Policy Recommendations for the National Agenda of Energy and Environment with Regard to Automobiles and Auto Emissions

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EXECUTIVE SUMMARY

Harmful green house gas and tail pipe emission levels created by the transportation sector, have been steadily increasing through the industry’s history. The U.S. Government recognized this externality and began regulating the industry starting in the 1950’s. Initially, smog and air quality issues were identified as the main externalities resulting from emissions created by this industry. Over the years, a host of other externalities have also been identified. These include climate change, health, and national security issues resulting from our dependence on foreign oil. Although these externalities are regulated, they have continued to grow due to the increased consumption of transportation related goods.

Since the 1950’s, the government has introduced various legislation meant to regulate tail pipe emissions and fuel efficiency. The Clean Air Act, the Energy Tax Act are the major pieces of legislation that address the externalities. These policies have resulted in an overall reduction of vehicle emissions and increase in fuel efficiency by 95 percent. Despite improvements, emissions and demand for gasoline are on the rise due to the increased consumption of transportation related goods. As a result, a new course of action must be considered to effectively deal with these transportation related externalities.

Under mandate, the Council on Environmental Quality has prepared the following three policy alternatives for the President of the United States for consideration and inclusion into the national agenda for energy and environment. They consist of: increased government spending for emission reducing and fuel efficiency research and development in the auto manufacturing sector; closing existing tax excise loopholes and creating greater subsidies for fuel and emission efficient vehicles; and enacting a higher gas tax. We rate these policy alternatives based on; the effects they would have towards reducing the level of emissions and fuel dependence as well as their ability to be implemented and administered.

An emission’s tax would serve as the Pigouvian tax, creating the socially optimal level of consumption of transportation related and externality producing goods. Current technology does not support an emission’s tax, as a result it serves as the measuring stick with which second and third best alternatives are judged.

To successfully mimic an emission’s tax we suggest the implementation of higher gasoline taxes, along with vehicle excise and tax subsidies as second best alternatives. Also since a change in demand for vehicles would have negative equity effects on manufacturers, funding for research and development into green technologies could also serve as a viable alternative.

It is our conclusion that the most optimal policy alternative is to increase the gas tax. This policy most closely aligns the costs and benefits of society and with careful implementation, we believe the equity issues can be minimized. In order to ensure market efficiency, we recommend that the gas tax first be implemented to provide a price floor of $4 per gallon. The U.S. has had recent experience at this level and was well on its way to adjusting to it before prices began to fall. We then suggest that the price continue to be increased to approximately $8 per gallon over the next five to ten years.
This will give the auto industry time to adjust to the shifting demand and will allow consumers time to make changes in their driving habits and vehicles.

Finally, we recommend that the increased revenue that is collected from this program, be used to provide focused subsidies to consumers for the purchase of advanced technology vehicles that meet specific emissions and efficiency standards. In order to further alleviate equity concerns, we suggest that this subsidy be provided on a sliding scale based on income, with those with the lowest income receiving the largest subsidy. These subsidies and the sliding scale must be such that any person that is able to purchase a new automobile can afford to purchase one meeting the specified environmental standards.

These policy alternatives all have their various efficiency and equity issues. Historically, the most difficult hurdle for emissions and fuel efficiency polices has come from the political arena. Powerful lobbying agencies exist on both the consumer and manufacturer side. However, recent improvements in public information regarding emissions and energy related externalities make this an ideal time to revisit the relevant issues and polices related to these serious issues.
INTRODUCTION
HISTORY

The United States government has long been aware of the negative externalities associated with automobile usage. The operation of automobiles creates harmful emissions as a bi-product. These emissions are comprised of carbon dioxide, carbon monoxide, nitrogen oxides, and hydrocarbons. All of these chemicals are pollutants or greenhouse gases. It has been demonstrated through scientific studies, over the last decade, that these greenhouse gasses are the major contributors to global warming and climate change. The 2007 Intergovernmental Panel on Climate Change (IPCC) indicates that it is 90 percent certain that human activities have caused global warming, much of which is attributed to the transportation sector (Teich, 2009, p159).

Automobile emissions are a major contributor to air pollution. They have been identified as the cause of many health, environmental, and climate change related issues, like smog and cancer to name a few. Air Pollution comes from other sources, such as general industry, as well as the transportation sector. However, the Department of Energy estimates that as much as one third of total green house gas emissions released into the atmosphere are from automobiles and the transportation sector (EIA, 1996, ch 3).

It has also been recognized that our dependency on foreign oil has created an externality weakening our national security footing. According to the Energy Information Administration (2006), the U.S imported around 5 billion barrels of Crude Oil and Petroleum Products. From this, members of the OPEC oil cartel earned $506 billion. Many of these oil producing OPEC member nations have come to be known as “petro-dictatorship” countries (Friedman, 2008). The chart below shows trends of U.S. imports of crude oil over the last several decades. Our demand and dependency on
foreign oil is on the rise. This increasingly makes our nation vulnerable to the demands of the petro-dictators of the world.

![Annual U.S. Imports of Crude Oil and Petroleum Products](image)

Public information regarding the harmful effects of automobile emissions has had minimal results on the overall level of annual emissions from automobiles. Consequently, the US Government began regulation of automobile emissions in 1955 with the Clean Air Act. The Clean Air Act gave the Environmental Protection Agency (EPA) the job of setting emission requirements for all industries, including automobiles. In 1975, Congress passed The Energy Policy Conservation Act, which established Corporate Average Fuel Economy, (CAFE) standards. This act placed automobile emission regulating authority with the Department of Transportation (DOT), along with the EPA, (Yacobucci, 2008, p6). CAFE emission requirements were supply side requirements levied on the manufactures.

Over the years with the Clean Air Act’s major revisions, emissions standards were tightened by more than 95 percent, (Office of Mobile Sources, 2005, p4). Despite this massive adjustment, overall emissions from automobiles have been on the rise. This rise has been attributed to the increased consumption of transportation by consumers. Even
as automobile emission standards have been improved, the increased miles driven by motorists over the years, has negated any emission reductions made possible by new pollution control equipment (PCE). As a result, beginning in 1978 the government started taxing the demand side of the model.

The Energy Tax Act of 1978 created the Gas Guzzler Tax. The tax was levied on consumers that purchased certain cars, as SUVs and light trucks were exempt, (Office of Transportation and Air Quality, 2006, p1). Two other recent pieces of emission legislation include the Energy Policy Act of 2005, which provides tax credits for the purchase of Hybrid and Alternatively Fueled vehicles and the American Recovery and Reinvestment Act, which allows buyers of new vehicles to deduct sales taxes from federal income tax, (IRS, 2009). Currently, the DOT, EPA, and Department of Energy, (DOE) have federal research and regulatory authority over automobile emissions.

**PROBLEM DEFINITION**

The usage of automobiles has led to market failure. This market failure is the result of the negative externalities associated with vehicle emissions and secondly, with energy dependency. The current level of emissions, created by the transportation sector and the resulting market failure, has been caused by the consumers’ failure to reduce vehicle emissions to the socially optimal level. Also, the demand for gasoline in this sector has created a national dependency on foreign oil, weakening our overall diplomatic and defense strategies. Automobile manufacturers have been able to reduce the amount of emissions and gasoline consumption by vehicles. However, automobile usage by
consumers has increased to the point where emission reducing and fuel efficiency technology improvements have been negated by the increased consumption.

Key variables that influence the level of vehicle emissions are engine size, miles driven, age of vehicle, pollution control equipment, fuel type used, the amount of cold starts, and the aggressive driving habits of each driver. Vehicle age is a significant factor in the creation of emissions. In a Report to the California Legislature, (2004) It was determined that about “30 percent of cars are 12 years old or older. These cars account for 25 percent of the miles driven by cars, but they are responsible for 75 percent of the pollution from cars.” Due to the numerous variables associated with the creation of emissions and the resulting externality, only a direct tax on emissions would have an economically efficient outcome resulting in the socially optimum levels of emissions. This emission’s tax is the market equivalent of a Pigouvian tax, (Feng 2005, p3). A Pigouvian tax corrects negative externalities by creating socially optimal market equilibrium through taxation. A Pigouvian tax for emissions would internalize, negative emission externalities and alter consumers’ demand for transportation related bundles of goods. This would ensure the socially optimum level of vehicle usage occurred, minimizing the dead weight loss created by the externalities, (Pigou, 1932).

The efficient emission’s tax is currently technologically unavailable. As a result of the emission tax being unavailable, first and second best policy alternatives must be used. Congress has made various attempts at an alternative to the emission’s tax. Current federal polices range from manufacturer and consumer regulations to excise taxes and tax subsidies.
Government has intervened on the technology development side, through the Partnership for a New Generation of Vehicles (PNGV) program. This is a government sponsored program, which provided incentives for industry to partner with the government and initiate research and development programs intended to provide technological advances in energy efficiency and emissions reduction of automobiles. The success of this program has been debated and is discussed further in the policy options section of this paper.

Current demand for emission controlling equipment and vehicles has a complementary relationship to gasoline prices. As a result of declining gasoline prices demand for efficient vehicles has waned. (Carty, 2009).

Enacted tax policies that affect emissions consist of the Gas Guzzler Tax, an excise tax, and tax subsidies including credits for alternatively fueled vehicles and new car sales tax deductions. The Gas Guzzler Tax, famously, has a loophole that makes it only applicable to cars and not SUVs and light trucks. Additionally, current tax subsidies are regressive and do not assist lower income households in purchasing fuel efficient vehicles.

Implementation of these policies has fallen on multiple federal and state agencies. Political difficulty in creating legislation and administering oversight has been a major hindrance to improvements in this area. First, consumers have proven unwilling to pay higher prices resulting from certain taxes, or change their preferences to a manner of consumption that would lead to decreased emissions. Examples are low consumer demand for smaller energy and emission efficient vehicles, and increased annual mileage driven by motorists. Secondly, the automobile lobby and, sometimes by extension, the
labor lobby have proven to be powerful opponents to emission regulation, (Johnson, 2009). Despite current regulations and legislation current emissions levels and demand for gasoline continue to rise.

POLICY GOALS AND METHOD OF EVALUATION

In response to the issues discussed above, we are providing an analysis of three policy options as a means to correct the market failure associated with emissions and by extension energy dependency. Ultimately we strive to meet the objectives of economic efficiency and equity. In addition, budget and political feasibility have been outlined as major factors for consideration.

With regards to economic efficiency, we are stating that any policy must contribute towards reducing the major externalities of this market failure with a minimal amount of dead weight loss to society. The externalities under consideration here are pollution and the national security issues resulting from the national dependency on foreign oil. In addition, we also are taking into account how each policy option impacts competition and the stimulation of innovation. With our goal of increasing economic efficiency, it is important that any policy option has a positive impact in each of these areas.

Equity is a second major area of consideration for any new policy presented here. As each option requires a significant redistribution of money, we need to make sure that this is done in an equitable manner. Specifically, we are analyzing the costs to citizens and the costs to the auto industry, as these are the primary stakeholders impacted by any policy option here.
Finally, it is noted that in order for any policy option to be successfully adopted and implemented, the budget and political implications must be addressed. For each of these four major goal areas (economic efficiency, equity, budget feasibility and political feasibility), we have included a brief discussion within each policy option section and have also summarized the results in the attached addendum.

POLICY ALTERNATIVES

We recognize that the policy options available to help correct the aforementioned market failures are numerous and expansive. Due to time and resource constraints, we have decided to limit our analysis to three specific policy options and have selected the three which we feel best fit with the overall energy agenda of the Administration. The three options that we are considering in detail are as follows:

Option #1: Government R&D Incentives for Companies to Develop Advanced Energy Efficient Vehicles.

Option #2: Closing of Current Tax Loopholes and Greater Tax Subsidies for Clunkers, Pollution Control Equipment and Emission/Energy Efficient Vehicles.

Option #3: Implement Increased Fuel Tax at the Pump.

Before going into detail regarding these three policy options, it is important to further elaborate on a fundamental idea with regards to the previously mentioned Emissions or Pigouvian tax and why this option was not selected. As discussed in the problem definition, an efficient outcome in the form of a Pigouvian tax is unavailable. This tax would internalize the externality into the market, which would lower demand for the
externality producing good to the social optimum level and minimize the dead weight loss created by the externality (Pigou, 1932). A Pigouvian tax, in this case, would take the form of an emissions tax. Applying the above definition, an emissions tax would internalize the externality of emissions into the market, creating economic efficiency and socially optimum levels of pollution by automobiles.

Currently, the technology that would allow an emission tax on automobiles to be effectively administered does not exist (Pigou, 1932). Fullerton and West (2002, p136) suggest two alternatives that serve as second best alternatives to the direct emission’s tax. The first involves a combination of new pollution control subsidies and a gas tax based on type of gas and engine size. This tax would be levied at the pump. The second tax involves a fee that is assessed during annual inspection that determines average emissions of a vehicle and multiplies it by the miles driven. These tax methods have their own administrative feasibility issues that arise from the heterogeneous consumption of emissions that could hinder efficiency. In addition, the gas tax could be defeated by siphoning, or the emissions tax could be beat by odometer tampering. As a result these second best alternatives are administratively unfeasible.

Administratively feasible second best solutions for the ease of administering require a homogeneous solution. Therefore, efficient policy alternatives must focus on uniformly applied gas taxes, vehicle inspections fees, or excise taxes and subsidies at purchase (Fullerton and West, 2002, p137). This brings us to our detailed discussion regarding the selected three policy alternatives.

**POLICY ALTERNATIVES**
Option #1: Government R&D Incentives for Companies to Develop Advanced Energy Efficient Vehicles.

There are many compelling reasons why partnerships between automakers and governments are desirable. As current events reveal to us, the U.S. auto industry in general has become a very tough place to do business. There is increasing competition from global automobile companies, including but not limited to Japan, Korea and China. This increase in competition combined with technological advances in other areas such as electronics, computers and cell phones, has put great demand on research and development (R&D) within the industry (Sperling, 2001). For example, the advent of cell phones with Bluetooth technology and availability of GPS have resulted in consumers demanding a high level of “connectivity” and “intelligence” within the automobile.

In addition to new consumer driven technology requirements, automakers are being faced with demands being placed on them by government regulation as well as consumer preferences to improve the environmental friendliness of their automobiles. The last decade has brought about an extreme, but necessary, concern for the release of greenhouse gases into the atmosphere. This relatively new awareness is resulting in consumers seeking out “green products” and governments worldwide setting regulations around the production of greenhouse gases. These combined factors have put increasing pressure on automakers to further their R&D efforts in order to meet the rapidly changing requirements in the marketplace. In addition, US automakers are also feeling pressure to reduce the price of their vehicles due to increasing competition from foreign companies.
This challenges their ability to fund numerous long-term R&D projects and makes governmental assistance much more appealing.

The auto industry is not alone in feeling pressure from increasing competition and changing consumer’s preferences, as these consumers are also taxpayers who expect the government to step in when there are market failures. As previously discussed, a market failure exists when a negative externality is created by the auto industry, which in this case is pollution and the release of greenhouse gases into the atmosphere. The auto industry is failing to correct this negative externality, likely due to the high cost of change (R&D and production line changes) combined with increasing cost pressures from competition. In addition, there may still be many consumers that do not know the full impact of the negative externalities, which may extend beyond pollution and may include national security interests, due to our dependency on foreign oil. This represents asymmetric information on the part of the consumer and is an additional market failure. So, the government has multiple incentives to step in and help to correct the market failures. One option for government interaction is to provide assistance in research and development in an attempt to create new technology to correct the market failures.

Government partnership with the auto industry around research and development is not a new concept. In 1993, the Clinton Administration created the Partnership for a New Generation of Vehicles (PNGV). The PNGV was established to increase fuel efficiency in US cars to 80 mpg by 2004. This program involved an initial funding budget to the auto industry in excess of $500 million. Success of this program has been debated and remains unclear, as the Bush Administration canceled the program in 2002. It is clear that there was much new technology developed during the time frame of this
project. What is uncertain is to what extent government involvement caused this innovation to happen. It is argued that the Big 3 automakers did not receive enough funding in proportion to what they were already spending to result in a significant change in their focus. In the end, the results were seriously questioned when smaller foreign firms (that did not participate in the PNGV program) introduced Hybrid cars before the US automakers did. (Sperling, 2001; http://www.pngv.org)

There have been numerous studies performed regarding the benefit of government sponsored R&D. For this discussion, we will consider government sponsored R&D to be in the form of payments to companies for specific technology development. These payments may come in the form of direct grants or as tax credits. Here we will assume the payment is made via tax credits, but the impact would be similar with a grant-based program.

It is important to understand why government funding is needed for private R&D from an economic viewpoint. This analysis also helps us to determine an appropriate level of funding from the perspective of maximizing the social marginal benefit. First let us look at why private firms may under invest in R&D. Figure 1 below shows Firm A with respect to the level of capital invested in R&D (Q) and the price of this capital (P). When determining how much to invest in R&D, Firm A considers the opportunity cost of all other items that the limited capital could be used for. Firm A then invests at a level where the marginal benefit to the firm equals the marginal [opportunity] cost, which simply states that Firm A will continue to invest in R&D until the cost of the last unit of capital just equals the expected benefit (Dahlby, 2005). This is shown on figure 1 where MC intersects MBprivate.
The decisions of Firm A as discussed above take into account only the benefits of the firm. In addition to the benefits provided to Firm A, there is also what is commonly referred to as “spillover effects”. These externalities refer to the benefits to other firms without incurring R&D expenses, the benefits to society created by the new technology, and the potential benefits to workers in the form of new or improved jobs, as a few examples (Dahlby, 2005).

When considering these additional benefits, you will see from figure 1, that the marginal benefits to society exceed those of Firm A. Therefore, if the level of R&D capital is limited to Q, society does not achieve the desired level of utility. Government may increase the level of R&D investment by offering a tax credit equal to the amount of \( P_1 - P \) as shown in figure 1. This then causes Firm A to invest at the level where the marginal [opportunity] costs are equal to the marginal benefits received by society as a whole. This is show in figure 1 as point a.

The triangle abc shown in figure 1 represents the amount of social surplus. This is the additional amount gained by society as a result of the increased level of R&D due to government intervention. This increase in social surplus also represents an overall increase in efficiency (Wiemer & Vining, 2005). Many attempts have been made to quantify this increase and the results are largely dependent on the industry and technology in question. In quantifying the impact of government sponsored R&D, the studies have looked specifically at the social rates of return on R&D spending. The average social rate of return has been found to be approximately 50% with a range of 20% to over 100% depending on the industry (Nadiri, Abstract).
Goals & Objectives – Policy Option#1: Economic Efficiency

There are several factors being discussed here with regards to economic efficiency. Each is listed below with a brief discussion of points relevant to government sponsored R&D incentives:

- **Reducing [Externality] Pollution**: The extent to which this policy option reduces pollution depends largely on the focus of the technology development. Therefore, it will be critical to outline very specific requirements that firms must follow in order to qualify for this benefit. In addition, it would also be desirable to consider a penalty clause if a specific firm does not meet specific milestones. This could simply be non-renewal of the benefit.

- **Reducing [Externality] National Dependency on Oil**: The same factors discussed with regards to reducing pollution also apply here. However, this objective may be even more dependent on the type of technology developed. For example, if the technology results in doubling the mpg rating of automobiles, then our
dependency on oil will be reduced with respect to the automobile sector. But, if the technology eliminates the use of oil based fuel, then we could completely eliminate our dependency on oil (with respect to the automobile sector) altogether.

• **Increasing Competition:** This policy option will likely increase competition if it is made available to all firms. It is critical in the auto industry that a firm does not fall behind other firms with regard to product offering. Therefore, if Firm A believes that Firm B is taking advantage of this government sponsored program that will likely expedite their R&D program, then it is in Firm A’s best interest to also participate. The end result is likely to be increased competition among each automaker. Taking this a step further, this may more significantly impact smaller firms, as the amount of money available to them will be a much larger percentage of their normal spending (Sperling, 2001). This has the potential to allow the smaller firms to compete more effectively with major automakers.

• **Stimulation of Innovation:** The stimulation of innovation is directly related to the amount of capital spent on R&D. Therefore, if the level of capital spent on R&D increases, it is likely that innovation will as well. The major unknown is what percentage of R&D spending will be an increase to what would have been spent without government intervention? One method to maximize the creation of additional R&D spending (and the resulting innovation) is to base the payment on the amount spent OVER prior years. This is currently used by some states, including New York State for general R&D tax credits.
Equity

There are equity problems that need to be considered with this policy option. The first issue is dependent on where the tax revenue comes from to pay for this policy. If the revenue comes from general tax payments but is not directly linked to the ownership or use of automobiles, then all taxpayers, including those that do not own or use automobiles, will pay for the burden of this. In this situation, those purchasing the new technology are receiving the greatest benefit, but the cost is spread across all citizens. However, given that one of the goals of this policy is to reduce pollution, all citizens will benefit from this if it is successful. Therefore, an argument can be made that all taxpayers should share some of the cost. Following are additional specific points for the costs to citizens and to the auto industry specifically:

- **Costs to Citizens:** Since the tax credit will be paid for by the government, all taxpayers may share the burden. The question becomes how significant of a burden will this be for each taxpayer? Reviewing the history of PNGV as previously discussed, we find that one major criticism is that the scale of R&D spending in the auto industry is so large without government funding, that the level of funding needed to significantly impact their behaviors may be very high. As Sperling indicates through various sources, “the Big 3 spent $17.3 billion on R&D in 1996 (about 5% of sales) (Chapman, 1998, pp.13-14; US GAO, 2000, p.24), about 200 times more than they received from PNGV” (Sperling, 2001, p.253). This indicates to us that in order to successfully create the desired change, the cost will be high. Therefore, the cost to citizens is also likely to be high.
• **Costs to Auto Industry:** Since the auto industry will receive a direct subsidy for their increased spending, the direct costs to the auto industry will be close to zero. In some cases, a specific automaker may already be planning R&D expenditures that will now be paid for by governmental intervention. In this case and in most scenarios, the auto industry benefits financially from this program.

**Budget Feasibility**

This new initiative will require substantial revenue that is outside of current budgets. Therefore, consideration must be given as to potential sources of revenue that would be appropriate for funding this. To improve the budget feasibility it may be desirable to link the tax directly to the purchase or use of automobiles. This could be done through an additional fuel tax, which as discussed in policy option #3, may also spur the demand for the technology developed under this R&D initiative. Alternatively, or in conjunction with this fuel tax, the tax on automobiles not meeting specific mpg standards could also be taxed at a higher rate. This would also provided needed revenue as well as shifting demand to the new more efficient technology. Both of these options would likely also increase the willingness of automaker participation and further private investment into the development of more fuel-efficient automobiles.
**Political Feasibility**

This policy will likely have a high level of political feasibility for several reasons. First, most of the auto industry is currently in very serious financial trouble and this initiative would provide funding to help improve the firms for the long term. Second, there will likely be jobs created from the expansion of R&D programs and the eventual production of new advanced technology vehicles. Considering the current recession and increasing unemployment rate, all will welcome these jobs. The only foreseen obstacle with regards to political feasibility is the expense of this program. The budget feasibility section attempts to address this; however, any increased tax given that we are in a recession, will be viewed negatively and will likely be a major political hurdle.

**Option #2: Closing of Current Tax Loopholes and Greater Tax Subsides for Clunkers, Pollution Control Equipment and Emission/Energy Efficient Vehicles.**

The US Government has levied various taxes as well as created subsides to encourage the purchase of lower emission vehicles. Many of these current tax policies have various efficient and equity issues that prevent their ideal performance.

The Government’s current excise tax policy consists of the Gas Guzzler Tax which was created through the Energy Tax Act in 1978. Although, the Gas Guzzler tax was primarily enacted to reduce gas consumption, it has a similar effect on emissions. Manufacturers that sell cars with lower then 22.5 miles per gallon fuel efficiency rating must pay an excise tax. The tax increases in incremental steps as a vehicle’s average
MPG rating becomes lower (EPA, 2006). Although the tax is on manufacturers, its burden is also passed on and felt by consumers.

In 1978, when the Gas Guzzler Tax was created, SUVs and trucks made up less than three percent of the vehicle population so they were left out of the Energy Tax legislation. This oversight has never been subsequently corrected, even when SUVs and light trucks began to account for close to half of the new vehicle market. SUVs and light trucks generally have higher emission and gas consumption rates due to their larger engines and heavier bodies, (EPA, 2006). The current loopholes that exist in the Energy Tax Act’s Gas Guzzler Tax provision make it an ineffective tax. Too remedy this, the Gas Guzzler Tax should be uniformly applied to all vehicles. Consideration should also be given to raising this excise tax’s average MPG standard to further increase demand for vehicles with better fuel economy. If effectively administered, this tax could be a key revenue generator for current and future subsidies for low emission vehicles.


It has been determined that demand for energy efficient vehicles appears to be tied to the prices of gasoline and not the marginal social benefit derived from lower emissions or energy efficiency. As a result, demand for pollution control equipment and energy efficient vehicles has waned as gasoline prices have dropped. Current tax credits for
hybrid vehicles range from $500 to $2,600 depending on model. This does not adequately cover the cost difference between Hybrid’s and their comparable models, which is averaged at $3,000 dollars, (Carty, 2009). To improve efficiency, credits for emission efficient vehicles should be increased to make them more desirable than their closest competitors that are not hybrids.

West (2004) claims that current pollution control equipment and new car subsidies are inequitable to lower income families and therefore regressive. Most new cars are out of the price affordability range of lower income and many middle class households, even with the current subsidies and tax deductions. The only households able to take advantage of current tax credits are wealthy or the financially sound middle class. As a result, lower emission vehicles are only redistributed to the well-off.

Vehicle age is a significant factor in the creation of emissions. In a Report to the California Legislature, (2004) It was determined that about “30 percent of cars are 12 years old and older. These cars account for 25 percent of the miles driven by cars, but they are responsible for 75 percent of the pollution from cars.” Lower income households tend to own the majority of these older vehicles. A better tax policy aimed at enticing lower income households with older vehicles to purchase PCE and newer cars is needed.

For equity and efficiency purposes a “Cash for Clunkers” program should be enacted. This program would give individuals a one time voucher for an older model car towards the purchase of a new car. All consumers would be eligible to receive discounts when purchasing an automobile. As a high percentage of emissions come from older vehicles, it would be prudent to create a policy that addresses this issue. A clunker’s program has
the potential to have the greatest effect of all other subsidies on the reduction of emissions. Congress is currently considering this option. A “clunkers” program in Germany also had the added benefit of increasing automobile sales 20 percent, (Bedard, 2009). Not every consumer is going to take advantage of the low-emission vehicle purchase policies a program for a variety of reasons. As a result a program subsidizing individual PCE purchases and upgrades should also be created. This would best be accomplished through a tax deduction.

The effectiveness of current tax programs depends on consumer response to the price of gasoline, and comparable vehicles and not the social benefit gained from lowering emissions. As stated earlier, when gas prices were high in 2008, so was demand for energy efficient and low emission vehicles. Now that gas prices are lower and the economy is weak, sales of more energy efficient vehicles have fallen. To effectively administer these taxes a plan must be created to ensure these programs continue to have their desired effect despite price changes. The authority to research and set tax credit prices should be invested in the DOT or an entity to within the Executive Office of the White House. This would ensure credits keep pace with other changes in the market.

**Goals & Objectives – Policy Option #2:**

*Economic Efficiency*

There are several factors being discussed here with regards to economic efficiency. Each is listed below with a brief discussion of points relevant to government subsidies for the purchase of advanced energy efficient vehicles:
• **Reducing [Externality] Pollution:** Tax programs for the purchase of fuel efficient and low emission vehicles, do not come close to the efficiency that would be achieved by an emissions or Pigouvian tax. This is because they only take the physical emission producing variables into account. Actual vehicle usage is a key determinate in the amount of emissions created by any vehicle. However imperfect, increased subsidies along with a Clunkers program would go a long way towards the reduction of emissions.

• **Reducing [Externality] National Dependency on Oil:** The same factors discussed with regards to reducing pollution also apply here. In addition, this is also directly linked to the type of technology that the subsidies support. Therefore, care must be given to be critical in the specifications of automobiles that are allowed in this program.

• **Increasing Competition:** This policy will likely increase competition among the automakers. As discussed above, when fuel prices increased, more consumers were purchasing high efficient hybrid vehicles. This in turn gave the automakers more incentive to produce and develop these vehicles, ultimately increasing the competition in this submarket. As this program effectively reduces the price to consumer of a specified automobile, it will likely increase demand. This will provide the automakers with a similar incentive as what was demonstrated during the time of rapidly increasing fuel prices.

• **Stimulation of Innovation:** Tax excises and subsidies will increase demand for PCE and fuel-efficient vehicles. This will encourage firms to find better and cheaper ways to create these vehicles.
**Equity**

As discussed above, it is argued that equity problems may exist with regards to lower income groups. In addition, similar problems exist as with policy option #1, depending on where the funds are derived to pay for these subsidies. These are discussed further below:

- **Costs to Citizens:** First, current policy does not adequately address citizens in the lower income groups. As these advanced vehicles are generally more expensive, this group likely will not have the financial means to participate in the program. Due to the regressiveness of current policy a Cash for Clunkers program should be created for both equity and efficiency purposes. Second, as this program is an expense to the government, it must be funded. If the source of these funds is not related to the use of automobiles (fuel tax, or through the Gas Guzzler Tax), then this may be inequitable to citizens that do not use automobiles. However, climate change and other issues resulting from emission related externalities must be addressed for the public good and may justify outside funding.

- **Costs to Auto Industry:** The auto industry would benefit from the clunkers and credit programs, as it will increase demand for newer vehicles, while they still receive the original full price. The auto industry may face extra costs from shifting production to meet government influenced consumer demand for fuel-efficient vehicles and away from gas guzzlers.
**Budget Feasibility**

The budget issues associated with this alternative are very similar to those already discussed with policy option #1. In addition to the points discussed there, we will also add that an additional revenue source could be created by fixing the loopholes in the gas-guzzler excise tax. SUVs and light trucks now account for half of the automobile market and a greater percentage of emissions produced. SUVs and light trucks should be included in the Gas Guzzler Tax. This would help to address part of the equity problems as well as providing the needed funding for this program.

**Political Feasibility**

As this policy builds on existing polices and is a comparatively unobtrusive, as compared to a gas tax, it will be easier to enact than most alternatives. Closing, the Gas Guzzler Tax loophole has met stiff opposition from the automobile and labor lobbies in the past. However, the increased demand for vehicles created by the tax subsidies may offset objections from those lobbies. A PCE deduction would also hopefully satisfy vehicle maintenance lobbies that are against the Clunkers program. Finally, if a Gas Guzzler tax is able to generate enough revenue to cover the costs of these programs, it may satisfy more fiscally conservative constituencies. If it does not, an argument for the critical need to reduce this externality can be made.
Option #3: Implement Increased Fuel Tax at the Pump.

As we have been discussing, global climate change, caused by pollution and oil security are major public-policy challenges for the U.S. As we have shown, these require government intervention to resolve. Our third public policy option to help correct these market failures is a fuel tax. As a whole, a fuel tax will allow the producer to calculate precisely the cost and return on energy–efficient and environmental investments in automobiles and the consumers will know exactly what they will pay or save depending on the decisions that they make. In addition, a fuel tax could induce sustained innovation in energy-efficient vehicles, and it will likely dampen the growth of gasoline consumption. In short, the fuel tax “aims to induce behaviors rather than command it” (Wiemer & Vining, 2005, p218). However, there is inevitably a net deadweight lost, and implementing a tax of any kind always has its political challenges. Here we will discuss the benefits and costs and provide an objective view as to how this option compares to the two previously discussed.

According to the data of Energy Information Administration, the United States is by far the largest consumer of oil in the world, at 20.6 million barrels per day in 2007 (EIA-Annual Energy Outlook, 2009 Early Release Overview). The most important reason is that gasoline prices are relatively low, for example gasoline costs less than half of what it does in Europe. This leads to weak incentives among vehicle producers, purchasers and drivers to change their behavior.

The chart below shows that, “the average cost of one gallon of gasoline in Europe is $8.70 as compared with the U.S. cost of $4.00 per gallon. But the components of the two
different cost figures are drastically different. In the U.S., only 11% of the final cost per gallon is from taxes. At the $4.00 per gallon average cost, this means that $0.44 is tax and $3.56 is the pretax cost per gallon. Europe’s prices, on the other hand, are comprised of 70% taxes and 30% pretax costs. Taxes on the $8.70 average per gallon cost are $6.09 and the pretax cost per gallon is $2.61.” (Morgan, 2008, http://www.babeled.com/2008/06/02/us-versus-european-gas-prices).

<table>
<thead>
<tr>
<th>Component</th>
<th>Unit</th>
<th>US</th>
<th>EU</th>
<th>Difference</th>
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<tr>
<td>Total Cost per Gallon</td>
<td>$</td>
<td>4.00</td>
<td>8.70</td>
<td>4.70</td>
</tr>
<tr>
<td>Taxes</td>
<td>$</td>
<td>0.44</td>
<td>6.09</td>
<td>5.65</td>
</tr>
<tr>
<td>Pretax Cost Per Gallon</td>
<td>$</td>
<td>3.56</td>
<td>2.61</td>
<td>0.95</td>
</tr>
<tr>
<td>Tax Rate</td>
<td>%</td>
<td>11.0</td>
<td>70.0</td>
<td>/</td>
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</table>

By keeping gasoline taxes low, the U.S. has created a situation where consumers are addicted to gasoline because it is such an affordable commodity. This has resulted in many consumers being stuck with big cars that they cannot afford to trade in for smaller, more fuel-efficient ones. This is demonstrated further, as we compare U.S. gasoline usage to that of Europe. Data from the International Energy Agency indicates that European per capita consumption of gas and diesel stood at 286 liters a year in 2001, compared to 1,624 liters per year in the U.S. (UNEP, The Environment In The News, 26 August 2005). It is difficult to say if this difference is entirely due to the excise tax; however, there is no doubt that an impact has been made.
Shifting to economic theory, we note that the demand of a good will decrease when its price increases, although, we do not know the exact shape of the demand curve for gasoline. We do believe the demand curve to be relatively inelastic; therefore, a fuel tax may be an effective source of revenue in the short term. This is due to the fact that substitutes for not using gasoline are not readily available. In the long-term, though, this is not likely the case. An increase in the price of gasoline will most likely cause individuals’ tastes to change for automobiles, which may cause the auto industry to develop more fuel-efficient vehicles. In the end, this will make the demand curve more elastic, as alternatives become available. When this happens, the tax as a form of revenue will decrease, but the end result of using less gasoline will be achieved to some extent.

There are many other examples of government using so called “sin-taxes” to change behavior of American citizens. Among these are taxes on cigarettes to get people to stop smoking and taxes on alcohol to decrease consumption. According to the report “Tobacco and the Economy”, the excise taxes on cigarettes likely resulted in a decrease in demand of approximately 13 percent over a ten-year period (Gale, Foreman, and Capehart, 2000). We believe that the impact on gasoline usage may be similar to what has been demonstrated with cigarettes. According to Stephen Glaister’s model, a professor of transportation at London's Imperial College, “if fuel prices go up ten percent ... fuel consumed goes down by about seven percent, as people start to use fuel more efficiently, not accelerating so aggressively and switching to more fuel-efficient cars. It does change people's behavior” (UNEP, The Environment In The News, 26 August 2005). Finally, we can see by the chart below, that the U.S. is lagging the rest of the world in regards to fuel efficiency. As a world leader, this is a trend that must be
Goals & Objectives – Policy Option #3:

Economic Efficiency

There are several factors being discussed here with regards to economic efficiency. Each is listed below with a brief discussion of points relevant to the implementation of a higher fuel tax:

- Reducing [Externality] Pollution: As demonstrated above, implementing a higher fuel tax will likely reduce the demand of gasoline over the long term. The pace and extent to which this happens, will depend largely on the level of the tax and how quickly the auto industry responds to providing substitute products. This
policy will likely cause a change in behavior. However, it will be the resulting new substitute products that result from this change in consumer behavior that will actually cause a decrease in pollution. Therefore, it is important to look at policies impacting the auto industry, as well as public transportation to be certain that they will be complimentary to a policy on increased fuel taxation.

• **Reducing [Externality] National Dependency on Oil:** This policy will have a direct impact on reducing the national dependency on oil. Again, the substitute products will ultimately cause this, so importance is elevated further to be sure all policies are complimentary.

• **Increasing Competition:** It is expected that the increased fuel tax will cause a change in preference for the type of automobile demanded. Therefore, we expect that this will also result in increased competition among automakers as they race to be the first to best meet the needs of this changing consumer.

• **Stimulation of Innovation:** This policy will likely stimulate innovation to the extent that consumers continue to demand more than what is being provided. In other words, if the next generation hybrid vehicles satisfy consumer demand as shifted from this increased tax, then the stimulation of innovation by this policy will likely stop. However, if the tax continues to be increased over time, both innovation and competition will grow with this tax. Therefore, it is important that this policy remains dynamic and is continually evaluated over the long term.
Equity

- **Costs to Citizens**: Increasing the gasoline tax and the resulting increase in the price of gasoline has a negative effect on people with lower incomes if other options are not available. It also has a negative effect on people who live in remote country sides and highly depend on the cars as a traffic tool. Measures should be taken to compensate and there are distributional equity issues that would need to be addressed. According to the ability-to-pay principle, government could levy the tax according to an individual’s ability to pay; that is, individuals with higher incomes should be charged higher taxes and those low-income families should receive larger income tax rebates. According to an expert, Christina Haines, “Ideally, proceeds from a revenue-neutral gasoline tax could be used to reduce income taxes and payroll taxes of the poor and lower middle class. Gasoline prices affect this group regressively” (Christina Haines, Hiking Taxes on Gasoline: Who Gets Hurt? June 8, 2004).

  On the other hand, under the benefit-to-pay approach, the taxes that people pay are in accordance with the benefits they receive. In order to ensure the equity, individuals who consume more fuel will pay more fuel tax.

- **Costs to Auto Industry**: Although this policy has no direct costs to the auto industry, it does have indirect costs. Since this policy will result in changing consumer preferences, individual automakers must respond to this with a new offering of automobiles in order to remain competitive. Therefore, there will be an indirect cost related to research and development. Consideration must be
given to smaller automakers or those in financial trouble, to be certain that they have an opportunity to meet this new consumer requirement.

**Budget Feasibility**

Ultimately, this policy results in an increase in funds since we are suggesting a tax increase to the consumer. However, we must also consider the best use of this new fund to be certain that the policy has the desired impact. For example, when reviewing the budget impact of this, we should consider the equity issues for low-income families and possibly the research and development costs that will be placed on the auto industry. The administrative costs will be low, as there already exists a fuel tax and this option simply increases the amount.

**Political Feasibility**

Increasing a tax is never an easy thing to accomplish from a political perspective. However, given the importance of this issue and how significantly it will impact our future, we believe that if the equity issues are addressed and the true problem is properly communicated to the taxpayers, this will be politically feasible. Supporting this, a 2006 New York Times/CBS News poll found that, “55 percent said they would support an increase in the tax, which has been 18.4 cents a gallon since 1993, if it did in fact reduce dependence on foreign oil. Fifty-nine percent were in favor if the result was less gasoline consumption and less global warming” (Uchitelle and Thee, 2006, p1). We believe that the favorability can likely be increased further if the public is further educated about the growing problems associated with our inefficient use of gasoline.
RECOMMENDATIONS

A tax on gasoline is the closest equivalent to a Pigouvian tax on emissions. As such it would be the most economically efficient way to reduce emissions and our dependence on oil. As we have seen through the past election gas taxes are a popular topic for voters, and carry a high political price for those who advocate raises in them. Also, a sudden government induced shock to consumer’s preferences, pushing them away from current vehicle bundles towards emission and fuel efficient ones, would create equity and cost issues for manufactures. Considering this, we recommend that the gas tax be implemented in steps and be viewed as a long-term solution. Considering the country’s recent experience with gas in excess of $4 per gallon, we believe that it would be appropriate to increase the tax to this level, creating a price floor and then begin to increase it further over a period of five to ten years.

Finally, although current tax subsides are not the most economically efficient way of reducing these externalities, they will help with the political feasibility of implementing the gas tax and if targeted appropriately, can also be used to address the equity issues presented by the increased gas tax. Therefore, we recommend that the revenues that are received by the implementation of an increased gas tax be applied towards the second best alternative and be used as targeted subsidies for the purchase of vehicles meeting set emissions standards. It is our recommendation that these subsidies be implemented on a sliding scale based on income, with the highest subsidies going to those with the lowest income.
By phasing in the gas tax over time, the auto industry will have enough time to efficiently make changes to their product offerings, including the development of new, more environmentally friendly automobiles. The increased consumer demand caused by the gas tax and subsidies, will spur the auto industry to shift current research and development efforts to be more focused on these advanced technology vehicles. We do not support the funding of research and development in the auto industry, as we do not feel that this is achievable from a budgetary standpoint, as the required funds would need to be extraordinarily large in order to make an impact on their R&D decisions. In addition, we believe that the induced shift in demand offers a more efficient way to cause the desired market change and best aligns the costs and benefits to society in the most equitable manner.
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<tr>
<th>Goals</th>
<th>Impact Category</th>
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<tr>
<td></td>
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<td>R&amp;D Incentives for Technology Development</td>
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<td>Economic Efficiency</td>
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<tr>
<td></td>
<td>Reducing Externalities: National Security (Oil Dependency)</td>
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<td></td>
<td>Increasing Competition</td>
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<td>Stimulate Innovation in Auto Industry</td>
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</table>

Ranking: poor, fair, neutral, good, excellent.
BIBLIOGRAPHY


Yacobucci, Brent. (2008). Regulation of Vehicle Greenhouse Gas Emissionis: State and