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THE ENVIRONMENTAL IMPACT ADJUSTMENT FEE:

CHANGING THE INCENTIVE STRUCTURE OF ANNUAL REGISTRATION FEES TO REDUCE EMISSIONS OF TRADITIONAL POLLUTION AND CARBON DIOXIDE BY PASSENGER VEHICLES IN CALIFORNIA

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As a means to reduce tailpipe emissions of greenhouse gases and traditional pollutants by passenger vehicles, the authors propose an Environmental Impact Adjustment to California's Vehicle License Fee. A plurality of California motorists would see no change to their annual registration cost, but owners of fuel-inefficient vehicles and older, high-polluting cars would pay from $20 to $135 more per year. Owners of highly fuel-efficient vehicles would enjoy a small reduction in their annual Vehicle License Fee. The authors also propose companion measures to require an immediate smog check of unregistered vehicles discovered during routine traffic stops and expand and improve the existing state buyback program that retires high-polluting older vehicles.

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INTRODUCTION

The emergence of global warming brings fresh challenges to the next era of vehicle emission control policy in California. Passenger cars emit a large amount of carbon dioxide, one of the greenhouse gases that contribute to global warming. Vehicular carbon dioxide emissions are a direct function of gasoline consumption, which in California has grown from 10 million gallons per year in 1970 to almost 16 million in 2004. As of 2005, gasoline powered vehicles emitted roughly one quarter of the state's total greenhouse gas emissions, but California has not yet implemented a policy to control these emissions (CEC 2006).

Seeking a policy instrument that could reduce hazardous pollution and carbon dioxide emissions by the entire fleet of passenger vehicles in California, we propose an "Environmental Impact Adjustment" to the Vehicle License Fee (VLF) assessed annually on all owners of passenger vehicles. At present, the VLF creates a perverse incentive for consumers, charging a higher registration fee for new cars than for older cars. Our proposed surcharge aims to reverse this incentive, making it more expensive to own and operate a high-emitting older car than a cleaner, newer car. We believe such a price signal would create a rational incentive for motorists to replace inefficient, high emitting older vehicles. To blunt political opposition to tax increases, we have designed the surcharge to bypass average-performing cars and only raise costs for the minority of vehicle owners with the highest polluting, least fuel efficient cars.

Our policy proposal is based on a quantitative analysis of the actual emissions of California's passenger car fleet. Using data from a statewide program of random roadside emissions tests, we illustrate the disproportionate effect of high emitting, inefficient older cars and demonstrate that model year can be used as a proxy for emissions of toxic pollution. We then design a surcharge that is easy to administer, maximizes fairness, and minimizes the intensity of political opposition.

As companions to our central proposal, we also suggest an immediate mandatory smog check for unregistered cars and an expansion of the existing program in which the state buys and retires older, high-polluting vehicles. Taken together, we believe this trio of policies can reduce traditional pollution and greenhouse gas emissions and provide a model for similar programs in other states.

CALIFORNIA EMISSIONS POLICIES

Until recently, California policy makers have focused on the localized health effects of toxic substances in tailpipe emissions. Over the last thirty-five years, regulators have targeted three substances: nitrous oxides, carbon monoxide, and hydrocarbons, which react with sunlight to produce ground level ozone (smog). The primary policy instruments used to reduce tailpipe emissions of these substances have been (i) mandating increasingly sophisticated emission control technologies for new vehicles sold in California, (ii) adopting "Low Emission Vehicle" standards for each pollutant, and (iii) improving the formulation of gasoline that is refined and used in the state.

Smog levels in the Los Angeles basin provide a vivid illustration of the success of these policies. In 1975, the year catalytic converters were first required, the Los Angeles basin experienced 118 smog alert days and the peak ozone concentration was 0.39 parts per million. By 2000, there were no smog alert days and the peak ozone concentration was only 0.18 parts per million (California Air Resources Board).[1] This reduction in smog is particularly impressive considering that the number of annual vehicle miles traveled (VMT) steadily increased in Southern California throughout the period.

The reduction of toxic pollution by newer cars has not been matched by reductions in carbon dioxide emissions, which are a function of fuel economy. Nationally, the average fuel efficiency of new cars has hovered around twenty miles per gallon throughout the last two decades (Heavenrich 2006). From 1990 to 2005, carbon dioxide emissions by gasoline powered vehicles in the state remained steady at approximately 125 million metric tons of carbon dioxide equivalent per year (CEC 2006). Thus, as newer vehicles replace cars from the eighties and nineties, emissions of hazardous substances in California are reduced, but carbon dioxide emissions are not.

The durability of older vehicles reduces the effectiveness of state regulations that pertain only to newly manufactured cars. California's mild, dry weather enables residents to enjoy a longer useful life for their cars, which are rarely exposed to snow, road salt, and other corrosive elements. These older cars tend to be the highest polluting, least fuel-efficient vehicles. According to the California Air Resources Board, by the year 2010, vehicles produced before 1998 will emit 75 percent of the smog-forming compounds produced by all passenger vehicles in the state (California Air Resources Board 2004).

THE NATURE OF THE EMISSIONS PROBLEM IN CALIFORNIA: A QUANTITATIVE ANALYSIS

Every two years, the California Bureau of Automotive Repair conducts random roadside tests of automobile emissions at approximately 300 locations around the state. This paper uses data from the 1999 study, which tested nearly 27,000 randomly selected California cars (California Department of Consumer Affairs 1999).[2] These data provide the opportunity to evaluate the emission problem posed by California's entire fleet of cars, in terms of both traditional pollutants and carbon dioxide.

We divided the vehicles into five model-year cohorts; the earliest year of each cohort corresponds with the introduction of a newly required emission control technology. The first cohort includes all cars from model years prior to 1975. The second cohort begins with the 1975 model year, when catalytic converters were first required for new cars sold in California. The third cohort begins in 1980, the first year that three-way catalytic converters were mandated by the state. The fourth cohort begins in 1988, when onboard diagnostic systems were first required. These systems illuminate a "check engine" dashboard light when emissions are abnormally high, alerting the driver that the vehicle needs service. The "check engine" light has been remarkably effective; analysis of the data confirm that many owners of pre-1980 vehicles continue to drive

poorly maintained, abnormally polluting cars, unaware that something is wrong with the engine or the exhaust system.

The fifth and final cohort begins in 1994, when the California Air Resources Board introduced the Low Emission Vehicle I (LEV I) emissions standards. The LEV I program was the first time California set a minimum performance level for automobile emissions rather than mandating the use of a particular technology.[3]

The Toyota Corolla provides a vivid demonstration of the efficacy of California's emissions policy.[4] Introduced in 1968 and available on a continuous basis since then, the Corolla is a small car that began as a subcompact and then graduated to compact size in 1993. Of the 26,702 cars tested in the 1999 study, 879 were Corollas, making the Corolla the second most popular model in the data set behind the Honda Accord.

Figure 1. Corolla- Hydrocarbon Emissions by Vehicle Age Cohort

Year	Mean Hydrocarbon grams per mile	Std. Dev.	Maximum
pre 1975	842.5	528	1216
1975-1979	308.5	674	4358
1980-1987	170.7	467.8	5575
1988-1993	48.8	53.7	306
1994-2000	14.4	43	392

The reduction in smog-forming hydrocarbons emitted by Corollas of different vintage is staggering: Corollas built between 1975 and 1979 emit, on average, more than twenty times the hydrocarbons emitted by Corollas built after 1993 (Fig. 1). The large maximums and standard deviations for pre-1988 Corollas illustrate an additional point; Corollas without an onboard diagnostic system often emit far more hydrocarbons than the average Corolla in the same age cohort.

Figure 2. All Cars- Hydrocarbon Emissions by Vehicle Age Cohort

Year	HC Mean	Std. Dev.
pre 1975	275	608
1975-1979	236	633
1980-1987	129	316
1988-1993	48	112
1994-2000	12	25

As Figure 2 demonstrates, the Corolla pattern holds true for the entire California fleet when divided into the same five age cohorts. Both the mean hydrocarbon emissions and the standard deviation shrink markedly over time. Upon the introduction of onboard diagnostics in 1988, the standard deviation drops from 316 to 112, suggesting that motorists tend to have their cars serviced when the check engine light comes on rather than continuing to operate vehicles

with engine or exhaust system problems. The data confirms that California's progressively stricter public policies have not only reduced mean emissions but have also considerably narrowed the spread around the mean, reducing the operation of abnormally emitting, poorly-maintained cars.

Figure 3. All Cars- Average Emissions of Each Pollutant by Vehicle Age Cohort

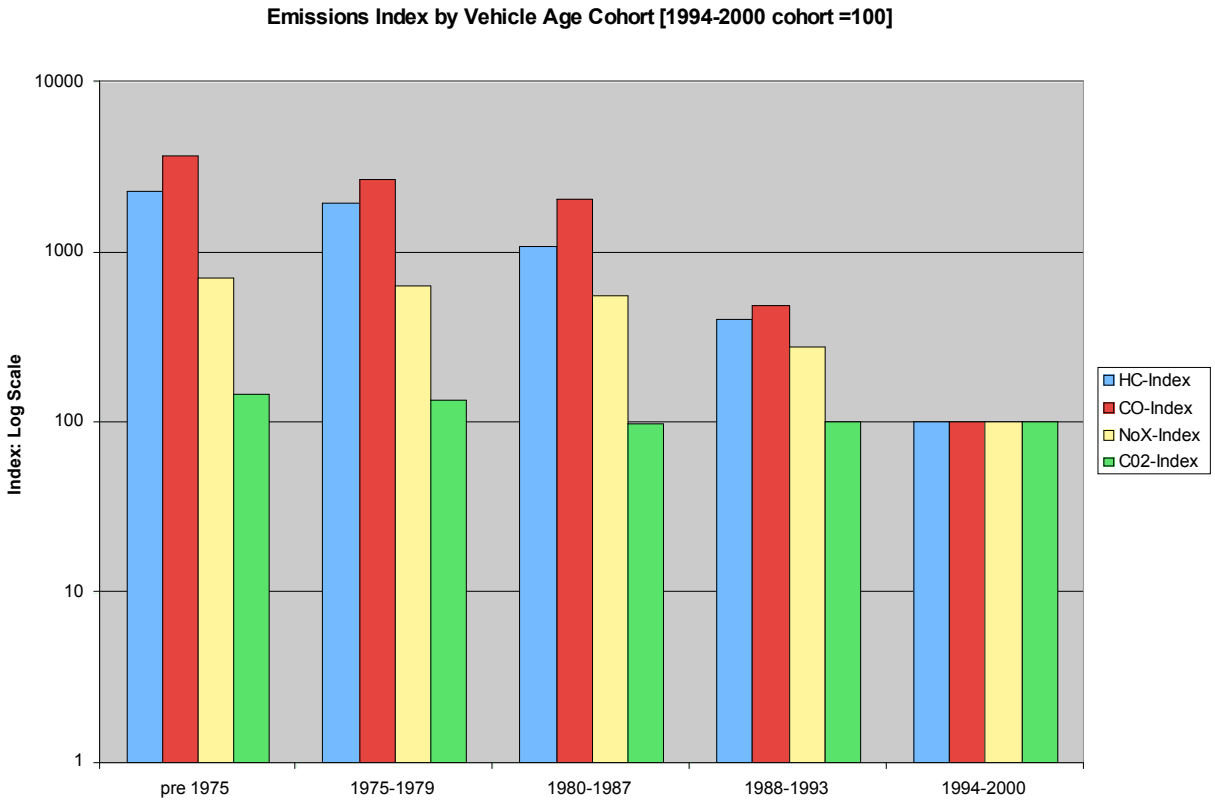
Year	HC	CO	NOX	MPG	Approx. CO2
pre 1975	275	1.88	1118	17.1	1.05
1975-1979	236	1.38	1011	19.1	0.95
1980-1987	129	1.05	880	27.2	0.70
1988-1993	48	0.249	444	27.8	0.72
1994-2000	12	0.051	160	27.5	0.71

Figure 3 shows that two other regulated pollutants, nitrous oxides and carbon monoxide, have also declined at similar rates for each age cohort of vehicles. The data suggest vehicle age can be used as a proxy for emissions of toxic pollutants.

Carbon dioxide emissions, however, do not correlate with vehicle age for cars manufactured after 1979. The roadside test data summarized in Figure 3 confirms the trend demonstrated by federal fuel economy statistics; average fuel economy for new models rose in the 1970s but has stayed roughly the same since then.

To compare each of the four pollutants in similar units, we assigned an index value of 100 to the mean emissions of each pollutant in the 1994-2000 cohort. Figure 4 shows the emissions index for each cohort-pollutant combination, displayed on a logarithmic Y axis, which compresses the vertical scale so that extremely high values can be compared with low values.

Figure 4. Emissions of Hydrocarbons, Carbon Monoxide, Nitrous Oxides and Carbon Dioxide by Vehicle Age Cohort [Index: 1994-2000 Cohort = 100]



The blue, red, and yellow bars represent the three traditional pollutants, and the green bars represent carbon dioxide. Cars built before 1988 emit more than ten times the hydrocarbons (blue) and carbon monoxide (red) emitted by cars built after 1993. Pre-1993 cars also emit five to eight times the nitrous oxides (yellow) as post-1993 cars.

The fundamental conclusion from this data is that policies to incentivize the replacement of cars built before 1994 with newer cars can have a major impact on ambient levels of all three hazardous pollutants. However, increasing the turnover of California's fleet will not reduce carbon dioxide emissions unless the newer vehicles are more efficient than the older vehicles that are taken out of service. Thus a comprehensive policy on tailpipe emissions of existing cars must use two different metrics to create an incentive, assessing one surcharge based on model year (for emissions of traditional pollutants), and another surcharge based on EPA mileage ratings (for emissions of carbon dioxide).

CALIFORNIA'S VEHICLE LICENSE FEE

California drivers write an annual check to the Department of Motor Vehicles for the privilege of owning and operating their cars. This annual cost is comprised of several different fees, the

largest of which is referred to as the Vehicle License Fee (VLF). The smaller fees are assessed equally for all vehicles, but the VLF varies and is based on the value of each vehicle.

California's VLF was enacted in 1935, replacing a patchwork of city and county regulations on vehicle owners. The VLF was structured to mimic property taxes and was initially set at 1.75 percent of the value of the automobile (California DMV).

In 1999, the state enacted the first of a series of VLF "offsets" to provide tax relief to motorists without making a statutory change to the VLF percentage. These offsets were designed as temporary measures that would be automatically eliminated if the state went through a budgetary crisis.

The VLF became a hot political issue during the 2003 campaign to recall Governor Gray Davis, who had presided over a state budget deficit that triggered an automatic increase in the VLF to 2 percent. As a candidate to replace Davis, Arnold Schwarzenegger campaigned against the pending increase in the "car tax" and promised relief to the state's motorists. After ousting Davis by winning the recall election, Governor Schwarzenegger fulfilled his promise, convincing the legislature to enact a permanent reduction in the VLF from 2 percent to 0.65 percent.

As currently structured, a motorist's VLF liability decreases with the value of her car. Rather than using actual market values for used cars, the DMV applies a standardized eleven-year depreciation schedule to the original new car purchase price. Since owners of less valuable older vehicles are assessed a lower annual VLF than owners of newer vehicles, the VLF provides an incentive for motorists to retain older, higher-emitting cars and light trucks.

POLICY PROPOSAL 1: AN ENVIRONMENTAL IMPACT ADJUSTMENT TO THE VLF

As a means to address the emissions problems posed by older vehicles, we propose an Environmental Impact Adjustment to the VLF. Our proposal is designed to change the incentive structure of California registration costs so that owners of high-emitting cars pay a surcharge on top of the existing VLF.

Our proposed Environmental Impact Adjustment (EIA) contains two elements: (i) an age-based surcharge on older vehicles that emit high quantities of traditional pollutants and (ii) a fuel-economy based surcharge on inefficient vehicles that emit high quantities of carbon dioxide. A small number of the most fuel-efficient vehicles will receive a fuel-economy credit that will reduce the VLF.

These two components will provide a modest incentive for motorists to replace older cars with newer and more fuel-efficient vehicles. We believe information is a key element to an effective EIA, in that a carefully designed and prominently explained surcharge can help motorists better understand the social costs of their vehicle purchasing decisions.

Mindful of the recent political history of the VLF, we have designed our EIA so that a

large plurality of motorists will see no significant change to their current registration fees. Rather than a new tax on all motorists, the EIA is designed to add costs for the minority of the state's motorists who are driving older vehicles or gas guzzlers. The political viability of the proposed policy will be further discussed in a later section.

The first component of our proposed EIA levies a progressively higher surcharge on each cohort of older vehicles. The policy groups together vehicles with the same mandatory emissions equipment. The surcharge raises annual operating costs for vehicles that do not have modern emissions controls, incentivizing motorists to replace older vehicles with newer ones.

Figure 5. EIA Component 1: Traditional Pollutants

Model Year	EIA: Pollution Charge	Approx. Share of 2006 Fleet
2004 and up	No Change	24%
1994-2003	$3	60%
1988-1993	$12	9%
1980-1987	$30	4%
1975-1979	$60	Less than 2%
pre 1975	$70	Less than 2%

As per the fee schedule in Figure 5, EIA Component 1 raises costs by more than $3 per year for only 17 percent of the passenger vehicles in California's current fleet: pre-1994 automobiles. Only 8 percent of motorists will be assessed a surcharge of $30 or more for pre-1988 vehicles. The amount of the surcharge is approximately 25 cents per gram of hydrocarbons emitted by the mean car in each cohort, as listed in Figure 2. (The fees for pre-1998 cars have been rounded to the nearest increment of ten dollars). Under this 25-cent formula, the magnitude of the pollution surcharge is commensurate with the magnitude of the social harm.

The second component of our EIA levies a surcharge on the least fuel-efficient vehicles and provides a credit for the most fuel-efficient vehicles, incentivizing motorists to choose vehicles that emit less carbon dioxide. EIA Component 2 is designed so that at least 60 percent of all car owners would see no change to their VLF. Although the state does not compile statistics on the fuel economy of the California fleet, national statistics from the EPA suggest that around 60 percent of cars are rated between 22 and 29 miles per gallon for combined driving, (calculated as 55 percent EPA City plus 45 percent EPA Highway) (CEC 2006).

EIA Component 2 is designed to change the VLF for only those "outlier" cars that are more or less fuel efficient than the plurality of vehicles clustered around the national mean. Any car or light truck rated at less than 20 miles per gallon combined would be assessed a surcharge, and vehicles rated at more than 29 miles per gallon would receive a credit.

Figure 6. EIA Component 2: Carbon Dioxide Emissions

EPA Combined Miles Per Gallon	EPA Grams of CO2 Equivalent per mile (EPA)	EIA: CO2 Charge	Typical New Vehicle Model
37 and higher	Less than 296	-$40	Honda Civic Hybrid, Toyota Prius
30-36	296-357	-$25	Toyota Corolla + Yaris, Honda Fit
20-29	358-482	No Change	**More than 60% of all cars**
18-19	545-606	$40	Smaller SUV's + Pickups
16-17	607-668	$50	Full Size SUV's + Pickups
15 and lower	669 or more	$60	Largest SUV's + Pickups

As illustrated at the top of Figure 6, owners of the most fuel-efficient vehicles would receive a small credit that would reduce the VLF. Using EPA national statistics, we estimate that approximately 5 percent of cars would receive the $25 credit, and only 1-2 percent of cars would receive the $40 credit. Owners of vehicles that are rated at less than 20 miles per gallon would pay a progressively larger fee ranging from $40 to $60 per year.

Taxpayer Education as a Secondary Incentive

Each component of the EIA would be explained in detail on the motorist's annual DMV renewal notice. The explanation would, in itself, provide a secondary incentive for some motorists by revealing the environmental impact of each registered vehicle. We recommend the use of a graphic device based on the EPA's labeling system for automotive fuel economy and greenhouse gas emissions.

Figure 7. Example of EPA Labeling System

The bar graphs in Figure 7 could be augmented by markings that indicate the emissions of an average new vehicle. Many motorists would be surprised to know that their 1987 compact car emits ten times more pollution than a car produced in 2004 or later, or that their brand new pickup truck is a major emitter of greenhouse gases.

Impact of EIA on Different Vehicles

Combining the two EIA components, we can look at the impact on particular cars and trucks. Cars built in 2004 or later that are within the average range of fuel economy would see no change in annual VLF; light trucks built in 2004 or later would generally pay $40-$60 more, depending on fuel economy. A 1989 Toyota Corolla would pay $12 more.

Figure 8. Total EIA for Sample Vehicles

Model Year	Vehicle	Pollution Charge	CO2 Charge	Total EIA
2005	Toyota Prius	$0	-$40	-$40
2003	Ford Focus	$3	-$25	-$22
1998	Ford Explorer	$3	$50	$53
1991	Ford Econoline Van	$12	$50	$62
1989	Toyota Corolla	$12	$0	$12
1985	GMC Suburban V8	$30	$60	$90
1974	Full Size Pickup	$70	$60	$130

The maximum EIA would be assessed only on pre-1975 vehicles that are rated at 15 or fewer miles per gallon. Full size light trucks from the nineties would be assessed an EIA of between $53 and $72, depending on model year and EPA fuel economy rating.

Maximizing Political Viability of the Proposal

Although all tax and fee increases are controversial in California, we believe the proposed EIA structure will generate less political opposition than the across-the-board increase in VLF fees that Governor Schwarzenegger opposed during the recall campaign. As proposed, the EIA would raise costs for only those motorists who pollute more than their fair share. The large number of motorists who would see no increase in fees may in fact be supportive of the proposal on environmental grounds or, at worst, be indifferent to it.

During the process of debating and enacting an EIA, the California legislature could constrain the policy to reduce political opposition by capping the costs to motorists. Possible constraints include:

- Setting a maximum amount of revenue raised by the EIA per year;
- Setting a maximum EIA assessment. (Our policy design uses $130 as the maximum, but legislators could select a different maximum or leave that decision to the California Air Resources Board); and
- Setting a maximum percentage of the fleet that would be assessed an EIA of greater than $5.

Any of these measures could potentially reduce public anxiety that the initially small EIA might grow substantially over time. The database of registered vehicles maintained by the California Department of Motor Vehicles would be an important tool in policy design, enabling legislative staffers to model the impact of various policy designs and seek the most palatable balance between program effectiveness and political viability.

POLICY PROPOSAL 2: USE INCREASED REVENUES TO EXPAND VEHICLE BUYBACK PROGRAM

We propose that the additional money received by the state of California from the EIA be specifically designated to finance a more robust vehicle retirement program than the patchwork of existing programs operated within the state. Using EIA revenue to fund vehicle buybacks would further increase the political viability of the overall policy, ensuring that the fees paid by owners of high-emitting vehicles would be used to take other high polluting vehicles off the road rather than diverted by legislators to unrelated programs.

Over the last decade, California has experimented with vehicle buyback programs designed to take older, high-polluting passenger vehicles out of service. At present, multiple programs are being operated by different agencies: the Bureau of Automotive Repair (BAR) buys and retires vehicles that have *failed* a smog check, while individual Air Quality Management Districts (AQMDs) operate programs to buy and retire vehicles that have *passed* a smog check.

The first version of BAR's vehicle retirement program began in July 1, 2000 and ran through the end of 2001, retiring 34,003 vehicles (California Air Resources Board July, 2004). The program was dormant for several years, and was restarted in September 2004. Offering $1000 to owners of operable vehicles, the current program retired 16,909 vehicles in fiscal year 2006-2007 (California Department of Consumer Affairs). The program is funded by a portion of the $12 per year Smog Abatement Fee, which is assessed by the Department of Motor Vehicles on newer vehicles (California Department of Consumer Affairs 2006).

Various AQMDs operate their own programs to retire vehicles that *pass* the smog check. The most vigorous such program is operated by the Bay Area AQMD, which covers the seven counties of the San Francisco region. This program pays $650 per car for operable vehicles from model years 1987 and earlier (Bay Area Air Quality Management District). In fiscal year 2004-2005, the program retired approximately 7200 vehicles (Bay Area Quality Management District 2005). The Bay Area program is funded by a $4 per year surcharge levied on cars registered within the Bay Area AQMD.[5]

We believe that EIA revenues could enable the establishment of a single statewide vehicle retirement program that would be larger and more effective than the existing hodgepodge of on again, off again programs. The cost-effectiveness of a consolidated program would be maximized if the state took the initiative to make direct buyout offers to owners of high polluting vehicles. One option would be to use statistical methods to target particular make/model combinations that are known to be high-polluting. Another method would be to mine the data on individual vehicle emissions collected by the smog check program. Once high polluting vehicles were identified, the state could print a buyback offer directly on the annual DMV renewal notice sent to the owners of these vehicles.

In addition to retiring more of the gross polluting vehicles, an expanded and improved buyback policy would provide a reasonable and fair incentive to motorists who do not want to pay the EIA, particularly low-income motorists. The combination of an EIA and an expanded

buyback program would offer the owner of high polluting vehicle the choice to either pay the EIA or sell the vehicle to the state and replace it with a newer vehicle. For certain older vehicles, the buyback would be significantly larger than the cash value of the vehicle, providing motorists with a subsidy that could be used to purchase a newer, lower emitting vehicle.

POLICY PROPOSAL 3: IMMEDIATE SMOG CHECK FOR UNREGISTERED VEHICLES DISCOVERED DURING A TRAFFIC STOP

One problem that may result from instituting an EIA is that California could see an increase in unregistered vehicles, as a small number of motorists choose not to register as a means to avoid the EIA. Currently 3.38 percent of California's fleet is unregistered at any given time; of the unregistered vehicles, more than two thirds are less than three months behind their registration date (Younglove 2004). Only 1 percent of the fleet is unregistered on a long-term basis. These vehicles tend be older, belong to predominantly lower income owners and are more likely to fail smog tests.

One way to anticipate the magnitude of an EIA-induced increase in unregistered vehicles is to look at the effect of previous DMV fee increases in the state. When Californians were first required to show proof of insurance in order to obtain their vehicle registration tags, DMV reported a 6 percent drop in vehicle registrations in the first and second quarter of 1997 and a 4 percent drop in the third quarter (California Legislative Analyst Office 1999). With stricter police enforcement, the registration rate eventually returned to prior levels.

We propose a mandatory smog check for any vehicle that is pulled over for a traffic stop and found to be unregistered. The logistics of such a program would require study. A well designed program could help bring unregistered gross polluters back into compliance, whether by forcing the vehicle to be repaired and registered, or registered and then purchased by the vehicle buyback program.

COMPARING EIA TO ALTERNATIVES

We believe EIA is the most viable policy option for addressing the dual problem posed by existing vehicles: emissions of traditional pollution and emissions of greenhouse gases. The EIA avoids two major pitfalls of other policies: it does not increase costs for the majority of motorists and it does not require complicated monitoring capabilities to enforce.

The simplest policy instrument to reduce vehicular carbon dioxide emissions would be a significant increase in the state gasoline tax, which would send a price signal to motorists. An increased fuel tax would internalize the societal cost of carbon dioxide emissions, incentivizing the purchase of more fuel-efficient vehicles and/or a reduction in vehicle miles driven. (Higher gas prices could, in theory, cause some motorists to buy fuel-efficient cars and then drive more miles, consuming the same amount of gasoline per year.)

The political environment in California makes a gas tax hike very difficult to accomplish. High gas prices are a major irritant to California motorists, particularly because the state's unique

gas formulation creates a self-contained market with the highest retail prices per gallon in the nation. In a sense, California motorists already pay four separate gas taxes: (i) the 18.4 cent per gallon federal excise tax, (ii) an 18 cent state gas tax, (iii) the state and local sales tax due on all consumer purchases, and (iv) a price premium compared to other states, due to California's unique smog-reducing gas formulation. The result is a price at California pumps that is an average of 25 to 45 cents higher than in other states. Higher gas prices hit low income Californians especially hard, which makes it even more difficult to generate the 2/3 majority in the legislature that is required to increase the state gas tax.

Another alternative is a tax on vehicle miles traveled, (VMT). In theory, a VMT tax is preferable to an EIA tax because consumers are taxed on total carbon dioxide emitted by their car, and not just the rate of emissions per mile. However, unlike EIA, a VMT tax is difficult and costly to implement. Enforcement of a VMT tax would require checking the odometer of more than twenty million individual vehicles and detecting odometer tampering, a daunting administrative problem. Furthermore, a VMT tax would politically divide the state, pitting suburban and exurban voters against voters with shorter commutes.

Neither a VMT tax nor a gasoline tax reduces the traditional pollution emissions of older vehicles. We believe an EIA efficiently addresses the twin problems of traditional pollution and carbon dioxide with an easy to implement policy that raises costs for only a minority of vehicle owners.

Distributional Effects

The incidence of our proposed EIA on motorists of various income levels is important from both a political and a fairness perspective. The intent is not to add a punitive tax to low-income motorists who can only afford to operate older, high-polluting vehicles. Rather, the policy offers a pair of related incentives: an incentive for motorists to drive newer, more fuel efficient cars (the EIA), and an incentive to dispose of the oldest, lowest value vehicles (the expanded buyback program).

The proposed EIA taxes motorists based on the age cohort and fuel economy of their vehicles. This mechanism spreads the costs across a wide variety of incomes.

Figure 9. Household Income Statistics for Vehicle Owners, by Age Cohort

Model Year Cohort	Percentage of CA Vehicles in 1999	Mean Household Income	10th Percentile Household Income
1994-1999	9%	$59,556	$37,008
1988-1993	32%	$57,334	$39,844
1980-1987	46%	$59,906	$36,505
1975-1979	8%	$62,966	$35,442
pre 1975	5%	$62,095	$36,506

Figure 9 indicates that an EIA based on model year cohort would not disproportionately fall on lower income households. It turns out that many high income persons own older cars and

many low income persons own newer cars.[6] The fuel economy portion of the EIA also spreads the burden, since affluent motorists tend to drive gas guzzling luxury cars and SUVs, while lower income motorists frequently own smaller, more fuel efficient cars. Given the heterogeneity of motor vehicle ownership patterns, the EIA would not be unduly borne by lower income motorists.

CONCLUSION

In the face of California's dual problem with the tailpipe emissions of older vehicles, an Emissions Impact Adjustment would be an appropriate mechanism to reduce emissions of carbon dioxide and traditional pollutants. Because the EIA has separate components for traditional pollution and greenhouse gases, it would help educate vehicle owners about the costs they are imposing on the environment. The information provided in association with the EIA could be as valuable an incentive as the fee itself in altering the decision process of vehicle owners. An EIA would also set an innovative policy precedent of charging motorists a fee for the environmental externalities caused by their driving.

While the EIA would burden a small percentage of low-income vehicle owners with an additional cost, the cost would be far less than typical gas price volatility, and the fees collected could be redistributed back to this population in the form of an expanded vehicle buyback program. Moreover, because an EIA is more politically feasible than a gas tax or a tax on vehicle miles driven, we believe it is the most viable policy to address the problem of tailpipe emission of older vehicles.

ENDNOTES

1. As a point of reference, the federal health standard for smog adopted in 1971 set a maximum concentration of 0.12 ppm.
2. Professor Matthew Kahn of the UCLA Institute of the Environment kindly provided us with the raw data. For Kahn's own analysis of the data set, see Matthew E. Kahn and Joel Schwartz, "Urban Air Pollution Progress Despite Sprawl: The "Greening" of the Vehicle Fleet," American Enterprise Institute, August, 2006
3. In 2004, California adopted LEV II, an even stricter set of standards. According to the California Air Resources Board, the average 1968 car emitted approximately twenty pounds of hydrocarbons for each thousand miles driven. Cars meeting the LEV I standard emit approximately a half-pound of hydrocarbon per thousand miles, and cars meeting the LEV II standard emit approximately one tenth of a pound per thousand miles. See California Air Resources Board, "LEV II -- Amendments to California's Low Emission Vehicle Regulations," http://www.arb.ca.gov/msprog/levprog/levii/factsht.htm
4. We selected the Corolla to illustrate changes in emissions over time because the Corolla is a popular model that has been available in California throughout the coverage period.
5. From 2000 through 2003, four Air Quality Management Districts operated similar programs, which paid between $500 and $600 per car and retired over 21,000 cars during the four year period.
6. The proposed policy based on vehicle age appears to be more favorable to lower income motorists than an alternative policy based on the actual emissions of each vehicle. Although low income motorists may be more likely to operate a poorly maintained vehicle, the EIA assesses a charge based on the age of the vehicle rather than on its mechanical condition. California already provides a subsidy for low income motorists to pay for repairs that are required to enable a vehicle to pass a smog test. See Department of Consumer Affairs, Bureau of Automotive Repair, "Consumer Assistance Program Frequently Asked Questions Factsheet,"

www.smogcheck.ca.gov/stdPage.asp?Body=/geninfo/factsheets/Consumer_Assistance_Program_FAQs-Aug_2006.htm

REFERENCES

Bay Area Air Quality Management District. "Vehicle Buyback Program Information." www.baaqmd.gov/pln/grants_and_incentives/vehicle_buyback/

Bay Area Air Quality Management District. 2005. "Agenda: September 13, 2005." Board of Directors Mobile Source Committee. www.baaqmd.gov/brd/brddirectors/agenda_packets/2005/msc_agenda_091305.pdf

California Air Resources Board. California's Air Quality History Key Events. www.arb.ca.gov/html/brochure/history.htm (accessed April 23, 2008).

California Air Resource Board. 2004. *Report to the California Legislature: Accelerated Light-Duty Vehicle Retirement Program*. www.arb.ca.gov/msprog/avrp/FINAL_Legislative_Scrap_Report07-04.pdf

California Air Resources Board. July 2004. *Accelerated Light-Duty Vehicle Retirement Program: Report to the California Legislature*. www.arb.ca.gov/msprog/avrp/FINAL_Legislative_Scrap_Report07-04.pdf

California DMV. "DMV Milestones: Major Events Affecting Drivers, Vehicles, and the DMV." California Department of Motor Vehicles. www.dmv.ca.gov/about/profile/milestones.htm

California Department of Consumer Affairs. *2006-2007 Annual Report*. www.dca.ca.gov/publications/06_07ar.pdf

California Department of Consumer Affairs. August 2006. "Consumer Assistance Program: Frequently Asked Questions Factsheet." California Department of Consumer Affairs, Bureau of Automotive Repair. autorepair.ca.gov/stdPage.asp?Body=/geninfo/factsheets/Consumer_Assistance_Program_FAQs-Aug_2006.htm

California Department of Consumer Affairs. 1999. *Roadside Vehicle Emissions Survey*. California Department of Consumer Affairs, Bureau of Automotive Repair.

California Energy Commission (CEC). 2006. *Inventory of California Greenhouse Gases: Emissions and Sinks: 1990 to 2004.* www.energy.ca.gov/2006publications/CEC-600-2006-013/figures/FIGURE-4.PDF

California Legislative Analyst Office. 1999. "Transportation Departmental Issues." *LAO Analysis of the 1998-99 Budget Bill*. www.lao.ca.gov

Environmental Protection Agency. "US EPA Vehicle Information Program: Greenhouse Gas Score." www.epa.gov/greenvehicle/about.htm

Heavenrich, Robert. 2006. *Light Duty Automotive Technology and Fuel Economy Trends: 1975 through 2006*. Advanced Technology Division, Office of Transportation and Air Quality, United States Environmental Protection Agency, (EPA420-R-06-011).

Younglove, Theodore et al. 2004. Unregistration Rates for On-Road Vehicles in California. *Journal of Transportation and Statistics*. Vol. 7; Number 2/3. www.collaboratory.ucr.edu/publications/Unregistration_Rates.pdf