Chapter 8
The Potential for Improving Fleet Fuel Economy by Changing Vehicle Buying Patterns

The fuel economy of the new car fleet is as dependent on vehicle attributes determined by consumer preference—especially, the size mix of the fleet, general performance attributes, and the prevalence of luxury features—as it is on basic vehicle design and technology. Although further improvements in vehicle design and technology can yield significant gains in fuel economy for the next 5 to 10 years, particularly if certain new technologies prove successful, very large fuel economy gains may be possible only with changes either in consumer preferences or in the availability of preferred features.

The potential effect of changes in consumer preferences can be approximated by examining what such changes could mean in the current fleet. OTA first examined this possibility in its 1982 report, ***Increased Automobile Fuel Efficiency and Synthetic Fuels,***[1] reporting that the 1981 automobile fleet fuel economy could have been 33 mpg, instead of its actual 25 mpg, if consumers had consistently chosen the most efficient vehicle in each of the nine EPA size classes and producers had been able to meet demand.

More recently, the Environmental Protection Agency has conducted a similar but expanded examination of the potential effect of changed consumer preferences on the 1990 fleet.[2] Using a detailed data base for the 1990 fleet, EPA evaluated the effect on fleet fuel economy of the following shifts in consumer preference:

- auto purchasers buy only vehicles among the dozen most fuel-efficient in each weight class;
- auto purchasers buy only vehicles among the five most fuel-efficient in each weight class; and
- auto purchasers buy only the most efficient car in each weight class.

For each scenario as well as for the ***actual*** purchasing pattern in each weight class, EPA also examined the effect on fleet fuel economy of consumers shifting purchases towards smaller, lighter cars. For example, for the moderate weight mix shift, with average vehicle weight reduced from 3,171 pounds to 2,974 pounds (a 6.2-percent decrease), purchases of cars in the 3,500-pound class decline from 31.3 percent to 20.2 percent of all sales, and purchases of cars in the 2,250-pound class rise from 1.4 percent to 7.5 percent. For a more severe shift, with average weight reduced 11.7 percent to 2,802 pounds, cars in the 3,500-pound class go from a 31.3 percent share to 12.1 percent, and cars in the 2,250-pound class go from 1.4 to 9.6 percent. Table 8-1 presents the changes in weight class market shares for both scenarios.

EPA's analysis, results of which are presented in table 8-2, shows that changes in consumer preferences for fuel economy, performance, and vehicle size can have very large effects on fleet fuel economy. For the case of purchasing only the dozen most fuel-efficient cars in each weight class, with a 6.2-percent shift in weight class mix, the fleet fuel economy improves from 27.8 mpg to 33.2 mpg, or 20 percent. About two-thirds of the fuel economy improvement is due to consumers selecting the more efficient vehicles in each weight class, with the remainder due to the actual shift in weight class market shares. The "cost" of the improvement in terms of loss of basic con-

[1] U.S. Congress, Office of Technology Assessment, *Increased Automobile Fuel Efficiency and Synthetic Fuel: Alternatives for Reducing Oil Imports,* OTE-E-185 (Springfield, VA: National Technical Information Service, September 1982), table 1.

[2] R.M. Heavenrich, J.D. Murrell, and K.H. Hellman, *Light-Duty Automotive Technology and Fuel Economy Trends Through 1991,* U.S. Environmental Protection Agency report EPA/AA/CTAB/91 -02, May 1991.

Table 8-1 –Hypothetical Shifts in Weight Class Market Shares for the 1990 U.S. Auto Fleet

Weight (lb)	1990 Weight Mix (%)	Re-mix (%)	Re-mix (%)
1,750	0.01	0.7	1.4
2,000	1.3	1.3	4.7
2,250	1.4	7.5	9.6
2,500	12.6	11.4	17.0
2,750	10.4	21.7	26.9
3,000	31.0	31.2	25.1
3,500	31.3	20.2	12.1
4,000	11.0	5.6	2.8
4,500	1.07	0.49	0.22
5,500	0.013	0.006	0.003
Average weight.	3,171	2,974	2,802
Change from status quo (%):		-6.2	-11.7

SOURCE: US. Environmental Protectlon Agency, Ann Arbor, MI

Table 8-2–"Best in Weight Class" Analysis, 1990 Model Cars

1990 3,171 lb average wt	Re-mix 2,972 lb average wt	Re-mix 2,802 lb average wt	Consumer Purchase
Average miles/gallon			
34.4	37.5	40.3	Best in class
32.5	34.7	36.8	Best five in class
31.2	33.2	35.3	Best dozen in class
27.8	29.6	31.5	All Cars
Average cubic feet			
98	94	93	Best in class
103	99	98	Best five in class
102	99	98	Best dozen in class
107	103	100	All Cars
Average O to 60 mph time, seconds			
14.2	15.1	15.6	Best in class
13.1	13.5	13.7	Best five in class
13.1	13.4	13.5	Best dozen in class
12.1	12.4	12.7	All cars

SOURCE U.S. Environmental Protectlon Agency, Ann Arbor, MI

sumer attributes is a 7-percent decrease in the average interior volume of the fleet (from 107 to 99 cubic feet.) an n-percent increase in O-to-60-mph acceleration time (12.1 to 13.4 seconds), and a general shift away from automatic transmissions. The "average car''—the car that attains the average fuel economy of the fleet-shifts from a Dodge Dynasty or Volvo 740 to a Toyota Camry.

A more extreme shift in consumer preferences will yield a significantly higher gain in fuel economy. If consumers had selected only the best model in each class and absorbed a 12-percent shift in weight classes (that is, an overall reduction in vehicle weight of 12 percent), fleet fuel economy would have been 40.3 mpg, a 45-percent improvement over the actual 27.8 mpg, with responsibility about evenly split between the shift to higher-fuel-economy models and the weight-class mix shift. The cost in consumer attributes is a 13-percent decrease in average interior volume (107 to 93 cubic feet), a 29-percent increase in O-to-60 time (12.1 to 15.6 seconds), and, as before, a general shift from automatic to manual transmissions. The average car shifts from the Dodge Dynasty or Volvo 740 with automatic transmission to a Pontiac Lemans or Ford Escort—much smaller cars—with manual transmission.

There can be endless argument about the realism of the above scenarios given the relative stability of fleet average interior volume over time, the general rising trend in O-to-60-mph acceleration time, and the popularity of automatic transmissions. In particular, many might question the likelihood of a massive shift away from automatic transmissions. If a change in transmission type is not allowed, the fuel economy benefits are about 60 percent of those where a large shift takes place.[3] Only a portion of the reduction in benefits is due to the transmission change alone. Some high-efficiency models such as the Honda Civic CRX HF do not have a model with automatic transmission, but have other attributes that contribute to fuel economy (in the HF's case, an efficient low-horsepower engine). These features are not available to purchasers of vehicles with automatic transmissions.

It is worth noting that most lost fuel economy could be recaptured—at a price—with advanced automatic transmissions with efficiencies close to those of a manual, for example, five-speed electronically controlled automatics with lock up in all upper gears.

[3] John German, Certification Division, U.S.Environmental Protection Agency, Ann Arbor, MI, personal communication, June 11, 1991.

Although these shifts are not realistic as measures of what could happen ***instantaneouly*** (they do not account for problems of expanding production capacity, for example), they do illustrate what could happen over time, perhaps 10 years—with some changes, especially those associated with selecting the dozen most efficient cars in each weight class and the moderate mix shift, happening even sooner.