ECONOMICS AT THE WHEEL

The Costs of Cars and Drivers

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Preface

The freedom that the automobile
has given the average American
is a good thing,
even though it may take him a long time
to learn how to use it.

Elmer Davis
America as Americans See It

Students have often asked me why I hate cars so much. I tell them, and I think truthfully, that I don't hate cars. They have given the industrialized world a degree of mobility that could not have even been dreamed of in the 19th century—when few European peasants ever got more than 20 miles from their birthplaces during their entire lifetimes.

I am as addicted to automobiles as anyone else. I rarely manage to give them entirely up for more than a week at a time. Sometimes, I must admit, I binge drive, all the way to Chicago and back. But I try to use cars in moderation. And that is the message of this book—that we use automobiles to excess and that we would all be better off if we could restrain our rate of consumption. I am not going to claim that people are irrational in their overuse of the car—indeed, you will soon see how rational it is to drive a lot. But "secondhand driving"—like "secondhand smoking"—imposes many costs that could and should be reduced.

But the book has another, equally important, goal—to get students who have had a little economics into the habit of using that economics when they think about social problems, policies, and solutions. The "economics" part of the title is just as important to me as the "cars and drivers" part. I think of the car as a "vehicle" for teaching students to think economically.

I chose the car as that vehicle partly because I live in Michigan, where cars are especially important in many ways. The money that pays our salaries and tuitions often comes from somewhere in the automobile industry. While talking about automobiles, I can also think economically about other things of interest to students. For some, it is sex, alcohol, speed, or parking; for others, it is death, air pollution, global warming, or oil spills.

This book arose from lecture notes. The classes have never been so large that I have been unable to ask students questions and get answers. I have tried to preserve that style here. Thus, there are many questions without answers. Don't just skip over them. They give you a chance to do some thinking on your own rather

than just memorizing my (and others') thinking. Most of them are flagged with a "Q." To these, the answers—or rather, my thoughts about the questions—are given in the back of the book, just before the References. Sometimes there is a single, clear, right answer, but more often than not various sensible responses are possible. So don't just look for "the" answer. But do remember to look for an *economic* answer. For example, when asked why the rich buy more child-restraint car seats but use them less than the poor, answering "because the rich think they care about their children but really they don't" misses the point—it might be the right answer, but it is not an *economic* answer.

The book is also filled with little boxes of side material. If you are in a hurry, you can skip them without loss of continuity, but it will be a shame if you do. Most are intended to be provocative or amusing; each one not only offers a little information about the auto periphery but also challenges you to think through the implications of some problem or policy.

The prose is frequently interrupted by citations. It bothers many readers, I know, and I apologize. But I want to encourage you to track down at least a few of these references when you disagree with what I am saying or want to know more about the subject. Some of these references are heavily mathematical or statistical, but you still may be able to browse and learn from them. The full citations are all in the reference section at the end of the book.

I mentioned that this book arose from lectures in a semester course called The Economics of the Automobile. The only prerequisite for the course has been Economics 101 (Introductory Microeconomics). I have been co-teaching this auto course for several years with two colleagues, Paul Courant and Jim Levinsohn. Paul looks at how the car has affected the size, shape, and structure of America's cities and regions; Jim looks at the productive process, industrial structure, and international trade of automobiles. None of those things are in this book (except for a few things I could not resist stealing from their lectures). I thank them for providing synergy for the course.

I also thank past students of the course—for asking the right questions and giving the right answers, reassuring me that the lectures were on the right track—and for asking the wrong questions and giving the wrong answers, telling me where the material needed to be made clearer.

Too many people have helped me learn about cars and drivers to list all their names. But some have been particularly helpful, and I want to thank them individually: Amy Ando, Chris Augustyniak, Joshua Baylson, Ted Bergstrom, Jean Berkley, Peter deBoor, Joan Crary, Jim DeMocker, Carolyn Fischer, John German, Laura Gottsman, John Hall, Winthrop Harrington, James Hedlund, Chuck Kahane, Greg Keoleian, Daniel Khazzoom, Jim Makris, Virginia McConnell, Geneva Moores, Stan Nicholson, Evan Osborne, Ray Perry, Paul Portney (personally and also for offering the facilities of Resources for the Future as a base when I was working in Washington), Chris Proulx, Barry Rosenberg, Steve Salant, Kathryn Sargeant, William Schroeer, Hilary Sigman, Jim Simons, Phil Tepley,

Gail Thomas, Klaas Van't Veld, Thomas Walton, Clifford White, Shelley White, Marina Whitman, David Wiley, Mark Wolcott, and Don Zinger.

Despite all this help, errors will persist. When you find them, I will appreciate it if you call them to my attention (rporter@umich.edu). Also welcome are comments, quarrels, ideas, anecdotes, etc. I always like a good eco-chat by e-mail. I am sometimes away from e-mail for a month or two, so the response may be delayed, but you will always get a response eventually.

Ann Arbor, Washington, DC, and Bridgetown

ALL DOLLAR FIGURES ARE IN 1995 PRICES

Throughout, U.S. dollar figures have been converted to 1995 prices, using the U.S. GDP deflator. For example, if a source says the value of something was $100 in 1982, that $100 figure is multiplied by 129.1 (the GDP deflator for 1995, with 1987 = 100) and then divided by 83.8 (the GDP deflator for 1982); the 1995 value is therefore $154.06, and is probably rounded off to $154, or even to $150. Foreign currency data are converted into U.S. dollars at the then-existing foreign exchange rate between that currency and the U.S. dollar, and then converted (as above) into 1995 prices.

Please forgive my laziness. Although it is no longer 1995, there has been so little inflation in the last few years that it doesn't seem worth the time to pull the dollars up to date.

Glossary

BAC	blood alcohol concentration
B/C	benefit–cost analysis
CAC	command and control
CAFE	Corporate Average Fuel Economy
CO	carbon monoxide
CO_2	carbon dioxide
EPA	Environmental Protection Agency
HCs	hydrocarbons
i	the interest (discount) rate
MLDA	minimum legal drinking age
MPG	miles per gallon
MPH	miles per hour
NHTSA	National Highway Traffic Safety Administration
NO_x	nitrogen oxides
p	the probability per mile or per potentially fatal crash of killing oneself or of being killed in a highway accident (the context indicates which)
P_g	the price per gallon of gasoline
PM	particulate matter (formerly known as TSPs—total suspended particulates)
P_t	the price of time (i.e., the driver's driving wage rate)
Q_g	the quantity of gasoline purchased per year
Q_m	the number of miles driven per year
Q_t	the amount of time spent driving per year
SO_x	sulfur oxides
V_L	the dollar value put on one's life by one's self or by society (the context indicates which)
VMT	vehicle-miles traveled
WTP	willingness-to-pay

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CHAPTER 1

Introduction

"The only amusement for a youth came to be
going out in a car with a girl,
or going out in a car to look for a girl,
or going out with a girl to look for a car.
Since you can't drive all the time,
they had to invent the pop and hot dog stand,
and since you can't stand and eat all evening,
they had to build a dance hall beside the pop stand.
You can't dance forever, so . . . ."

Stephen Leacock
Good-Bye, Motor Car

Barely 1 century ago, the Duryea Motor Wagon Company of Springfield (Massachusetts) rolled 13 cars out of its construction barn—and sold them. The idea of mounting an engine on wheels had been around for a long time, and cars had even been produced before 1896, but until then only one car at a time. The mass-produced car was an instant success. In 1905, the first car theft was reported. In 1911, painted center lines on roads began to appear. By 1913, more automobiles than horse buggies were being manufactured. By 1914, "stop" signs and traffic lights had begun to sprout.

In 1908, Henry Ford introduced the moving assembly line and was turning out thousands of Model T vehicles per year. That turned the automobile from a rich man's toy into a middle-income-family necessity. The change was rapid. For someone earning a wage equal to that of a Ford assembly-line worker, the Model T cost 7 months' wages in 1908. By 1916 it cost less than 3 months' wages and Model T sales had passed a half-million per year; by 1920, half the cars in the world were Model T Fords (Rae, 1965).

SPREAD OF THE AUTO

During the 1920s, the car continued to flourish. By 1929, there was one registered vehicle for every five Americans—a ratio not surpassed until the 1950s. By 1935, parking meters pushed up out of the sidewalks.

Road construction also boomed in the 1920s. The Federal Highway Act of 1921 began the process of federal subsidies to state highway departments, and the states themselves began levying gasoline taxes to finance their share of intercity road costs. By 1929, the average gasoline tax had risen to 30 cents per gallon (remember, dollar figures are throughout inflated to 1995 prices). Thirty cents is not much different from today's gasoline tax rate, although the average American family was much poorer then. The first transcontinental auto trip took 63 days; by the end of the 1920s, it took 1/10th that time. It seemed that everybody drove, even Bonnie and Clyde—Mr. Barrow wrote Mr. Ford, "I have drove Fords exclusively when I could get away with one."

Slowed by economic depression in the 1930s and World War II in the 1940s, automobile growth did not recommence until the 1950s when middle-income families began moving from the cities to rapidly expanding suburbs that were badly or not at all served by mass transit facilities. The automobile made suburbia possible, and the suburbs made the automobile essential.

Until the 1950s, long-distance auto travel was either done on city street extensions, which meant traveling through the center of every village on the route, or done on state-financed toll roads. The National System of Interstate and Defense Highways Act of 1956 ended this, providing for a 40,000-mile network of toll-free superhighways—"the Interstates"—built almost entirely at federal expense. As a result, the car could compete with other forms of transportation for intercity, as well as intracity, travel.

Today, there are half a billion cars on the world's roads, roughly two-fifths of them in the United States. They have given us mobility, which not only makes us better off as consumers but allows us to achieve economies of scale in production and retailing. This mobility, however, has come at heavy cost. In this book, we will explore many aspects of that cost.

We will also look at U.S. government policies to limit the costs that autos impose upon us. In one sense, these policies have been successful. Our cars get more miles per gallon (MPG) than they used to; new cars produce many fewer air-polluting emissions than their predecessors did; and highway deaths per vehicle-mile traveled (VMT) have come down steadily since the 1960s.

In another sense, we have failed. The cost of U.S. policies has been high—as you will soon see. And we use as many gallons of gasoline today as we ever did, the air over many of our cities is still unacceptably polluted, the total number of highway deaths per year in the United States has fallen little in the last half-century, and traffic congestion is becoming an ever worse problem in our cities.

In introductory microeconomics courses, you learn not only how markets function but also that "markets work" in the sense that they produce the right amount of product at the lowest cost and allocate that product to the people with the highest willingness-to-pay for it. You also learn that some markets do not work.

EXTERNALITIES

The "market" for automobile driving does not work. It is perhaps our best example of "market failure"—or should I say our worst example? Why does this market fail? Externalities. When someone's actions impose costs on other people, these costs are called external costs. If that word is foreign to you, read the appendix to this chapter carefully. Indeed, the concept of externalities is so critical to understanding this book that I highly recommend to every reader at least a quick run through that appendix.

Almost all our automobile problems arise from the car's generation of external costs.[1] When we get into our cars, we are prepared to pay the private costs of driving. But we ignore the external costs which, when added to the private costs, make the social cost of driving extremely high. Optimally, we would only drive each mile if our personal benefit exceeded the marginal *social* cost; in fact, we drive whenever our personal benefit exceeds the marginal *private* cost. As a result, we drive too much—way too much.

Governmental bodies in the United States are not unaware of the automobile's externalities. There are policies aimed at almost all of them, that is, aimed at reducing the external costs of driving. Unfortunately, as we will see, most of the policies selected are not cost-effective. Most *do* reduce the external costs, at least somewhat, but whatever success they achieve is gained at a cost that is much higher than necessary. We will search for policies that are cost-effective—cost-effective in the sense that, whatever externality reduction they achieve, they achieve it at the lowest possible cost.

There is no single solution to all of our auto problems, but there is one that comes close: steadily raise gasoline taxes by a few (real) cents per year for several years. By the time gasoline taxes go up by another $1 per gallon—still much less than the gasoline taxes already instituted long ago in almost all other industrialized countries—we as a nation will have stopped taking frivolous driving trips, where the private benefit to the driver falls far short of the social cost. In the process of driving much less, we will use much less gasoline, create much less air pollution, kill far fewer people on highways, and. . . . But that is what the rest of the book is all about.

The advantage of gasoline taxation is that it gets the government out of the business of telling people what kinds of cars to drive. Some people will react to higher gas taxes by driving fewer cars, others fewer miles per car, and still others more fuel-efficient cars. By leaving the decision to individuals, people will react by driving less, but in a way that is the least costly to their own welfare. Gas taxation is a cost-effective way of reducing our driving because people have an incentive to react in cost-effective ways. Throughout this book, we will be looking at the ways higher gasoline taxation can help solve our car troubles.

Gasoline taxation does not solve all our auto problems, by any means. Automotive air pollution, for example, is caused (mostly) by exhaust emissions. Higher

gas taxes help here, by reducing gasoline consumption, but gasoline taxes by themselves do not affect emissions per gallon. Gasoline taxes do not solve the problems of drunk driving, speeding, congestion, oil spills, etc. Again, we will come to these in the chapters ahead. In short, we will also be looking for market-oriented ways other than higher gasoline taxation to help solve our automobile problems.

Since the purpose of this book is to get readers to think economically about these issues, little attention is paid to the question of why the U.S. government persistently utilizes policies that are so obviously not cost-effective. It is not that we officially ignore the problems caused by automobiles—there are plenty of policies that are intended to correct automotive externalities. If you are politically minded, you may enjoy thinking, as you are reading the coming chapters, why our federal and state governments have so regularly adopted a direct command-and-control (CAC) approach instead of a more cost-effective indirect market-oriented approach.

I will venture my two guesses here, and you can test them, along with your own hypotheses, as you go along through the book: (1) government policymakers believe that everything about automobile demand and use is price-inelastic, so that market-oriented solutions would achieve too little and too slowly[2] and (2) government policymakers fear that the magnitude of the costs of automobile policies would shock and dismay citizens/voters, so that policies that hide the costs are preferred even if they greatly raise the costs they hide.

ENDNOTES

[1]In theory, externalities work both ways, as benefits as well as costs. If you plant flowers at your curbside, and your neighbors enjoy them, you have provided an external benefit. Alas, as you might guess, external costs are much more common than external benefits, especially as concerns cars.

[2]The term "price elasticity" will appear regularly in the chapters ahead. A little review follows. The term refers to the extent to which consumption of a product changes when its price changes. If a given percentage change in price has a big effect on consumption, the demand is said to be price-elastic; if it has a small effect on consumption, price-inelastic. More precisely, the price elasticity of demand is defined as the percentage change in the quantity demanded divided by the percentage change in the price. Technically the price elasticity is a negative number—the quantity demanded goes down when price goes up, and vice versa—but we conventionally omit the minus sign. Price-elastic means this number is bigger than one; price-inelastic means it is smaller than one.

Appendix: External Costs and Policy

"Your right to swing your fist ends where my nose begins."

American Proverb

In perfect competition in equilibrium, price equals marginal cost (MC) in the short run, and price equals the minimum possible long-run average cost (LRAC) in the long run. Thus, all those potential consumers whose willingness-to-pay (WTP) for a good exceeds the lowest possible opportunity cost of producing the good get to consume it. As a corollary, no resources are wasted producing goods for people whose WTP is less than the opportunity cost of production. As you well know if you took the usual introductory microeconomics course, these are the great virtues of the perfectly competitive equilibrium, that it channels scarce resources into their most valued uses.

But all this is premised on the assumption that all valuable resources bear prices that reflect their scarcity. When people, either producers or consumers, are able to use a scarce output or input without having to pay for it, all the optimality attributes of competitive equilibrium break down.

Consider a consumer who consumes just two things: food and a neighboring river to dispose of his or her garbage. The consumer pays a price for the food, but in an unregulated environment, the consumer pays nothing for the use of the river. If the countryside abounded in rivers, so that people were not inconvenienced by the presence of the garbage, there would be no problem.[1A] Rivers would be a "free

good" if they were so abundant that river pollution caused no inconvenience to any human being. And the proper price of free goods is indeed zero.

If, however, rivers are scarce, downstream producers and consumers *will* be inconvenienced by our hypothetical consumer's method of garbage disposal. Commercial and recreational fishing will be damaged, swimming will be less pleasant and healthful, drinking water will need to be treated, etc. In short, the use of the river for waste disposal burdens society even though it does not cost anything to the person who does the disposing. There are social costs even though there are no private costs. This excess of social cost over private cost is the external cost.

The private cost is the scarcity signal that this consumer receives and responds to; if the private cost of the river is less than the social cost, the consumer will overuse the river. In general, where there are external costs attached to the production or consumption of something, too much of it will be produced or consumed. In this example, one can say either that too much river garbage is being produced or that too much river quality is being consumed.

DEALING WITH EXTERNAL COSTS

There are several ways of correcting this misuse of resources:

1. Downstream residents could band together and negotiate with this consumer, offering a payment in return for reduced waste dumping. This solution was suggested and analyzed by Ronald Coase and is called Coasian negotiation (Coase, 1960). It has the advantage of yielding economically efficient outcomes because people will continue negotiating as long as there are ways to make one of them better off without making the other worse off. And, if you don't like the idea of the blameless downstream residents having to pay the antisocial upstream resident to reduce his or her pollution, you can make river pollution illegal unless the polluter has permission from all the downstream residents; then the upstream polluter will have to negotiate with the downstream residents and pay them for the right to continue polluting. But the Coasian solution has a big disadvantage: the downstream residents must be sufficiently few and sufficiently organized that they can band together and negotiate. For most automobile-related externalities, the number of people affected is too great for a negotiation to take place at reasonable cost.

2. The government could pass a law banning or restricting certain practices that generate external costs. This is the usual approach in contemporary society, once an external cost is recognized as a serious misallocation problem. It is called the "command-and-control" (CAC) approach. It overcomes the problems of negotiation among large numbers of affected parties. But there is no reason for thinking that the politically-legally-bureaucratically-adversarially determined CAC allocation is efficient. To see this possible inefficiency, think of two factories (ABC Corp.