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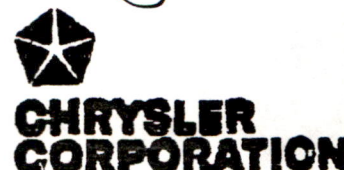
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CAFE [2]

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APR 9 '92 14:49

PAGE 002
PAGE 02

File 4/21/92



Note: The opinions of the Big 3
on the recently released

NAS Study of Automotive Fuel Economy

The study of automotive fuel economy performed by a committee of the National Academy of Sciences (NAS) is the most comprehensive independent study of this subject ever reported. The study has properly identified the regulation of vehicle fuel economy as an extraordinarily complex issue involving critical tradeoffs that impact the safety, size, market acceptability and utility of the future vehicle fleet, the economic health and competitiveness of the nation's auto industry and the choice of vehicles.

The determination of "practically achievable" fleet average fuel economy in future years is left for government policy makers to decide, but the report provides a range of "technically achievable" averages which form the upper bound of fuel economy levels for policy makers to consider in establishing any future requirements for vehicle fuel economy. *Even these upper bounds are substantially lower and provide much longer lead time than standards proposed in Congress in the last several years.*

The Committee concludes that the present system of Corporate Average Fuel Economy (CAFE) requirements is flawed and is particularly harmful to the domestic auto industry, favoring Japanese manufacturers, and suggests areas where structural changes in the system should be studied. The study provides an estimate of the substantial costs, not only of technology to improve fuel efficiency, but also of the added costs of vehicle safety and emissions standards already promulgated for future vehicles.

Further, the Committee rejects the assertions that high mileage prototypes are proof of easily achievable near term technology and benefit and that these technologies can have any substantial impact on fuel economy in the near term.

The Committee report, however, is not perfect. It fails to provide adequate consideration of the limitations of fuel economy improvement for full size light trucks and vans due to the need to design for heavy duty, load carrying requirements. In addition, the study falls short of providing analysis of the limited effect of CAFE on fuel conservation and U.S. dependence on imported oil.

Furthermore, the study inappropriately criticizes the "uniform percentage increase" approach to any future CAFE; the study fails to recognize that this approach assures that all manufacturers contribute to improving fuel economy of the new car fleet as a whole. The Committee asserts that the uniform percentage increase is unfair to Asian manufacturers, who

APR 9 '92 14:49

PAGE 003
PAGE 003

-2-

generally have the highest fleet average fuel economy. This claim of unfairness is difficult to understand. The Committee recognizes that Asian manufacturers have higher CAFE levels because they sell predominantly small and mid-size cars, not because they have superior technology. In fact, the study identifies domestic cars as having superior fuel economy to Japanese vehicles on an individual size class basis.

This comprehensive report should be carefully studied by all who seek to understand this important and complex issue. The following points further summarize its key elements.

- **Fuel Economy Projections:** The Committee projections of "technically achievable" levels are not suggestions for fuel economy standards but reflect what may be technically feasible for the new car fleet as a whole. Individual manufacturers, because of their vehicle mix, may not meet these overall levels. Further, while these levels consider current safety and Tier I emissions standards, they do not consider Tier II and California standards or market and demographic trends. When these and other factors identified in the report are considered, the fuel economy levels "practically achievable" will be less than those identified in the report. Additionally, it should be noted that the technology projections did not include certain vehicles, such as large vans and large utility vehicles.
- **Cost and Risk Considerations:** The Committee estimates that the incremental costs of the fuel economy technologies necessary to reach the "technically achievable" levels range from \$500 to \$2,750 per vehicle. These estimates *do not include* additional costs attributable to known new safety and Tier I emissions requirements, which range from \$300-\$500 for safety and up to \$1,600 for emissions. The study notes that domestic manufacturers are already facing serious financial burdens just to meet government safety and emissions regulations, and to respond to foreign competition, while consumers are increasingly unable to afford new vehicles. It concludes that setting overly stringent fuel economy standards that conflict with societal and market forces would increase annual costs to consumers and industry by tens of billions of dollars.
- **Technology:** The Committee's determination of "technically achievable" levels of future fuel economy considers: (1) compliance with known safety standards and Tier I emission standards; (2) maintaining vehicle characteristics of importance to consumers (such as interior volume, acceleration, performance and amenities) equivalent to MY 1990 vehicles; and (3) the range of available technologies that would pay for themselves at gasoline prices of up to \$10/gallon. However, the report notes there is no consideration of the effects on affordability, sales, employment, competitiveness, and safety in the "technically achievable" levels, all of which would tend to reduce the "practically achievable" levels.
- **Safety:** The report recognizes that safety is a valid and critical issue in the fuel economy debate. It confirms the increased safety risks to motorists resulting from "downsizing" and "downweighting" of vehicles to achieve higher fuel efficiency

APR 9 '92 14:50

PAGE.004
PAGE.04

-3-

ratings. It calls on policymakers to recognize those trade-offs and to consider whether potential gasoline savings justify the additional deaths and injuries that may result from overly aggressive fuel economy mandates. It also recommends further research and analysis by NHTSA, to better assess the various safety risks involved.

- **Environment:** The report acknowledges that future Tier I federal emission standards will result in an estimated 0.5 mpg penalty. The Committee could not quantify the additional penalties of more stringent Tier II federal and California emissions standards, but they did recognize the fact that such standards are likely to foreclose the broad application of many promising fuel efficient technologies.
- **Inequities of Current CAFE:** The report recognizes that the current CAFE system does not present equal technical or financial challenges to all manufacturers and has operated to the benefit of Japanese manufacturers at the expense of domestic full line manufacturers. It has enhanced the competitive position of the Japanese who "pose the greatest threat" to the domestic industry, U.S. jobs and the national economy.
- **Energy Conservation:** The report notes the defects and limitations of CAFE regulation as a policy to reduce fuel consumption and to reduce U.S. vulnerability to oil supply disruptions. It notes that the CAFE system does not provide an incentive for the consumer to save fuel by choosing an efficient vehicle or changing driving habits. The report identifies the importance of fuel price as a motivation for reduced consumption.

In summary, the Committee deserves much credit for illuminating the broad impacts of fuel economy regulation. Future regulation requires much more thorough analysis of the many implications of this vital public policy issue. In fact, one of the Committee's conclusions is "It is inescapable that Congress and government agencies are attempting to regulate an industry of tremendous importance to the U.S. economy in the absence of sufficient information from neutral sources on which to base such regulation." In addition, the Committee concluded that "...if the federal government intends to continue regulating automotive fuel economy, it must make a more substantial investment in understanding the technical issues, costs, benefits, and risks of such regulation."



OFFICE OF THE VICE PRESIDENT
WASHINGTON

COUNCIL ON COMPETITIVENESS FACT SHEET ON:
CORPORATE AVERAGE FUEL ECONOMY (CAFE)

"My goal is to make travel safer, more efficient, and less expensive for the American consumer."

-- George Bush

The Bryan Bill (S. 1224) -- A Deadly Exercise in Futility

The Bryan Bill mandates unrealistic and costly increases in Corporate Average Fuel Economy (CAFE) standards that harm U.S. competitiveness while failing to achieve any reduction in oil consumption for the next 5 years. The President's Senior Advisers, including Transportation Secretary Skinner and Energy Secretary Watkins, have recommended that he veto S. 1224. It would: decrease highway safety, harm U.S. competitiveness, impose high costs on car buyers, fail to address the current oil supply disruption, and would not be an appropriate response to potential global climate change.

S. 1224 Would Decrease Highway Safety.

- o Increasing CAFE standards substantially increases deaths and injuries on our nation's highways.
- o Downsizing Causes Traffic Deaths. Studies of single-vehicle crashes by the National Highway Traffic Safety Administration (NHTSA) conclude that in the 1970's and early 1980's downsizing of cars results in increases of 1,340 deaths and thousands of injuries each year.
- o S. 1224 Would Cause Additional Traffic Fatalities. Preliminary Department of Transportation estimates indicate that the weight reductions needed to meet S. 1224's requirements could result in an additional 600 - 1,140 deaths and 2,900 - 5,350 injuries each year for single-vehicle crashes alone. Ongoing NHTSA studies indicate that these estimates substantially understate the actual casualties because they do not reflect the effects on multi-vehicle crashes.

- o A recent independent study by researchers at the Brookings Institution and the Harvard School of Public Health yielded similar conclusions.

S. 1224 Would Harm U.S. Competitiveness.

- o S. 1224 Would Single Out the Makers of the Most Economical Cars for Unfair Treatment. Although Chrysler is now in the worst financial shape of the three, it would be hit the hardest for both cars and light trucks simply because it was the best CAFE performer of the three in 1988.
- o By mandating percentage increases in CAFE, S. 1224 would require the three U.S. auto makers to meet different standards, since their 1988 fleet averages differed. This table shows the fuel economy requirements (in fleet average miles per gallon) for model year 2001.

<u>Firm</u>	<u>Cars</u>	<u>Light Trucks (incl. minivans)</u>
Chrysler	39.9	29.7
GM	38.6	28.3
Ford	37.2	28.8

- o S. 1224 would most likely hurt the market sectors in which the U.S. predominates -- inexpensive large vehicles. Currently, U.S. companies account for 91% of mid- and full-size cars and 97% of standard-size light trucks.
- o U.S. auto manufacturing job losses could easily exceed 60,000 by 2001, depending upon the extent to which U.S. sales are affected.

S. 1224 Would Impose High Costs on New Car and Truck Buyers.

- o S. 1224 would cost more than \$90 per barrel of oil (in today's dollars) to achieve the last few mpg of the increase required by 2001. And this ignores the cost to society of additional tailpipe emissions and the cost to consumers of (1) reduced safety and (2) being unable to buy cars and light trucks with the size, comfort, and performance attributes they value.
- o This does not compare favorably with the cost of other actions the Administration is taking that reduce oil consumption. For instance:

- The alternative fuels provision in the Senate's Clean Air bill would save up to 300,000 barrels per day at a cost of less than \$25 per barrel.
- The acid rain title of the Senate's Clean Air bill would save 500,000 barrels of oil per day. The marginal cost of these savings approaches zero.
- o By the year 2001, the aggregate purchase price increase of the new vehicle fleet would be \$8 billion per year. This is more than the cost of the air toxics title of the Senate's Clean Air bill. Yet this bill would more than wipe out the projected savings in fatalities from that title.

S. 1224 Would Fail to Address the Current Oil Supply Disruption.

- o S. 1224 would have no effect on U.S. oil consumption before 1995.
- o Even by 2010 (when the most stringent standards would have been in effect for 10 years), the bill would still reduce U.S. oil consumption by under 1 million barrels per day -- less than five percent of projected U.S. consumption in that year.

S. 1224 Would Not Be An Appropriate Response to Potential Global Climate Change.

- o S. 1224 would actually increase regulated tailpipe emissions because consumers would respond to forced increases in CAFE by keeping their older, more polluting vehicles longer and by driving their new cars (those affected by the standards) more miles.
- o These same consumer responses would substantially offset the CO2 savings that bill's sponsors promise.
- o Even if the offsets are completely ignored, the bill could only reduce world greenhouse gas emissions by less than three tenths of one percent by 2000, while in many nations emissions would grow dramatically.
- o The Administration has already undertaken or proposed actions that would reduce U.S. greenhouse gas emissions by at least 20 percent without imposing severe economic dislocation or unilateral economic disarmament.

Facsimile Transmission Cover Sheet

Plans and Policy
National Highway Traffic Safety Administration
U.S. Department of Transportation

400 Seventh Street, S.W.
Room 5208
Washington, DC 20590

FROM:

NAME: DON BISCHOFF

FAX NUMBER:

(202) 366-2559

TELEPHONE NUMBER:

366-2550

DATE: 4-22-92

NUMBER OF PAGES (excluding this cover page): 7

PLEASE DELIVER THE FOLLOWING MATERIAL TO:

RICHARD PORTER

PHONE:

456-6640

MESSAGE:

CAFE MATERIAL FOR YOUR MTG

- QTA - ON CAR SIZE VS. SAFETY
- BULLET SUMMARY OF NAS STUDY
- DRAFT CARD STATEMENT ON NAS STUDY -
LONGER VERSION OF WHAT WAS RELEASED

Charles Kahane
62560
March 3, 1992

CAR SIZE, CAFE AND SAFETY

Question: What is the relationship between car size, safety and fuel economy? Specifically, to what degree can fuel economy be increased without compromising safety.

Answer: Since model year 1975, passenger cars in the United States have become about 1,000 pounds lighter.

- o The National Highway Traffic Safety Administration studied the effect of these changes in car size on fatalities and injuries and estimates that they resulted in increases of nearly 2,000 fatalities and 20,000 serious injuries per year.
- o When a light car and a heavy car collide, there is a dramatic advantage for occupants of the heavier car.
- o Small, light cars are more prone to spinning out of control, running off the road, and rolling over than large cars.

The agency is concerned that requiring a major increase in fuel economy would force consumers into yet smaller and lighter cars, with additional adverse impacts on safety.

- o Major downsizing of vehicles would result in a tradeoff of lives and injuries for greater fuel economy. On the other hand, smaller increases in fuel economy may be achievable without significant reductions in car size or increases in deaths or injuries.
- o The safety impact of past car size reductions has been obscured because all types of travel have become safer. We would have saved even more lives, had cars not been downsized.

HIGHLIGHTS OF THE NAS REPORT:
AUTOMOTIVE FUEL ECONOMY: HOW FAR SHOULD WE GO?

- o Charge to the committee was to estimate "practically achievable" fuel economy levels in various size classes of new passenger cars and light trucks.
- o The committee recognized that any such determination of practically achievable fuel economy levels necessarily involves balancing an array of societal benefits and costs. Since such judgments must include a complex manifold of considerations in the committee's view, that determination is appropriately the domain of the political process.
- o In order to illuminate the issues for decision makers, the committee has thus approached its charge by first estimating "technically achievable" fuel economy levels.
- o The term "technically achievable" is circumscribed by three assumptions: 1) all new vehicles meet Tier 1 emissions standards and existing and pending safety standards; 2) that current vehicle characteristics (such as interior volume and acceleration performance) remain unchanged; and 3) technologies considered are currently in mass production.
- o Technically achievable fuel economy levels for MY 1996, MY 2001 and MY 2006. The committee has wisely recognized that their fuel economy estimates form an "upper bound" of what is "practically" achievable in that time frame.

	<u>MY 1996</u>	<u>MY 2001</u>	<u>MY 2006</u>
Passenger Cars	29	31-33	34-37
Light Trucks	22	24-25	26-28

- o Incremental Retail Price Equivalents for improved fuel economy in MY 2006 were:

	<u>Higher Confidence</u>	<u>Lower Confidence</u>
Passenger Cars	\$500 - \$1250	\$1000 - \$2500
Light Trucks	\$500 - \$1750	\$1000 - \$2750

- o The committee recognized the link between safety and fuel economy. They concluded that any major reduction in weight carries the potential for reduced safety in single vehicle collisions. The committee believes, however, at the technically achievable levels safety impacts would be small,

-2-

since they entail no more than a 10 percent reduction in weight and safety technology presents the opportunity to reduce the effects of weight reduction.

- o The committee recognized that the automotive industry is currently in an unprecedented downturn, suffering losses of tens of billions of dollars. Competitive pressures on domestic manufacturers will likely intensify and major restructuring is necessary. Such changes will have major impacts on the U.S. economy. These changes could be aggravated if stringent standards, or standards of an inappropriate form, lead to significant increases in purchase prices that lower sales or contribute to a shift toward vehicles manufactured outside the U.S.
- o The committee recognized that the imposition of higher fuel economy standards that are extremely costly, or that greatly distort normal product cycles, would place an untenable financial burden on the industry.
- o The committee recognized that current low fuel prices result in relatively limited consumer interest in purchasing or manufacturers producing vehicles with high fuel economy. They also recognized the major shift in consumer demand toward light trucks and for options that negatively affect fuel economy.
- o The committee believes the existing system for setting fuel economy standards has serious defects - chief of which is that CAFE is increasingly at odds with market signals, which serve to mute and diminish the system's effectiveness and to increase its costs. They recognized that the standards can have perverse competitive effects, having their most severe impacts on the full-line domestic manufacturers.
- o They also recognized that the percentage improvement approach to CAFE regulation - an approach proposed in the Bryan Bill - has the perverse effect of requiring those manufacturers with the best fuel economy in the base year to comply with more stringent CAFE requirements in the outlying years than those applied to manufacturers with lesser base year accomplishments or that specialize in larger cars.
- o A policy of increasing fuel prices warrants consideration as an alternative or a supplement to vehicle-efficiency regulation.
- o Similarly, a system of fees and rebates that is related to the fuel economy of vehicles should be considered. Such "feebates" would establish incentives to encourage the acquisition of fuel-efficient vehicles.

-3-

- o If the basic CAFE system is retained, Congress should consider several modifications. Fuel economy requirements for light trucks should be brought into conformance with those for automobiles. Domestic content and credit provisions should be reexamined. And, the law should be modified so that non-compliance is not unlawful conduct and the penalty for non-compliance should be adjusted so that it better reflects the social cost of departure from the requirements.

STATEMENT OF SECRETARY CARD

I am very pleased with the National Academy of Sciences' comprehensive analysis of the potential to improve passenger car and light truck fuel economy between now and year 2006. In late 1990, we asked the Academy to perform this study for us to help clear up the political gridlock that has characterized this issue in the past. The Academy's study committee has done an outstanding job of bringing together representatives from groups on all sides of the fuel economy debate to sort out the truths from the misconceptions. We are particularly appreciative of the time and effort applied to this task by the individual members of the study committee, highly-accredited experts in their respective fields who served on a volunteer basis.

This report clearly defines the realistic bounds of what is technologically achievable through the early years of the 21st century. The committee has wisely recognized that their fuel economy estimates form an "upper bound" of what is "practically" achievable in that time frame: that the final balancing of technical capability, costs to consumers and manufacturers, competitiveness and employment impacts, safety impacts, affordability, and other impacts are "appropriately the domain of the political process."

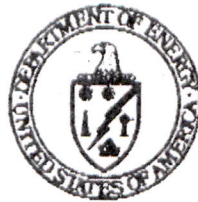
-2-

In estimating fuel economy potential, the committee has not tried to force consumers into small, poor-performing vehicles, but has recognized their needs for vehicles of appropriate size and power. They point out that consumer desires for performance, size, safety, accessories, and cargo space must be considered in setting new fuel economy standards. They have recognized that if cars are made substantially lighter, they will be less safe. The committee has appropriately considered the current economic and competitiveness challenges the U.S. auto industry faces, noting that "...the imposition of higher fuel economy standards that are extremely costly or that greatly distort normal product cycles would place an untenable financial burden on the industry."

The committee has also concluded the existing system of setting fuel economy standards has serious defects. They recognize that CAFE is increasingly at odds with market signals, that it has "perverse" competitive effects, that it does not apply equivalent challenges to all manufacturers, and that it has operated to the detriment of the domestic auto companies. The committee also has pointed out how the "percentage increase" approach to fuel economy standards, pushed by some members of the Congress, hurts auto companies that have incorporated many fuel economy technologies, and limits competition (and consumer choice) in the market.

-3-

The Department believes that the National Academy of Sciences study is a real contribution to the national debate on fuel economy. It will help us move forward toward our goal of enhanced energy conservation, as well as improving the health and welfare of the U.S. auto industry and its workers.

**TELEFAX COVER SHEET**DATE: 4/22/92

FROM: DOUG TODD *Bud Gorikes*
DEPUTY ASSISTANT SECRETARY
FOR SENATE LIAISON
CONGRESSIONAL & INTERGOVERNMENTAL AFFAIRS
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TO: Richard PorterTELEFAX NO: 456-6216CONFIRMATION NO: 456-6640

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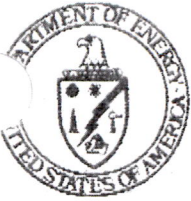
FTS 896-4891

TO: RICHARD PORTERTELEFAX NO: 456-6216CONFIRMATION NO: 456-6640

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RICHARD -
ATTACHED IS (1) CLOTURE VOTE ON BRYAN CAPE
BILL S.1224 FROM 1990. GLENN'S VOTE OPPOSED
BRYAN. (2) CLOTURE VOTE ON S. 1220 IN
NOV. 1992. GLENN VOTED AGAINST CLOTURE. S.1220
HAD A CAPE TITLE. GLENN'S VOTE OPPOSED MOVING
- SCOTT AN MERITS OF THE ENTIRE BILL.



Department of Energy
Washington, DC 20585

April 14, 1992

MEMORANDUM FOR: Bud Garikes
FROM: Kathy Peery *Kathy Peery*
SUBJECT: Remarks and Votes by Senator Glenn on CAFE Standards

We have searched both the 101st and 102nd Congresses to find Senator Glenn's position indicated by votes or remarks on CAFE standards. Attached are three votes on S. 1224, Motor Vehicle Fuel Efficiency Act of 1990. No remarks were found.

cc: T. J. Hopkins

101st Congress - Senator Glenn's CAFE Votes on S. 1224

S. 1224 by BRYAN, RICHARD (D-NV) -- Motor Vehicle Fuel Efficiency Act of 1990
National Highway Traffic Safety Administration Authorization
Act of 1990

1) 09/14/90 -- SENATE Vote No. 235: 68-28 (DEM: 45-9; REP: 23-19)

(Three-fifths of those Senators duly chosen and sworn having voted in the affirmative, Senate agreed to close further debate on the motion to proceed to S. 1224, to amend the Motor Vehicle Information and Cost Savings Act to require new standards for corporate average fuel economy.)

-----Among 68 Members Who Voted 'YES'-----

GLENN (D-OH)

2) 09/24/90 -- SENATE Vote No. 247: 55-40 (DEM: 24-29; REP: 31-11)

(Senate agreed to the Danforth Amendment No. 2755, to remove the cap on increases in average fuel economy attributable to dual energy automobiles and natural gas energy automobiles.)

-----Among 55 Members Who Voted 'YES'-----

GLENN (D-OH)

3) 09/25/90 -- SENATE Vote No. 248: 57-42 (DEM: 42-13; REP: 15-29)

(Three-fifths of those Senators duly chosen and sworn not having voted in the affirmative, Senate failed to close further debate on the committee amendment in the nature of a substitute, as amended.)

-----Among 42 Members Who Voted 'NO'-----

GLENN (D-OH)

CAFE Cloture Vote SENATE

(6)

SLATE Report for the 101st Congress

Thu, October 4, 1990 3:26pm (EDT)

Recorded vote in the SENATE (Vote 2248: 57-42)
15-29)

(Dem: 42-13; Rep:

Voting on:

S.1224 BY BRYAN, RICHARD (D-NV) -- Motor Vehicle Fuel Efficiency Act of 1990
National Highway Traffic Safety Administration Authorization
Act of 1990

09/25/90 -- IN THE SENATE

Consideration of cloture motion on the committee amendment, in the nature of a
substitute, as amended (CR Page S-13703)

Motion, BY MITCHELL, GEORGE (D-ME) (VOTE NO. 2248:57-42) Senate failed to
close further debate on the committee amendment in the nature of a
substitute, as amended

(Three-fifths of those Senators duly chosen and sworn not having voted in the
affirmative, Senate failed to close further debate on the committee amendment
in the nature of a substitute, as amended)

-----57 Members Who Voted'

YES'

ADAMS (D-WA)
AK (D-HI)
BL (D-MT)
BENTSEN (D-TX)
BIDEN (D-DE)
BINGAMAN (D-NM)
BOSCHWITZ (R-MN)
BRADLEY (D-NJ)
BRYAN, RICHARD (D-NV)
BUMPERS (D-AR)
BURDICK (D-ND)
CHAFEE (R-RI)
COHEN (R-ME)
CONRAD (D-ND)
CRANSTON (D-CA)
DANFORTH (R-MO)
DASCHLE (D-SD)
DECONCINI (D-AZ)
DODD (D-CT)

DURENBERGER (R-MN)
D'AMATO (R-NY)
EXON (D-NE)
FOWLER (D-GA)
GORE (D-TN)
GORTON (R-WA)
GRAHAM, BOB (D-FL)
HARKIN (D-IA)
HATFIELD (R-OR)
HEINZ (R-PA)
HOLLINGS (D-SC)
INOUE (D-HI)
JEFFORDS (R-VT)
KENNEDY, EDWARD (D-MA)
KERREY, BOB (D-NE)
KERRY (D-MA)
KOHL (D-WI)
LAUTENBERG (D-NJ)
LEAHY (D-VT)

LIEBERMAN (D-CT)
MCCAIN (R-AZ)
METZENBAUM (D-OH)
MIKULSKI (D-MD)
MITCHELL, GEORGE (D-ME)
MOYNIHAN (D-NY)
PACKWOOD (R-OR)
PELL (D-RI)
PRESSLER (R-SD)
PRYOR (D-AR)
REID (D-NV)
ROBB (D-VA)
ROCKEFELLER (D-WV)
ROTH, WILLIAM (R-DE)
RUDMAN (R-NH)
SANFORD (D-NC)
SARBANES (D-MD)
SIMON (D-IL)
WIRTH (D-CO)

-----42 Members Who Voted NO

ARMSTRONG (R-CO)
BOND (R-MO)
BOREN (D-OK)
BREAUX (D-LA)
BURNS (R-MT)
BYRD, ROBERT (D-WV)
COATS (R-IN)
COCHRAN (R-MS)
DIXON, ALAN (D-IL)
DOLE (R-KS)
DOMENICI (R-NM)
FORD, WENDELL (D-KY)
GARN (R-UT)
GLENN (D-OH)

GRAMM, PHIL (R-TX)
GRASSLEY (R-IA)
HATCH (R-UT)
HEFLIN (D-AL)
HELMS (R-NC)
HUMPHREY (R-NH)
JOHNSTON, BENNETT (D-LA)
KASSEBAUM (R-KS)
KASTEN (R-WI)
LEVIN, CARL (D-MI)
LOTT (R-MS)
LUGAR (R-IN)
MACK (R-FL)
MCCLURE (R-ID)

MCCONNELL (R-KY)
MURKOWSKI (R-AK)
NICKLES, DON (R-OK)
NUNN (D-GA)
RIEGLE (D-MI)
SASSER (D-TN)
SHELBY (D-AL)
SIMPSON (R-WY)
SPECTER (R-PA)
STEVENS (R-AK)
SYMMS (R-ID)
THURMOND (R-SC)
WALLOP (R-WY)
WARNER (R-VA)

-----1 Members Who Were 'NOT
VOTING'-----

WILSON, PETE (R-CA)

Cafe

Document Originally
Attached to
Following Page

Jim

The Effect of Annual Changes in Automobile Fuel Economy Standards

ANDREW N. KLEIT

Federal Trade Commission

Bureau of Economics, Washington, DC 20580

Abstract

Since 1978 the Federal government has regulated the fuel economy of new cars sold in the United States. The purpose of Corporate Average Fuel Economy (CAFE) standards is to lessen the national dependence on foreign oil. Through the use of theoretical and empirical models this paper examines the impact of CAFE standards on the automobile industry and on energy consumption. It is shown that CAFE standards may or may not save energy. If CAFE does save energy, it does so at a prohibitive cost to the economy. CAFE standards are also shown to have a number of perverse impacts on the automobile industry as well as consumers.

1. Introduction

Since 1978 the Federal government has mandated that new fleets of all firms selling over 10,000 cars per year in the United States reach a certain level of average fuel efficiency. Corporate Average Fuel Economy (CAFE) standards were intended to decrease energy consumption by automobiles to reduce the threat to national security from imported oil.¹ More recently, CAFE standards have been defended as a means of reducing environmental damage caused by automobile emissions.

In 1985, under an escape clause in the CAFE legislation, General Motors and Ford petitioned the National Highway Transport and Safety Administration (NHTSA) for relief from the standards. GM and Ford claimed that meeting the standards for model year 1986 would have caused significant economic damage and requested that the 1986 model standard be lowered from 27.5 to 26.0 MPG. GM and Ford repeated this process in 1986 for model years 1987 and 1988 and in 1988 for model years 1989 and 1990. Opponents of the petition claimed that granting the petition would substantially increase energy consumption with little or no gain to the economy. The auto manufacturers' requests were granted in 1985, 1986, and 1988, but not before sparking heated public debate.² It appears that CAFE standards will be with us as a controversial policy issue for the foreseeable future.

This paper will examine the costs (in terms of producer and consumer welfare and automobile industry employment) and benefits (in terms of changes in gasoline consumption) of imposing CAFE standards. Section 2 will present a brief outline of the CAFE

program and debate. Section 3 examines CAFE in a competitive framework and demonstrates how CAFE standards can have several perverse impacts. The magnitude of these effects is then presented in Section 4 with simulations of the automobile market. In particular, Section 4 will examine the question faced by the federal government in 1988 on whether or not to lower the CAFE standard for model year 1989. The simulations demonstrate who gains and who loses from the imposition of various CAFE standards.

The results of the simulation in the automobile market are then used to estimate the savings in gasoline consumption from the imposition of CAFE standards. It is shown that it is likely that higher CAFE standards may actually *increase* gasoline consumption. Under circumstances where CAFE standards do save gasoline, they do so at an extraordinary cost to the economy. While the economy as a whole appears to be adversely affected, this analysis shows that firms that are in the proper position in the marketplace may find the imposition of CAFE standards to be highly advantageous.

2. Description of CAFE Regulations

The CAFE program, as enacted in 1975, called for all manufacturers selling more than 10,000 auto units per year in the United States to reach the mandated CAFE levels. CAFE levels were to rise from 18.0 MPG in 1978 to 27.5 MPG in 1985 and later years.

If a review process finds that a manufacturer has not met the CAFE standard, that manufacturer is subject to a civil fine. The level of the fine is set equal to fifty dollars times the difference in MPG between the CAFE standard and the fuel economy actually reached by the firm times the number of automobiles sold by the firm in that year. For example, if the standard is 20 MPG and a producer makes one million cars with a harmonic average fuel efficiency of 18.5 MPG, that firm is liable for a fine of \$75 million. Firms, however, are reluctant to be seen as lawbreakers; they therefore appear to view the standards as binding. Apparently, the implicit cost of breaking the law is greater than the additional cost of reaching the CAFE standard.

Under the statute, a firm can apply credits earned during the three previous model years to its CAFE level in a given year. If no such credits are available, the firm has the option of using credits it expects to earn in the next three model years, if it can convince NHTSA that such an expectation is reasonable. This carry forward/back provision of the CAFE program was designed to increase firms' flexibility. The legislation divided a firm's fleet into two distinct groups. All domestic cars and all foreign cars of a firm were to be averaged separately.⁴ This provision was designed explicitly to prevent U.S. manufacturers from meeting the CAFE standard by importing small foreign cars.⁵

The statute gives NHTSA the authority to modify the standard for model years after 1984, to the "maximum feasible average fuel economy," after taking into account four factors: technological feasibility; economic practicability; the effect of other federal motor vehicle standards, such as emissions controls, on fuel economy; and the need of the nation to conserve energy. NHTSA was given clear authority to modify the post-1984 standards between 26.0 and 27.5 MPG. Any modification outside this range was subject to a one house Congressional veto. (Such legislative vetoes were later declared unconstitutional by the Supreme Court.)

As noted above, the explicit fine on a firm is equal to

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$$F = 50 * (Q_1 + q_1) * (S - MPG), \quad MPG < S \quad (1)$$

if the firm does not reach the standard, where S is the level of the CAFE standard, Q_1 and q_1 are the number of large and small cars sold by the firm, and MPG is the firm's average fuel efficiency.

The measurement of a firm's CAFE level was not defined as the simple average of a manufacturer's fleet MPG . Instead, a firm's CAFE level is the harmonic average of that firm's fleet MPG .⁶ The harmonic average for the firm is calculated by

$$MPG = \frac{Q_1 + q_1}{\frac{Q_1}{M_L} + \frac{q_1}{M_S}} \quad (2)$$

where M_L and M_S are the fuel efficiencies of the two types of cars.

Using the harmonic average, the marginal CAFE fine to the firm of producing a large car is

$$\frac{\partial F}{\partial Q_1} = 50 * \left(S - 2MPG + \frac{MPG^2}{M_L} \right) \quad (3)$$

Assume now that the standards are binding. In that case $MPG = S$, the explicit fine of \$50 per MPG is replaced by a shadow tax L and the implicit CAFE tax on a car of type 1 becomes

$$\frac{\partial F}{\partial q_1} = L * S * \left(\frac{S}{M_L} - 1 \right) \quad (4)$$

where L is the value of the constraint discussed above.⁷

3. Theoretical Analysis of CAFE Standards

For model years 1985, 1986, and 1989, there were only a few months between the time CAFE relief was requested by GM and Ford and the beginning of the model year to which the CAFE standard was to apply. Indeed, in all three occasions NHTSA did not announce that it was granting relief until the very start of the relevant model year. In the short time available, the Big Two would not have been able to increase the fuel efficiencies of particular automobiles, because such technological changes generally take several years to put into place. GM and Ford had already exhausted their supply of credits earned in previous years. Thus, if NHTSA had denied the relief petitions, the only course of action available to these two firms would have been to "mix-shift," that is to sell more fuel efficient cars and fewer fuel inefficient cars to meet a CAFE standard of 27.5 MPG.

3.1 Reaction of a Firm to a Binding CAFE Standard

Consider a competitive (price-taking) firm that makes both large and small cars.⁸ Let Q_1 and q_1 stand for the quantities of large and small cars sold by the firm; M_L and M_S stand for the fuel efficiency of each type of car in miles per gallon. Large cars sell for price P and small cars for price p . Since the firm is a price taker, it treats these prices as exogenously

determined. Assume that a firm has the following cost functions, which imply a linear, upward sloping marginal cost curve:

$$C(Q_1) = aQ_1 + .5bQ_1^2, \quad a, b > 0 \text{ and} \quad (1)$$

$$C(q_1) = eq_1 + .5fq_1^2, \quad e, f > 0. \quad (2)$$

The firm faces a CAFE standard S , $M_S > S > M_L$. With harmonic averaging:

$$S \leq \frac{Q_1 + q_1}{\frac{Q_1}{M_L} + \frac{q_1}{M_S}} \quad (3)$$

For simplicity, (3) will be written as

$$q_1 \geq RQ_1, \quad (4)$$

where

$$R = \frac{\frac{S}{M_L} - 1}{1 - \frac{S}{M_S}}. \quad (5)$$

Note that R is positive monotonic in S , that is, $dR/dS > 0$. This allows us to focus on R as a proxy for the level of the CAFE standard. The firm thus has the objective function

$$\text{Max } \pi = Q_1(P - a - .5bQ_1) + q_1(p - e - .5fq_1) \quad (6)$$

$$\text{s.t. } q_1 \geq RQ_1.$$

Assume that the constraint is binding, and let T be the shadow cost of the constraint. Taking derivatives gives:

$$\frac{\partial \pi}{\partial Q_1} = P - a - bQ_1 - RT = 0, \quad (7)$$

$$\frac{\partial \pi}{\partial q_1} = p - e - fq_1 + T = 0, \quad (8)$$

$$\frac{\partial \pi}{\partial T} = q_1 - RQ_1 = 0. \quad (9)$$

Solving (7) and (8) yields

$$P = MC(Q_1) + RT, \text{ and} \quad (10)$$

$$p = MC(q_1) - T, \quad (11)$$

where $MC(\cdot)$ stands for marginal cost. Equations (10) and (11) demonstrate that, when the constraint is binding, CAFE standards act as a shadow tax on large cars and a subsidy on small cars, discouraging the production of the first and encouraging the production of the second. The only difference between the implicit taxes and subsidies generated by the

standard and an explicit tax is that the firm gets to keep the tax revenue from the production of small cars.

Even though the regulation is measured as $q_1 + Q_1$, a standard, the above equations for

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This points to an interesting policy implication: if the CAFE standard is set low enough, the industry will have to employ more workers. (See Herlihy, 1984, for a discussion of the slope of the marginal cost curve on small cars will have to lead to the perverse effect of an increase in the number of cars consumed. This is because CAFE standards can be interpreted as a tax on CAFE standards have a straightforward and the industry will have to employ more workers.)

This simple model shows that CAFE standards can act as a tax on large cars and a subsidy on small cars. Second, the industry will have to employ more workers.

3.2 Reaction of Industry

The model can be extended to show that, under a binding CAFE standard, the tax on large cars is equal to the tax on large cars endogenously as a function of the policy maker's choice. The policy maker's choice is identical to the firm's choice. The tax on small cars, $(Q^T = \Sigma Q)$, supply functions are

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standard and an explicit tax/subsidy scheme is that, under the CAFE standard, the producers get to keep the tax revenue. This tax revenue, however, must be used to subsidize the production of small cars.

Even though the regulation is a constraint on the firm, it can actually increase firm output, measured as $q_1 + Q_1$, above the level that would occur were the firm unconstrained. Solving the above equations for quantities Q_1 and q_1 yields

$$Q_1 + q_1 = \frac{P-a}{b} + \frac{p-e}{f} + T \left(\frac{1}{f} - \frac{R}{b} \right), \quad (12)$$

where the shadow tax has the value

$$T = \frac{(e-p)b + (P-a)fR}{b + fR^2}. \quad (13)$$

(4)

If CAFE standards are binding, T is positive. Therefore output rises if

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$$R < \frac{b}{f}.$$

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This points to an interesting feature of CAFE regulation. If the standard is binding, but at a low enough level, CAFE standards may actually increase firm output, and perhaps even employment (See Henderson (1985)). Output is more likely to rise the smaller f is (the flatter the slope of the marginal cost curve for small cars), as this implies that the CAFE subsidy on small cars will have a larger quantity impact. The larger quantity of automobiles can lead to the perverse effect Kwoka (1983) discussed, where a CAFE standard leads to an increase in the number of cars on the road and, therefore, to an increase in total gasoline consumption. This is actually one of several reasons discussed in Section 4 why higher CAFE standards can increase gasoline consumption. (Since there are a number of effects CAFE standards have on gasoline consumption, modelling them directly would not be straightforward and thus will not be done here.)

(8)

This simple model illustrates two important aspects of the CAFE program. First, the standards can act as an implicit tax on large cars and an implicit subsidy on small cars. Second, the industry output and employment effects of the CAFE program are indeterminate.

(9)

3.2 Reaction of Industry to Binding CAFE Standards

(10)

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The model can be extended to cover all firms in a competitive sector. It will be shown that, under a binding CAFE standard industry, output and industry profits can rise. Let RT equal the tax on large cars and T equal the subsidy on small cars. T is determined endogenously as a function of R . R is a function of the CAFE standard S , set exogenously by the policy maker. Assume that there are N firms in the industry with cost functions identical to the firm described above. Let Q^T and q^T equal the industry output of large and small cars. ($Q^T = \sum Q_i$, $q^T = \sum q_i$, i representing an individual firm in the industry.) Industry supply functions are generated by horizontally adding each firm's marginal cost curve

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$$P(Q^T) = MC(Q^T) = a + \frac{bQ_i}{N} + RT = a + BQ^T + RT, \text{ and} \quad (14)$$

$$p(q^T) = MC(q^T) = e + \frac{fq_i}{N} - T = e + Fq^T - T. \quad (15)$$

Industry demand curves⁹ are

$$P(Q^T) = g - hQ^T, \text{ and} \quad (16)$$

$$p(q^T) = j - kq^T. \quad (17)$$

Solving for firm output and implicit subsidy levels, yields

$$T = T(R) = \frac{R(g-a)(k+F) - (j-e)(h+B)}{h+B+R^2(k+F)}, \quad (18)$$

$$Q^T = \frac{g-a-TR}{h+B}, \quad P = g - h\left(\frac{g-a-TR}{h+B}\right), \quad (19)$$

$$q^T = \frac{j-e+T}{k+F}, \quad p = j - k\left(\frac{j-e+T}{k+F}\right). \quad (20)$$

Total industry output $Q^T + q^T$ is

$$Q^T + q^T = \frac{g-a}{h+B} + \frac{j-e}{k+F} + T\left(\frac{1}{k+F} - \frac{R}{h+B}\right). \quad (21)$$

Similar to the results for one firm shown above, industry output will rise as a result of the shadow tax (given R constant) if and only if

$$R < \frac{h+B}{k+F}. \quad (22)$$

In a competitive industry CAFE standards may thus have the effect of raising firm output and perhaps employment. The reasoning is the same as in the single firm case. The steeper or less elastic the demand and supply curves for large cars (E and B), the less effect a CAFE tax will have on reducing large car output. The flatter or more elastic the demand and supply curves for small cars (k and F), the more a CAFE tax will increase the output of small cars. Similarly, the smaller R is (the farther large car MPG's are from the standard relative to small car MPG's), the more small car production will be necessary, and the greater the likelihood that total production will rise.

Industry profits in the model presented equal

$$\pi = \frac{(g-a-TR)^2}{h+B} + \left(\frac{g-a-TR}{h+B}\right)^2 (-h-.5B) + \frac{(j-e+T)^2}{k+F} + \left(\frac{j-e+T}{k+F}\right)^2 (-k-.5F). \quad (23)$$

It may be that firms would actually desire that a higher CAFE standard be imposed on them. Looking at the derivative of profits with respect to a change in the standard R

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$$\begin{aligned}
 (14) \quad \frac{\partial \pi}{\partial R} = & -2 \left(T + R \frac{\partial T}{\partial R} \right) \left(\frac{g - a - TR}{h + B} \right) + (2h + B) \left(T + R \frac{\partial T}{\partial R} \right) \left(\frac{g - a - TR}{(h + B)^2} \right) \\
 (15) \quad & + 2 \left(\frac{\partial T}{\partial R} \right) \left(\frac{i - e + T}{k + F} \right) - \left(\frac{\partial T}{\partial R} \right) (2k + F) \left(\frac{i - e + T}{(k + F)^2} \right)
 \end{aligned} \quad (24)$$

where

$$\frac{\partial T}{\partial R} = (k + f) \left(\frac{g - a - 2RT}{h + B + R^2(k + F)} \right). \quad (25)$$

CAFE standards would increase profits if $\partial \pi / \partial R > 0$, or (substituting (19) and (20) into (24)),

$$(18) \quad Q^T \left(T + R \frac{\partial T}{\partial R} \left(\frac{2h + B}{h + B} - 2 \right) + q^T \left(\frac{\partial T}{\partial R} \right) \left(2 - \frac{2k + F}{k + F} \right) \right) > 0. \quad (26)$$

(19) For instance (assuming $\partial T / \partial R > 0$, which is true at $T = 0$), the regulation would be more likely to increase profits the lower f (the smaller the increase in marginal costs for small cars). Or, the higher h (the lower the elasticity of demand for large cars), the more likely that CAFE standards will increase profits. Similar results can be derived for an oligopolistic industry (see Appendix 2) but not for the monopoly firm Kwoka described, since a monopoly is already maximizing industry profits. Intuitively, the standards act to impose a cartel-like restriction on the output of large cars, whose profits can outweigh the losses in the small car sector. This may explain why, in the early years of the CAFE program, GM and Ford were supporters of strict CAFE standards (See Yandle (1980)). Imposing CAFE standards can also increase consumer welfare, as the rents extracted from producers by consumers can outweigh the deadweight loss impact of the policy. This is likely to occur if the demand for large cars is elastic and the demand for small cars is inelastic (the opposite of the conditions necessary for firm profits to increase).

4. Simulation of the Effects of CAFE Standards

This section will simulate the effects of various CAFE levels on the automobile market and on energy consumption. The model presented analyzes the effects of CAFE on industry profits, structure, and employment. It will also examine whether CAFE standards do indeed save energy. The simulation will present an analysis of the decision faced by NHTSA for model year 1989.¹⁰

The first part of this section will analyze the results of a static model of CAFE standards. The effects of various binding CAFE levels on industry profits, employment, and structure will be calculated. The second part will generate any savings in gasoline that the results of the static model imply. It will chart the course of the fuel savings from the flow of new automobiles, adjusted for the changes induced by the imposition of CAFE standards, as well as the change in the stock of used automobiles due to the change in the price of new cars.

4.1 Static Model

The comparative statics model used here is an extension of the Council of Economic

$$\left(\frac{T}{-k - .5F} \right)^2 \quad (23)$$

imposed on them.
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Advisers (1985) model used to analyze the effects of import quotas on the total number of Japanese cars and is very similar to the simulations used by Rogers (1986) and FTC Staff (1988). Model year 1987 serves as the base period.

In the model there are five types of automobiles: (1) Asian Basic Small, which includes regular minicompacts and subcompacts such as the Sentra, the Corolla, and the Hyundai; (2) Asian Luxury Small, which includes specialty subcompacts and regular compacts such as the RX7 and the Stanza; (3) American Basic Small, which includes minicompacts and subcompacts such as the Cavalier and the Escort; (4) American Luxury Small, which includes specialty subcompacts and regular compacts, such as the Reliant K and the Mustang; and (5) American Large, which includes intermediate and large cars such as the Cutlass, the LTD, and the New Yorker. This breakdown is based on categories used by *Ward's Automotive Yearbook* (1988, 155 and 233). Luxury European cars, which constitute about 4 percent of the market, are excluded from the model. Volkswagen and Yugo are included in the American Basic small segment. On-shore Asian production is included in the Asian segments. "Captive" imports (autos built by Asian firms but sold under American nameplates) are included in the Asian segments.

During the 1980s, Japanese car sales in the United States have been restricted by import quotas ("voluntary restraint agreements"). For 1987 the quota was set at 2.3 million units. During the 1987 model year, however, Japanese imports were only about 2.25 million units.¹¹ Thus, the initial implicit tariff in the simulations is set to 0.

Each segment is divided into constrained and unconstrained production. Constrained are Japanese imports (potentially by the import quota) and General Motors and Ford (by CAFE standards). Unconstrained production includes on-shore Japanese (cars whose parts are made in Japan and assembled in the U.S.) and off-shore Korean output, Chrysler, Volkswagen, and Yugo.¹² The quantities, prices, and fuel efficiencies for each type of car for model year 1987 are shown in table 1.

Equilibrium prices and quantities are computed through a series of five demand and thirteen supply equations. Quantity demanded is determined by a set of linear demand curves¹³

$$Q = AP + B \quad (1)$$

where Q is the vector of five quantities, P is the price vector, A is a five by five matrix of slope coefficients, and B is a vector of intercepts.

Quantity supplied is determined by a set of linear supply curves

$$Q = C(P - T) + D(P - V) + EP + F \quad (2)$$

where C is a diagonal five by five matrix of supply coefficients for GM and constrained Japanese firms, D is a diagonal matrix of supply coefficients for Ford (with the first two diagonal elements equalling zero), E is a diagonal five by five matrix of supply coefficients for the unconstrained firms, F is a vector of supply curve intercepts, and T is a vector of implicit taxes, $T' = (T_1, T_2, T_3, T_4, T_5)$. T is applied to General Motors and offshore Asian (Japanese) production. T_1 and T_2 are the implicit tariffs for each type of off-shore Asian car, $T_1 = T_2$. T_3, T_4, T_5 are the implicit CAFE taxes applied to each type of American car sold by GM.¹⁴ V is a vector of implicit taxes applied to Ford. $V' = (V_1, V_2, V_3, V_4, V_5)$,

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where $V_1 = V_2 = 0$. The level of these implicit taxes will be generated by the model.

CAFE standards are assumed to be just non-binding in the initial conditions (that is, that the levels reached by automobile companies under a lower CAFE standard are the same as those they would have reached without any CAFE standard at all), but differentially binding on the "Big Two" (General Motors and Ford) if the policy is enforced. This is likely to yield an underestimate of deadweight loss (DWL), as DWL is a function of the implicit tax squared. Crandall and Graham (1989) suggest that even with a 26.5 MPG standard, CAFE regulation would be binding on GM and Ford, meaning that an implicit tax already applies to these two firms. If CAFE standards are imposed, they are assumed to be binding, and the implicit tax per "Big Two" car is calculated accordingly. The system of 21 equations (five demand curves, thirteen supply curves, two CAFE constraints, and one import constraint) in 21 unknowns (five prices, thirteen quantities, and three implicit taxes) is solved by having the implicit tariff and the shadow tax per MPG for GM and Ford iterated until the desired quota and CAFE standard level are reached.

The point elasticities of demand at the original 1987 equilibrium are shown in table 1. The own-price elasticity of demand for automobiles is assumed to be one. (This is consistent with the results reported in Irvine (1983).) Based on past studies of the demand for automobiles, an elasticity of demand for small cars of -2.0 and elasticity of demand for large cars of -3.0 is assumed, as in Langenfeld and Munger (1985). The cross-elasticities shown should not be interpreted as precise figures, but merely internally consistent with the overall market demand and the own-elasticities for each of the segments from 2 to 3. The method for the derivation of the cross-elasticities is available upon request.

To the author's knowledge, no study exists which estimates short-run cost curves for the production of automobiles. Results obtained by Friedlander et. al. (1982) indicate that the industry has constant long-run marginal cost curves. In the short-run, however, it seems likely that marginal costs are increasing. Thus, the point elasticity of supply (marginal cost) in the model is set equal to 2. This assumes that while the industry has a competitive structure, there are short-term economic rents available in the sale of automobiles. (A sensitivity analysis of these results is contained in Appendix 1.)

Without a higher CAFE standard, Ford expected to have a fleet MPG of 26.6 MPG in Model Year 1989 and GM expected to reach 27.2 MPG.¹⁵ Thus, a 27.5 MPG CAFE standard would require a "stretch" of 0.9 MPG for Ford and 0.3 MPG for GM. It is assumed that GM and Ford meet the standard and do not choose to pay civil penalties. The economic effects generated in the model are therefore relative to those that would have occurred if NHTSA set the CAFE standard for the Model Year 1989 at 26.6 MPG or less.

Employment changes are calculated using data from the Congressional Budget Office (1982) that provides the hours of work required to produce an additional domestic automobile. From this information a coefficient is computed that shows the change in the number of jobs that would result from a given change in the number of each type of automobile produced. Such a coefficient is computed for the three types of cars sizes (see table 1). Multiplying these coefficients by the change in the sales of domestic small and large cars generates an estimate for the employment changes brought about by an adjustment to a 27.5 MPG CAFE standard. The employment effect is less favorable to autoworkers than would be suggested solely by examination of changes in total automobile production.

Table 1. Initial Conditions - Model Year 1989 Parameters Used in CAFE Simulation						
Elasticity Table						
Class	1	2	3	4	5	
1) Asian Small	-2.000	0.243	0.334	0.355	0.704	
2) Asian Luxury Small	0.217	-2.500	0.125	0.837	2.661	
3) Domestic Small	0.856	0.446	-2.000	0.583	1.160	
4) Domestic Lux. Sma.	0.165	0.539	0.103	-2.500	2.237	
5) Large	0.015	0.083	0.010	0.103	-3.000	
(The demand for each type of car is categorized by row. Thus, for example 0.867 (the value in the second row, first column) is a measure of how the demand for basic Asian small cars will change with respect to a change in the price of Asian luxury small cars.)						
Totals by Class						
Class	Price (Initial) (\$000)	Quantity (Init.) (million)	MPG	Cars/Job		
1	8.689	1.748	35.51	22.65		
2	13.764	1.173	29.57	19.38		
3	8.373	1.168	32.45	7.55		
4	10.719	1.884	27.42	6.46		
5	15.077	3.645	25.31	5.40		
Initial Quantities by Firms (millions of units)						
Class	GM	Ford	Chrysler	Other	Constrained Asian	Unconstr. Asian
1	0.000	0.000	0.000	0.000	1.343	0.405
2	0.000	0.000	0.000	0.000	0.909	0.264
3	0.416	0.461	0.150	0.140	0.000	0.000
4	0.884	0.466	0.534	0.000	0.000	0.000
5	2.234	1.128	0.283	0.000	0.000	0.000
Supply Elasticity: 2.0 (all firms and classes)						
Source for prices: Ward's Automotive Yearbook 1988, pp. 216-221 and 287-293. Source for quantities and fuel efficiency: Patricia S. Hu and Linda S. Williams, "Light Duty Vehicle MPG and Market Shares Report: 1st Six Months Model Year 1988," Oak Ridge National Laboratory (1988) E-41 to E-44.						

This is because the production of large cars involves more domestic labor than the production of small cars. Since on-shore assembly requires approximately only one-third as much American labor per vehicle as would on-shore domestic production (most of the components for on-shore assembly are manufactured overseas), it will be assumed that the amount of domestic labor required is only one-third of what it would be for similar domestic segments.

4.2 Effects on Firms, Autoworkers, and Consumers

The most obvious conclusion to be derived from running the static model is that imposing CAFE standards can create tremendous losses for various parts of the economy. Imposing an increase in fuel economy levels to 27.5 MPG costs the economy about \$1.006 billion in lost producers' and consumers' surplus. The complete details of the impact of a 27.5 MPG

Table 2. Sim

GM MPG Incr
GM Implicit T.
Japanese Imp

Class

1

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Class

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5

Class

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Table 2. Simulation Results: The Effects of a CAFE						
Standard of 27.5 MPG for Model Year 1989						
GM MPG Increase = 0.30			Ford MPG Increase = 0.90			
GM Implicit Tax = \$657.27/MPG			Ford Implicit Tax = \$1026.31/MPG			
Japanese Implicit Tariff = \$0.00						
Price and Output Effects						
(Prices in thousands and Quantities in millions)						
Class	Price	Qty.	Pchange	Qchange		
1	8.617	1.719	-0.072	-0.029		
2	13.933	1.202	0.169	0.029		
3	6.950	1.603	-1.423	0.435		
4	10.699	1.996	-0.020	0.112		
5	15.530	3.321	0.453	-0.333		
Output Effects by Firms (in thousands of units)						
Class	GM ¹	Ford	Other	GMChange ¹	FChange	OthChange
1	1.321	0.000	0.398	-0.022	0.000	-0.007
2	0.931	0.000	0.270	0.022	0.000	0.006
3	0.579	0.831	0.192	0.163	0.370	-0.099
4	0.946	0.518	0.532	0.062	0.052	-0.002
5	2.068	0.953	0.300	-0.175	-0.175	0.017
Welfare Effects on Consumers and Firms (In billions of dollars)						
Class	Cons.	Firms	DWL	GMChange ¹	FChange	Othchange
1	0.125	-0.125	0.000	-0.098	0.000	-0.029
2	-0.201	0.201	0.000	0.156	0.000	0.045
3	2.244	-3.108	0.864	-0.958	-1.806	-0.344
4	0.050	-0.088	0.016	-0.030	-0.026	-0.010
5	-1.561	1.346	0.215	0.685	0.329	0.132
Economic Welfare Changes (\$ billion)						
Consumer Change = 0.657						
American Firms Change = -1.683			Asian Firms Change = 0.076			
GM Change = -0.103			Ford Change = -1.503			
Chrysler Change = -0.057			Other Firms Change = -0.165			
Gasoline Consumption Savings: -367 million gallons						
Change in Employment(000s): 19.311						
¹ The first two entries in these columns refer to on-shore Japanese production and profits.						

CAFE standard are in table 2.

As for winners and losers, it depends on how tight a CAFE standard is set. Figure 1 shows the changes in profits for the Big Two companies, Chrysler, and the Asian firms. As the more tightly constrained firm, Ford's losses are much larger. At 27.5 MPG Ford loses \$1.5 billion, while at 28.5 MPG Ford loses \$3.6 billion. General Motors loses only \$103 million at 27.5 MPG and \$1.788 billion at 28.5 MPG.

The impact of CAFE regulations on Chrysler's profits are quite different. Chrysler loses a little money (at most \$97 million) at low CAFE increase levels as increased Big Two small car sales lower the price Chrysler can gain for its small cars. At higher CAFE levels, however, Chrysler's profits are sharply positive as Chrysler increases its sale of large cars

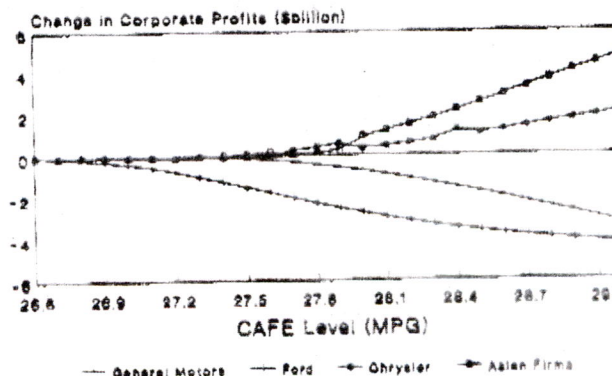


Figure 1. Change in corporate profits.

while GM and Ford are severely constrained in that segment. A CAFE standard increase to 28.0 MPG increases Chrysler profits by \$326 million, while a CAFE standard of 28.5 MPG increases Chrysler profits by \$1.032 billion.¹⁶

Asian firms do not produce any large cars and hence would seem to be more vulnerable in the short run to CAFE increases than Chrysler. With a CAFE standard of up to 27.6 MPG Asian firms lose money as GM and Ford lower small car prices. As CAFE standards rise above that level, however, more and more would-be large car buyers switch into Asian luxury small cars, resulting in increasing Asian profits. With a CAFE standard of 28.0 MPG Asians gain \$877 million in profits, and at 28.5 MPG they make about \$2.5 billion.

Figure 2 illustrates the effects of higher CAFE levels on automobile industry employment. The potential gains for autoworkers through CAFE regulation appear to be quite small relative to the potential losses. At most, imposing a higher CAFE level results in an increase

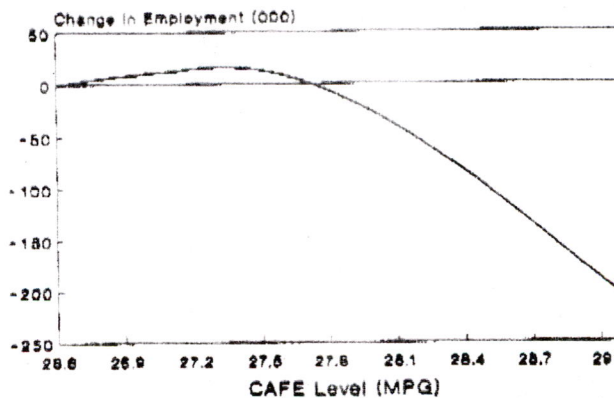


Figure 2. Change in employment.

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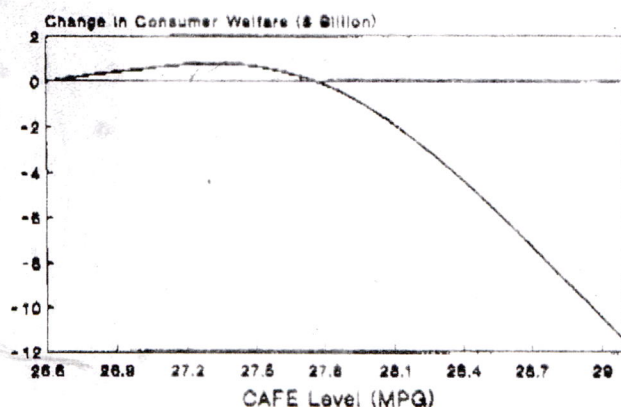


Figure 3. Change in consumer welfare.

of only about 16,000 jobs. A CAFE standard level of 27.5 MPG leads to an increase in employment of 13,300. As the CAFE level increases, however, the effect on autoworkers turns sharply negative. With a CAFE standard of 28.0 MPG 27,400 jobs are lost, and imposing a standard of 28.5 MPG results in the loss of 100,200 jobs. Thus, while it is possible CAFE standards can serve as a means of domestic content legislation to protect industry jobs, they are more likely to reduce auto employment.

Figure 3 illustrates that consumers can gain from higher CAFE standards. At 27.5 MPG, consumer welfare rises \$657 million. The effect on consumer welfare, however, turns sharply negative as the CAFE standard rises. A CAFE standard of 28.0 MPG decreases consumer welfare by \$1.2 billion while a CAFE standard of 28.5 MPG decreases welfare by \$5.3 billion.

Increasing Big Two CAFE levels by any significant amount generates large implicit taxes. A CAFE standard of 27.5 MPG induces a shadow tax of \$1026 per MPG on Ford cars and \$657 per MPG on GM cars. A CAFE standard of 28.5 induces a shadow tax of \$2050 per MPG on Ford cars and \$1962 per MPG on GM cars.

4.3 Gasoline Consumption Model

To measure the change in gasoline consumption that will result from changing the CAFE standard, it is necessary to estimate and compare (1) the lifetime gasoline consumption of new cars sold under the standard, (2) the estimated gasoline consumption of the cars that would have been sold had the higher CAFE standard not been imposed, and (3) the "scrappage effect" (the change in the stock of used cars that results from a change in the price of new cars) to determine the total stock of cars in operation.¹⁷ Many of the changes in fleet composition reflect large car buyers switching to new small cars in response to changes in relative car prices. But because smaller cars use less fuel, the marginal cost of driving declines, and driving is encouraged. The model uses Blair et. al.'s (1984) findings to adjust for changes in the rate of use of new cars induced by higher CAFE standards.

Data on miles driven and scrappage rates are incorporated into the gasoline consumption

calculations.¹⁸ The scrappage rates are adjusted for new car price changes using Gruenspecht's (1982b) estimates. It is assumed here that Gruenspecht's results can be applied to each of the three classes of automobiles (Basic Small, Luxury Small, and Large). In the gasoline consumption model, Asian cars are combined with their corresponding American segments.¹⁹ A real discount rate of 4 percent is used.

4.4 Results of Consumption Model

The gasoline consumption results are summarized in figure 4. The simulation was run with various CAFE MPG levels in force for one year and with the additional scrappage and substitution effects described above for various CAFE levels.

As noted before, Kwoka hypothesized that CAFE standards could increase gasoline consumption by placing more cars on the road. Gruenspecht reached a similar conclusion when he showed that pollution standards could actually increase pollution levels by raising the price of new cars and hence decreasing the scrappage rates of old cars. Figure 4 shows that CAFE standards can indeed have such a perverse effect. CAFE standard of up to 28.1 MPG (CAFE level increases of up to 1.5 MPG above the market level) do lead to increases in gasoline consumption (no more than 370 million gallons out of an annual automobile consumption of about 60 billion). As CAFE standards grow tighter, fuel savings turn positive, reaching 505 million gallons at 28.5 MPG and 1.356 billion gallons with a CAFE standard of 29.0 MPG.

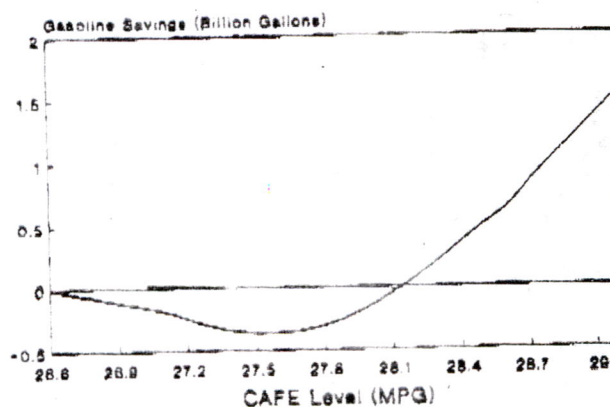


Figure 4. Gasoline savings from CAFE.

While CAFE policy can save gasoline, it does so at a prohibitive cost to the economy. The average cost per gallon saved with a CAFE standard of 28.5 MPG is \$19.17, which declines slightly to \$11.59 with a CAFE standard of 29.0 MPG.²⁰

It is inappropriate to compare the CAFE-imposed cost to the economy with the cost of any gasoline saved. If gasoline costs \$1 per gallon to produce and consumers give up 1 gallon of gasoline, consumers lose, at the margin, \$1 worth of consumption. The loss per gallon noted here is in addition to this even tradeoff. (See Stucker *et al.*, 1980, 61). The true benefit from this policy is the reduction of any externality associated with gasoline

consumption. This also implies that it is appropriate to discount future savings of gasoline in any cost-benefit analysis.

5. Conclusion

While CAFE standards were originally designed to decrease consumption of gasoline in this country, they can have other effects that perhaps were not considered by the authors of the legislation. Small increases in CAFE standards can increase consumer welfare by hundreds of millions of dollars, while large increases in the CAFE standard can decrease consumer welfare by several billion dollars. CAFE standards can increase domestic employment in the auto industry and by placing a check on competition in large cars, CAFE regulation can also serve to increase the profits of unconstrained firms.

As Kwoka suggested, it is indeed quite possible that CAFE standards can increase gasoline consumption. The simulations run show consumption increasing for CAFE standards of 28.1 MPG or greater. While CAFE standards can save energy at levels above 28.1 MPG, they do so at a very large cost (over 10 dollars per gallon) to the economy. This suggests that should policy makers desire to reduce gasoline consumptions for reasons of national security or environmental concerns, they should do so with more direct methods, such as additional taxes on gasoline.

Appendix 1. Sensitivity Analysis

Given the need to make a large number of assumptions when establishing this model, it would be informative to examine the robustness of the conclusions reached above. The most important assumptions of the model are the relative elasticities of demand (whether demand for small cars is more or less elastic than the demand for large cars) and the elasticity of supply.

Table A1-1 shows the results of the model under various supply and demand elasticity conditions with a 1989 CAFE standard of 27.5 MPG. Supply elasticities are set at 1.0, 2.0, and 4.0. A demand elasticity of "same" refers to the same demand elasticity being used as in the base case. "Alternative" refers to alternative demand elasticities where the own elasticity of demand for small cars is increased from 2.00 to 3.0 and the own elasticity of demand for large cars is decreased from 3.00 to 2.00. New cross-elasticities are then computed using the different assumptions according to the method described in the technical appendix of this paper.

In each of the scenarios presented, Ford loses money. The losses range from \$875 million to \$2.305 billion. The most favorable circumstance for Ford comes with a supply elasticity of 4 (making substitution into small cars relatively easy) and under the alternative demand elasticity conditions which require a smaller price decrease for small cars. General Motors, which is less constrained, has its profit affected from positive \$144 million to negative \$304 million. GM makes money in three scenarios and loses money in three scenarios.

Asian firms increase their profits by small amounts (\$54 to \$83 million) in three scenarios. These scenarios are under the "same" elasticity conditions in which enough buyers switch from American large cars to Asian luxury small cars. Asian firms lose a good deal larger amounts (\$192 to \$457 million) under the alternative elasticities. The results for Chrysler

Table A1-1. Results of Alternative Scenarios

Imposing a 27.5 MPG CAFE standard results in -						
GM Profits (\$billion)			Ford Profits (\$billion)			
Supply Elasticities			Supply Elasticities			
	1.0	2.0	4.0	1.0	2.0	4.0
Demand Same	-0.304	-0.103	0.009	-2.305	-1.503	-1.017
Alt. Elast.	-0.003	0.118	0.144	-2.025	-1.287	-0.875
Asian Firms' Profits (\$billion)			Chrysler Profits (\$billion)			
Supply Elasticities			Supply Elasticities			
	1.0	2.0	4.0	1.0	2.0	4.0
Demand Same	0.083	0.076	0.054	-0.073	-0.057	-0.033
Alt. Elast.	-0.457	-0.322	-0.192	-0.074	-0.062	-0.041
Consumer's Surplus (\$billion)			Employment Change (000 jobs)			
Supply Elasticities			Supply Elasticities			
	1.0	2.0	4.0	1.0	2.0	4.0
Demand Same	0.772	0.657	0.527	15,537	13,311	10,546
Alt. Elast.	0.621	0.536	0.444	21,982	22,846	22,385
Gasoline Saved (billion gallons)						
Supply Elasticities						
	1.0	2.0	4.0			
Demand Same	-0.384	-0.367	-0.330			
Alt. Elast.	-0.378	-0.351	-0.311			

For the demand elasticities "Same" refers to baseline case where own demand for large cars is assumed to be -3.00 and own demand for small cars is -2.00. "Alternative" refers to the alternative scenario where the two numbers are reversed and new cross-elasticities are computed using the different assumptions.

are more consistent. Chrysler loses small amounts of money in every scenario examined, with losses ranging from \$33 to \$74 million.

The effect on consumers is always positive, with gains ranging from \$444 to \$772 million. Auto industry employment rises as well, with from 10,546 to 22,846 workers being added on. Gasoline consumption increases range in the narrow band of 311 to 384 million gallon.

Thus, under a wide range of assumptions, imposition of the higher CAFE standard increases gasoline consumption and automobile employment, while harming Ford stockholders a great deal and Chrysler stockholders by a much smaller amount. The effects on General Motors and Asian firms are mixed.

Appendix 2. Results of the Oligopoly Model

A. Theoretical Oligopoly Model

In the previous examples of competitive and monopoly industry structures, the effects of a binding CAFE standard on output, employment, and industry profits are uncertain. Similar

results can be obtained in the oligopoly case.

Assume as before that there are two types of cars, large and small. There are two identical firms in the industry. Each firm can build large cars at cost C and small cars at cost c . Let Q_1 and q_1 be the large and small car output of firm 1, and Q_2 and q_2 be the corresponding output for firm 2. Let TR be the implicit CAFE tax on large cars and T be the implicit subsidy on small cars.

The demand curves for large and small cars are

$$P = a - bQ = a - b(Q_1 + Q_2) \text{ and} \quad (1)$$

$$p = d - eq = d - e(q_1 + q_2). \quad (2)$$

Assume that each firm has Cournot conjectures about the other firm's output. Firm 1's profit function is

$$\begin{aligned} \pi &= PQ_1 - CQ_1 - TRQ_1 + pq_1 - cq_1 + Tq_1 \\ &= (a - b(Q_1 + Q_2))Q_1 - CQ_1 - TRQ_1 + (d - e(q_1 + q_2))q_1 - cq_1 + Tq_1 \end{aligned} \quad (3)$$

Taking derivatives

$$\frac{\partial \pi}{\partial Q_1} = a - 2bQ_1 - bQ_2 - C = TR \text{ and} \quad (4)$$

$$\frac{\partial \pi}{\partial Q_2} = d - 2eq_1 - eq_2 - c + T. \quad (5)$$

Since the firms are identical, $Q_1 = Q_2$ and $q_1 = q_2$. Solving for $Q = Q_1 + Q_2$ and $q = q_1 + q_2$ yields

$$Q = \frac{2(a - C - TR)}{3bP} = a - \left(\frac{2}{3}\right)(a - C - TR), \text{ and} \quad (6)$$

$$q = \frac{2(d - c + T)}{3ep} = d - \left(\frac{2}{3}\right)(d - c - T). \quad (7)$$

Total industry profits are

$$\begin{aligned} \pi &= Q(P - C) + q(p - c) \\ &= \frac{2}{9} \left((a - C - TR) \frac{a - C + 2TR}{b} + (d - c + T) \frac{d - c - 2T}{e} \right). \end{aligned} \quad (8)$$

Taking derivatives of profits with respect to the CAFE tax T

$$\frac{\partial \pi}{\partial T} = \frac{2}{9} \left(\frac{R(a - C - 4TR)}{b} - \frac{d - c + 4T}{e} \right). \quad (9)$$

CAFE will thus increase industry profits if

$$\frac{e}{b} \left(\frac{a - C - 4TR}{d - c + 4T} \right) > 1. \quad (10)$$

Upon inspection, it can be seen that the larger the ratio e/b , the more likely it is that the imposition of a CAFE standard will increase industry profits. In other words, if the demand for large cars is inelastic relative to the demand for small cars, CAFE is more likely to be advantageous for firms in the industry. This conclusion depends on keeping the value of T relatively low, as the derivative of the above equation with respect to T is negative.

B. Simulation of Oligopoly Model

The model of Section 4 has been adjusted to assume that General Motors and Ford are playing a Cournot quantity setting game in the face of a competitive fringe (Asian firms, Chrysler, Volkswagen, and Yugo). Instead of elasticities of supply for GM and Ford, the

Table A2-1. Simulation Results: The Effects of a CAFE						
Standard of 27.5 MPG for Model Year 1989 (Oligopoly Model)						
GM MPG Increase = 0.30			Ford MPG Increase = 0.90			
GM Implicit Tax = \$633.02/MPG			Ford Implicit Tax = \$1051.09/MPG			
Japanese Implicit Tariff = \$0.00						
Price and Output Effects						
(Prices in thousands and Quantities in millions)						
Class	Price	Qty.	Pchange	Qchange		
1	8.602	1.713	-0.087	-0.035		
2	13.895	1.195	0.131	0.022		
3	6.891	1.609	-1.482	0.441		
4	10.647	2.004	-0.072	0.120		
5	15.490	3.347	0.413	-0.307		
Output Effects by Firms (in thousands of units)						
Class	GM	Ford	Other	GMChange	FChange	OthChange
1	1.318	0.000	0.397	-0.027	0.000	-0.008
2	0.926	0.000	0.269	0.017	0.000	0.005
3	0.587	0.834	0.188	0.171	0.373	-0.103
4	0.954	0.523	0.527	0.070	0.057	-0.007
5	2.093	0.955	0.299	-0.150	-0.173	0.016
Welfare Effects on Consumers and Firms (in billions of dollars)						
Class	Cons.	Firms	DWL	GMChange	FChange	Othchange
1	0.150	-0.150	0.000	-0.115	0.000	-0.035
2	-0.156	0.156	0.000	0.121	0.000	-0.005
3	2.322	-1.488	-0.834	-0.378	-0.755	-0.355
4	0.098	0.222	-0.320	0.196	0.065	-0.038
5	-1.706	0.496	1.210	0.353	0.023	0.120
Economic Welfare Changes (\$ billion)						
Consumer Change = 0.708						
American Firms Change = -0.599			Asian Firms Change = 0.006			
GM Change = 0.171			Ford Change = -0.667			
Chrysler Change = -0.103			Other Firms Change = -0.171			
Gasoline Consumption Savings: -419 million gallons						
Change in Employment(000s): 12.975						
The first two entries in these columns refer to on-shore Japanese production and profits.						

Table A2-2. Results of Alternative Scenarios, Oligopoly Model						
Imposing a 27.5 MPG CAFE standard results in -						
GM Profits (\$billion)				Ford Profits (\$billion)		
Supply Elasticities				Supply Elasticities		
	1.0	2.0	4.0	1.0	2.0	4.0
Demand Same	0.102	0.171	0.157	-1.083	-0.867	-0.484
Alt. Elast.	-0.067	0.025	0.047	-1.365	-0.873	-0.826
Asian Firms' Profits (\$billion)				Chrysler Profits (\$billion)		
Supply Elasticities				Supply Elasticities		
	1.0	2.0	4.0	1.0	2.0	4.0
Demand Same	-0.086	0.008	0.027	-0.154	-0.103	-0.057
Alt. Elast.	-0.528	-0.357	-0.207	-0.109	-0.088	-0.056
Consumer's Surplus (\$billion)				Employment Change (000 jobs)		
Supply Elasticities				Supply Elasticities		
	1.0	2.0	4.0	1.0	2.0	4.0
Demand Same	1,306	0,708	0,271	19,595	12,975	8,170
Alt. Elast.	0,529	0,276	0,057	19,252	19,069	18,210
Gasoline Saved (billion gallons)						
Supply Elasticities						
	1.0	2.0	4.0			
Demand Same	-0.485	-0.419	-0.358			
Alt. Elast.	-0.432	-0.363	-0.329			
For the demand elasticities "Same" refers to baseline case where own demand for large cars is assumed to be -3.00 and own demand for small cars is -2.00. "Alternative" refers to the alternative scenario where the two numbers are reversed and new cross-elasticities are computed using the different assumptions.						

inverse of their elasticity of marginal cost with respect to quantity is used. In the base case this is set to 2. The fringe firms are assumed in the base case to have an elasticity of supply of 2.

The results of the base case for the oligopoly model are set out in table A2-1, while table A2-2 gives the results of the simulation of the oligopoly model using various assumptions. Because the level of the standard sets the same constraint on firm behavior in both industry structures, many of the results are similar to the competitive model. In particular, enforcement of the standard in all scenarios leads to increased gasoline consumption of about 400 million gallons (as opposed to about 360 million in the competitive model). The reason for this slight increase is that because they are facing a more elastic demand curve in small cars as a result of stronger fringe competition, the two oligopolistic players, GM and Ford, are more prone to increase car production in that segment as a response to a binding CAFE standard. This acts to put more cars on the road and thus leads to slightly higher gasoline consumption.

There are two important different results in this model from the competitive one. First, because GM and Ford are not price takers, they can respond to a constraint at less cost. In

particular, increased production in the small car market does not reduce profits as greatly as it does in the competitive model. Since the firms have restricted small car output initially, they lose less money on their incremental small car sales.

Second, imposition of the standard can result in a decrease in deadweight loss in the domestic small and domestic luxury small categories. Prior to the standard, the oligopoly market structure generated a deadweight loss because GM and Ford were selling cars at prices above their marginal costs. If the shadow CAFE subsidy on these cars is not too large, it pushes output closer to the optimal level and reduces deadweight loss. It is theoretically possible that with such market imperfections a CAFE standard could act as a second best policy and increase domestic welfare. (See Kleit (1987, 49-53) for a discussion of this possibility.) In the oligopoly model simulation presented in table A2-1, net welfare declines slightly (\$68 million), while U.S. welfare increases slightly (\$109 million). This difference is largely accounted for by a loss of \$171 million in small car profits by "Other" firms (Volkswagen and Yugo.)

This result is not robust to the assumption of the model. For instance, with the base case demand elasticities and a supply elasticity of 4, net welfare declines \$271 million, while U.S. welfare declines \$181 million. Using the alternative demand elasticities and a supply elasticity of 4, net welfare declines \$1.705 billion, while U.S. welfare declines \$1.012 billion. Raising the CAFE standard 0.1 MPG to 27.6 MPG and using the base demand elasticities generates an estimate welfare loss of \$498 million and a loss to the U.S. of \$379 million.

Notes

The views presented here are solely those of the author and not those of the Federal Trade Commission or any of its members. The author would like to thank Paul Godek, Robert Hahn, Alvin Klevorick, Richard Levin, Merton Peck, Robert Rogers, Mike Vita, and two anonymous referees for their help with this paper.

1. See "Passenger Automobile Average Fuel Economy Standards for Model Year 1989," 53 Federal Register 39275 (October 6, 1988).

2. In May of 1989, NHTSA rejected the GM and Ford petitions for a model year 1990 rollback, largely on the grounds that a 27.5 MPG standard would not be binding in that year. See "Passenger Automobile Average Fuel Economy Standards for Model Year 1990," 54 Federal Register 21985, 21991 (May 22, 1989).

3. General Motors and Ford have stated on numerous occasions in 1985, 1986, and 1988 before Congress and in submissions to NHTSA that they viewed the standards as binding and would not contemplate paying fines. The only firms that have actually paid CAFE fines are Jaguar and Mercedes-Benz. However, when Jaguar was spun off from British Leyland it was explicitly stated in Jaguar's articles of incorporation that Jaguar expected to pay CAFE fines. This apparently reduced the legal cost to Jaguar of paying the fines.

4. Under a provision in the 1980 amendments to the CAFE law, Volkswagen's domestic production is included with its foreign output when determining VW's CAFE level.

5. NHTSA "1982 Annual Report on Fuel Economy," at 9.

6. Public Law 46:15-2003. One property of a harmonic average is that, if it is doubled, fuel consumed by driving the same number of miles in each type of car is halved.

7. The marginal fine derived above presents a more difficult problem to manufacturers than would occur with a standard based on simple averaging. Consider a firm that is deciding whether or not to produce an additional car with fuel efficiency equal to 20.0 MPG where the binding CAFE standard is 27.5 MPG. If simple averaging were used, the firm would have to offset that additional unit by producing one car with fuel efficiency of 35.0 MPG (or the equivalent). Under harmonic averaging, however, to produce another unit of 20.0 MPG, the firm must also produce the equivalent of one unit with fuel efficiency of 44.0 MPG. Thus, compared to simple averaging, harmonic averaging makes the CAFE standard more difficult to meet.

8. The assumption of competitive conditions is made for ease of presentation. All of the following results hold qualitatively if the firms in the industry have market power. See Appendix 2 for a presentation of the effects of

CAFE standards in an oligopolistic model.

9. Cross-price effects are omitted for the sake of simplicity. This omission does not significantly alter the results of this section.

10. Imposing a higher CAFE standard for one year may also have a longer term effect in terms of greater innovation, if it signals to automobile manufacturers the willingness of decision makers to act irrationally on future CAFE decisions. The effects will depend on the structure of the regulatory game being played. See Kleit (1988b). For an empirical analysis of the effects of CAFE standards on vehicle technology and weight see Crandall and Graham (1989).

11. In model year 1988, Japanese imports fell to 2.05 million units, as on-shore Japanese production increased. Data received from Oak Ridge National Laboratory.

12. The closest of these producers to being constrained by CAFE standards is Chrysler, which generally obtains CAFE ratings in the range of 27.5 to 28.5 MPG. Godek (1989) indicates that for model year 1989 Chrysler would have approximately 5.6 MPG worth of CAFE credits available. In other words, if the standard for model year 1989 were set at 27.5 MPG, Chrysler could have a CAFE rating as low as 21.9 MPG before it would run out of credits. Chrysler could also borrow credits from the future. Thus, the model will assume that Chrysler is unconstrained by a 27.5 MPG CAFE standard.

13. With the imposition of a standard, linear curves generate less deadweight loss than constant elasticity curves.

14. Assume that under one scenario the implicit tariff on Japanese cars is \$500 and the implicit CAFE tax is \$300 per MPG for General Motors. Using the formula for calculating implicit CAFE taxes (see above) and the MPG per class in table 1 yields an implicit tax vector $T' = (500, 500, 300 \cdot 27.5 \cdot ((27.5/32.45) - 1), 300 \cdot 27.5 \cdot ((27.5/27.42) - 1), 300 \cdot 27.5 \cdot ((27.5/25.31) - 1)) = (500, 500, -1258, 24, 714)$.

15. NHTSA Final Rule, 53 Federal Register 39282 (October 3, 1988).

16. Chrysler was a strong opponent of CAFE relief in 1985 and 1986. See "Passenger Automobile Fuel Economy Standards Model Year 1986," 50 Federal Register 40528 (October 4, 1985). A simulation of the effect of the 1985 standard (Kleit 1988b) shows that raising the standard would have unambiguously increased Chrysler's profits for MY 1985. Much of Chrysler's gain came from increased sales of mid-size "K cars" being bought by consumers driven out of the large car market. By the late 1980's, however, Chrysler's mid-size car sales had dropped relative to the rest of its fleet, accounting for the results on Chrysler's profits shown here. Chrysler does not appear to have taken a position on CAFE relief for model year 1989. See 53 Federal Register 39275 (October 6, 1989).

17. Several studies, such as Gruenspecht (1982a; 1982b), have found that scrappage rates of used cars are significantly affected by new car prices. See also Berkovic (1985) and Parks (1977).

18. Figures obtained from the Motor Vehicle Manufacturer Association, *Motor Vehicle Facts and Figures* (1987).

19. The MPG values for each of the three classes can be determined from the information used in the automobile market model. The entire fleet fuel efficiency for 1973 is known to be about 14.2 MPG. The model assumes that the ratio of fuel efficiencies between classes is the same for each year. With this assumption, knowledge of the fraction of cars in each class for 1973, and the entire fleet fuel efficiency for 1973 the fuel efficiency for each class of new car in 1973 can be estimated. It is also assumed that, for each class of car, fuel efficiency grew at a constant rate between 1973 and 1987. MPG's are then calculated accordingly. The fuel efficiency of cars produced before 1973 is assumed to be equal to the 1973 level.

20. The costs of generating gasoline savings through direct taxation is much lower. If gasoline supply and demand curves are assumed to be linear, and costs are constant, welfare loss is equal to $.5 dQ dP$ and average welfare loss is equal to $.5 dP$. Assume dQ is 505 million gallons (the savings from a CAFE standard of 28.5 MPG). dP is calculated as $dP = P dQ/Qe$, where e is the elasticity of demand. A demand elasticity of $-.7$ is used. (See Bohi (1981).) Q in the first year of this model is approximately 60 billion gallons. Gasoline is assumed to cost \$1. Under these conditions, a tax increase of 1.20 cents is required. If there are no previous taxes on gasoline this implies an average deadweight loss per gallon saved of 0.60 cents. Gasoline, however, is heavily taxed by both federal and state authorities. Thus, the deadweight loss per gallon through new taxes to save 505 million gallons is 0.60 cents plus the level of the previous combined taxes. In Connecticut, for example, that combined tax in 1987 was 25 cents.

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Abstract

This paper re... in energy regu... possible. Fir... regulatory pro... regulation give... social contrac... capacity, then... regulation.

1. Introdu

In the last de... to replace tr... incentive me... a price ceil... would be ad... price ceiling... utility can re...

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September 4, 1992

ESTIMATES OF JOB LOSSES FOR "BRYAN BILL" CAFE STANDARDS

The "Bryan bill" (S. 279) would require auto manufacturers to increase CAFE levels for cars and light trucks 40 percent by model year 2001. The baseline is model year 1988 CAFE levels. For the passenger car fleet as a whole, this would require average manufacturer CAFE to rise from 28.8 mpg in 1988 to 40.3 mpg by 2001. For the light truck fleet as a whole, this would require average manufacturer CAFE to rise from 21.3 mpg in 1988 to 29.8 mpg by 2001. Several estimates have been made of the potential job losses associated with the "Bryan bill" (S. 279) CAFE standards. This paper briefly outlines these estimates, and explains the primary reasons for the differences between them.

Bush Administration: Council on Competitiveness Fact Sheet (dated September 21, 1990)

"U.S. auto manufacturing job losses could easily exceed 60,000 by 2001..."

This was a very rough, informally-derived estimate, based on an expected price increase of about 10 percent (\$1,500, in 1990 dollars) for domestic passenger cars and light trucks. The estimated price increase was developed from some Department of Energy contractor work. Using a price elasticity of -1.0, domestic light vehicle production was assumed to drop by 10 percent (1 million units) in that year. Using an estimate that each auto industry production employee produces an average of 16 cars annually, the 1 million unit loss translates into job losses of 62,500 (the "...could easily exceed 60,000" figure). This estimate does not include job losses at suppliers (i.e., steel manufacturers, glass manufacturers, electronics, etc.). Adding supplier impacts would raise this figure to about 150,000 to 187,500 job losses. Unlike the estimates discussed below, this estimate included both cars and light trucks. It did not assume that manufacturers would have to shift the sales mix of their vehicles toward small cars; however it did assume vehicle weight reduction.

MVMA - "Higher CAFE: The Job Loss Impact" (dated January 1991)

"...implementation of the higher CAFE standards that have been proposed threaten to reduce employment in U.S. auto assembly and component facilities...by...between 150,000 and 300,000 jobs by 2001 for passenger cars alone."

These estimates were based on S. 1630, rather than S. 279. S. 1630 would have set limits on the average amount of carbon dioxide (CO₂) emissions from passenger cars. Because these CO₂ limits were equivalent to a 40 mpg CAFE standard, these impact estimates also could be used for S. 279. MVMA limited their analysis to passenger cars; they did not

- 2 -

estimate the impacts on light truck production and employment. MVMA used several scenarios to estimate the range of job loss impacts. *In each of the scenarios, MVMA assumed that only about one-half of the required increase in fuel economy would be achievable through the use of technology; the remaining fuel economy gains would have to be achieved by switching consumers to smaller cars.*

For the "150,000" figure (which was actually 159,000 in their analysis), MVMA assumed a 10 percent decline in industry sales volume, "...reflecting higher consumer costs for new technology not recovered in fuel savings." Manufacturers would have to severely restrict large car sales and subsidize small car sales: the analysis assumed that the large car market share would drop from 15 percent in 1989 to 2.7 percent by the turn of the century; the small car market share would have to rise from 33 percent in 1989 to 48 percent. The decline in large and mid-size cars sales has a disproportionate impact on the domestic manufacturers. As a result, while the overall market drops 10 percent, sales for the domestics drop 31 percent. In addition, because it takes fewer labor-hours to make a small car than a large car, U.S. auto employment declines due to the mix shift toward small cars.

For the "300,000" figure (which was actually 315,000 in their analysis), MVMA assumed an additional 30 percent decline in industry sales volume beyond the 10 percent reduction assumed above, for a 37 percent total reduction in passenger car sales. This additional sales decline is based on the assumption that "...consumers decide to hold onto older vehicles rather than buy a smaller vehicle with less utility." Manufacturers still would have to severely restrict large car sales and subsidize small car sales: the analysis assumed that the large car market share would drop from 15 percent in 1989 to 2.2 percent by the turn of the century; the small car market share would have to rise from 33 percent in 1989 to 68 percent. Again, the decline in large and mid-size car sales has a disproportionate impact on the domestic manufacturers. As a result, while the overall market drops 37 percent, sales for the domestics drop 61 percent. And again, because it takes fewer labor-hours to make a small car than a large car, U.S. auto employment declines due to the mix shift toward small cars.

MVMA also has been distributing another range of 173,000-210,000 job losses. This range is based on assumptions between the two sets discussed above.

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- 3 -

Chrysler paper: "Major Economic Implications, Clinton/Gore Position on Autos and the Environment" (dated July 30, 1992)

"Reaching 40 miles per gallon early in the next century will eliminate at least 250,000 jobs and most likely in excess of 300,000 jobs."

This analysis has not been widely circulated outside of the industry. These estimates were derived in a fashion similar to those of the MVMA numbers. *In this case, however, Chrysler assumed that technology would be able to achieve about 75 percent of the required increase in fuel economy, with the remaining 25 percent achieved through mix shifts. This differs from the MVMA assumption that the fuel economy increase would be achieved through a 50-50 split of technology and mix shifts.*

Based primarily on the National Academy of Sciences (NAS) fuel economy study¹, Chrysler estimated that passenger car manufacturers could achieve 37.4 mpg through the use of technology. Chrysler assumed total price increases for these technologies ranging from roughly \$1,800 to \$2,700 per car (in 1991 dollars). The former estimate is the mid-point of the NAS cost estimates, while the latter estimate was derived by Chrysler based on some work that SRI had performed for MVMA. Using a -1.0 price elasticity, Chrysler estimated these price increases would lead to sales decreases ranging from 11-17 percent. Mix shifts toward smaller vehicles then are used to raise the fleet average CAFE from 37.4 mpg to 40 mpg. As in the MVMA study, because there are fewer "jobs per car" as cars get smaller, there is an additional employment loss due to this mix shift. The Chrysler analysis implicitly assumes that all of the decline in industry volume comes at the expense of the domestic manufacturers (resulting in sales drops of about 16-24 percent) and all of the "mix management" must be done by the domestic manufacturers. Chrysler then uses a supplier multiplier of 1.7 to estimate the additional job losses that would occur in steel manufacturers, glass manufacturers, electronics, etc. This "1.7" figure is consistent with supplier industry job loss estimates NHTSA has made. The reason that Chrysler has a range of impacts (i.e., 250,000 to "...in excess of 300,000" jobs) is because of their assumed range of cost impacts (the above \$1,800 to \$2,700 per car).

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¹AUTOMOTIVE FUEL ECONOMY: How Far Should We Go?, April 1992, funded by the U.S. Department of Transportation.

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- 4 -

Conclusions

We are concerned about using any job loss figure substantially above 150,000 in describing the possible job losses associated with the Bryan bill. We have a number of concerns about the MVMA/Chrysler estimates:

- 1) Both the MVMA and Chrysler analyses ostensibly address the Bryan bill's impact only on employment related to the production of passenger cars in the United States (although the Bryan bill requires 40 percent CAFE gains for both cars and light trucks). However, we determined that multiplying MVMA's and Chrysler's "jobs/car" figures times their car sales assumptions over-estimates current U.S. auto industry employment involved in the production of passenger cars. *This results in a substantial over-estimate of the job loss effect of any production decline.* It appears that MVMA and Chrysler did not adjust their jobs/car figures to remove employment related to truck production.
- 2) The MVMA analysis, in particular, includes a number of unsubstantiated assumptions that exaggerate sales losses. Their assumption that only half of the necessary fuel economy increase can be achieved through technology probably is excessively conservative. This assumption leaves an extremely daunting task to be achieved by shifting mix toward smaller cars. Because MVMA assumes domestic manufacturers are impacted disproportionately by any mix shift toward smaller cars, this results in a "double whammy" impact on MVMA's job loss estimates. MVMA's "300,000 job loss" estimate also includes a wholly-undocumented assumption that there is a 30 percent sales loss because many consumers will not accept a smaller vehicle with less utility. This assumption dramatically raises the job loss estimates. Although some such effect is likely, MVMA has not justified an impact of this magnitude.
- 3) The "upper end" of Chrysler's job loss estimate is based on an extremely-high estimate of the cost of the technologies used to improve fuel economy. This results in a likely overstatement of sales and, consequently, employment losses. This is especially a problem because Chrysler assumes that all of the industry sales loss comes at the expense of the domestics.
- 4) Putting these job loss estimates in perspective reveals some of their problems: In 1991, total employment in the U.S. motor vehicle and equipment manufacturing industry was about 775,000 people. These people produced 5.44 million cars and 3.44 million trucks. If the 775,000 jobs are allocated between cars and trucks based on their relative production levels, there are about 475,000 passenger car jobs in the

- 5 -

industry. *If the MVMA estimates of job losses were to be believed, 32-63 percent of these jobs would be eliminated by the Bryan bill. This estimate simply is not credible.*

The Chrysler job loss estimates (250,000 to "in excess of 300,000") are somewhat more plausible than MVMA's (150,000 to 300,000), even though they are higher. The reason is that the Chrysler numbers explicitly include supplier jobs outside the auto industry. If these supplier jobs are removed from Chrysler's calculations, their numbers shrink to 90,000 to 122,000, or approximately 19-26 percent of passenger-car-related auto industry employment. (Chrysler actually says the Bryan bill would reduce auto employment by 13-18 percent; this discrepancy is because, as noted above, Chrysler mistakenly did not adjust their employment figures to remove jobs associated with truck production.)

- 5) It should be noted that all of the above estimates (including the 1990 Competitiveness Council estimates) assume that consumers perceive no benefit because new vehicles become more fuel-efficient. In theory, the value of the fuel savings consumers would receive because their vehicles are more fuel-efficient should mitigate some of the sales losses calculated above, which would reduce the job losses. However, it also can be argued that consumers will pay "costs" (i.e., poorer performance, smaller size, less safety) in addition to the price increases associated with the fuel-economy-improving technologies. All of the above analyses implicitly assume that these "costs" offset the fuel-saving benefits (the high end of the MVMA analysis assumes these "costs" are even greater). Policymakers need to be aware of this assumption.

Recommendation

We believe that we can analytically defend a job loss estimate of "at least 150,000 jobs" for the auto industry and its suppliers as a consequence of a requirement for a 40 percent increase in fuel economy by the early 21st century, *for both cars and light trucks*. However, we believe that the "250,000 to over 300,000 job losses" associated with passenger-car-only fuel economy requirements are greatly overstated and should not be used by members of the Bush Administration.

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Fuel-Efficient Cars Rank Among the Worst Selling

EPA and Industry Group Release Figures

By Warren Brown
Washington Post Staff Writer

America has lots of cars that can run long distances on one gallon of gas. But those cars don't have many buyers.

That is the message implicit in the mileage and sales reports released over the weekend by the Environmental Protection Agency and the Coalition for Vehicle Choice, the research and lobbying arm of auto companies that oppose higher federal mileage standards.

The EPA report, an annual compilation of vehicle gasoline mileage numbers, lists every make of car and truck sold in this country, along with their city, highway and combined mileage ratings.

The coalition's sales report, largely based on numbers provided by the Detroit-based Automotive News Data Center, is a study of consumer preference.

Taken together, the reports add fuel to America's long-running debate over who should take primary responsibility for reducing gasoline consumption—the automakers or the people who buy their products.

For example, in the 1993 model year that begins Oct. 1, the subcompact Geo Metro XFi will be the highest-mileage car sold in the United States. The Metro XFi gets 53 miles per gallon in the city and 58 mpg on the highway, for a combined mileage rating of 55.5 mpg.

However, GM's sales of all Metro models, including many versions with lower mileage than the bare-bones XFi, totaled 76,499 cars in calendar 1991. By comparison, the company sold 114,599 of its biggest cars, the Chevrolet Caprice models, which get 18 mpg in the city and 26 mpg on the highway for a combined rating of 22 mpg.

GM's bestseller in 1991 was the Chevrolet Cavalier, with 259,386 sold. Cavalier '93 cars and wagons have a combined average of 25 mpg.

Still, according to Automotive News and other sales reports, trucks increasingly are becoming the hottest sellers in the nation. Trucks include vans, minivans, sport-utility vehicles and pickups, which collectively account for 33 percent of all new vehicles sold in this country, according to industry reports.

Buyers are flocking to trucks, analysts said, because they generally can be used to carry many passengers and lots of cargo. But trucks get fewer miles per gallon than cars.

For example, one of the most popular trucks is Chrysler Corp.'s Dodge Caravan, which tallied 216,510 sales in 1991. Caravans get a combined average of 22 mpg, according to the EPA figures.

Environmentalists argue that the sales figures mean automakers must do a better job of producing more economical trucks and family sedans, and they are lobbying Congress to pass tougher fuel-economy laws.

Automakers disagree and contend that the environmentalists are trying to force them to build vehicles that relatively few people want to buy.

"There are plenty of small, high-mileage subcompacts for those who want them," said Ron Defore, spokesman for the Coalition for Vehicle Choice. "But those models account for less than 2 percent of all new-car sales."

There are, however, cars that sell more poorly than the super-high-mileage subcompacts. They are the super-low-mileage luxury autos, such as the Ferrari, which barely scratches 12 mpg, according to EPA numbers. Only 960 Ferraris, priced from \$117,000 to \$205,000 apiece, were sold in the United States last year.

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SECRETARIAL ISSUE PAPERS

CORPORATE AVERAGE FUEL ECONOMY STANDARDS (CAFE)

Background: Title V of the Motor Vehicle Information and Cost Savings Act requires DOT to establish Corporate Average Fuel Economy (CAFE) standards for passenger cars and light trucks. Recent concerns about U.S. energy security and "global warming" have led to Congressional and public interest in raising CAFE standards.

Status: The current passenger car standard is 27.5 mpg. It will remain at this level indefinitely, unless DOT amends it. NHTSA is required to issue light truck CAFE standards for each model year. To date, the agency has issued light truck CAFE standards through Model Year (MY) 1994. We are beginning the process of developing standards for post-MY 1994 light trucks. Light truck standards have remained in the range of 20.0 to 20.5 mpg since MY 1986.

The most-publicized Congressional proposal to raise CAFE standards has been S. 279, sponsored by Senator Bryan (D-Nevada). This would require manufacturers to raise their CAFE levels by 20 percent and 40 percent by MY 1996 and MY 2001, respectively, compared to their MY 1988 CAFE levels.

The Bush Administration has opposed the legislation because (1) vehicles would have to be made smaller and lighter, which would have an adverse impact on safety, (2) the technological feasibility of these standards has not been demonstrated, (3) these drastic CAFE increases would radically curtail the choice of new vehicles available to American consumers, (4) it would have a negative impact on the health of the domestic auto industry, and (5) the auto industry already faces major demands from new safety standards, as well as emissions standards from the 1990 Clean Air Act Amendments.

To support the development of the President's National Energy Strategy, DOT asked the National Academy of Sciences (NAS) to perform a study estimating fuel economy levels that could practically be achieved for new passenger cars and light trucks in the next decade, considering the Clean Air Act Amendments and other requirements faced by the auto industry. The study was released on April 9, 1992.

DOT had considered doing a "Phase II" NAS report, which would address issues such as electric and hybrid vehicles. On June 19, 1992, the Secretary announced that, because of the comprehensive nature of the "Phase I" study, the Department would not proceed with the Phase II study.

Now that the NAS report is out, the Department will likely face pressure to respond to the NAS report by proposing changes in CAFE standards or CAFE legislation.

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161

While it is nearly impossible to anticipate the design changes manufacturers might make and how consumers might respond to them, it is possible to make some estimates of the effect of increased vehicle costs on sales. Consider first the worst case--that consumers respond only to the increase in the retail price of the vehicle. Assume for sake of illustration that (1) a 1 percent price increase for a new car leads in the short run to a 1 percent drop in unit sales,⁹ (2) that, in the absence of higher fuel economy standards, the average price of the MY 2006 car would be the same as the average price of a MY 1990 car, or \$16,000 (MVMA, 1991); and (3) that the lower estimates of improved fuel economy are achieved. With these assumptions the retail price increases in Table 8-3 to this average vehicle price would yield unit sales reductions for new cars of about 3 to 8 percent, using the lower estimates of technically achievable levels. This would represent a significant impact on the automotive industry even though sales revenue would remain unaffected under the one-to-one elasticity assumption.

More realistically, however, consumers may take into account the benefits of reduced lifetime expenditures on fuel when making new-vehicle purchase decisions. In the absence of any estimate of the effect on vehicle sales of the present value of lifetime fuel savings (i.e., the "elasticity" of vehicle sales with respect to fuel costs), one way to make the estimate is to assume that vehicle sales respond to changes in the present value of fuel costs in the same way they do to vehicle price changes. As exemplified in Table 8-3, with the estimates of technically achievable fuel economy and costs reported for this study, the net present cost of higher fuel economy to the consumer is always substantially less than the initial vehicle price increase, and there may even be a positive benefit. Thus, the estimate of the impact on future vehicle sales given in the preceding paragraph is an upper bound that probably overstates the effect.

Employment

The impact of higher fuel economy on employment in automotive and related industries is difficult to assess. Under the worst case scenario for the impact on sales, discussed above, unit sales of passenger cars and light trucks might decline by 3 to 8 percent. Assuming that the number of jobs in the industry is proportional to unit sales (see Chapter 5), a reduction in sales of this magnitude would lead to a decline in employment of similar proportions.

Several factors would tend to mitigate this decline. First, as noted above, the worst case scenario assumes that consumers respond only to the higher price of more efficient vehicles. To the extent that this effect is offset by fuel cost savings, sales reductions--and thus employment reductions--would be less than the worst case suggests.

⁹An elasticity of -1 to -1.5 was reported by Michael J. Boskin in his presentation to the committee at the workshop that was held in Irvine, California, July 8-12, 1991. Ford Motor Company, in its presentation to the Impacts Subgroup of the committee, September 16, 1991, suggested an elasticity of -1.

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162

Second, as also noted above, even a decline in unit sales due to a price increase might leave automotive industry sales revenues unchanged since higher prices might essentially offset lower unit sales. Some portion of the price increase, however, arises from the wages paid to the workers who manufacture and install the new fuel economy technologies that generate the price increase. So, while there might be a loss of jobs due to any shrinkage in unit sales, the loss would be offset to some extent by the growth of jobs in producing the fuel economy technologies.

The employment impacts of fuel economy changes must also be put in context. As pointed out in Chapter 5, the global automotive industry is now in a state of chronic overcapacity that is likely to continue for some time. Overcapacity, combined with long-term increasing productivity, will lead to continuing reductions in employment in motor vehicle manufacturing and related industries, regardless of fuel economy standards. Indeed, the long-term shrinkage in employment may dwarf the employment impacts of new fuel economy requirements.

Competitiveness

More stringent fuel economy standards may have a greater impact on who manufactures cars for the U.S. market and where they are manufactured than on aggregate sales or employment. That is, higher fuel economy standards may affect the competitive position of U.S. manufacturers vis-à-vis the rest of the world more than they would affect the industry as a whole. The importance of the competitive effect depends heavily on the form of the regulation, perhaps more so than its level. For example, a fuel economy standard that averages corporate fuel economy performance across all classes--the current approach--has important differential effects among manufacturers. Because domestic producers make a larger proportion of midsize and large cars than do most foreign manufacturers, even if domestic producers met the committee's technically achievable fuel economy levels in each class, they could not reach the same corporate average levels of fuel economy as the foreign (primarily Japanese) producers could unless they changed their market mix and incurred higher adjustment costs.¹⁰

Imported light trucks already achieve significantly higher fuel economy than domestic trucks in the same size classes.¹¹ If fuel economy standards for light trucks were set above levels characteristic of current domestic trucks, but at or below those of the imports, the domestic manufacturers would be at a serious disadvantage. In particular, import manufacturers could make their light trucks larger, heavier, or more powerful in each size class to gain market share while domestic manufacturers would be severely constrained.

¹⁰These matters are discussed more thoroughly in Chapter 9.

¹¹For example, in 1990 the fuel economy of imported small pickups was 27.0 mpg, compared with 24.5 mpg for domestics, 34.1 vs. 21.2 mpg for compact utilities, 28.6 vs. 16.2 mpg for full-size utility vehicles, and 25.4 vs. 22.9 mpg for compact vans (Heavenrich et al., 1991).