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CAFE Standards and the Federal Gas Tax: Impact on Private Transit CO2 Emissions

Emily Giovannetti

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CAFE STANDARDS AND THE FEDERAL GAS TAX: IMPACT ON PRIVATE TRANSIT CO2 EMISSIONS

by

Emily Giovannetti

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Richard Tyler Priest
Thesis Mentor

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Richard Tyler Priest
Environmental Policy and Planning Honors Advisor

CAFE Standards and the Federal Gas Tax: Impact on Private Transit CO_2 Emissions

Emily Giovannetti
University of Iowa Environmental Policy and Planning Studies 2018

I) Abstract

The United States is the largest contributor to greenhouse gas (GHG) emissions per capita in the world, and the majority of those emissions are created in the transportation sector. Two policies are often debated in regards to reducing gasoline consumption, and therefore CO_2 emissions: Corporate Average Fuel Economy Standards (CAFE) and the Federal Gasoline Tax. Additionally, there are many policies that been considered at the federal level but not yet enacted, which may be effective at achieving the same goal. The CAFE Standards, alone, are not entirely successful. They place a significant burden on auto manufacturers to produce fuel-efficient vehicle technologies that are not valued by American consumers at the current gasoline tax rate. The Federal Gasoline Tax incentivizes consumers to purchase more fuel-efficient vehicles produced by manufacturers. An increase in the tax is needed as less fuel-efficient vehicles are growing in popularity in response to low gas prices. However, the political feasibility of a substantially increased Federal Gasoline Tax is improbable. The CAFE Standards have proven effective at reducing gasoline consumption, however are contingent on American's want to purchase fuel efficient vehicles. An increase in the Federal Gas Tax creates an effective economic incentive for American's to purchase fuel-efficient vehicles. Therefore, the combination of the two policies are optimal, thereby mandating increased supply and increasing consumer demand.

II) Introduction

The nearly 270 million vehicles registered in the United States exemplify Americans' dependence on their personal transportation. U.S. Energy Information Administration recently reported that the transportation sector has surpassed the energy production sector in carbon dioxide emissions for the first time in over 40 years (Milman) (EIA). Additionally, while total United States' energy related GHG emissions fell 1.7% in 2016, the transportation sector was the

only sector that saw an increase in emissions, by 1.9% (EIA). With the eminent threat of climate change, it seems that the transportation sector may the most important component in the fight to mitigate Co_2.

The United States has enacted various policies that may reduce transportation emissions, though it was not the original intention of such policies. CAFE Standards were enacted after the 1975 Energy Crisis as a means of reducing oil dependency. After the Supreme Court ruled in 2007 in *Massachusetts v EPA* that Co_2 was legally recognized as an air pollutant, the EPA has been using the CAFE/GHG joint rulings to the regulate pollutants in the transportation sector. Although the effectiveness has been challenged, nevertheless it is still a federal regulatory tool.

The Federal Gas Tax was not originally implemented as a Pigouvian Tax, enacting a tax to dissuade use of a good that causes negative externalities. Instituted Pigouvian taxes include noise taxes and carbon taxes, and act as a corrective tax. However, with increasing data on the transportation industry's environmental impact, it is evident that economic disincentives on oil would have positive externalities, giving rise to the argument that the Federal Gas Tax should be increase and enforced as a Pigouvian Tax. In addition to the positive externalities that come with monetarily dissuading use of a harmful good, increasing the Federal Gas Tax would benefit the Highway Trust Fund that is in dire need of funding to advance transportation infrastructure.

Both policy implementations are possibilities for effectively reducing emissions in the private transportation sector. There is an array of policy options that may reduce the transportation emissions that have not been considered or enacted on the federal level. The United States has been less progressive on environmental policies and taxation than European countries that have substantially higher gasoline taxes in addition to more policies that reduce

driving and therefore CO_2 emissions. However, this paper will primarily analyze the CAFE Standards and the Federal Gasoline.

III) History of the Corporate Average Fuel Economy Standard

Congress passed the United States Energy Policy Act of 1975 amid an oil supply crisis. The United States suffered from a reduced supply of oil, due to the brief Arab Oil Embargo of 1973. The oil embargo created an awareness that domestic oil price volatility was contingent on the amount of oil imported from a non-domestic source. At that time, Americans consumed 40% of the globally produced energy, primarily from fossil fuels, and 55% of all gasoline consumed from autos. In 1973, U.S. congressman Morris "Mo" Udall, proposed the United States would be fossil fuel independent by 2000, claiming that the United States was "glutinously" consuming oil (Udall, 1973). Though, this claim was debatable, it was evident that the United States' economy was fossil fuel intensive and dependent on foreign sources.

The Energy Policy Act of 1975 established the Corporate Average Fuel Economy Standards and directed the Environmental Protection Agency and the Department of Transportation to enforce them. The CAFE Standards mandated auto manufactures to not only produce, but sell, passenger vehicles that averaged at an initial 14.6 miles per gallon target for all Model Year (MY) 1978 car and light trucks (Gelick, 2003). Starting with MY 1985, the EPA and The DOT increased the Standard to 27.5 miles per gallon for passenger vehicles and 20.7 MPG for light-trucks (Union, 2017). The 27.5 mpg standard remained in place through 2006.

The CAFE Standards have been a large, federal collaboration between agencies. The responsible agencies for implementing the Standard are the EPA, Department of Transportation, and the National Highway Traffic Safety Administration (NHTSA). The EPA is responsible for administering the test to calculate fuel economy, vehicle emissions, and the overall CAFE targets

for auto manufacturers. The NHTSA is responsible for establishing and enforcing the CAFE Standards, and penalizing auto manufacturers that do not meet the Standard.

The Energy Independence and Security Act (EISA) of 2007 significantly revised CAFE standards for the first time since 1975. EISA increased the Standard to 35.5 mpg by MY 2016 ("*Proposed,*" 2012). Additionally, following the Supreme Court Ruling of *Massachusetts v. EPA* in 2007, carbon dioxide emissions were now required to be regulated under the Clean Air Act. In 2010, the EPA and NHTSA began joint regulating GHG emissions and fuel efficiency from automobiles through various means, including the CAFE regulations and the Tier 3 Motor Vehicle Emission Standards. In addition to the Federal CAFE Standards, California, 13 participating states, and the District of Columbia enacted more stringent auto pollution standards following 2004 as directed by the California Air Resources Board (CARB) ("*Automobile*", 6). Additionally, in response to the new ruling, the NHTSA was required to adjust the regulation to regulate "based on 1 or more vehicle attributes related to fuel economy … in the form of a mathematical function," ("*Automobile*", 6). In response, the NHTSA initiated a size-based regulation that was later adopted by the EPA ("*Automobile*", 6).

When the standard was initially instituted MY1978, light-trucks were regulated separately under the premise that they were needed for hauling and farm use. However, in MY 2008 this was revised. The standard now instituted a "footprint" based regulatory system that categorized vehicle emission requirements based a measure of vehicle size called "footprint," the product of multiplying a vehicle's wheelbase by its track width. A mandated maximum fuel economy is established for each increment in footprint, meaning smaller footprint light trucks have higher targets and larger ones, lower targets. Subsequent, this has disputably encouraged auto manufacturers to produce larger vehicles (National Highway, 2018).

The series of joint rulemakings to streamline fuel standards was titled the "National Program." Regulations were agreed upon by state governments, the federal government, and auto makers alike during the Obama Administration in order to regulate GHG emissions and fuel standards. In 2011, the EPA and the NHTSA agreed to increase the target for a 5% yearly increase, reaching 54.5 mpg by MY 2025 ("*Proposed*", 133). The 54.5 mpg is equivalent to about a 35-40 real world mpg, due to the format of the EPA's testing. The first increase will require automobile fleets to increase their average fuel economy to 41.0 miles per gallon, and must be met by 2021. The second increase is set at 54.5 miles per gallon, and must be met by 2025 (*Tier*, 2).

Table 1. MY2016-MY2025 Combined Passenger Car and Light Truck GHG and CAFE Standards

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
GHG Standard (grams/mile)[a]	250	243	232	222	213	199	190	180	171	163
GHG-Equivalent Fuel Economy (miles per gallon equivalent)[a]	35.5	36.6	38.3	40.0	41.7	44.7	46.8	49.4	52.0	54.5
Fuel Economy (CAFE) Standard (miles per gallon)[a]	34.1	35.4	36.5	37.7	38.9	41.0	43.0[b]	45.1[b]	47.4[b]	49.7[b]

Source: EPA and NHTSA, *2017 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions and Corporate Average Fuel Economy Standards*, Prepublication Version, August 28, 2012.

Figure 1: The Increase GHG and MPG Standards MY206-MY2025

Additionally, this 5% increase would reduce gasoline consumption by 27 million gallons each year, reduce CO_2 emissions by 190 million metric tons per year, and cost $25 billion annually. The increase would nearly double from the standards of 2010 in a period of fifteen years, and there is criticism from auto manufacturers that they will be unable to meet the standard, due to lacking technology and lack of consumer demand, putting the EPA on defense.

Figure 1 depicts the progression of GHG emmission allowances along with fuel economy allowances for MY 2016-2025.

IV) History of the Federal Gas Tax

The first federal tax on gasoline was established through the Revenue Act of 1932, during the Great Depression. Though, individual states had implemented gasoline taxes prior to the federal enactment. The act levied a one-cent-per-gallon tax on gasoline. The policy was driven by the need to balance the budget in a time of increased federal spending for relief and work projects. The gas tax would continue to be used to generate general revenue for decades. The gas tax, alone, was predicted to raise $150 million for the general treasury in the period of a year. The Federal Gas Tax was set to expire after a year. In 1933, Congress renewed the federal gas tax and increased it to 1.5 cents per gallon. Although the tax was initially proposed to be temporary, the Revenue Act of 1941 extended it again at 1.5 cents, much to the dismay of oil producers, auto manufacturers, trucking firms, and farming groups who strongly petitioned against the tax (Weingroff, 2017).

Due to the successful revenue production of the Federal Gas Tax, the tax was increased to financially aid the Korean War. The Revenue Act of 1951 increased the gas tax to two cents. Although, again, a supposed temporary increase, the tax was extended until 1956 in a series of renewals. The Highway Act of 1956, passed to fund the construction of the national interstate highway system, increased the federal gas tax to three cents and dedicated revenues to the Highway Trust Fund. The fund was created to be a part of the general revenue, but the gas tax revenue would be held in a trust fund to be reserved for interstate and highway creation and maintenance. The Federal Highway Act of 1961 increased the tax, again, to four cents, where it remained at until 1972 (Weingroff, 2017).

During the Reagan Administration, Congress increased the tax to nine cents under the Surface Transportation Assistance Act. Additionally, the Act divided the Highway Trust Fund into two funds, the Highway Account and the Mass Transit Account. The Highway Account received the majority of revenue collected, eight cents per gallon, and the Mass Transit Account received a paltry one cent. Four years later, an additional account was added to the Highway Trust Fund, the Leaking Underground Storage Tank Trust Fund, which received an additional .1 cent to the tax for environmental cleanup efforts (Weingroff, 2017).

In 1990, the gas tax initiated purpose strayed from the Highway Trust Fund, and half of the tax revenue was dedicated to deficit relief. The Omnibus Budget Reconciliation Act of 1990 also increased the gas tax by another five cents. Three years later, the Omnibus Budget Reconciliation Act of 1993 increased the gas tax a final time to a total of 18.4 cents. The Omnibus Budget Reconciliation Act of 1993 dedicated the entire increase of 4.3 cents to deficit reduction, which was later redirected to the Highway Trust Fund in 1997 (Weingroff, 2017). Over the course of the gas tax history, its primary purpose was revenue collection and gas and transit needs. While the gas has been discussed as Pigouvian Tax, it has generally been used to increase revenues (United States. Congress, 1989).

V) CAFE Standards in Modern Context

Auto makers and politicians alike have major concerns about recent revisions to the MY 2017-2024 CAFÉ standards. A large concern is the cost of compliance imposed by increased gasoline usage. President Trump stated, “My administration will work tirelessly to eliminate the industry-killing regulations, to lower the job crushing taxes and to ensure a level playing field for all American companies and workers,” in reference to CAFE regulations (Glinton, 2017).

The increased standards have resulted in petitions from multiple entities including a large petition from the President and CEO of the Alliance and Automobile Manufactures and the Association of Global Automakers in 2016, stating that the attempted harmonization of the then lower federal regulation and the higher state regulations are likely going to result in American auto makers paying a penalty for missing CAFE Standards. Additionally, the petition questions "inconsistencies" in the standard, such as the accounted technology that has yet been implemented, the amount of fuel realistically saved due to the standard in relation to increased vehicle miles traveled (VMT), and the application of previous earned credits. Although a portion of the petition's arguments are not legitimate, their argument remains. Overall, this petition asked the EPA to reduce their goal for MY 2017-2025 by 8% (*Petition*, 2016).

Moreover, American automakers did miss the regulatory standard's goal in 2016. The standard was missed by 9 grams of CO_2 per mile for MY 2016. Auto makers were not forced to pay a penalty, and rather applied credits from previous years earned from exceeding the standards in previous years. Auto makers stated that they missed the CAFE Standard regulatory target because cheap gas prices have been encouraging Americans to buy light trucks (Bloomberg, 2018). Additionally, data would support auto makers claim. Sales of light-duty trucks, small SUVs, and large SUVs alike have soared, far outselling sedans. This transition occurred as gas prices remain nearly stagnant. The image below shows a side-by-side comparison of the depletion of cars sales in conjunction with the increase of light truck sales, along with stagnant gasoline prices which are strongly correlated.

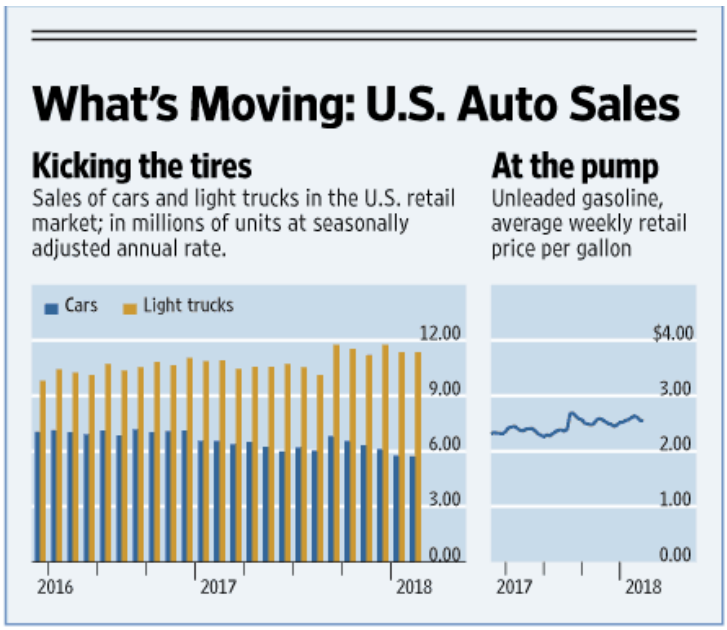

Figure 2: Car and Light Truck Sales 2016-2018 and Gasoline Costs 2017-2018 ("*Autosales*", *Wall Street Journal*, 2018)

The Obama Administration, led by then EPA Administrator Gina McCarthy, completed a midterm evaluation of the Standards in 2017. The EPA concluded that the regulations were feasible and proposed economic and societal benefits subsequent of the standard increase. However, the EPA under the Trump Administration reopened the midterm review in March, 2017. As of April 2, 2018, the controversial EPA Administrator, Scott Pruitt, announced a plan for revision of the CAFE/GHG Standards for MY2022-2025. Pruitt stated that the Obama-era midterm evaluation was based on outdated information, and current data would suggest that the standards are excessively stringent. "Obama's EPA cut the Midterm Evaluation process short with politically charged expediency, made assumptions about the standards that didn't comport with reality, and set the standards too high," announced Pruitt. With this, the EPA has committed to revising the Standards in partnership with the NHTSA to make the regulations more auto industry flattering. Additionally, the more stringent emissions standards of California and 13

other states, allowed by a waiver in for California in the Clean Air Act, is being reexamined. Pruitt, in the interest of auto makers, would prefer a national standard that allows auto makers to streamline their production (*EPA*, 2018).

The current state of the CAFE Standard/GHG Program is certainly in question by the current Administration. The business sympathetic Administration recognizes Automakers challenges with the combination of Americans' desire to drive larger vehicles and the claim of unavailable technology to improve the MPG for light-duty vehicles. This legitimate argument takes into question the inefficiencies of the CAFE regulation in conjunction with low gas prices.

VI) Fiscal Implications of Increased CAFE Standards

The mandated increase of the standard between MY2016 and MY2025 will increase the cost of a vehicle an average of $1,800 per the EPA (Yacobucci,7). However, the payback period of the instituted technology will occur in slightly over three years. The fuel efficiency savings are expected to exceed the cost of the technology for the consumer in the long run, resulting in the amount paid for the technology will be returned in an estimated three years. For a MY 2025 vehicle that meets the current expected regulatory requirement of 54.5 MPG, the projected net savings in fuel costs is between $3,400 and $5,000 over the lifetime of the vehicle, according to the EPA (Yacobucci, 7). The EPA and the NHTSA both agree that though the costs of implementing the regulations are high, the benefits financially exceed the costs. Per the Congressional Research Service, the EPA estimates the costs of the program to automakers and consumers at about $148 billion to $156 billion, while the benefits are about $510 billion to $639 billion over the lifespan of the vehicles covered by the rule, depending on various factors, most of all the discount rate. Roughly 80% of these benefits are expected to be a result of reduced fuel

expenditures (Yacobucci, 8). However, this is mainly beneficial to the consumers and not manufacturers, as consumers are not demanding the increased fuel economy, however are benefiting from the increased fuel technology that auto makers are mandated to implement.

The cost to increase the fuel efficiency for auto manufacturers is often criticized as economically burdening. The technology designs have been debated as costly for auto manufacturers and consumers alike. There is variation between auto manufacturers regarding the costs of compliance. As auto manufactures have argued, meeting the regulations would not come without a price. A primary fiscal argument made against the CAFE Standards is that the regulations force auto manufacturers to divert money away from features that consumers take into high consideration when purchasing a car, and redirects that financial support to meet regulations. Otherwise, auto manufacturers would be able to invest in styling, performance, and other vehicle features, rather than the technology to meet the requirements (Anderson, 67.) Fuel efficiency efforts transcend consumers' interests, and therefore are a wasted investment from the auto maker's perspective.

Additionally, because the CAFE regulations are based on car sales and not car production, auto manufactures' marketing strategies have been forced to evolve towards the standards. The standards have assigned auto markers' marketing teams the burden of promoting fuel efficient vehicles, and have displaced marketing efforts to promote vehicles that meet or exceed the regulatory requirements. Studies indicate that consumers place more interest on increased power, rather than increased fuel efficiency, which has created a marketing challenge for marketing teams to convince consumers that fuel-efficient vehicles are more attractive than fuel guzzling, powerful vehicles (Zielinski, 462). Marketing strategies must overcome the

innovative tradeoffs that do not please consumers' wants, due to low gasoline prices, in order to comply to the standard.

Research and development engineering costs have not unduly increased due to increasing Standards. According to Transportation Research Board and the National Research Council, research and development costs have increased regardless of the Standards, forfeiting the argument that the increase fuel efficiency standards increase research and development costs. The argument states that automotive engineering costs would have increased regardless of the CAFE Standards, due to collective engineering improvements in vehicles (Transportation, 23-24).

Additionally, larger the auto manufacturer, the more expensive it is to produce regulatory compliant vehicles. This is explained as follows. While some smaller manufactures are not predicted to be burdened by the increase in regulation, some of the largest domestic car makers will see higher cost volumes, because of combination of the fuel efficiency technology and their massive production. While economies of scale may play in their favor, it remains that this is a costly arrangement for large auto manufacturers. Below are the estimated incremental costs for based on projected car sales for MY 2025.

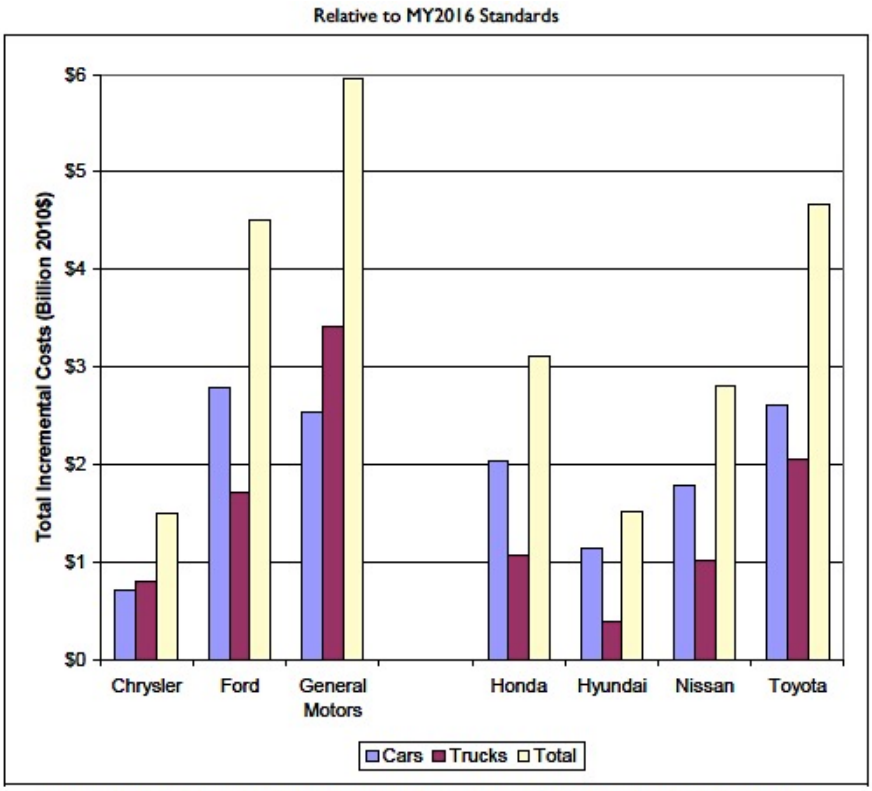

Figure 3: EPA's Estimate Cost to Automaker's Based on Predicted Sales of MY 2025 (Yacobucci, 9).

VII) Social Implications of CAFE Standards

There are important positive monetary and social externalities that are generated by CAFE. The CAFE Regulations and the Tier 3 Fuel Efficiency Standards enforced by the EPA work together, because of the tight linkage between fuel consumption and GHG. The Tier 3 Standards regulate the allowed particulate matter in tailpipe emissions from vehicles, which allows emission controls to be more effective. In return, this allows the vehicle's catalytic converter to function more efficiently and facilitates the improvement of lower cost technologies to improve fuel economy (*Tier*, 4-5). Under the Tier 3 Standards 10 parts per million (ppm) sulfur is the regulatory maximum, down from 30 ppm under the Tier 2 Standards. The Standards

regulate air pollutants including carbon monoxide (CO), formaldehyde (HCHO), nitrogen oxides (NOx), non-methane organic gases (NMOG, a class of volatile organic compounds (VOCs), and particulate matter (PM). The health benefits from regulating the fuel efficiency of vehicles results in a projected $7.4-$19 billion in monetarized health benefits, from a reduction in missed school days, missed work days, and less hospital visits related to air pollution intake (*Tier*, 4-5).

Auto makers cite that the Standards will cause job loss; however, reports have cited both job creation and job loss due to the Standards. Reports from the Union of Concerned Scientists state positive job growth stimulated by the CAFE Standards. The monetary savings in fuel will result in increased spending in other areas of the economy, causing increased economic development. Additionally, the study cites that job creation would result from necessary engineering to meet the Standards. It is estimated that 300,000 jobs would be created from the economic stimulation resulting from CAFE (*Potential*, 407). Jobs that will see the largest growth, according the study, will be in the services and motor vehicle sector. However, it would cause job displacement, primarily in the energy sector due to reduced fuel dependency.

Reports have cited that the "rebound effect," i.e., increased vehicle miles traveled (VMT) due to increased fuel efficiency and lower, per-mile, out-of-pocket costs, would result in no monetary savings and no beneficial externalities. The speculation is due to higher fuel-efficiency, consumers will choose to drive more, and the result will be no net fuel or monetary savings. However, this speculation is not well substantiated (*Potential*, 408). CAFE regulations have reduced fuel consumption by 19 million gallons a year from 1978 to 1993 (*Potential*, 408). Because of the increased CAFE Regulation, fuel consumption in the transportation sector is projected to significantly decreased, proposing lower costs to consumers. The National Program is estimated to save 4 billion barrels of oil, or 168 billion gallons, and to reduce GHG emissions

by 2 billion metric tons over the lifetimes of those light duty vehicles produced in MYs 2017–2025 (*Rules*, 62625). Figure 4 is a simulated gasoline consumption projection, showing a downward trend, years 2016-2050.

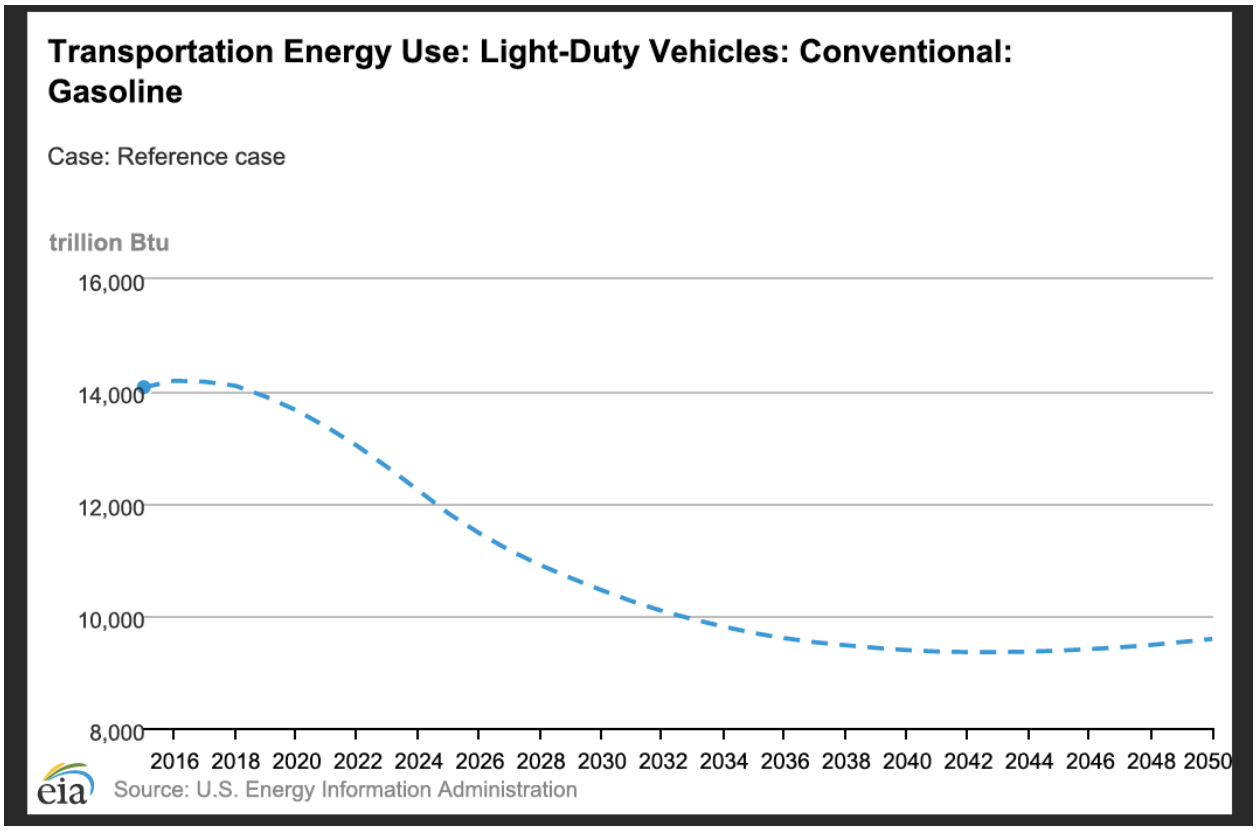

Figure 4: Light Duty Vehicles Gasoline Consumption Projection (Annual Energy Outlook 2017
Table: Light-Duty Vehicle Energy Consumption by Technology Type and Fuel Type
Case: Reference case)

However, because of the decrease in fuel consumption, there is proportionally less gasoline tax revenue, causing a negative impact on the National Highway Trust Fund (HTF). The National Highway Trust Fund, which as earlier stated, largely supports the construction and maintenance of roads, gains its revenues from a tax per gallon of gasoline purchased. If consumers are consuming less gas, then the gasoline tax is raising less revenues. Adjusted for inflation, there is a calculated 27% decrease in annual revenues in the HTF from 1993 to 2014.

The fuel-efficiency of vehicles and the continued road usage are resulting in an ongoing erosion in the HTF, and annual battles in Congress to remedy the deficiency (Kieran, 20152015). Therefore, if fuel consumption continues to decline, the HTF will have to implement another solution to generate funds. Likely alternative possibilities are a VMT tax or using the General Revenue Fund (Kieran, 2015).

VIII) Fiscal Implications of the Federal Gas Tax and Political Feasibility

As previously stated, the Federal Gas Tax may have Pigouvian effects, being that there are positive externalities by instituting an environmental tax. The effect of taxing a good that has large externalities, results in the erosion of negative externalities. Therefore, environmental taxes lead to efficiency gains (Ballard, 2005). The efficiency gains pertaining to an increase in the Federal Gas Tax include reduced pollution, traffic congestion, and vehicle accidents. The Federal Gasoline Tax has been instituted for the purpose of increasing revenues throughout its history, however with new knowledge of air pullulating impacts of gasoline emissions and a depleting HTF, there is stronger incentive than ever to increase the Federal Gas Tax.

First, it is worth noting that the Federal Gas Tax creates more revenue than any other commodity tax, $30 billion annually on the federal level and a varying amount between states (West, 2007). Although, this number is declining, and are costing Americans in the long run. Due to the lack of maintenance on our bridges, highways, and transportation surfaces, it is estimated that it costs approximately $97 billion in vehicle operating costs, $32 billion in travel time delays, $1.2 billion in safety costs, and $590 million in environmental costs, (Reid, 54). Additionally, the $30 billion generated does not nearly meet what the Federal Highway Administration cites is necessary each year for capital highway improvements, which is $170

billion (Reid, 54). Since 2008, Congress has transferred $54 billion from the General Treasury Fund to the HTF, still negligible compared to the amount needed (Puro, 1).

Also, worth noting is that when gas prices increase, it has insignificant effects on the Federal Gas Tax in its current state. As stated in by Robert L. Reid, senior Editor of the academic journal *Civil Engineering*, "According to the Energy Information Administration's statistics, that threefold in- crease over two decades did not benefit the Highway Trust Fund at all because the tax is charged only on the number of gallons purchased; the tax has never been indexed to inflation." Therefore, when gas prices are high, the HTF sees no benefit. Reid goes on to stating that the Federal Gas Tax is "…the equivalent of someone trying to live in 2013 on a salary he or she made in 1993 without ever receiving a raise," (Reid, 54-55). According to the Congressional Budget Office, if the tax were adjusted for inflation to meet the revenue of 18.4 cents per gallon in 1993, the equivalent gasoline tax would be 30 cents per gallon today (Puro, 8).

Additionally, fuel efficiency is a culprit in the HTF deficiencies. In 1993, VMT was 2.3 million. In 2012, VMT increased to just below 3 million. Presumably, if VMT increases, so would gas tax revenue, although this is not the case, and CAFE is cited as the reasoning as to why. It is estimated that the Obama Era CAFE Standards would result in a 21% decrease in gasoline tax revenues by 2040 (Reid, 56). As stated previously, the CAFE Standards would largely reduce gasoline consumption, and therefore Federal Gas Tax Revenues.

Conversely, it is often cited that the Federal Gas Tax is a regressive tax, meaning that it disproportionately impacts lower income households. However, when alternatively viewing household spending expenditures versus household income, the gasoline tax appears far less regressive than conventional analyses suggest (Poterba, 145). Although the top 5% of income expenditure households spend much less than the bottom 5% of income expenditure households,

it is true that low-expenditure households devote a smaller share of their budget to gasoline than do their counterparts in the middle expenditure distribution. “Consumers in the lowest expenditure decile spend 3.9% of their income expenditures on gasoline and motor oils compared to 5.6% of deciles in the fifth and sixth deciles,” says economist from MIT, James M Poterba. However, it may be noted that urban planning and geographic income distributions may play a role. People from lower-expenditure households may rely on public transportation as opposed to middle-expenditure households who live in suburban areas that do not offer reliable public transit. Lower-expenditure households, additionally, likely have less vehicles then middle-expenditure households. Therefore, it is possible to conclude that due to middle-expenditure households’ dependency on their autos, they would be most impacted by an increased Federal Gas Tax.

However, it remains that the political feasibility of increasing the Federal Gas Tax appears negligible. Historically, the Federal Gas Tax has been implemented or increased for the purpose of generating revenues that do not pertain to transportation needs more so than generating funding for transportation. This includes, raising revenues for wars or deficit relief. President Trump proposed in early 2018 to increase the Federal Gas Tax by 25 cents per gallon, to meet the Americans infrastructure needs, which was met with a deafening cry of “no.” Although, a 25-cent hike phased in over five years would generate an additional $375 billion over the next 10 years, per the U.S. Chamber of Commerce, which backs the idea, cites Politico (Gardener, 2018). Trump was met with huge upset from large, conservative groups including FreedomWorks, Americans for Tax Reform, and Americans for Prosperity. This backlash resulted in Trump later dropping the proposal.

IX) Gas Tax Necessary to Curb Driving Habits

Currently, the gas tax is an average of 41 cents nationally, with the combined 18.4 cent federal gas tax and the varying state and local gas tax. The average state gasoline tax is 23.5 cents per gallon, and ranges from 12.25 cents to 58.2 cents per gallon (Drenkard, 2017). According to researchers, the current gas tax rate is not an optimal rate to curb Americans' driving habits, and therefore reduce air pollution, traffic congestion, and vehicle accidents. The optimal gas tax rate is significantly higher than marginal damages and fully corrects for the externalities, which exceed $130 billion dollars annually (West, 2007), (Reid, 54).

Regarding gasoline consumption, studies suggest that an increase in the federal gas tax rate as little as 1% would result in .72% increase in fuel economy (Poterba, 161). Estimates conclude with the assumption of a VMT elasticity of -0.2, a 30 cent per gallon gasoline tax would save the same present discounted quantity of gasoline at a cost that is 71% lower than the comparable CAFE policy. Thirty cents per gallon would represent a 73% increase over the

Discount rate	**12%**		**6%**	
VMT elasticity	**−0.2**	**−0.15**	**−0.2**	**−0.15**
Discounted gals saved, +3.8 mpg CAFE	41.7 bn	43.8 bn	64.5 bn	67.8 bn
"Equivalent" gasoline tax	30.0¢	33.7¢	32.7¢	36.3¢
Discounted welfare costs, CAFE	$21.5 bn	$21.5 bn	$29.2 bn	$29.2 bn
Discounted welfare costs, Gasoline tax	$6.3 bn	$7.4 bn	$10.5 bn	$12.3 bn
Reduction in cost, tax vs. CAFE	71%	65%	64%	58%

Note: Equivalence of gasoline tax with 3.8-mpg increase in CAFE standards is determined by total (discounted) gallons saved over 14 years.

Figure 5: Present discounted costs, CAFE versus gasoline tax over 14 years: 3.8-mpg increase in CAFE standards versus "equivalent" gasoline tax (Austin, David and Dinan, Terry, Clearing the air: The Costs and Consequences of Higher CAFE Standards and Increased Gasoline Taxes)

existing tax on gasoline in the US. Therefore, a 30 cent per gallon increase in the gas tax would be as effective as the CAFE Standard in the span of 14 years (Austin, 2005). Figure 5 presents the gas tax and CAFE Standard equivalencies per VMT elasticity.

Additionally, as opposed to the CAFE Standard, the Federal Gas Tax would have immediate effects. The CAFE Standards regulatory increase would not have an impact on half of the American fleets for 12 years, the median age of cars in the United States. Rather than wait the amount of time it would take to phase in fuel-efficient model years, an increase in the gas tax would have immediate impacts on driving habits. The reduction in driving would also aid congestion issues plaguing densely populated areas. Effectively, an increase in the Federal Gas Tax would be most effective at dissuading use (Austin, 2005). As Figure 6, below, explains high oil prices have a significant impact on VMT. Figure 6 depicts, As simulated from years 2016-

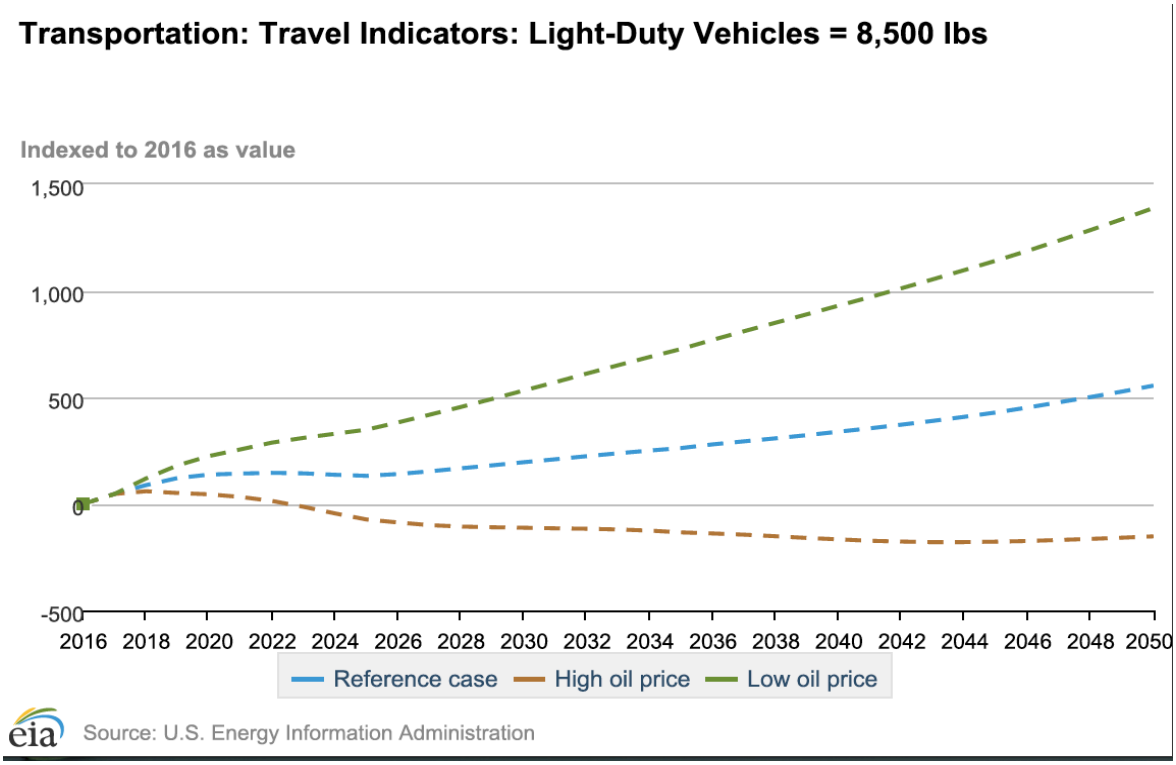

Figure 6: Transportation: Travel Indicators: Light-Duty Vehicles (Annual Energy Outlook 2017

2050 by the U.S. Energy Information Administration, the higher the oil prices, the less drivers choose to travel, and the lower the oil prices, the more drivers choose to travel. Drivers consciously choose to drive approximate VMT based on the economic impact it has on their individual.

Moreover, an increase in the Gas Tax is more fiscally responsible. At a 6% discount rate, the cost of an increased tax would be an estimated $12 billion, 58% less than the cost of CAFE standards for the same fuel savings (Austin, 2005). This results from the lack of enforcement required and voluntary compliance resulting from an increase demand of fuel efficient vehicles from consumers. In addition to the gas tax being significantly cheaper to implement and causing immediate impacts, the Federal Gas Tax increase will aid highway infrastructure costs.

X) International Comparison of Gasoline Tax Rates

European Nations have been more instrumental in implementing high gas taxes compared to the United States. European Nations have substantially higher gasoline taxes for the purpose

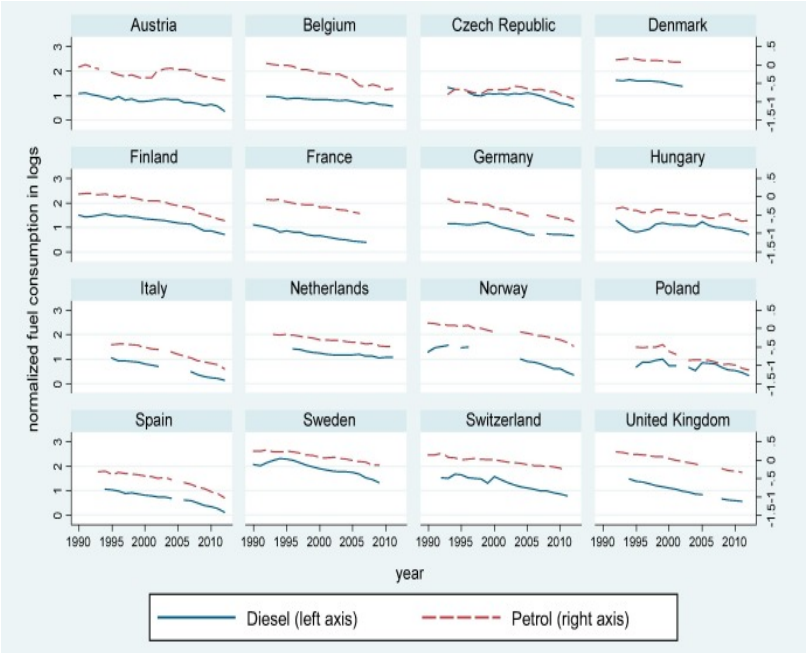

Figure 7: European Normalized Fuel Consumption Logs (Anne Zimmer, Nicolas Koch, Fuel consumption dynamics in Europe: Tax Reform Implications for Air Pollution and Carbon Emissions)

of dissuading use and limiting negative externalities. Similar to the United States, the only sector that has seen an increase of emissions in the EU is transportation. Road transport accounted for around 20% of total greenhouse gas emissions in the EU in 2013, and is the second largest contributor to GHG (Zimmer, 2017). European Nations have found that fuel efficiency policies fail to set consistent incentives to reduce gasoline consumption. However, price-based policies have been effective. The Figure 7 shows the impact higher gasoline costs have on consumption. As the oil prices in European Nations have increased, oil consumption has decreased. This is likely a concious decision from consumers to consume less oil, based on the monetary impact in has on the individual.

Comparatively, the United States is seriously lagging behind other nations regarding gasoline tax rates. Per the Organisation for Economic Cooperation and Development, the average gas tax rate amongst the 34 most advanced global economies is $2.62 per gallon. This is nearly

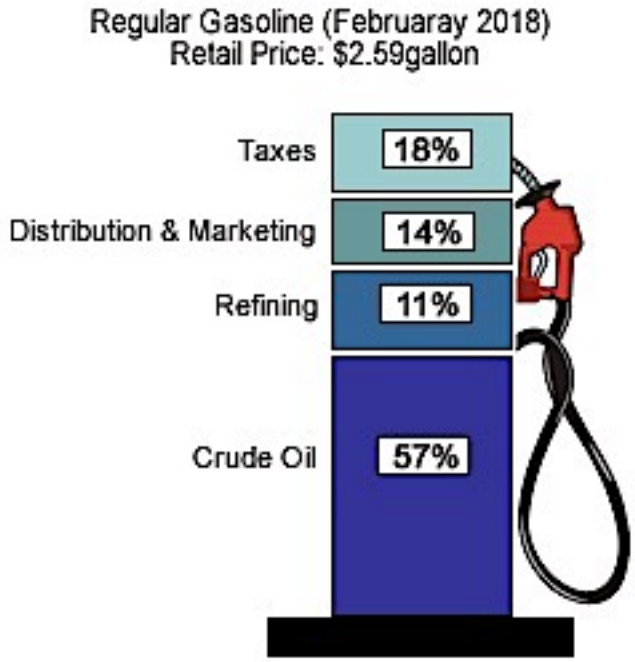

Figure 8: United States Regular Gasoline Retail Prices (February 2018) (EIA, Gasoline and Diesel Fuel Update)

equivalent to what Americans spend in total for a gallon of gasoline (Pomerleau, 2017). Figure 8 depicts where money is allocated according to the price per gallon of gasoline. In the United States, the price per gallon of gasoline was an average of $2.59 per gallon in February of 2018.

Proposal alternatives to the CAFE Standards and to the Federal Gas Tax have been contemplated on a Federal level, with little sincerity due to the difficulty of policy implementation and gridlock in the United States. Foreign nations, especially European Nations with aggressive environmental goals, have proposed a variety of policy solutions to reducing emissions and negative externalities in the transit sector. These policy alternatives include a Vehicle Miles Traveled Tax, a CO_2 Tax, and Indexed User Roadway Tolls among others.

XII) Ultimate Policy Proposal

Ultimately, the CAFE Standards have proven effective in reducing gasoline consumption, and therefore GHG emissions among other negative externalities. It is established that the social costs, accounted for in positive environmental externalities, increased productivity, fuel savings, and job creation are substantial. These positive externalities exceed the costs to auto manufacturers and consumers, accounted for in engineering costs, new technologies, and regulatory costs. Additionally, there is evidence that suggests that an increase in the Federal Gas Tax would be largely effective, or more effective than the CAFE Standards. An increase in the Federal Gas Tax would be more economical and have immediate impacts on Americans' VMT, and therefore emissions. An increase in the Federal Gas Tax would, additionally, aid the deficit that the High Trust Fund suffers.

Phasing in an increase of the Federal Gas Tax a total of 40 cents per gallon within a two-year period would be optimal. According to researchers, the CAFE Standards have accomplished what a projected 40 cent Federal Gas Tax would have accomplished. The current complaint from

auto manufactures is they are producing vehicles that are mandated to be engineered more fuel efficient, and current consumers do not value the fuel saving technology. A Federal Gas Tax equivalent to 40 cents would create demand for the fuel-efficient vehicles that are mandated, and the CAFE Standard increasing until 2025 ensure that auto manufactures produce the fuel-efficient vehicles.

To the advantage of the Highway Trust Fund's, the 40 cents per gallon total would increase the Highway Trust Fund revenues. If lawmakers continue to use the Highway Trust Fund as the sole revenue producer for highway infrastructure, then the increase would return the taxes to the level they were in 1993, adjusting for inflation, and some additional in the interest of curbing driving habits. As a result of the increased revenue, the opportunity to fix the nation's depleting roads will arise. Road improvements and will have additional positive effects on fuel economy and therefore emissions.

To avoid disruptions in the oil market and markets contingent on gasoline prices, phasing in the increase will be most efficient. Optimally, the incremental increase will cause less backlash from constituents, in addition to avoiding market shocks, making the tax increase more politically feasible. Additionally, a revenue neutral taxation route may be the least disruptive. An increase in the Federal Gas Tax in conjunction with a decrease in another federal commodity tax would likely have less market disruption, however still cause the positive externalities that come from environmental taxes. In the interest of reducing greenhouse gas emissions, improving energy efficiency, and reducing monetary burden on taxpayers, it would be most beneficial to incrementally increase the Federal Gas Tax and continue the 5% emissions reduction year-to-year that the current CAFE Standards propose.

The most effective policy proposal to reduce GHG emissions in the private transportation sector are likely a combination of regulatory policies and market incentives. The CAFE Standards and Gas Tax rates strongly correlate, as the gas tax rate incentivize consumers to purchase fuel-efficient vehicles, and the CAFE Standards ensure the production of fuel-efficient vehicles. Creating demand for fuel-efficient vehicles via increased gasoline tax will subdue auto manufacturers' concern that they are allocating time, energy, and money to creating fuel-efficient technologies that consumers do not want. Additionally, the auto industry would be less incentivized to cheat the CAFE Standard regulation, through the creation of larger vehicles, if consumers are interested in purchasing fuel-efficient vehicles.

Furthermore, the gasoline tax incentivizes consumers to purchase fuel-efficient vehicles, or immediately curb driving habits. However, it is uncertain that job creation will see benefits from an increased Federal Gas Tax and CAFE Standard joint implementation, as it would if just the CAFE Standard were to increase. The analysis of the CAFE Standard increase assumes that because consumers will be saving money at the pump, that they will be spending money elsewhere, thereby stimulating economic activity. A revenue neutral tax would attempt to minimize negative economic growth. Although, the immediate positive externalities, and improved productivity rates will likely stimulate economic activity.

In addition, this policy action will effectively mitigate CO_2 emissions in the largest emitting sector of the United States, in the largest per capita CO_2 polluting country in the world. This aggressive environmental tax and regulation would align the United States with the world's most advanced global economies. Therefore, there is international relation advantages to the pursuit more aggressive personal transportation CO_2 emission policies along with domestic environmental and economic incentives.

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