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ANALYSIS

The effectiveness of gasoline taxation to manage air pollution

Kristin N. Sipes *, Robert Mendelsohn

Yale School of Forestry and Environmental Studies, 360 Prospect Street, New Haven, CT 06511, USA

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Abstract

Higher gasoline taxes can be justified because cars cause significant local, regional, and global air pollution damages. This study examines whether charging higher taxes would result in significant emission reductions. Both experimental survey data and actual behavior in Southern California and Connecticut are evaluated to explore whether people would change their driving behavior in response to higher gasoline prices. Both sets of results reveal that drivers are price inelastic in the short run (−0.4 to −0.6) and long run (−0.5 to −0.7). Imposing environmental surcharges on gasoline will result in only a small reduction in driving and thus only a small improvement in the environment. Such taxes will place a heavy and clear burden on drivers, however, making gasoline taxes extremely unpopular. Finally, the study finds that the income elasticity of gasoline is low (0.1–0.2) so that the gas tax will fall heavily on the poor.

Keywords: Air pollution management; Gasoline taxation; Demand for gasoline; Price elasticity

1. Introduction

Dropping real gasoline prices and rising incomes have led to a 30% increase in motor vehicle travel in the United States in the past decade (National Research Council, 1997). From 1998 to 1999, US gasoline consumption rose by 2.5% and vehicle miles traveled increased by 1.4% (Federal Highway Administration, 1999). Although increases in gasoline prices over the last 6 months have taken many Americans by surprise, the inflation-adjusted price of gasoline is still cheaper today than it was for most of the post-World War II period. Unfortunately, these increasing vehicle miles have caused serious local pollution problems, such as increasing emissions of particulate matter, and regional problems from the emissions of the precursors for ozone and photochemical smog. These pollutants are detrimental to human health (Wilson and Spengler, 1996), reduce visibility, harm crops, and damage vegetation (US Envi-

* Corresponding author. Tel.: +1-203-4325128; fax: +1-203-4323809.

E-mail address: robert.mendelsohn@yale.edu (K.N. Sipes).

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ronmental Protection Agency, 1997). Further, mobile sources produce 22% of carbon dioxide emissions, contributing to global greenhouse gas problems (Michaelis et al., 1996).

The US Environmental Protection Agency (US EPA) has made great strides in controlling the pollutants from stationary sources, but the agency has made much less progress controlling mobile sources. This article argues that mobile sources are intrinsically more difficult to control because people value the opportunity to travel so highly. Several environmental policies have been considered that would decrease vehicle miles traveled in order to control mobile source pollution. Fuel efficiency targets have been given to manufacturers. Public transit has been subsidized. Carpooling has been encouraged. None of these programs have managed to prevent aggregate mileage from growing. Partly, these programs have not been stringent enough. For example, fuel efficiency on US cars has recently fallen as a result of the increase in SUVs. The fuel efficiency standards did not stop SUVs because, officially, the SUVs are considered trucks. However, we argue that these programs are not likely to succeed primarily because Americans want to be able to drive. For example, many citizens support public transit subsidies because they hope that other drivers will leave congested highways, not because they themselves plan to use public transit.

In this paper, we examine a very efficient tool to discourage driving, gasoline taxes. Economists argue this popular tool can be designed to raise prices by the amount of damage caused. Gasoline taxes currently account for only the cost of road construction and maintenance (and even this assertion is controversial). An additional environmental surcharge on the price of gasoline would charge drivers for the damage they cause to the environment, and may have the beneficial effect of encouraging people to drive less and purchase more fuel-efficient vehicles. Economists have estimated the marginal damages associated with motor vehicle air pollution using vehicle emissions, human exposures (population), human morbidity responses (Eyre et al., 1997), and morbidity values. Depending on local dispersion, populations, and values, economists have estimated that pollution from motor vehicles causes health damages ranging from $0.60 (Small and Kazimi, 1995) to $1.60 (Small, 1997) per gallon. Economists have recommended raising taxes on gasoline to reflect these local and regional damages. Economists have also recommended creating a carbon tax of $5–20/ton to reflect global damages (see summary by Pearce et al., 1996).

These environmental taxes would be economically efficient because they would force drivers to consider the full cost of their decision to drive an extra mile and to buy efficient vehicles. However, studies of gasoline demand suggest that taxes would have only a small impact on driving behavior. Archibald and Gillingham (1980) estimate an overall short-run price elasticity (percentage change in miles per percentage change in price) of −0.43 using household data from 1972 to 1973 Consumer Expenditure Survey. Walls et al. (1993) used 1990 National Transportation Survey to estimate a short-run price elasticity of −0.51. Drollas (1984) estimates price elasticities of −0.35 over the short run and −0.73 over the long run. Dahl and Sterner (1991a,b) survey the gasoline demand literature and find mean price elasticities for panel data to be −0.26 over the short run and −0.86 over the long run. Johansson and Schipper (1997) find similar long-run price elasticities of −0.87.

Our study uses experimental survey data collected in Los Angeles and Connecticut just prior to the recent increase in gasoline prices. The study poses hypothetical gasoline price increases to evaluate whether taxation will encourage a substantial change in driving behavior and a subsequent decrease in air pollution. Given the results in the literature, we expect that gasoline demand will be price inelastic over both the short and long run. Because people can make more adjustments over time, long-run demand is expected to be more elastic than short-run. If gasoline demand is highly price inelastic, this would imply that gasoline taxation will have little influence on driving behavior and that it is not an effective policy to reduce air pollution.

California has one of the lowest gasoline tax rates of any state ($0.18 per gallon), despite the extraordinary health risks posed by motor vehicle air pollution in especially the Los Angeles basin. In contrast, Connecticut's gasoline taxes are higher than most states ($0.36 per gallon). In 1994, Californians drove about 272 billion miles or about 8693 miles per person. With the higher prices in Connecticut, people in Connecticut drove approximately 27 million miles (Federal Highway Administration, 1996) or about 8303 miles per person.

2. Methods

To evaluate the effectiveness of gasoline taxation as an air pollution management policy, our study uses a survey design similar to contingent valuation. The survey combines open-ended and discrete choice questions to estimate short- and long-run changes in driving behavior due to changes in price. Due to the tendency for aversion toward taxes, we decided to use a gasoline price payment vehicle. To ensure that the survey was realistic, respondents were asked questions relating to decisions they were familiar with making in everyday life. The survey format poses hypothetical gasoline price increases interspersed with questions about how respondents would adjust. The plausibility of price increases was justified through reference to current prices in Europe. Now that prices have increased substantially, these questions do not seem so hypothetical. At the time of the survey, however, people had been facing steadily declining real prices for decades.

The survey began with a prompt to make respondents feel comfortable answering questions that followed. Respondents were asked to provide demographic and socioeconomic information, as well as information about their current driving behavior. They were then asked to describe their behavioral changes in response to two sets of gasoline prices — one slightly higher than current prices and one substantially higher. For each price level, respondents were first asked how many miles they would drive in response to an instantaneous price increase. They were then asked what adjustments they would make over time and how many miles they would eventually drive. Each survey was composed of two specific prices. Alternative surveys explored a wide range of prices from $1.70 to 2.90 for the low price and high prices ranging from $3.10 to 5.80. A pilot phase was conducted to test whether the survey instrument was well behaved. Post-survey interviews indicated that the respondents understood the questions and could answer them. The survey instruments for Los Angeles and Connecticut are in Appendices A and B.

The survey was conducted in the Los Angeles basin from November 20, 1999 to January 20, 2000, and in Connecticut from February 14 to February 27, 2000. Questionnaires were randomly distributed to 201 people living in the Los Angeles basin and 336 people in south central Connecticut. The survey versions were randomly arranged and each respondent was handed a survey from the top of the pile. Each questionnaire was assigned a unique identification number. Surveys with questionable validity were marked with a question mark at the top right corner immediately after being returned. A high fraction of the surveys distributed were completed because they were filled out in front of the interviewer. There were 200 complete responses in Los Angeles and 300 complete responses in Connecticut.

Although the questionnaires were distributed in a random fashion, they are not a perfectly representative sample of either state. Table 1 compares sample and state statistics for age, sex, annual household income, race, and vehicle miles traveled. The California sample contains too many high-income people to be representative of the state. There are too many males in the California sample and not enough Hispanic people. The Connecticut sample is slightly below the income of the state and has too many young people, not enough elderly, and not quite enough males. One must be careful about generalizing from each sample to each state. However, there is no reason to expect that an empirical model constructed from this data would be biased.

Gasoline consumption was calculated from the vehicle miles per gallon ratio. Non-responses were dropped from the analysis. Race was divided into three dummy variables — 'white,' 'black,' and 'Hispanic.' Long-run adjustments were categorized as separate dummy variables. Income was classified from the categorical response as follows, a = 5000; b = 17 500; c = 37 500; d = 75 000; e = 200 000. To account for changes in vehicle stock, gasoline consumption was calculated using the miles per gallon of the new vehicle if the respondent chose to purchase a more fuel-efficient vehicle. Gasoline consumption was recorded as zero if the respondent chose to purchase an electric vehicle. If the respondent chose to purchase both a more fuel-efficient car and an electric vehicle, gasoline consumption was recorded relative to the fuel-efficient car response.

Diagnostic residual plots were used to identify outliers in the data. Any outliers were double-checked in the original dataset to assess their validity. Due to illogical or inconsistent answers, one survey was omitted from the data analysis for Los Angeles and 36 were omitted for Connecticut.

3. Analysis

The traditional demand model is given by the following equation:

$$\ln Q_i = \text{Constant} + \beta_1 \ln P + \Sigma(\beta_i X_i) + \varepsilon \quad (1)$$

where the log of individual gasoline consumption ($\ln Q_i$) is a function of the log of price ($\ln P$), and the sum of the socioeconomic variables (X_i).

Assuming that gasoline demand followed the traditional model in Eq. (1), the change in price postulated by the hypothetical question should have led to a change in gasoline consumption. Because only the price changes in the hypothetical case, Eq. (1)) suggests that the socioeconomic variables should have dropped out:

$$\ln Q_1 - \ln Q_0 = \text{Constant} + \beta_1(\ln P_1 - \ln P_0) + \varepsilon \quad (2)$$

That is, the β_i from Eq. (1) should equal zero given a change just in prices. However, there is a possibility that different people in the sample would respond differently to the proposed changes in price, making β_1 different from zero for some variables. To test for a significant influence of socioeconomic characteristics on the change in gasoline consumption, Eq. (2) was modified:

$$\ln Q_1 - \ln Q_0 = \text{Constant} + \beta_1(\ln P_1 - \ln P_0) + \Sigma(\beta_i X_i) + \varepsilon \quad (3)$$

If socioeconomic characteristics significantly influence the change in gasoline consumption, then this requires a modification of the traditional model in Eq. (1) to include interaction terms between socioeconomic variables and price:

$$\ln Q_i = \text{Constant} + \beta_1 \ln P + \Sigma\beta_2(\ln P \times \ln X_i) + \Sigma(\beta_i X_i) + \varepsilon \quad (4)$$

where $\Sigma\beta_2(\ln P \times \ln X_i)$ involves interaction terms and $\Sigma(\beta_i X_i)$ involves each socioeconomic variable independently.

Table 1
Sample and state statistics

Variable estimated	LA sample	CA state[a]	CT sample	CT state[a]
Percent age 17–34	39.3	33.3	44.4	31.5
Percent age 35–64	45.5	51.2	52.5	50.0
Percent age 65 and over	15.2	15.4	3.1	18.9
Percent male	60.3	50.0	43.8	48.5
Median household income	75 000	40 500	37 500	45 000
Percent white	80.8	79.5	74.6	88.0
Percent black	3.6	7.5	11.0	9.3
Percent hispanic	9.7	31.0	7.4	8.2
Miles traveled per week	165.3	167.2	161.5	159.7

[a] Sources, Federal Highway Administration (1996), US Census Bureau (1999), Horner (2000).

Table 2
Change in gasoline consumption model: Los Angeles[a]

Independent variable	Definition	Dependent variable: change in gasoline consumption	
		Short run[b]	Long run[c]
Constant	Intercept	−0.857 (−4.66)	−1.11 (−3.30)
$\ln(P_1-P_0)$	log of change in price	−0.351 (−7.15)	−0.593 (−7.62)
$\ln Y$	log of income	0.096 (5.47)	0.127 (3.93)
$\ln V$	log of number of household vehicles	−0.085 (−2.79)	−0.140 (−2.42)
Adjusted R^2		0.183	0.174

[a] T-statistics in parentheses (α-level 0.05).
[b] $F(3308)=23.84$; $P<0.0001$.
[c] $F(3304)=22.20$; $P<0.0001$.

4. Results

Multiple regressions explaining the change in gasoline consumption were estimated for the California and Connecticut samples. A number of socioeconomic variables were explored including miles from work, miles from a train station, miles from a bus station, income, number of people in the household, number of household vehicles, sex, age, and race. Many of these variables were not significant and were subsequently dropped from the regression.

Diagnostic tests revealed heteroscedasticity with respect to prices. To correct for non-constant variance, we regressed the change in log of gasoline on the log change in price and used the predicted values of this regression to form a weighting variable (W_i), such that $W_i=1$/predicted residual, (Neter et al., 1996). Weighted least squares was then used throughout the analysis.

Table 2 presents results for the change in gasoline consumption for Los Angeles. As hypothesized, the short- and long-run demand functions are downward sloping, with price elasticity estimates of −0.35 and −0.59, respectively. These estimates are consistent with the literature, but they are on the low side. The respondents were more price-responsive over the long run than the short run, as expected. Income and the number of household vehicles influence the short- and long-run change in gasoline consumption, although this effect is smaller than one might expect. Higher income groups are less responsive to an increase in gasoline price than lower income groups. Households with more vehicles are likely to be more responsive to gasoline price increases. These responses suggest that socioeconomic variables influence price elasticity.

In Table 3, we estimate a traditional demand model using these data. The results indicate that age, sex, and distance from work all influence the short-run demand for gasoline in California. For long-run demand, age and sex no longer matter. Long-run demand is influenced by distance from work, income, and number of vehicles. Although higher income people buy more gasoline, the income elasticity is low (0.2). People with twice the income buy only 20% more gasoline. These income elasticities are lower than estimates from panel and cross-sectional data. This could be a flaw associated with opinion research as many contingent valuation studies find low-income elasticities. People with different incomes may think they will respond the same way to some hypothetical change but, in fact, income will play a larger role than they anticipate.

The results from Table 2 suggest that the traditional demand model should be modified to include interaction terms. As shown in Table 4, the results of regressions that include these interaction terms are subtly different. Income interacts with price in the short-run model, but sex and distance from work come in independently. In the long-run model, income and number of vehicles interact with price and only distance from work comes in independently. The data closely fit both the models in Tables 3 and 4. Traditionally, economists have assumed that price elasticities are the same for everyone as in Table 3. However, what this analysis indicates is that price elasticities may be subtly different for different income and other groups.

Table 5 presents the results for the change in gasoline consumption in Connecticut. As hypothesized, the short- and long-run demand functions are downward sloping; short and long-run price elasticity estimates are −0.39 and −0.49, respectively. Again, these estimates are consistent with the literature, but on the low side. As expected, demand is more price elastic over the long run than over the short run. Short- and long run changes in gasoline consumption are significantly influenced by the number of people in a household. As the number of people in a household increases, the household is more responsive to an increase in gasoline prices. Long-run changes in gasoline consumption are influenced by income,

Table 3
Traditional demand model: Los Angeles[a]

Independent variable	Definition	Dependent variable: level of gasoline consumption	
		Short run[b]	Long run[c]
Constant	Intercept	0.033 (0.066)	−0.746 (−1.00)
ln P	log of price on survey	−0.545 (−3.98)	−0.707 (−4.68)
ln age	log of age	0.307 (2.36)	[d]
Sex	1 = Reference person male	0.510 (4.66)	[d]
ln W	log of miles live from work	0.402 (8.81)	0.317 (6.41)
ln Y	log of income	[d]	0.231 (3.30)
ln V	log of number of household vehicles	[d]	−0.281 (−2.05)
Adjusted R^2		0.307	0.209

[a] T-statistics in parentheses (α-level 0.05).
[b] $F(4261) = 29.84$; $P < 0.0001$.
[c] $F(4252) = 17.56$; $P < 0.0001$.
[d] Variable dropped out of model due to insignificant coefficient.

Table 4
Interaction demand model: Los Angeles[a]

Independent variable	Definition	Dependent variable: level of gasoline consumption	
		Short run[b]	Long run[c]
Constant	Intercept	1.28 (6.85)	1.55 (8.15)
ln P	log of price on survey	−2.13 (−3.39)	−2.57 (−3.96)
Sex	1 = Reference person male	0.460 (3.98)	[d]
ln W	log of miles live from work	0.353 (7.41)	0.320 (6.47)
ln $P \times$ ln Y	Interaction term between log price and log income	0.154 (2.71)	0.189 (3.21)
ln $P \times$ ln V	Interaction term between log price and log number of household vehicles	−0.158 (−1.37)	−0.264 (−2.15)
Adjusted R^2		0.283	0.208

[a] T-statistics in parentheses (α-level 0.05).
[b] $F(5243) = 20.07$; $P < 0.0001$.
[c] $F(4252) = 17.47$; $P < 0.0001$.
[d] Variable dropped out of model due to insignificant coefficient.

Table 5
Change in gasoline consumption model: Connecticut[a]

Independent variable	Definition	Dependent variable: change in gasoline consumption	
		Short run[b]	Long run[c]
Constant	Intercept	0.203 (3.33)	−1.23 (−2.68)
$\ln(P_1-P_0)$	log of change in price	−0.387 (−8.30)	−0.492 (−5.46)
ln Hse	log of size of household	−0.079 (−3.32)	−0.135 (−2.18)
ln Y	log of income	[d]	0.114 (2.65)
White	1 = Person white	[d]	0.284 (3.70)
Adjusted R^2		0.145	0.123

[a] T-statistics in parentheses (α-level 0.05).
[b] $F(3414)=39.50$; $P<0.0001$.
[c] $F(4346)=13.08$; $P<0.0001$.
[d] Variable dropped out of model due to insignificant coefficient.

Table 6
Traditional demand model: Connecticut[a]

Independent variable	Definition	Dependent variable: level of gasoline consumption	
		Short run[b]	Long run[c]
Constant	Intercept	−1.31 (−2.26)	−1.39 (−2.95)
ln P	log of price on survey	−0.370 (−3.37)	−0.451 (−5.06)
ln W	log of miles live from work	0.428 (12.3)	[d]
ln Hse	log of number of people in household	[d]	−0.133 (−2.08)
ln Y	log of income	0.213 (3.97)	0.124 (2.82)
White	1 = Reference person white	[d]	0.286 (3.63)
Adjusted R^2		0.378	0.118

[a] T-statistics in parentheses (α-level 0.05).
[b] $F(3361)=73.79$; $P<0.0001$.
[c] $F(4351)=12.69$; $P<0.0001$.
[d] Variable dropped out of model due to insignificant coefficient.

the size of the household, and race. The coefficients suggest that white individuals and higher income groups are less likely to change their driving behavior as price rises.

Table 6 presents the results for the traditional demand model for Connecticut. Short-run gasoline consumption is best explained by the distance an individual lives from work and income. Long run gasoline consumption is influenced by the number of people in a household, income, and whether the respondent is white. The income elasticity reported in Table 6 is 0.2 in the short run and 0.1 in the long run. The change in gasoline consumption model in Table 5 suggests that the traditional demand model should be modified to include interaction terms. Table 7 presents the results for a gasoline demand model with interaction terms in Connecticut. The significance of the interaction terms serves as an explanation for the influence of socioeconomic variables on the change in gasoline consumption. Interestingly, both the long-run model of the change in gasoline consumption and the long-run model of gasoline consumption with interaction terms suggest the identical independent variables affect price elasticity. In both models, the key variables are household size, income, and race.

R^2 in these regressions were low, ranging from 0.11 to 0.38. This range of results is typical for a cross-sectional survey of the US population.

There are several sources of error that would contribute to such a low R^2. First, many people are not even aware of the miles per gallon that they get from their current vehicle. Second, many people have a hard time imagining how they would respond to a hypothetical situation, even when it is a familiar phenomenon such as a change in the price of a regular household purchase. Third, individual circumstances are different so that many households will react differently to the same stimulus. That is, there is every reason to expect a varied response across households.

5. Conclusion

Surveys in California and Connecticut suggest that households have similar responses to gasoline taxation. The results suggest that higher gasoline prices would encourage people to drive fewer miles and to purchase cars that are more fuel-efficient. Both of these responses are in a desirable direction and may encourage policy makers to consider environmental gas taxes. However, the results from several demand models for Los Angeles and Connecticut consistently demonstrate that gasoline demand is price inelastic over both the short and long run. That is, people will make only relatively small changes in their behavior in response to higher prices.

These survey results are further supported by actual behavior. Studies of panel and cross-sectional data sets from the literature reveal low price elasticities in actual driving behavior. This study, however, reports price elasticity results that are slightly lower than the bulk of the empirical literature. The income elasticities in this study are conspicuously lower than the estimates from other studies. This discrepancy may be a flaw of hypothetical survey methods. People may find it difficult to imagine the hypothetical situation and how they would actually respond to it. They tend to underestimate how they will adapt. Several people verbalized this dilemma saying they could not imagine how they could survive if gasoline prices increased. It would be interesting to see how these people have actually reacted to the gasoline price increases that have occurred since the survey was completed.

Our results indicate that if an environmental surcharge is added to gasoline taxes, then the additional tax will decrease gasoline consumption only slightly and, therefore, will have little effect on air pollution. For example, the price elasticity estimates suggest that a 33% increase in gasoline prices (a $0.50 per gallon tax) would decrease gasoline consumption by only 13–23%. Given the political opposition that followed from the modest $0.05 gasoline tax proposed by the Clinton administration in the early 1990s, it is not appar-

Table 7
Interaction demand model: Connecticut[a]

Independent variable	Definition	Dependent variable: level of gasoline consumption	
		Short run[b]	Long run[c]
Constant	Intercept	−0.802 (−1.31)	0.040 (0.376)
ln P	log of price on survey	−0.903 (−6.73)	−1.63 (−4.10)
ln Y	log of income	0.238 (4.30)	[d]
ln $P\times$ ln Hse	Interaction term between price and number of people in household	−0.099 (−1.49)	−0.089 (−1.64)
ln $P\times$ ln Y	Interaction term between price and income	[d]	0.101 (2.74)
ln P*white	Interaction term between price and white reference person	[d]	0.229 (3.46)
Adjusted R^2		0.366	0.110

[a] T-statistics in parentheses (α-level 0.05).
[b] $F(4358)=52.34$; $P<0.0001$.
[c] $F(4351)=11.82$; $P<0.0001$.
[d] Variable not included in regression because insignificant with interaction terms included.

ent that it would be worth pursuing such an unpopular environmental tax for such a small improvement in the environment.

This analysis is not intended to be an indictment against using taxes to control pollution. It is well understood that taxes are effective instruments to control pollution and other negative externalities. The analysis is instead revealing that people place great value on being allowed freedom of movement. Any attempt to restrict transport, for example, with gasoline taxation, is likely to find significant resistance from citizens. Even attempts to provide public forms of transport are likely to be resisted unless they improve access (as they would in highly congested spaces such as Manhattan). In this circumstance, a tax on transport such as on gasoline will cause significant welfare losses that may not be politically worth the small environmental improvement they generate.

In addition, our results raise questions about the equity of a gasoline tax. The results for Connecticut and California suggest that the income elasticity of gasoline consumption ranges from 0.1 to 0.2. The results suggest that people with twice the income buy only 10–20% more gasoline. Of course, governments could use the revenues from gas taxes to address equity issues by lowering taxes on poor people or subsidizing services for them. However, in practice, it is not clear that current subsidies for transport actually benefit poor people more than others. Even if the income elasticity estimates in this paper are low, a tax on gasoline would most likely fall most heavily on the poor.

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Appendix A. Survey instrument: Los Angeles

Survey on responses to gasoline price increases.

I am a graduate student at Yale University and this survey is a part of my program. I would like to ask you a few questions about your driving behavior. There are no right or wrong answers; I am just interested in your opinions.

Age——

Sex (M/F)——

Annual household income, (a) under 10 000; (b) 10 000–25 000; (c) 25 001–50 000; (d) 50 001–100 000; (e) over 100 000

Race——.

City of residence——.

Household size——.

Number of household vehicles——.

Approximate number of miles you live from a bus stop——.

Metro station—.

Approximate number of miles you live from work——.

Make and model of the car you drive——.

Average miles per gallon of the car you drive——.

For all of the questions below, assume the average price of regular gasoline today is $1.35.

1. Approximately, how many miles do you drive each week? ——
2. If gasoline prices rose to $1.70 per gallon today, how many miles do you think you would now drive each week? ——
3. If you had time to adjust to this new price of $1.70 per gallon, which of the following adjustments do you think you would make? Check each one that applies.

–None	–Move closer to your job
–Public transportation	–Purchase a car that gets — miles per gallon
–Carpool	–Purchase an electric vehicle
–Change jobs	–Other

4. Considering the above adjustments, how many miles do you think you would now drive each week? ——
5. Now suppose that gasoline prices rise to $2.70 per gallon today, which is close to the current price in Europe. How many miles do you think you would now drive each week? ——

6. If you had time to adjust to this new price of $2.70 per gallon, which of the following adjustments do you think you would make? Check each one that applies.

–None	–Move closer to your job
–Public transportation	–Purchase a car that gets — miles per gallon
–Carpool	–Purchase an electric vehicle
–Change jobs	–Other

7. Considering the above adjustments, how many miles do you think you would now drive each week? ——

Appendix B. Survey instrument: Connecticut

Survey on responses to gasoline price increases.

I am a graduate student at Yale University and this survey is a part of my program. I would like to ask you a few questions about your driving behavior. There are no right or wrong answers; I am just interested in your opinions.

Age——.

Sex (M/F)——.

Annual household income, (a) under 10 000; (b) 10 000–25 000; (c) 25 001–50 000; (d) 50 001–100 000; (e) over 100 000.

Race——.

City of residence——.

Household size——.

Number of household vehicles——.

Approximate number of miles you live from a bus stop——.

Metro station—.

Approximate number of miles you live from work——.

Make and model of the car you drive——.

Average miles per gallon of the car you drive——.

For all of the questions below, assume the average price of regular gasoline today is $1.35.

1. Approximately, how many miles do you drive each week? ——
2. If gasoline prices rose to $1.70 per gallon today, how many miles do you think you would now drive each week? ——
3. If you had time to adjust to this new price of $1.70 per gallon, which of the following adjustments do you think you would make? Check each one that applies.

None	Move closer to your job
Public transportation	Purchase a car that gets — miles per gallon
Carpool	Purchase an electric vehicle
Change jobs	Other

4. Considering the above adjustments, how many miles do you think you would now drive each week? ——
5. Now suppose that gasoline prices rise to $2.70 per gallon today, which is close to the current price in Europe. How many miles do you think you would now drive each week? ——
6. If you had time to adjust to this new price of $2.70 per gallon, which of the following adjustments do you think you would make? Check each one that applies.

None	Move closer to your job
Public transportation	Purchase a car that gets — miles per gallon
Carpool	Purchase an electric vehicle
Change jobs	Other

7. Considering the above adjustments, how many miles do you think you would now drive each week? ——

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