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Deals on Wheels

An Analysis of the New Federal Auto Feebate

Robin Banerjee

The Backgrounder in Brief

Ottawa's new feebate program to promote fuel efficiency in new cars requires some major retooling.

About the Author

Robin Banerjee is a Policy Analyst at the C.D. Howe Institute.

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Canadians are becoming increasingly engaged in heated debates about how to respond to the potential threats of global climate change to the environment and the economy. Even though Canada's obligations to reduce greenhouse gas emissions under the Kyoto Protocol now seem unattainable in the short run, a consensus seems to be emerging among policymakers that emissions reductions need to be undertaken in a fashion that minimizes negative effects on the economy.

Clearly, policies to deal with the automotive sector's emissions will be a key part of any reduction plan. Emissions from light vehicles currently account for about 12 percent of Canada's total greenhouse gas emissions.[1] The federal government has several options to achieve emissions reductions. They can be used alone or in combination, and include market-based measures, such as subsidies or tax increases (either on gasoline or on CO_2 directly via a carbon tax); and non-market instruments, such as regulations on vehicle fuel economy or measures to encourage switching from gasoline to alternate fuels.

One of the key elements of Ottawa's current strategy is its so-called "feebate." A feebate is a market-based instrument that provides a financial incentive for consumers and manufacturers to shift towards more fuel-efficient vehicles by subsidizing fuel efficiency and taxing fuel inefficiency. Within this framework, there remains a wide variety of ways in which the government can structure a feebate program to achieve varying levels of fuel efficiency at varying levels of costs.

Although many economists and environmentalists support feebate programs, such measures raise theoretical, empirical and practical questions: Are feebates a better alternative than regulations? Do consumers actually react to them? Are they preferable to broader-based gasoline or emissions taxes?

This *Backgrounder* argues that the federal government should address such concerns as it goes forward with its feebate program. As well, the paper argues that Ottawa's feebate program should be consistent with a broader approach, which would include tools like emissions taxes.

The paper begins with a summary of the federal plan, followed by a discussion of the limited experience in Canada and abroad with auto feebate schemes. Next comes a review of some alternative methods for reducing fuel use and an overview of some analytical issues in evaluating feebates. Finally, the paper puts forth policy recommendations.

Ottawa's Feebate Plan

The federal government's 2007 budget introduced a feebate scheme known as the "vehicle efficiency initiative." It combines a rebate program for fuel-efficient

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1 The value is from Canada (2005) and represents the sum of emissions from "Gasoline Automobile" and "Light Duty Gasoline Trucks." The transportation sector as a whole accounts for more than a quarter of all emissions. The report singles out a 109 percent increase in Light Duty Truck emissions between 1990–2005 driven largely by the popularity of SUVs.

vehicles with a tax on fuel-inefficient ones. The benchmark is fuel consumption in litres per 100 km driven.[2] Although a direct focus on CO_2 may be more effective in combating global warming, fuel consumption has the benefit of public familiarity since it is a factor that consumers already consider when making vehicle purchase decisions.

A feebate involves both taxing vehicles that fail to reach a target and subsidizing the purchase of those vehicles that perform better than the target.[3] Some policy options in designing a feebate program are:

(i) The "pivot point," where rebates switch to taxes;
(ii) The rate of the tax and subsidy;
(iii) Whether to use different schedules (pivot points and rates) for different types of vehicles;
(iv) Whether to use a linear feebate or to include "dead-zones" where the feebate doesn't apply; and
(v) Whether to impose caps on taxes and rebate amounts.

The current subsidy, the ecoAUTO Rebate Program, offers a rebate of between $1,000 and $2,000 for cars with fuel-efficiency levels of better than 6.5 litres per 100 km or light trucks achieving better than 8.3 L/100km. In practice, only 10 car models and nine truck models are eligible for rebates for the 2006 and 2007 model years.[4] Additionally, the initiative has a rebate for flex-fuel vehicles, which run on a combination of gasoline and ethanol, and have E85[5] ratings of at least 13 L/100km. Four models of flex-fuel vehicles achieved this standard in the 2006 and 2007 model years.

The Green Levy on Fuel Inefficient Vehicles imposes a tax that starts at $1,000 for vehicles which use between 13 L/100km and 14 L/100km and proceeds in $1,000 steps for every litre increase in consumption up to 16 L/100km. At that point, the tax is capped: all vehicles that use 16 L/100km or more are subject to the same maximum $4,000 tax.

The federal government had been studying the possibility of using feebates for some time, commissioning two major reports, the first in 1999 and another in 2005. As well, the National Round Table on the Environment and the Economy (NRTEE) was tasked with examining the possibility of using feebates under a set of guidelines that included environmental effectiveness and revenue neutrality. NRTEE's conclusions will be discussed below after introducing some background about fuel-reduction policy and some analytical results on feebates.

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2 Based on a combination of city (55 percent) and highway (45 percent) driving. In principle, a feebate could also target fuel economy, the distance travelled on a given amount of fuel, or carbon dioxide emissions directly.

3 Targeting consumers or manufacturers will have the same effect if manufacturers pass on the rebates or taxes.

4 "Finance officials estimate about five per cent of vehicles on the market would be subject to the fee and about three per cent would qualify for the fuel efficiency rebate." *Globe and Mail*, March 19th, 2007: "Environment: Fee slapped on SUVs."

5 A fuel mixture which is up to 85 percent ethanol.

Limited Grounds for Comparison

Although the concept and specific proposals for auto feebates have existed for several years, the policy has not been implemented in a significant way elsewhere in the world. As a result, there is no international empirical evidence of a feebate's impact on consumer choices and manufacturer reactions. Several jurisdictions in the United States and overseas have announced intentions to introduce various versions of feebate programs, so the accumulation of evidence should increase if and when these programs are put in place.

Governments in Canada have been in the forefront of examining and implementing feebate policies. In addition to the new federal plan, Ontario has had a version of a feebate in place for several years. However, the parameters of Ontario's feebate program are such that it works, in effect, as a gas-guzzler tax rather than as a balanced tax-rebate scheme designed to alter purchasing behaviour. The vast majority of cars sold in Ontario fall within the range of a $100 rebate or a $75 tax, with 90 percent subject to the $75 tax (Barg et al., 2000). These amounts are likely too small to affect individual purchasing decisions on cars that cost tens of thousands of dollars. As well, the uniformity of the financial incentive does not provide consumers with a sufficient reason to purchase even lower emissions models. Indeed, it is unlikely that most auto consumers in Ontario are even aware of the program, since it is not prominently advertised.

The Role of Feebates in the Broader Policy Context

Emissions from the automobile and broader transportation sector are related to the average fuel economy of the vehicle fleet, as well as distances driven. Using targeted economic instruments should allow for a more efficient transition towards a lower carbon economy.

Most economists favour market-based instruments, such as taxes, over regulatory measures. Offering consumers the freedom to adjust their behaviour in reaction to small differences in prices usually produces the desired results more efficiently than a fixed set of regulations. These types of instruments also get around the problem of amassing the large amounts of information that may be needed to make regulations effective and efficient. Two types of instruments considered below are gas taxes and feebates.

After a carbon tax, an increase in the gasoline tax is well-suited as an instrument to reduce carbon dioxide emissions because higher prices tend to reduce fuel use which, in turn, will reduce emissions. A gas tax increase will also encourage long-term changes in fuel use by encouraging people to buy more efficient cars, thus increasing average fuel economy.[6] Consumers also may be induced to make changes to travel patterns by, say, living closer to public transit or moving nearer their workplaces (yielding additional benefits from reduced congestion, pollution and accidents).

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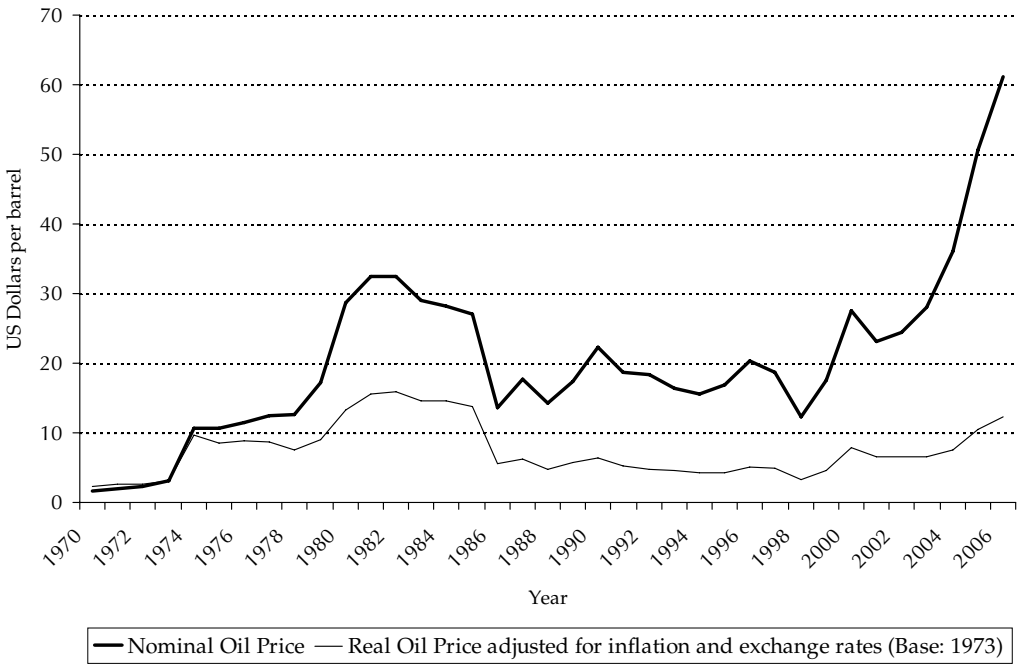
6 It may also encourage technological switching to automobiles which run on alternative fuels, such as ethanol or electricity.

Figure 1: *Crude Oil Price (Nominal and Real)*



Source: OPEC Annual Statistical Bulletin 2006.

Despite large fluctuations in the nominal price of oil, which makes up a large part of the non-tax price of gasoline, the real world price of oil has remained fairly stable (see Figure 1). Since the real effect of the oil price has been muted, there may be scope to use gasoline taxes to magnify the effect on buyers.[7] However, several drawbacks would need to be taken into account. According to a recent Angus Reid poll, an increase in the gasoline tax would encounter major public resistance. Despite concern for the environment, only 29 percent of the respondents favoured "an additional 25-cent tax per litre of gasoline" (Angus Reid Strategies, 2007).

Additionally, gas tax hikes are politically difficult because such increases will affect rural residents and those with lower incomes more severely.[8] Recent studies have also shown that short-run adjustments in consumption to increases in the price of gasoline are not large (i.e. the short-run price elasticity of demand is low).[9] Economists Ian Parry and Kenneth Small (2004) assert that incorporating the costs of global warming externalities in a tax would not increase gas prices by more

7 Crude oil is the largest and most volatile input to gasoline production, to which much of the recent volatility in gasoline prices can be traced. Increases in crude oil prices are quickly passed through to consumers (Natural Resources Canada, 2005). The other major components of the price of gasoline are taxes, refining and distribution costs, and local market factors.

8 For some examples of the use of household level data to evaluate the effects on different types of individuals see: Kayser (2000) and Nicol (2003).

9 For a sample of work on gasoline price demand elasticities see: Dahl and Sterner (1991a and 1991b); Epsey (1996 and 1998); Kayser (2000); Nicol (2003). For evidence that there has been a recent shift towards an even lower elasticity of demand, see Hughes et al. (2007). For an alternative result using Canadian data see Yatchew and No (2001).

Box 1: *An Example of the Effects of Underestimating Fuel Savings*

Many studies of feebates rely on suggestions from survey results that consumers often have trouble calculating the full lifetime fuel cost savings from driving a more fuel-efficient car. A commonly asserted value for a consumer's timeline for calculating fuel savings is three years (i.e. consumers have a three-year discounted payback period for fuel savings).

The following example will demonstrate the potential effects of using a three-year payback period instead of taking into account fuel savings over the lifetime of the car:
Imagine a consumer is considering buying one of two types of cars: Car A has a fuel efficiency of 10 L/100km and Car B has a fuel efficiency of 12 L/100km. These two cars are basically the same other than the fuel-use ratings; i.e. same basic features, styling, etc.

If our hypothetical individual drives 20,000 km per year and the price of gasoline is $1/L, then yearly gasoline costs will be $2,000 for driving Car A and $2,400 for driving Car B.

How does this affect the car purchase decision? If the consumer has a three-year payback period and a discount rate of 10 percent, then the gasoline savings from driving the more fuel-efficient Car A instead of Car B will be $994.74. So, if all else is equal, the consumer should be willing to pay up to $994.74 more for Car A. If Car A and Car B have the same features, then the fuel savings will make Car A more valuable due to the fuel savings.

Now assume that a car has an average lifetime of 15 years. The value of the lifetime fuel savings to the consumer from driving Car A instead of Car B is now $3,042.43. So again, all else equal, Car A is now notionally worth more than $3,000 more than Car B; this is obviously a more significant incentive. One can clearly see that with a full lifetime perspective, the fuel savings are worth over three times more.

Many of the economic benefits that computer models of feebates show come from forcing consumers to realize the extra benefits from valuing the full lifetime fuel savings from their car purchases.

This discussion has focused on consumers using a short payback period. Dreyfus and Viscusi (1995) also estimate that consumers use a high discount rate when evaluating fuel efficiency, which would lead to the same results. Indeed, a combination of high discount rate and a short payback period would cause the largest distortions.

than a few cents, which implies that it would be difficult to justify a rise in the gas tax to levels high enough to affect consumers.[10]

Still, a fuel tax can be effective in reducing fuel consumption over the long term, by reducing mileage driven, and could complement a more effective strategy that targets the purchase of new cars. A reason to target car purchases directly rather than relying exclusively on a gas tax is that there is evidence that consumers by and large are unable to accurately measure the dollar value of fuel

10 They estimate that using a value for the estimated cost of carbon dioxide of $25/ton of carbon implies a tax of only six cents per gallon of gasoline, since a gallon contains .0024 tons of carbon. Assuming they are referring to short tons, the rough conversion would be a tax of $0.016/L. Since even the highest estimates of the economic externality only range up to about US$100/tC (the paper quotes a range of possible global warming costs of US$0.7 to US$100 yielding a per gallon cost range of 0.2 to 24 cents per gallon), the optimal tax will never be more than a few tens of cents.

efficiency differences between vehicles over their useful lifetimes.[11] Box 1 illustrates the potential effects of incorrectly measuring lifetime fuel savings.

One non-market approach that does appear to reduce fuel use in new cars is regulation. The US Corporate Average Fuel Economy standards and similar measures in Canada had a major impact on fuel economy in the 1970s and 1980s, (Hughes et al., 2007). Recently, Ottawa negotiated a Memorandum of Understanding with auto manufacturers regarding the acceptable level of emissions from new cars, although this sort of non-binding regulation has had an unclear incentive effect on auto manufacturers.[12] However, in addition to the reasons for preferring market-based instruments noted above, regulations need continuous updates, which can prove both contentious and complicated.

Designing the Most Effective Feebate [13]

Changing the basic features of a feebate plan will modify the impact on average fuel efficiency as financial incentives are changed. Increasing the tax rate, reducing the pivot point, reducing the number of schedules, and eliminating the dead zones and caps will all tend to reduce fuel use over time. This type of incentive policy is understood and supported by the public; the same polls that show severe opposition to increases in gasoline taxes also show significant support for gas-guzzler taxes and rebates for higher fuel-economy vehicles.[14]

Another attractive feature of feebates is that the choice of the pivot point can be made in such a way that the policy is revenue neutral, i.e., the amount paid out in subsidies exactly balances the amount received in taxes. Of course, the pivot could also be set in order to generate revenues for the government, or to provide a net subsidy to automobile consumers.

Although there has not been an opportunity to study auto feebates empirically, a number of studies (including two done for the federal government) have used

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11 For example, see: Greene (2007), Kurani and Turrentine (2004) and Marbek Resource Consultants Ltd. (2005). There is evidence that recent rises in the price of gasoline have spurred purchases of smaller vehicles, which is consistent with a larger long-run price elasticity of demand for gasoline. Dreyfus and Viscusi (1995) estimated consumers' discount rate for fuel savings to be between 11 and 17 percent, a value that they found to be consonant with prevailing market rates in auto loans, but higher than conventional estimates of the social discount rate of around 5 percent. In addition, a wide variety of studies on discount rates for operating efficiencies in various durable goods, such as appliances, have found much higher values than 17 percent, (see Dreyfus and Viscusi 1995 for a discussion). More study is needed to determine the nature of the relationship between gasoline prices and consumers' ability to determine associated lifetime costs.

12 An and Sauer (2004) found that Canada has some of the worst fuel economy results in the world. For some discussion of progress so far, see Canada (2007). Ottawa published a *Notice of Intent* in October 2006 to build on the MOU's voluntary provisions by implementing new fuel-efficiency regulations starting with the 2011 model year.

13 This section draws on a number of US and Canadian studies on the prospects for feebates. From the US: Greene et al. (2005); US DOE (1995); Langer (2005). From Canada: HDL Decision Economics Inc. (1999) and Marbek Resource Consultants Ltd. (2005).

14 Angus Reid Strategies (2007). It is unclear how these social preferences will change as increasing numbers of vehicles become exposed to taxes, although the balancing increase in rebates should make this increase more palatable.

computer simulations to model the possible effects. The general conclusions from these studies confirm what economic intuition suggests regarding financial incentives to buy fuel-efficient cars: people tend not to buy cars that are made relatively more expensive by a feebate policy.

The most important finding is that a wide range of possible feebate rates and structures can produce positive environmental effects, (there is also a positive net economic benefit from the realization of fuel savings).

Another key insight is that, in the models, the majority of the effects of a feebate policy seem to come from manufacturers attempts to preserve their market shares through technological innovation and improvements to their vehicles. Implementing innovative technologies often makes more economic sense once the added financial incentives of the feebate are in place. The adoption of such new technologies has a much greater positive impact than that of consumers switching to smaller, more fuel-efficient vehicles in order to take advantage of the rebates and avoid the tax. But there is also a rebound effect which works against the policy, as consumers-now able to travel further at lower cost—offset some of the efficiency—related reduction through higher use. However, even with the increase in fuel consumption due to this rebound effect, the studies still anticipate an overall positive result.

The simulation results suggest that there are strong benefits from coordinating policies across jurisdictions. Since technological innovations are such a strong driver of benefits from a feebate policy, any marginal increase in the return on investment of implementing new technologies will improve the effectiveness of the policy. For example, an auto manufacturer will be more willing to introduce a new technology or model redesign if the fixed cost can be spread among a greater number of consumers. This implies that a policy that is, for example, coordinated between the US and Canada, will be more effective than a Canada-only policy. Domestic sales are usually a small percentage of total sales for most models that Canadians can choose from. Indeed, even most Canadian vehicles are manufactured for export. Thus, there is less incentive to redesign models specifically for Canada.

A phase-in period for the policy reduces the net reductions in fuel use by delaying the short-run benefits, but provides manufacturers with more time to implement some of the technological improvements and redesigns that will help them maintain market share. This is especially critical for the North American manufacturers who are predicted to lose market share due to their reliance on sales of larger, less fuel-efficient vehicles.

Feebate policies also are found to have less of an effect on fuel use in the presence of strong, effective regulation. However, regulations are not able to provide continuous incentive for improvement, as feebates do, unless they are updated on a regular basis. Another consideration: a large increase in the price of gasoline as a result of market forces will obviously reduce the effects of the feebate policy on fuel use, although the inability of consumers to correctly value fuel savings implies that positive benefits can still be found.

Assessing the Federal Government's Plan

When the federal feebate plan is examined in light of the design parameters set out above, several deficiencies emerge. The first is that Ottawa implemented the program without adequate consultation with the industry. Secondly, it took effect immediately without mandating a timetable, or at least a phase-in period. As discussed, the simulation evidence strongly suggests that a large part of the gains from a feebate scheme come from attempts by manufacturers to preserve market share by introducing new fuel-saving technologies or by redesigning their vehicles to make them more fuel efficient. It follows, therefore, that pre-announcing the policy and giving manufacturers more time to adjust their models would have reduced their costs.

Indeed, the simulation models generally suggest that feebates will produce a decrease in market share for the "Big Three" North American auto manufacturers, without a large reduction in overall demand for automobiles. The implication is that the "Big Three" may be better able to compete if given a period of adjustment to re-tool their fleets, since on average, they sell less fuel-efficient vehicles.[15]

General policies to aid Canadian-based manufacturers, such as reductions in the marginal tax rates on new investment, would also help ameliorate the effects of the feebate on them. However, policies which may have net environmental and economic benefits should not be shied away from for the sole purpose of protecting the market share of the North American-owned auto manufacturers.

The current feebate structure is not a linear curve, but rather contains a "dead-zone" in which most vehicles fall. As noted above, most vehicles are not subject to the incentives. This reduces the effectiveness of the policy and reduces the impetus for manufacturers to make continuous improvements.

Revenue neutrality is an attractive potential feature of feebates since they combine revenue and expenses in the same instrument, (although a net tax would provide a marginal incentive towards a reduction in the number of vehicles). Although the federal plan is not expected to result in a large net inflow of tax revenue, it will need to be adjusted over time to maintain revenue neutrality. However, the non-linear nature of the feebate might make this exercise difficult.

Another problem with the federal plan is that it exempts pickup trucks, which are regarded as primarily commercial vehicles. One possible consequence is that consumers might switch to these vehicles in order to avoid the tax on other larger vans and trucks. This exemption also means the possibility for reducing fuel use in the commercial sector remains unaddressed. In principle, profit-maximizing firms should already be choosing the least fuel-intensive vehicles that fit their needs in order to minimize fuel costs. But the introduction of a subsidy could make seeking further improvements economical at the firm level.

The major motivation for the feebate was to reduce greenhouse gas emissions. In a recent C.D. Howe Institute study, Jaccard et al. (2007) estimate that the feebate will reduce Canadian emissions by at most 1 Megatonne of CO_2 equivalent by

15 It is worth bearing in mind that an increasing volume of Canadian auto manufacturing, both in assembly and parts, is now generated by "foreign"-owned manufacturers.

2010. Clearly, the plan alone will make only a small contribution to achieving ambitious emissions reduction targets. If the government wishes to induce greater reductions as a result of this policy, then the rate will have to be adjusted to provide greater incentives.

Policy Recommendations

The current program is a first step in introducing market instruments to help address concerns about fuel use. Going forward, the government should take steps to ensure that the program is improved in such a way that it is more environmentally effective by providing a greater incentive to switch to lower-emission vehicles, but balancing any changes with an attempt to minimize adverse consequences on the auto manufacturing sector.

Since many of the likely gains will come from technological innovations and redesigns of current models, the adverse effect of the feebate on domestic auto manufacturers should be lessened by pre-announcing the path of the feebate over time so that the auto manufacturers have sufficient time to adjust their plans. A time frame of several years to introduce major changes is reasonable, given the long lead times required in auto manufacturing. Any increase in regulated emissions reductions would overlap with the feebate and may provide a basis for a reduction in the feebate rate, although the feebate will continue to have positive effects.

The current feebate uses a rate of $1,000 per L/100km, which is in line with the rate recommended by the federal government's studies, however the feebate structure should apply to more vehicles to ensure that correct incentives are present. Revenue neutrality (on average) can also be attained if the government slightly adjusts the pivot point and rates from year to year to ensure that the expected tax earnings are balanced by the payouts in rebates, although such adjustments can introduce uncertainty into manufacturers' plans. In its analysis of feebates, the NRTEE recommended that they not be implemented in isolation but rather as part of a "comprehensive, integrated strategy" for the transport sector. Since feebates only directly affect new car purchases, the government should take this advice to heart and ensure that its policies are actually part of a coherent plan.

One area that the current feebate regime misses is the used-car market. The federal government has also announced a program that will pay to scrap older cars. Although this will speed up the improvement in average fuel economy, the feebate in isolation will also achieve this goal over time as older cars are replaced by vehicles purchased under the feebate incentives.

It is essential to maintain an incentive for people to travel less. This involves maintaining, or possibly increasing the cost of using fuel. Examples of policies to target travel are: the basic fuel tax, (which although perhaps not ideal for influencing fuel efficiency in new cars, will still affect how far those cars are driven); a carbon tax; or mileage-based charges, (which also target emissions from driving, but less directly, and thus less efficiently than a fuel or carbon tax.)[16] Such

16 An innovative new suggestion from a reviewer is the use of Pay as You Drive automobile insurance, which also provides incentive to reduce distance travelled.

taxes would also provide an added incentive for drivers to switch to more fuel-efficient cars. As well, they could alter other lifestyle choices such as the distance from home to work and the amount of public transit usage.

In general, the federal government should continue to implement environmental policy via market instruments. Feebates offer an opportunity to overcome a potential undervaluing of fuel savings by consumers while reducing or even neutralizing revenue effects on the government. Ultimately a long-term, incentive-based perspective will allow the government to effect desired changes in the most efficient way possible.

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