

Progressivity of Canada's federal fuel charge (GGPPA Part I) and the Canada Carbon Rebate (CCR) Ontario, Manitoba, Saskatchewan, Alberta (2019–2025)

Methodology, Python implementation, and validation summary

Scope. This report estimates the distributional incidence of the federal *fuel charge* (Part I of the Greenhouse Gas Pollution Pricing Act, GGPPA) on households in four provinces (Ontario, Manitoba, Saskatchewan, Alberta) from 2019 (implementation) to 2025 (abolition of Part I), and contrasts results with and without the Canada Carbon Rebate (CCR).

Outcome variables. For each province, year and income quintile we compute: (i) **gross fuel charge cost** (\$/household-year), (ii) **effective tax rate (ETR)** = gross cost / total household expenditure, and (iii) **net cost** after subtracting a CCR amount for an illustrative household type.

Executive summary

- Across all four provinces, the **gross** fuel charge is **regressive** when measured against household expenditure: lower-income quintiles spend a larger share of their budgets on taxed fuels, producing higher ETRs. The Kakwani index for the gross fuel charge is negative in every province-year in our estimates.
- Introducing the CCR (a largely lump-sum transfer) makes the policy markedly more progressive. Under a **single-adult** CCR assumption, the lowest quintile typically becomes a **net beneficiary** (negative net tax), while the highest quintile often remains a **net payer**.
- The gross fuel charge rises over time with the carbon price path (from \$20/tCO₂e in 2019 to \$80/tCO₂e in 2024), and is set to **zero in 2025** in line with abolition of Part I.

Data sources

We use three main quantitative inputs:

- **Household expenditures by income quintile** (Survey of Household Spending; user-provided table 11-10-0223-01 extract). We use: *Gas and other fuels (all vehicles and tools)*, *Natural gas for principal accommodation*, *Other fuel for principal accommodation*, and *Total expenditure*.
- **Retail energy prices** (user-provided table 18-10-0001-01 extract): annual average *regular gasoline* price and *household heating fuel* price (cents/litre), by province.
- **Fuel charge rates** by fuel type and backstop province (user-provided “Tax Rate Items.xlsx”, consistent with CRA rate tables). Rates are observed through the \$50/tCO₂e year (2022–23) and scaled to \$65 (2023–24) and \$80 (2024–25) proportionally to the carbon price.

CCR amounts. We anchor CCR amounts to the 2024–25 province totals for a family of four reported by Finance Canada (Alberta \$1,800; Saskatchewan \$1,504; Manitoba \$1,200; Ontario \$1,120). We derive other household types using standard adult/partner/child shares and scale earlier years in proportion to the carbon price level.

Methodology

1. Gross fuel charge cost. For each taxed fuel j we compute: $\text{Tax}_{q,r,t,j} = \text{Quantity}_{q,r,t,j} \times \text{Rate}_{r,t,j}$, where q is income quintile, r province, and t the policy year.

2. Quantity estimation. Fuel quantities are inferred as follows:

- **Motor fuels:** quantity = expenditure in “Gas and other fuels (all vehicles and tools)” ÷ annual average gasoline price. (Assumes this category is dominated by gasoline.)
- **Other heating fuels:** quantity = expenditure in “Other fuel for principal accommodation” ÷ annual average “Household heating fuel” price. (Treated as light fuel oil. Alberta lacks heating-fuel prices in the provided table; we set this component to zero for Alberta and flag as a limitation.)
- **Natural gas (consumption-based):** because the provided price table does not include natural gas, we use Canada Energy Regulator (CER) data on (i) the share of homes using natural gas as the primary heating fuel and (ii) average annual natural gas use (GJ) among those homes. This yields an approximate unconditional annual natural gas use per household by province. We allocate this average across income quintiles using each quintile’s natural-gas expenditure share within the province-year.

3. Effective tax rate. $ETR_{q,r,t} = \text{GrossTax}_{q,r,t} / \text{TotalExpenditure}_{q,r,t}$.

4. Net cost with CCR. For household type h , $\text{NetTax}_{q,r,t,h} = \text{GrossTax}_{q,r,t} - \text{CCR}_{r,t,h}$.

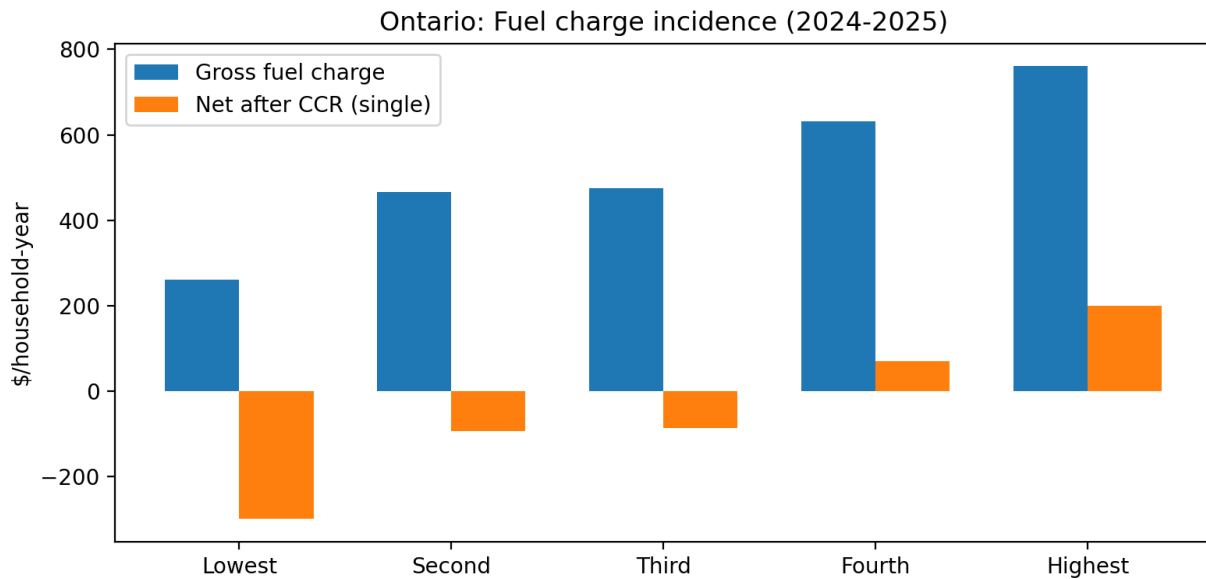
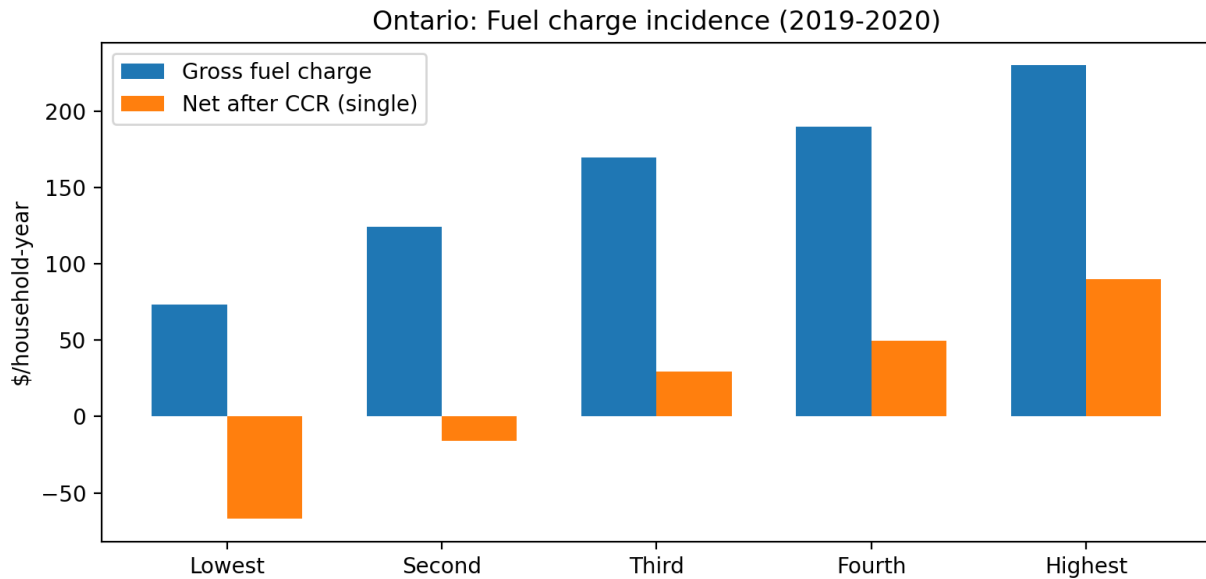
Key assumptions and implementation choices

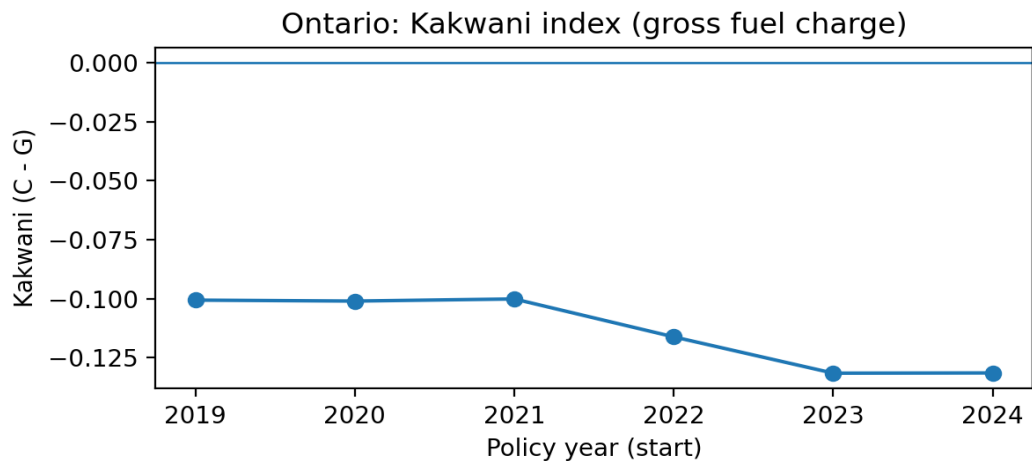
- Expenditure categories are mapped to specific fuels (vehicle fuel → gasoline; other home heating fuel → light fuel oil).
- Natural gas consumption parameters are taken from CER (2015) and treated as broadly stable over 2019–2024.
- Missing SHS expenditure years (2020 and 2022) are linearly interpolated; 2024–2025 are extrapolated using the 2021–2023 growth rate.
- Fuel charge rates for 2023–24 and 2024–25 are obtained by proportional scaling from 2022–23 rates (carbon price \$50 → \$65 and \$80).
- CCR amounts before 2024–25 are approximated by scaling with the carbon price; actual administrative amounts can differ due to annual recalibration and supplements.

Results

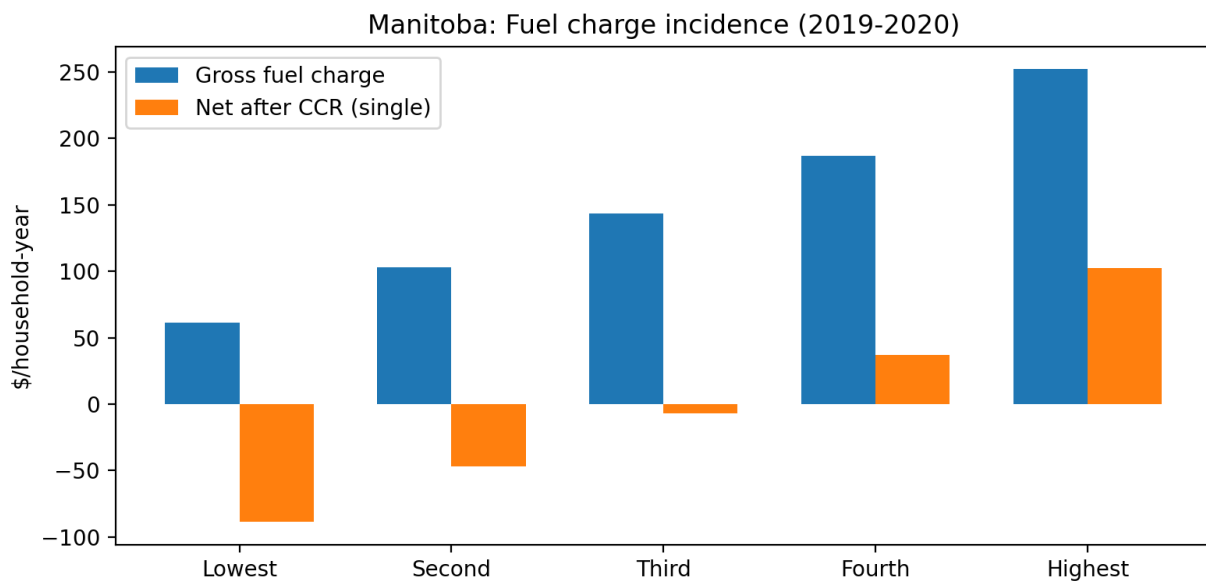
Figures below show gross fuel charge and net incidence after subtracting the CCR for a **single adult** household (illustrative). Values are in dollars per household-year for each income quintile.

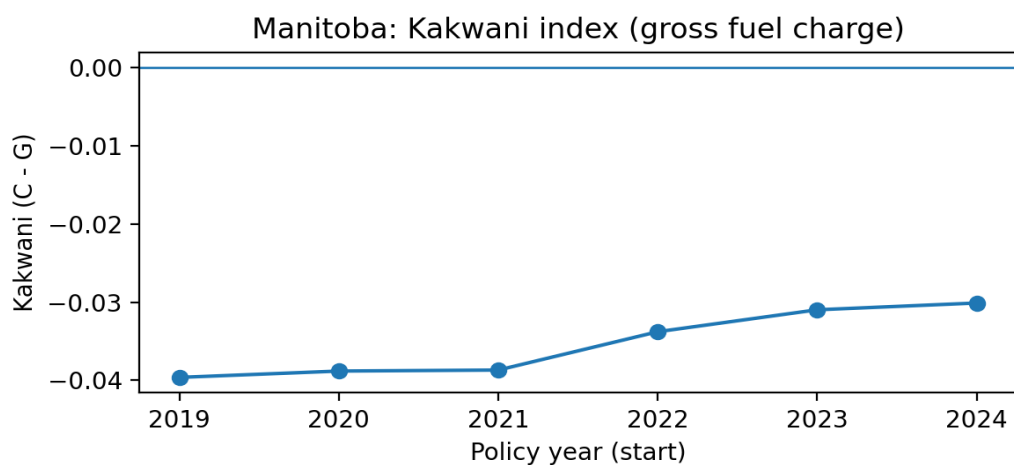
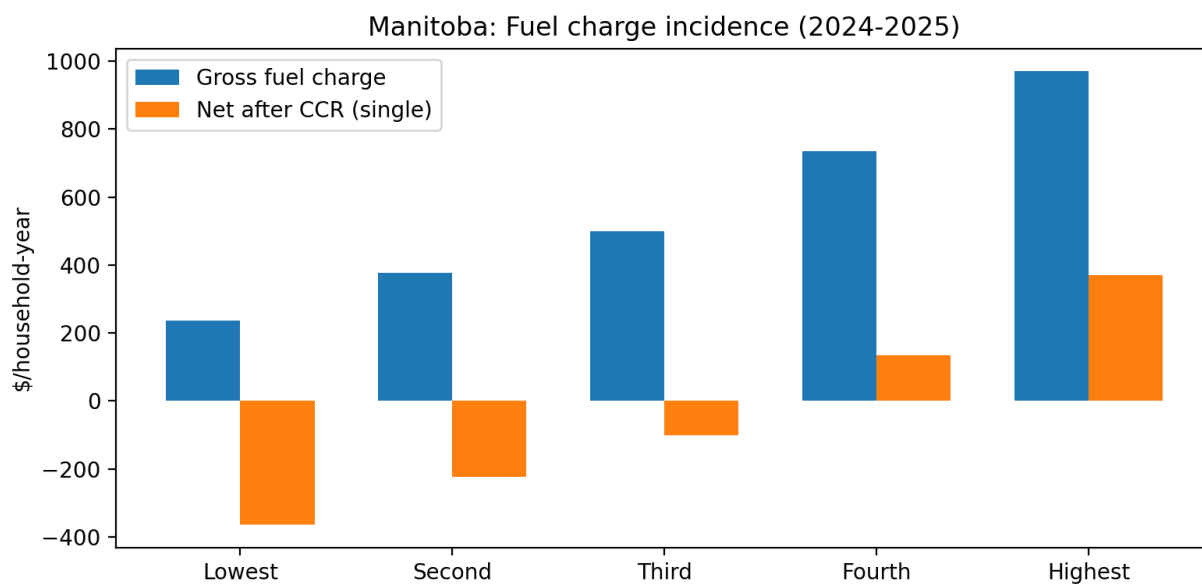
Ontario





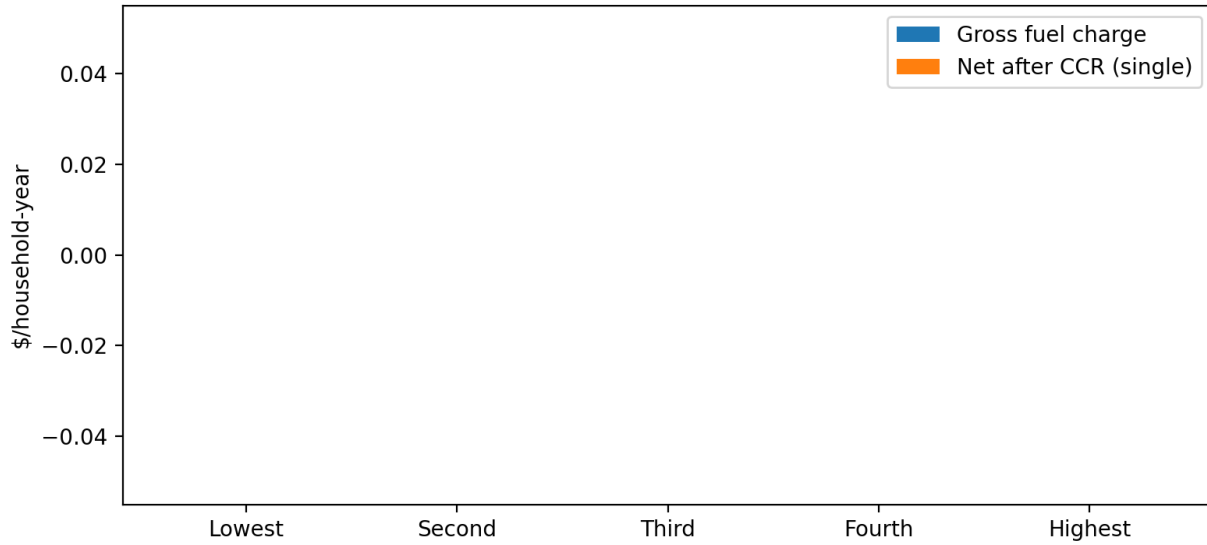
Manitoba



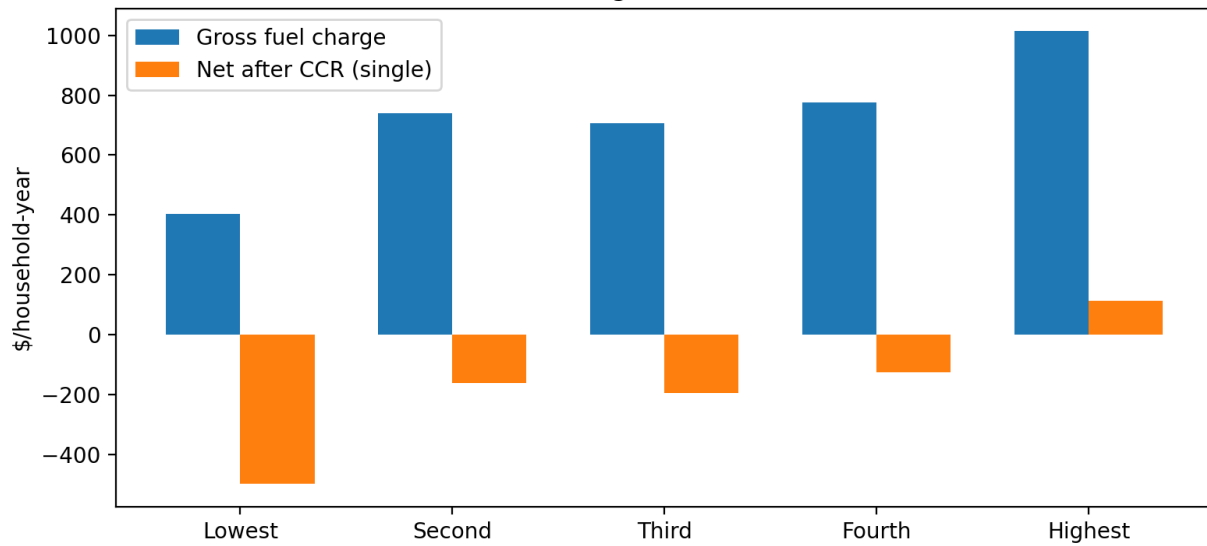


Alberta

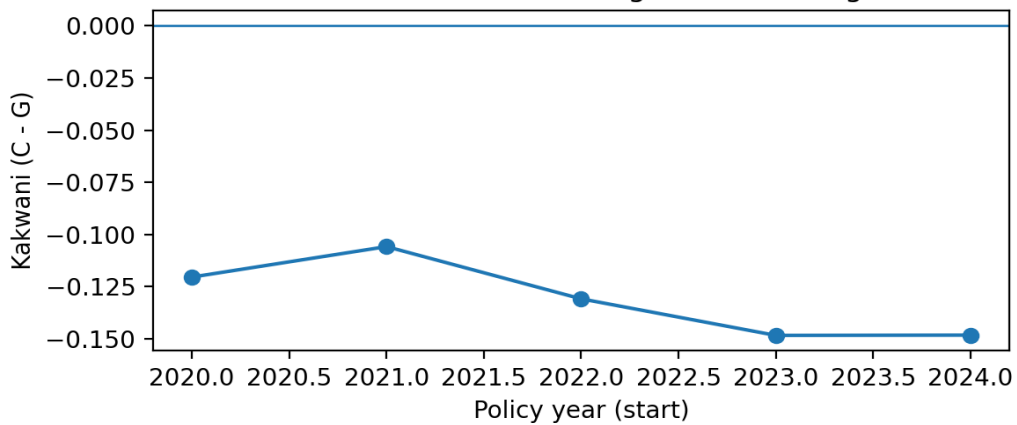
Alberta: Fuel charge incidence (2019-2020)



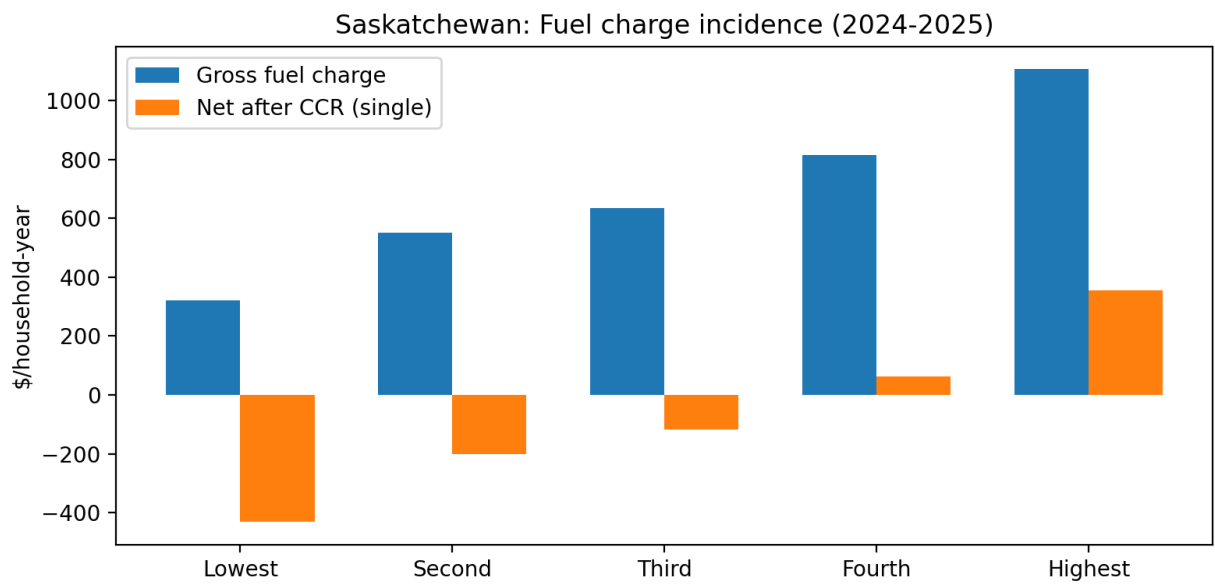
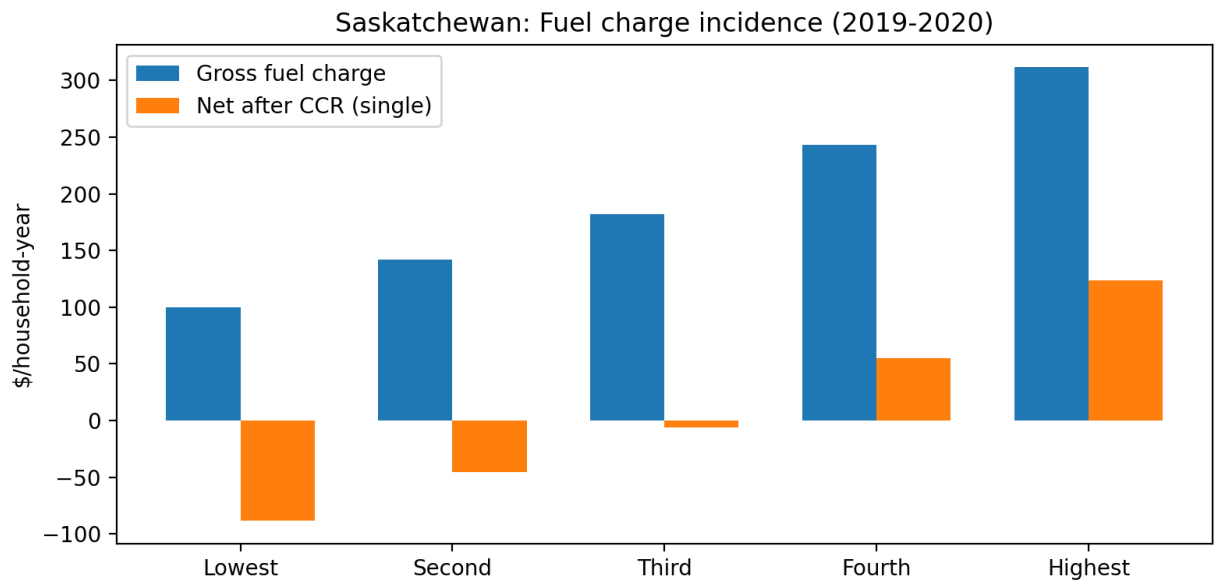
Alberta: Fuel charge incidence (2024-2025)

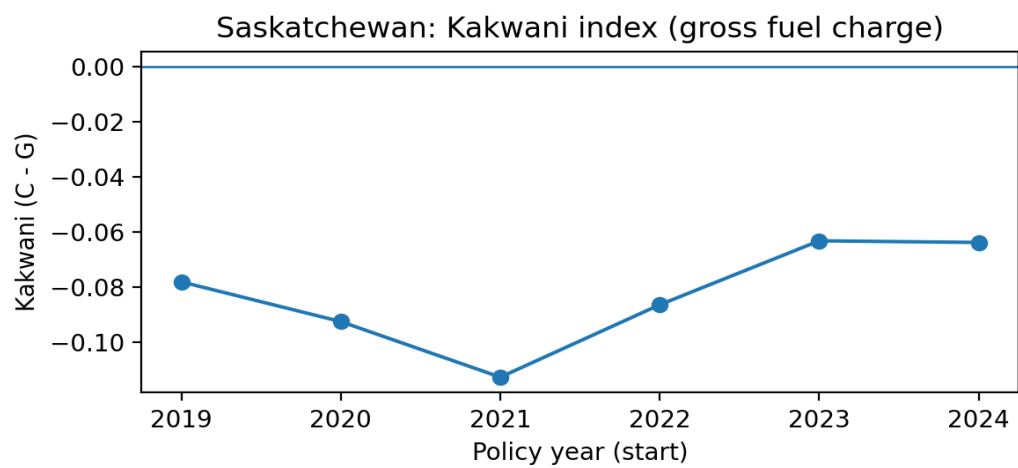


Alberta: Kakwani index (gross fuel charge)



Saskatchewan





Selected numeric results (Q1 vs Q5)

Lowest (Q1) and highest (Q5) income quintiles' gross and net incidence (single adult) for 2019 and 2024 policy years.

Province	Year	Gross tax Q1	\$ Gross tax Q5	Gross ETR Q1 (%)	Gross ETR Q5 (%)	Net tax (single) Q1	Net tax (single) Q5
Alberta	2019	0	0	0.00	0.00	0	0
Manitoba	2019	61	252	0.16	0.14	-89	102
Ontario	2019	73	230	0.19	0.12	-67	90
Saskatchewan	2019	100	312	0.26	0.17	-88	124
Alberta	2024	403	1014	0.84	0.42	-497	114
Manitoba	2024	236	971	0.62	0.53	-364	371
Ontario	2024	262	761	0.59	0.31	-298	201
Saskatchewan	2024	321	1107	0.81	0.63	-431	355

Validation and consistency checks

- **Natural gas consumption:** combining CER natural-gas use and prevalence with SHS natural-gas expenditures implies average delivered residential unit prices broadly in the \$0.4–\$0.7 per m³ range (varies by province-year), which is plausible and supports the consumption-based imputation.
- **CCR anchoring:** our 2024–25 CCR values match Finance Canada's published totals for a family of four, and other household types are derived mechanically from that anchor.
- **Progressivity direction:** academic evidence indicates that carbon pricing is often regressive absent recycling, while lump-sum rebates can make net impacts progressive. Our gross (negative Kakwani) and net (benefits concentrated in lower quintiles) results align with this pattern.

Limitations

- We model only **direct** household fuel charges on three fuel proxies; indirect price effects are excluded.
- Fuel-type mapping from aggregate expenditure categories is approximate.
- Natural gas consumption parameters are from CER 2015 and assumed stable.
- CCR amounts are scaled over time; actual administrative amounts and supplements may differ.

Appendix: Reproducibility outputs

Outputs written by the Python code include: **ggppa_progressivity_results.csv**, **ggppa_kakwani_gross_tax.csv**, and the runnable script **compute_ggppa_progressivity.py**.

References (external)

- Canada Revenue Agency (CRA): Fuel charge rates (Greenhouse Gas Pollution Pricing Act).
- Finance Canada: Canada Carbon Rebate (CCR) 2024–25 amounts (backgrounder/news release).
- Canada Energy Regulator (CER): Residential natural gas bills in Canada (natural gas prevalence and average use, 2015).
- Dolphin et al. (2023): “Distributional Impacts of Carbon Pricing: A Meta-Analysis” (Springer).