption.[2] We will use an elasticity factor of .3. Using the median income of $12,051 and assuming a two-adult family, the impact of the $100/adult rebate is given in Table 14 below. We will assume for this scenario that its effect is to increase VMT by .1%.

TABLE E-2 EXPECTED IMPACT OF $100/ADULT REBATE

Median Income	No. Adults/Family	Rebate: % increase in income	% Increase in Gasoline Consumption
$12,051	2	2%	.06%

Our judgment of the net impacts, per year, is given in Table E-3. The additional impact of a 7% price increase in July, 1976 would, we estimate, depress vehicle miles travelled by 1.3% over 1975. In addition, we would expect a depression in the growth of new car sales posited in the base case,

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1 See p. 15-16 of Task 1 report.

2 Ibid., p. 21

and a slight further depression in the sales of high and low standard cars, picked up mostly by the intermediate category.

TABLE E-3 NET CHANGES IN MARKET SHARE, NEW CAR SALES, VMT, AND SPEED, 1976-1980 GASOLINE TAX INCREASE WITH REBATE

EXPECTED CHANGES		1976[1]	1977[1]	1978[1]	1979[1]	1980[1]
New Car Sales		+2.6%	+2.8%	+4%	+2.8%	+4%
Market Share	(1974 share)[2]					
Luxury	3.6%	-.2%	-.2%	-.1%	-[3]	No Chg.
High Standard	10.0	-.5%	-.1%	-.1%	-.1%	"
Low Standard	12.3	-.5%	No Chg.	-.1%	No Chg.	"
Intermediate	24.4	+.9%	"	-.1%	-.2%	"
Compact	24.4	+.3%	"	+.1%	+.5%	+5.4%
Subcompact	8.9	-1.5%	-.8%	-.5%	-.2%	-1.5%
Subsubcompact	16.0	+1.5%	+1.1%	+.8%	No Chg.	-3.9%
Vehicle Miles Trvld.		+1.5%	+1.7%	+1.7%	+1.7%	+2.8%
Speed		No Change	No Change	No Change	No Change	No Change

1 Compared to previous year. Includes changes, noted in Table 12, of base scenario.

2 Faucett, op. cit.

3 Less than .1% change

In 1977 we estimate a slowing of the normal VMT growth and a slowing of new car sales growth due to the 6% gas price increase. We do not believe, however, that switching will occur in 1977 over the base case scenario, since in that year we expect the standard size cars to be modified--the fuel economy improvements would, we believe, offset the gasoline price increase. If the intermediate sized car is dropped, the 1977 alternative shares would, we believe, be as follows:

Alternative 1977 Shares

	Luxury	High Std.	Low Std.	Inter.	Comp.	Subc.	Subsubc.
Change from 1976	-.2%	+2.4%	+7.5%	-25.3%	+15.3%	-.8	+1.1%

In 1978, new car sales will not, we estimate, be affected by the gasoline price increase, due to the introduction of a new subsubcompact, as well as continued modification of the car lines. But we expect VMT's normal growth to be diminished somewhat by the increased cost of gasoline. We foresee no change in car switching over the base case as a result of the increase; we expect the introduction and improved mileage in the larger lines will offset the switches that would otherwise take place. The alternative 1978 shares, if the intermediate car line is dropped, would, we expect, look as follows:

Alternative 1978 Shares

	Luxury	High Std.	Low Std.	Inter.	Comp.	Subc.	Subsubc.
Change from 1977	-.1%	+2.4%	+7.4%	-25.2%	+15.2%	-.5%	+.8%

In 1979, we judge, vehicle miles travelled will continue to be somewhat depressed from their normal growth and new car sales will also suffer a decline in growth due to the increased price of gasoline. Standard and intermediate-sized shares, we estimate, will also decline somewhat as people switch to smaller-sized cars in the face of 95¢/gallon gasoline.

The stabilization of the gasoline price in 1980 will, we believe, cause both new car sales and VMT to bounce back to former levels. We also anticipate no further trading down (over the base case scenario).

APPENDIX F. SCENARIO 3: GASOLINE TAX WITHOUT REBATE

F.1 ASSUMED CONDITIONS

Increases per gallon over the January, 1976 price of 75¢ per gallon, due to taxation:

Date	Increase
July 1, 1976	5¢
January 1, 1977	10¢
January 1, 1978	15¢
January 1, 1979	20¢

F.2 EXPECTED EFFECT ON GOVERNMENT

The administration of this tax can, we judge, be easily handled as the present gasoline tax is administered.

F.3 ANTICIPATED EFFECT ON MANUFACTURERS

We can foresee no change in the manufacturer behavior posited in the base case scenario. See Table 11 for a summary of those changes.

F.4 EXPECTED EFFECT ON CONSUMERS

Except for the elimination of the income effect, we expect consumers will behave as estimated for Scenario 2 in Table E-3. Note that VMT would be down .1% for each year to adjust for the lack of income effect: e.g., VMT would increase 3.8% for each of the years 1977-79.

APPENDIX G. SCENARIO 4: EXCISE TAX

G.1 ASSUMED CONDITIONS

Beginning with the 1978 model year, new cars sold which fall short of certain mpg standards will have a one-time tax, payable at the time of purchase placed on them. Table G-1 below gives the proposed excise taxes, based in part on proposed legislation.

TABLE G-1 ASSUMED AMOUNTS OF TAXES

MPG	1978	1979	1980	1981
<13	$800	1,000	1,200	1,400
13-14	400	500	700	800
15-16	100	300	500	600
17-18	0	100	200	300
19-20	0	0	100	100
>20	0	0	0	0

This tax is on a car-by-car basis, so consumers, by choosing engine and other options, can make size/option trade-offs.

G.2 EXPECTED EFFECT ON GOVERNMENT

Since there is not, at present, a federal excise tax on cars, an administrative program would, we believe, need to be set up to levy the tax. Dealers will most likely have to be checked periodically to see whether or not they are conforming to the regulations; some form of compensation will undoubtedly have to be made for the increased paperwork; finally, the procedures need to be developed for the utilization of the monies collected.

G.3 ANTICIPATED EFFECT ON MANUFACTURERS

We do not believe that the excise tax will affect the manufacturers' programs for car-line changes hypothesized in the base-case scenario.

G.4 EXPECTED EFFECT ON CONSUMERS

The effect of the excise tax is to increase the purchase price of selected cars. As noted in the Task 1 report,[1] we will use a -1.o elasticity figure for both new-car sales and car-switching behavior. These elasticities may, we believe, be offset by other factors. Where this occurs, we will note the result.

Using the EPA mileage figures for 1976 cars[2] as a rough guide, we have used our best judgments of average fuel economy by size class. We would like to caution, however, that there is considerable variability from model to model. As noted in the Wall Street Journal on September 23, 1975,[3] the 1976 models measured at 12 mpg included three luxury cars, three full-sized, high-priced cars, three full-sized station wagons, and two cars in yet another category.

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[1] Task 1 report, p. 23.

[2] "Mileage of 1976 Autos and Trucks," New York Times, September 23, 1975, p. 65.

[3] Wall Street Journal, September 23, 1975.

Table G-2 gives out best estimates of the average list price and average mpg by size category by year.

TABLE G-2 AVERAGE LIST PRICE AND AVERAGE MPG, BY SIZE CATEGORY, BY YEAR[1]

	Luxury	High Std.	Low Std.	Inter.	Compact	Subc.	Subsubc.
1976							
Aver. list price	$8,800	$5,000	$4,200	$3,700	$3,200	$3,000	$2,800
Aver. mpg	12-13	13-14	15-16	17-18	19-20	23-25	28-30
1977							
Aver. list price	9,000	5,200	4,400	3,700	3,200	3,000	2,800
Aver. mpg	13-14	14-15	16-17	17-18	19-20	23-25	28-30
1978							
Aver. list price	9,200	5,500	4,600	4,000[2]	3,200	3,100	2,900
Aver. mpg	15-16	16-17	17-18	19-20	19-20	23-25	28-30
1979							
Aver. list price	9,200	5,500	4,600	4,000[2]	3,200	3,100	2,900
Aver. mpg	15-16	16-17	17-18	19-20	21-22	23-25	28-30
1980							
Aver. list price	9,200	5,500	4,600	4,000[2]	3,200	3,400	3,200
Aver. mpg	15-16	16-17	17-18	19-20	21-22	23-25	28-30

1 Price figures here, as elsewhere, are in constant 1975 dollars.

2 If it is modified.

Given the prices and fuel economy estimated in Table G-2, the maximum penalties, as a percent of list price, are given in Table G-3.

TABLE G-3 MAXIMUM PENALTIES, AS A % OF LIST PRICE, BY SIZE, 1978-1980

1978	Luxury	High Std.	Low Std.	Inter.	Compact	Subc.	Subsubc.
Penalty	$100	-	-	-	-	-	-
% of list price	1%	-	-	-	-	-	-
1979							
Penalty	300	$100	-	-	-	-	-
% of list price	3%	2%	-	-	-	-	-
1980							
Penalty	500	200	$100	-	-	-	-
% of list price	5%	4%	2%	-	-	-	-
1981[1]							
Penalty	600	300	100	-	-	-	-
% of list price	7%	5%	2%	-	-	-	-

[1] Not discussed; outside the bounds of our study.

Table G-4 indicates our estimates of the impact of the excise tax on consumer car-purchasing patterns, assuming the program is well publicized in advance.

TABLE G-4 CHANGES IN NEW CAR SALES AND SWITCHES IN PURCHASES DUE TO EXCISE TAXES, 1976-1980

EXPECTED IMPACTS		1976[2]	1977[2]	1978[2]	1979[2]	1980[2]
New Car Sales		+4%	+5%	+4%	+3.2%	+4%
Market Share	(1974 share)[1]					
Luxury	3.6%	-.2%	+.8%	-1.1%	-1.1%	-.1%
High price standard	10.0	-.4%	-.2%	No Chg.	-.1%	-.2%
Low standard	12.3	-.4%	-.1%	No Chg.	+.4%	+.1%
Intermediate	24.4	+.7%	-.2%	+.1%	+.3%	+.2%
Compact	24.4	+.3%	-.2%	+.3%	+.4%	+5.4%
Subcompact	8.9	-1.5%	-.9%	-.4%	-.1%	-1.5%
Subsubcompact	16.0	+1.5%	+.8%	+1.1%	+.2%	-3.9%

[1] Faucett, ibid.
[2] Compared to previous year.

Since no penalties are anticipated for 1976, new-car sales and market shares will, we believe, be like those in the base case.

In 1977 we expect to see a higher increase than normal in car sales, as people make early purchases of the less efficient penalty-prone cars, since the penalties will be in force the following year. We estimate, therefore, an increase over the base case in the market share of large cars.

In 1978, the only penalty tax levied, according to our assumptions, would be on luxury cars. The $100 penalty, although theoretically a 1% tax on the list price, is actually lost in the "noise" of trade-in "deals," option add-ons, and the dealer's offer off list. We therefore conclude that there would be no impact on sales or switching as a result. Thus, we would expect a normal 4% growth in new car sales and changes over the base case, in market share, to bring the excise tax market shares back into line with those for the base case.

In 1979, we estimate that the penalty on the luxury car will increase its price by 3%. We believe, however, that elasticities on higher-priced cars are less severe than those on lower-priced ones. In our judgment, the excise tax would drop the luxury car share by 0.1%. Another 1% loss would consist of those who bought luxury cars early, in 1977. The $100 penalty (2%) on the high-priced standard would, we believe, get lost in the normal price negotiations at time of purchase, between trade-in, price off-list, and options. There would be some (+0.2%) "stocking up" of low-priced standards in anticipation of the 1980 excise tax. Thus, we would anticipate a growth in new car sales of only 3.2% (4% - 1.% + 0.2%).

By 1980, the penalty on luxury cars will be, by our estimates, 5%. Again, we expect the elasticity factor to be lower than -1.0 and will use -.5. Because of the announced penalty the following year (and because of the increased buying previously), we would judge that postponement will not be a significant factor under these circumstances. High-priced standards would now have a 4% price increase, according to our estimates. We will use a -.75 elasticity of their switching behavior. Much of the low-priced standard penalty of 2% would be lost in the dealing at the time of purchase. We estimate that, at most, some 50% of the penalty would be lost in this way. We will use a -1.0 elasticity, thus, on a 1% price increase. All other base case changes would remain the same.

In the above discussion, we conclude that, within the time frame, through 1980, the main effects of excise taxes are to change the timing of auto sales, and to change the market-share mix. The number of new cars sold, on the average, is unmodified. Some of those who would have bought larger cars, in the absence of the excise tax, will buy smaller cars instead. Others will persist in buying large cars, during our time frame. It is probable, however, that, beginning in 1981, when the excise taxes become quite high, they will actually cut into total new-car sales. This will happen as some of those who already own large cars will defer trading them in on other large cars, thus reducing sales of new cars of this size class in a given year.

APPENDIX H SCENARIO 5: GOVERNMENT REGULATION OF MANUFACTURERS

H.1 ASSUMED CONDITIONS

In this scenario, automobile manufacturers will be required, under penalty, to have specific sales-weighted mpg averages for each model year, starting with 1978. Although 1981-1984 are to be determined, and 1985 is to be 28 mpg, we are only concerned with 1978 to 1980, which are given below.

YEAR	SALES-WEIGHTED MPG AVERAGE
1978	19
1979	20
1980	21

It can thus be estimated that, on the whole, the regulations can be met under the base-case scenario. However, the question becomes, "What are the fuel economy averages for individual U.S. manufacturers?" In order to determine that, we first removed the foreign component of our estimated sales and recomputed its effect on the sales-weighted averages. The results are shown in Table H-2.

Domestic manufacturers will be considered separately from their foreign counterparts. To be considered a domestically manufactured car, a vehicle has to have 75% value added in the U.S.

This scenario, too, raises some questions, since it appears to be based on a reference-car basis. The variation in mileage achieved varies widely within a single make, depending on the number of cylinders, engine size, and options (manual vs. automatic transmission, etc.) [1] What EPA rating will be used for each reference?

H.2 EXPECTED EFFECT ON GOVERNMENT

We believe that the present system for administering the EPA emissions regulations would undoubtedly be adequate for monitoring the progress of the four domestic manufacturers in meeting the regulations outlined above.

H.3 ANTICIPATED EFFECT ON MANUFACTURERS

Before we could estimate changes in manufacturer behavior to meet the regulations, we used the fuel economy data from Table G-2 with the market shares anticipated in the base-case scenario, Table D-3. Total fuel economy, including foreign cars and using these measures, is estimated in Table H-1.

TABLE H-1 TOTAL AVERAGE FUEL ECONOMY, 1976-1980

YEAR	AVERAGE FUEL ECONOMY[2]	GOVERNMENT REGULATION
1976	19.7	-
1977	20.0	-
1978	21.0	19
1979	21.5	20
1980	21.2	21

[1] According to the EPA ratings, the new Chevette ranges from 26 to 33, the Gremlin from 16 to 23.

[2] Sales-weighted average

TABLE H-2. TOTAL DOMESTIC AVERAGE FUEL ECONOMY, 1976-1980

YEAR	AVERAGE DOMESTIC FUEL ECONOMY	GOVERNMENT REGULATION
1976	18.1	-
1977	18.6	-
1978	19.7	19
1979	20.3	20
1980	20.1	21

As a whole, it appears that domestic manufacturers will meet the federal standards except for 1980, when the safety measures anticipated on small cars raise their prices to or beyond the list price of a compact and cause substantial switching upward to the compact. In this event, manufacturers may well be forced to increase compact prices to preserve the difference. However, this will depress sales as well as create a downward switch. Another alternative is to eliminate the subcompact group entirely, which would preserve some of the distinctions between categories, if a slight increase in the compact price also occurred.

But what of individual manufacturers?

The most vulnerable is Chrysler, with a history of poor fuel economy and with no small domestic-car entries to balance the line. Chrysler, furthermore, has a capital problem which makes it difficult to make the major capital expenditures required to build manufacturing capacity for smaller, light weight cars.

We suspect that, denied the opportunity to import its Simca line to augment large car sales, Chrysler is going to have to limit production on its larger car lines, coupled with price increases, to ration the less efficient cars.

As for other manufacturers, 1980 appears to be the only problematic year. Our estimate of their most likely changes for that year is that the price of compacts would be raised to be higher than subcompacts, and cars with large V-8 engines will incur a price increase of around $300--to help "ration" the larger cars. But the changes in market share due to these price increases is insufficient, as noted in Table 22 below.

TABLE H-3 CHANGES FROM PRICE INCREASES IN 1980

CATEGORY	Total Increase from 1979	% Increase	Change in Market Share
Luxury	300	3%	-.1%
High standard	300	5%	-.3%
Low standard (for 1/2)[1]	300	(for 1/2)[1] 7%	No Change
Intermediate (for 1/2)[1]	300	(for 1/2)[1] 8%	-.6%
Compact	400	11%	-2.3%
Subcompact	300	10%	+2.9%
Subsubcompact	300	10%	+.4%

[1] Only about half of the low standard and intermediate cars sold have V-8 engines.

Thus, manufacturers would simply have to limit production of the larger cars in sufficient numbers to be assured of the appropriate average mpg. This limitation would have to be quite severe for luxury and standard sized cars to effect the switch. Without a commensurate penalty on consumers (e.g. an excise tax), we do not believe the consumers will be willing to purchase smaller cars but will, instead, postpone car purchase, depressing new car sales. The type of changes needed to fulfill a 21-mpg average are noted in Table H-4.

TABLE H-4 MARKET-SHARE CHANGES NEEDED IN 1980 TO MEET 21-MPG AVERAGE[1]

CATEGORY	CHANGE IN MARKET SHARE
Luxury	-.6%
High standard	-3.9%
Low standard	-4.3%
Intermediate	-.1%
Compact	-.7%
Subcompact	+8.3%
Subsubcompact	+1.3%

1 Changes over base-case 1979 scenario. Includes changes anticipated due to price changes noted in previous table.

The limitation of purchases of large cars can be accomplished, in the simplest sense, by using one of three procedures: either limit production so that cars are in effect rationed, or raise the prices of the larger luxury cars disproportionately, so that consumer demand is reduced for price considerations alone, or both. However, to undertake the second course is to alienate the consumer, who will complain about arbitrary price increases and inflation. Since the automobile companies require the good will of the consumer, there will be the strong temptation to make only minor upward price adjustments and then to ration the large cars by stopping production. This then allows dealers to tell consumers that the government is at fault and also allows dealers to take up the price increases on their own (e.g., by manipulating trade-in allowances) in a manner similar to the period following World War II.

APPENDIX I

DEFINITIONS OF CARS IN EACH CATEGORY IN TABLE B-4

Definitions

HIGH PRICE:	Cadillac, Lincoln, Imperial
MEDIUM PRICE:	Dodge, Pontiac, Oldsmobile, Buick, Mercury, Chrysler
REGULAR SIZE:	Chevrolet, Ford, Plymouth, AMC Ambassador
INTERMED. SIZE:	AMC Matador, Plymouth Fury/Satellite, Dodge Coronet/Charger, Ford Torino, Mercury Montego, Buick Century, Chevelle, Oldsmobile Cutlass, Pontiac LeMans
COMPACT:	Buick Apollo, Olds Omega, Pontiac Ventura, Chevy Nova/Sportvan, Maverick/Club Wagon, Plymouth Valiant/Voyager, Dart/Sportsman, AMC Hornet, Mercury Comet
SUBCOMPACT:	Vega, Pinto, Gremlin, Mercury Bobcat, Pontiac Astre, Chevette
SPECIALTY/ SPORTS:	AMC Javelin, AMX, Continental Mark IV/III, Barracuda, Mustang/II, Thunderbird, Cougar, Riviera, Eldorado, Camaro, Corvette, Toronado, Firebird, Dodge Challenger, Chevrolet Monte Carlo, Pontiac Grand Prix, Chrysler Cordoba, Dodge Charger SE, Ford Granada, Ford Elite, Mercury Monarch, Buick Skyhawk, Chevrolet Monza, Olds Starfire, Pontiac Sunbird, AMC Pacer, Plymouth Volare, Dodge Aspen, Cadillac Seville, Cougar XR-7

APPENDIX J

PROBLEMS DETERMINING FUEL ECONOMY TO USE IN CONSUMER TESTING

Even within just one category--domestically manufactured subcompacts--it becomes clear that there are some problems associated with quoting fuel economy figures for a size class to consumers. First, there is considerable spread (16-28 mpg) in the fuel economy achieved in the category. Variables such as the size of the engine, the number of cylinders, the presence of a converter, and the type of transmission account for much, but not all, of the difference.

It appears important to know the engine size, type of transmission, and number of cylinders that a consumer wishes to purchase before such fuel economy could be quoted, but we suspect many consumers will be unable to give us that kind of precision. A quote of 16-28 mpg is inappropriate for getting consumer reactions, however.

Categorization of all cars is a problem as well. There is no one recognized industry categorization. Categorization sometimes is done by size, sometimes by weight, sometimes by size and price, sometimes by price, sometimes by styling.

Even if we could agree on categories, however, an additional problem remains: overlap of fuel economy between categories. Some compacts have better fuel economy than some subcompacts. For example, a Ford Maverick, with manual transmission, a 200-cubic-inch six-cylinder engine, and a converter has a 25-mpg rating--23 subcompacts have a rating less than that, some with 140-cubic-inch, four-cylinder engines and a converter, but with automatic transmission.

TABLE J-1 SUBCOMPACTS

(Pinto, Vega, Gremlin, Monza 2+2, Skyhawk, Starfire, Mustang II, Astre, Sunbird)

	MILEAGE	TRANS.	ENG. SIZE	CYL.
Pinto	28	M	140	4*
Vega	27	M	140	4*
Mustang II	27	M	140	4*
Pinto wagon	27	M	140	4*
Monza	26	M	140	4*
Vega Kammback	26	M	140	4*
Mustang II	26	A	140	4*
Pinto	26	A	140	4*
Pinto wagon	26	A	140	4*
Astre	26	M	140	4
Astre	26	M	140	4*
Astre Safari wagon	26	M	140	4*
Sunbird	26	M	140	4*
Monza	25	M	140	4
Vega	25	M	140	4
Vega Kammback	25	M	140	4
Astre Safari wagon	25	M	140	4
Sunbird	25	M	140	4
Gremlin	23	M	258	6
Monza	23	A	140	4*
Vega	23	A	140	4*
Starfire	22	M	231	6*
Astre	22	A	140	4
Astre Safari wagon	22	A	140	4
Sunbird	22	M	231	6*
Sunbird	22	A	140	4
Gremlin	21	M	232	6
Gremlin	21	A	258	6
Gremlin	21	A	232	6
Skyhawk	21	A	231	6*

*With catalytic converter.

TABLE J-1 SUBCOMPACTS (CONTINUED)

	MILEAGE	TRANS.	ENG. SIZE	CYL.
Pinto	21	A	171	6*
Starfire	21	A	231	6*
Sunbird	21	A	231	6*
Vega	20	M	122	4*
Astre	22	A	140	4
Mustang II	19	A	171	6*
Mustang II	19	M	171	6*
Pinto wagon	19	A	171	6*
Gremlin	18	M	306	8*
Monza	18	A	262	8*
Gremlin	16	A	304	8*

APPENDIX K

IDENTIFICATION OF CAR CATEGORIES USED IN TABLE D-3

LUXURY STANDARDS:	Cadillac, Eldorado, Imperial, Lincoln, Mark IV
HIGH-PRICED STANDARDS:	Ambassador, Buick, Chrysler, Dodge, Mercury, Oldsmobile, Pontiac, Riviera, Thunderbird, Toronado
LOW-PRICED STANDARDS:	Checker, Chevrolet, Ford, Plymouth
INTERMEDIATES:	Century, Chevelle, Coronet, Cougar, Cutlass, Grand Prix, LeMans, Matador, Monte Carlo, Montego, Satellite, Torino
COMPACT (includes "luxury small"):	Barracuda, Camaro, Challenger, Club Wagon, Comet, Dart, Firebird, Hornet, Javelin, Maverick, Nova, Omega, Sportsman, Sportvan, Valiant, Ventura, Voyager, Mustang II
SUBCOMPACT:	Gremlin, Pinto, Vega
SUBSUBCOMPACT:	Chevette, Datsun B210, Subaru, etc.

N.B.: Foreign cars are added into these categories by size.

APPENDIX L
REPORT OF INVENTIONS

This report describes scenarios for different policy options for alternative energy conservation policies. After diligent investigations, no other innovations, discoveries or improvements of inventions were revealed.

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