SUSTAINABILITY WITHIN A GENERATION

Drive Green

COMPANY CAR TAX SHIFT

David Suzuki Foundation

SOLUTIONS ARE IN OUR NATURE

David Suzuki Foundation

Introduction

Drive Green: Company Car Tax Shift is a groundbreaking new policy proposal to reduce vehicle greenhouse gas emissions and air pollution.

Modeled on a successful program introduced in the United Kingdom, the proposal is designed to:

- Reduce greenhouse gas emissions by one megatonne of CO2 per year
- Reduce the pollutants that cause smog
- Reduce fuel costs for businesses and employees
- Avoid job loss in Canadian automobile assembly plants
- Retain current income tax revenue

Drive Green encourages employees to drive more fuel efficient company cars (pick-up trucks are excluded) by shifting some of the tax burden from efficient cars to those that pollute more.

Under current tax rules, employees who receive company cars pay additional income tax based on the cost of the vehicle. Under the *Drive Green* proposal, employees who drive lower emission company cars would enjoy a tax reduction, while those who choose less efficient cars would be taxed at an increased rate.

This kind of policy, known as ecological fiscal reform (EFR), helps improve economic efficiency by correcting the prices of goods and services to include costs born by society as a whole, such as increased health care costs due to air pollution.

Currently, Canada lags behind most other industrialized countries in the adoption of EFR measures, including economic instruments. Canada's slow adoption of economic instruments places a burden on the economy and the environment. According to the OECD, the annual rate of productivity and GDP growth of many OECD countries surpasses Canada's.[1] And 27 of 30 OECD countries now rank ahead of Canada on environmental performance.[2]

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[1] Canada's average annual growth in productivity (1994-2003) was surpassed by several OECD countries, including the following: Japan, United Kingdom, Norway, Denmark, Sweden and Finland. Canada's average annual growth in GDP (1991-2003) was surpassed by several OECD countries, including the following: USA, New Zealand, Norway, Australia, Korea and Ireland. Source: OECD Factbook 2005

[2] Sustainable Planning Research Group, Simon Fraser University. 2005. *The Maple Leaf in the OECD: Comparing Progress Toward Sustainability*. David Suzuki Foundation. www.davidsuzuki.org

In response to this policy gap, the 2005 federal budget outlined a rationale for the use of economic instruments to pursue environmental and economic goals simultaneously. Stakeholders were invited to submit proposals for economic instruments to the federal government.

Drive Green, prepared by MK Jaccard and Associates for the David Suzuki Foundation, projects economic and environmental impacts over the course of the next 15 years. It is the first in a series of policy proposals from the David Suzuki Foundation designed to help Canada achieve sustainability within a generation.

R E P O R T

Analysis of Proposed Changes in Tax Treatment for Company Cars in Canada (Company Car Tax Shift)

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Executive Summary

Canada has ratified the Kyoto Protocol to the United Nations Framework Convention on Climate Change, which commits it to reducing greenhouse gas (GHG) emissions to 6% below 1990 levels by 2008-2012. Greenhouse gas emissions in Canada were 24% above 1990 levels in 2003 and are projected to continue to grow through to 2012 in the absence of aggressive policies. Canada's commitment under the Kyoto Protocol therefore represents a reduction of greenhouse gas emissions of more than 30% from business as usual levels.

The Government of Canada has developed a series of climate change action plans to meet its GHG reduction commitments. These plans outline the importance of using economic instruments to reduce GHG emissions. This was echoed in *The Budget Plan 2005*, which discussed some of the advantages of using economic instruments to meet economic and environmental goals simultaneously.

The objective of this study is to describe and evaluate a new economic instrument aimed at reducing GHG emissions from passenger light-duty vehicles in Canada. Greenhouse gas emissions from passenger light-duty vehicles accounted for about 10% of total emissions in Canada in 2003, and have grown by about 15% since 1990. This sector is therefore a significant contributor to Canada's overall GHG emissions, and an important source for potential reductions in GHG emissions.

The policy described in this document is targeted at a sub-sector of passenger light-duty vehicles: vehicles purchased or leased by companies and which employees use for personal travel as well as business travel. These vehicles are called "company cars." When an employee is given a company car, the value of the company car to the employee is added to the employee's base income as a "benefit-in-kind" for the purposes of calculating income tax. Currently, the benefit-in-kind associated with an employee's use of a company car is calculated as a percentage (24% per year) of the price of the company car. The percentage is the same regardless of the characteristics of the vehicle.

The United Kingdom, which uses a similar system to Canada to tax employee use of company cars, recently reformed its system for calculating benefit-in-kind to reflect the CO_2 emissions of the company car. Cars with low CO_2 emissions are now taxed at a lower rate than cars with high CO_2 emissions, as shown in Table 1. The UK Department of Inland Revenue calculates that the reform to the calculation of benefit-in-kind had reduced CO_2 emissions by 0.5-0.75 Mt CO_2 by 2003, and is expected to reduce emissions by 1.8-3.6 Mt CO_2 annually in the long-term.

Table 1: Company car taxable benefit rate under reformed UK system at selected CO_2 intensity intervals

CO_2 Emissions (g/km)			Taxable Benefit (% of Car Price)
2002/03	2003/04	2004/05	
165	155	145	15
190	180	170	20
215	205	195	25
240	230	220	30
265	255	245	35

The principal aim of this report is to evaluate the impact of making similar changes to the calculation of company car benefit-in-kind in Canada. A vehicle choice and stock accounting model, based on the CIMS energy-economy model, was developed to serve this purpose. The model includes all vehicle models purchased by Canadian companies for use as company cars in 2004 (excluding pickup trucks and cargo vans), and simulates employee and employer choice of company cars based on empirical observations of behaviour in Canada and the US. The model forecasts changes in CO_2 emissions, criteria air contaminant emissions, vehicle stocks, fuel consumption, government revenue, and employment in Canadian auto manufacturing plants as a result of policy implementation.

Changes to the tax treatment of company cars could take many forms. Several different scenarios for reform of company car tax treatment were analyzed to provide a sense of the importance of policy design on GHG reductions and other outputs, as shown in Table 2. For vehicles with CO_2 emissions intensity at or below the "Lower threshold," the benefit-in-kind is calculated using the "Lower rate." For vehicles with CO_2 emissions intensity at or above the "Upper threshold," the benefit-in-kind is calculated using the "Upper rate." Tax treatment increases between the lower and upper threshold at the "Rate of increase" shown in the table. The policy is implemented in 2007 and applies to all new company cars in 2007, and all company cars from 2008 to 2020 except pickup trucks and cargo vans. The policy is assumed to remain fixed over time at levels described in Table 2; in practice it may make sense to periodically review the policy stringency as vehicle technology changes.

Table 2: Policy scenarios modelled in this report

Scenario	Lower Threshold	Upper Threshold	Lower Tax Rate	Upper Tax Rate	Rate of Increase
Base	120 g/km	360 g/km	12%	48%	1.5% / 10 g/km
P1	160 g/km	260 g/km	17%	37%	1% / 5 g/km
P2	160 g/km	260 g/km	15%	35%	1% / 5 g/km
P3	160 g/km	345 g/km	15%	45%	1% / 5 g/km to 24%, then 1.5% / 10 g / km
P4	160 g/km	290 g/km	15%	45%	1% / 5 g/km to 24%, then 2.5% / 10 g / km
P5	160 g/km	310 g/km	15%	45%	1% / 5 g/km

Results of the modelling associated with each of the policy scenarios described in Table 2 are shown in Table 3. The model predicts reductions of 0.3 Mt CO_2 annually by 2010 and reductions of about 1.0 Mt CO_2 annually by 2020 as a result of policy implementation for the Base policy scenario. Reductions in CO_2 emissions result primarily from improvements in vehicle GHG intensity; starting from a base intensity of 253 g CO_2/km, intensity improves to 227 g CO_2/km for new company cars as a result of the policy. The model also predicts reductions in emissions of most criteria air contaminants (CAC) – emissions of volatile organic compounds, carbon monoxide, oxides of nitrogen, and sulphur dioxide are reduced, while emissions of particulate matter are increased as a result of policy implementation.

As a result of lower fuel consumption and the purchase of less costly vehicles, a drop in federal government revenue is forecasted. By 2010, federal fuel excise tax is reduced by about $12.5M, but federal income tax revenue is increased by about $4.8M. Under the Base case scenario, employment in Canadian auto manufacturing plants would grow slightly slower compared to the business as usual scenario. Employment impacts are small since most vehicles manufactured in Canada are exported, and most vehicles purchased in Canada are imported. Overall, the number of vehicles purchased is not likely to change substantially as a result of the policy, but the total value of vehicles purchased may decrease as consumers opt for smaller, more fuel efficient, and cheaper vehicles.

Table 3: Condensed results for all policy scenarios

Scenario	CO_2 Reduction 2010 (kt)	CO_2 Reduction 2020 (kt)	Total CAC reduction 2020 (t)	Loss of Fed Gov't Income Tax Revenue 2010 ($2004M)	Loss of Fed Gov't Income Tax Revenue 2020 ($2004M)	Direct Job Losses 2010	Reduction in sales 2010 (units)
Base	284	980	11,288	(4.77)	(5.96)	52	2,337
P1	322	1,109	13,255	10.09	13.10	9	531
P2	296	1,020	12,019	20.20	26.10	7	(188)
P3	275	965	10,639	4.43	(2.10)	30	1,339
P4	352	1,199	14,199	10.23	15.47	42	1,501
P5	319	1,098	12,651	6.32	8.29	38	1,565

In order to address uncertainty in the model parameters, an effort was made to determine the robustness of the results to changes in parameter values using a sensitivity analysis. This analysis showed that the results are sensitive to assumptions about the discount rate and elasticity values. Empirical data exists to allow informed choice of these parameters, but some uncertainty about their true values remains. Although the sensitivity analysis revealed that the results are sensitive to the choice of these parameters, the analysis also showed that for reasonable parameter values, the policy should result in substantial GHG and CAC reductions, minimal loss of federal government revenue, and insignificant employment changes in Canadian auto manufacturing plants.

Evaluation using the criteria in *The Budget Plan 2005* showed that the policy is well targeted and environmentally effective for the niche market that it affects. The fiscal cost-effectiveness of the policy was determined to be about \$38/t CO_2 reduced in 2020 for the Base case when all revenue streams are considered, and about -\$6/t CO_2 reduced when only changes in income tax revenue are considered (any policy that reduces gasoline consumption causes fiscal impacts because of reductions in revenue from the federal excise tax on fuels). Fiscal cost-effectiveness should not be used on its own to evaluate a policy, since it does not account for social costs or benefits. The policy can be considered to improve economic efficiency since it acts to correct prices for negative environmental externalities by providing improved price signals. Overall, there are minimal impacts on fairness, although some drivers that are unable to switch vehicle classes could experience increased taxes. In addition, it is likely that manufacturers with higher emission fleets would lose market share. Finally, the policy is considered relatively simple, since it involves changes to existing tax rates, and all institutions and mechanisms required to carry out the policy are already in place.

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Glossary

Benefit-in-kind **–** the calculated monetary value of a company car that is added to the income of the employee for the purposes of determining federal and provincial income tax.

Business as Usual (BAU) **–** a scenario that assumes no changes to current policies.

Company car - a car that is provided by a company to an employee for business and personal travel.

Criteria air contaminant (CAC) **–** emissions that affect local air quality, including emission of volatile organic hydrocarbons (HC), carbon monoxide (CO), oxides of nitrogen (NOx), sulphur dioxide (SO_2), and particular matter (PM<10 and PM<2.5). Also called local air emissions.

Direct employment / Indirect employment **–** direct employment is employment within auto manufacturing plants; about 37,000 Canadians are directly employed in auto manufacturing plants. Indirect employment is employment generated by auto manufacturing plants; almost 300,000 Canadians are indirectly employed by the auto manufacturing sector.

Discount rate **–** the implicit interest rate applied by consumers in calculating the present value of a future stream of costs or benefits.

Elasticity **–** the percent change in market share of a vehicle or class or percent reduction in overall demand for vehicles caused by a one percent increase in cost.

Lower threshold / Upper threshold **–** the lower threshold is the carbon emissions intensity (in g CO_2/km) of a vehicle below which the tax treatment does not change. The upper threshold is the carbon emissions intensity of a vehicle above which the tax treatment does not change.

Rebound effect **–** increase in use of a vehicle caused by decrease in the cost of driving.

Single-use commercial vehicle **–** a vehicle that is purchased by a company and which is used strictly for business purposes.

1. Introduction

Objective and structure of the report

This report presents the results of analysis that was conducted in order to measure the effect of possible changes to the tax treatment of company cars in Canada. It also presents an assessment of possible changes to company car tax treatment using the criteria established in *The Budget Plan 2005: Framework for Evaluating Environmental Tax Proposals*.[1]

The report begins with a discussion of the context for the study, focusing on Canada's international commitment to reduce greenhouse gas emissions and its interest in using economic instruments like environmental tax reform to this end. It includes a discussion of the current tax treatment of company cars in both Canada and the United Kingdom, as well as a discussion of the recent changes in the UK and their effect on GHG emissions. It then summarizes the results of economic modelling that was undertaken to project the effects of making changes to the tax treatment of company cars in Canada. Potential changes to the tax treatment of company cars in Canada are assessed using the criteria for policy evaluation described in *The Budget Plan 2005*.

Background

Canada has ratified the Kyoto Protocol to the United Nations Framework Convention on Climate Change, which commits it to reducing average annual greenhouse gas (GHG) emissions between 2008 and 2012 to 6% below the 1990 level. Because of increases in population, economic growth, and certain industrial activities, greenhouse gas emissions in Canada had grown to 24% above 1990 levels by 2003, and are forecast to continue growing through 2012 in the absence of strong policies.[2] Canada's commitment under the Kyoto Protocol therefore represents a reduction of greenhouse gas emissions of more than 30% from business as usual levels. The Government of Canada has developed a series of plans to help meet this commitment, and has incorporated the objective of reducing GHG emissions throughout government departments.

In *The Budget Plan 2005*, the Government of Canada outlines the importance of economic instruments, such as grants, subsidies, and tax measures, in meeting our economic and environmental goals simultaneously. In particular, the government discusses the potential for using the tax system to pursue broader government objectives (additional to its basic role of generating revenue). One such objective is the correction of "negative environmental externalities", which occur when an individual or company does not pay the full cost of polluting. In this situation, market prices understate actual costs to society, and the individual or company produces more pollution than is socially

[1] Department of Finance, 2005, "The Budget Plan 2005", Government of Canada, Ottawa. pp. 313-327.

[2] Environment Canada, 2005, "Canada's 2003 Greenhouse Gas Inventory", Government of Canada, Ottawa.

optimal. Because the outcome in this situation deviates from the socially optimal outcome, economists call it a "market failure". Under certain conditions, government may be able to correct for such market failures by using economic instruments to establish improved price signals. This type of market-based approach can be more economically efficient than using a more traditional regulatory approach to achieve the same goal.

Greenhouse gas emissions are a negative externality associated with many activities; there is typically no monetary cost for emitting GHG, and GHG emissions are thought to be responsible for human-induced climate change. By using economic instruments to incorporate the social cost of GHG emissions into the market prices for activities that produce emissions, it may be possible to reduce GHG emissions in an economically efficient manner. The Government of Canada is already using economic instruments to reduce GHG emissions. For example, in 2001 it announced the Wind Power Production Incentive, which is designed to stimulate investment in wind power using subsidies. In 2005, it announced changes in the tax treatment of renewable energy and cogeneration technologies, which should stimulate investment in such technologies. To date, however, most economic instruments in Canada designed to address greenhouse gas emissions have been fiscal incentive mechanisms, with few existing examples of fiscal disincentive mechanisms, which some analysts suggest may be more effective.[3]

Many other governments also have significant experience with using economic instruments, and fiscal disincentives in particular, to reduce GHG emissions. For example, the European Union has implemented an emission trading system that requires operators of large industrial facilities to hold permits to cover all GHG emitted by the facility. Several countries, among them Sweden, Norway, and New Zealand, have implemented greenhouse gas taxes that embed the social cost of GHG emissions into some or all activities that emit GHG emissions. In addition to these broad economic instruments, governments around the world have also implemented more targeted taxes and subsidies aimed at reducing GHG emissions from particular technologies or processes, and have made changes to tax systems with the same goal.

In the United Kingdom, a successful tax change aimed at reducing GHG emissions that has recently been implemented involves reform of the tax treatment of "company cars" – vehicles provided by a company to an employee, and which employees drive for personal as well as business use.[4] The new policy in the UK provides more favourable tax treatment for company cars that produce low GHG emissions. This report is a discussion of how the changes made to the tax treatment of company cars in the UK could be implemented in Canada.

[3] We are unaware of any economic disincentive mechanisms implemented by the Government of Canada that are designed to reduce GHG emissions.

[4] A vehicle which is owned by a company, but which is not used by employees for personal driving is not a "company car", it is a single use commercial vehicle.

Company car tax treatment in Canada and the UK

In Canada, when a company car is made available to an employee for personal use, the employee is required to include the "benefit-in-kind" derived from the use of the company car in their personal income tax calculations.[5] For cars that are owned by the company (as opposed to leased), the benefit-in-kind is calculated by multiplying the cost of the automobile by 2% for every month (24% per year) in which the car is available to an employee (1.5% if the employee drives less than 20,004 km/year for personal use).[6] For a vehicle that costs $30,000, and which is driven year-round by an employee for a total personal travel distance of 25,000 km, the benefit-in-kind is therefore $7,200. This total is reported on an employee's T4, and is added directly to other sources of income for the purposes of calculating provincial and federal personal income tax.

In the UK, the benefit-in-kind derived from an employee's use of a company car is also added to an employee's income for the purposes of calculating income tax. Prior to 2002, the UK used a similar system to that currently in place in Canada, where the benefit-in-kind from an employee's use of a company car was calculated based on the cost of the vehicle and the annual business and personal miles travelled. In 2002, the UK reformed its system for calculating the benefit-in-kind of company cars in order to encourage the use of cars that emit lower quantities of GHG per kilometre travelled. Car manufacturers, employers, and employees were given three years notice of the change.

Under the new system, the annual percentage charge applied to the price of a company car running on gasoline or diesel varies from 15% to 35% (per year) based on the CO_2 emissions produced by the vehicle (official figures are rounded down to the nearest 5 g/km). In the first year of the program, the charge of 15% was applied if the CO_2 emissions intensity of the vehicle was 165 g/km or less. This "lower threshold" was tightened to 155 g/km in 2003/04 and to 145 g/km in 2004/05. In 2005/06 it will be further reduced to 140 g/km. Scheduled changes over time attempt to ensure that the tax reform will continue to be relevant as the overall fuel efficiency of new cars improves.

Every additional 5 g/km by which the CO_2 emissions figure of a vehicle exceeds the lower threshold increases the benefit-in-kind rate by 1%. Gasoline company cars with CO_2 emissions figures of 255 g/km or higher in 2003/04 incur the maximum charge of 35%. Diesel vehicles that do not meet EU emissions standards incur an additional charge of 3% to reflect higher levels of local air pollutants, while cars running on certain alternative fuels qualify for additional discounts. Table 4 illustrates the annual percentage of the car price that is added to employee income as a benefit-in-kind for 2002/03, 2003/04 and 2004/05 at selected intervals.

[5] A complete description of the current tax treatment for company cars in Canada can be found in: Canada Revenue Agency, 2005, "Employers' Guide to Taxable Benefits 2004-2005 – Chapter 1 – Automobile Benefits and Allowances", Government of Canada.

[6] An additional benefit-in-kind may also be added to this total if the employer pays for fuel, insurance, and other operating costs, and if the employee does not reimburse the employer for these operating costs associated with personal driving.

Table 4: Taxable percent of car price at selected emissions levels for 2002/03, 2003/04 and 2004/05 under the new UK system

CO_2 Emissions (g/km)			Taxable Benefit (% of Car Price)
2002/03	**2003/04**	**2004/05**	
165	155	145	15
190	180	170	20
215	205	195	25
240	230	220	30
265	255	245	35

Source: Table 4 is a condensed version of the table presented by the Society of Motor Manufacturers and Traders Limited (SMMT) at http://www.smmt.co.uk/co2/co2intro.cfm.

Inland Revenue estimates that the emission reduction in 2003 associated with the reform will be from 0.15 to 0.2 million tonnes of carbon (0.5 to 0.75 Mt of CO_2). They also anticipate being on track to meet the long-term target of 0.5 to 1 million tonnes of carbon reductions per year (1.8 to 3.6 Mt of CO_2). It is estimated that employers faced one-off costs of £55 million to comply with the changes, but that they enjoyed a reduction in annual compliance costs of £35 million in 2002/03. The effect on Exchequer revenues was greater than anticipated and is now forecast at £10 million in 2002/03, £120 million in 2003/04 and £140 million in 2004/05. These costs are modest in the context of overall revenue receipts from company cars.[7] Despite the reported success of the program, some analysts conclude that employees will simply "cash out" of their company car program, taking an increase in salary and buying their own vehicle.[8] These purchases will not be subject to the incentives created by the company car tax system.

The passenger transportation sector and company cars in Canada

There were about 15.9 million light duty passenger vehicles (cars and light trucks) in Canada in 2003, of which about 1.4 million were new vehicles purchased that year. These vehicles produced 74.5 Mt CO_2e of GHG emissions in 2003, about 10% of Canada's total of 740 Mt.[9] Emissions from light-duty passenger vehicles have increased 14.8% since 1990. The sector is therefore a significant contributor to Canada's overall GHG emissions, and an important source for potential reductions in GHG emissions.

A significant amount of the new vehicles sold in Canada are bought or leased by companies and used by employees as company cars. In 2004, about 100,000 of the new vehicle registrations in Canada (about 7% of total sales) were to companies for use as company cars (this number excludes pickup trucks, since this analysis will not address this vehicle type, as well as all cargo vans and other vans used as single-purpose

[7] Inland Revenue, April 29, 2004, "Report on the evaluation of the company car tax reform".

[8] Turpin, A. 2000, "Running on empty", *Director* 54, no. 2: 17.

[9] Natural Resources Canada, 2005, "Energy Use Data Handbook", Government of Canada; Environment Canada, 2005, "Canada's 2003 Greenhouse Gas Inventory", Government of Canada.

commercial vehicles).[10] While used by companies, these vehicles produced about 1.2 Mt of emissions in 2004. However, company cars are used for a relatively short period by companies before being sold into the second-hand vehicle market, so the bulk of the life cycle emissions of a vehicle that is purchased as a company car are produced during its second-hand life. In total, company cars being used by companies and those that were purchased by companies but that are now in the second-hand market emitted 5.1 Mt of GHG emissions in 2004.

The distribution of CO_2 emissions of company cars sold in 2004 is shown in Figure 1. The emissions intensity of most cars ranges from 150 – 290 g CO_2/km, for minivans the emissions intensity ranges from 240 – 350 g CO_2/km, and for sport utility vehicles[11], the emissions intensity ranges from 220 – 380 g CO_2/km. The weighted average emissions intensity of all company vehicles sold in 2004 (excluding pickup trucks and cargo vans) was 253 g CO_2/km.

In 2004, companies spent about $3.2B on vehicles to be used as company cars (excluding pickups, cargo vans, and single-purpose commercial vans), and the federal government collected about $220M in GST for these vehicles.[12] Employers reported a total benefit-in-kind associated with employee use of company cars of about $950M on average between 2001 and 2003, which corresponds to federal income tax revenue of about $230M and provincial income tax revenue of about $160M.[13]

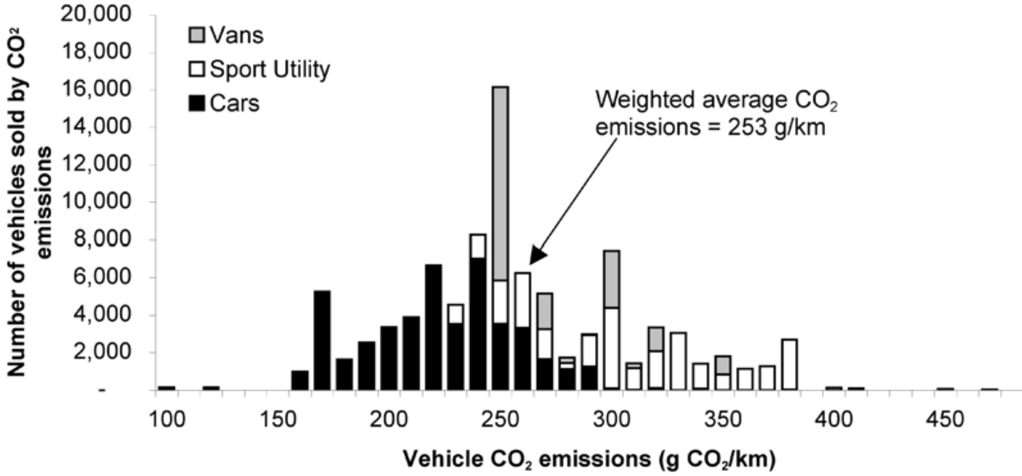
[10] Calculated using data on company new vehicle registrations from R.L. Polk and Co. and data on the number of individuals reporting Code 34 T4 taxable benefits from Canada Revenue Agency.

[11] Sport utility vehicles include vehicles like the Chrysler PT Cruiser, which have characteristics (size, weight, seating) that cause them to be included in this category.

[12] All monetary values in this report are in constant 2004 Canadian dollars unless otherwise noted.

[13] Data from Canada Revenue Agency, T4 Infodec Supplementary Files.

Figure 1: Distribution of company car sales by CO_2 emissions (excluding pickup trucks and cargo vans), 2004

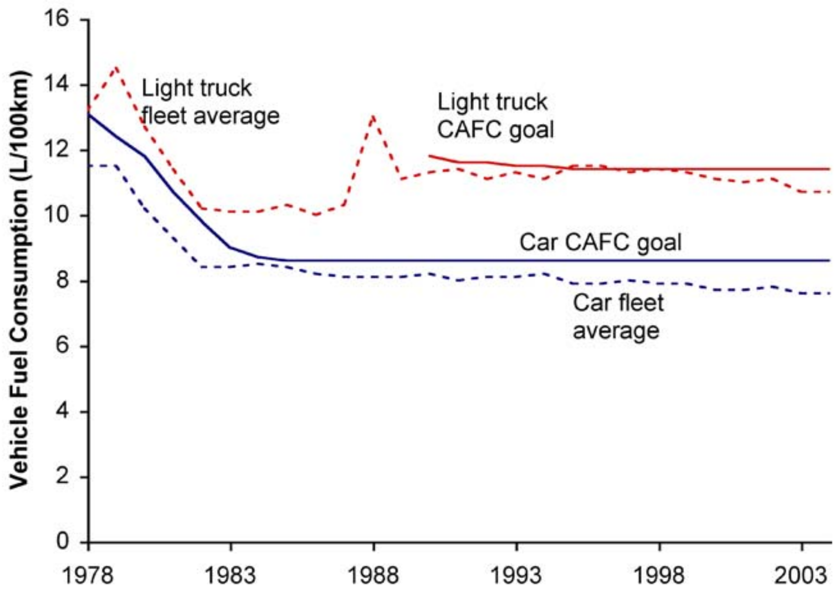


Source: Data on vehicle stock from R.L. Polk and Co., Data on CO_2 emissions by vehicle type from Natural Resources Canada, Fuel Consumption Guide, 2004.

Passenger transportation policies for GHG reduction in Canada

Since 1978, the Government of Canada has set voluntary goals for Company Average Fuel Consumption (CAFC) for vehicle manufacturers. Canadian light duty passenger cars and light trucks have met the CAFC goals every year. Between 1978 and 1985 the goals were steadily made more stringent, but since 1985, the CAFC goal for passenger cars has remained static and only slight changes have been made to the CAFC standard for light duty trucks, as shown in Figure 2. As a result, since 1990 (the base year for Canada’s current climate change commitments), CAFC goals have not contributed to meeting Canada’s climate change goals.

Figure 2: Canada's company average fuel consumption



Source: Transport Canada, 2005. http://www.tc.gc.ca/programs/environment/fuelpgm/cafc/page2.htm

Canada's most recent climate change plan recognized the importance of reducing GHG emissions from light duty vehicles, and proposed a target of reducing emissions by 5.3 Mt CO_2/year by 2010 relative to business as usual levels.[14] The policy instrument being used to meet this target is a memorandum of understanding (MOU) signed in 2005 between automakers and the government, in which the automakers have voluntarily committed to meeting the government target.[15] It remains unclear what technological or behavioural changes the MOU will induce, and some uncertainty remains in the actual level of emissions reductions stipulated by the MOU since changes to the business as usual projections will be made to update factors characterized in the MOU as beyond the control of auto manufacturers.

The policy being evaluated in this report involves changes to the *Income Tax Act* to provide more favourable tax treatment for company cars with lower GHG emissions. The proposed change would affect about 7% of all new cars sold in Canada. Details of the proposed policy are discussed in the following section.

[14] Government of Canada, 2005, "Project Green: Moving Forward on Climate Change", p. 18.

[15] "Memorandum of Understanding between the Government of Canada and the Canadian Automotive Industry Respecting Automobile Greenhouse Gas Emissions", April 5, 2005, http://www.nrcan-rncan.gc.ca/media/mous/2005/20050405_e.htm.

2. Options for Changes in Tax Treatment of Company Cars

Policy description

Changes in tax treatment of company cars to reduce GHG emissions could take many different forms. We outline the possibilities in terms of the following six variables:

- ***Rate basis*** – the rate basis is the variable upon which changes in tax treatment are based. Tax treatment could be based on the fuel consumption of a vehicle (in L/100 km), the fuel efficiency of a vehicle (in miles per gallon or km/L), or the GHG emissions of a vehicle (in g CO_2/km). In this report, changes in tax treatment are based on vehicle GHG emissions, in a similar way to the policy recently implemented in the UK.
- ***Functional form*** – the function used to calculate the tax treatment for specific vehicles can take many forms. It can be linear or non-linear and incorporate upper and lower thresholds to eliminate excessive taxes for high emission vehicles, and include a "deadband" where all vehicles receive identical tax treatment. In this report, the tax changes analyzed incorporate an upper and lower threshold and use a linear rate of tax increase between them, with no deadband.
- ***Rate*** – for a linear function, as analyzed here, the rate shows how fast the tax rate increases as vehicles produce more CO_2 emissions. In the UK, tax rate increases at a rate of 1% per 5 g/km of vehicle CO_2 emissions.
- ***Differentiation by vehicle class*** – potential exists for differentiating the policy according to vehicle class, but this reduces economic efficiency and environmental effectiveness. In this report, all pickup trucks and cargo vans are excluded from the analysis, but the policy does not differentiate according to remaining classes.
- ***Phase-in period*** – in the year they are first implemented, changes in the tax treatment of company cars can be applied to all company cars, or applied only to new company cars, which reduces market disruptions. In addition, the policy can be gradually made more stringent over time, as is being done in the UK. In this report, the analysis simulates application of the policy to new company cars beginning in 2007 and to all company cars in 2008 and after, and the policy is not made more stringent over time.
- ***Exemptions*** – the current tax treatment of company cars in Canada provides exemptions to the base benefit-in-kind calculation of 24% of vehicle price. For employees that drive less than 20,004 km/year and for whom personal vehicle use represents less than 50% of total vehicle travel, or for vehicle sales people, the benefit-in-kind is reduced by 25%. The analysis in this report maintains these exemptions. In the UK, diesel vehicles are assessed a 3% penalty to account for

increased local air emissions. The analysis in this report does not differentiate tax treatment based on fuel type.

3. Methodology

The primary objective of this study is to project the economic and environmental impacts of possible changes to the tax treatment of company cars in Canada. In order to do this, a vehicle choice and stock accounting model covering the company car segment and second-hand vehicle segment of the Canadian vehicle market was developed. The model is briefly described here; a detailed description of the model is included in Appendix A.

Model description

The model starts by predicting how a change in the tax treatment of company cars affects the type of vehicles that are purchased by companies, using a methodology based on the functions developed for the CIMS and ISTUM energy-economy models. Each individual vehicle model used as a company car in Canada in 2004 is included (excluding pickup trucks and cargo vans), with its fuel economy and list price. New vehicle purchases are simulated every year from 2004 to 2020 in order to satisfy projected company demand for new vehicles, and are influenced by fuel prices, company car tax treatment, and assumptions about employee and company preferences and behaviour. Key variables relating to behaviour are shown in Table 5, and assumptions about the values of these variables in the Base policy scenario are also listed.

Table 5: Descriptions of behavioural parameters and base case values

Parameter	Description	Value in Base scenario
Discount rate[16]	The implicit interest rate applied by employers and employees in determining the present value of future cash flows (specifically fuel costs)	22.6%
Years of fuel valuation	Number of years of fuel cost considered by employer and employee in decision-making	3 years
Model elasticity[17]	The percent reduction in market share of a model within a vehicle class associated with a 1% increase in its cost	-10
Class elasticity[17]	The percent reduction in market share of a vehicle class associated with a 1% increase in the (weighted) average cost of vehicles in the class	-5
Overall elasticity[17]	The percent reduction in overall vehicle sales associated with a 1% increase in the (weighted) average cost of all vehicles	-0.5
Fuel Prices	Change in gasoline and diesel prices from 2004-2020	Based on US EIA world crude oil price forecast, see Appendix A
Income	Average employee income dictates marginal tax rate	$80,000 and 41.09% marginal tax rate
Ratio of company car travel to personal vehicle travel	Company vehicles are assumed to travel more than personal vehicles because they are used for both business and personal travel	1.5

A stock accounting model was developed to track vehicle stock by vehicle age in both the company car and second-hand vehicle markets. Using data from the Canada Revenue Agency and R.L. Polk and Co., average turnover for company cars was determined to be 2 years. All company cars are assumed to be sold into the second-hand vehicle market. Overall vehicle turnover rate was determined to be 14 years based on data from DesRosiers Automotive Consultants.

With a projection of vehicle stocks in the business as usual case (no change to company car tax treatment) and policy case, greenhouse gas and local air contaminant emission reductions corresponding to policy implementation are calculated each year. In addition, the model calculates changes in overall fuel costs and spending on vehicles, and

[16] Horne, M., Jaccard, M., & Tiedemann, K., 2005, "Improving Behavioural Realism in Hybrid Energy-economy Models Using Discrete Choice Studies of Personal Transportation Decisions". *Energy Economics*, 27, 59-77.

[17] See Greene., D., Patterson, P., Singh, M., & Li, J., 2005, "Feebates, Rebates, and Gas-guzzler Taxes: A Study of Incentives for Increased Fuel Economy", *Energy Policy* 33, 757-775; Berry, S., Levinson, J., & Pakes, A., 1995, "Automobile Prices in Market Equilibrium", *Econometrica*, 64(4), 841-890; Bordley, R., 1993, "Estimating Automotive Elasticities from Segment Elasticities and First Choice/Second Choice Data". *The Review of Economics and Statistics*, LXXV(3), 401-408; Greene, D., 1994, "Alternative Fuels and Vehicle Choice Model", ORNL/TM-12738, Center for Transportation Analysis, Oak Ridge National Laboratory, Oak Ridge, TN; McCarthy, P., 1996, "Market Price and Income Elasticities of New Vehicle Demands", *The Review of Economics and Statistics*, LXXVII(3), 543-547.

corresponding changes in government tax revenue. Finally, an employment model is used to determine changes in direct manufacturing employment and indirect employment in Canada resulting from implementation of the policy.

Modelling scenarios

The primary purpose of the analysis reported here is to show how the implementation of a company car policy will influence GHG emissions, other air emissions, government revenue, employment, and vehicle stocks. We model several different policy scenarios in order to provide a sense of the effect of changes in policy design on these outputs. Table 6 outlines these scenarios. All policies modelled are implemented in 2007, remain constant over the period covered by the analysis, and cover all vehicle classes except pickup trucks and cargo vans. In 2007, the tax reform is applied only to new company cars, while in subsequent years the tax reform is applied to all company cars. In practice, it would be useful for government to periodically review the tax schedule and update it to reflect changes in vehicle technology. Any updates to the tax schedule would need to be communicated to manufacturers, companies, and employees in advance of implementation.

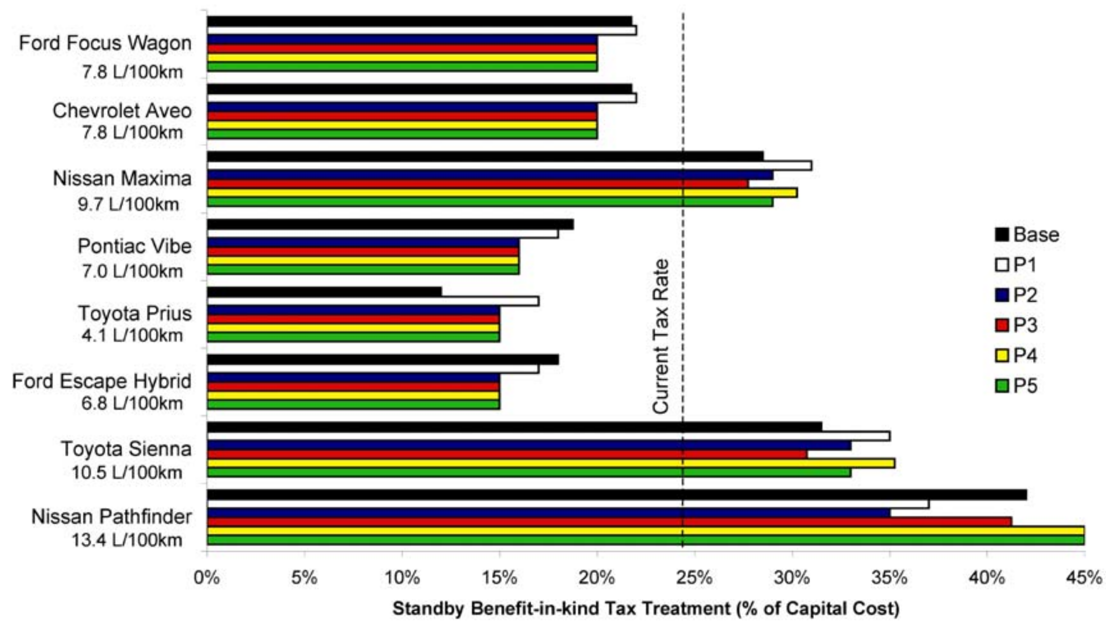
Table 6: Policy scenarios modelled in this report

Scenario	Lower Threshold	Upper Threshold	Lower Tax Rate	Upper Tax Rate	Rate of Increase
Base	120 g/km	360 g/km	12%	48%	1.5% / 10 g/km
P1	160 g/km	260 g/km	17%	37%	1% / 5 g/km
P2*	160 g/km	260 g/km	15%	35%	1% / 5 g/km
P3	160 g/km	345 g/km	15%	45%	1% / 5 g/km to 24%, then 1.5% / 10 g / km
P4	160 g/km	290 g/km	15%	45%	1% / 5 g/km to 24%, then 2.5% / 10 g / km
P5	160 g/km	310 g/km	15%	45%	1% / 5 g/km

* *This policy is similar to the one recently implemented in the United Kingdom. The policy introduced in the UK was subsequently made more stringent.*

Figure 3 shows the tax treatment for each policy scenario applied to several popular vehicle models. For most policy scenarios tax treatment becomes more beneficial (i.e., lower tax rate and so lower taxes) for compact, small, and medium cars, and becomes less beneficial (i.e., higher tax rate and so higher taxes) for large cars, minivans, and sport utility vehicles.

Figure 3: Tax treatment for selected vehicle models



In addition to modelling the effect of alternative policy designs, we also model the impact of changes in key assumptions, to show the sensitivity of the results to the assumptions made. Table 7 describes the key sensitivity analysis scenarios that were run in order to determine the impact of uncertain parameters on model results. All sensitivity analysis scenarios are run using the Base policy scenario.

Table 7: Sensitivity analysis scenarios on key uncertain parameters

Scenario	Description
S1	Discount rate = 10%
S2	Years of fuel valuation = 14
S3	Model and class elasticity = -5 and -2.5
S4	Overall elasticity = -1
S5	Fuel prices = low crude oil prices (EIA forecast)
S6	Fuel prices = high crude oil prices (EIA forecast)
S7	Income = $50,000
S8	Income = $120,000
S9	Ratio of company car to private car travel = 2

Model limitations and uncertainties

Like all models, this one is a simplification of the real world, and so does not represent it perfectly. The main uncertainties and limitations are as follows:

- ***Discount rate*** **–** the discount rate is a concept frequently applied in modelling trade-offs between present costs or benefits and a stream of future costs or benefits. However, there is significant controversy in the energy economics community about the appropriate discount rate to apply in order to accurately forecast decisions made by consumers. Most empirical studies find that consumers implicitly apply relatively high discount rates (20-50%) in making decisions relating to energy consuming goods. Some analysts suggest that the high discount rates found in empirical studies are inconsistent with proper market function (they exceed rates of return on common stocks by a factor of three or more, exceed rates of return to public utilities, and exceed lending rate offered by credit card companies by a factor of two or more), and should therefore be discredited.[18] However, the bulk of the literature on private-sector decision making with regards to energy finds that high discount rates revealed in empirical studies are likely a reflection of the reality of obtaining information in the market, the high perceived risk of energy efficiency investments, the skepticism of consumers to *ex ante* claims of high rates of return on energy efficiency investments, the option value of waiting for more information before making a decision, and the limited time available to consumers to evaluate energy saving technologies, among other factors.[19] The value used in the base case in this study is from a recent empirical study conducted to determine implicit discount rates applied by vehicle owners in Canada.[20] It is consistent with values found in other similar studies. We test the sensitivity of the results to the choice of discount rate later in this document.

- ***Years of fuel valuation*** **–** there is substantial evidence that consumers do not fully value fuel costs for all years of vehicle life when making decisions about vehicle purchase. Unfortunately, data does not exist to show the degree to which Canadian consumers value fuel costs when making vehicle purchases. We assume a value of 3 years and test the sensitivity of the results to this assumption later in this document.
- ***Elasticity*** **-** the concept of elasticity is used frequently in economics. In this study, it denotes the percent reduction in market share for a vehicle model or class associated with a 1% increase in its total cost. Several empirical studies have attempted to measure the elasticity of vehicle model and class elasticity.[21] For a

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[18] See DeCanio, S. & Laitner, S. (1997). "Modeling Technical Change in Energy Demand Forecasting: A Generalized Approach". Technological Forecasting and Social Change, 55, 249-263.

[19] See Dixit, A. K., & Pindyck, R. S. (1994). Investment under Uncertainty. Princeton: Princeton University Press; Hasset, K., & Metcalf, G. (1994) "Energy Conservation Investments: Do Consumers Discount the Future Correctly?". Energy Policy, 21(6), 710-716.

[20] Horne, M., Jaccard, M., & Tiedemann, K. (2005). "Improving Behavioural Realism in Hybrid Energy-economy Models Using Discrete Choice Studies of Personal Transportation Decisions". *Energy Economics*, 27, 59-77.

[21] See Greene., D., Patterson, P., Singh, M., & Li, J. (2005). "Feebates, Rebates, and Gas-guzzler Taxes: A Study of Incentives for Increased Fuel Economy". *Energy Policy* 33, 757-775; Berry, S., Levinson, J., & Pakes, A. (1995). "Automobile Prices in Market Equilibrium". *Econometrica*, 64(4), 841-890; Bordley, R. (1993). "Estimating Automotive Elasticities from Segment Elasticities and First Choice/Second Choice Data". *The Review of Economics and Statistics*, LXXV(3), 401-408; Greene, D. (1994). "Alternative Fuels and Vehicle Choice Model". ORNL/TM-12738, Center for Transportation Analysis, Oak Ridge National

vehicle model within a class, estimates of elasticity (at 3% starting market share) range from –2.4 to –10, with most estimates around –5 to –6. For a vehicle class, the elasticity (according to theory) must be lower (in absolute value) than the model elasticity. The only empirical estimate we found in literature was –5. For overall vehicle sales, estimates range from –0.5 to –1. All of the studies we found were conducted in the US; no similar study was found specific to Canada. We test the sensitivity of the results to the choice of elasticity later in this document.

- ***Local air emission factors*** – to estimate changes in local air emissions resulting from policy implementation, the model uses the data from the US EPA MOBIL 6 database. The database is up to date and is used frequently by both the Canadian and US Governments to predict local air emissions from mobile sources. However, the database contains aggregated data, not data on local air emissions by vehicle model. In addition, local air emissions are heavily influenced by control technology policy. Lacking other data, we assumed policy on local air emission controls remained fixed at 2004 levels. Estimates of CAC emissions therefore have significant uncertainty associated with them.
- ***Static vehicle model*** – the model is based on a database of all vehicles purchased for use as company cars in 2004, and assumes that no changes are made to vehicle types or characteristics over the period 2004-2020. This is clearly unrealistic, and will cause the model to underestimate the amount of GHG emissions reductions due to policy implementation.
- ***Distance travelled by company cars*** – data does not exist to capture the average annual distance travelled by company cars. We assumed that company cars travel 50% more than personal vehicles, and test the sensitivity of the results to this assumption later in this document.
- ***Employee income*** – the impact of the changes tax treatment of company cars depends on the average marginal income tax rate for employees with company cars, for which data is not available. We assumed an income of $80,000 and test the sensitivity of the results to this assumption later in the document.

Despite these limitations, we feel that the results generated by the model can usefully inform policy. As discussed above, we test the sensitivity of the results to assumptions relating to key uncertain variables to show the degree to which the results are affected by assumptions.

4. Modelling Results

This section is divided into three parts. First, detailed results are presented corresponding to the Base policy and Base case assumptions. Next, results are summarized for all policy scenarios, with a discussion of the effect of alternative policy designs on results.

Laboratory, Oak Ridge, TN; McCarthy, P. (1996). "Market Price and Income Elasticities of New Vehicle Demands". *The Review of Economics and Statistics*, LXXVII(3), 543-547.

Third, results are summarized for all sensitivity scenarios, with a discussion of the effect of assumptions about key uncertain parameters on results. Detailed results for each scenario analyzed are summarized in tabular format in Appendix B.

Base case results

Impacts of changes in company car tax treatment on CO_2 and CAC emissions

The impact of the change in company car tax treatment on CO_2 emissions is shown in Figure 4. Overall, CO_2 emissions are reduced by about 0.3 Mt in 2010 and about 1.0 Mt in 2020 as a result of policy implementation. In the first few years following policy implementation, most CO_2 reductions result from changes in company cars, while in later years the bulk of the CO_2 reductions occur in the second-hand vehicle market, as more efficient company cars are sold for use as personal vehicles. Average CO_2 emissions intensity of company cars improves from 253 g CO_2/km before policy implementation to 227 g CO_2/km after policy implementation, an improvement of 10.4%.

Figure 4: CO_2 emissions reductions from policy implementation, 2004-2020

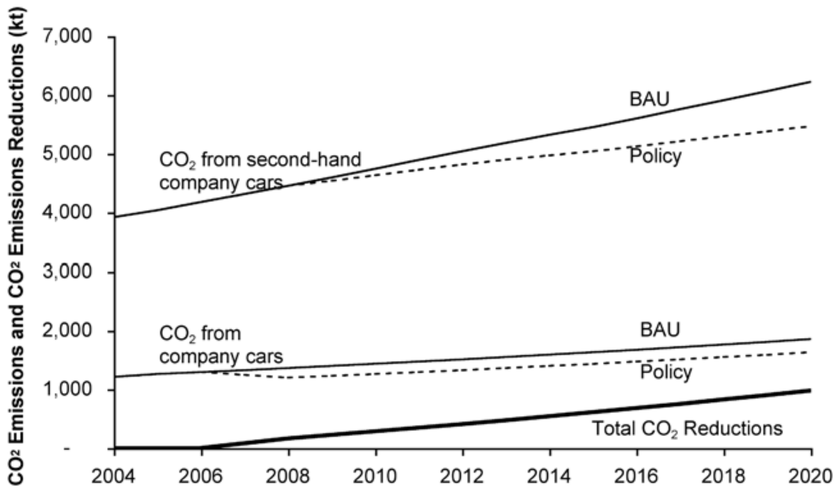
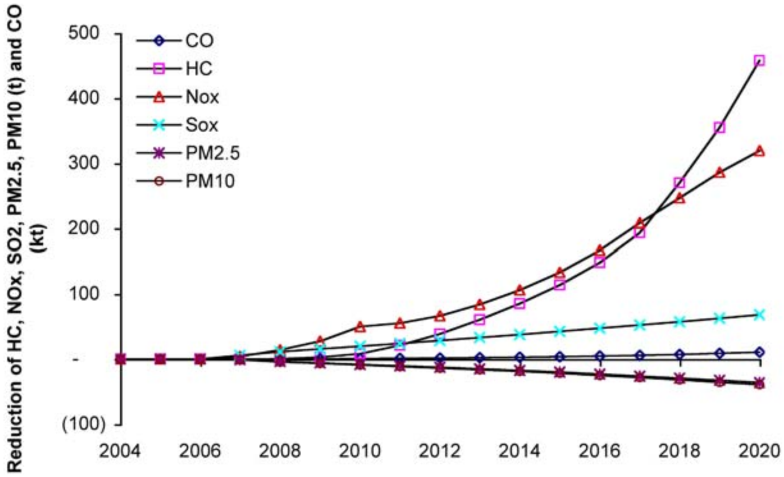


Figure 5 shows changes in local air emissions resulting from policy. Implementation of the policy is projected to reduce emissions of carbon monoxide (CO), volatile organic hydrocarbons (HC), oxides of nitrogen (NOx), and sulfur dioxide (SO_2) as a result of improvements in average vehicle fuel economy. It is projected to increase emissions of particular matter (PM2.5 and PM10) because of increases in the number of diesel vehicles, which have lower GHG emissions, so increase in number as a result of policy implementation, but which have higher particulate matter emissions. These results are sensitive to changes in CAC emissions regulations in both fuel (e.g., sulphur levels), and vehicle control technology. The results shown here assume no changes in CAC emissions regulations from 2004.

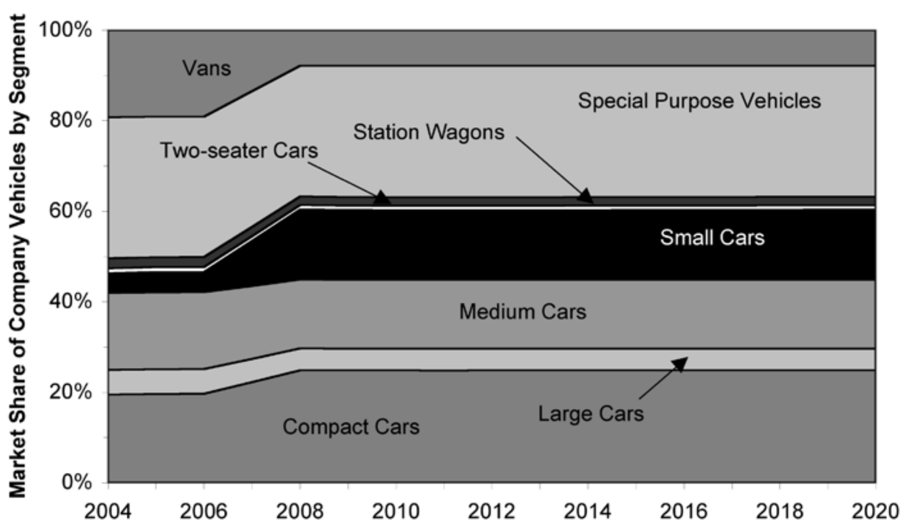
Figure 5: Local air emissions reductions from policy implementation, 2004-2020



Impacts of changes in company car tax treatment on vehicle and fuel purchases

Implementation of the policy is projected to result in three types of consumer response: (1) a switch from higher emission vehicle models to lower emission vehicle models within a vehicle class; (2) a switch from higher emission vehicle class to lower emission vehicle class; (3) increase or decrease in overall demand for vehicles. Figure 6 shows the changes in market share of the company car market by vehicle class as a result of the policy. In 2004, roughly 24% of the company cars purchased were compact or small cars, a further 22% were medium or large cars, 31% were sport utility vehicles, and about 19% were minivans. After policy implementation, 40% of new company cars are compact or small cars, 20% are medium or large cars, 29% are sport utility vehicles, and 8% are minivans.

Figure 6: Trends in company car market share by vehicle class due to policy implementation, 2004-2020



In addition to changes in types of vehicles purchased, the policy induces a change in overall vehicle demand as a result of policy implementation. For the base case policy, slight decreases in overall demand are projected; by 2020 sales of new company cars climb from their current level of about 100,000 per year to about 149,000 in the policy case compared to 152,000 in the business as usual case. The average purchase cost of new company cars is projected to decrease from about $34,500 in the business as usual scenario to about $28,800 in the policy scenario as a result of companies purchasing smaller, more fuel-efficient vehicles. As a result of these changes, spending on new company cars declines by about $0.75B annually by 2010, and annual spending on fuel, by both company cars and second-hand company cars, declines by about $98M by 2010 and by $347M by 2020. The substantial decline in spending on new company cars projected by the model is likely an overestimate; since the model assumes static technologies from 2004-2020, the only way to reduce GHG emissions is to switch to smaller vehicle models and vehicle classes, which are generally cheaper. In reality, it is likely that new low-GHG technologies (e.g., hybrid drivetrains) will be developed and applied to all vehicle classes in the near future.

Impacts of changes in company car tax treatment on government revenue

The reduction in fuel consumption induced by the policy reduces government revenue from fuel excise taxes correspondingly. For the policy simulated here, federal fuel excise tax revenue is reduced from business as usual levels by about $12.5M in 2010 and by $43M in 2020 (2004 dollars). In addition, as a result of changes in the tax treatment of company vehicles, federal income tax revenue is affected. For the policy simulated here, federal income tax revenue is increased by about $4.8M in 2010 and about $6M in 2020.

Impacts of changes in company car tax treatment on employment

About 37,000 Canadians are directly employed in vehicle manufacturing plants in Canada, making about 30 models of vehicles and a total of about 2.5M vehicles. Most of the vehicles made in Canada are exported, so changes in vehicle purchasing in Canada have a limited effect on production of vehicles in Canada. Based on the policy simulated here, about 50 fewer new jobs are created in Canadian auto manufacturing plants by 2010. Loss of employment in auto manufacturing plants creates indirect losses in other sectors of the economy that support the auto manufacturing plants. It is anticipated that the policy simulated here will cause about 340 indirect job losses relative to the business as usual case. However, both of these estimates need to be taken in the context of overall job growth in the sector – the 50 job losses are not losses of current jobs, but reduction in creation of new jobs.

Results for alternative policy specifications

The base case described above is based on a specific schedule of tax changes for vehicles with different CO_2 emissions. Many alternative designs exist that would produce different results. In this section, results are presented and discussed for several alternative policy specifications.

Table 8 shows the general results for the alternative policy specifications described in Table 6. It shows, unsurprisingly, that the results of the policy are sensitive to policy design. Policies with lower thresholds and faster rates of increase are more stringent and have greater environmental effectiveness as measured in CO_2 and criteria air contaminant emissions. Impacts on federal government revenue and employment do not appear to be correlated with the stringency of the policy.

Table 8: Results for alternative policy designs

Scenario	CO_2 Reduction 2010 (kt)	CO_2 Reduction 2020 (kt)	Total CAC reduction 2020 (t)	Loss of Fed Gov't Income Tax Revenue 2010 ($2004M)	Loss of Fed Gov't Income Tax Revenue 2020 ($2004M)	Direct Job Losses 2010	Reduction in sales 2010 (units)
Base	284	980	11,288	(4.77)	(5.96)	52	2,337
P1	322	1,109	13,255	10.09	13.10	9	531
P2	296	1,020	12,019	20.20	26.10	7	(188)
P3	275	965	10,639	4.43	(2.10)	30	1,339
P4	352	1,199	14,199	10.23	15.47	42	1,501
P5	319	1,098	12,651	6.32	8.29	38	1,565

Results from sensitivity analyses

Any model is a simplification of the real world, and to some degree produces uncertain results. Sensitivity analysis can be used to estimate the degree to which results are sensitive to assumptions about uncertain parameters. Table 9 shows the sensitivity of the results to the key assumptions in the model as outlined earlier in this document. In all cases the policy simulated is the Base policy, as described in Table 6.

- ***Discount rate*** (S1) – the Base case analysis assumes a discount rate of 22.6%, consistent with empirical studies. If the discount rate is actually 10%, the policy produces about 27% more CO_2 reductions and about 21% more total CAC reductions. Loss of federal revenue is greater, primarily because of lower fuel purchases.
- ***Fuel valuation*** (S2) – there is some empirical and anecdotal evidence that consumers do not fully value all years of fuel purchase. In the base case, we assumed consumers only consider 3 years of fuel costs when making vehicle purchase decisions. If consumers actually fully value fuel costs, the policy will produce slightly less CO_2 and CAC reductions than forecast in the base case.
- ***Model and class elasticity*** (S3) – there is considerable uncertainty about the appropriate model and class elasticities to use to realistically simulate vehicle purchases, primarily because of a lack of empirical studies conducted in Canada. If the actual elasticity is only half the value used in the base case, CO_2 reductions are about 25% lower than the base case. In addition, vehicle sales are reduced substantially relative to the business as usual scenario: by about 3,800 in 2010.

- ***Overall elasticity*** (S4) – the base case analysis used the assumption that the overall demand elasticity was –0.5%. There is limited empirical evidence for this parameter, so this sensitivity analysis tested a doubling of its value to –1.0%. This change causes the policy to produce about 15% more CO_2 reductions than under the base case assumption.
- ***Fuel prices*** (S5 and S6) – the base case analysis used a gasoline and diesel price forecast developed from the Reference crude oil price forecast in the US Energy Information Administration's "International Energy Outlook". We tested the sensitivity of the results to higher and lower crude oil prices (corresponding to the high and low fuel price forecasts in the IEO), and found that the assumption of fuel price has very little effect on the results.
- ***Income*** (S7 and S8) – employee income affects the marginal tax rate, which affects the total change in incentive caused by the policy change. We assumed employee income was $80,000 in the base case, and tested values of $50,000 and $120,000. We found only small effects on the amount of CO_2 reductions.
- ***Company car distance travelled*** (S9) – data on the average distance travelled by company cars in Canada does not exist. The base case assumed an average travel distance 50% greater than for personal vehicles. This sensitivity analysis tested the effect on results if company car distance is actually 100% greater than for personal vehicles. In this case, CO_2 reductions in 2010 are 17% larger than the base case, but this effect becomes smaller over time. Other results are not significantly affected.

Table 9: Sensitivity of results to uncertain assumptions

Scenario	CO_2 Reduction 2010 (kt)	CO_2 Reduction 2020 (kt)	Total CAC reduction 2020 (t)	Loss of Fed Gov't Income Tax Revenue 2010 ($2004M)	Loss of Fed Gov't Income Tax Revenue 2020 ($2004M)	Direct Job Losses 2010	Reduction in sales 2010 (units)
Base	284	980	11,288	(4.77)	(5.96)	52	2,337
S1	362	1,249	13,726	22.59	29.31	59	1,769
S2	267	919	10,601	(11.49)	(14.55)	46	2,455
S3	212	730	10,462	(38.88)	(50.27)	7	3,816
S4	326	1,124	14,846	0.26	0.38	60	4,801
S5	290	1,000	11,562	(5.79)	(7.54)	55	2,617
S6	281	962	11,012	(5.14)	(6.11)	52	2,280
S7	258	891	10,371	(12.07)	(15.44)	50	2,433
S8	294	1,015	11,564	(1.58)	(1.93)	54	2,365
S9	334	1,029	11,055	(7.64)	(9.67)	50	2,422

Overall, two main uncertainties emerge: (1) the discount rate, and (2) the model and class elasticities. If the correct value for the discount rate is 10%, rather than the 22.6% used in the base case value, CO_2 reductions are about 27% greater than the base case. If the correct value for the model and class elasticities is –5 and –2.5, rather than the –10 and –5 used in the base case, CO_2 reductions are about 25% lower than predicted in the base case. Other uncertain parameters do not have as significant an effect on results.

Discussion of results

Several general observations emerge from the modelling scenarios described above:

- ***GHG Reductions*** **–** all policy scenarios produce substantial GHG reductions. Policy design has an important impact on GHG reductions: policies with less stringent thresholds produce less GHG reductions, and policies with a lower rate of increase (in % / g/km) produce less GHG reductions. Uncertainty in the model parameters translates into uncertainty about GHG reductions. In particular, uncertainty about elasticities and the discount rate have a significant effect on overall GHG reductions. However, even over the wide range of policy scenarios and uncertain parameters analyzed, all scenarios produced significant GHG reductions (from 0.73 to 1.25 Mt CO_2 by 2020).
- ***CAC Reductions*** **–** all policy and sensitivity scenarios produce significant overall CAC reductions. In particular, the policy induces reductions in VOC, CO, NOx, and SO_2 emissions, but induces increases in PM2.5 and PM10 emissions because of an increase in diesel vehicles.
- ***Fiscal Impact*** **–**most of the policies simulated do not impact federal government income tax revenue significantly. Impacts range from a slight increase in government revenue to a slight decrease (the overall range for all scenarios is from an increase of $39M to a decline in $23M annually in 2010). However, in all scenarios modelled, the policy reduces federal government revenue related to fuel excise taxes because fuel consumption is reduced. This is an unavoidable impact of almost any policy aimed at reducing emissions in the passenger transport sector.
- ***Employment Impact*** **–** under most policy scenarios, employment growth is slightly slower compared to the business as usual scenario.   Impacts are small because the majority of vehicles manufactured in Canada are exported and the majority of vehicles bought in Canada are imported. Policy design has an important impact on employment losses.
- ***Uncertainty*** - uncertainty related to model parameters was described in Section 2. In the modelling, a range of policy parameters was tested to determine the robustness of the results to changes in uncertain parameters. While the results are clearly sensitive to differing assumptions about uncertain parameters, the range of results is not large, with all scenarios producing substantial GHG and overall CAC reductions and small loss in overall federal government revenue. This provides confidence in the results despite the uncertainty in the input parameters.

5. Policy Evaluation

Annex 4 of *The Budget Plan 2005* provides criteria by which economic policies should be evaluated. This section provides a brief evaluation of potential changes to company car tax treatment using these criteria.

- ***Environmental effectiveness*** – this study forecasts that the proposed tax reform will reduce annual emissions of CO_2 by approximately 0.3 Mt from BAU levels in the year 2010, rising to 1 Mt in 2020 (these values are sensitive to policy design). Although the main environmental goal of the tax reform is GHG emission reduction, all criteria air contaminants are reduced as well, with the exception of particulates. An increase in particulate emissions occurs because more diesel vehicles are purchased under the simulated tax reform. Special provisions could be included in the final reform package to address this issue if necessary. For example, diesel vehicles not passing air pollution standards might be subject to an increase in the taxable percentage of the company car price, as in the UK system. This type of exemption would likely reduce the GHG benefits of the policy somewhat.

  To achieve environmental effectiveness, *The Budget Plan 2005* states that an environmental tax measure must be targeted effectively. It should affect the transactions in the marketplace – and only those transactions – that are germane to the pursuit of the environmental goal. Changes to the tax treatment of company cars build on an existing taxation framework, with changes directly affecting GHG intensity of new vehicles. Any rebound effect will be minimal, since variable operating costs for employees should not change significantly (operating cost benefit-in-kind is generally calculated using a flat rate that does not depend on fuel efficiency of the vehicle).

- ***Fiscal impact*** - the proposed tax measure is composed of both a financial incentive for the purchase of low GHG emission vehicles and a financial disincentive for the purchase of high GHG emission vehicles (taxable benefit falls below the existing 24% of the vehicle price for low emission vehicles and rises above 24% for high emission vehicles). There is uncertainty regarding the impact of the tax measure on federal income tax because this outcome is dependent on the behaviour of car purchasers. Revenue neutrality is possible under a system such as the one proposed, based on the structure of the taxable benefit percentages assigned to different GHG emission levels, as well as the behavioural response to the reform. The modelling shows an increase in federal income tax revenue of about \$4.8 million in 2010, rising to \$6 million in 2020. To put this reduction in context, federal income tax collected for the company car benefit was \$223 million in 2004, and is predicted by the model to increase to \$263 million in 2010 under business as usual conditions.

  Federal fuel excise tax revenue inevitably declines because the tax instrument improves energy efficiency, achieving a reduction in GHG emissions through a decrease in energy consumption. The analysis showed a reduction in federal excise tax revenue of $13 million in 2010 relative to business as usual conditions, increasing to $43 million in 2020.

In total, the fiscal cost-effectiveness of the proposal is $38/t CO_2 reduced (C$2004) in 2020 when loss of federal fuel excise tax is included, and –$6/t CO_2 when only changes in income tax are included. Measuring cost-effectiveness in terms of only fiscal revenue change has limited usefulness, since a policy might have low fiscal costs and very high social costs (or vice versa). This indicator should therefore be used with caution.[22]

In considering the fiscal impacts described above, one must take into account government costs of reducing GHG emissions using alternative methods – including offering incentives to businesses and consumers to take action and purchasing emission reduction credits on the international market. The results probably overstate the fiscal impacts because they do not consider the macroeconomic impacts of the tax reform proposal. For example, businesses that spend less on fuel because they have purchased more efficient company cars will spend the saved money in other areas of the economy, which will also generate tax revenue for government.

- ***Economic efficiency*** - GHG and CAC emissions resulting from the combustion of fossil fuels in vehicles impose social costs that are not reflected in the price of the vehicles. Examples of these negative externalities include the cost of adaptation to global climate change and health costs associated with urban air pollution. The tax reform described in this document helps address this market failure and improves economic efficiency by incorporating some of the societal cost of a company car into the amount of income tax an individual pays associated with their use of that car (the tax reform has the opposite effect on particular matter emissions). The model indicates that the improved price signals will reduce GHG and overall CAC emissions, thereby contributing to a reduction in associated externality costs and a more productive use of resources. The incentive created by the tax reform to purchase vehicles with reduced CO_2 emissions also has the potential to stimulate technological innovation, as car companies may begin to provide more low-GHG options in response to increased consumer demand. The modelling did not account for this.

  Competitiveness impacts are not expected to be associated with the proposed tax reform. The overall level of taxation in the economy is not increasing, nor is the tax burden on internationally competitive sectors of the economy. Adjustment costs associated with the change, including impacts on employment at Canadian

[22] A large part of the overall fiscal impact is due to loss of gasoline excise tax revenue. Reducing one tonne of CO_2 emissions through reducing gasoline demand reduces federal government revenue by $42. This part of the fiscal impact is an inevitable cost of any program to reduce emissions from the transportation sector.

auto plants, are not significant. The impact of the policy on employment in Canadian auto plants is minimal, since over 85% of the vehicles made in Canada are exported, while over 75% of the vehicles purchased in Canada are imported. However, the policy is projected to reduce overall revenues of auto manufacturers (from all countries, not just Canadian manufacturers) by about $0.75B in 2010. It is likely that the projected loss is largely a result of limitations of the model, which did not include changes in vehicle attributes over time.

- ***Fairness*** – there may be some disproportionate effects of the policy on particular individuals, but the design of the policy is aimed to reduce this effect. Pickup trucks and cargo vans were removed from the policy to avoid imposing higher taxes on individuals not able to switch towards a lower emission vehicle class. Minivans were left within the policy, and if a minivan is required for business travel, the policy could adversely affect employees of companies that require minivans.

  Although not considered in the analysis, there are unlikely to be disproportionate effects on particular regions of the economy.

- ***Simplicity*** - the proposed change could be implemented through a modification to the existing *Income Tax Act*. In terms of administration, no substantive changes would be necessary, only a modification to the current procedure for calculating the taxable benefit associated with use of a company car. If businesses were provided with an appendix to their tax guidelines listing all makes and models of cars and the associated percentage to be used for determining benefit-in-kind, the operation would be quite straightforward. The proposed changes should be communicated to businesses and company car users in advance in order to improve the effectiveness of the reform. Interactive websites that calculate the tax impact based on the type of vehicle could be useful in promoting understanding for taxpayers.

6. Conclusions

The objective of this report was to evaluate the effect of implementing reforms to the system for calculating the benefit-in-kind associated with company cars in Canada, in a similar manner to reforms recently implemented in the United Kingdom. The modelling that was conducted shows that:

- Reforms to the system for calculating company car benefit-in-kind are expected to reduce GHG emissions by about 0.25-0.3 Mt CO_2 by 2010 and by about 0.9-1.0 Mt CO_2 annually by 2020. Reductions in GHG emissions are sensitive to policy design.
- Reforms to the system for calculating company car benefit-in-kind are expected to induce reductions in federal government revenue. Most scenarios modelled predicted reductions in annual federal government revenue of about $7-25M in 2010 and about $30-70M by 2020. Most of the revenue loss is associated with reductions in federal fuel excise tax revenue, which is an inevitable impact of any

policy to reduce emissions from the passenger transport sector. The policy is almost revenue neutral with respect to federal government income tax revenue, with most scenarios projected to change government revenue by ($5)-$10M in 2010 and by ($7)-$25 in 2020. Overall, the cost of the policy was calculated at $38/t CO_2 reduced by 2020 for the Base policy scenario (see caveats in Section 5) and at -$6/t CO_2 when only income tax revenue is considered. These figures are also sensitive to policy design.

- Under the Base case scenario, employment in Canadian auto manufacturing plants is expected to grow slightly slower than under the business as usual scenario. Employment in all scenarios is not reduced significantly compared to the business as usual scenario (less than 60 jobs in all scenarios by 2010), and job losses in the sector are overshadowed by overall growth in the sector (in other words, the policy will not cause job losses from today's levels, only job losses with respect to employment that would have occurred in the absence of the policy).
- Evaluation using the criteria in *The Budget Plan 2005* showed that the policy is well targeted and environmentally effective for the niche market that it affects. It can be considered to improve economic efficiency since it corrects negative environmental externalities by providing improved price signals. Overall, there are minimal impacts on fairness, although some drivers that are unable to switch vehicle classes could experience increased taxes. Finally, the policy is considered relatively simple, since it only involves changes to existing tax rates, and all institutions and mechanisms required to carry out the policy are already in existence.

Drive Green: Company Car Tax Shift is a ground-breaking new policy proposal to reduce greenhouse gas emissions and air pollution.

Modeled on a successful program in the United Kingdom, *Drive Green* shows how the federal government can:

- Reduce greenhouse gas emissions by one megatonne of CO_2 per year
- Reduce the pollutants that cause smog
- Reduce fuel costs for businesses and employees
- Avoid the loss of jobs in Canadian automobile assembly plants
- Retain current income tax revenues

Drive Green was prepared by MK Jaccard and Associates for the David Suzuki Foundation. It is the first in a series of policy proposals from the David Suzuki Foundation designed to help Canada achieve sustainability within a generation.

David Suzuki Foundation

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