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What Will We Gain from Axing the Tax?*

Leslie Shiell†

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† Department of Economics, University of Ottawa, 120 University Private, Ottawa, Canada K1N 6N5, Leslie.Shiell@uottawa.ca

Abstract

In March 2015, the Canadian Prime Minister terminated the federal carbon price and rebate system, in response to widespread belief that the carbon price was a major factor in the ongoing affordability crisis. The previous autumn, the Parliamentary Budget Officer (PBO 2024) released a report indicating that, including both cash and economics effects, approximately 60% of households paid more on the carbon price than they received in the rebate, and therefore the average household across the eight affected provinces (all but BC and Quebec) was made worse off by the policy.

However, there are several features of PBO (2024) which were apt to create confusion and lead to misunderstanding of the results, including: (i) vagueness about income levels, (ii) disproportionate emphasis on 2030 results, (iii) use of after-tax (disposable) income as the basis of analysis, (iv) use of average income, rather than median income, to summarize typical impact, and (v) lack of information on greenhouse gas (GHG) emissions at different income levels.

We address these issues and provide a clearer picture of the distributional impacts of the carbon price and rebate system. In 2024-2025, the policy made 50% or more of households, in four of the eight affected provinces, better off financially, and all households were forecast to be better off by the final year of the policy, 2030-2031, than they were in 2024-2025, as standard growth factors were forecast to outweigh the modest costs associated with the policy. We conclude that, far from making most households worse off, the federal carbon price and rebate policy was an effective policy to counteract the affordability crisis among those who needed help the most, and of course it was forecast to result in important environmental benefits as well.
Key words: *Canada's carbon tax and rebate; distributional impact.*
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I. Introduction

A majority of Canadians heaved a sigh of relief when Mark Carney paused the federal carbon tax, in his first act as Prime Minister. Due to persistent attacks in the last two years by opposition politicians, many voters came to believe the tax was a major factor in the ongoing affordability crisis. These views were reflected in an Abacus poll in January 2024, in which 64% of those with an opinion agreed that "the price on pollution is a big reason why prices for many things have risen so much," and 68% of those with an opinion stated they would save money if the tax were eliminated.

Nonetheless, there is an enormous gap between what most people believe about the carbon tax and what the evidence shows. To begin with, according to the Abacus poll, very few respondents were aware of receiving a rebate related to the carbon price. Further, only 24% of respondents believed it was true that "most get the same amount or more back in a rebate than they pay."

In contrast, the Parliamentary Budget Officer (PBO 2024) indicated that 80% or more of households received more back in the rebate than they spent, when assessed on a net cash basis. However, the policy also had deeper economic impacts, leading to reductions in household incomes. When factoring in these impacts, the PBO estimated only 40% of households received more back in the rebate than they spent, and therefore the average household across the eight affected provinces (all but BC and Quebec) faced a positive net cost under the carbon price and rebate system (CPRS).

However, several features of the PBO's report were apt to lead readers to draw the wrong conclusions, including the politicians. I focus here on five main features which either impede accessibility or obscure useful information that otherwise could help elevate and clarify the debate: (i) vagueness about income levels, (ii) disproportionate emphasis on 2030 results, (iii) use of after-tax (disposable) income as the basis of analysis, (iv) use of average income, rather than median income, to summarize typical impact, and (v) lack of information on greenhouse gas (GHG) emissions at different income levels.

To rectify these problems, I reached out to the PBO to ask for additional data, which they provided, and then I combined it with data from Statistics Canada's Social Policy Simulation Database and Model (SPSD/M), on which PBO (2024) was based. The results, taking into account both cash and economic impacts, will likely surprise many people. Far from making most households worse off, the federal CPRS made 50% or more households better off financially in 2024-2025, in four of the eight affected provinces, and all households were forecast to be better off by the final year of the policy, 2030-2031, than they were in 2024-2025, as conventional growth factors were forecast to outweigh the modest costs associated with the policy.

In the final analysis, there is no basis for the claim that the federal CPRS contributed to the affordability crisis. Instead, it appears the Canadian government has terminated a very effective policy on false pretenses.

II. Five shortcomings of PBO (2024)

1. Vagueness about income levels.

PBO (2024) presents its results by dividing households into five groups ranked by income – referred to as income quintiles. While this is a standard approach in policy analysis, unfortunately they do not provide the income ranges for these quintiles. As a result, readers can only guess where to situate themselves in these five groups and thus what the likely impact has been on them.

2. Focus on 2030 results

In the main body of their paper, PBO (2024) only presents results for the final fiscal year of the policy, 2030-2031, which corresponds with a carbon price of \$170 per tonne of CO_2eq.[1,2] However, in the political sphere, voter had to decide what they thought of the policy in 2024-2025, which corresponded with a much lower carbon price of \$80 per tonne of CO_2eq. While the final year of the policy was certainly important, so too was the current year and those in between. More importantly, when politicians tell voters they are being made worse-off by a policy based on 2030 results, voters are apt to think those results apply to them currently, not six years in the future, when the carbon price would be more than doubled and when their base incomes would also be higher due to economic growth.

This presentation also encourages the misunderstanding that there is only one outcome for the policy, and thus the choice is either to support it or eliminate it. In fact, the architecture of the CPRS is compatible with many different paths for the carbon price. The final price of \$170 per tonne of CO_2eq corresponded with the Trudeau government's objective of reducing GHG emissions 40% by 2030 (compared with the 2005 level); in other words, using a price mechanism to achieve a quantitative target. But the quantitative target itself was chosen arbitrarily.

Economics tells us that a price mechanism is suitable for achieving a pollution reduction target in a cost-effective (least-cost) manner. However, in climate policy, economics is mostly silent regarding the efficiency of the final target. Thus, a reasonable policy could perhaps consist of altering the target – for example reducing it and reducing the carbon price accordingly. The

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[1] PBO (2024) presented selected results for all years (2024-25 to 2030-31) in an Appendix.

[2] Greenhouse gas (GHG) emissions include CO_2 (carbon dioxide), CH_4 (methane), N_2O (nitrous oxide), and various fluorinated gases. To express warming potential, all GHGs are measured in terms of equivalent amounts of CO_2, denoted as CO_2eq.

appropriateness of the target would need to be debated, but whatever target was chosen, a carbon price could achieve it in a cost-effective manner.

3. After-tax (disposable) income vs. before-tax (gross) income

Despite the vagueness about income levels mentioned above, the PBO (2024) does express the 2030-2031 net costs as percentages of disposable income (e.g. Tables 1 and 3), expressing them, in effect, as a tax. From this information, a committed reader could calculate the corresponding levels of disposable income. However, this is clearly not something one can expect of most readers.

Furthermore, few people know what their disposable income is (earned income plus government transfers minus personal income tax), and tax rates are never expressed as a percentage of disposable income anyway. In contrast, most people do know what their gross income is (earned income plus government transfers). Also, since disposable income is less than gross income, expressing the equivalent tax rates in this manner makes them appear larger, thus exaggerating the size of the tax.[3]

4. Average income vs. median income

PBO (2024) employs Statistics Canada's Social Policy Simulation Database and Model (SPSD/M) v.30.1 to estimate average net costs of the policy for households within each quintile, and then they verbally link the estimate to the "average household" within the corresponding quintile. This label is not entirely clear, however. Do they mean average in the sense of typical, or do they mean the household enjoying average income in the quintile?

This is not simply a question of semantics, since the average is known to be a poor measure of what is typical when income is not symmetrically distributed, as a relatively small number of very high or very low incomes can significantly influence it. A better measure of what is typical is the median – the income level that divides the population between the lower 50% and the upper 50%. Then we should use the net cost of the policy corresponding with the median income of the quintile, or of the population, to represent what is typical.

The median can be lower or higher than the average, depending on whether the income distribution is right or left skewed (i.e. long right tail or long left tail). It is an empirical matter which situation prevails in each quintile. However, we have reason to expect a right skew in the fifth (richest) quintile, as the media frequently reports on small numbers of very rich individuals. If true, this will result in a median income that is lower than the mean, within the quintile. Moreover, since the levels of income in the fifth quintile are by definition significantly higher than other quintiles, a right skew in this group can also make the population median less than the

[3] To be precise, income tax rates are expressed as percentages of taxable income, which is less than gross income but greater than disposable income.

population mean, even if skews are different in some of the lower quintiles. If that is true, then the PBO's use of average income, instead of the median, would exaggerate the size of net carbon costs for the typical household both in the population and in the fifth quintile.

5. What are greenhouse gas emissions at different income levels?

The main lesson of PBO (2024) is the range of net costs of the CPRS across the five categories of income. While the report does present information on total carbon pollution levels by year, aggregated over the eight affected provinces, it does not break it down by income levels. Nonetheless, the carbon pollution levels of the average household of each income group can be calculated very easily from the information provided in the tables. This information would have provided readers with useful context for judging the reasonableness of the net costs imposed by the policy on households at different income levels.

III. Extending the analysis

1. Average gross income and median income by quintile

In an effort to address the issues identified above, I obtained data on average gross incomes (earned income plus government transfers) for the five quintiles (Q1-Q5) in the study period, as well as the upper-income thresholds for deciles (D1-D10), from SPSD/M v.30.1, for the eight provinces covered by the CPRS. By definition, the upper-income values for D1, D3, D5, D7, and D9 correspond with the median incomes of Q1, Q2, Q3, Q4, and Q5, respectively, and the median income of Q3 (upper threshold of D5) corresponds with the median of the population.

2. Linking average net costs to average income by quintile

The next step is to understand how to link the PBO's net-cost estimates to income. Is it reasonable to assume that the household enjoying the average income in a quintile also faces the average net cost, i.e. average of net cost over all the households in the quintile?

Two complications must be addressed. First, households are differentiated not only by income but also by the carbon intensity of their choices and local options. Second, there are multiple households at each income level. Therefore, we cannot talk of a single household enjoying a specific income level, but rather the average household enjoying a specific income level, where the averaging is conducted over the range of carbon intensities and other non-income factors exhibited by the households at that level. It follows that there can be a variety of experiences, including negative net costs (rebate exceeds carbon tax payments) and positive net costs (carbon tax payment exceeds rebate), at each income level.

Thus, we must ask whether the average household (average over carbon intensities and other non-income factors) enjoying the average income in a quintile faces the average net cost (average over net costs experienced in the quintile). The following notation will allow us to answer that question.

Let $i = 1, \dots, N$ represent the households in a specified group (population, quintile, decile, etc.), for a given period. Define NC_i as the net cost of household i under the CPRS, p as the carbon price in the period, c_i as the carbon consumption/emission of the household, and s_i as the share of the household in the pool of revenue generated by carbon pricing. Also define an economic loss function L_i as an increasing function of the carbon price, i.e. $L_i(p)$ with $L' > 0$, reflecting the negative indirect effect of carbon pricing on the household through its impacts on production and incomes.

By definition,

$$NC_i = pc_i - s_i \sum_{k=1}^{N} pc_k + L_i(p), \qquad (1)$$

or net cost of household i equals its expenditure on carbon emissions less its share of the rebated revenue pool (i.e. its rebate) plus the household specific loss due to indirect economic effects.

If the group is the total population and households were identical, then s_i would simply equal $\frac{1}{N}$. However, in the real world, households vary in size and structure, and therefore shares are not identical. In any case, given a sufficiently large number of households, s_i is vanishingly small. For example, the SPSD/M includes more than 300,000 households across all provinces, representing more than 1 million individuals. Scaling this by the population of the eight provinces subject to the federal carbon price (64.1%), yields more than 192,300 households.[4] Now scaling this by the size of each province in the group, yields a wide divergence, from a high of 117,396 households in Ontario to a low of 1,300 households in PEI.[5] Thus, assuming identical households for the sake of illustration, each household's share would range between 8.5×10^{-6} in Ontario and 7.7×10^{-4} in PEI. But even these shares are too high, since the 1 million individuals accounted for in the SPSD is only about 2.5% of the total Canadian population.

Given the exceedingly small size of s_i, the household ignores the effect of changes in its carbon consumption c_i on its rebate, and therefore it treats the rebate as a constant value.[6] We can denote this (perceived) constant rebate value as R_i. Substituting into (1) yields the household's perceived net cost,

$$NC_i = pc_i - R_i + L_i(p) \qquad (2)$$

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[4] Source: World Population Review 2024, https://worldpopulationreview.com/canadian-provinces , and authors' calculations.

[5] It is assumed, for the sake of illustration, that households are allocated in the SPSD/M in proportion to the population of each province.

[6] Still, the revenue pool is very large, and therefore the dollar value of a household's rebate may be significantly different than zero.

Note that the perceived net cost is just an affine transformation of c_i, since R_i and $L_i(p)$ are exogenous from the household's perspective. It follows that NC_i is an equivalent representation of the household's demand for carbon services. Nonetheless, the perceived constant values R_i and $L_i(p)$ do vary across households, and therefore we must account for them in the aggregation. Therefore, we focus on c_i as the representation of the household's demand for carbon.

Demand is divided into systematic and idiosyncratic components. The systematic component is represented by a function $F(\mathbf{P}, m_i)$ of household income, m_i, and a vector of relevant prices **P**, including the carbon price p. The idiosyncratic component reflects the influence of household preferences and local options on carbon intensity, for example presence or absence of reliable public transit, preference for transportation mode, passion for motor sports, etc. Note that the carbon intensity of the electrical supply is not included in this list, as it is mostly a constant factor across all households in each province. The idiosyncratic aspect of demand is represented with a real-valued random variable ε_i, which can take on positive or negative values.

Now define the systematic component of demand as that reflecting typical household carbon intensity for the group, for the given income and prices. Specifically, $\varepsilon_i = 0$ for the typical household, and thus demand for carbon is determined solely by $F(\mathbf{P}, m_i)$ for this household. (In the analysis below, focusing on quintiles, such households are defined as "quintile-typical".) Further, $F(\mathbf{P}, m_i)$ is normalized to centre the distribution of ε_i such that the average value equals zero; i.e.

$$\frac{\sum_{i=1}^{N} \varepsilon_i}{N} = 0. \qquad (3)$$

We can abstract from other aspects of the distribution of ε_i, as they will not affect the results below.

Now assume the two demand components are additively separable; i.e.

$$c_i = F(\mathbf{P}, m_i) + \varepsilon_i \qquad (4)$$

Many commonly used demand frameworks are multiplicative in income; for example CES preferences (Constant Elasticity of Substitution). Proceeding in this manner, we can define a sub-function of prices, $f(\mathbf{P})$, and modify (4) as follows:

$$c_i = f(\mathbf{P})m_i + \varepsilon_i \qquad (4')$$

Substituting into (2) yields

$$NC_i = p(f(\mathbf{P})m_i + \varepsilon_i) - R_i + L_i(p) \qquad (2')$$

To answer the question at hand, we require notation to distinguish the two dimensions of averaging – first, averaging over carbon intensities and other non-income factors for households at the same level of income, and second, averaging over income. For this purpose, define an integer-valued vector of ranked household gross income levels within the group $\mathbf{M} = (\ell_{LO}, \dots, \ell_{HI})$. Thus $m_i \in \mathbf{M}$. Now define S_j as the set of households with gross income $m_j \in \mathbf{M}$ and N_j as the number of households in S_j.

Now let $\bar{m}$ denote average income, $\overline{NC}$ denote the average net cost in the quintile, and $\overline{NC}_j$ denote the average net cost experienced by households enjoying income level m_j. Also, let AVG represent an alternative index for average. Thus, $\overline{NC}_{AVG}$ represents the average net cost experienced by households enjoying the average level of income. Similarly, define $\bar{R}$ and $\bar{L}$ as the average rebate and average indirect income loss respectively in the quintile, $\bar{R}_i$ and $\bar{L}_i$ as the average rebate and average indirect income loss experienced by households enjoying income level m_j, and $\bar{R}_{AVG}$ and $\bar{L}_{AVG}$ as the average rebate and average indirect income loss of households enjoying the average income level $\bar{m}$.

Average income is calculated

$$\bar{m} = \frac{1}{N}\sum_{i=1}^{N} m_i = \frac{1}{N}\sum_{j=\ell_{LO}}^{\ell_{HI}} \sum_{i\in S_j} m_i = \sum_{j=\ell_{LO}}^{\ell_{HI}} \frac{N_j}{N} m_j \quad (5)$$

We can now calculate the average net cost of the CPRS at the quintile level; i.e.

$$\begin{aligned}
\overline{NC} &= \frac{1}{N}\sum_{i=1}^{N}[p(f(\mathbf{P})m_i + \varepsilon_i) - R_i + L_i(p)] \\
&= \frac{1}{N}\sum_{j=\ell_{LO}}^{\ell_{HI}} \sum_{i\in S_j}[p(f(\mathbf{P})m_i + \varepsilon_i) - R_i + L_i(p)] \\
&= pf(p)\bar{m} - \sum_{j=\ell_{LO}}^{\ell_{HI}} \frac{N_j}{N}\left(\frac{1}{N_j}\sum_{i\in S_j} R_i\right) + \sum_{j=\ell_{LO}}^{\ell_{HI}} \frac{N_j}{N}\left(\frac{1}{N_j}\sum_{i\in S_j} L_i(p)\right) \\
&= pf(p)\bar{m} - \bar{R} + \bar{L} \quad (6)
\end{aligned}$$

where (3) and (5) are used in the simplification.

Next, calculate the average net cost among households enjoying the average income level $\bar{m}$.

$$\begin{aligned}
\overline{NC}_{AVG} &= \frac{1}{N_{AVG}}\sum_{i\in S_{AVG}}[p(f(\mathbf{P})\bar{m} + \varepsilon_i) - R_i + L_i(p)] \\
&= pf(p)\bar{m} + p\frac{\sum_{i\in S_{AVG}} \varepsilon_i}{N_{AVG}} - \bar{R}_{AVG} + \bar{L}_{AVG} \quad (7)
\end{aligned}$$

Comparing (6) and (7), we observe that, while $\overline{NC}$ and $\overline{NC}_{AVG}$ share the first term related to the systematic demand component, $pf(p)\overline{m}$, they differ with respect to terms related to the idiosyncratic demand component, ε_i, the rebate, and the indirect loss.

Beginning with the first item, note that ε_i has no influence on $\overline{NC}$ as the quintile average value of ε_i vanishes by construction; i.e. $\frac{\sum_{i=1}^{N} \varepsilon_i}{N} = 0$ (equation 3). In contrast, $\overline{NC}_{AVG}$ is influenced by the average idiosyncratic deviations among households enjoying average income, $\frac{\sum_{i \in S_{AVG}} \varepsilon_i}{N_{AVG}}$. Of course, this term disappears if we assume that $\frac{\sum_{i \in S_{AVG}} \varepsilon_i}{N_{AVG}} = \frac{\sum_{i=1}^{N} \varepsilon_i}{N} = 0$. But whereas equation (3) represents a normalization of $F(\mathbf{P}, m_i)$ over all households in the quintile, $\frac{\sum_{i \in S_{AVG}} \varepsilon_i}{N_{AVG}} = 0$ represents a strong assumption that the same property also holds among a subset of households enjoying a specific level of income, namely $\overline{m}$. Now in practice, the two averages may not be very different, provided there is a relatively even distribution of households among income levels and carbon intensity choices are not strongly correlated with income levels within the quintile. However, this is an empirical matter, and it cannot be justified on the grounds of normalizing $F(\mathbf{P}, m_i)$.

Turning now to rebates and losses, we observe a similar problem in that (6) shows terms reflecting the quintiles averages, $\overline{R}$ and $\overline{L}$, while (7) shows terms related to the averages for a specific level of income, i.e. $\overline{R}_{AVG}$ and $\overline{L}_{AVG}$. However, the differences in these cases are less worrisome, as difference in rebates are related solely to family structure (e.g. number of members, ages, etc.) while differences in loss values are primarily determined by the level of the carbon price, which is common across all households.

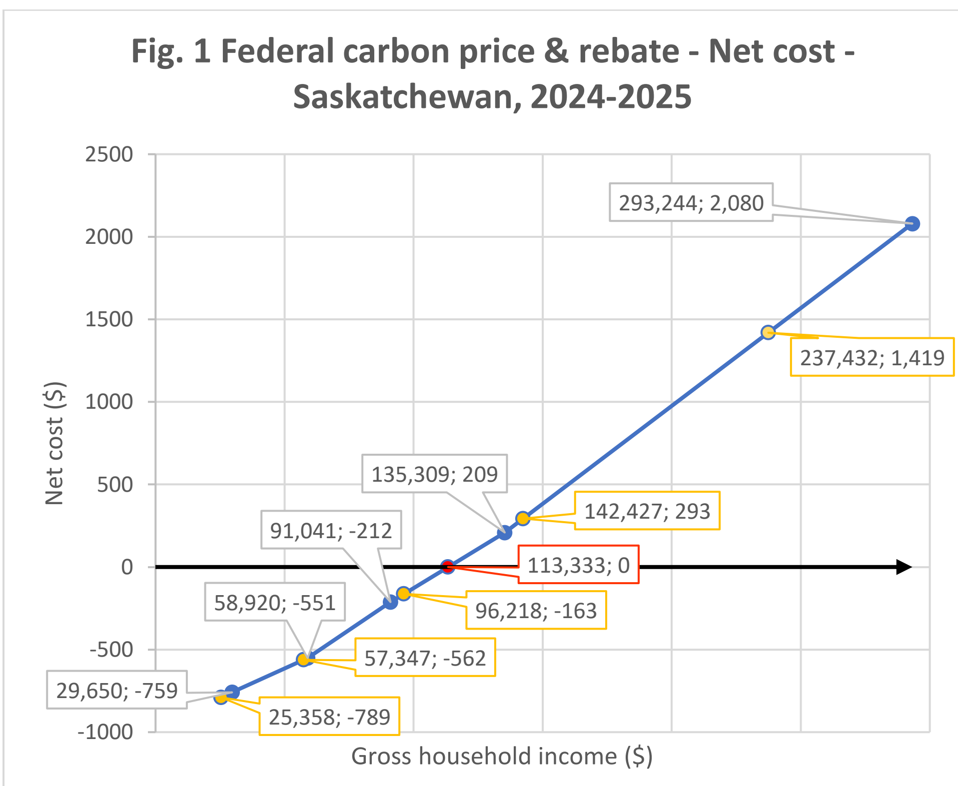
In any case, these problems can be avoided simply by redefining what we are looking for. Earlier, we defined the concept of a quintile-typical household as one for which $\varepsilon = 0$; i.e. demand for carbon services is determined solely by the systematic component of the demand function. We can extend this definition to also include rebates and losses equal to the quintile averages; i.e. $R_i = \overline{R}$ and $L_i = \overline{L}$. Then, for quintile-typical households enjoying average income, equation $(2')$ established that $NC = pf(\mathbf{P})\overline{m} - \overline{R} + \overline{L}$, which is identical to (6). It follows therefore that we can link the quintile-average net costs to quintile-typical households enjoying average income and proceed on this basis. These may not be the average net costs over all households at $\overline{m}$, but they are the net costs for some households at that level, and these households are highly typical for the quintile in terms of carbon intensity, rebates, and indirect losses.

3. Estimating net cost for median income by quintile

The results of the previous section indicate that, for each province covered by the CPRS, in each period, we have five data points, corresponding with the (average gross income, average net cost) pairs of the five quintiles. In addition, the basic economic principle that higher income correlates with higher consumption means that, holding other factors constant, higher income also correlates with higher carbon purchases and therefore higher carbon tax payments, at least for households with average carbon intensity in the quintile (quintile-typical households). We can use this information to plot a continuously increasing relationship between income and net carbon costs, for each province and year, reflecting the quintile-typical household at each income level.

Figure 1 demonstrates this approach for Saskatchewan in 2024-2025, where the blue dots correspond with the five observational points corresponding with quintile averages. Linear interpolations have been used to link the five points, given the relative closeness of most of the points (four out of five) and lack of information which might be used to justify more particular functional forms (e.g. positive second derivative or negative second derivative). A statistical curve-fitting approach is not recommended, given the lack of information on the stochastic process generating the observational points. Indeed, since the points are obtained through further processing of results from a computable general equilibrium model, and the CGE approach is calibrated to reproduce an empirical baseline exactly, it seems appropriate that the approximation of the income /net cost relationship should exactly satisfy the five quintile observations. Further, there is no information to support the choice of a parametric functional form which would be required for curve-fitting.

Next, using the step-wise linear functional form, we are able to infer the net costs corresponding with the median income values which were obtained for each quintile from SPSD/M. The



(average income, average net cost) observations are represented by black data labels in Figure 1, while the (median income, net cost) pairs are represented by yellow labels.[7]

Similarly, the breakeven income level is represented by the red data label in the figure, i.e. the income level for which the net cost is zero (the sum of total expenditure on the carbon tax and economic loss is exactly offset by the rebate).

Proceeding this way for all provinces under the CPRS provides the basis to determine whether most households were better off in immediate economic terms under the policy (i.e. negative net cost) or worse off (positive net cost), taking into account both the direct cash impact related to the policy (total carbon tax expenditure less rebate) and the economic impact of the policy (induced changes in income). For example, inspection of Figure 1 indicates that, in 2024-25, the median household in Saskatchewan (median income for Q3 of $96,218) had a negative net cost – it received more in the rebate than the sum of expenditure on the carbon tax and indirect income loss. Further, the amount of the net rebate – at $163 – was sufficiently large to suggest this result was not simply a result of approximation error. In addition, the significant excess of the breakeven income over the median income – at $17,115 – indicates that significantly more than 50% of households in Saskatchewan were better-off economically due to the policy in 2024-2025. Indeed, the break-even income of $113,333 is significantly closer to the 60 percent threshold income of $117,309 (not shown in the figure) than to the 50 percent (median) threshold income of $96, 218.

Further, the figure illustrates the significant heterogeneity in the ranking of average and median incomes for the five quintiles, as well as the significant differences between these measures, especially for the fifth quintile. Specifically, the median income is less than average income in Q1, Q2 and Q5, but greater than the average income in Q3 and Q4. It follows that the distribution of households is right-skewed in Q1, Q2 and Q5 but left-skewed in Q3 and Q4. This pattern is common for Q1, Q2, and Q5 for all eight of the covered provinces, while, in one of the provinces, Q3 and Q4 are right-skewed (median income less than average) instead of left-skewed.

In terms of differences in the levels, the median income in Figure 1 is 15% lower than the average income in Q1 and 19% lower in Q5. For Q2, Q3, and Q4, the percentage differences are in the single digits, with the median income lower than the average in Q2 (3%) and higher in Q3 (6%) and Q4 (5%). Note, however, that the use of percentages masks important differences in dollar values, depending upon the base. Thus, a 14.5% difference between the median and average income amounts to only $4,292 in Q1, while a 19.0% difference between the median and average income in Q5 amounts to $55,812.

[7] Note: Inferring the next cost associated with the median income of Q1 requires extrapolation based on the Q1 and Q2 average points, rather than interpolation, since the median income of Q1 is lower than the average income.

Also, the resulting percentage differences in net cost, from switching from average income to median income, are not equivalent to the percentage differences in income, as the elasticity of the net cost function increases in income. Thus, in Q1, although there is a 15% drop from average to median income in the figure, there is only a 4% increase in the net benefit. At the other extreme, in Q5, with median income 19% lower than average income, the net cost is 32% lower.

Table 1 summarizes the differences between median and average income across all eight provinces under the CPRS, as well as the corresponding differences in net cost values. (A complete table, showing results disaggregated by province, is provided in the Appendix.) Similar lessons emerge as those presented above for Saskatchewan. For income, percentage differences between median and average incomes are in the single digits in Q2, Q3, Q4, in both 2024-2025 and 2030-2031, while the differences in Q5 are in the double digits. These differences in Q5 reflect large differences in dollar value, due to the high base. In contrast, while the double-digit differences for Q1 in 2024-2025 are no doubt significant for those households, they reflect much smaller differences in dollar value.

Table 1: Summary, Median vs Average, All Provinces

Quintile	2024-2025		2030-2031	
	Gross income	Net costs	Gross income	Net costs
	(%)	(%)	(%)	(%)
1	-13.2%	-6.9%	6.1%	2.7%
2	-4.1%	-5.8%	1.7%	3.4%
3	0.3%	28.1%	2.2%	36.5%
4	1.0%	8.1%	1.4%	2.8%
5	-21.6%	-31.4%	-17.2%	-23.0%

Another example of the small-base distortion emerges in Table 1 when considering the percentage changes in net cost for Q3, corresponding with the switch from average to median income. For both 2024-2025 and 2030-2031, we observe high percentage values in the change in net cost (28.1% and 36.5% respectively). However, Q3 is the group where we see households transitioning from net benefits (rebate exceeds carbon tax) to net costs (carbon tax exceeds rebate). In both cases, the dollar values are quite modest (negative and positive). Thus, small changes in the measures, following the switch from average income to median income, translate into large percentages, due to the small bases. But in terms of impact on the affected households, these changes remain relatively small.

Thus, it is the combination of large percentage difference and a large base that makes the differences between median and average income especially important in Q5. The most extreme examples are found for Ontario (25.3% drop from average to median income), New Brunswick (26.5% drop), and Nova Scotia (26.7% drop) in 2024-2025 (see the Appendix). Similarly, these three cases show remarkably large differences in the corresponding measures of net cost, as we switch from average income to median income, with a 32.9% reduction in net cost in Ontario, a 33.3% reduction in New Brunswick, and a 46.0% reduction in Nova Scotia. The Appendix shows the specific values for the corresponding measures of income and net cost.

IV. Results

For conciseness, all the results for the eight affected provinces are grouped and presented in Table 2. Values are reported for the quintile-typical household enjoying median income for the lowest and highest quintiles (Q1 and Q5), as well as the population median income (Q3 median), and finally the breakeven level of income (income level corresponding with zero net cost under the CPRS – rebate exactly equals carbon tax expenditure).

Table 2 also includes the annual greenhouse gas (GHG) emissions by income level, which was obtained by adding net cost (fiscal impact only) and the carbon rebate in Appendix C of PBO (2024) and then dividing by the carbon price. This calculation provided the average GHG emissions per quintile, which, as explained in the previous section, corresponds with quintile-typical households enjoying average income in the quintile. We then employed the linear interpolation technique to estimate the greenhouse gas emissions for the desired median and breakeven levels of income.

GHG emissions are presented in this manner for Alberta, Saskatchewan, Manitoba, and Ontario. However, this approach does not work for New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland and Labrador, due to high reliance on heating oil, which was excluded from the carbon price, and therefore from net cost, in October 2023. For these four provinces, the corresponding cells are marked n.a. in Table 2.

An interesting geographic result emerges in the table for 2024-2025. Specifically, for the three prairie provinces, the net cost of the CPRS for population-median (Q3) households is negative, and it is sufficiently negative to indicate that more than 50% of households were better-off financially (greater rebate than carbon tax expenditure) due to the policy. Also, the estimated net cost of the policy for the median household in Nova Scotia – at $11 per annum – is so modest as to suggest that roughly half of households were better-off and half worse-off under the policy.[8]

The 2024-2025 results for the remaining provinces lean more heavily toward positive net costs for the population (Q3) median household, with $249 in Ontario, $82 in New Brunswick, $52 in Prince Edward Island, and $53 in Newfoundland & Labrador. The gaps between breakeven and median incomes are also significant, at $27,602 in Ontario, $12,088 in New Brunswick, $9,230 in Prince Edward Island, and $5,214 in Newfoundland & Labrador respectively. Still, these net costs are still extremely modest. For example, the largest value, $249 in Ontario, amounts to less than half of one percent (0.3%) of the median household income of $98,556. The corresponding percentages are even lower (0.1%) for the other three provinces in this group.

[8] While we have no formal measure of statistical significance here, the value of $11 per annum seems well within the bounds of error related to the various modeling choices here and in PBO (2024). As a result, the true value of net cost for Q3 in Nova Scotia could plausibly be negative or positive, but modest in either case.

Table 2: Gross income, Net Cost, and GHG Emissions, by income level and province									
Province	Income group / level	2024-2025				2030-2031			
		Gross income ($)	Net Cost ($)	Net Cost (%)	GHG Emissions (tonnes CO2-eq)	Gross income ($)	Net Cost ($)	Net Cost (%)	GHG Emissions (tonnes CO2-eq)
AB	Q1 median	28,390	-429	-1.5%	8.5	33,535	-627	-1.9%	7.1
	Population (Q3) median	104,935	-49	0.0%	14.2	103,549	0	0%	10.4
	Breakeven	109,242	0	0.0%	14.6	124,103	323	0.3%	11.7
	Q5 median	264,836	1023	0.4%	19.3	316,952	2582	0.8%	15.0
SK	Q1 median	25,358	-789	-3.1%	7.5	30,169	-1217	-4.0%	6.5
	Population (Q3) median	96,218	-163	-0.2%	14.6	97,296	0	0%	10.5
	Breakeven	113,333	0	0%	16.3	114,708	374	0.3%	11.5
	Q5 median	237,432	1419	0.6%	22.3	285,180	4263	1.5%	17.8
MAN	Q1 median	25,448	-465	-1.8%	3.9	30,138	-638	-2.1%	3.4
	Population (Q3) median	86,400	-68	-0.1%	9.0	82,215	0	0%	5.9
	Breakeven	99,158	0	0%	9.8	102,713	224	0.2%	6.7
	Q5 median	206,655	828	0.4%	13.5	247,375	2256	0.9%	10.3
ON	Q1 median	25,050	-389	-1.6%	4.3	29,865	-525	-1.8%	4.0
	Breakeven	70,954	0	0%	8.5	76,889	0	0%	6.3
	Population (Q3) median	98,556	249	0.3%	10.7	117,527	581	0.5%	8.3
	Q5 median	254,756	1161	0.5%	13.9	306,037	2446	0.8%	10.9
NB	Q1 median	24,457	-257	-1.1%	n.a.	28,922	-396	-1.4%	n.a.
	Breakeven	64,853	0	0%	n.a.	69,553	0	0%	n.a.
	Population (Q3) median	76,941	82	0.1%	n.a.	91,696	208	0.2%	n.a.
	Q5 median	193,170	659	0.3%	n.a.	233,419	1538	0.7%	n.a.
NS	Q1 median	24,636	-290	-1.2%	n.a.	28,972	-486	-1.7%	n.a.
	Breakeven	75,979	0	0%	n.a.	72,146	0	0%	n.a.
	Population (Q3) median	77,936	11	0.0%	n.a.	93,788	359	0.4%	n.a.
	Q5 median	199,139	668	0.3%	n.a.	241,568	1951	0.8%	n.a.
PEI	Q1 median	24,871	-263	-1.1%	n.a.	29,284	-439	-1.5%	n.a.
	Breakeven	72,715	0	0%	n.a.	74,978	0	0%	n.a.
	Population (Q3) median	81,945	52	0.1%	n.a.	98,301	217	0.2%	n.a.
	Q5 median	203,083	890	0.4%	n.a.	243,308	1871	0.8%	n.a.
NF & LB	Q1 median	23,932	-449	-1.9%	n.a.	28,147	-795	-2.8%	n.a.
	Breakeven	76,750	0	0%	n.a.	86,562	0	0%	n.a.
	Population (Q3) median	81,964	53	0.1%	n.a.	95,941	182	0.2%	n.a.
	Q5 median	215,653	1064	0.5%	n.a.	259,863	2686	1.0%	n.a.

It is not surprising to observe that the richest 20% of households in 2024-2025 experience higher net costs, ranging from $659 in New Brunswick to $1419 in Saskatchewan. Richer households consume more, and thereby pay more in carbon tax, while receiving rebates on the same scale as lower-income households. Yet the income levels in this group are also much higher, ranging from $193,170 in New Brunswick to $264,836 in Alberta. Thus, expressed as a percentage, the net costs experienced by the richest 20% of households still amount to less than 1% of gross income, ranging from a low of 0.3% in New Brunswick and Nova Scotia to a high of 0.6% in Saskatchewan.

Meanwhile, the carbon emissions of the richest 20%, in the provinces where we have measures, range between 2.1 times greater and 3.0 times greater than the emissions levels of the poorest 20%. Thus, it is not surprising that these households would pay more in total carbon tax, as they consume more of everything. And yet, as a percentage of income, the net cost is still quite modest.

Switching focus to the predicted results for 2030-2031, we see that population median (Q3) households in all provinces now pay positive net costs. Also, the gaps between breakeven and median income are higher – with an average value of almost $22,000 over the eight provinces. It follows that more than 50% of households in 2030-2031 are projected to be worse off financially compared to what they would have been in 2030-2031 in the absence of the CPRS. This result is not surprising, as the planned carbon price in that year – $170 per tonne CO_2-eq – is more than double the $80 carbon price in 2024-2025.

However, due to growth factors in the economy, incomes are expected to be 19.2% higher in 2030-2031 than in 2024-2025 (average growth rate across the eight provinces). As a result, expressed as a percentage of median gross income, the net costs are still extremely modest – ranging from 0.2% to 0.5%. For the richest 20% in this year, the net costs make up a slightly larger share of gross income, ranging from 0.7% to 1.5%, with most clustered around 0.8%. Meanwhile, the most vulnerable households are fully sheltered by the rebate, with breakeven income ranging from $69,553 in New Brunswick to $103,549 in Alberta. As for the environmental impact, the policy is forecast to lead to an average reduction in household GHG emissions between 2024-2025 and 2030-2031 of 23% (average among the four provinces for which we have estimates).

The 19.2% projected growth rate in household incomes over the six-year period from 2024 to 2030 is equivalent to a constant annual growth rate of 3.0%. This rate seems high compared to recent performance. Nonetheless, it illustrates that the scale of net costs due to the CPRS is small enough that it can easily be dwarfed by growth factors in the economy. Specifically, the CPRS is found to cause an average reduction in the 6-year growth rate across the eight affected provinces of 0.3%, or 0.07% on an annualized basis. Thus, households are still better-off in 2030 under the policy than in 2024 – just marginally less better-off than they would have been otherwise. This conclusion may not change under lower growth rates, as lower growth would lead to lower incomes, lower consumption, lower carbon tax payments, lower rebate payments, and lower net costs (all elements reduced proportionately).

Of course, determining whether the costs presented in the previous section are modest or not also depends upon the value of the environmental benefits which may be achieved by the CPRS. Although valuation of environmental benefit is a very important topic, it is beyond the scope of the present analysis.

V. Conclusion

Several conclusions can be drawn from the cost analysis in the previous section. First, the results for the carbon price of $80 per tonne CO_2-eq in 2024-2025 indicate that there is no merit to the argument that the CPRS contributed to the affordability crisis that Canadians have experienced during the past several years. In four of the eight provinces (Alberta, Saskatchewan, Manitoba, and Nova Scotia), 50% or more of households were made better off financially by the CPRS, leaving only upper income households exposed to net costs. In the other four provinces (Ontario, New Brunswick, Prince Edward Island, and Newfoundland and Labrador), more than 50% of household were made worse off financially. But in all eight provinces, the scale of net costs for those made worse off was such a small percentage of gross income – less than 1% – that it cannot be regarded as a significant contributor to the affordability crisis. Further, in all cases, the breakeven incomes were sufficiently high to shield those most vulnerable from cost pressures.

Second, the results for the carbon price of $170 per tonne CO_2-eq in 2030-2031 indicate that, while more than 50% of households were expected to be worse off financially (positive net cost) by the CPRS, the impacts were quite modest, ranging from 0.2% to 0.5% of median income across the eight affected provinces and less than 1% for the richest 20% in most provinces. Meanwhile, the most vulnerable households were fully sheltered by the rebate, with breakeven income ranging from $69,553 in New Brunswick to $103,549 in Alberta.

Third, despite increasing net costs of the CPRS over time, households in 2030-2031 were still forecast to be significantly better off than they were in 2024-2025, as growth factors in the economy were expected to far exceed the effects of carbon costs on households' incomes.

Fourth, the policy was forecast to result in significant reductions in household GHG emissions, estimated at 23%, by 2030-2031.

Fifth, the switch from average to median in the measurement of typical income for each group represents an important methodological improvement over past approaches, as it provides a more compelling picture of what is typical at different levels of income, as well as greater precision regarding who benefits financially from the redistributive impact of the policy.

The question now is what should we expect, after the initial thrill of seeing the price of gasoline go down? Clearly, for upper-income households, there will be some improvement in their budget, but it will be modest, given the small share of net costs related to the CPRS (less than 1% of gross income in 2024). For middle-income households, the impact will be barely noticeable, ranging from marginally positive to marginally negative, depending upon the province. For lower-income households, there is likely to be confusion, as the visible reduction in price at the gas pump will correspond with a worsened financial situation at the end of every month. This may cause real consternation among those who were convinced the carbon tax was a major factor in their affordability challenges.

Of course, effective July 1, the Carney government has implemented a cut in the personal income tax rate for the first bracket of taxable income, from 15% to 14%, This measure was promoted as an antidote to the affordability challenges that households face. One might expect, therefore, that this measure would offset the harm caused to lower-income households by the elimination of the CPRS. Unfortunately, this is not the case, as recent research (Shiell and Dahir 2025) shows the Carney tax cut provides little to no benefit to lower income households.

On balance, it appears that significant progress in reducing household carbon pollution has been lost, for the sake of extremely modest gains among high-income households, while low-income households have been made worse off.

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Appendix

Median vs. Average Measures														
Province	Quintile	2024-2025						2030-2031						
		Gross Income			Net costs			Gross Income			Net costs			
		Average ($)	Median ($)	Diff (%)	Quintile-typical Net Costs at Average Income ($)	Quintile-typical Net Costs at Median Income ($)	Diff (%)	Average ($)	Median ($)	Diff (%)	Quintile-typical Net Costs at Average Income ($)	Quintile-typical Net Costs at Median Income ($)	Diff (%)
AB	1	32,234	28,390	-11.9%	-415.0	-428.7	-3.3%	31,232	33,535	7.4%	-641	-627	2.2%
	2	66,365	66,085	-0.4%	-293.0	-294.0	-0.3%	70,649	77,384	9.5%	-400	-318	20.5%
	3	102,243	104,935	2.6%	-79.0	-48.6	38.5%	114,241	124,103	8.6%	130	323	148.5%
	4	150,968	157,044	4.0%	471.0	500.5	6.3%	172,214	186,988	8.6%	1,265	1,399	10.6%
	5	338,232	264,836	-21.7%	1,379.0	1,023.1	-25.8%	376,345	316,952	-15.8%	3,122	2,582	-17.3%
SK	1	29,650	25,358	-14.5%	-759.0	-789.5	-4.0%	26,528	30,169	13.7%	-1,275	-1,217	4.6%
	2	58,920	57,347	-2.7%	-551.0	-562.2	-2.0%	62,486	67,476	8.0%	-698	-598	14.3%
	3	91,041	96,218	5.7%	-212.0	-162.8	23.2%	105,027	114,708	9.2%	155	374	141.0%
	4	135,309	142,427	5.3%	209.0	293.3	40.3%	156,469	170,246	8.8%	1,316	1,631	24.0%
	5	293,244	237,432	-19.0%	2,080.0	1,418.8	-31.8%	316,083	285,180	-9.8%	4,970	4,263	-14.2%
MAN	1	30,202	25,448	-15.7%	-427	-465	-8.8%	27,706	30,138	8.8%	-670	-638	4.7%
	2	55,284	52,542	-5.0%	-228	-250	-9.5%	62,823	62,503	-0.5%	-211	-215	-2.0%
	3	83,756	86,400	3.2%	-82	-68	17.2%	102,250	102,713	0.5%	218	224	2.6%
	4	122,824	124,400	1.3%	126	139	10.5%	150,387	148,850	-1.0%	817	798	-2.3%
	5	270,274	206,655	-23.5%	1360	828	-39.1%	317,387	247,375	-22.1%	3,295	2,256	-31.5%
ON	1	33,171	25,050	-24.5%	-322	-389	-20.7%	28,476	29,865	4.9%	-540	-525	2.8%
	2	61,640	59,429	-3.6%	-88	-106	-20.7%	70,800	70,674	-0.2%	-87	-88	-1.6%
	3	96,463	98,556	2.2%	241	249	3.5%	118,044	117,527	-0.4%	588	581	-1.3%
	4	144,169	148,630	3.1%	432	461	6.8%	180,214	177,756	-1.4%	1,085	1,065	-1.8%

	5	340,999	254,756	-25.3%	1729	1161	-32.9%	400,463	306,037	-23.6%	3,467	2,446	-29.5%
NB	1	26,977	24,457	-9.3%	-242	-257	-6.3%	27,558	28,922	5.0%	-410	-396	3.3%
	2	50,728	47,124	-7.1%	-98	-120	-22.3%	56,772	55,974	-1.4%	-120	-128	-6.6%
	3	75,375	76,941	2.1%	73	82	11.9%	92,346	91,696	-0.7%	214	208	-2.9%
	4	109,656	113,996	4.0%	264	285	7.8%	138,986	137,177	-1.3%	609	594	-2.5%
	5	262,720	193,170	-26.5%	988	659	-33.3%	279,538	233,419	-16.5%	1991	1538	-22.8%
NS	1	26,962	24,636	-8.6%	-277	-290	-4.8%	27,346	28,972	5.9%	-500	-486	2.9%
	2	50,285	49,593	-1.4%	-144	-148	-2.7%	58,996	59,393	0.7%	-218	-211	3.0%
	3	97,568	77,936	-20.1%	121	11	-90.9%	94,465	93,788	-0.7%	370	359	-3.0%
	4	146,050	118,769	-18.7%	252	178	-29.3%	143,286	142,143	-0.8%	654	647	-1.0%
	5	271,679	199,139	-26.7%	1237	668	-46.0%	290,192	241,568	-16.8%	2593	1951	-24.8%
PEI	1	26,804	24,871	-7.2%	-252	-263	-4.3%	28,849	29,284	1.5%	-443	-439	1.0%
	2	53,426	50,246	-6.0%	-122	-104	14.5%	60,108	60,234	0.2%	-137	-136	0.8%
	3	80,319	81,945	2.0%	41	52	26.8%	96,904	98,301	1.4%	202	217	7.5%
	4	116,415	121,465	4.3%	285	320	12.4%	147,464	146,221	-0.8%	753	739	-1.8%
	5	250,555	203,083	-18.9%	1222	890	-27.1%	296,264	243,308	-17.9%	2,488	1,871	-24.8%
NF & LB	1	27,882	23,932	-14.2%	-435	-449	-3.1%	27,672	28,147	1.7%	-798	-795	0.4%
	2	49,347	45,968	-6.8%	-361	-373	-3.2%	54,984	53,660	-2.4%	-612	-621	-1.5%
	3	78,116	81,964	4.9%	18	53	194.5%	96,004	95,941	-0.1%	183	182	-0.7%
	4	116,145	121,382	4.5%	364	401	10.1%	146,459	145,018	-1.0%	1,164	1,136	-2.4%
	5	242,468	215,653	-11.1%	1253	1064	-15.1%	306,670	259,863	-15.3%	3,314	2,686	-19.0%