PENNY-WISE AND POUND-FUELISH?

New Car Mileage Standards in the United States

Paul R. Portney

The debate over domestic energy policy has one side shouting "produce more" while the other side shouts "use less." Not surprisingly, the Corporate Average Fuel Economy (CAFE) standards were fought over during hearings on the Senate energy bill. The chairman of the NRC's CAFE Committee offers his perspective on where to go from here.

Our seemingly endless debate about energy policy in the United States has been especially sharp since May 2001 when the Bush administration announced its new national energy policy. If anything, that debate has been much sharper still since the terrorist attacks of September 11, 2001, reminded us of the perils of using as much oil as we do in the United States.

Most of us remember the tiresome beer commercial in which seemingly normal people debated whether a particular brand was better because it "tasted great" or was "less filling." At the risk of only some exaggeration, we have our own version of this debate over domestic energy policy, with half the protagonists shouting "produce more" while their opponents shout "use less." The former look especially fondly at the Arctic National Wildlife Refuge (ANWR) as a possible source of additional oil, while the latter focus on improved fuel economy standards for new cars as the way to slake America's unquenchable thirst for petroleum. Both sides suffered at least temporary losses when the Senate—in the space of a few short days—recently rejected efforts to open ANWR for oil exploration and to tighten the Corporate Average Fuel Economy (or CAFE) standards for all new light-duty vehicles produced in the United States.

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Last year, I had the pleasure of chairing a committee assembled by the National Research Council (the study arm of the National Academy of Sciences) to examine the past and possible future effects of the CAFE standards (hereafter referred to as the CAFE Committee). The committee's final report, *Effectiveness and Impact of Corporate Average Fuel Economy (CAFE) Standards*, was published last summer. Accordingly, I watched the debate over fuel economy standards quite closely. Here I report on the findings of that study and offer some suggestions on the way readers might think about the CAFE program. Let's begin with a bit of history regarding the fuel economy standards and what we know (and don't know) about their early effects.

LOOKING BACK

Because of several disruptions in world oil markets during the 1970s, the price of oil went from less than $20/barrel in 1970 to more than $80/barrel in 1981 (converted to year 2000 dollars). Even before the end of that decade, Congress passed legislation requiring all new passenger cars and light-duty trucks (in other words, pickup trucks, minivans, and the now-ubiquitous sport utility vehicles, or SUVs) to meet federal mileage standards. Cars were required by Congress directly to meet a fleet average of 27.5 miles per gallon (mpg) by 1985, and the National Highway Traffic Safety Administration mandated that light-duty truck fleets were to average no less than 20.7 mpg. Since new cars were averaging only about 16 mpg in 1977, the year before the CAFE requirements begin to ramp up, and new trucks about 13 mpg, these required increases were quite significant.

What effects did the new standards have? Perhaps surprisingly, this is a harder question to answer than one might think. The principal confounding factor is that the price of gasoline had been going up since well before the CAFE standards were established. This created a strong demand on the part of new car buyers for more fuel-efficient cars, as well as an incentive for automakers to produce them. The CAFE Committee found that these two forces working together—higher gasoline prices and federally mandated fuel economy standards—resulted in a greater than 50% improvement in new car and light-duty truck fuel economy between 1978 and 1985. As a result, the country enjoyed significant reductions in oil consumption and also emissions of carbon dioxide, a greenhouse gas.

In fact, the CAFE Committee estimated that by the year 2000, improved fuel economy was reducing oil consumption by 2.8 million barrels per day (or about 14% of the current total) and reducing annual emissions of carbon in the United States by about 100 million metric tons (or 6% of current annual emissions). The committee could not determine how much of these improvements were due to the price effect (which subsided rather dramatically beginning in 1981 when oil prices began their fall back to about $20/barrel in year 2000 prices) and how much was due to the effects of the CAFE standards. Since 1981, it is highly likely that fuel economy remained where it did solely because of the federal standards.

There is another, less happy consequence to the rapid improvement in fuel economy between 1978 and 1985, however. Because automakers were being forced both by consumer demand for more fuel-efficient cars (for a time, at least) and by government regulations, they had little choice as to the way they could improve fuel economy so rapidly. The result was an almost decade-long cohort of new cars and light-duty trucks that were smaller and lighter than their predecessors. According to all but two dissenting members of the CAFE Committee, the rapid downsizing and "downweighting" of new vehicles that began in 1978 was responsible by 1993 for about 2,000 more fatalities annually than would have been observed had vehicles remained as

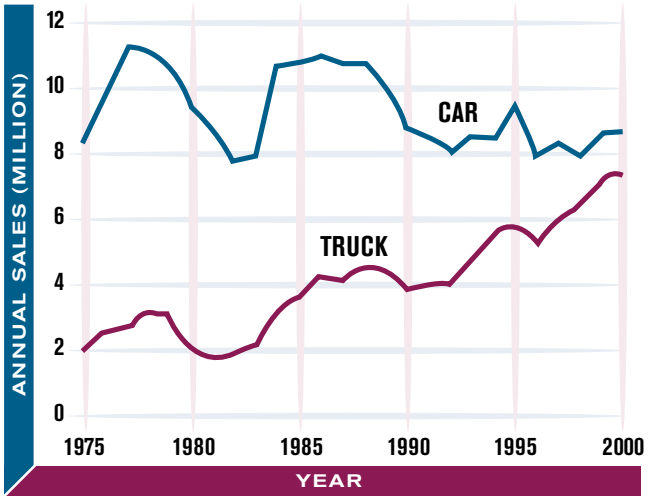
large as they were prior to 1978. As we shall soon see, this does not necessarily mean that further enhanced fuel economy must come at the cost of highway safety, but the rapid improvements of the late 1970s and early 1980s most likely did.

LOOKING AHEAD

Given the improvements of the past, why the continuing concern about future fuel economy? Despite the fact that both passenger car and light-duty truck fleets continue to meet their respective standards, the average fuel economy of the combined new car fleet has declined about 8% since 1986. "How can this be?" you might reasonably ask. Actually, the answer is quite simple, as Figure 1 illustrates. In 1975, when the law establishing the CAFE program was passed, light-duty trucks (once again, this category comprises pickups, minivans, and SUVs) accounted for about 2 million of the 10 million total vehicles sold that year in the United States. By 2001, however, light-duty truck sales accounted for *51* % of the 17 million-plus new vehicles sold. Since these light-duty trucks are only required to average 20.7 mpg, as opposed to 27.5 mpg for passenger cars, their growing share of all new-vehicle sales is gradually pulling down the combined new vehicle fuel economy average. Along with robust growth in the number of miles that all cars are being driven, this shift in the new-car mix is a major reason why oil use and imports are growing steadily.

FIGURE 1

HISTORIC VEHICLE SALES



Notes:
1. Source: Friedman et al. (2001) (see For More Information for details).
2. Trucks include vehicles under 8,500 pound gross vehicle weight (GVW) that are not classifiied as passenger cars.

What can and should be done about this? The former is much easier to answer than the latter. Regarding possible future fuel economy improvements, the CAFE Committee thoroughly investigated the technological potential for short-, medium- and long-term gains. According to the committee report, "Technologies exist that, if applied to passenger cars and light-duty trucks, would significantly reduce fuel consumption within 15 years."

I cannot even begin here to identify all the technologies the committee considered, but they include mostly things that are already in limited use for some parts of the new vehicle fleet rather than technologies for which dramatic breakthroughs are required. Examples are such things as variable valve timing, intake valve throttling, variable-compression ratio engines, continuously variable transmissions, friction reductions, 42-volt electrical systems, and reduced aerodynamic drag and rolling resistance.

So what if the technological potential exists for fuel economy improvements? It is almost always possible to do better technologically than we are currently doing—whether from an automotive, computing, medical, or agricultural standpoint. The really important questions are how much will these improvements cost and what benefits will we derive from them?

The committee provided at least some information along these lines. Beginning with technologies that could improve fuel economy rather inexpensively, and moving successively to those that could do so but at greater expense, the committee first sketched out what economists

would recognize as a marginal cost curve for fuel economy improvement. This was done on the assumption that the automakers would have at least 10 and as many as 15 years to make these changes—an extraordinarily important assumption, as we shall later see. By combining these cost estimates with estimates of the discounted value of the fuel that would be saved, the committee summarized part of its work in a table like that in Table 1.

As the table indicates, through the application of the technologies the committee identified, it would be possible in 10 to 15 years to improve the fuel economy of a mid-sized passenger car (for example, a Buick Regal, C-class Mercedes, or Honda Accord) from the current mpg average of 27.1 to 32.6 (a gain of 20%). This would add an estimated $791 to the purchase price of the car but would be more than offset by the $1,140 in discounted (at 12%) fuel economy savings over the assumed 14-year life of the car. Additional fuel-saving technologies could be applied, but according to the committee these technologies would add more to the purchase price of the car than they would save in discounted fuel costs. The larger the car, the greater the savings: the fuel economy of a mid-size SUV (such as a Ford Explorer or a Toyota Highlander) could be improved from its current 21 mpg to 28 mpg (33%). This would add $1,254 to its purchase price but would result in more than $2,000 in discounted fuel savings over its lifetime.

One question immediately arises: would these estimated improvements in fuel economy adversely affect safety? No, according to the committee. In fact, the committee found that neither passenger safety nor vehicle performance (acceleration and towing capacity, for example) would suffer when measured against today's standards so long as the technologies the committee identified were introduced throughout the fleets. The committee even figured into its calculations a slight increase in the weight of vehicles because of safety requirements likely to be imposed over the next 15 years. (It is possible, even likely, however, that performance would suffer in comparison to what it might be in 10 to 15 years were automakers not required to improve fuel economy.)

TABLE 1

Vehicle Class	Base mpg	Enhanced mpg (% Improvement)	Purchase Price Increase ($)	Lifetime Fuel Savings ($)
CARS				
Subcompact	31.3	35.1 (12)	502	694
Compact	30.1	34.3 (14)	561	788
Midsize	27.1	32.6 (20)	791	1,140
Large	24.8	31.4 (27)	985	1,494
LIGHT TRUCKS				
Small SUVs	24.1	30.0 (25)	959	1,460
Mid SUVs	21.0	28.0 (33)	1,254	2,057
Large SUVs	17.2	24.5 (42)	1,629	2,910
Mini Vans	23.0	29.7 (29)	1,079	1,703
Small Pickups	23.2	29.9 (29)	1,067	1,688
Large Pickups	18.5	25.5 (38)	1,450	2,531

Source: Adapted from NRC CAFE report (see For More Information for details).

THINKING MORE DEEPLY

Does all this mean that it's a good idea to impose more stringent fuel economy standards on automakers? Possibly, but not necessarily. First, one could argue, most people already know full well they could get better fuel economy by purchasing a different car. After all, no one buys a large SUV thinking it will stretch his or her gasoline dollar. Rather, at gasoline prices that typically range between $1.25 and $1.75 per gallon, there simply isn't very great demand among the American public for "fuel-sippers." Although I take strong issue with several of the arguments put forward by automakers during the recent Senate debate on CAFE, they are dead right on at least one count. CAFE standards require them to produce more fuel-efficient cars than large segments of the public appear to want—at least at current gasoline prices.

Second, if the government does require better new-car fuel economy, or if automakers provide it voluntarily, then the cost of driving a given distance falls (you'll use less gas per mile driven). This means the number of miles traveled will increase—about 1 to 2% for each 10% reduction in the cost of driving, according to research. This "rebound" effect—andits possible contribution to air pollution, increased congestion, and accident risks—has to be factored into CAFE policymaking.

Third, if people are much more sensitive to the upfront cost of buying a new car than to the fuel savings they will enjoy over its life, tighter CAFE standards could slow down the retirement of older vehicles on the road. ("We can't afford a new car, so we'd better keep ol' Bessie for a while.") We have observed this effect (called "new source bias") in decisions regarding the construction of new coal-fired power plants, certainly (see the article by Gruenspecht and Stavins in this issue), and it could keep gas-guzzlers on the road longer than we expect.

Fourth and finally, suppose CAFE standards are made more stringent. Although the CAFE Committee argued that this need not adversely affect safety or performance so long as automakers adopt the technologies identified by the committee, there certainly would be no requirement that they do so. If they chose to meet tighter standards by, once again, making cars smaller and lighter, drivers and passengers could be put at greater accident risk. Of course, consumer insistence on vehicle safety could force automakers down the technological route to enhanced fuel economy.

Given these possible shortcomings, CAFE standards must be weighed against the benefits of improving fuel economy. It is clearly worth something to reduce emissions of carbon dioxide and there are benefits as well to lessening our dependence on oil and, hence, our vulnerability to oil price shocks.

Suppose that a ton of carbon reduced is valued at $50, the figure used by the CAFE Committee (admittedly at the high end of the current range of estimated benefits of carbon abatement). Suppose further that the external benefits of each barrel of reduced oil consumption are valued at $5 (again, at the high end of estimated values). Together, these are equivalent to a $0.25 premium on the price of a gallon of gasoline. For this premium to be larger, either additional benefits of fuel economy improvements have to be identified or larger values justified for carbon reduction and/or oil consumption reductions.

A BOTTOM LINE

By far, the hardest question for any policy analyst to answer is this one: What would you do if the decision were yours to make? First, recognize that CAFE standards are distinctly inferior to higher gasoline taxes (and thus prices) as a way of dealing with both climate change and oil market externalities, a key finding in

the CAFE Committee report. Higher gasoline prices would motivate new car buyers to demand better fuel economy; accordingly, automakers would be more willing to produce such vehicles since the demand would be there. Much more importantly, higher gasoline prices would also create an incentive for those driving the 200 million plus vehicles already on the road in the United States to drive less, carpool (or take public transport) more, and keep their cars in better tune. By working only on the new-car margin, CAFE is an incredibly slow way to deal with climate change and oil consumption. Thus, in my world of worlds, I would gradually increase gasoline taxes (along with taxes on all other carbon-based fuels), while rebating the tax revenues to the public by reducing other taxes so as not to exert drag on the economy.

But what if our elected officials continue to lack the wisdom or, more likely, the will to increase the taxes on gasoline and other carbon-based fuels? Is the CAFE program an acceptable, second-best alternative? Yes, I reluctantly conclude, but only if it is modified in ways the committee recommended.

I would support gradual increases in the required fuel economy targets automakers face, beginning in model year 2007 and extending through 2017. By that time, the passenger car fleet ought to be averaging 35 mpg and the light-duty truck fleet, 28 mpg. However, manufacturers whose fleets fall short of these targets must be able to purchase fuel economy "credits" from companies whose cars or light-duty trucks exceed the goals.

There is no reason why an automaker wishing to specialize in heavy-duty pickups or large SUVs should have to produce smaller vehicles to offset its fleet impact so long as it can pay another manufacturer to make "gasoline misers." Moreover, if fuel economy improvements are harder to come by technologically than the CAFE Committee believed (so that safety might be compromised), the government should offer to sell extra fuel economy credits to automakers at some predetermined price—a "safety valve," if you will, to ensure that the fuel economy program does not become more expensive than it should.

There are no easy calls regarding fuel economy. Now you have mine.

For More Information:

Committee on the Effectiveness and Impact of Corporate Average Fuel Economy (CAFE) Standards, Board on Energy and Environmental Systems, Transportation Research Board, National Research Council. 2001. *Effectiveness and Impact of Corporate Average Fuel Economy (CAFE) Standards.* Available from the National Academy Press at http://www.nap.edu/catalog/10172.html (accessed May 13, 2002).

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