1-1-1991

Automobile Emissions Control in a Competitive Global Environment: At What Price?

Stuart Boose
Lehigh University

Follow this and additional works at: http://preserve.lehigh.edu/perspectives-v09

Recommended Citation
http://preserve.lehigh.edu/perspectives-v09/7

This Article is brought to you for free and open access by the Perspectives on Business and Economics at Lehigh Preserve. It has been accepted for inclusion in Environmental policy issues by an authorized administrator of Lehigh Preserve. For more information, please contact preserve@lehigh.edu.
AUTOMOBILE EMISSIONS CONTROL IN A COMPETITIVE GLOBAL ENVIRONMENT: AT WHAT PRICE?

Stuart Boose

Introduction

Automobiles have an enormous impact on our daily lives. Most of our lifestyles are built around the mobility provided by driving to work, to the store, or to a friend's house. One of the prices we pay for this convenience is the slow deterioration of our environment due to automotive emissions. This deterioration is not just an aesthetic problem. Automotive emissions present a major health risk, and consequently the automotive industry is one of the most regulated in the United States today. This paper reviews the evolution of these regulations and discusses their impact in a competitive global marketplace.

History of Environmental Regulation of the U.S. Auto Industry

The Air Quality Act of 1967 was the first major piece of clean air legislation to have an impact on the automobile industry. The act provided more money for research on emission controls, but it also set some important precedents. The act was the first to be written with the underlying premise that manufacturers would never install costly control equipment on their own initiative. In addition the act established the federal government's power to regulate auto emissions. The states had to comply with federal policy, but could legislate tougher standards if they so desired.

In 1969 Congressional debate over the Clean Air Act began to center around the question of "technology forcing." Many Congressmen felt that adequate control technologies would not be developed unless the government legislated emissions limits which would force manufacturers to improve existing technologies. This concept was eventually accepted, and air pollution regulation changed drastically. Included in the Clean Air Act of 1970 were the original National Ambient Air Quality Standards (NAAQS.) The NAAQS set emissions goals for hydrocarbons, carbon monoxide, and nitrogen oxides at five to ten percent of the average levels for 1968 model automobiles. The hydrocarbon and carbon
monoxide levels—0.41 and 3.4 grams per mile—were to be implemented by 1975. The acceptable level of emissions of nitrogen oxides was set at 0.4 grams per mile and was to be reached by 1976. In addition, the act established ongoing air quality testing all over the country. An area which does not meet the ambient air quality standard for a certain pollutant is said to be a “non-attainment” area for that standard.

Since these standards were based on possible future technology rather than on currently attainable levels, the automakers applied for and received extensions for compliance. The Clean Air Act Amendments of 1977 legislated more realistic time constraints for manufacturers to meet the standards. The original hydrocarbon and carbon monoxide standards were postponed until 1980. The standard for nitrogen oxides was relaxed to 2.0 grams per mile before 1980 and 1.0 after. The 1977 amendments also set a limit of 2.0 grams per mile on particulate emissions for cars produced after the 1980 model year and established the National Commission on Air Quality to study the effects of the clean air legislation.

New limits have also been set for emissions of nitrogen oxides and particulate matter. In model year 1994 each manufacturer must have 40% compliance in its fleet of passenger cars, increasing to 100% in subsequent years. For light trucks 40% must comply in 1995 and 100% thereafter. For passenger cars and light trucks with a fully loaded rating below 3750 pounds, the acceptable limits are 0.4 grams per mile of nitrogen oxides and 0.08 grams per mile of particulate matter. For trucks up to 6000 pounds the nitrogen oxide standard is relaxed to 1.0 gram per mile.

The new law also gives the EPA Administrator the authority to tighten the standards for model year 2003 if he feels it necessary to attain NAAQS and the technology is available and cost-effective. The allowable limits are: 0.125 grams per mile of NMHC, 1.7 grams per mile of CO, and 0.2 grams per mile of nitrogen oxides. The standards set by the Administrator would hold for ten years or 100,000 miles, whichever came first.

New equipment required in passenger cars and light trucks includes emissions diagnostic systems and onboard vapor recovery systems. The diagnostic systems must be capable of detecting malfunctions in emissions systems and alerting vehicle owners. All systems must also use standard connectors and must not depend on proprietary technology; this is to facilitate the repair of emissions control systems produced by all manufacturers. The vapor recovery systems are cannisters capable of capturing 95% of evaporative emissions during refueling.

Starting with model year 1995, manufacturers will be required to guarantee their products to be free from emissions defects for two years or 24,000 miles. This warranty will apply to all components except the catalytic converter and the electronic control system, which must be warrantied for eight years or 80,000 miles.

Finally, the amendments require states with either a serious, severe, or extreme ozone non-attainment area with a population of at least 250,000 or a CO non-attainment area with a 1988 design value (the value which the EPA set in a 1988 plan) of at least sixteen parts per million to devise clean-fueled fleet vehicle programs. A fleet is defined to be ten or more

The Clean Air Act Amendments of 1990

The Clean Air Act Amendments of 1990 constitute a very comprehensive package of reforms to existing clean air legislation. The sections of the law which deal with the automotive industry tighten emissions standards and testing procedures, regulate public and private fleets of vehicles, and set standards for fuel content and handling.

The new emissions standards for non-methane hydrocarbons (NMHC) and carbon monoxide (CO) for passenger cars will be phased in over a period of several years. For model year 1994 each manufacturer must produce 40% of its fleet of passenger cars and light trucks in compliance. The percentage is increased to 80% for model year 1995 and 100% thereafter. The standards for the first five years or 50,000 miles are 0.25 grams per mile of NMHC and 3.4 grams per mile of CO. For the subsequent five years the standards are relaxed to 0.31 grams per mile of NMHC and 4.2 grams per mile of CO.

50
vehicles, owned or operated by a single person, not including vehicles for rental or sale, police and emergency vehicles, off-road vehicles and farm equipment. The vehicles which must be regulated are those in the fleet which are capable of being centrally refueled. The programs must require new fleet vehicles to be clean-fueled. In addition, the fleets must consist of 30% clean-fueled vehicles by 1995, 50% by 1996, and 70% by 1998. The EPA Administrator must issue specific emissions standards for clean-fuel vehicles within a year of passage of the law. The state plans must also allow the fleet operator to choose alternative fuels and vehicles within the limits set by the EPA.

The sections of the law which concern fuels require the EPA Administrator to issue regulations for cleaner, less volatile gasoline within a year of the law's passage. States containing even part of a moderate or serious CO non-attainment area must submit plans to ensure that all gasoline sold in these areas contain not less than 2.7% oxygen.

The Price of the Clean Air Act Amendments of 1990

The amendments to the Clean Air Act will affect the industry by increasing costs for both domestic and foreign firms. Although some costs are direct and relatively easy to estimate, others arise indirectly and can only be estimated very roughly. As of this writing there are no comprehensive public estimates of the cost of compliance with the new amendments. There are, however, estimates of the cost of compliance with a very similar bill, S.1894, which was presented by the Senate Committee on Environment and Public Works on November 20, 1987. The bill was eventually tabled. All of the following cost estimates are taken from a Congressional Research Service report by David E. Gushee entitled “Emission Controls on Motor Vehicles and Fuels,” last updated April 13, 1988. The added costs to the manufacturers will be in the following areas: increased research, more expensive emissions controls, onboard vapor recovery systems, increased recall rates, and increased warranty costs.

The more stringent emissions standards will require a massive increase in research spending to meet the requirements. The fact that the legislation is “technology forcing” only adds to the cost. In other words, instead of paying development costs to adapt existing technology to automotive controls, the manufacturers must develop completely new technologies. The increasing complexity of control systems makes them more expensive, as the permissible limits of emissions become more strict. Although it is impossible to price controls which do not yet exist, the most likely cost per car is expected to be between $50 and $150. Applying these estimates to the twelve million cars sold in the United States in recent years yields a total cost of between $600 million and $1.8 billion per year. (Gushee, 1988, p. 9) Under the assumption that light trucks will need controls comparable to those for large cars, the cost might be increased by $200 million to $520 million annually. These figures assume light truck sales of around 3.5 million vehicles. (Gushee, 1988, p. 14) It is also assumed that the EPA Administrator will not feel the need to further tighten emissions requirements for the 2003 model year. If twelve or more of the “seriously polluted” cities fail to attain the NAAQS, the costs of implementing the next phase of emissions standards will be enormous. Since the second phase involves halving the emissions of hydrocarbons and nitrogen oxides, a conservative cost estimate is twice as much as the first phase for a total of between two and five billion dollars.

It is difficult to estimate the cost of installing the onboard vapor control cannisters in production quantities. The EPA submitted an estimate of $20 per car, but Toyota testified before a Senate subcommittee that the cost would likely be closer to $100 per car. Installing these systems even at a fleet average of $50 per vehicle will cost manufacturers another $800 million per year. (Gushee, 1988, p. 34)

Currently manufacturers experience an overall recall rate of about 10% at an average cost of $50 per recall. Manufacturers expect both their rate and average costs to rise due to the new legislation. The doubled warranty period on emissions control systems, increased data on emissions control system deterioration from state testing programs and a new clause in the law will raise the recall rate. The
new clause now makes manufacturers liable for emissions system problems which occur after "normal" maintenance and not "proper" maintenance as the existing law requires. Although the difference in wording seems slight, the old law made it possible for manufacturers to claim that a vehicle with a damaged emissions control system was not "properly maintained." "Normal maintenance" implies only the automotive care taken by an average owner. Again manufacturers will feel the cost of more expensive controls which will raise the average cost of recalling a car for emissions problems. If the rate increases another ten percentage points and the average cost doubles, the additional cost will be another $120 million per year. (Gushee, 1988, p. 11) Applying the same assumption of a ten percentage point increase in truck recalls and assuming that average recall costs will be higher than that for cars because of larger and most likely more complex control systems, the cost to the industry will be about $44 million per year. (Gushee, 1988, p. 14)

The increased warranty period and more sophisticated control devices are expected to lead to an increase in warranty work. These control devices are not only more liable to fail, but also are more expensive to repair. Gushee estimates that the additional cost will be twice the increase in recall costs or another $240 million per year. (Gushee, 1988, p. 12) Using the same logic to estimate the increased cost of honoring truck warranties yields an additional cost of $88 million a year. (Gushee, 1988, p. 14)

All in all, the total cost to manufacturers of the above requirements is in the range of $1.8 to $3.4 billion per year. Even an industry as large as the automobile industry will be hurt by increases that large. Although the laws apply to all firms selling automobiles in the United States market, the costs are not necessarily the same for domestic and foreign manufacturers. The costs differ because of each manufacturer's position in the market, as the next two sections will show.

The Present State of the Automobile Industry

In 1961 Volkswagen sold 177,000 cars in America for 46.8% of the import market. (Halberstam, p. 425) Japanese manufacturers, notably Nissan and Toyota, were understandably anxious to enter the lucrative American automobile market and they followed the example set by Volkswagen. The economical imports became much more popular in the wake of gasoline shortages in the early seventies. Later, throughout the seventies and eighties, however, the European and Japanese manufacturers have pursued different strategies to raise profits. The Europeans have shifted their product lines toward high-profit luxury cars and have developed a reputation for high technology with innovations like electronic fuel injection and antilock brakes. The Japanese, on the other hand, have concentrated on selling more cars by developing a reputation for the quality of their small cars and pickup trucks. Throughout this period American manufacturers have continued to produce the traditional "family-sized" car that had been so popular for the last forty years. Many of the Japanese manufacturers are now aggressively marketing high-performance luxury sedans with advanced multivalve engines while American manufacturers continue to plod along with the same strategies used by Alfred Sloan and Henry Ford Sr. in the 1920's.

American manufacturers face many obstacles to regaining world competitiveness in the automobile industry. Among these are outdated products, high costs, poor customer relations, public perception of poor quality, inefficient spending, and a long product development process.

As an example of an outdated product, consider the Mustang, Ford's best selling sports car. The Mustang has not undergone any major changes since 1978. Rather than developing new models, American manufacturers have too often revamped old ones with new styling and added more expensive interiors and "standard" features to increase profits.

Many of Detroit's problems stem from the high costs of parts, labor, and capital. For decades the Big Three automakers have been pursuing short-term gains at the expense of closer ties to their suppliers. Instead of developing symbiotic working relationships with suppliers, the Big Three have focused on bottom-dollar procurement processes. They are
now paying the price in higher parts costs. Similarly the Big Three are still paying dearly for their past mistakes in labor relations. Although union membership nationwide has fallen greatly in the past twenty years, the auto industry unions are still very powerful. Throughout the seventies, unions demanded and received wages that increased faster than productivity growth, which proved to be a major burden on the American automakers. Only in recent years have the Big Three been able to convince the unions to agree to wage concessions. Even with the concessions, unionized autoworkers still receive wages that are significantly higher than the average industrial worker. Some Japanese auto plants in the United States hire only nonunion labor at a savings of ten dollars an hour. (Taylor, p. 62)

Parts and labor are not the only expensive commodities used by the American auto industry. Although there are opposing viewpoints on the extent of the problem, most economists agree that the cost of capital is higher in the United States than in most other industrial economies. This is a factor which greatly affects American manufacturers' decisions to upgrade plants and equipment.

Equally detrimental to the competitiveness of the Big Three are the inefficient spending patterns established by their corporate traditions. In the early eighties, they had no good idea of what the American market wanted in spite of the enormous sums spent on market research. A good example of inefficient spending is Ford's entry into the luxury car market. Ford bought Jaguar for $2.5 billion and may have to spend another $2.5 billion to make it competitive. To enter the same market Toyota spent $700 million to develop the Lexus LS 400. (Taylor, p. 64)

Perhaps the most crippling aspect of the American auto industry is the long product development process. The Big Three still take about five years to develop a car from design through production. In contrast, the Japanese have cut the time to three years, making it possible for them to leap into new markets two full years before their American counterparts.

Foreign car producers are not entirely without problems of their own. They face restrictions on imports, such as President Reagan's "voluntary" limits on the number Japanese autos for sale in the U. S. market. Many Americans have a great deal of national pride and are fiercely loyal to the Big Three. There are also macroeconomic forces at work against the foreign producers. At the time of this writing, the dollar is relatively weak against the yen and the deutschmark. If the dollar weakens further to 120 yen, the Big Three could enjoy a price advantage they haven't had in a long time. (Taylor, p. 65)

Because of these difficulties, foreign manufacturers are now trying to enter the higher-profit luxury car market. In 1987 about one-sixth of all imported automobiles sold in the United States were produced in Europe, but due to their high value they accounted for about one-third of the dollar value of all imports. Since the voluntary limitations on imports, the Japanese have also been trying to sell more profitable cars. They have established a solid reputation for quality and value in small and midsize autos and are now trying to enter the luxury market. In addition to the previously mentioned Lexus, Honda builds Acura, and Nissan builds Infiniti. Luxury cars are not the only market niche to have high value-added status. The Japanese firms are also building sportscars like the Nissan 300ZX and the Mitsubishi 3000GT VR-4 to compete with the Corvette in the $30,000 to $40,000 range. The current battle for market share in the high value-added auto industry is likely to determine the place of American manufacturers in the beginning of the next century.

In short, American automakers have been losing ground to foreign competition in the small and midsize car markets while retaining a strong grasp only in the large luxury car market. This division of the market means that the price of the Clean Air Act Amendments will not be evenly shared. As I will argue below, American manufacturers will incur larger costs per car because of their fleets of larger models.

Who Will Pay the Price?

The costs of compliance with the new law which would theoretically be the same for every manufacturer are those of controls, onboard vapor recovery systems, warranty and
recall increases, and loss of sales due to higher price. Hardware such as catalytic converters and vapor recovery systems should also cost about the same amount per car for each producer. These costs could be lowered by good engineering work in the design phase. Simpler solutions to pollution control will result in hardware that is cheaper to produce and is less likely to fail, resulting in low recall and warranty costs. Even a small cost savings in the production of each car adds up very quickly because of the size of the market. All manufacturers will feel the cost of falling sales due to passing the higher cost of emissions compliance on to the consumer.

Many of the provisions of the act will actually result in higher costs to American manufacturers than to their foreign counterparts. America's antitrust laws make it illegal for the Big Three to collaborate on pollution control technology which will clearly benefit the entire population. Each American manufacturer must therefore fund independent research and development which will cost a great deal more than would a cooperative effort. In the current environment of lax enforcement of antitrust legislation, manufacturers may be able to cut development costs by the establishment of a joint consortium for controls research. However, manufacturers may be hesitant to try this approach since they were prosecuted for antitrust violations concerning the sharing of emissions control technology in 1969. (Merson, p. 14) Collaboration efforts are also likely to be hindered by the fact that antitrust enforcement is subject to change with the political environment.

Another reason why the costs of emissions controls will be higher for domestic firms than for their foreign competitors is the Big Three's dependence on the large car market. Larger cars require more sophisticated controls because of their larger engines. Many of these cars need “closed loop control systems” to meet the newly tightened emissions standards. These systems monitor the content of the emissions and send information to a microprocessor which regulates the engine operation. Closed loop controls are both more expensive to install and more expensive to maintain. They are also more likely to break down and drive up warranty and recall rates. Furthermore, the higher cost of large cars will not just postpone decisions to buy, but will also induce some consumers to purchase smaller cars. This trend will not only hurt the Big Three when they need a large volume of sales to survive, but will also send many new sales to the makers of small cars, primarily the Japanese. For example, if one-fourth of this year's 300,000 large car buyers instead opt to buy medium and small imported cars, the loss to the domestic manufacturers would be about $1.5 billion. In an industry which averages twenty jobs per million dollars of wholesale output, 30,000 job-years would be lost. (Gushee, 1988, p. 31)

**Conclusion**

Regulation has some far-reaching consequences for the automobile industry. While necessary, the Clean Air Act Amendments of 1990 carry with them associated costs that will have a negative impact on the competitiveness of American automakers. Although the law imposes standard requirements on all manufacturers of vehicles sold in the United States, the costs of making Detroit's larger models meet the new standards are higher than those of their competitors. While these new costs by no means constitute an insurmountable obstacle to regaining lost market share, the Big Three will have to work harder to compete effectively.

It is still too early to tell what effect these increased costs for the automobile industry will have on the American economy. While it is a certainty that manufacturers will increase automobile prices to meet the costs of compliance with federal regulations, it is still unclear how many jobs may be lost.

Of course, the economic costs of emissions control regulations are offset by the benefits of cleaner air — primarily a reduction in future health problems and an increase in the quality of life. Unfortunately, it is not possible to quantify the value of these other benefits of clean air for direct comparison with the costs. However, neither the true costs nor the true benefits of the new emission control regulations will be apparent for many years to come.
REFERENCES


