

B a d P u b l i c G o o d s
CAFE – the Corporate Average Fuel Economy Mandate

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Abstract

Congress enacted the Corporate Average Fuel Economy mandate to shield the United States from disruptions such as those that followed the 1973 Arab oil embargo. Retarding a growing stream of small imported automobiles was a projected ancillary consequence. Commentators also credit CAFE with reducing urban pollution and slowing global warming. Belief that CAFE has succeeded in those ways results from careless misinterpretation of the government's own data. CAFE has perverse impacts on each front. An obvious alternative policy would have more effectively advanced those goals that are worth pursuing, and at less cost.

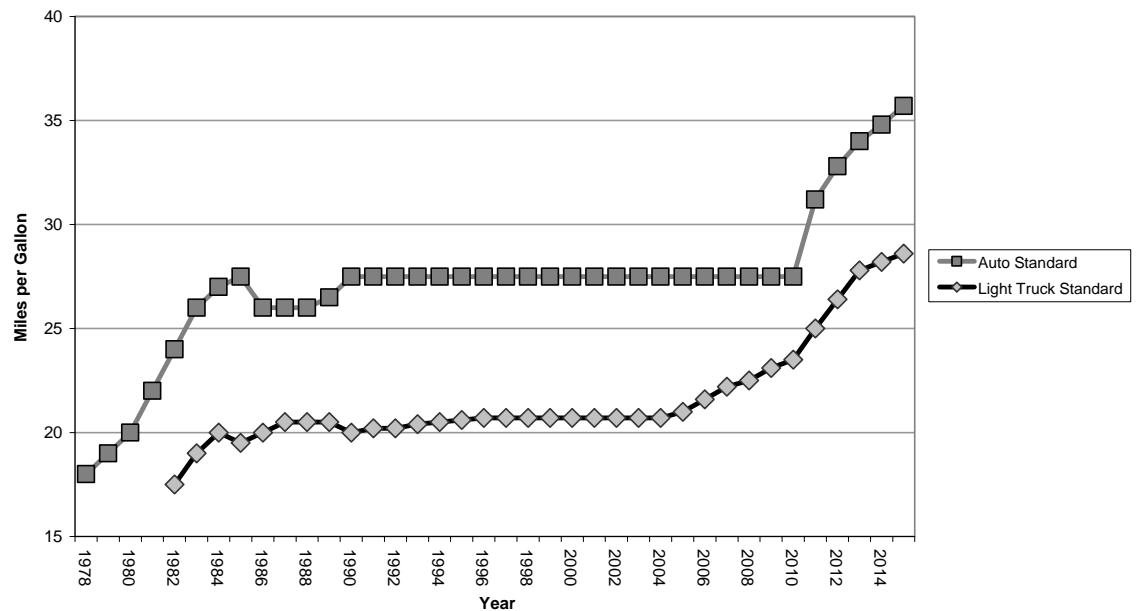
Taking advantage of the hiatus occasioned by the most important of Jewish holidays, Egypt and Syria launched a coordinated surprise attack on Israel on October 6, 1973. The Yom Kippur War did not proceed favorably for the Arab belligerents. Neither Egypt nor Syria is a major oil producer, but many citizens of the largest petroleum exporting nations are hostile toward Israel. In consequence, eleven days into the war Arab producers placed an embargo on oil exports, explicitly intending to damage the economies of the United States and some European nations in retaliation for their support of Israel. Other Organization of Petroleum Exporting Countries members, understanding the opportunity the embargo presented, quickly and substantially increased the prices

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they charged for oil. As the Arab nations intended, the rapid increase in fuel prices was economically disruptive for energy intensive economies such as that of the U.S.

The disruption led to a stream of policy initiatives throughout the first world, initiatives that assumed a life of their own and continue to evolve today more than a third of a century after the war ended. They include simulating ethanol production in the U.S. and biodiesel production in Europe as substitutes for petroleum, developing hybrid gasoline-electric engines, and using fuel cells in city buses, among other initiatives.

Figure 1: Mandated CAFE Standards
Source: NHTSA - Average Fuel Economy Standards
Passenger Cars and Light Trucks
Model Years 2011-2015



We confine our focus to another response, legislation passed by the U.S. Congress that empowered the Department of Transportation's National Highway Traffic Safety Administration (NHTSA), to determine and administer Corporate Average Fuel Economy standards. As figure 1 illustrates, CAFE mandates minimum miles per gallon that a manufacturer's average car must attain if the firm is to escape sanctions. Having

remained steady since 1990, the minimum will soon rise to twice the level at which it originated. It is important to note that all the data used in this paper originate with NHTSA itself, with the exception of historical gasoline price data.

CAFE does not require that every car sold in the U.S. be frugal in its energy consumption. Those who are prepared to pay the price can still obtain cars that consume substantial fuel. Instead, the mandates require that each manufacturer meet an estimated miles per gallon averaged over the entire fleet of cars the manufacturer sells in the U.S. during a given model year.¹ That is the *manufacturer's fleet average*.

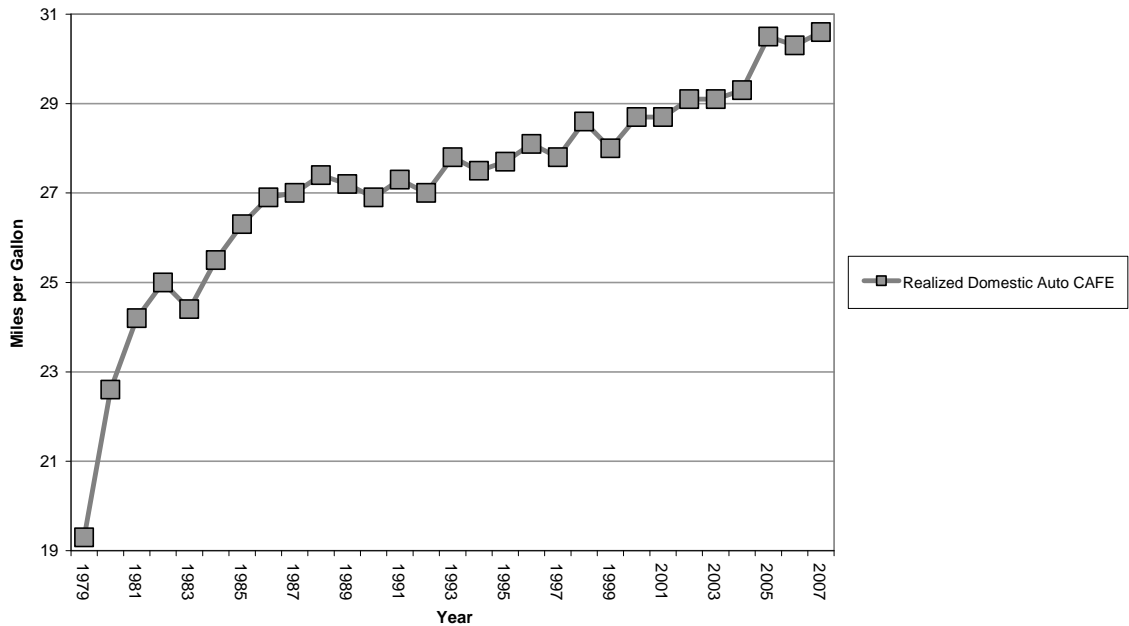
In response to manufacturers' appeals that their trucks were innately different – mainly work vehicles that had to be heavier and more fuel using than cars in order to carry their cargos – NHTSA introduced a separate light truck standard in 1982. As one would anticipate, CAFE treats pickups as light trucks while eighteen-wheelers are not. For purposes of CAFE, however, the distinction between an automobile and light truck does not hinge on the vehicle's appearance but on its weight. Thus, most vans and sport utility vehicles (SUVs) are considered light trucks rather than automobiles.

In addition to defining the mandatory minimum fleet miles per gallons of Figure 1, NHTSA also reports the various manufacturers' realized fleet averages, as well as several averages aggregated over various sectors of the industry. One major objective of CAFE was to induce U.S. producers to downsize automobiles, so the press often focuses on changes in the realized average for all automobiles produced domestically during the

¹ To prevent firms from selling a few freakish cars that use astonishingly little fuel while continuing to produce gas-guzzlers for the rest of their fleets, the CAFE average is harmonic rather than the more familiar algebraic average. That fear was most likely groundless, but in any event, the distinction between averages is seldom relevant here, so we rarely have cause to mention it. Where we construct alternative representations of CAFE fuel consumption averages below, however, we employ the mandated harmonic average.

most recent model year. Figure 2 shows that time series. The average miles per gallon actually realized by the average car produced in North America has usually (though not always) exceeded the mandatory minimum by a small margin, increasing from 19.3 mpg in 1979 to 30.6 mpg in 2007, an increase of nearly 60%.

Figure 2: Realized Domestic Auto CAFE
Source: NHTSA - Summary of Fuel Economy Performance, March 2008
U.S. Dept. Transportation



Credits under CAFE are earned if a firm's fleet average miles per gallon is above rather than at the mandated average, and deficits are incurred if the fleet average is below the mandated average. A firm may save credits or borrow deficits for up to three years, both at an interest rate of zero. A firm cannot purchase another firm's CAFE credits. Instead, when a firm's credits cannot cover its deficits within the permitted timeframe NHTSA imposes substantial fines. That penalty is imposed on every car the manufacturer sold during the model year, even on the units (if any) that met CAFE's requirements.

Many CAFE details are of marginal interest here and thus ignored, but one final detail will prove relevant. When Congress debated the legislation establishing CAFE, General Motors, Ford, and Chrysler – the so-called U.S. Big Three – all had subsidiaries that operated abroad, manufacturing the small cars that European and Japanese drivers preferred. The United Auto Workers union feared that CAFE would merely induce the Big Three to begin importing the small cars that they were already producing on foreign soil, thus reducing employment in the U.S. automobile industry. In consequence, Congress inserted an added stipulation into the mandates – companies producing both domestically and abroad must meet the CAFE fleet average for domestically produced cars, and as a separate calculation, they must also meet it for the fleet of vehicles imported from their foreign operations.² If a company cannot clear its domestic fleet deficit within three years, the company must pay a fine on the vehicles in that fleet regardless of any credit realized by those in the company’s import fleet, and vice-versa.

I. The Public Goods Paradox: *Quis custodiet ipsos custodiet?*

Private markets rarely yield ideal outcomes, though in view of the cost of doing still better those imperfect market outcomes are often optimal (Demsetz 1969, 1). A similar consideration applies to government programs – neither the private nor the government alternative will be ideal, so a reasonable person might well ask which is likely to come closer? Unfortunately, that question often goes unasked.

The discussion below outlines a common argument that economists employ to urge government intervention under particular circumstances, then moves to a

² NHTSA defines a vehicle as domestic if 70% or more of its cost arises from U.S. or Canadian materials. Initially the cutoff was of minor consequence, though today a substantial number of vehicles assembled in North America qualify as imports for CAFE purposes.

fundamental problem that fewer of them have discerned – government intervention is apt to fail under precisely the same circumstances as private provision, *and for precisely the same reason.*

A. The Economic Definition of a Public Good

If I eat an apple, you cannot eat it, so we are rivals with respect to apple consumption. In contrast, if I tune my television to a particular program you can tune in as well, and are likely neither to know nor care whether I am watching. Thus, enjoyment of television is nonrivalrous. The degree of rivalrousness among consumers affects whether a market can exist for a particular product, and if so its nature.

A related attribute influencing the existence and nature of markets is a producer's (or subsequent owner's) ability to prevent unsanctioned use. Most personal services are completely excludable – there seems to be no way that you can benefit from an appendectomy that the doctor performs on me. Though theft of goods is peripheral here, some items influence the well-being of others though non-owners do not steal. I build a dam to protect my farm from floods. Your farm is affected too if it lies downstream. Within those confines, the impact is nonexcludable – my dam benefits me and simultaneously affects everyone else in the floodplain; as will be discussed shortly, the word properly applying to “everyone else” is *affects*, not *benefits*. Economists call things that are simultaneously nonrivalrous and nonexcludable *public goods*.³

³ Some items are incompletely excludable so some people can encroach but others cannot – some upper story residents across from Wrigley Field watch Chicago Cubs games through their window. Others must purchase a ticket or make do with a telecast. The distinction is immaterial here, so discussion will be limited to perfection, sometimes called pure public goods.

The prospect of a moderate individual benefit is unlikely to motivate someone to make a major expenditure. Yet as consumption is nonrivalrous an individual's valuation of a public good understates its aggregated value, perhaps grossly so. Thus it is often argued that nobody acting as an individual ever provides an adequate amount of any public good.⁴ Most economists recognize that production of a nonrivalrous good may pose no problem when an entrepreneur can exclude those who do not share the cost – cable television, for instance, is a nonrivalrous good whose provider can exclude non-payers. Because a public good is nonexcludable by definition however, the entrepreneur may be unable to cover the cost of provision, creating a danger that public goods will be inadequate if provided privately. When ideal amounts are not forthcoming privately, many people, economists and non-economists alike, argue that tax-financed government provision should substitute. Call that the *government-provision rationale*.

Severing the word pair “public goods” into “public” and “goods” is misleading. Many economists treat *PUBLIC* goods as though they are in some inexorable nexus with government, and public *GOODS* as though they are necessarily beneficial for everyone if they are beneficial for anyone; both suppositions are false.⁵ To be clear, the distinction in this paper is not that things such as odors from decaying garbage are nonrivalrous, nonexcludable, and bad for virtually everyone; in analogy with the economic concept of a public good, decaying garbage would be a public bad. For a public bad there often exists a related public good – e.g., garbage removal – so nonrivalrous, nonexcludable items that

⁴ It would be distracting to falsify the supposition here, beyond citing contradictory analysis (cf. Buchanan and Stubblebine 1962; Olson 1965; North 1990; Spiegel 1995; Haddock 2007).

⁵ See Haddock (2008b) regarding the false nexus between public goods and government, and between private goods and individuals.

are bad for everyone require no separate theory, merely standard public goods theory applied to whatever might mitigate the bad.

The point here is quite different: Very few public goods (the words conjoined) are good for everyone, perhaps none – even defense of the nation is bad for those who hope the enemy will be victorious. Consider my dam, which I built privately. I made the investment for the benefits I expected the dam to provide me personally, but it also has nonrivalrous and nonexcludable impacts, though downstream rice farmers may well consider those impacts deleterious. If a public good verifiably (as opposed to conjecturally) conveys a sizeable benefit to ninety percent of the community but is mildly injurious to ten percent, many people will think that close enough. Nevertheless, some nonrivalrous and nonexcludable government projects are good for a small, influential part of the community though bad, even potentially fatal, for a large though nearly voiceless part (Haddock 2008a). That is a horse of a different color.

Even if a government project yields indisputable nonrivalrous and nonexcludable benefits for everyone, that still does not guarantee efficient provision of the benefits. Given enough governmental inefficiency, non-ideal private provision may yet dominate.

B. The Paradox of Government Provision of Public Goods

Barely a handful of commentators have recognized the paradox embedded in the government-provision rationale. For illustration, the paragraph above hypothesized a dam, but the foundational idea is not so limited. It could have been anything, providing the impact on one person is unchanged whether or not another person is also affected, and

providing further that a person deciding to produce the public “good” (which may be bad for some) cannot exclude the affected.

The public good at issue might be monitoring the government, for instance. Philosophers caution government operatives in a liberal nation to be agents of the general public, neither principals themselves nor agents of a king, a dictator, or a favored subset of the public. Yet agents – either private or governmental – have the same failings as the rest of us – agents make mistakes regarding the appropriate limits or even desirability of their actions, agents may place more weight on their own preferences than on those of their principals, some agents enrich themselves corruptly at their principals’ expense.

Someone must monitor agents or they will not be properly motivated to act in their principals’ interest. A market provides tools for monitoring private agents (though imperfectly), and some of those tools are useful for monitoring government agents as well (also imperfectly). Others tools in the private set, however, are unusable for monitoring government agents. Consider one such tool: Upon discovering an agent’s underperformance in the private sphere, a monitor often can purchase from a non-monitoring principal a substantial share of the assets that the agent has been controlling, replace or otherwise discipline the agent, and reap the increased asset value that ensues. The mere threat suffices to discipline many agents, so its execution may be rare. In those instances where the threat need not be executed, even non-monitoring principals benefit from the monitoring of non-owners who search for undervalued assets to purchase.

In contrast, a monitor of government agents cannot purchase title to additional shares of whatever benefits flow to a broadly defined public. Thus when monitoring is of a form that serves the interest of a broad public, a potential monitor cannot magnify

private returns to defray the private costs that monitoring imposes. Still, someone must monitor government agents if they are to be properly motivated to look after the interest of their principals, the public. How, for example, are agents to be motivated to provide the proper amount of a public good, and how are they to be motivated to arrange for efficient provision?

Will the vote suffice to obtain ideal monitoring of governmental agents? Optimal, perhaps, but far from ideal. One is certainly likely to pay careful attention if a program is apt to result in a million dollar windfall to oneself, and will support it even if it costs everyone else in the U.S. a dollar apiece, in other words nearly \$300 million in aggregate. Such an individual has a *special interest* in mind when supporting that program, not the interest of a broadly defined public. It would not be at all good from that person's perspective if some philanthropist were to volunteer the public good of monitoring in the broad public's interest in order to defeat the program.

One is just as certainly unlikely to pay attention if the policy is apt to result in a million dollar windfall to some stranger though it will cost everyone else, including oneself, a dollar apiece. Ay, there's the rub. If implemented – and only the side favoring passage, the special interest, is willing to bear the cost of monitoring the relevant government agents – the program impoverishes the nation as a whole by \$299 million. The public interest is counter to passage but unvoiced while proponents articulate the special interest with alacrity, with care given to put the best possible public face on passage.

Putting aside instances where an individual has an exceptionally large stake in a public policy outcome, the private benefit from expending time and resources to monitor

government agents will be relatively small while the private cost to monitor will be substantial. As to most public policy decisions then, citizens are quite ignorant and quite apathetic, and it is quite rational though quite costly for us to be so.

We perform little monitoring of our government agents even when the benefit of monitoring would be massive if aggregated over the entire electorate. That is due to the relatively small scale of individual, personal losses that we may suffer from any specified government program – from any specified one of the *plethora* of government programs. Yet just add together a plethora of small personal losses, then gasp at the large personal sum. In brief, anyone who monitors bureaucrats to see that they are performing according to some broad public interest (as opposed to a narrow special interest) provides a public good (Tullock 1971; Stroup 2000).

Thus, as Winston Churchill noted, "Many forms of Government have been tried and will be tried in this world of sin and woe. No one pretends that democracy is perfect or all wise. Indeed, it has been said that democracy is the worst form of Government except all those other forms that have been tried from time to time." Thus, even franchised voters gain the benefit of less than ideal monitoring of government agents. Because monitoring of government agents is a public good, according to the government-provision rationale the government must provide it.

That then is the paradox: *Quis custodiet ipsos custodiet* – who will watch the watchmen? Government agents will misbehave if not properly monitored; monitoring of government agents is a public good; hence according to the government-provision rationale government agents (who predictably misbehave if improperly monitored) must monitor government agents in order to prevent the latter from misbehaving with respect

to the interests of their principals, the general public. Who will monitor the monitors to see that they monitor appropriately? Quite apart from the expense and degraded information flows that would result, adding a deeper layer of agents whose role was to monitor the monitoring agents would merely push the paradox back one level – who then is to monitor the monitors of the monitors? It is turtles all the way down (Wikipedia).

Even though problems associated with the imperfection of government are commonly recognized, it is seldom noted explicitly that the root of those problems is precisely the same as that of the free-rider problem associated with private production of public goods. The formation and successful control of a government program in the public interest, for any reasonable definition of that nebulous term, are themselves public goods.

Stroup (2000, 485)

Thus, monitoring of government agents to achieve a broad public interest is itself a public good whether the monitored agents, at taxpayer expense, provide a public good in the economic sense, such as a dam, or provide a rivalrous and excludable good such as food stamps. Nonetheless the issue of government provision of a public good – e.g. a dam – is different in at least one important respect from the issue of government provision of other goods. We expect proponents to rationalize tax-financed food stamps and the like on some reasoned basis, but in many influential circles, careful consideration of the appropriateness of tax finance is missing for public goods.⁶ That does not imply

⁶ Consider the following remarks, recently published by five well-regarded Harvard University professors:

Goods (or services) that are nonexcludable and nonrival are called *public goods* by economists. ... It is apparent that public goods will not be adequately supplied by the private sector. The reason is plain: because people can't be excluded from using public goods, they can't be charged money for using them, so a private supplier can't make money from providing them. ... Because public goods are generally not adequately supplied by the private sector, they *have to be supplied by the public sector* (Jackson, Kaplow, Shavell, Viscusi, and Cope, 2003, 361-63; Emphasis added).

Or this, from the leading law & economics text:

There is rivalry in the consumption of private goods. The polar opposite is a purely public good, for which there is no rivalry in consumption ... [but] it is costly to exclude anyone from enjoying [it]. ... [E]fficiency *requires* that rivalrous and excludable goods should be controlled by individuals or small groups of people, whereas nonrivalrous and nonexcludable goods should be controlled by a large group of people such as the state (Cooter and Ulen 2004, 107-08; Emphasis added).

that food stamps will be provided or denied on the basis of sound reasoning – monitoring of that activity is also a public good (though food itself, being both rivalrous and excludable, is not) so voters are apt to be rationally ignorant and rationally apathetic with respect to that issue too. Nevertheless, that public goods are required in order ideally to monitor provision of public goods is the garden-variety public goods problem raised to a power. Evidently, a goodly number of economics professors, even some at high-level universities, have overlooked the multidimensional nature of the economic concept public good.

Thus, though private provision of public goods may not be ideal, any one of the alternative ways government might arrange that provision will also miss that target. The issue, then, is not to reject one option because it is imperfect, but to ask which option does best in any particular instance.

The view that now pervades much public policy economics implicitly presents the relevant choice as between an ideal norm and an “imperfect” institutional arrangement. This *nirvana* approach differs considerably from a *comparative institution* approach in which the relevant choice is between alternative real institutional arrangements. In practice, those who adopt the nirvana viewpoint seek to discover discrepancies between the ideal and the real and if discrepancies are found, they deduce that the real is inefficient. Users of the comparative institutional approach attempt to assess which alternative real institutional arrangement seems best able to cope with the economic problem; practitioners of this approach may use an ideal norm to provide standards from which divergences are assessed ... and select as efficient that alternative that seems most likely to minimize the divergence.

Demsetz (1969, 1)

The ideal, in other words, is optimal only if it is possible. Otherwise the best that could possibly be selected is optimal. If it is to be more than a cumbersome, technical synonym for ideal, the word optimal requires comparisons.

To argue that there is no monitoring of government would be inane. For one, journalists eagerly take on that job, reducing the cost to rationally ignorant and rationally apathetic voters of discovering and acting on malfeasance. But for matters of limited individual importance (though great aggregated importance) readers seldom can afford the time to attend carefully to what journalists tell them any more than voters can afford to monitor government agents directly and carefully. Besides, journalists monitor private agents in addition to government agents, so that form is shared, whereas monitoring prompted by alternatives such as asset-transfer incentives is exclusively private.

Celebrate those tools that are available to monitor government. Acknowledge that they are much more potent in the modern first world than at many other times and places. Understand, however, that important items are missing from the government-monitoring toolbox, and search ceaselessly for appropriate institutional improvements that will ameliorate the consequences.

II. CAFE's Institutional Setting

As Congress debated CAFE in 1975, the most common argument raised in its favor was that it would reduce U.S. dependence on foreign petroleum and moderate potential disruptions to the economy similar to those that had followed the 1973 Arab Oil Embargo. The apparent way for domestic automobile makers to meet fuel saving objectives, at least in the short-run, was to build smaller and lighter vehicles, and to some observers that implied a second CAFE advantage. A stream of small automobiles imported into the country had been growing gradually since Volkswagen entered the U.S. market in 1949. Some non-Big Three U.S. manufacturers such as the American Motors Corporation with its Rambler had specialized in smaller automobile varieties, but those

were small in an additional way – as automobile manufacturing goes, they were small-scale operations that ultimately had been unable to compete with Volkswagen and the subsequent entry of several Japanese producers. By inducing the Big Three to decrease the average size of domestically produced automobiles, Congress expected to stem job losses in the domestic automobile industry. Commentators have also credited CAFE with reducing urban pollution and with slowing global warming, though in 1975 only a handful of scientists had become concerned with the latter.

It is important at the outset to put aside issues that we do not address. Some careful observers believe that few if any of the motivations detailed above are sufficient to warrant CAFE. For instance, some embargo-induced disruptions in 1973 were self-inflicted. The imposition of wage and price controls with the ensuing time-wasting queues and other more subtle distortions certainly exacerbated the disruption by far more than CAFE could have ameliorated it, had CAFE already been in place. Nonetheless, in this paper we do not quarrel with the desirability of the articulated objectives. We treat the objectives as meritorious and instead ask whether CAFE's regulatory structure can attain those objectives.

By articulating those (possibly misguided) motives, CAFE's supporters are asserting that the mandates provide several nonrivalrous and nonexcludable – hence public – goods: Shelter for the domestic economy against potentially hostile foreign governments; retention of employment in the domestic automobile industry; decreased urban smog; slower global warming. The issue that we address, then, is not whether the hoped for results are worth pursuing but whether CAFE is well designed to achieve those

targets. If a readily available alternative policy would have provided a more secure shelter from hostile attempts to disrupt the U.S. economy at the same or less cost, CAFE has failed at its assigned task. If CAFE augments job losses in the domestic industry, again CAFE has failed. Similarly, the mandate is defective if alternative policies would have, at equivalent or lower cost, led to less urban smog and lower carbon emissions. As we detail below, CAFE seems to fail on each score.

III. An Alternative to CAFE

An increase in fuel taxes would be the most straightforward means to curtail petroleum consumption. Higher prices at the pump would induce many drivers to opt for automobiles that could squeeze more miles from the fuel the driver purchased. That most cars sold in Europe and Japan are notably smaller than those driven in the U.S. is due in substantial part to high tax-augmented European and Japanese fuel prices. Certainly, some drivers would decide to continue to drive large cars and bear the increased fuel costs, but CAFE also permits some drivers to opt for large cars. Under CAFE, those drivers do not even have to pay substantial fuel costs. Perhaps, as many allege, the rich will just buy their way out of a duty to conserve fuel, but there is no apparent reason to let them buy their way out as cheaply as CAFE does.

This observation should be interpreted neither as an argument for nor against an increased fuel tax. We intend to show only that the economy-wide result from increasing the fuel tax would have been more beneficial than CAFE's impact if those favoring measures to reduce fuel consumption are correct, and less costly if those opposing such a policy have it right. Automobile drivers would no doubt resist a fuel tax increase, but

CAFE has increased the cost of producing cars, a cost that is passed on to buyers, and that amounts to a hidden tax of the sort sometimes referred to as taxation-by-regulation.

Adopting an indirect and hidden CAFE-induced tax increase rather than increasing the fuel tax acts against the goals of curtailing carbon emissions and urban smog. A new car's purchase price is higher, which certainly dissuades some potential buyers. For the subset of buyers who purchase a new car despite the increased price, however, CAFE does nothing to curtail the incentive to drive and burn gasoline.

Moreover, few who delay or forgo a new car purchase will turn to walking, biking, or riding buses; most will consider a used car to be a better substitute. Often that will merely mean keeping the old jalopy an extra year or two, since retaining one's own well-used car imposes no transaction cost. Throughout the history of the automobile industry, hence well before CAFE, gradual reductions in fuel use have been the norm rather than the exception because reduced fuel consumption decreases operating costs and thus increases buyers' demand for cars. Though one-third the weight of today's average import, Henry Ford's Model T burned a gallon of fuel about every 15 miles, but could generate only 20 horsepower and a maximum speed of 45 miles per hour in the process. The Model T was an extraordinary automobile in its day, but today it would be extraordinary only for its deficiencies. Thus, older cars usually burn more fuel per mile than a postponed replacement. The implicit CAFE tax fails to exert the marginal disincentive to emit carbon that an increased fuel tax would have achieved.

As fuel use has gradually fallen with automobile evolution, emissions have fallen as well. Even the cars that domestic manufacturers marketed in the 1950s were far cleaner than those marketed in the 1920s though there was hardly any governmental

pressure to control automobile emissions in either decade. The reduced emissions did not result from automobile manufacturers' environmentalism, but were an incidental result of the same reduction in fuel use that decreases buyers' operating costs. Moreover, the emissions from a car of a given vintage increase as it ages. For both reasons – vintage and age – a car that continues in service for an extra year or two will contribute more pollutants than would the new car that would otherwise have replaced it.

More subtly but also of more importance, an increased fuel tax would have induced all users to conserve fuel, whereas CAFE applies only to passenger cars and light trucks. The heavy trucks, railroads, ships, barges, and air freighters that carry nearly all intercity bulk commodities, burning extensive fuel in the process, are subject to no CAFE restraints. Indeed, if CAFE exerts a notable downward pressure on the fuel consumed by passenger cars and light trucks it will moderate fuel prices, thus encouraging rather than discouraging fuel use in the heavy freight sectors.

For at least some uses, various fuels are substitutes in either production, consumption, or both. For example, the proportion of a barrel of petroleum distilled into fuel oil rather than gasoline is a choice variable. In consequence, the same considerations apply to all fuel use. People are pressured to conserve the gasoline they burn in their cars, but unlike a comprehensive fuel tax, CAFE provides no incentive to conserve the oil or methane that heats their homes or the electricity that cools them.

In brief, even if CAFE works as planned to reduce fuel consumption by cars and light trucks, it affords a ridiculously flimsy shelter for a national economy targeted by a hostile government. It is as though we are preparing for a hurricane by ramping up umbrella production. By the way, the hurricane may never make landfall.

IV. Automobile Size

A reasonable person may ask why U.S. consumers seem so determined to purchase larger cars than European and Japanese drivers do. There seem to be three principal reasons for the difference. First, as alluded to above, fuel prices gross of tax are higher in Europe and Japan – even today U.S. motor fuel prices are the lowest among first world nations.

Second, Europe and Japan urbanized long before automobiles came on the scene. Their populations are dense and higher proportions of them live in cities, where the streets and lanes are narrow, winding, and often choked with vehicular and pedestrian traffic. A small car may afford less comfort during the occasional high-speed jaunt along a wide, straight rural highway, but it is more maneuverable in tight quarters and around the obstructions encountered on a daily basis.

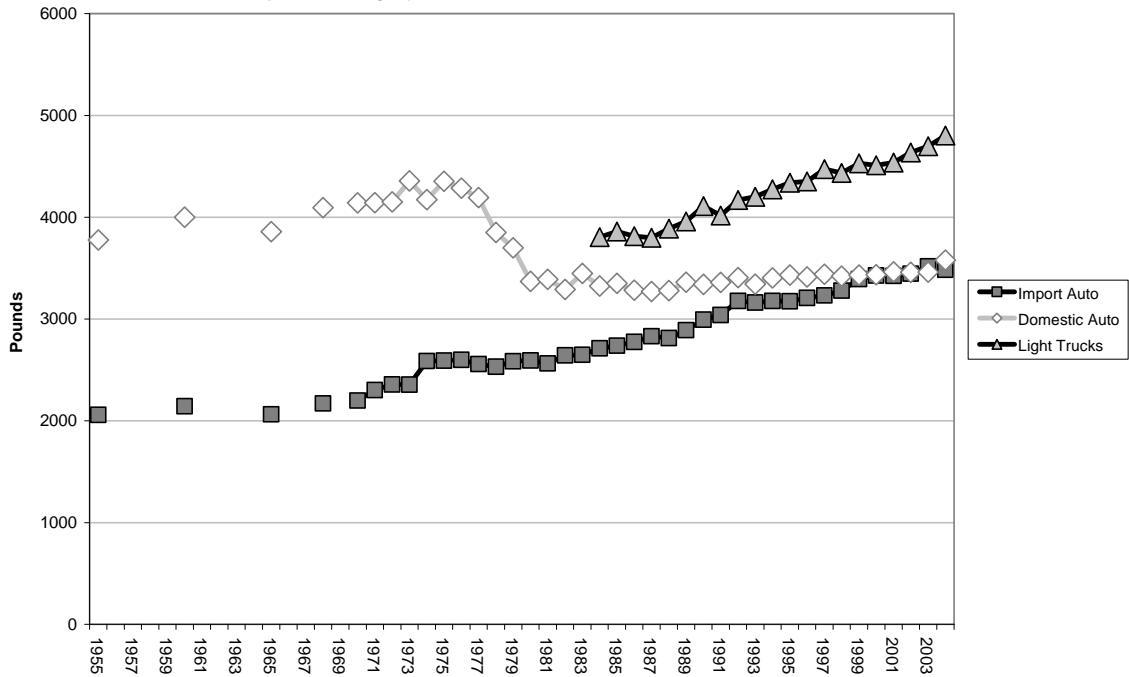
Third, in addition to having a sparse population and a lower proportion living in cities, the U.S. is enormous relative to Japan and western European nations. American cities are much more widely dispersed (Cain and Haddock, 2005). In consequence, Japanese and European public transport is denser and more frequent than the U.S. economy could support. Thus, American drivers are accustomed to high-speed long-distance driving where a larger and therefore heavier car's comfort and safety become relevant. Neither France nor Spain is substantially larger than California though they are the two biggest nations in western Europe. Most of the people a French citizen travels to meet (often by rail) are relatively nearby, as are most of those a Spaniard travels to see. Japan has Montana's area but the population density of Massachusetts. The United Kingdom is an Oregon-size nation with Connecticut's population density.

In brief, U.S. drivers, Canadians, Australians, and residents of other large, sparsely populated, and dispersed nations, have understandable preferences for relatively large vehicles. As supporting evidence, notice that those Europeans who take frequent extended trips on superhighways often drive larger cars than their compatriots. Though most vehicles are Mercedes, BMW, Audi, or the like, the Autobahn looks rather similar to a U.S. Interstate Highway in the size distribution of its cars, despite much higher German fuel prices. The distribution of cars on German city streets, in contrast, looks very different than in a city in the U.S. CAFE did not change the U.S. environment but merely induced drivers to search for alternative ways to obtain the vehicles they preferred, given that environment.

Supporters expected CAFE's mandates to force lighter cars from domestic manufacturers, but as an empirical matter that impact disappeared within three years. As figure 3 indicates, however, domestically produced automobile weights did shift from one very nearly horizontal trend to a different though still nearly horizontal trend that is roughly a half-ton lighter.

Figure 3 also illuminates a much more remarkable change – CAFE's introduction coincides with replacement of a rather flat trend in the weight of imported automobiles sold in the U.S. by a noticeable upward trend. Before CAFE, imported automobiles were roughly half the weight of domestically produced cars; today the imports and their domestic counterparts are of virtually the same weight on average. Note as well that light trucks have been steadily increasing in weight. The upward trends in light truck and imported automobile weights are not incidental, but a direct result of CAFE.

Figure 3: Test Weight
 Source: NHTSA - Domestic & Imported Passenger Car Fleet Average Characteristics
<http://www.nhtsa.gov/portal/site/nhtsa/menuitem.43ac99aefa80569eea57529cdba046a0/>

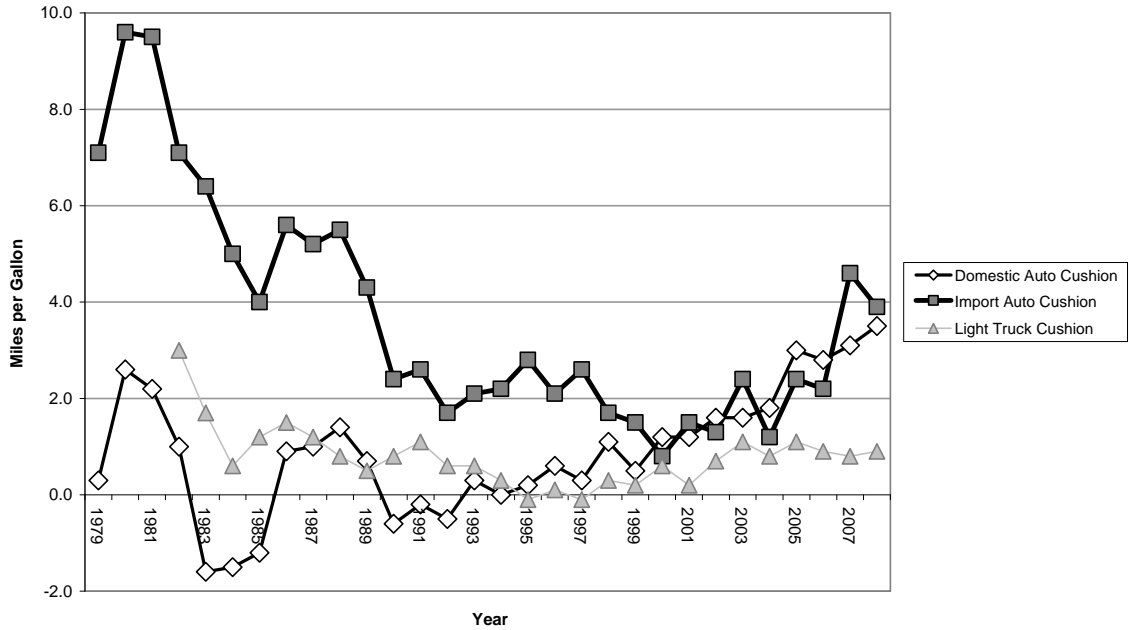


We define a cushion to be the divergence between the average miles per gallon that a firm realizes and the average the mandate requires the firm to meet. Thus, a positive cushion implies that the firm was exceeding the mandated average during a particular year and a negative cushion implies falling short of the mandated average. Because imports were relatively small and therefore light at CAFE's inception, they had large CAFE cushions, as shown in figure 4. An implication of their cushions was that imports immediately began earning CAFE credits. NHTSA would bank those credits to the company's account for three years but if unused by then they expired.

CAFE credits are inalienable to other firms, so if a credit is to have value to its owner it can only be use value, not sale value. If one firm, say General Motors, has a deficit, it cannot purchase an offsetting credit in a competitive market consisting of all the other firms whose fleets have realized average miles per gallon above the mandated

average. Instead, there is but one supplier of the required offsetting credit, and GM is compelled to make a purchase, though NHTSA calls the price a fine. As one would expect with a legal monopoly as the only credit merchant, the price (fine) is substantial.

Figure 4: Cushions: Realized CAFE minus Mandated CAFE
 Source: NHTSA - Summary of Fuel Economy Performance, March 2008
 U.S. Dept. Transportation



CAFE forced domestic companies to curb the average weight of the automobiles they produced, which they accomplished by decreasing production and sale of larger and thus heavier models and increasing the production and sale of smaller and lighter ones. The reduced large car supply increased large car market prices while the countervailing increased small car supply decreased the market price of that variant. The profit margin consequently became higher for large than for small cars, but only the imports had the CAFE cushions necessary to take advantage of the divergence.

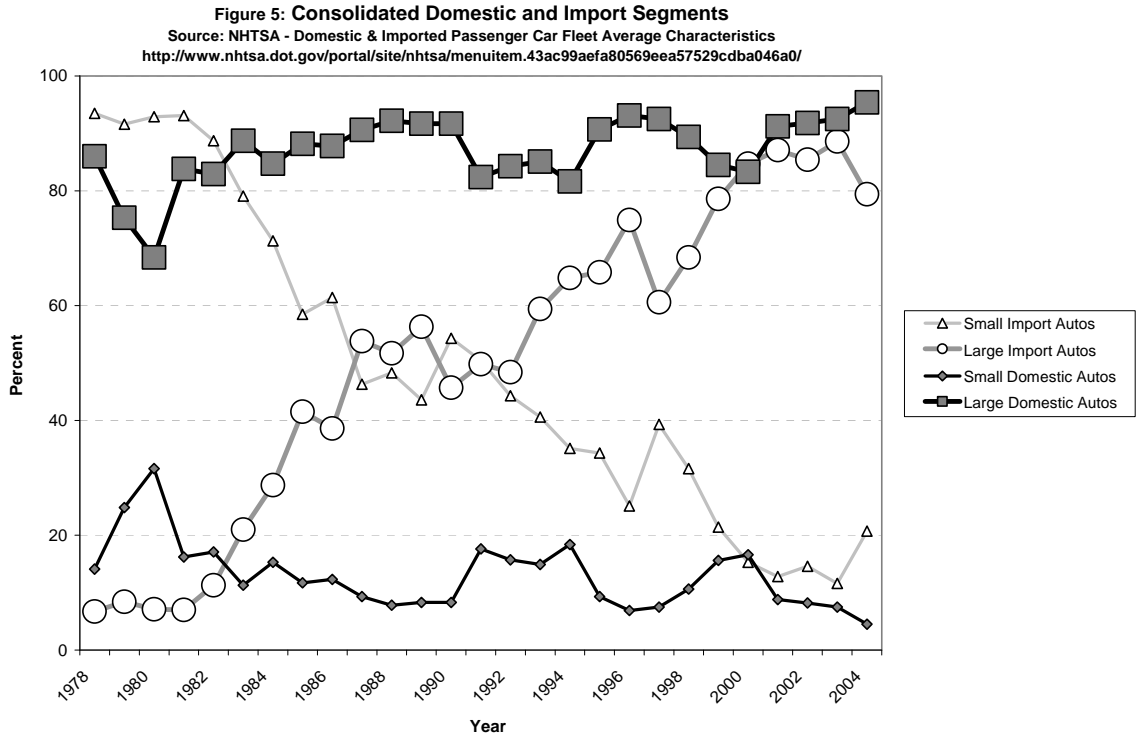
Once the Big Three had completed the alterations in production and sales necessary to shield themselves from fines, opportunity was at hand for import companies

that were holding credits. Companies such as Toyota and Honda that had been producing cars that were stingy with fuel now had artificial incentives to exploit the increased large car profit margin while simultaneously cutting back on small car production, where the profit margin had fallen. In brief, CAFE forced the Big Three to decrease the estimated fuel their fleets would burn, which, narrowly considered, at least sounds good. Simultaneously however, CAFE induced firms that had been producing frugal cars to *increase* the fuel their fleets burn, and that should sound good only to OPEC.

That NHTSA imposes fines on producers but forbids them to purchase available credits from other companies is worse than vindictive. The policy negates a potential value to a small-car producer from accumulating credits to sell to other companies. Because it is unsalable, a credit is valuable only if its owner can find a way to use the credit. Thus, CAFE induced companies that understandably had specialized in large cars to begin manufacturing small ones while inducing companies that understandably had specialized in small cars to begin manufacturing large ones. Assuming for the moment that economy-wide petroleum imports are the same in either case, artificially homogenizing the industry in that way provides no national advantage against hostile petroleum producers; it merely increases production cost. As a result, CAFE forces automobile prices to higher levels than should be necessary to achieve the stated goals.

NHTSA divides automobiles by size into six categories. Preliminary attempts to incorporate all that detail yielded an almost unreadable diagram but altered no conclusions. Consequently, we combined NHTSA's three small categories into two sums that we call small import autos and small domestic autos, and similarly combined NHTSA's three large categories into two sums that we call large import autos and large

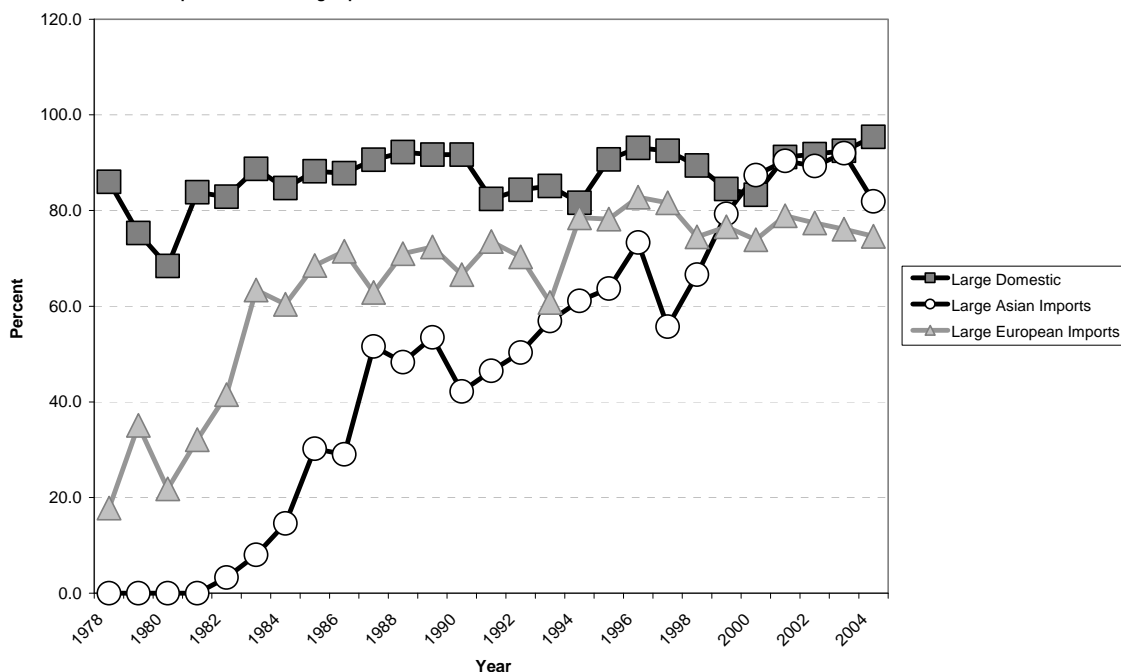
domestic autos. As figure 5 shows, the result is startling when one compares domestic and import sales in large and small segments.



Amazingly, over CAFE’s history the proportion of domestic automobiles that fall in NHTSA’s three small categories has actually declined. Following several years of crisis management by domestic manufacturers, they have met the mandates by altering engine performance. Equally notable, the imported automobile distribution, initially were well more than 90% small category cars, now closely mirrors the domestic distribution. Figure 6 shows that absolutely no Asian imports were included among the three large car categories until 1982; today that proportion hovers around 90%.

Figure 6: Consolidated Domestic, Asian, and European Large Segment

Source: NHTSA - Domestic & Imported Passenger Car Fleet Average Characteristics
<http://www.nhtsa.dot.gov/portal/site/nhtsa/menuitem.43ac99aefa80569eea57529cdba046a0/>



Domestic and import cushions have now become comparable so convergence may be nearly complete. What gain has resulted from inducing European and Asian automobile manufacturers to resemble their North American counterparts so closely? Before CAFE they were and should still be specializing in smaller cars. Alienable CAFE credits could have achieved identical petroleum imports into the U.S. with a more rational worldwide distribution of automobile production.

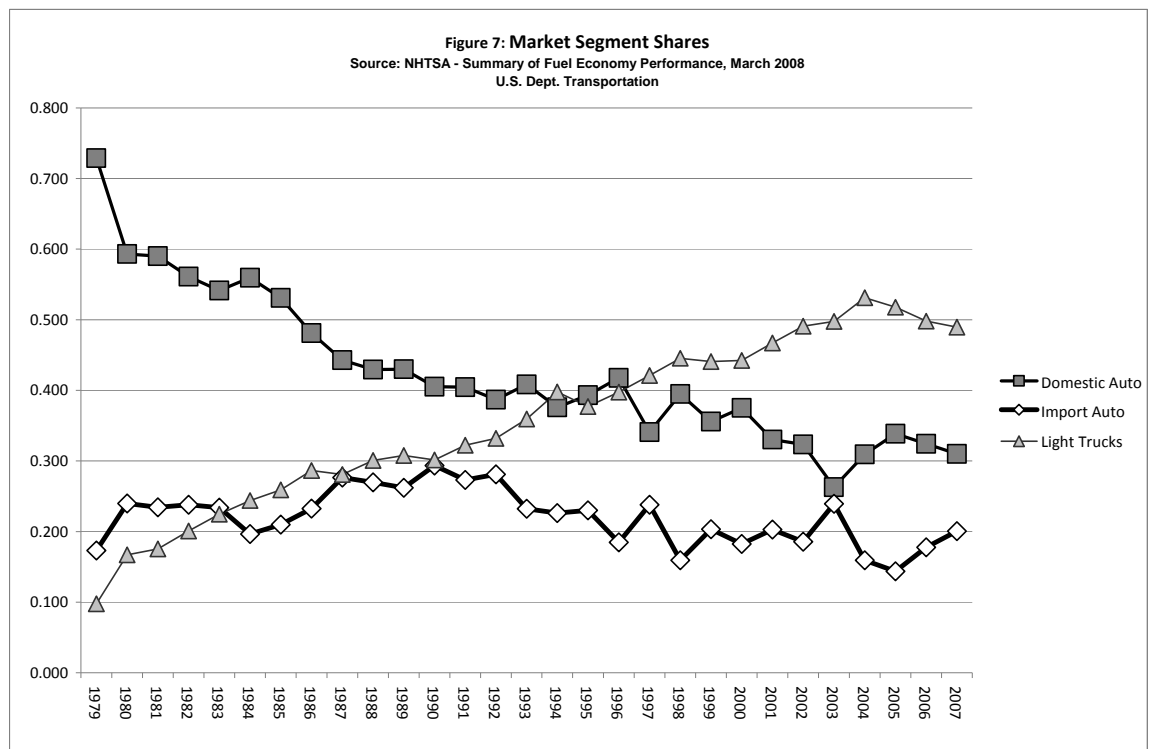
Domestic producers have not pushed imports from the small categories. Instead, due to the incentive to exploit their CAFE credits in the higher-profit-margin segment, CAFE mandates have induced foreign manufacturers to design larger cars intended mainly for sale in the North American market, increasingly pushing domestic producers from the large car categories. Rather than retaining employment in the U.S. automobile industry, CAFE has accelerated job loss to the imports.

V. CAFE's True Impact On Fuel Use

With their higher weights, according to CAFE rules most vans and SUVs are included in a manufacturer's light truck rather than automobile pool. Though light as contrasted with commercial trucks, light trucks are heavier than cars by NHTSA's very definition. A vehicle could look to all the world like a pickup but NHTSA would consider it a car if it were too light (and therefore frugal with its fuel). You might see another vehicle as a car while NHTSA considers it a light truck because it is too heavy to be a car (and therefore a spendthrift with fuel). Because CAFE holds light trucks, vans, and SUVs to less stringent fuel use requirements than cars, many drivers opt for larger, more fuel using vehicles than they would have purchased otherwise.

Perhaps the most stunning upshot is that U.S. manufacturers no longer produce a single station wagon model, which NHTSA would evaluate as a car for CAFE purposes. Before CAFE, station wagons comprised a substantial part of North American automobile production, but few foreign producers made any station wagons at all because they were not popular in Europe or Japan. Today's buyers who prefer a station wagon must purchase an imported variety such as Volvo or BMW (companies that previously manufactured none) or resign themselves to a substitute domestic vehicle that is heavier than the thwarted station wagon would have been. Sharing overhead (such as initial design cost) across a sizeable number of units is necessary, or consumers refuse to pay prices that are high enough to make a model profitable. Given that minimum viable production scale for any particular model, it seems unlikely that Hummers would exit without CAFE.

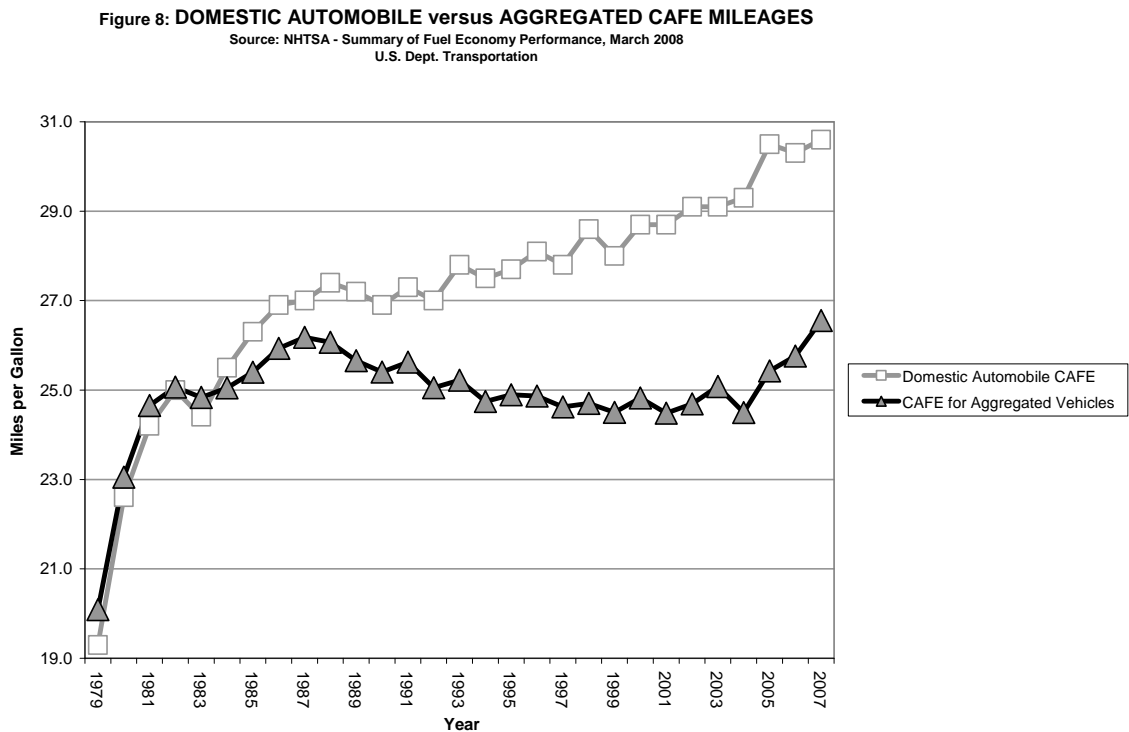
Figure 7 is an implication of the perversity of disadvantaging domestic automobiles in comparison with light trucks and imported cars. Before CAFE, light trucks were the lowest sellers of the three segments with less than 10% of the market. At the time, most light trucks were working vehicles used for hauling a few animals, non-bulk freight or construction materials, or the owner's tools – pickup trucks for the most part but also some vans. SUVs hardly existed outside the military. Today the light truck segment accounts for about half of all new personal vehicle purchases, only a minority of them directly employed in the owner's job. Before CAFE, domestically produced automobiles sold well over four times as many units as imported cars; now the shares are similar and converging.



It is also noteworthy that today many Toyotas, Hondas, Volkswagens, and such meet NHTSA's 70% domestic content cutoff and are numbered among the domestic cars.

Car buyers should applaud new North American producers were that a natural evolution, but entry is worrisome to the extent that motivation hinges on artificial CAFE-created incentives.

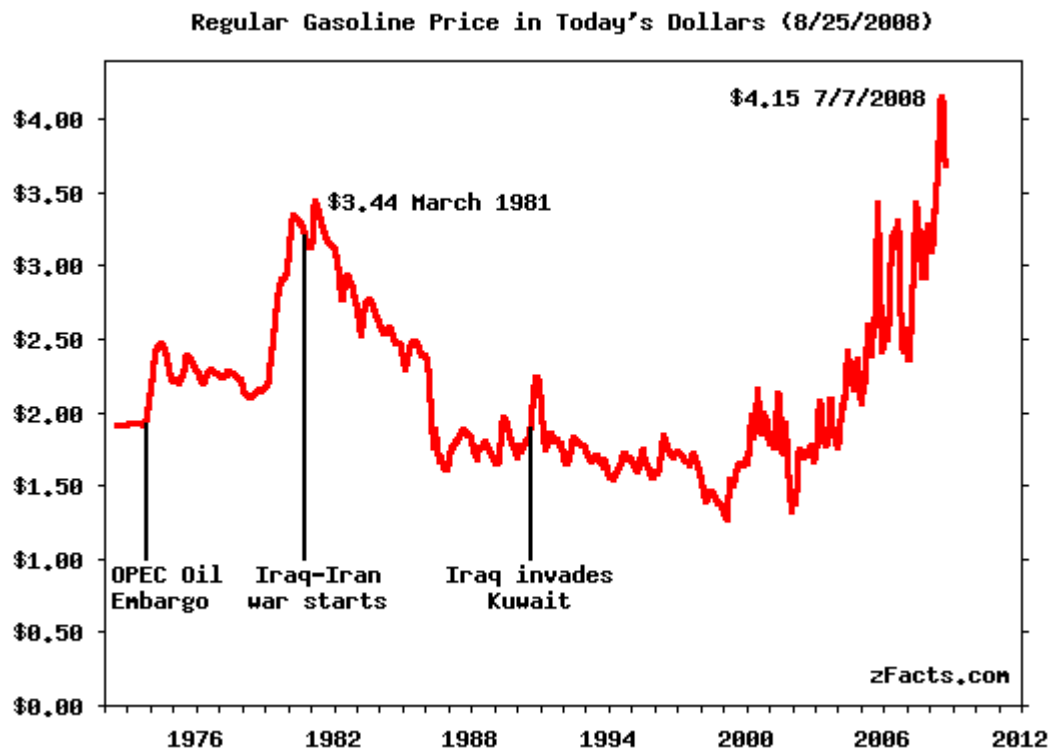
Recall from figure 2 – replicated by the lighter series in figure 8 – that the realized miles per gallon averaged over all automobiles produced and sold domestically has increased by nearly 60% during CAFE’s lifetime. That result becomes unimposing after accounting for the falling relative domestic automobile share, the decreased frugality CAFE has induced in imported automobiles sold in the U.S., and the dramatic shift away from cars and toward light trucks, vans, and SUVs that enjoy less stringent CAFE standards.



Because they fail to consider such compositional shifts, characteristic press reports of CAFE averages are grossly misleading. The darker series in figure 8 shows the

corrected CAFE harmonic average after taking into account the compositional shift. Not only is the trend of CAFE averages less impressive than shown in figure 2, the properly computed national CAFE average miles per gallon actually decreased nearly continuously from 1987 until 2004. CAFE's major impact seems to have been to alter vehicle shapes and to increase the prices necessary to acquire them, not to extend the miles realized from fuel purchases.

Figure 9: Fluctuations In U.S. Gasoline Prices



Even the initial increase in frugality between 1979 and 1982 as well as the more recent one that began after 2004 may have less to do with the mandates than with changes in fuel prices. Adjusted for inflation, gasoline prices increased from less than \$2.00 per gallon (in today's prices) immediately before the Yom Kippur War to \$3.44 in early 1981. Gasoline prices then fell quite rapidly before stabilizing between the latter 1980s

and the early years of the new millennium. Fuel prices then took a sharp upturn that continued to the recent peak of \$4.17 in July of 2008. As in Europe and Japan, high fuel prices have induced U.S. car buyers to shift the composition of their purchases toward vehicles that use less fuel. No credit is due to CAFE for that.

VI. Conclusion

Agricultural, chemical, energy, and freight interests were influential lobbies that opposed increasing taxes on petroleum and other energy minerals, so Congress authorized CAFE instead. As command-and-control regulations inevitably do, CAFE has had a material impact on collateral matters that have absolutely nothing to do with its stated objectives. While the naïve believe that CAFE substantially reduces petroleum imports, almost the entire impact has been to distort people's car buying decisions. CAFE has not merely distorted U.S. citizens' decisions however; because its economy is the world giant, the regulations have distorted the automobile industry worldwide.

The literature discusses many other aspects of CAFE that we have ignored here due to space constraints (Liu 2008). The most important may be regulation's safety aspects. Reducing an automobile's weight reduces its fuel use, and new materials have resulted in substantial weight reductions in domestic automobiles, even as imports and light trucks have grown heavier. Some of those materials offer less protection in the event of an accident than the materials they replaced, however. Reducing acceleration capability also decreases fuel use, but can leave a driver unable to avoid an onrushing vehicle. Our scrutiny of NHTSA's own data leaves us wondering where CAFE's hypothesized energy saving is hiding. If none exists, it hardly merits sacrificing lives.

By inducing conservation throughout the economy rather than limiting itself solely to the personal vehicle sector, a comprehensive fuel tax increase would have provided a more secure shelter from hostile attempts to disrupt the U.S. economy at the same or less cost than CAFE. Conclusion: CAFE has failed at that assigned task.

CAFE has augmented rather than reduced the loss of jobs in the domestic automobile industry. Most economists take naturally occurring interindustry reallocations of resources in stride, but there is nothing natural about a CAFE-created reallocation. Conclusion: CAFE has failed at that assigned task.

An increased fuel tax would have led to less urban smog and lower carbon emissions. Conclusion: CAFE has failed at those assigned tasks.

Perhaps an increased fuel tax would have imposed more economic costs on the U.S. than it provided benefits; we have not addressed that issue. A fuel tax would certainly have done better than CAFE however, increasing the net benefits from reduced energy consumption if those benefits exist, decreasing the net costs otherwise. Either way the conclusion remains that this government initiative has grotesquely failed to provide any public goods in a reasonable manner. CAFE has had a perverse impact with respect to every task it was assigned.

The public and the press have a tendency to overlook a disappointing fact – a regulation has a way of calling into being new interest groups that benefit from the regulation's continued existence. One sort of powerful if rarely recognized interest group created by a regulation consists of those bureaucrats employed to administer it. They understandably do not want to lose their jobs or to experience wrenching modifications in

their assigned tasks if Congress repeals the legislation. Interest groups make regulations difficult to dislodge even after they have proven inappropriate.

CAFE certainly shows no signs of dissolving despite its many failings. Instead, as individual failings become undeniable, Congress and NHTSA propose to address them by further and even more rigid mandates that are bound to generate still newer interest groups. Other energy users face uncoordinated regulations of their own instead of coordinated and minimally intrusive controls that would permit those with better information than government bureaucrats to make less fettered decisions regarding their personal interests.

People disagree violently about the advisability of increasing energy taxes, but with due contemplation, members of both camps must agree that CAFE and an energy tax logically are substitutes, not complements. Unfortunately, CAFE's interest groups, not the least being its own bureaucracy, have become so entrenched the mandates seem bound to needlessly distort automobile production and purchase decisions even if those concerned about global warming succeed in obtaining some form of energy tax. CAFE is a calamity; its command-and-control structure makes that outcome inevitable. CAFE has not been, nor ever will be, nor possibly could be the bringer of the public goods its proponents claim.

Congress should relinquish the acronym CAFE and let the word return to its proper use – a small purveyor of beverage and sustenance.

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European Imported Car

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Historical Passenger Car
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