EXPLORING THE LANDSCAPE OF CANADIAN CLIMATE POLICY

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University of Calgary

Canadian Public Policy Lecture

Canadian Economics Association 57th Annual Meeting

June 3, 2023

Today's Talk

History and current state of Canadian climate policy

Canadian climate policy research

Key questions and gaps

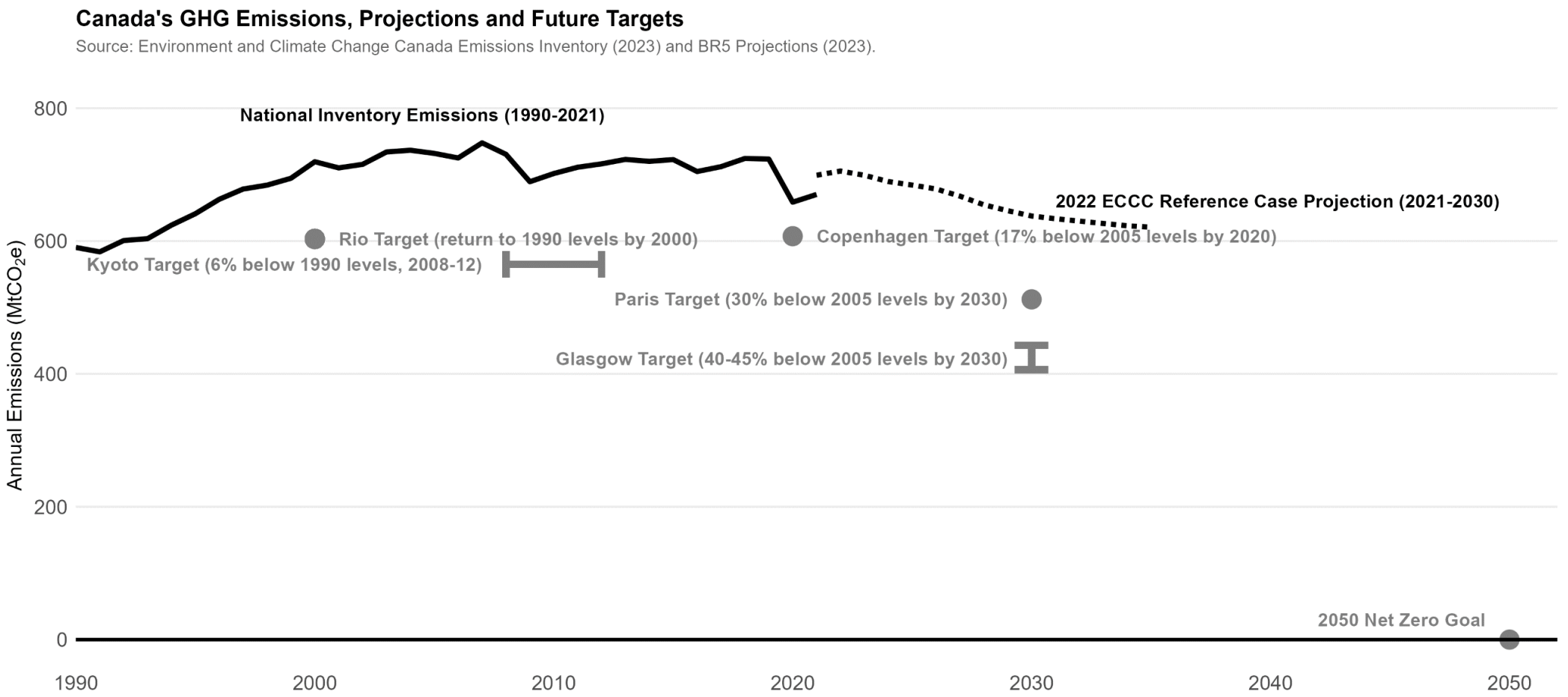
Evolution of Canadian Climate Policy

A Brief History of Canadian Climate Policy

Source: Kusch, L. 2009. "Next-to-last trip as premier sees Doer meet Schwarzenegger, others," *Winnipeg Free* Press. Oct 1. http://www.winnipegfreepress.com/local/next-to-last-trip-as-premier-sees-doer-meet-schwarzenegger-others-63055657.html

- 1997: Canada signs Kyoto Protocol
- 2002: National Climate Change Process ends
- 2006: Conservatives elected
- 2006 to 2015: Provincial leadership, some federal regulatory actions
- End of 2015: Liberals elected, Canada signs Paris Agreement
- 2017: Pan-Canadian Framework
- 2019: Canada-wide carbon pricing
- 2020: Oil and gas methane regulations
- 2021: Healthy Environment and a Healthy Economy
- 2022: Updated emissions price benchmarking
- 2023: Additional regulatory actions

Canada’s Increasingly Ambitious Emissions Targets



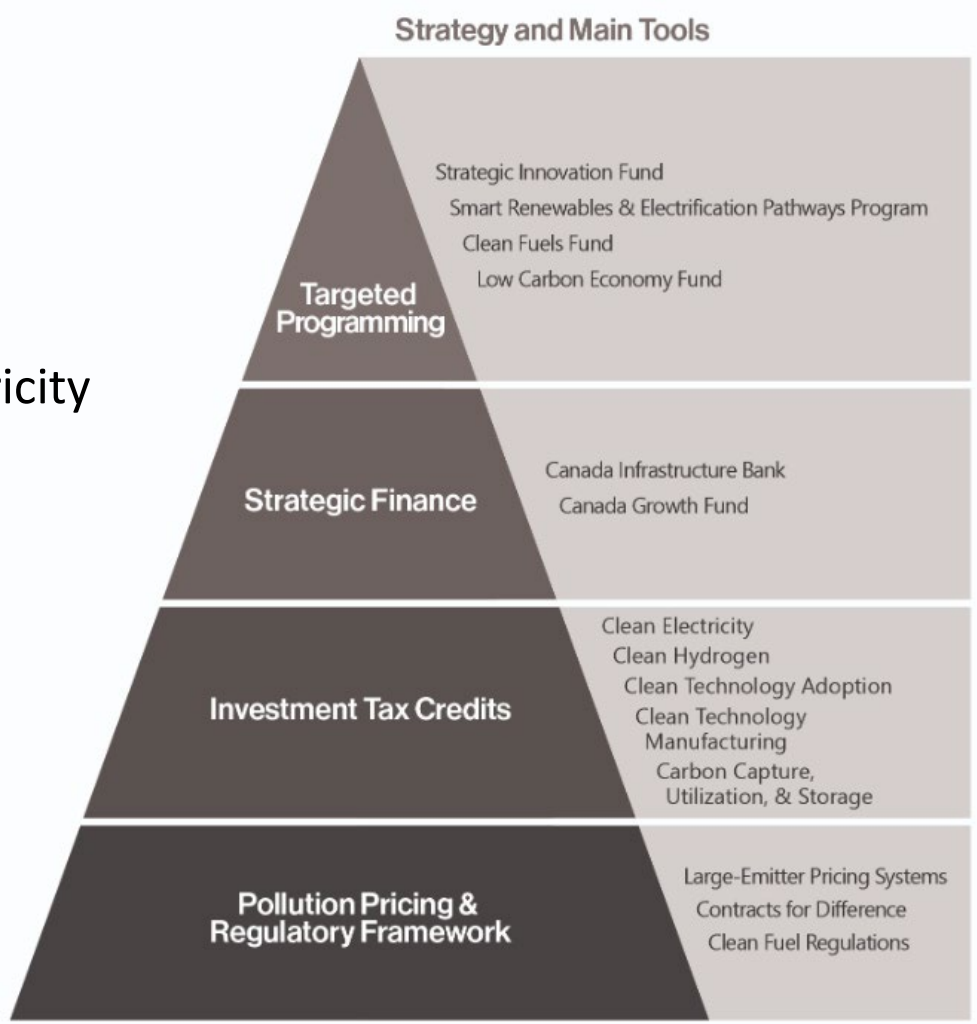
Source: Andrew Leach, https://leachandrew.github.io/NIR/.

Environmental and Climate Policy in Canada

- Regional differences
- Federal system of government
  - environment is a joint responsibility
  - provinces own natural resources
- Influence of the United States (and now Europe)
- Approximately 450+ distinct FTP policies and programs, with narrow to broad scope

Pan-Canadian Framework

- Pricing emissions
  - Minimize carbon leakage and competitiveness impacts
  - Revenue recycling
- Complementary policies
  - Electricity (coal phase-out, no/low-GHG sources, electricity standards)
  - Energy efficiency improvements
  - Transportation (vehicle emissions standards, fuel standards, ZEVs, infrastructure)
  - Industry (CH4 & HFC regulation, energy efficiency, technology)
  - Forestry, agriculture & waste
- Adaptation



Source: Finance Canada. 2023. *Budget 2023 — A Made-in-Canada Plan: Strong Middle Class, Affordable Economy, Healthy Future.*

Federal Pricing Benchmark

- Explicit pricing system
  - Minimum: BC carbon tax system's coverage (combustion emissions)
  - Hybrid: AB (pre-2019) carbon tax plus output-based pricing
  - Price rises from $10 (2018) to $50 (2022)
  - 2021 price amendment: increase by $15 per year to $170 in 2030

- Or, cap & trade
  - Cover a broad base of emissions similar to BC carbon tax
  - Emissions reduction target as or more stringent than Canada's 30% by 2030 target
  - Declining annual caps
  - 2021 target amendment: at least as stringent as reductions under an explicit pricing scheme

Updated Benchmark Principles (2022)

- Common scope and coverage
  - Exemptions and activities to negate price signal treated as uncovered
- Clear price signal
- Ensuring protections against carbon leakage are restricted to sectors at risk
- High quality offset credits
- Multi-year assessment period
- Public reporting

Federal Backstop

- Levy applied to fossil fuels
  - 90% of revenue returned to HHs through lump-sum rebate
  - Exemptions: farm fuel, exports, used as a non-energy input, used at facilities covered by OBPS, biofuels, international aviation/shipping

- Output-based pricing system (OBPS)
  - All facilities emitting ≥ 50 kt CO2e per year; smaller facilities can opt in
  - Emissions from combustion and industrial processes and product use
  - Product or sector-specific performance standard
  - Payment at federal carbon price where emissions exceed performance standard

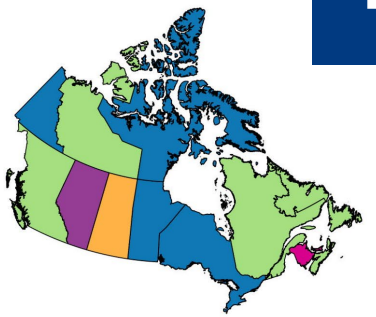
Pricing Systems Constantly Evolving

2023

- Eliminate exemptions
- Nova Scotia moving from C&T to OBPS
- Atlantic provinces standing down fuel charge

2019

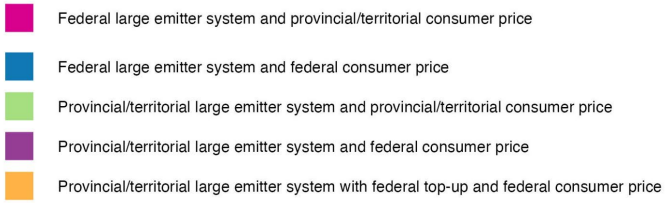
2020



2021

2022

2023



Current Federal Policy Actions

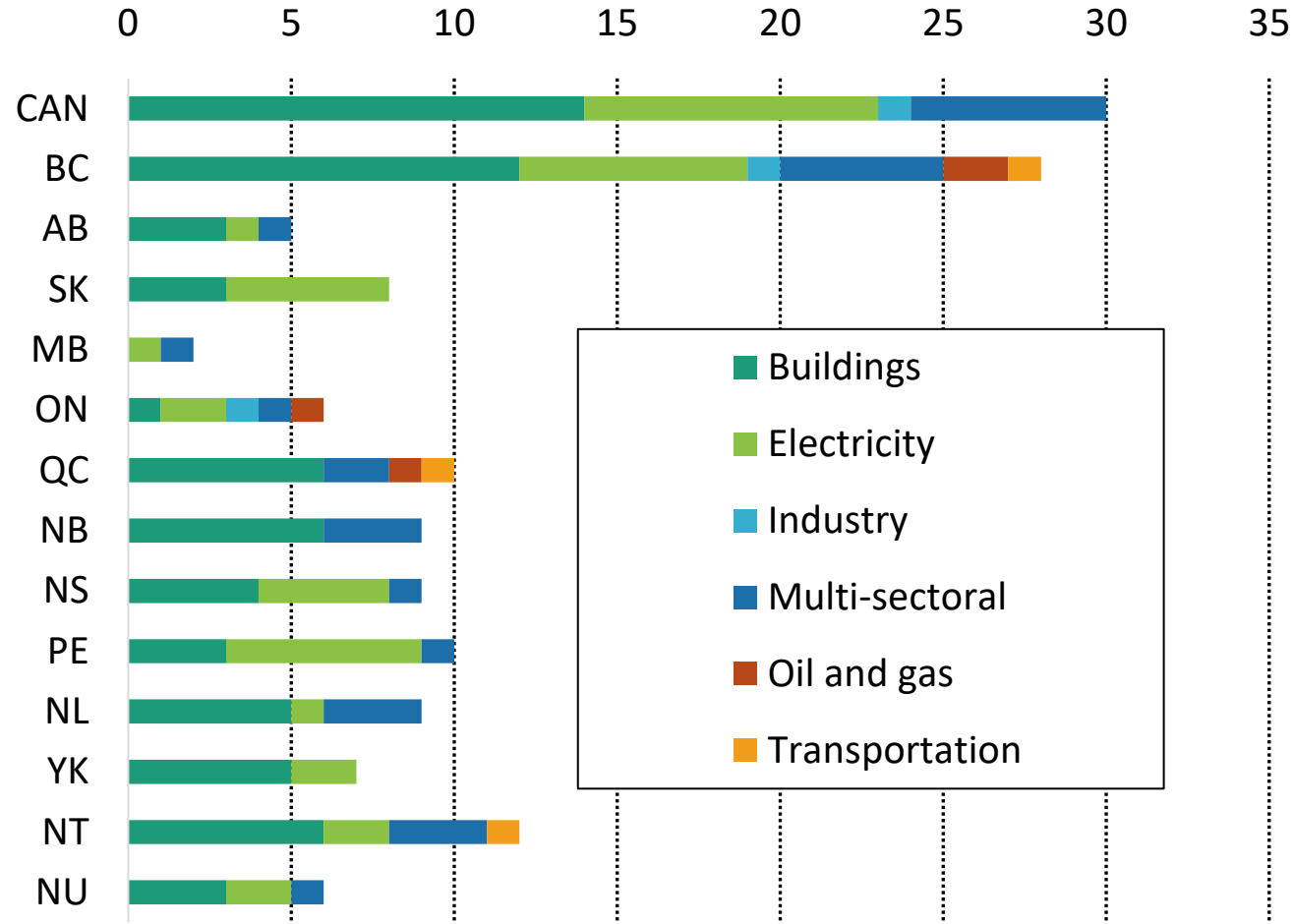
- Carbon price: $65/tonne now, rising to $170/t in 2030
- Output-based pricing for large emitters
- Minimum pricing and emissions coverage for provinces and territories
- Clean Fuel Regulation
- **Clean Electricity Regulations (forthcoming)**
- **Oil and gas emissions cap (forthcoming)**
- CCUS tax credit
- Methane reduction regulations (oil and gas, landfills, other sectors to come)
- Offset markets
- R&D funding
- Energy-switching incentives (e.g., zero-emissions vehicles, heat pumps)
- Energy-efficiency incentives (e.g., Canada Greener Homes Grant)
- Etc., etc., …

Policy Count by Jurisdiction and Targeted Sector

Policies that affect emissions in the building sector

Channels

- Energy source decarbonization (i.e., incentivizing renewable electricity generation)
- End-use fuel switching (i.e., electrification of home heating)
- End-use energy efficiency (i.e., appliance energy efficiency standards)
- Reduce embodied emissions



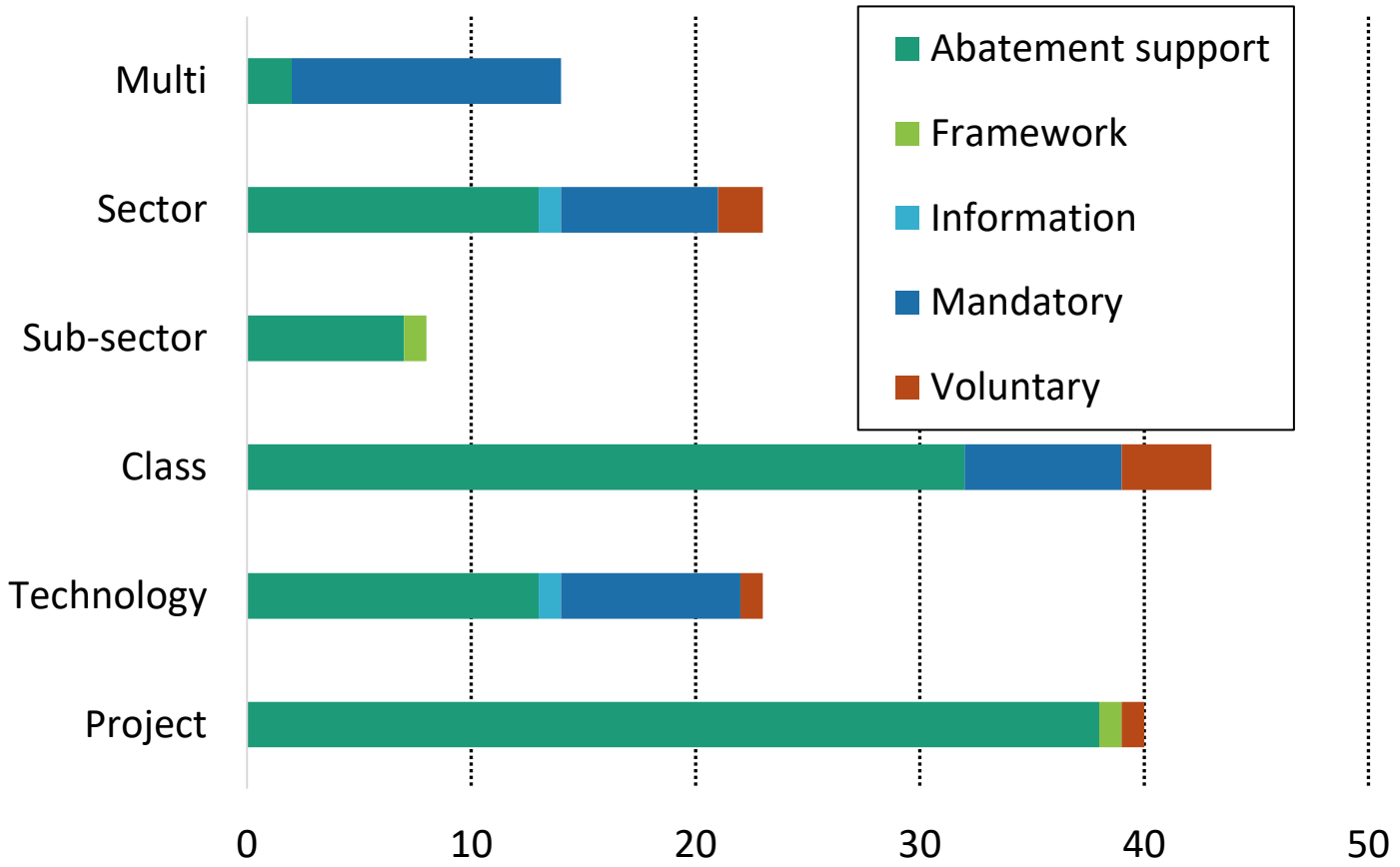
Source: Winter, J. et al. 2023. *Examining the Interplay between Building Codes and Canadian FPT Policies, Programs, and Targets Related to Reducing GHG Emissions*. Report prepared for the National Research Council of Canada. https://jenniferwinter.github.io/website/NRC_Report_2023.pdf.

Policy Count by Scope and Instrument Type

Policies that affect emissions in the building sector

Examples:

- **Project:** NB Total Home Energy Savings Program
- **Technology:** Appliance Energy Efficiency Standards
- **Class:** ON Energy Efficiency and Demand Management Program
- **Sub-sector:** Federal Greening Government Buildings
- **Sector:** BC Home Energy Labelling Platform
- **Multi:** QC cap-and-trade program



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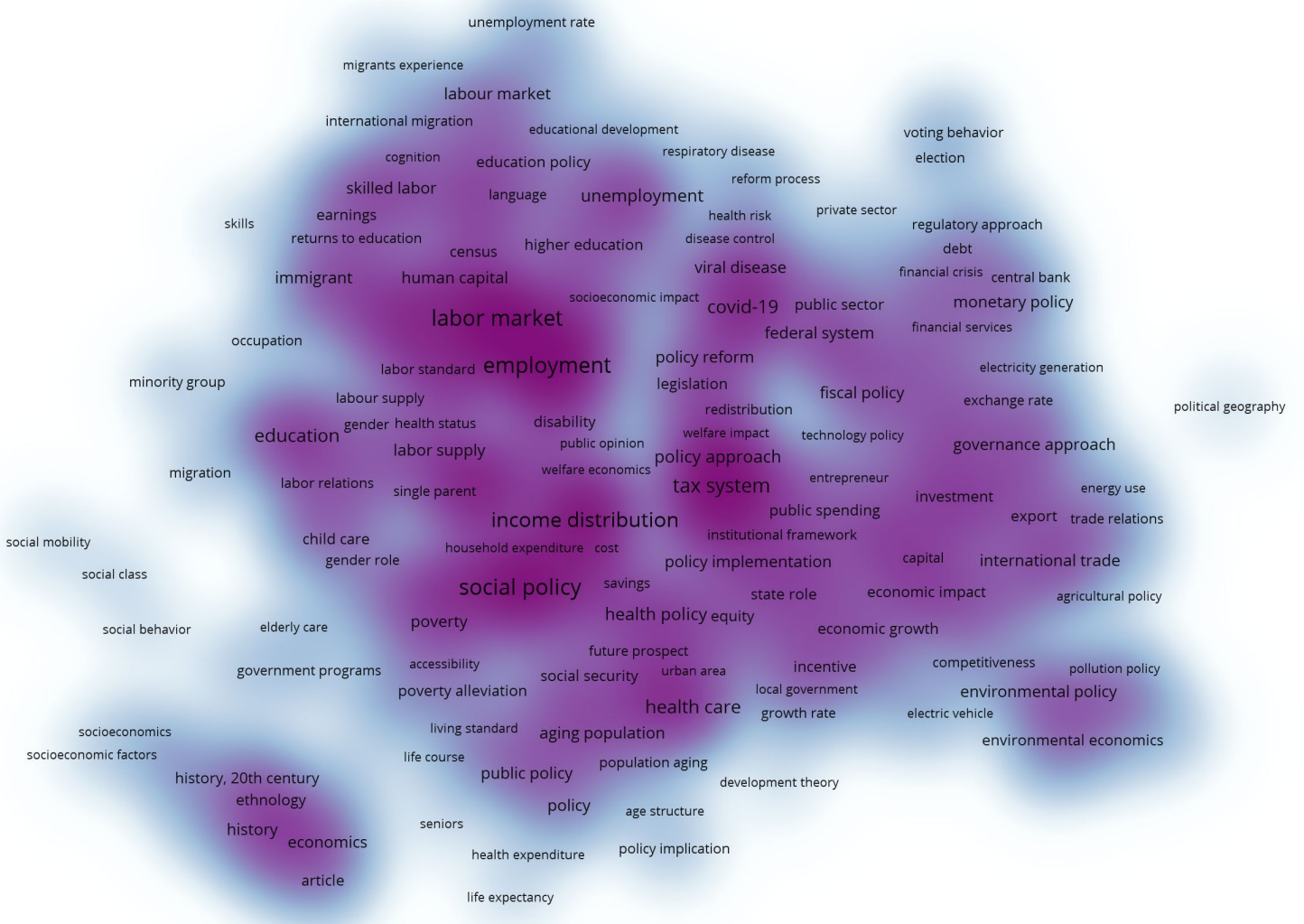
Canadian Climate Policy Research

Canadian Public Policy Research Themes

Colour density shows the number of times a keyword is present in the dataset of article keywords.

Geography keywords removed.



VOSviewer

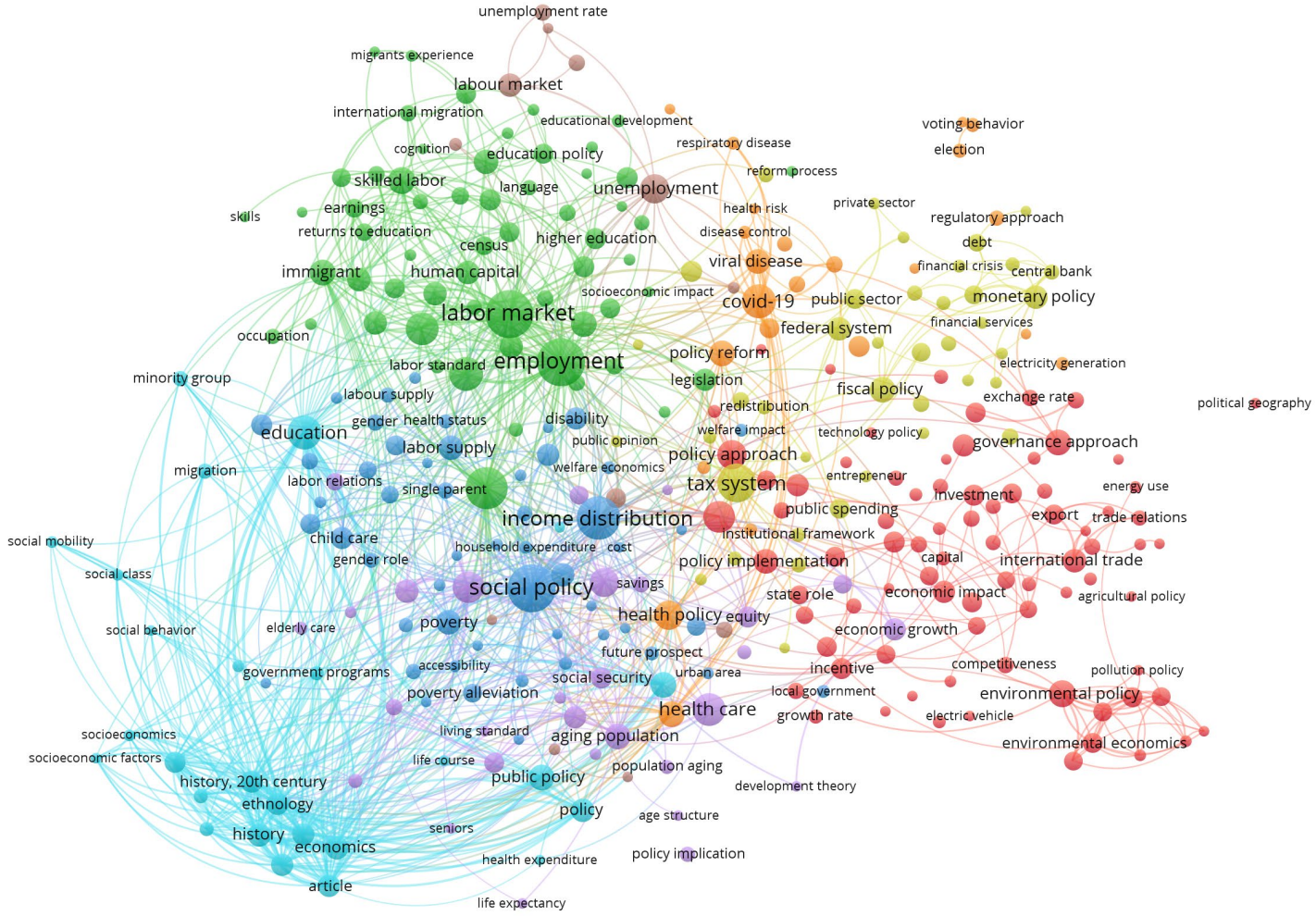
Source: Scopus, *CPP* articles, downloaded May 5, 2023.

Canadian Public Policy Research Themes

Bubble size shows the number of times a keyword is present in the dataset of article keywords.

Lines show co-occurrence of keywords across articles.

Geography keywords removed.

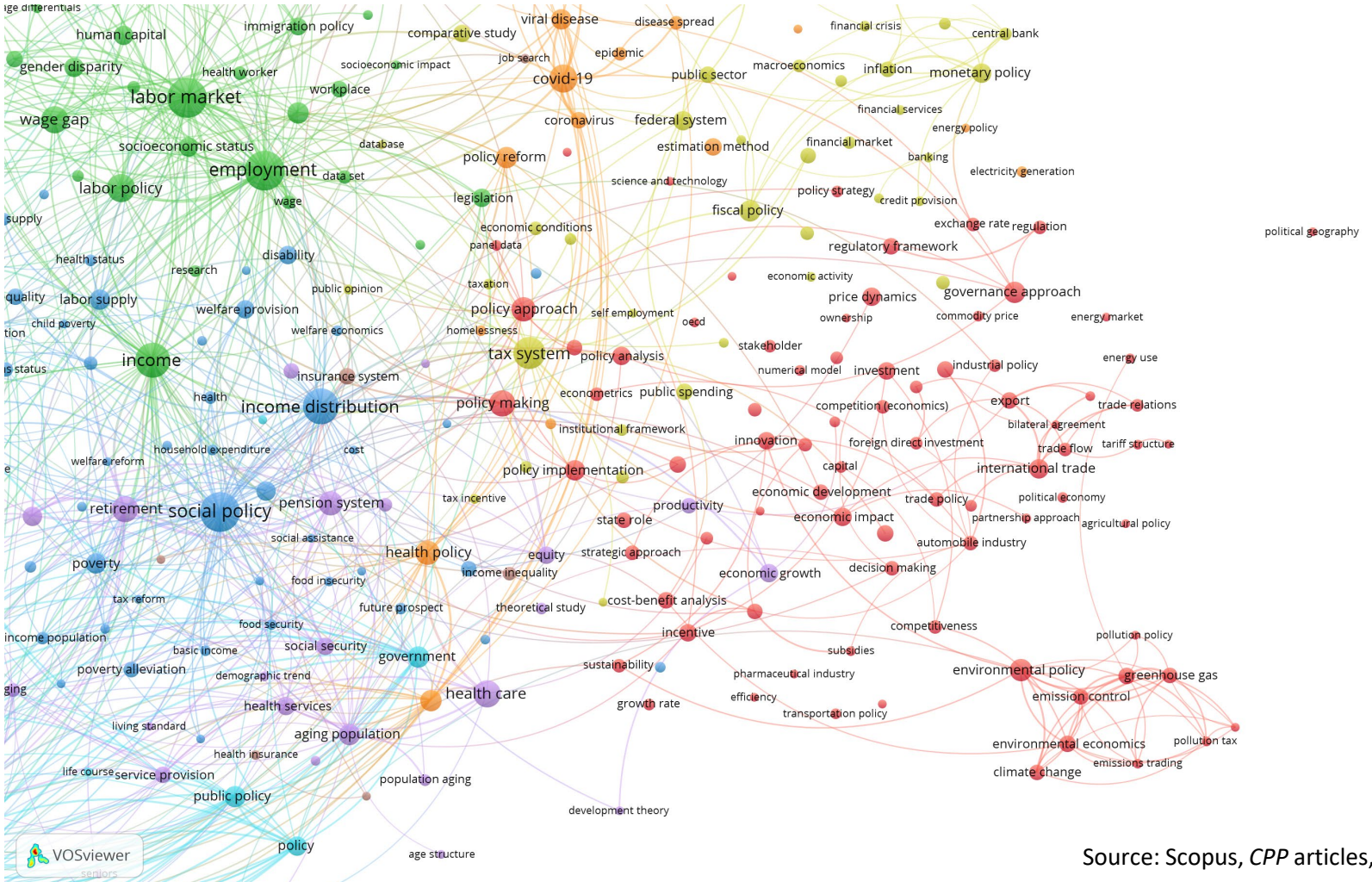


VOSviewer

Source: Scopus, *CPP* articles, downloaded May 5, 2023.

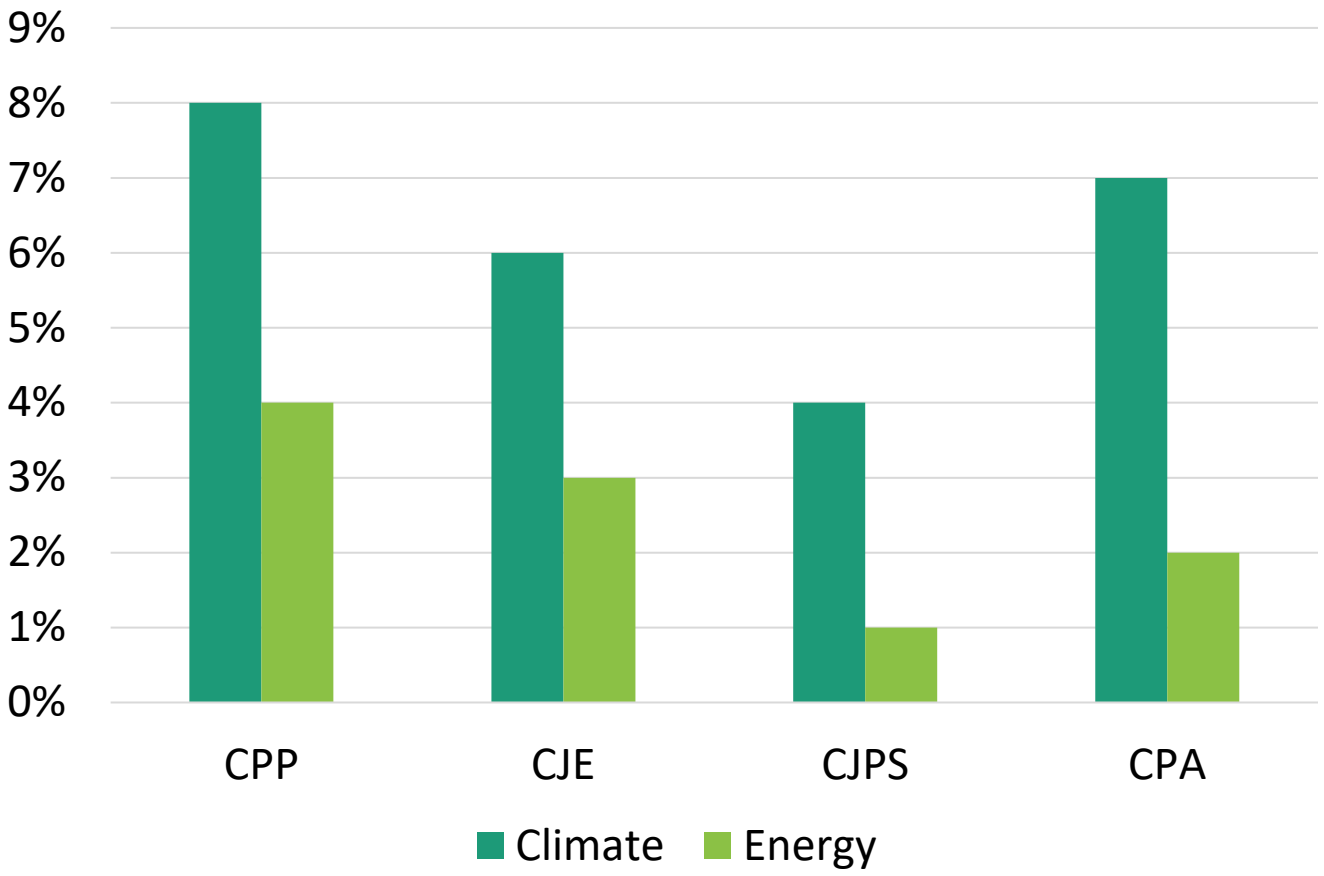
Canadian Public Policy Research Themes

Environmental and energy economics or policy research has little linkage to other fields.



Source: Scopus, *CPP* articles, downloaded May 5, 2023.

Canadian Climate and Energy Policy is Understudied

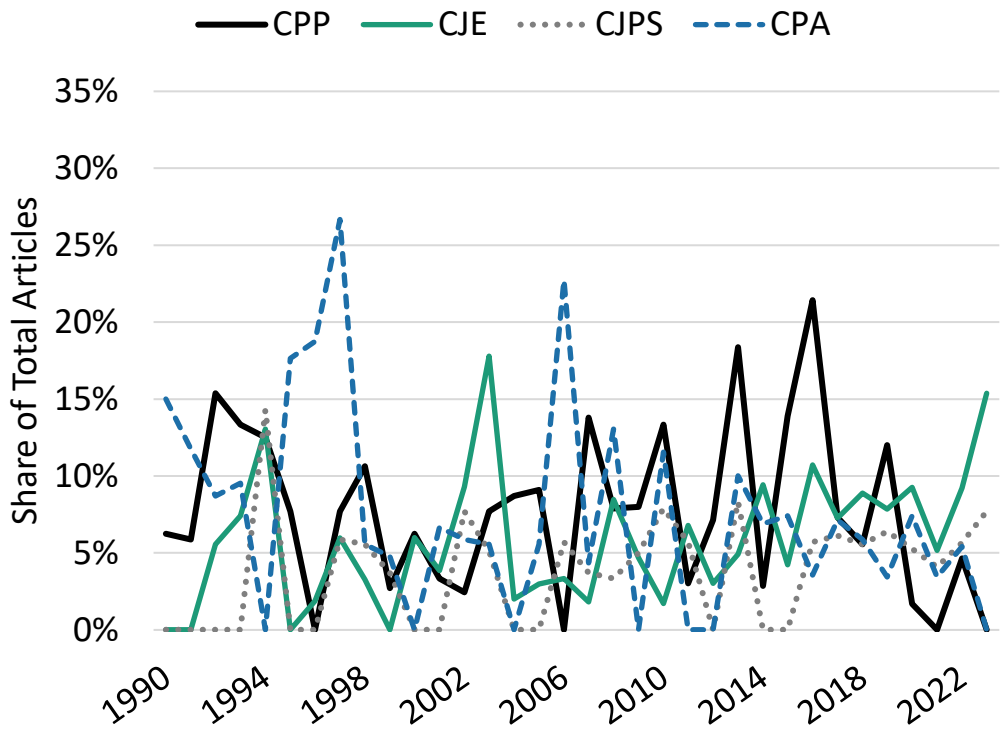


Share of total articles published that have a climate or energy keyword in the abstract.

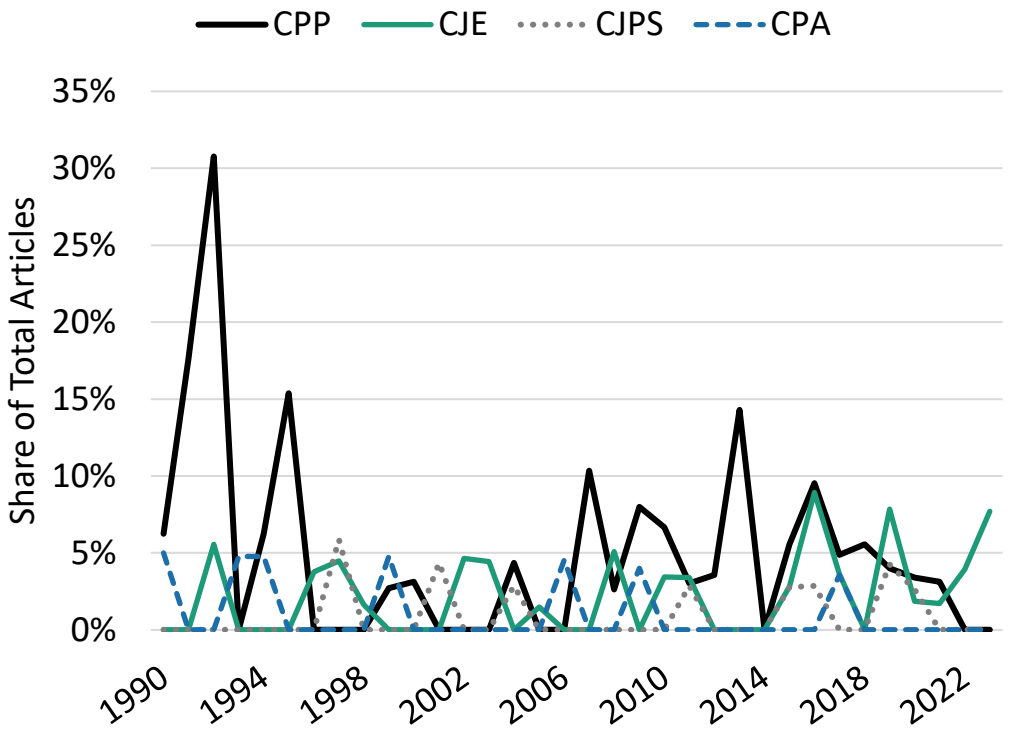
Source: Scopus, downloaded May 5, 2023. Climate keywords: "climate", "pollution", "emissions", "carbon", "environment", "sustainability", "green« . Energy keywords: "energy", "electricity", "oil", "gas".

No Concrete Time Patterns

Climate Articles



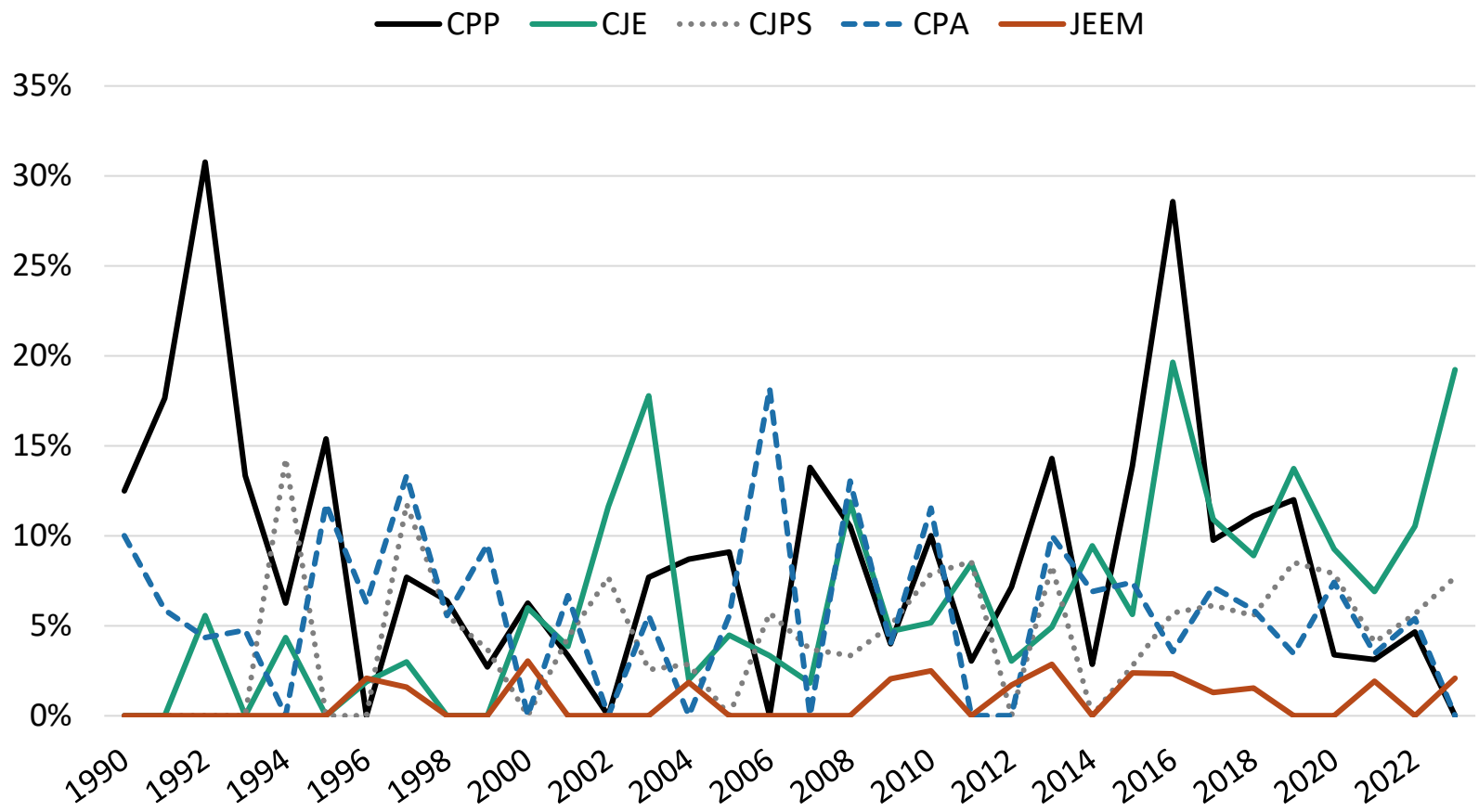
Energy Articles



Source: Scopus, downloaded May 5, 2023. Climate keywords: "climate", "pollution", "emissions", "carbon", "environment", "sustainability", "green« . Energy keywords: "energy", "electricity", "oil", "gas".

We Aren’t Publishing Elsewhere

Field journals don’t appear to be a substitute for *CPP* or *CJE*.



Source: Scopus, downloaded May 5, 2023. Climate keywords: "climate", "pollution", "emissions", "carbon", "environment", "sustainability", "green« . Energy keywords: "energy", "electricity", "oil", "gas". Canada keywords: "canada", "Canadian", « British Columbia", "Alberta", "Manitoba", "Saskatchewan", "Ontario", "Québec", “New Brunswick", “Prince Edward Island", “Nova Scotia", “Newfoundland and Labrador", "Yukon", “Nunavut", “Northwest Territories".

Outstanding Research Questions and Gaps

Three Avenues for Future Research

Effectiveness and cost-effectiveness of policy interventions

Equity

Policy interactions

Effectiveness of Policy Interventions

Economists have a toolkit for ex post evaluation of policy interventions, including causal inference!

EMISSION REDUCTIONS THROUGH GREENHOUSE GAS REGULATIONS

Federal government does not know the extent to which greenhouse gas regulations are reducing emissions

Report 5 | Reports of the Commissioner of the Environment and Sustainable Development

Passenger Automobile and Light Truck Greenhouse Gas Emission Regulations (2010, amended 2015)

Heavy-Duty Vehicle and Engine Greenhouse Gas Emission Regulations (2013, amended 2018)

Reduction of Carbon Dioxide Emissions From Coal-Fired Generation of Electricity Regulations (2015, amended 2018)

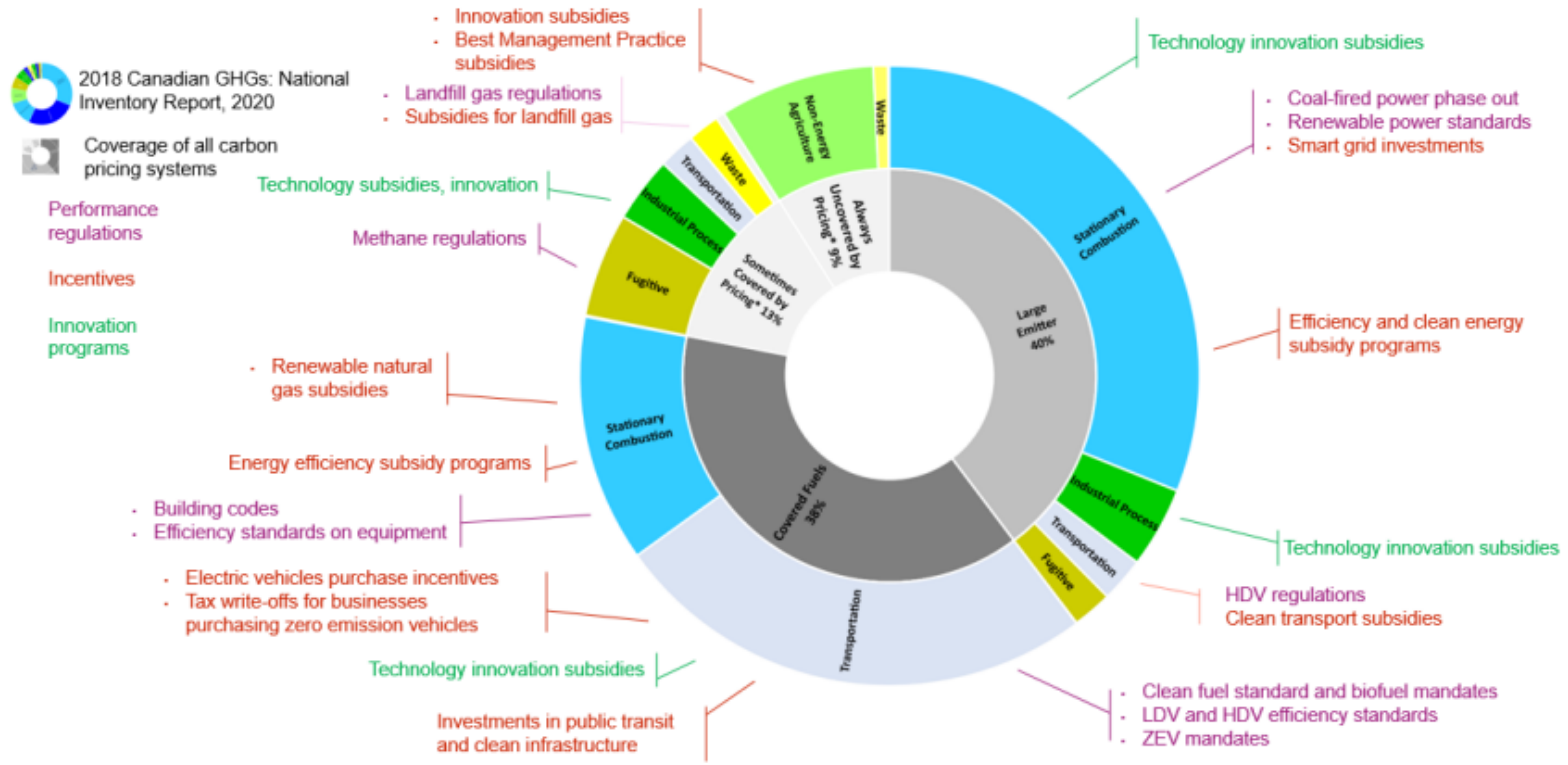
Regulations Limiting Carbon Dioxide Emissions From Natural Gas-Fired Generation of Electricity (2019)

Regulations Respecting Reduction in the Release of Methane and Certain Volatile Organic Compounds (Upstream Oil and Gas Sector (2020)

Source: Commissioner of the Environment and Sustainable Development. 2023. *Emission Reductions Through Greenhouse Gas Regulations—Environment and Climate Change Canada*. Reports of the Commissioner of the Environment and Sustainable Development to the Parliament of Canada, Office of the Auditor General of Canada. https://www.oag-bvg.gc.ca/internet/docs/parl_cesd_202304_05_e.pdf.

Very Complex Policy Environment

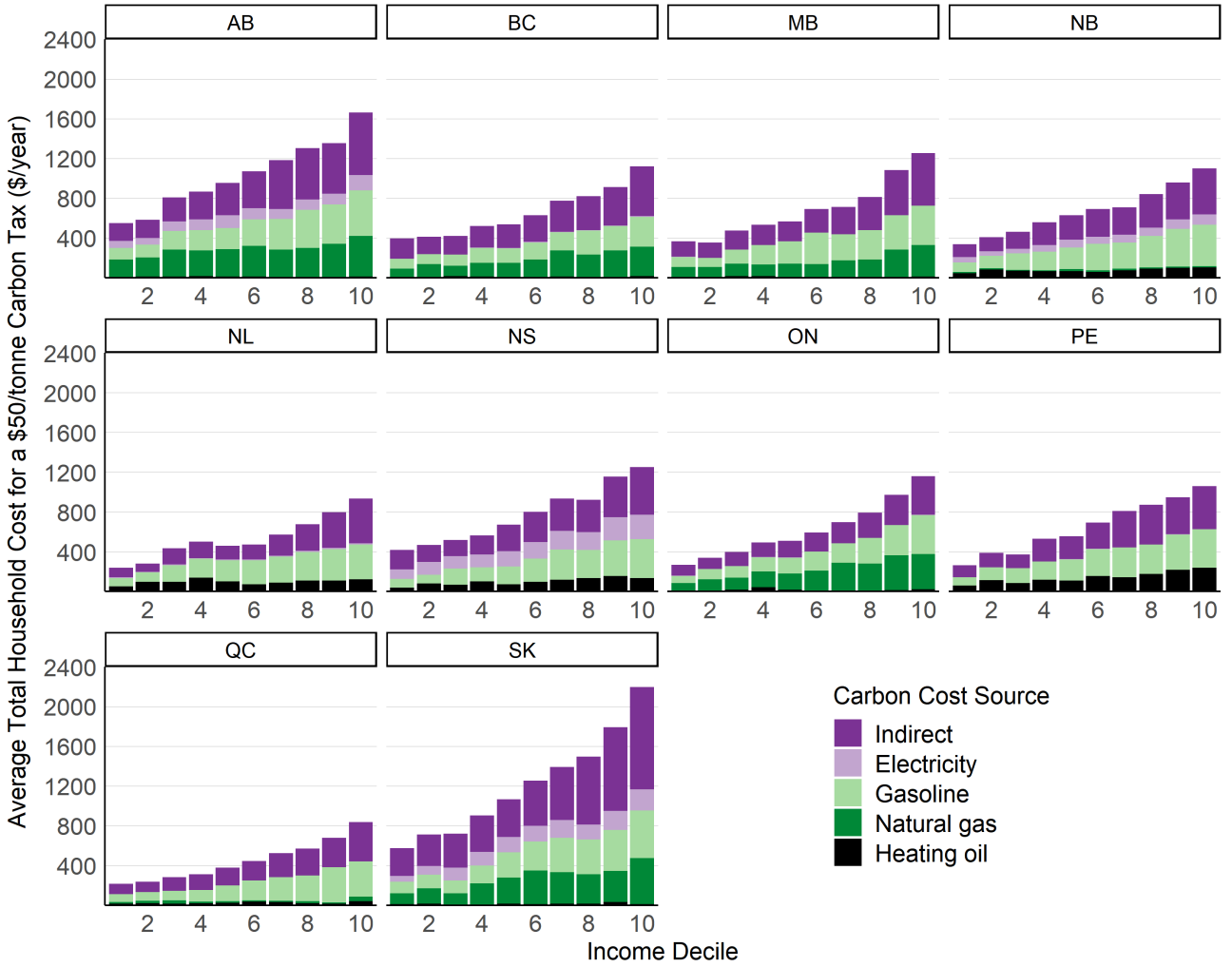
Figure 1: Canada's Climate Carbon Policy Architecture
Performance regulations, carbon pricing, incentives, and innovation programs targeting different emission sources.



Source: Sawyer, D., S. Stiebert, R. Gignac, A. Campney, & D. Beugin. 2021. *2020 Expert Assessment of Carbon Pricing Systems*. Canadian Climate Institute [Canadian Institute for Climate Choices]. https://publications.gc.ca/collections/collection_2021/eccc/En4-434-2021-eng.pdf.

Carbon Tax Costs at $50/Tonne

- Mechanical effect, assuming no behavioural change and 100% pass-through — very much an upper bound.
- Missing general equilibrium effects.
- Doesn't address nuance of specific PT pricing systems.



Source: Winter, J., B. Dolter, & G.K. Fellows. 2023. "Carbon Pricing Costs for Households and the Progressivity of Revenue Recycling Options in Canada." *Canadian Public Policy* 49(1) 13-45. https://www.utpjournals.press/doi/full/10.3138/cpp.2022-036.

Carbon Pricing Channels

- Consumption channel
  - Pass-through
  - Production response by firms
  - Leakage
  - Demand response by consumers
- Income channel
  - Destruction of brown jobs
  - Creation of green jobs
  - Structural changes (factor income, demand for skills)
- Health channel
- Revenue recycling channel

Source: Shang, B. 2023. "The Poverty and Distributional Impacts of Carbon Pricing: Channels and Policy Implications." *Review of Environmental Economics and Policy* 17(1) 64-85. https://www.journals.uchicago.edu/doi/10.1086/723899.

Oil and Gas Emissions Cap

Blake Shaffer
@bcshaffer

Why is @ppforumca modelling a *production* cap when no one other than political misinfo are suggesting that. The proposed policy is an *emissions* cap. 1/2

ChrisVarcoe @ChrisVarcoe · May 11
Varcoe: Big $60B hit for Alberta — & $100B for Canada — in a net-zero world if oil & gas production phased out by 2050, study finds
"'An accelerated phaseout introduces economic pain with no added environmental gain," says Public Policy Forum
calgaryherald.com/opinion/column... #yyc #ableg

8:47 AM · May 11, 2023 · **25.9K** Views

Public Policy Forum
@ppforumca

A gradual phase-out of Canadian oil and gas production as a means of achieving net-zero emissions versus investments to decarbonize oil and gas, such as carbon capture would introduce greater costs to the economy without a corresponding environmental benefit, according to economic modeling commissioned by the Public Policy Forum.

Entitled *The $100 Billion Difference: Relative Costs of Two Net Zero Approaches*, the study compares two possible scenarios for achieving net zero emissions in this country.

In one scenario, Canada pursues broad-based, sector-agnostic emissions reductions, and in the second, oil and gas production is gradually phased out.

The study found that both scenarios lead to net zero emissions, but the phase-out of oil and gas imposed an additional $100 billion in lost GDP, with some $60 billion of the losses occurring in the province of Alberta.

Canada's trade balance is also affected as we eventually become a net importer of oil.

The study was carried out by Vancouver-based @NaviusResearch, an independent and impartial research firm that models the effect of climate and energy policy on the economy and environment.

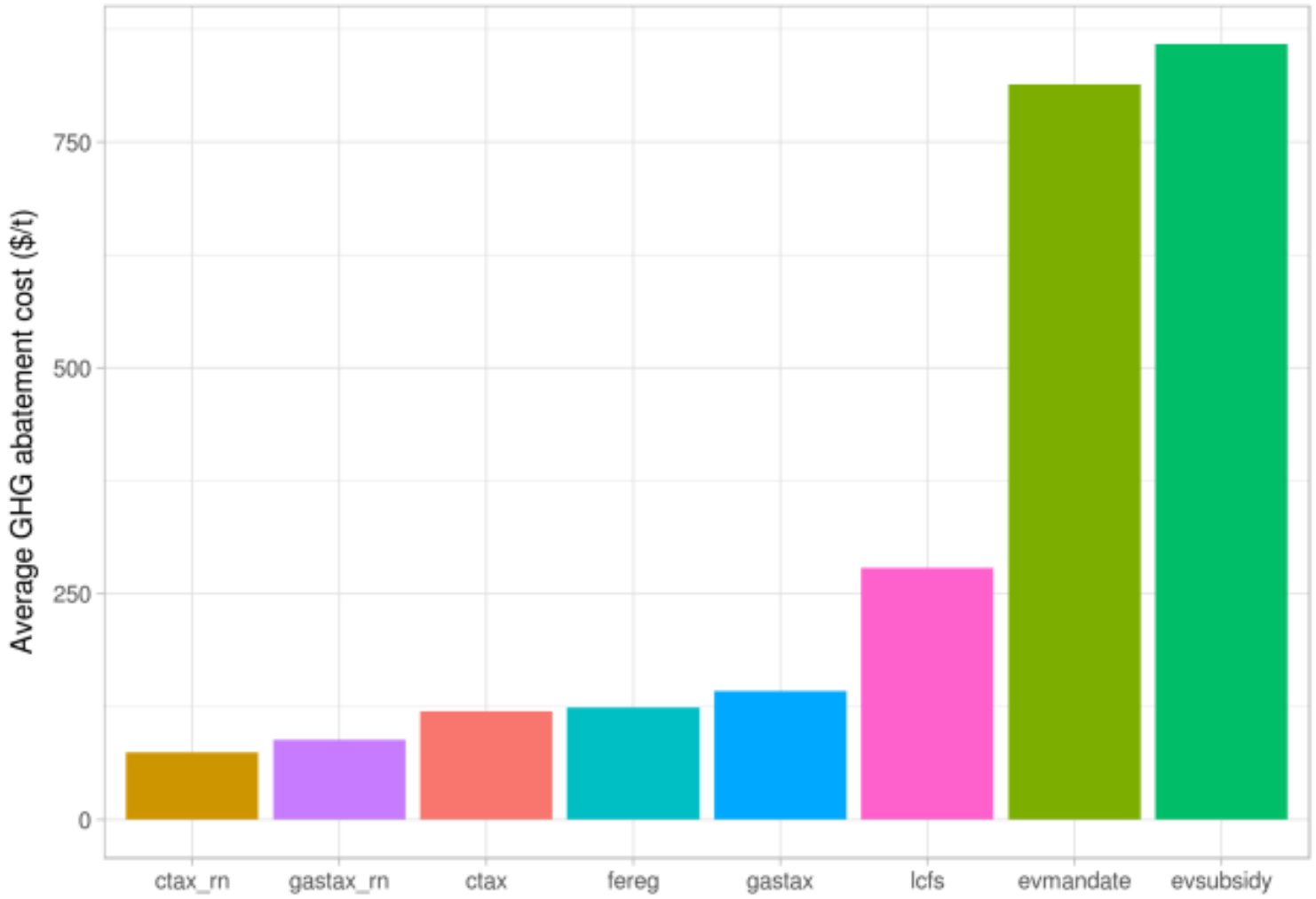
ppforum.ca/publications/n

#netzero#cdnpoli#oilandgas

Source: Shaffer, B. 2023. Twitter. May 11. https://twitter.com/bcshaffer/status/1656672294801125378?s=20.
Public Policy Forum. 2023. Twitter. May 11. https://twitter.com/ppforumca/status/1656638123776901121?s=20

Cost of Policy Options for GHG Mitigation in Transport

Ex ante analysis of reducing emissions from transport by 9.1%.

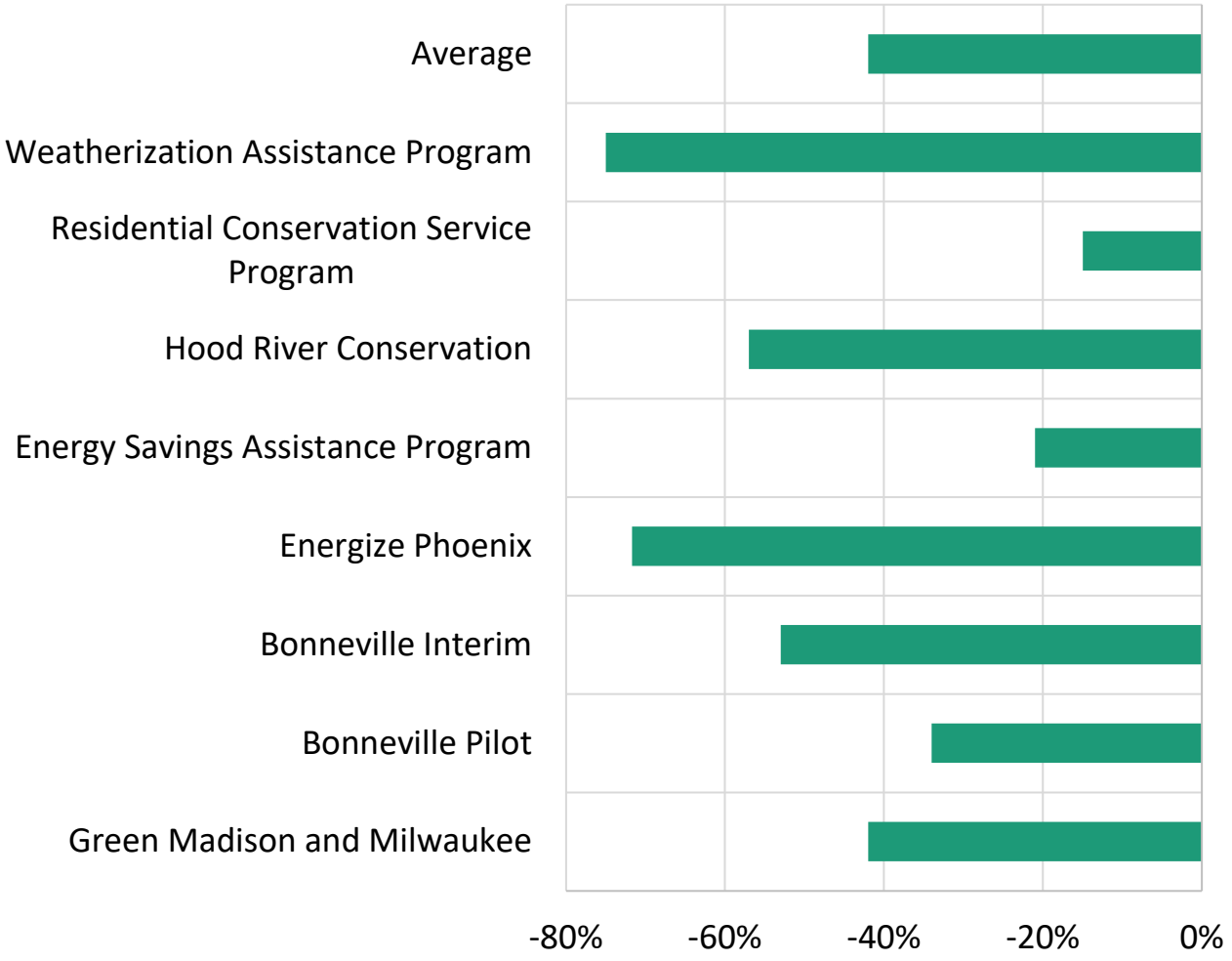


Source: Rivers, N. & Wigle, R. 2018. “An evaluation of policy options for reducing greenhouse gas emissions in the transport sector: The cost-effectiveness of regulations versus emissions pricing.” LCERPA Working Paper N0. 2018-1. January. https://www.lcerpa.org/public/papers/LCERPA_2018_1.pdf.

Energy Efficiency Programs Under-Perform

- Engineering estimates of energy savings overestimate actual savings in all cases.

- Despite Canada's many energy-switching and energy-efficiency subsidy programs, most research is US-focused.



Source: Giandomenico, L., M. Papnineau, & N. Rivers. 2020. "A systematic review of energy efficiency home retrofit evaluation studies." Smart Prosperity Institute working paper WP 20-10. https://institute.smartprosperity.ca/publications/home-retrofit.

Trade and the Environment

- How will trade change as a result of increasingly stringent emission-reduction policies in Canada?
- What will the EU carbon border adjustment mechanism mean for Canada?

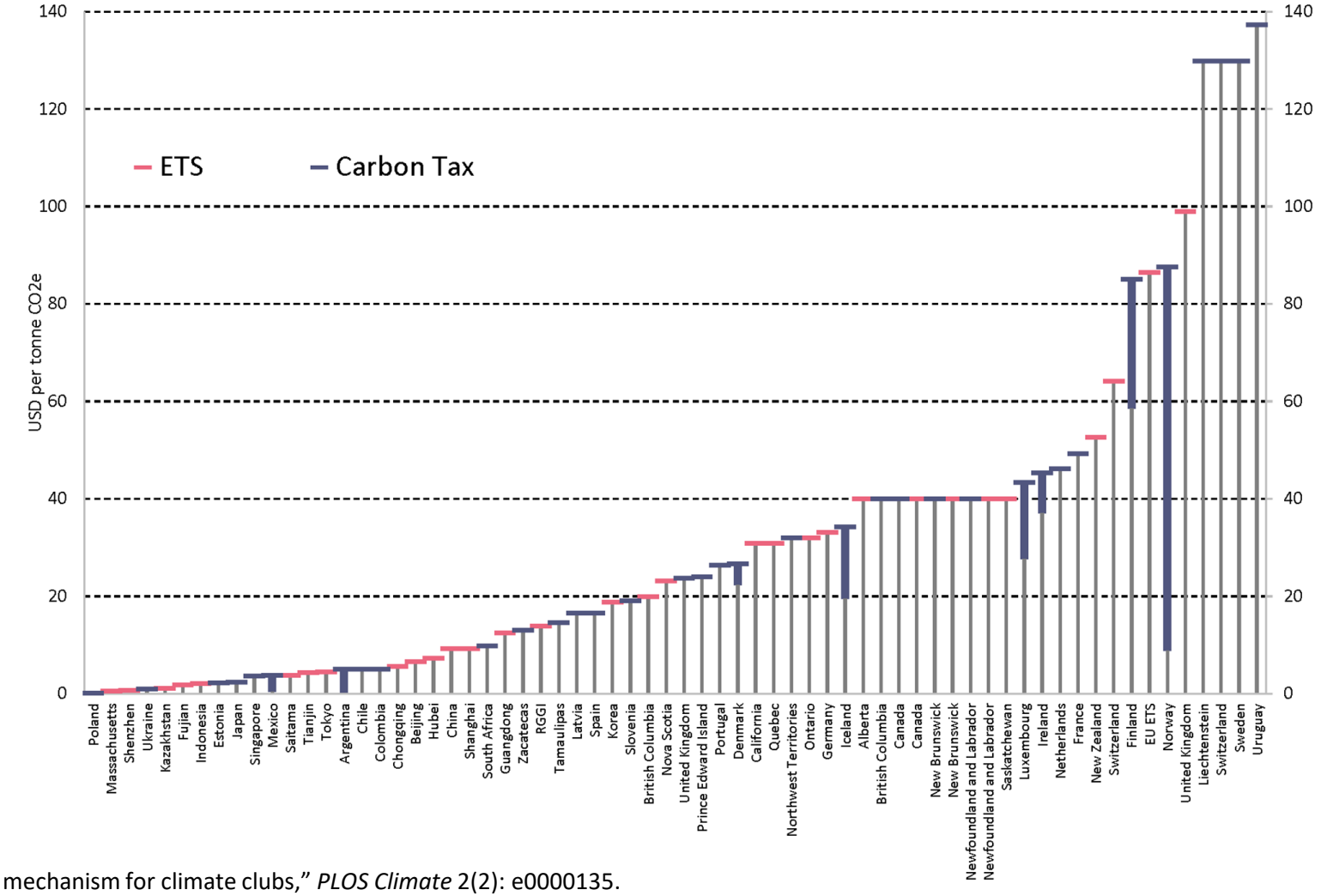
III. Reducing Emissions Through Trade Policy

We recognize that trade and trade policies are important tools to tackle climate change and can be drivers of sustainable growth. Based on this recognition, we will pursue trade policies that drive decarbonisation and emissions reduction, by spurring markets to account for embedded emissions in traded goods, and affirm that environmental standards should not be lowered to unfairly gain competitive advantage. We welcome the work of the WTO in this area. We recognize that, while sharing common goals, our climate policies may take different approaches including carbon pricing mechanisms, regulations, and incentives. We will also collaborate intensively on our efforts to develop the necessary data and tools, such as information on embedded emissions throughout supply chains, to implement such policies. We recognize that the risk of carbon leakage may increase with more divergent climate policy ambition and will continue to work collaboratively, including with relevant international organizations, to address this risk. We request that the Organization for Economic Cooperation and Development (OECD) report to us on the progress of the Inclusive Forum on Carbon Mitigation Approaches (IFCMA) to explore methodological approaches for computing carbon intensity of goods or sectors.

Source: G7. 2023. *G7 Clean Energy Economy Action Plan*. May 20. https://www.g7hiroshima.go.jp/documents/pdf/session5_02_en.pdf.

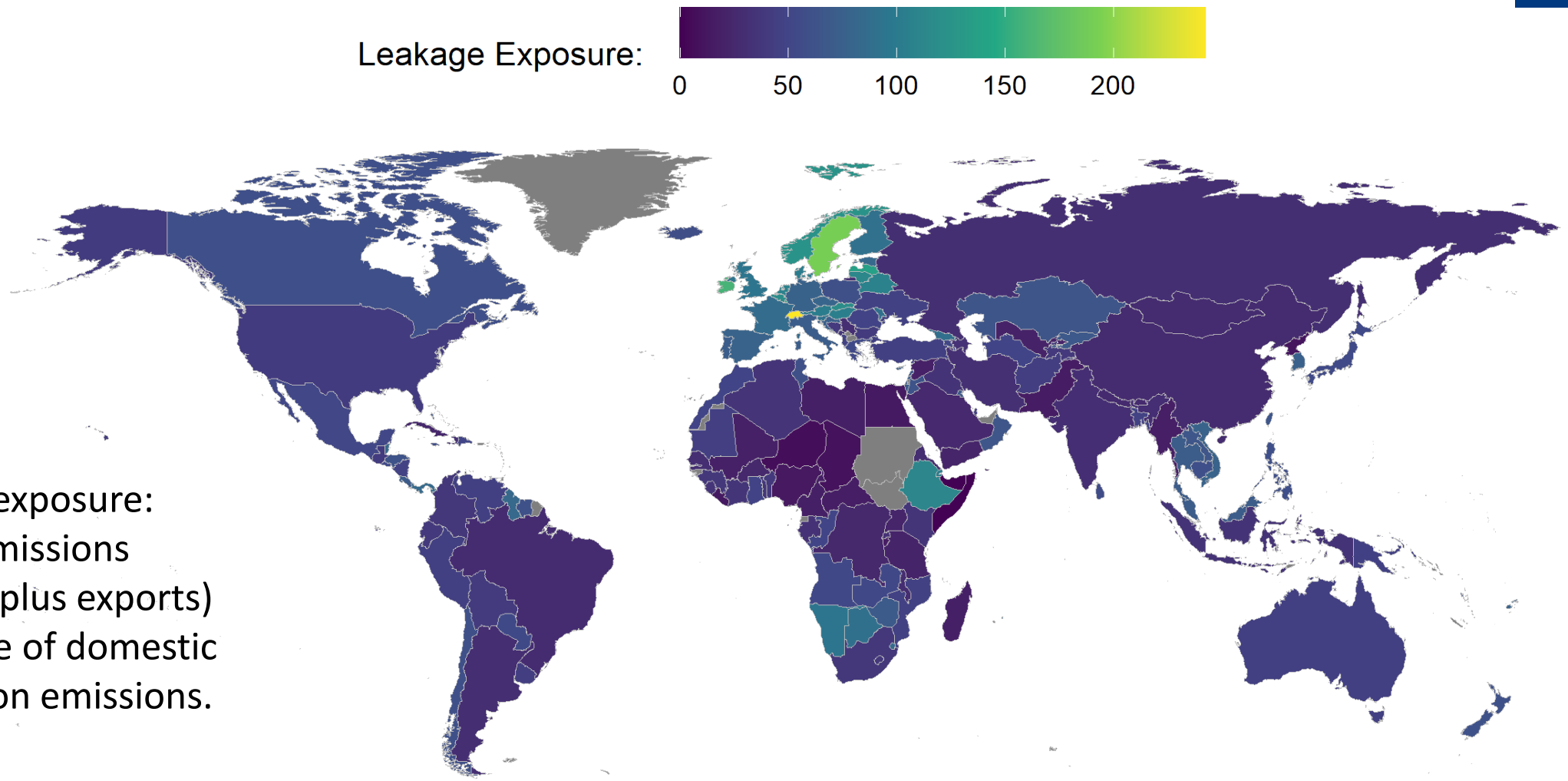
2022 Global Emissions Pricing

Differences in emissions pricing creates the potential for leakage, a major concern for many industrialized countries.



Source: Winter, J. 2023. "The challenge of border carbon adjustments as a mechanism for climate clubs," *PLOS Climate* 2(2): e0000135. https://doi.org/10.1371/journal.pclm.0000135. Data from World Bank Carbon Pricing Dashboard.

2016 Leakage Exposure



Leakage exposure: traded emissions (imports plus exports) as a share of domestic production emissions.

Source: Winter, J. 2022. "Emissions Markets and International Trade," in *Energy and Geostrategy, 9th Ed.*

Gray indicates no data.

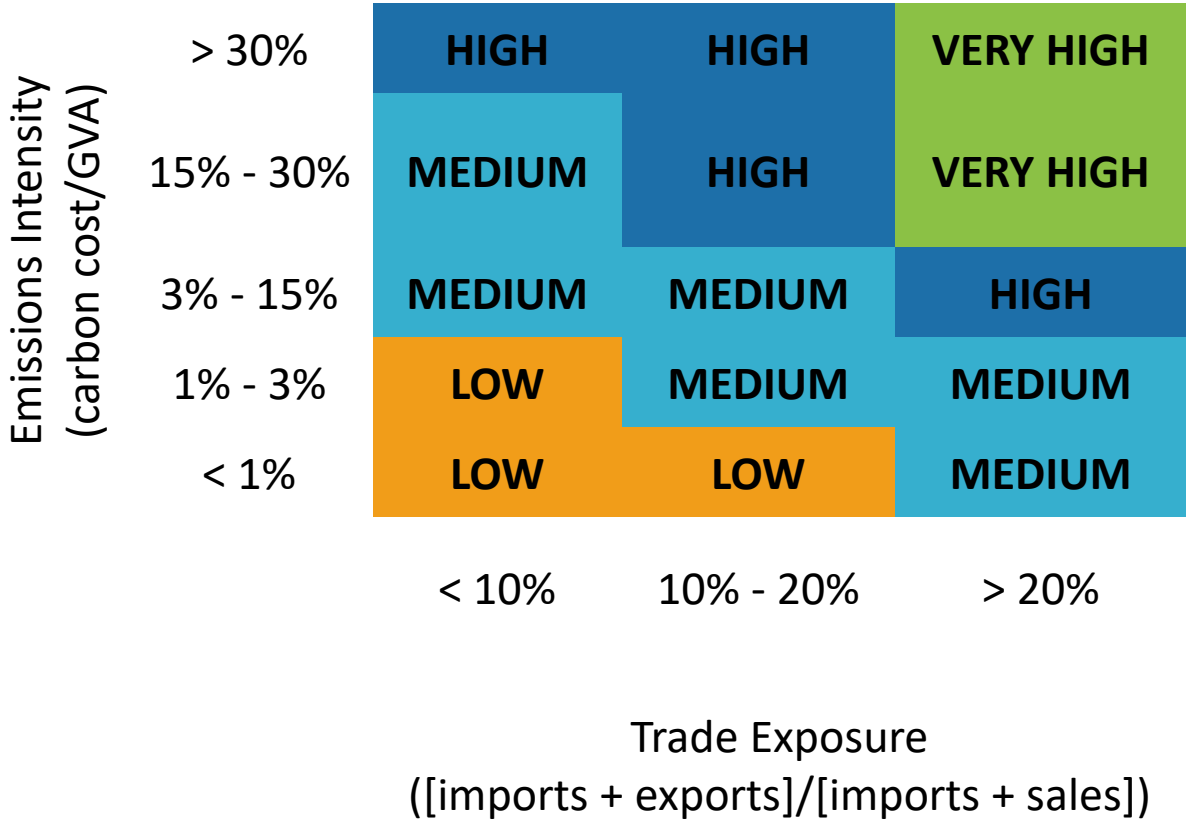
Addressing Leakage

- Exempt certain sectors

- Domestic policy
  - Implicitly or explicitly subsidize certain sectors
  - Explicit: free permit allocations or output-based subsidies

- Border carbon adjustments

Leakage — Federal EITE Criteria



- Is there a better way to measure leakage exposure?
- Is there a better way to target competitiveness supports?

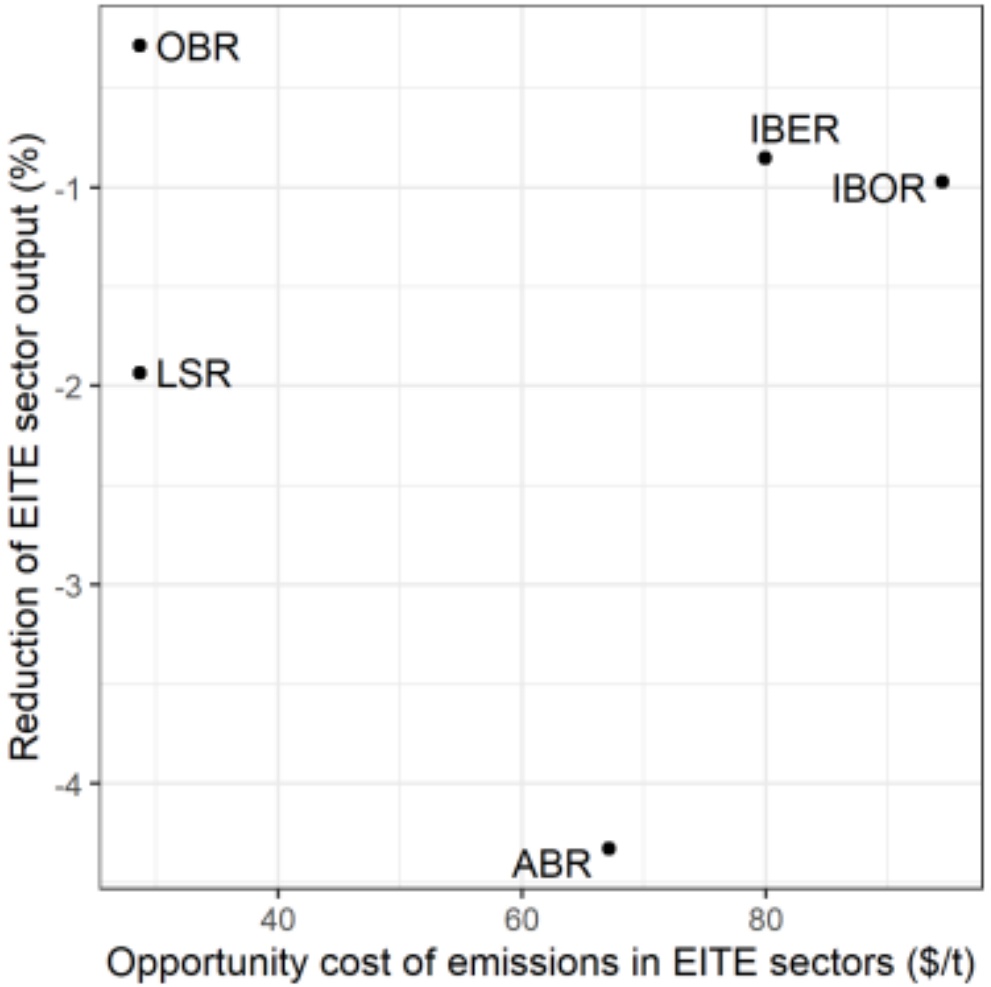
Source: Environment and Climate Change Canada. 2022. *Regulatory Impact Analysis Statement, Regulations Amending the Output-Based Pricing System Regulations and the Environmental Violations Administrative Monetary Penalties Regulations*. Canada Gazette, Part I, Volume 156, Number 44. https://canadagazette.gc.ca/rp-pr/p1/2022/2022-10-29/html/reg2-eng.html.

EITE Policy in Canada (Select Examples)

- BC (right now): full rebate above $30/t for facilities meeting an emissions-intensity performance standard
- Federal: different performance standards for coal and natural-gas electricity generation
- NS C&T: auctions were after production (and emissions) decisions (e.g., 2020 auctions were for 2019 emissions)

- Mix of sector-, product- and facility-specific performance standards
- Differences in covered sectors and covered emissions
- Substantial free allocations of emissions permits

EITE Policy Design Matters



Comparison of rebating options on incentives to abate and output protection in EITE sectors

LSR: lump-sum rebating

ABR: abatement-based rebating

OBR: output-based rebating

IBOR: intensity-based output rebating;

IBER: intensity-based emissions rebating.

Source: Böhringer, C., C. Fischer, & N. Rivers. 2022. "Intensity-based Rebating of Emissions Pricing Revenues." RFF Working Paper 21-37. https://www.rff.org/publications/working-papers/intensity-based-rebating-of-emissions-pricing-revenues/.

Effectiveness and Cost-Effectiveness of Policy Interventions

- Scope for both ex ante and ex post work

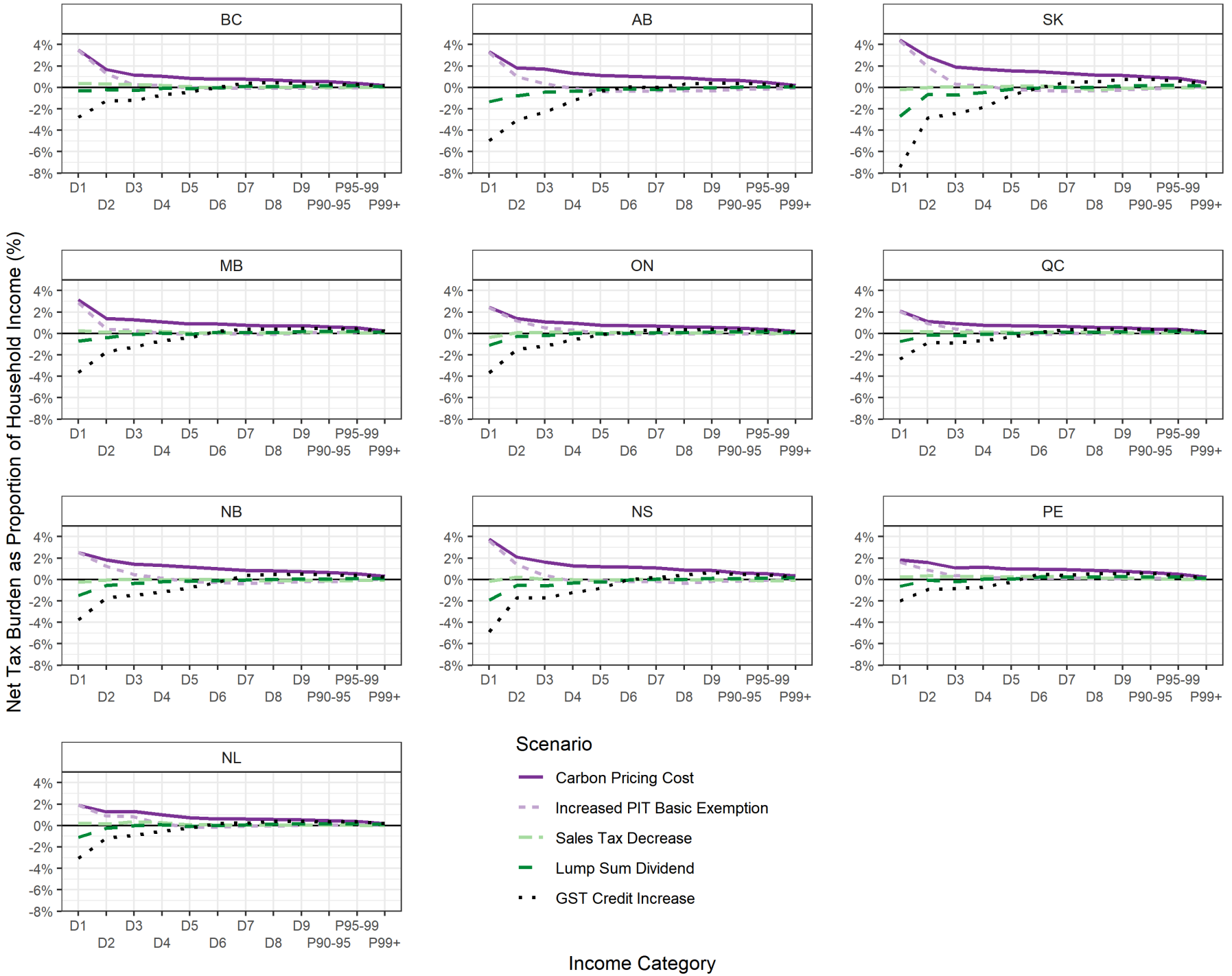
- (Some) key questions
  - What are emissions reductions from a given policy? (*Does carbon pricing work?!?*)
  - What are the general equilibrium effects of carbon pricing on households and firms?
  - What are the trade-offs from different emissions-mitigation policies?
  - What are the costs and benefits of energy-efficiency and energy-use interventions?
  - What are the relative effects on output, emissions and productivity from different FPT EITE policies?
  - How will trade change as a result of increasingly stringent emission-reduction policies in Canada?
  - What will the EU carbon border adjustment mechanism mean for Canada?
  - Is there a better way to measure leakage exposure?
  - Is there a better way to target competitiveness supports?

Three Avenues for Future Research

Effectiveness and cost-effectiveness of policy interventions

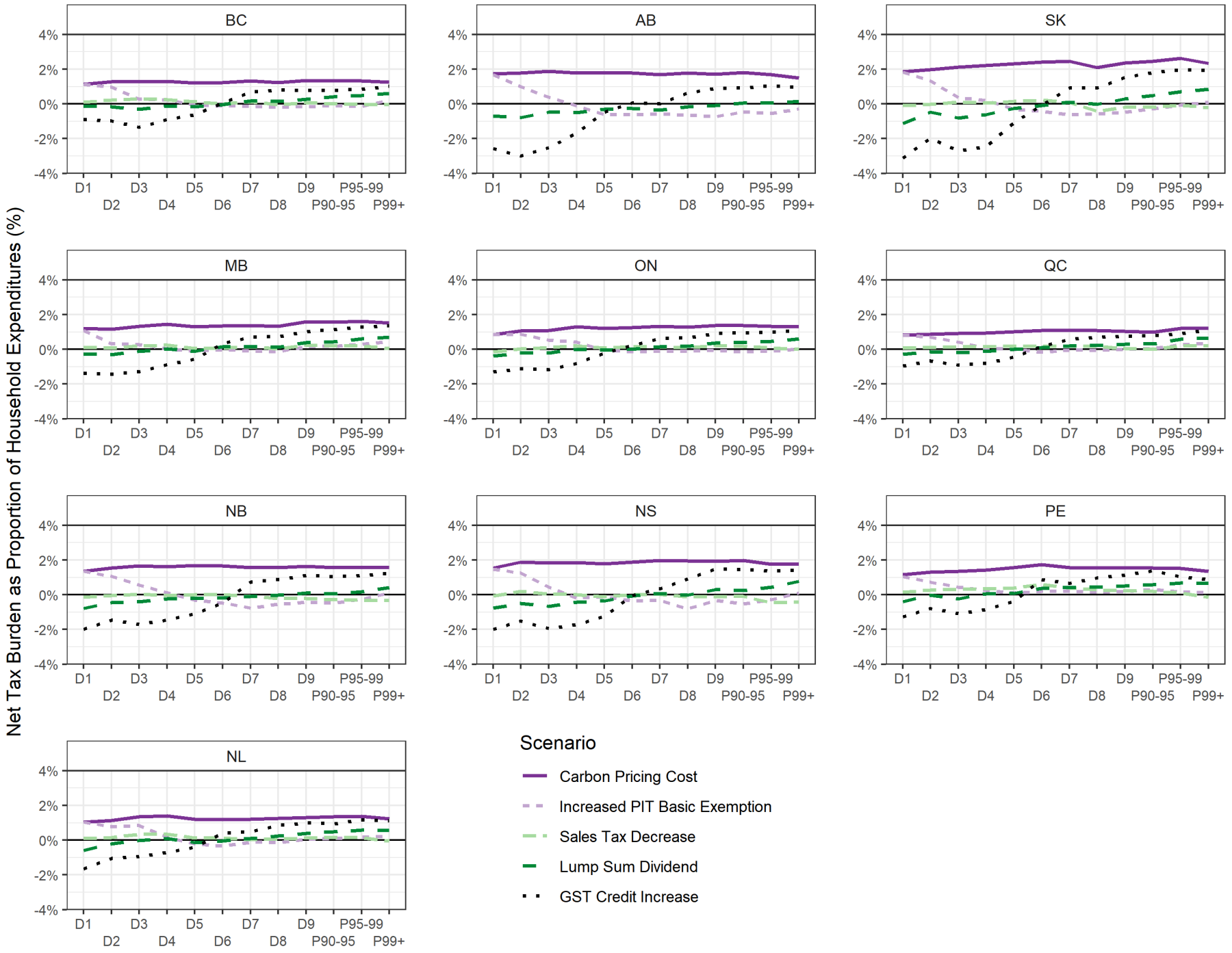
Equity

Policy interactions



Net tax burden as a share of income at $50 per tonne, by province and income percentile

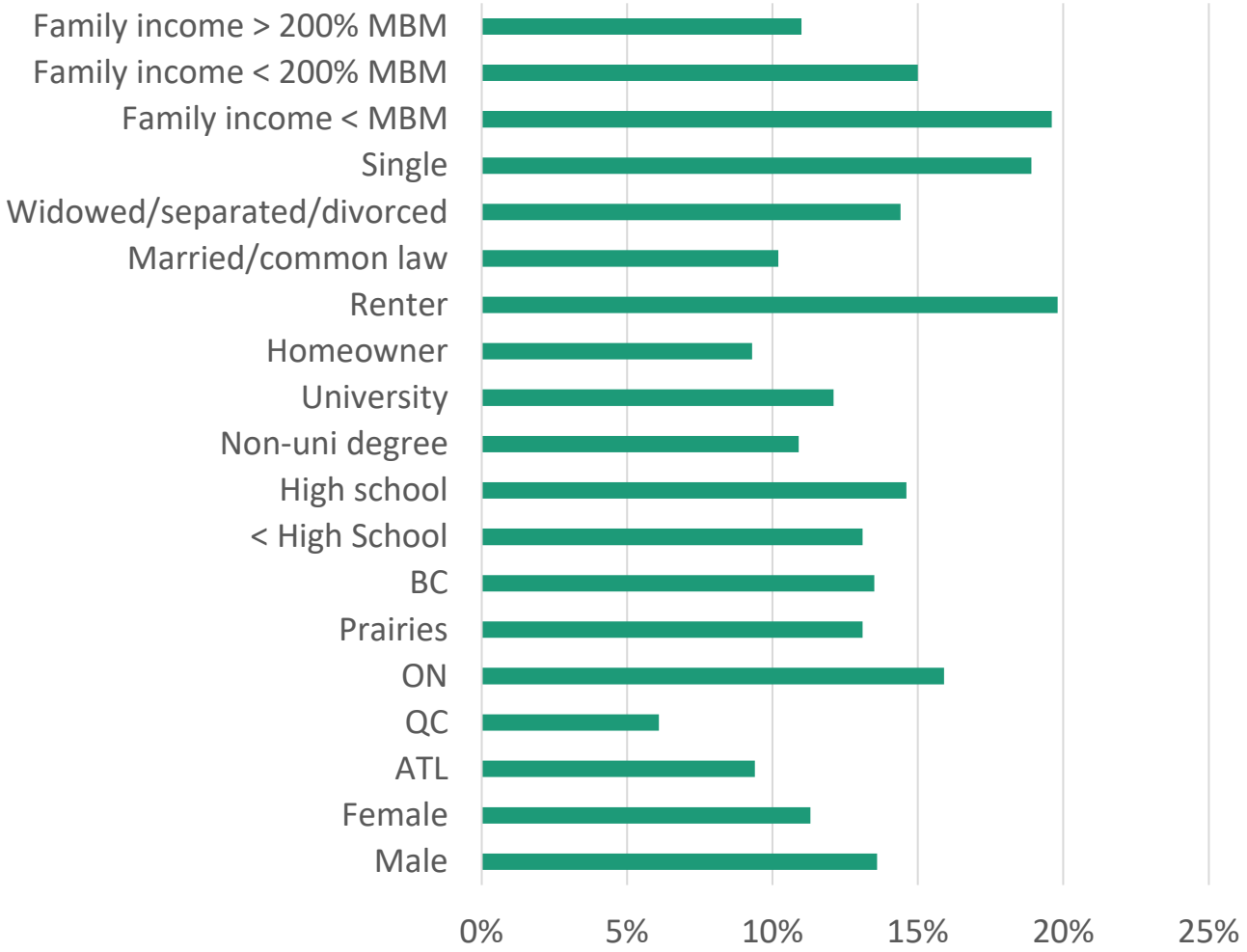
Source: Winter, J., B. Dolter, & G.K. Fellows. 2023. "Carbon Pricing Costs for Households and the Progressivity of Revenue Recycling Options in Canada." *Canadian Public Policy* 49(1) 13-45. https://www.utpjournals.press/doi/full/10.3138/cpp.2022-036.



Net tax burden as a share of expenditure at $50 per tonne, by province and income percentile

Source: Winter, J., B. Dolter, & G.K. Fellows. 2023. "Carbon Pricing Costs for Households and the Progressivity of Revenue Recycling Options in Canada." *Canadian Public Policy* 49(1) 13-45. https://www.utpjournals.press/doi/full/10.3138/cpp.2022-036.

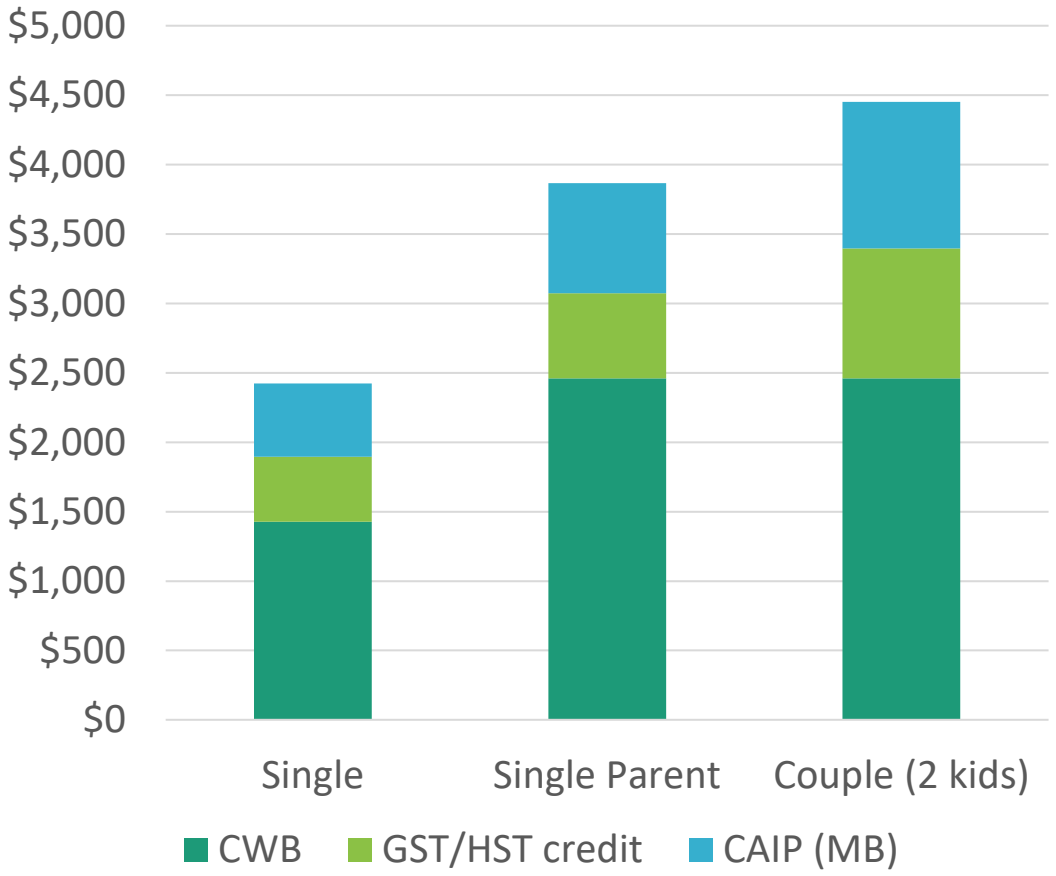
Share of Non-Tax-Filers by Socio-Economic Characteristics



- Approximately 10-12 percent of Canadians do not file a tax return and receive benefits.
- This is almost 20% of some socio-economic groups.

Source: Robson, J. & S. Schwartz. 2020. "Who Doesn't File a Tax Return? A Portrait of Non-Filers." *Canadian Public Policy* 46(3) 323-339. https://doi.org/10.3138/cpp.2019-063.

Example Lost Benefits, 2022 Tax Year



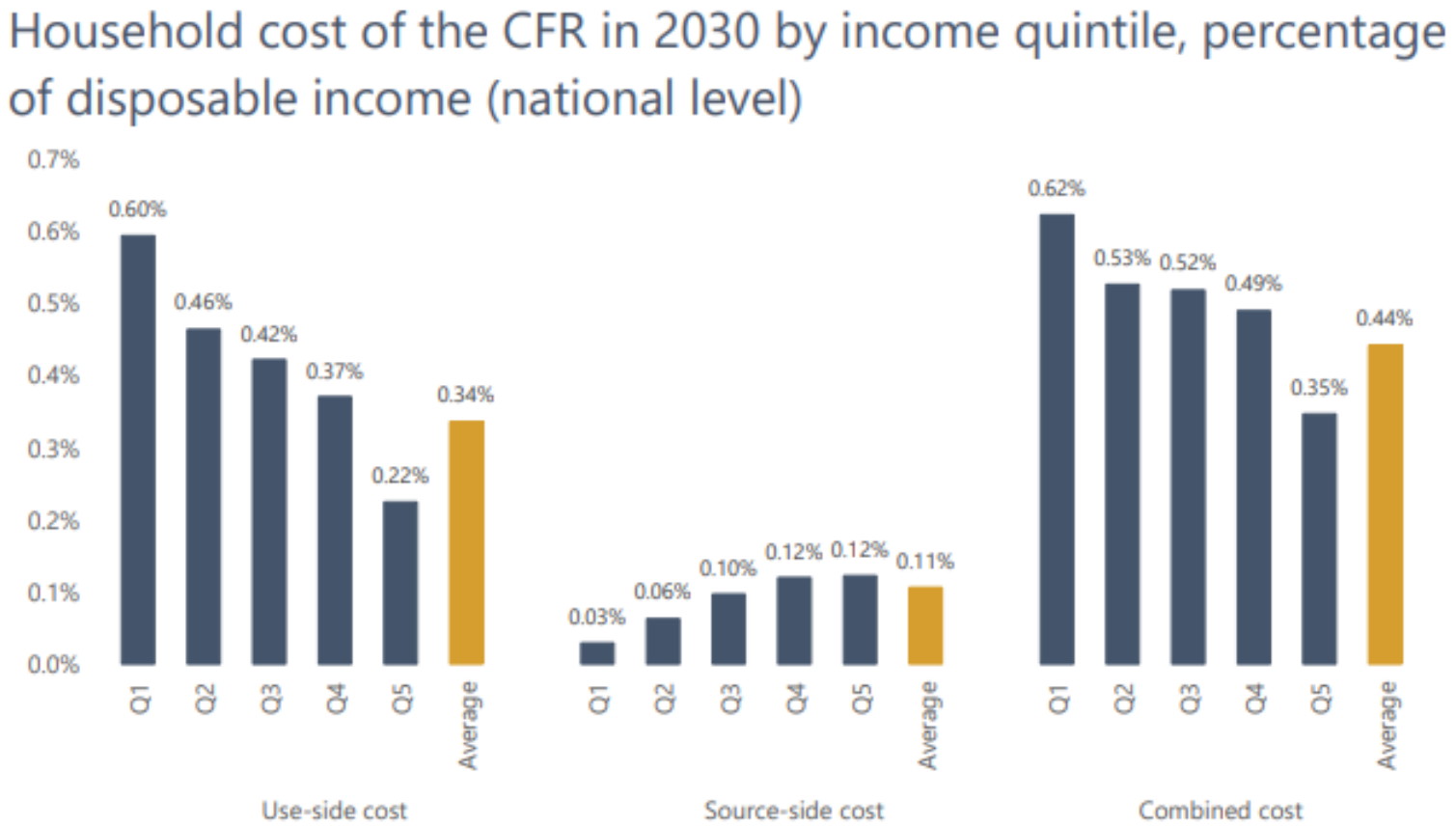
- Approximately 10-12 percent of Canadians do not file a tax return and receive benefits.
- Figure assumes maximum benefits where income-tested.

Electricity Expenditure as a Share of 2021 Income

- Analysing how net zero electricity investment affects electricity bills
  - Electricity rates and use change
- Presents mean change in electricity expenditure as a proportion of income
- Holding income constant exaggerates the affordability effects
- As rates and electricity use change, electricity expenditure becomes a larger share of **current** incomes

Source: Dolter, B. & J. Winter. 2022. “Electricity Affordability and Equity in Canada's Energy Transition: Options for Rate Design and Electricity System Funding.” Scoping paper, Canadian Climate Institute. https://climateinstitute.ca/wp-content/uploads/2022/09/Electricity-and-equity-canadas-energy-transition.pdf.

Clean Fuel Regulations are Regressive (?)



Cost burden without behavioural change is regressive

Use side: changes in product prices

Source side: changes in factor prices

Source: Ammar, N., M. Laurin, P. Bagnoli, T. Scholz & D. Sourang. 2023. *A Distributional Analysis of the Clean Fuel Regulations*. Office of the Parliamentary Budget Officer. May 18. https://www.pbo-dpb.ca/en/publications/RP-2324-004-S--distributional-analysis-clean-fuel-regulations--analyse-distributive-reglement-combustibles-propres.

CBC

Gasoline has never been more expensive — and high prices are likely to stick around for a while

Calgary

Calgarians experience 'sticker shock' at increasing energy bills

New Brunswick · Analysis

Gas price spikes create carbon-tax turmoil for politicians

British Columbia

B.C. government announces gas relief rebate of $110 for ICBC customers

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Alberta

Energy affordability programs

Current and upcoming ways we're helping to save you money.

Fuel tax relief

Alberta drivers will automatically save 13 cents per litre when filling up at the pump from April 1 until at least June 30.

Electricity rebates

1 million+ homes, farms and businesses will receive $150 rebates over 3 months to cover the high costs this winter. Details to come.

Natural gas rebates

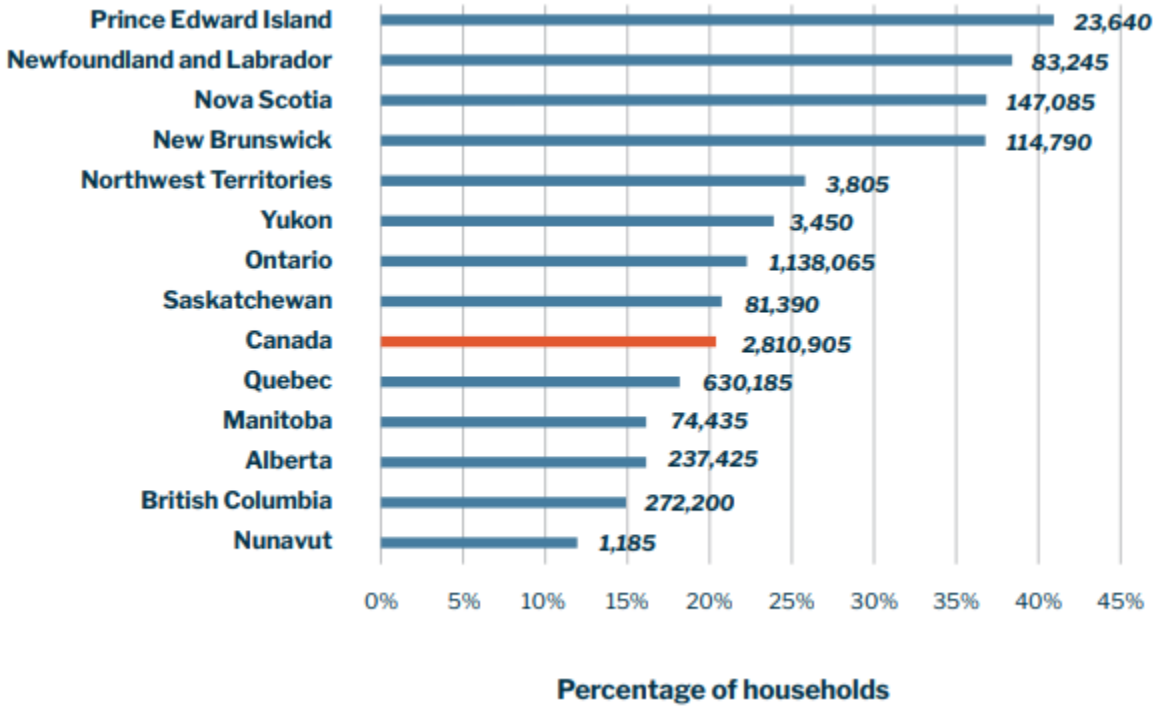
Rebates coming to address high winter heating costs from October 2022 to March 2023. More information will be announced soon.

Energy Poverty (?)

NRCan/CER:10% threshold of energy-expenditure-to-income ratio

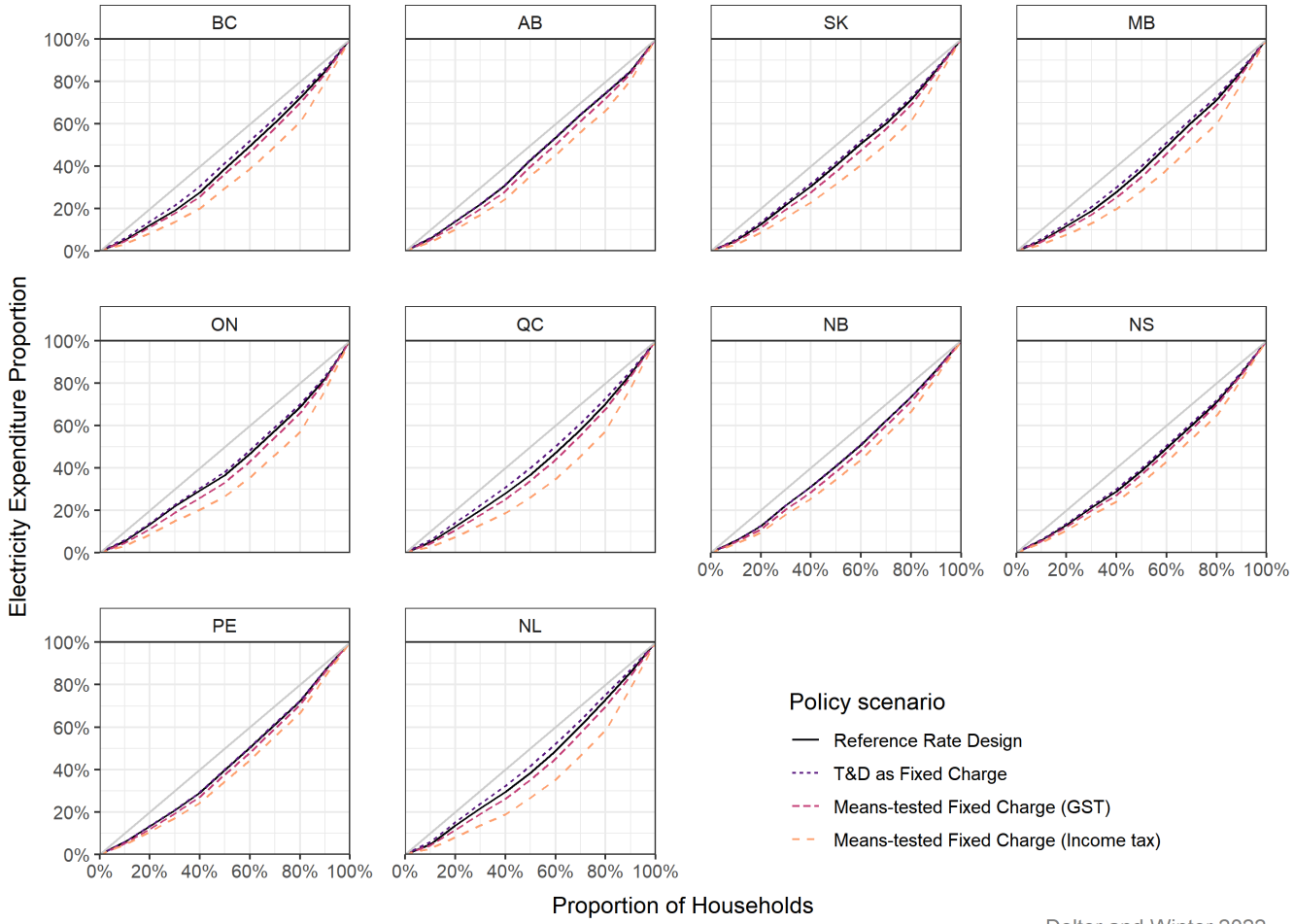
Energy poverty rates, by income quintile and geography						
	Q1 (Lowest)	Q2	Q3	Q4	Q5 (Highest)	Average
Canada	21%	6%	2%	0%	0%	6%
Atlantic Provinces	49%	19%	4%	0%	0%	15%
Que.	17%	4%	1%	0%	0%	4%
Ont.	20%	5%	0%	0%	0%	5%
Man.	21%	7%	1%	0%	0%	6%
Sask.	34%	8%	2%	0%	0%	9%
Alta.	23%	3%	1%	0%	0%	5%
B.C.	25%	4%	1%	0%	0%	6%

CUSP: 6% threshold of energy-expenditure-to-after-tax-income ratio



Source: Natural Resources Canada. 2022. *Energy Fact Book 2022-2023*. Government of Canada. https://natural-resources.canada.ca/sites/nrcan/files/energy/energy_fact/2022-2023/PDF/Energy-factbook-2022-2023_EN.pdf. CUSP. 2019. *Energy Poverty in Canada: a CUSP Backgrounder.* https://energypoverty.ca/backgrounder.pdf.

Lorenz Curve (Electric Gini)



Dolter and Winter 2022
Expenditure data from SPSDM v.29.0
Modelling data provided by CCI

Plots proportion of expenditure by household (y-axis) against cumulative share of households arranged from lowest to highest incomes (x-axis).

Source: Dolter, B. & J. Winter. 2022. “Electricity Affordability and Equity in Canada's Energy Transition: Options for Rate Design and Electricity System Funding.” Scoping paper, Canadian Climate Institute. https://climateinstitute.ca/wp-content/uploads/2022/09/Electricity-and-equity-canadas-energy-transition.pdf.

Equity

- Equity and affordability issues in climate policy is an area of key concern, but not well-understood (yet)

- (Some) key questions
  - What are the general equilibrium effects of carbon pricing on households, and how does that change the distributional effects?
  - What are the distributional effects of other key emissions-mitigation policies like the *Clean Fuel Regulations* or the (expected) *Clean Electricity Regulations*?
  - What is the burden of emissions-reduction policies on vulnerable populations (e.g., non-tax-filers)?
  - What are the distributional consequences of targeted energy-shifting or energy efficiency subsidy programs?
  - Are current government energy affordability programs effective or meeting their stated goals? What are the distributional consequences?
  - Can we better assess energy affordability and equity issues with techniques rooted in the economics of inequality?

Three Avenues for Future Research

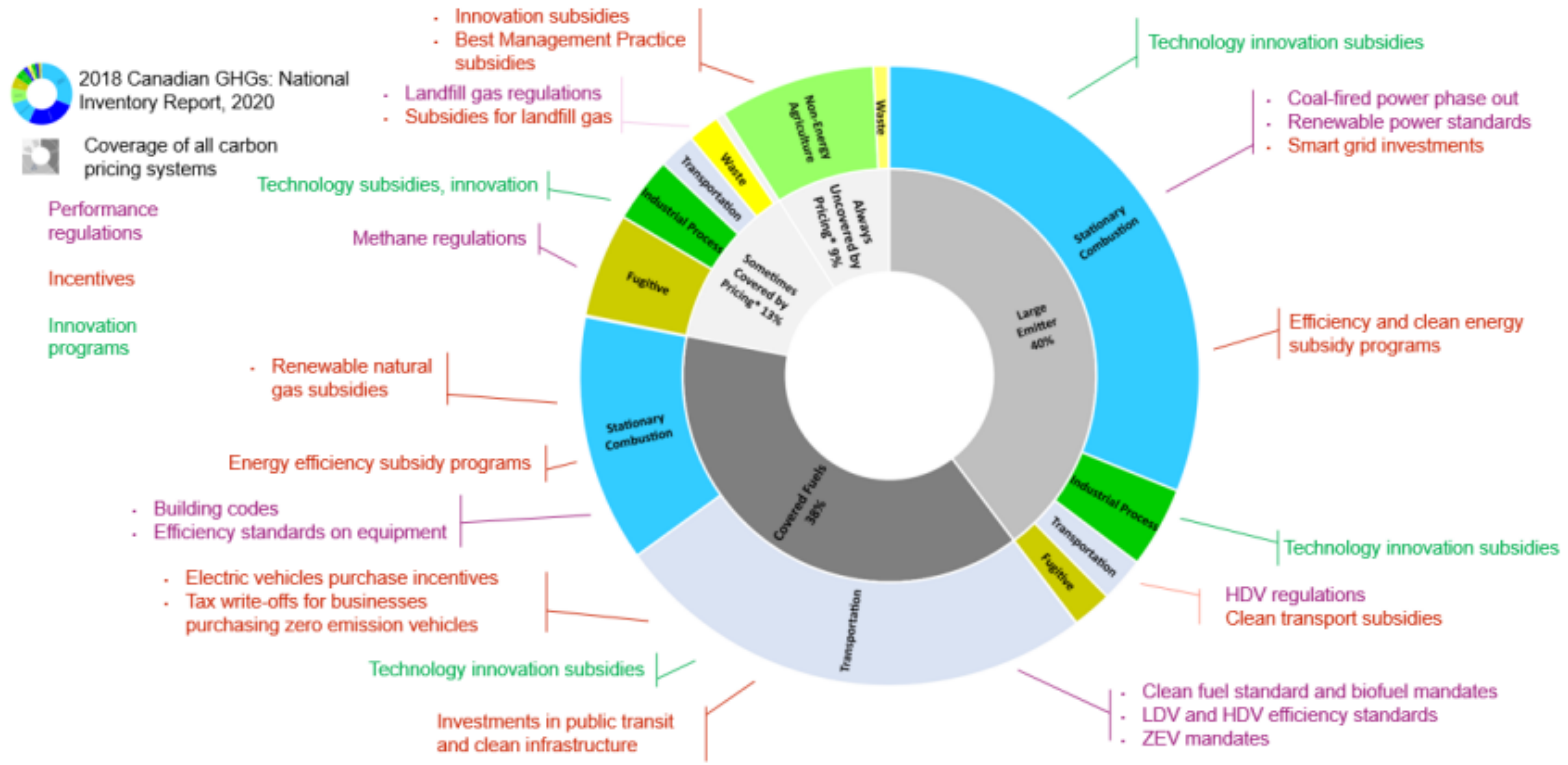
Effectiveness and cost-effectiveness of policy interventions

Equity

Understanding policy interactions

Very Complex Policy Environment

Figure 1: Canada's Climate Carbon Policy Architecture
Performance regulations, carbon pricing, incentives, and innovation programs targeting different emission sources.



Source: Sawyer, D., S. Stiebert, R. Gignac, A. Campney, & D. Beugin. 2021. *2020 Expert Assessment of Carbon Pricing Systems*. Canadian Climate Institute [Canadian Institute for Climate Choices]. https://publications.gc.ca/collections/collection_2021/eccc/En4-434-2021-eng.pdf.

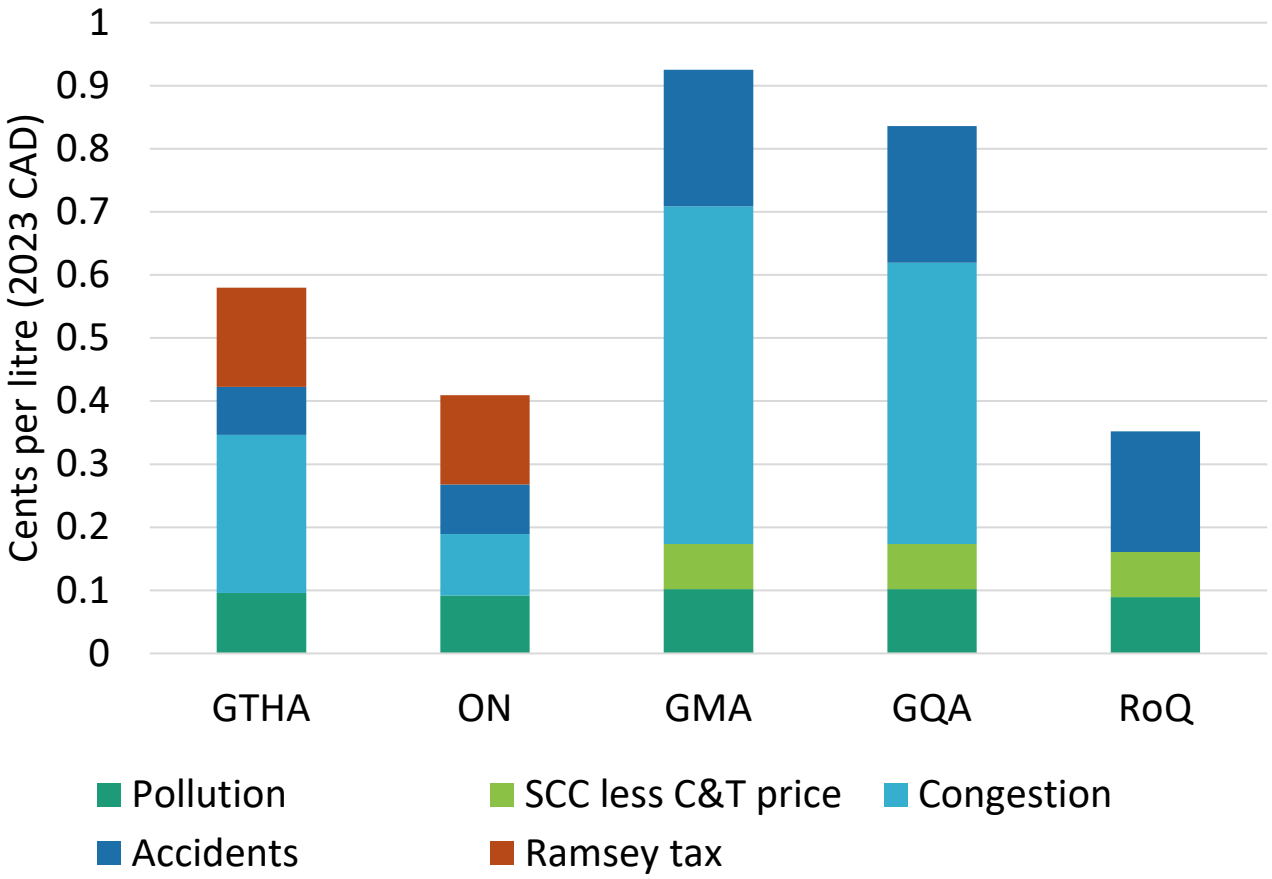
Policy Interactions Have Vast Scope

Legend		
Score	**Type of Interaction**	**Definition**
2	Reinforcing	Enhances the effect of existing policy
1	Consistent	Adds additional impact without negating existing policy
0	Redundant	No additional impact expected
-1	Constraining	Mitigates impact of existing policy
-2	Counteracting	Counteracts achievement of existing policy
?	Unknown	Further analysis required to determine interaction effect
NA	No interaction	No direct interaction effect expected (regulates different sector/emissions source/pathway)

Jurisdiction	Sector	Policy	Type	Canada: Clean Fuel Standard*	Canada: CO2 Standards for Aviation	Canada: EE Reqs for Domestic Marine Vessels	Canada: EE Reqs for Marine Vessels	Canada: Renewable Fuels Regulations	Canada: Heavy Duty Vehicle GHG Regulations	Canada: Light-Duty Vehicle GHG Regulations	BC: BC Carbon Tax	BC: Renewable and Low Carbon Fuel Reqs	BC: Fund ZEV Charging Infrastructure	BC: Tailpipe Emissions Standards	BC: Zero Emissions Vehicle Mandate
Canada	Transport (6)	Clean Fuel Standard*	Perf. Std.		?	?	NA	-1	1	1	1	0	?	1	?
		CO2 Standards for Aviation	Regulatory	?		NA	NA	NA	NA	NA	1	NA	NA	NA	NA
		EE Reqs for Domestic Marine Vessels	Regulatory	?	NA		NA	1	NA	NA	1	NA	NA	NA	NA
		EE Reqs for Marine Vessels	Regulatory	NA	NA	NA		NA	NA	NA	1	NA	NA	NA	NA
		Renewable Fuels Regulations	Regulatory	0	NA	1	NA		1	1	1	0	1	1	?
		Heavy Duty Vehicle GHG Regulations	Perf. Std.	1	NA	NA	NA	1		NA	1	1	1	?	1
		Light-Duty Vehicle GHG Regulations	Perf. Std.	1	NA	NA	NA	1	NA		1	1	1	?	1
BC	Multi	BC Carbon Tax	Carbon Price	1	1	1	1	1	1	1		1	1	1	1
	Transport (4)	Renewable and Low Carbon Fuel Reqs	Perf. Std.	-1	NA	NA	NA	-1	1	1	1		1	1	?
		Supporting ZEV Charging Infrastructure	Regulatory	1	NA	NA	NA	NA	NA	1	1	?		1	1
		Tailpipe Emissions Standards	Perf. Std.	1	NA	NA	NA	1	0	0	1	1	?		?
		Zero Emissions Vehicle Mandate	Perf. Std.	?	NA	NA	NA	NA	-2	-2	1	1	1	?	

Source: Scott, W., E. Rhodes & C. Hoicka. 2023. "Multi-level climate governance: examining impacts and interactions between national and sub-national emissions mitigation policy mixes in Canada," *Climate Policy,* https://doi.org/10.1080/14693062.2023.2185586.

Optimal Gasoline Taxes



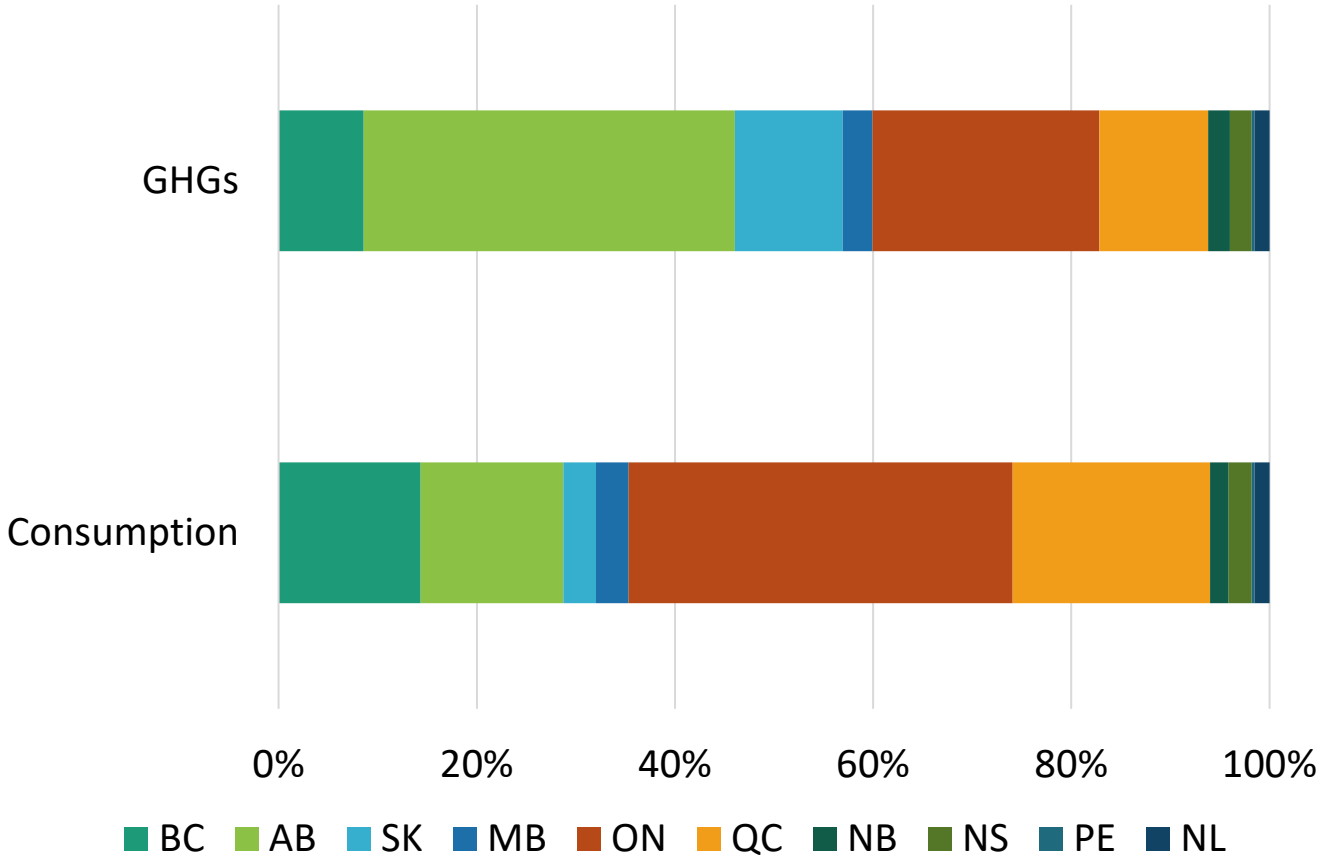
- What are optimal taxes with broad-based carbon pricing?
- Does an OBPS or free permit allocations effect optimal taxes?

Wood: converted from 2006 CAD

Dorval & Barla: converted from 2013 CAD

Source: Wood, J. 2015. "Is It Time to Raise the Gas Tax? Optimal Gasoline Taxes for Ontario and Toronto," *Canadian Public Policy* 41(3): 179-190. https://doi.org/10.3138/cpp.2015-011. Dorval, J. & P. Barla. 2017. "Does Quebec Have the Right Gasoline Tax? An Empirical Investigation." *Canadian Public Policy* 43(4): 350-362. https://doi.org/10.3138/cpp.2016-065. Bank of Canada. "Inflation Calculator." https://www.bankofcanada.ca/rates/related/inflation-calculator/.

Equalization and Carbon Pricing (2016/17)

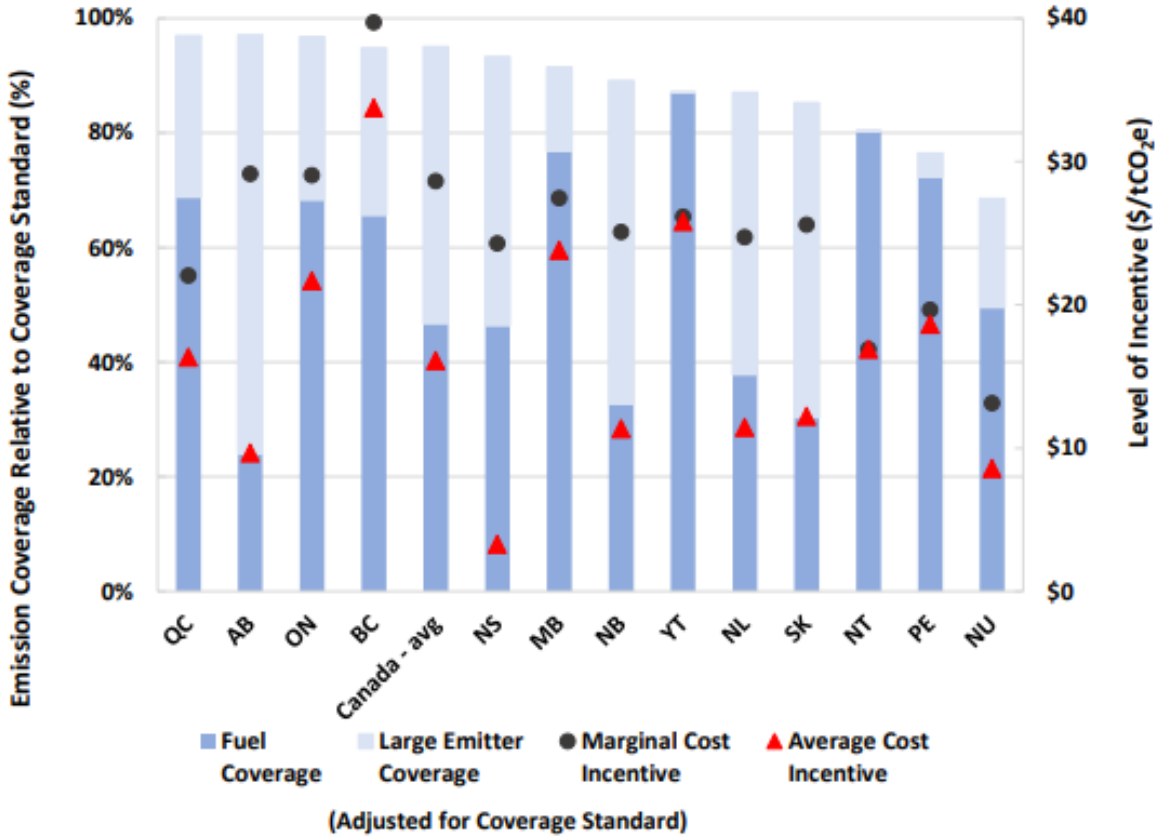


- Emissions as a tax base is very different from consumption.
- Carbon taxes are treated like any other consumption tax in equalization.

Source: Snoddon, T. & T. Tombe. 2019. "Analysis of Carbon Tax Treatment in Canada's Equalization Program," *Canadian Public Policy* 45(3): 377-392. https://doi.org/10.3138/cpp.2019-036.

Gains from Harmonization?

Figure 22: Price Incentives Adjusted for the Coverage Standard
Covered fuels and large emitter programs.

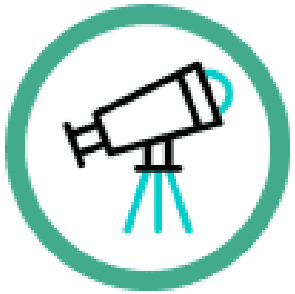


System design, covered emissions, and pricing stringency differs significantly across provinces.

Coverage standard: emissions that could be priced.

Source: Sawyer, D., S. Stiebert, R. Gignac, A. Campney, & D. Beugin. 2021. *2020 Expert Assessment of Carbon Pricing Systems*. Canadian Climate Institute [Canadian Institute for Climate Choices]. https://publications.gc.ca/collections/collection_2021/eccc/En4-434-2021-eng.pdf.

A Tool for Identifying Potential Interactions



POLICY TRACKER

To track progress on policy implementation, we've compiled a database of emissions reduction policies currently implemented, developing, and announced in Canada at the federal, provincial, and territorial levels.

Access at https://440megatonnes.ca/policy-tracker/

Source: Canadian Climate Institute. 2023. "Policy Tracker." https://440megatonnes.ca/policy-tracker/.

Policy Interactions

- We know far too little about how different policies interact, and whether they compliment or counteract each other

- (Some) key questions
  - How do specific policies interact, and what are the consequences for GDP, emissions, productivity and welfare?
  - What are optimal taxes with broad-based carbon pricing?
  - Does an OBPS or free permit allocations effect optimal taxes?
  - What are the consequences of emissions pricing as a (growing) tax base?
  - What are the gains from harmonizing pricing policies, and specifically large-emitter systems?

Final Thoughts

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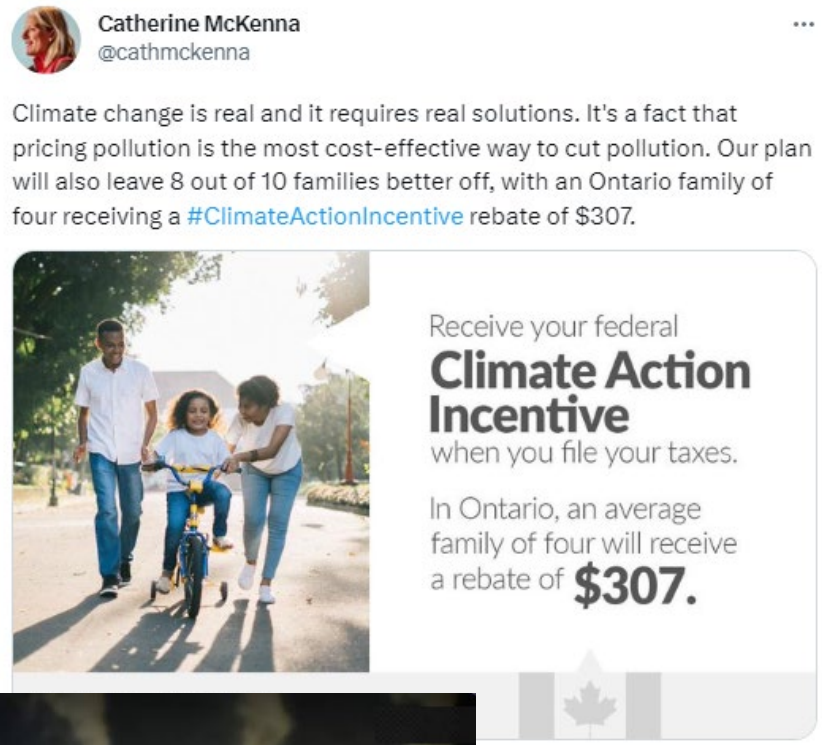
CBC NEWS

Politics

Canada's budget watchdog troubled by spin around latest report on carbon pricing



Conclusions

- Canadian climate policy is in constant flux, and ***very politicized***
- Differences in policy create natural experiments
- The effects of different policy interventions are under-studied and poorly understood

- Scope for both ex ante and ex post work to understand:
  - Effectiveness and cost effectiveness of policy interventions
  - Equity implications of climate policy and the role of complementary interventions
  - How different policy levers interact — are they complementary or counteractive?

Thank You!

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