คณะเศรษฐศาสตร์
FACULTY OF ECONOMICS
Chulalongkorn University

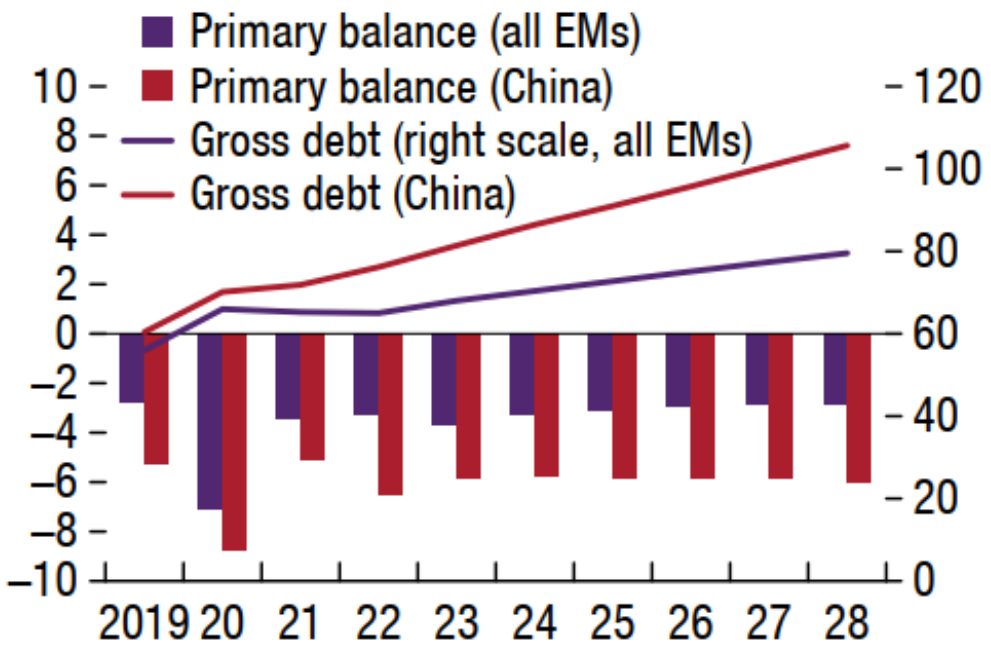
How Carbon Tax Communication Shapes Fuel Use: Experimental Evidence from Thailand

เอกสารประกอบ

Athiphat Muthitacharoen
Kanittha Tambunlertchai
Nuttirudee Chareonruk
Thanee Chaiwat
Chanalak Chaisrilak

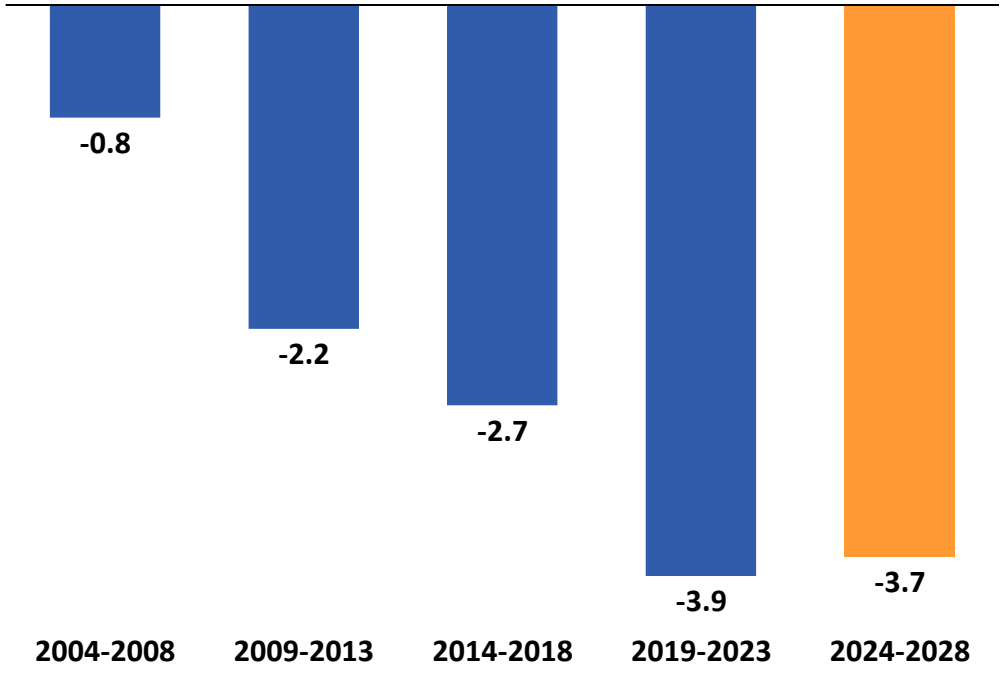
ประเทศกำลังพัฒนาส่วนใหญ่กำลังเผชิญการเพิ่มขึ้นของภาระการคลัง

ดุลการคลังเบื้องต้นและหนี้สาธารณะของ Emerging markets, 2019–28 (% of GDP)



ที่มา: IMF

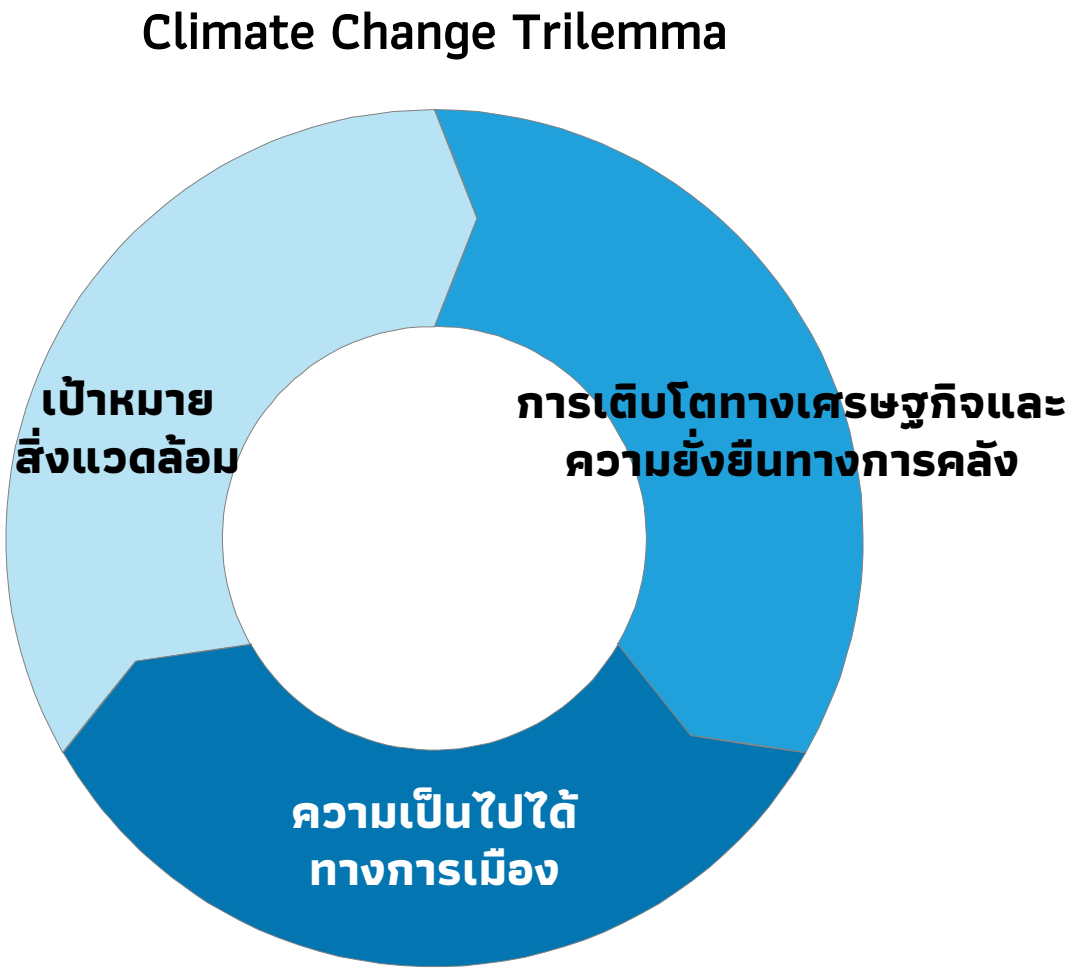
ดุลการคลังในอดีตและอนาคตของไทย (% of GDP)



หมายเหตุ: ดุลการคลังรวมถึงดุลงบประมาณและดุลนอกงบประมาณ และไม่รวมการกู้ยืมฉุกเฉินภายใต้กฎหมายพิเศษ

ที่มา: การวิเคราะห์ของผู้เขียนจากข้อมูลของ สำนักงานเศรษฐกิจการคลัง

ข้อจำกัดทางการคลังนี้ส่งผลโดยตรงต่อ ความสามารถของรัฐในการรับมือ Climate change



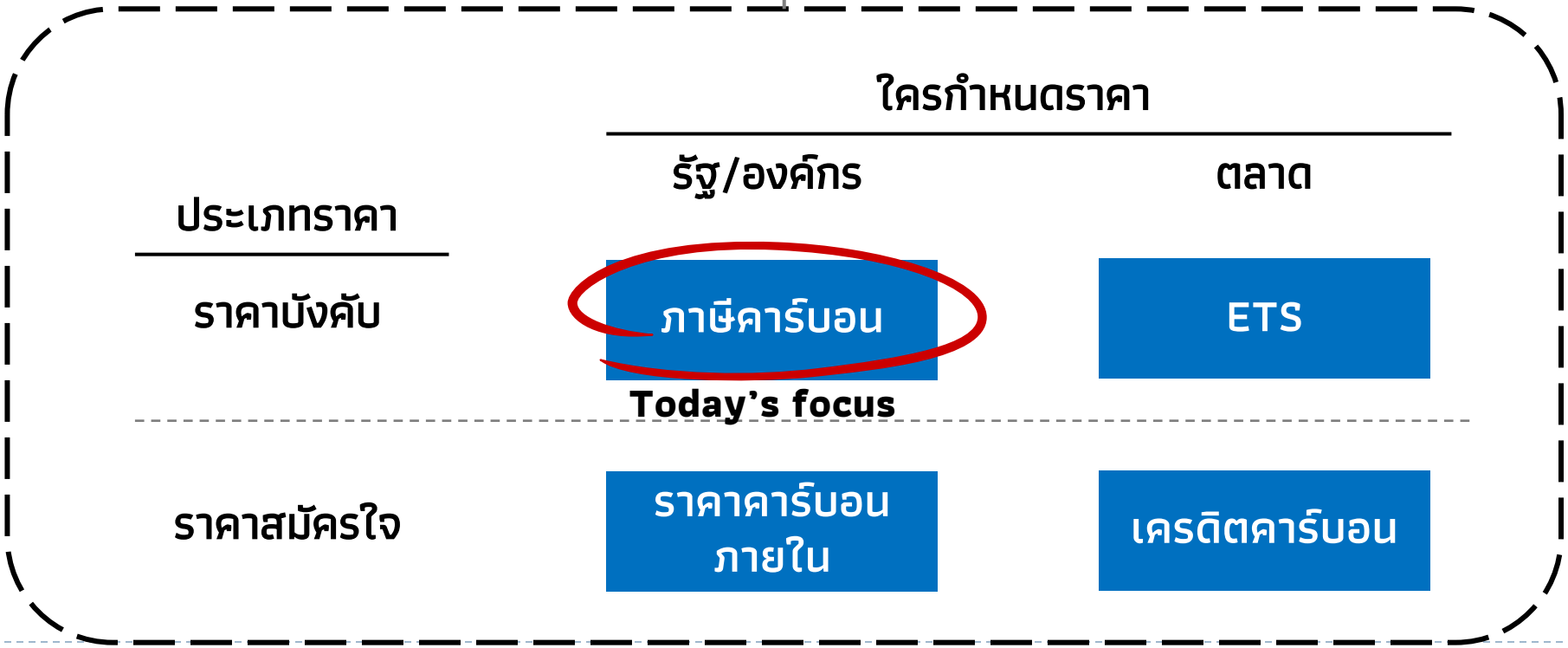
รัฐจะส่งเสริมการลดการปล่อยคาร์บอนได้อย่างไร

แนวนโยบายส่งเสริมการลด CO2 emission

1 มาตรการด้านการใช้จ่าย

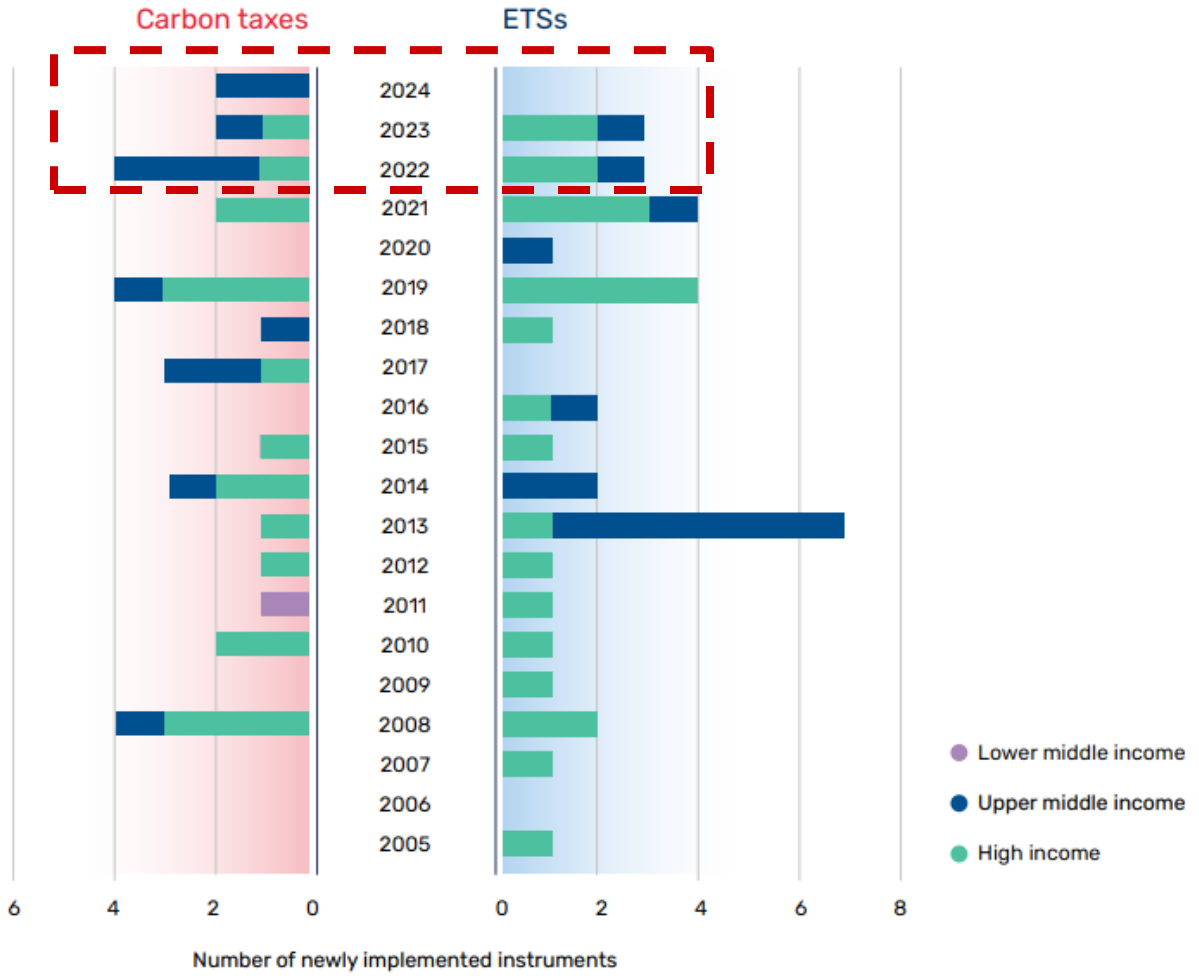
2 การกำหนดราคาคาร์บอน

3 การกำหนดเกณฑ์ต่างๆ



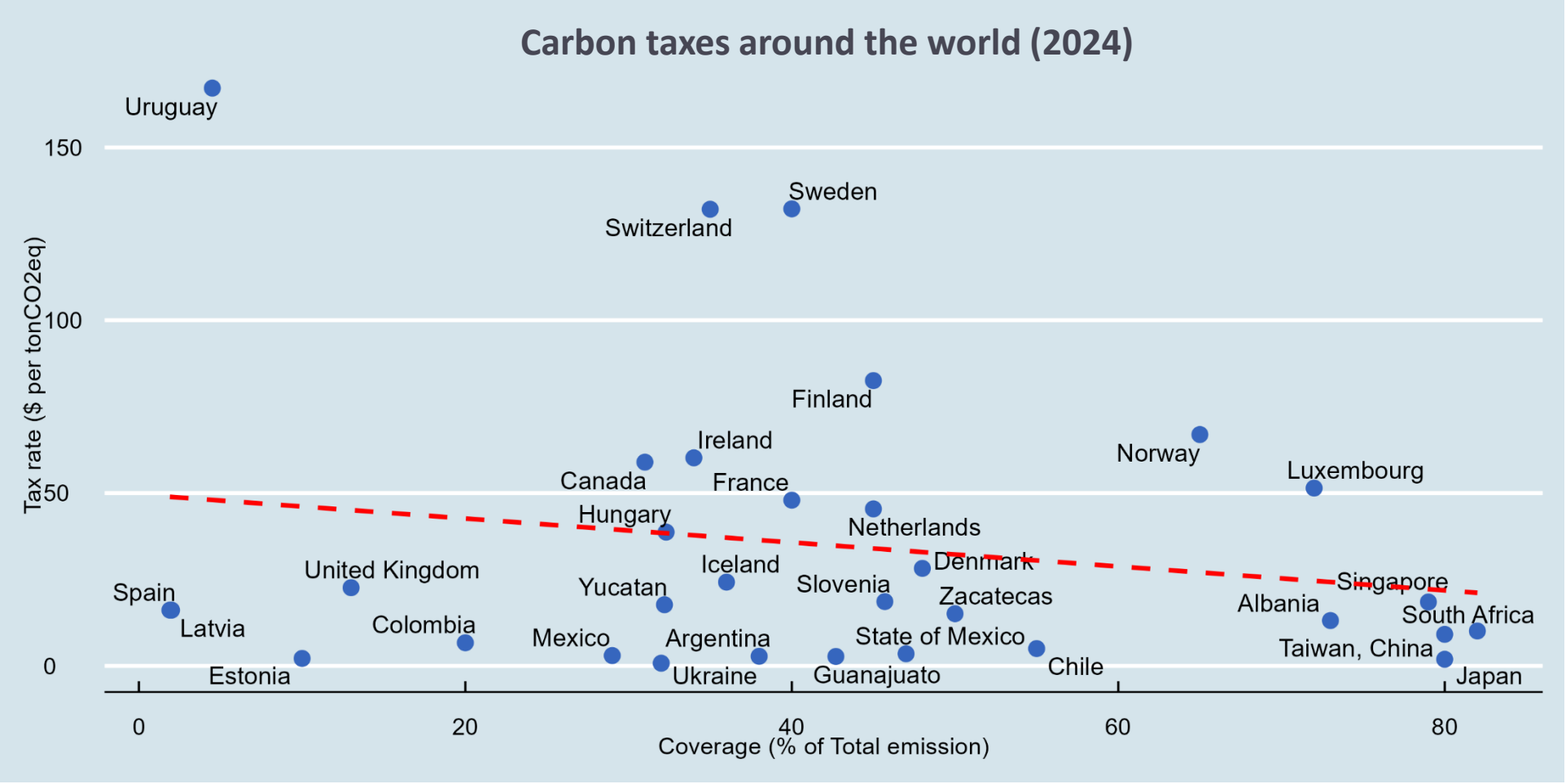
แนวโน้มการใช้ภาษีคาร์บอนในกลุ่มประเทศรายได้ปานกลางเพิ่มขึ้นอย่างมีนัยสำคัญในช่วง 3 ปีที่ผ่านมา

Take up of carbon tax and ETS by countries' income group over time (2005-2024)



ที่มา: IMF

อัตราและขอบเขตของภาษีคาร์บอน แตกต่างกันอย่างมากระหว่างประเทศ



Note. Data is as of April 1, 2024. Average price is used if a scheme has more than one carbon price.

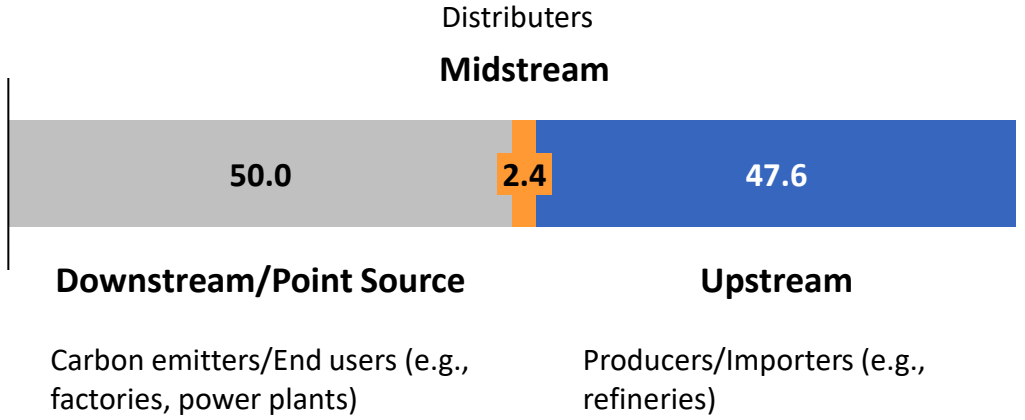
Source: Author's analysis based on data from World Bank (2024)

Carbon Taxes Are Widespread—But Are They Noticed?

- **Carbon taxes** are among the most cost-effective tools to reduce emission.
- Many countries impose tax **upstream**, embedding it in energy prices (e.g., through excise structure).
- As a result, **consumers often do not notice the tax**—limiting its ability to influence behavior.
- A key challenge is **tax salience**: how clearly individuals **perceive** and **understand** the taxes they face (Chetty et al., 2009).

Where Are Carbon Taxes Applied?

% of Carbon Taxes by Point of Regulation (2025)



Note: The calculation includes all carbon taxes currently implemented as of April 2025.
Source: World Bank

Some governments attempt to make the carbon tax more visible

Ontario: Carbon tax signage at pump

Vancouver: Itemized breakdown of taxes

Key Policy Questions:

- Does making the carbon tax more salient change consumer behavior?
- Does the degree of salience—how intuitive or easy to understand the tax is—make a difference?

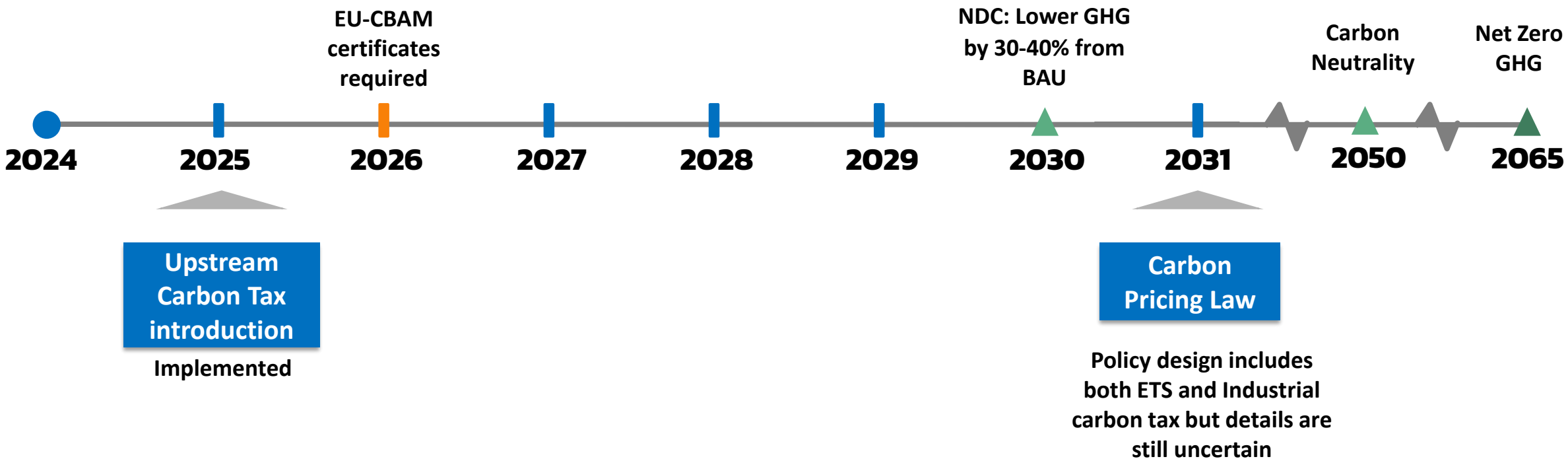
Thailand offers a rare policy setting:

- Carbon tax disclosed without increasing fuel prices
- Enables clean test of salience independent from price effects

Source: 1) https://www.cbc.ca/news/canada/toronto/carbon-tax-stickers-law-ontario-1.5265380
2) https://grist.org/climate-energy/heres-why-b-c-s-carbon-tax-is-super-popular-and-effective/

Policy Context: Thailand's Key Climate Commitments

Thailand's key climate change goals and policy timeline



How Thailand's Carbon Pricing is integrated into Excise Structure

Examples of How Carbon Pricing is Integrated into Excise Structure

Fuel Type	Pre-Policy Change	Post-Policy Change		
	Excise Tax (Baht/Litre)	Carbon Tax (Baht/Litre)	Excise Tax (Baht/Litre)	Total Tax (Baht/Litre)
Benzine	7.5	0.45	7.05	7.5
Gasohol 95 (E10)	6.75	0.40	6.35	6.75
Gasohol E20	6.00	0.36	5.64	6.00

1 **Carbon tax is based on emission factor and carbon price (THB 200/tonCO_2eq)**

2 **Excise tax is reduced to keep total tax unchanged**

This Study..

Research Questions	Research Design	Key findings
How do different levels of carbon tax salience influence fuel consumption?	▪ Randomized survey experiment on representative sample of Thai personal drivers ▪ Tax salience: General vs. Simplified formats of carbon tax information ▪ Message framing: Carbon emission vs. Climate harms	1 Simplified carbon tax information significantly reduces fuel use 2 Framing the tax in terms of climate consequences is more effective than carbon-emission framing 3 Effects are concentrated among less environmentally-engaged individuals

Research Design: Randomized Survey Experiment

1. **Representative panel of personal car drivers in Thailand, with a focus on fuel type**

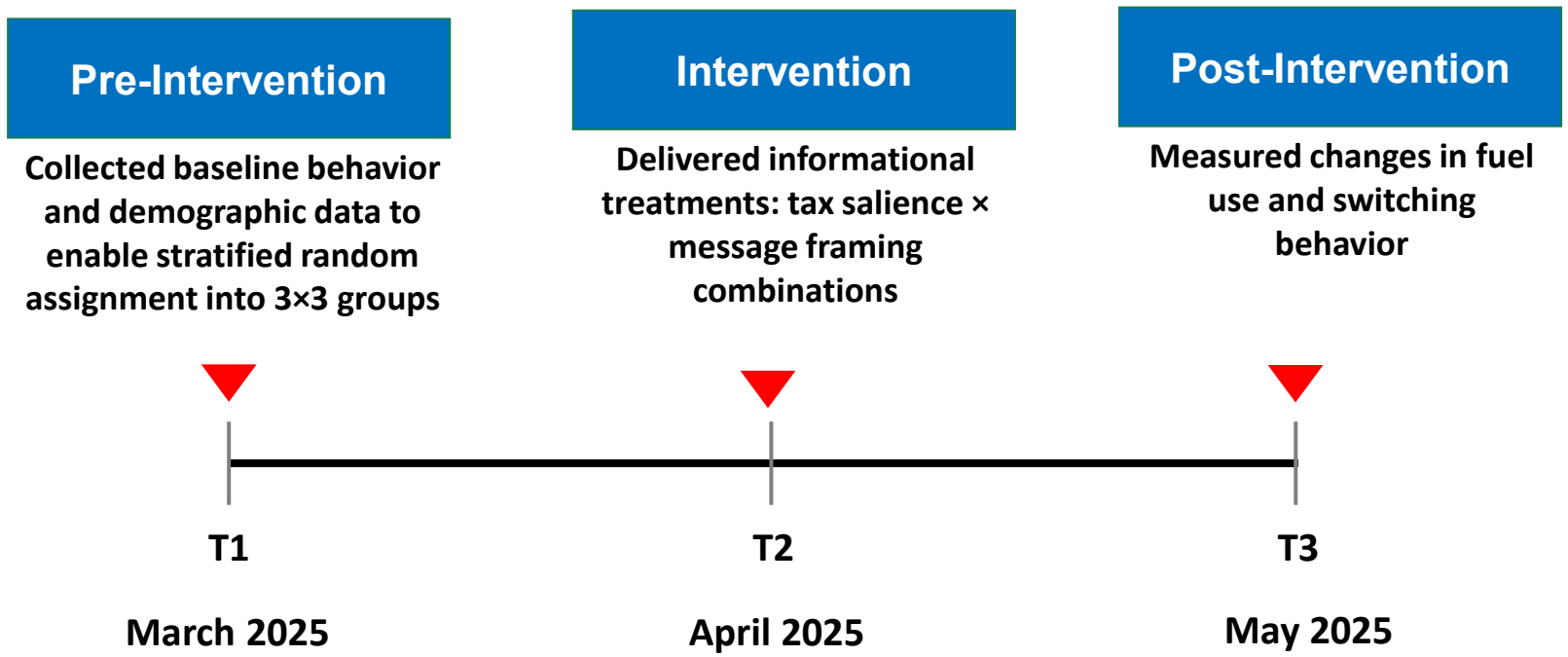
2. **3x3 Intervention**

Representative Panel of Thai personal car drivers

- **Target population:** Personal car drivers in Thailand
- **Sample size**: 1,800 respondents
- **Panel design:** Surveyed across three rounds — *before*, *during*, and *after* the intervention
- **Sampling approach:** Quota-based sampling to mirror Thailand's driver demographics (age, gender, income)
- **Geographic coverage:** Diverse representation from all major regions — Central, Eastern, Northern, Northeastern, and Southern Thailand (Bangkok, Chonburi, Chiang Mai, Khon Kaen and Songkhla)
- **Fuel focus:** Restricted to users of **Gasohol 95** (E10: 90% gasoline, 10% ethanol)
  - Over 80% of Thai drivers use this fuel
  - Offers realistic scope for behavioral responses (e.g., fuel switching or reduced usage)

3x3 Intervention Design (1)

- Participants completed three survey rounds
  - Capturing behavior before, during, and after the intervention
- Each respondent received THB 300 (USD 9.2) upon completion



3x3 Intervention Design (2)

Message Framing: Pro-Climate Concern

Tax Salience: Carbon Tax Communication

	No	**Carbon Emission**	**Environmental Impact**
No	Control	Emission framing only	Env. impact framing only
Generalized Info	Generalized info only	Generalized info + Emission framing	Generalized info + Env. impact framing
Simplified Info	Simplified info only	Simplified info + Emission framing	Simplified info + Env. impact framing

Tax Salience: Carbon Tax Communication Treatments

Control

ประเภทของน้ำมัน	ราคา (บาทต่อลิตร)
แก๊สโซฮอล์ 95	36.05
E20	33.94

Generalized Carbon Tax Info

ประเภทของน้ำมัน	ราคา (บาทต่อลิตร)	ราคาคาร์บอน (บาทต่อลิตร)	รวม (บาทต่อลิตร)
แก๊สโซฮอล์ 95	35.65	0.40	36.05
E20	33.58	0.36	33.94

Simplified Carbon Tax Info

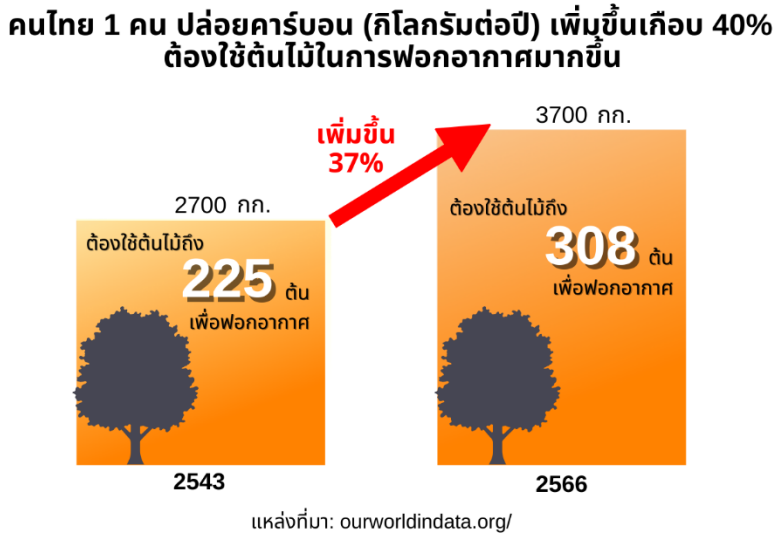
ประเภทของรถยนต์	จำนวนลิตรเฉลี่ยต่อถัง	ภาษีคาร์บอนเมื่อเติมเต็มถัง (บาท)	
		แก๊สโซฮอล์ 95	E20
รถเก๋งขนาดเล็ก	45	18.13	16.13
รถเก๋งขนาดกลาง	51	20.55	18.28
รถเก๋งขนาดใหญ่	66	26.59	23.65

Note: The carbon tax rates are based on the Excise Department's official announcement (March 2025), which sets the carbon price at THB 200 (USD 6) per ton of CO_2 equivalent. Fuel-specific tax rates are detailed in the official announcement.

Message Framing: Pro-Climate Concern Treatments

Carbon Emission Framing

“เปลี่ยนจาก 95 เป็น E20 ช่วยลดคาร์บอนเท่ากับต้นไม้ใหญ่ 1 ต้น ฟอกอากาศใน 1 ปี”

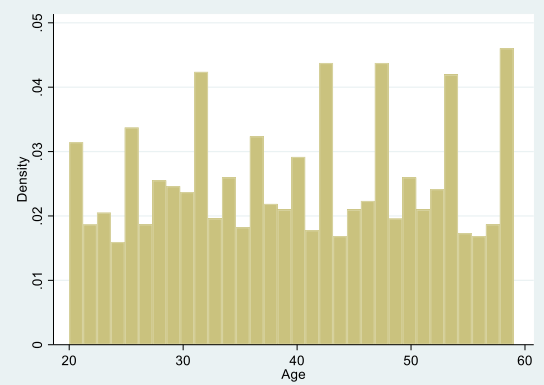


Environmental Impact Framing

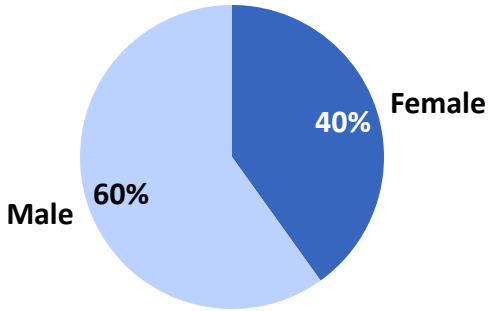
“เปลี่ยนจาก 95 เป็น E20 วันนี้ ช่วยลดความเสี่ยง 4 หายนะโลกร้อน: น้ำท่วม ไฟป่า แห้งแล้ง คลื่นความร้อน”

Who are our respondents? (1)

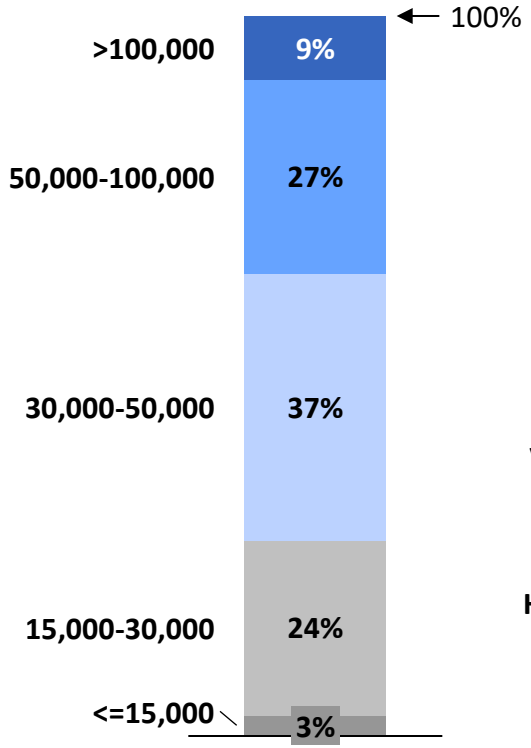
Age



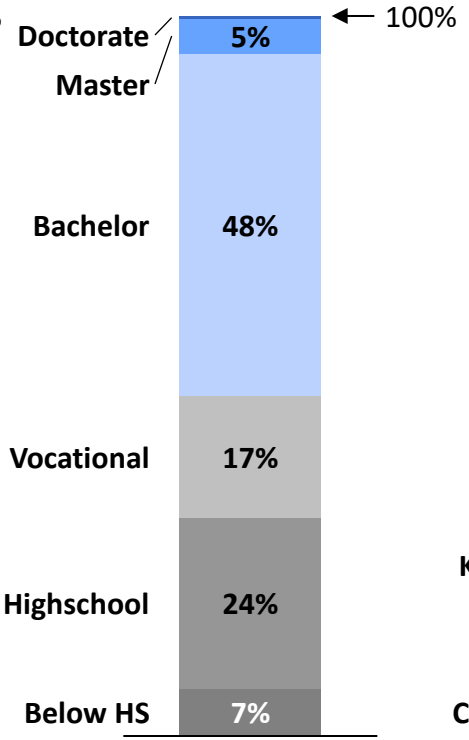
Gender



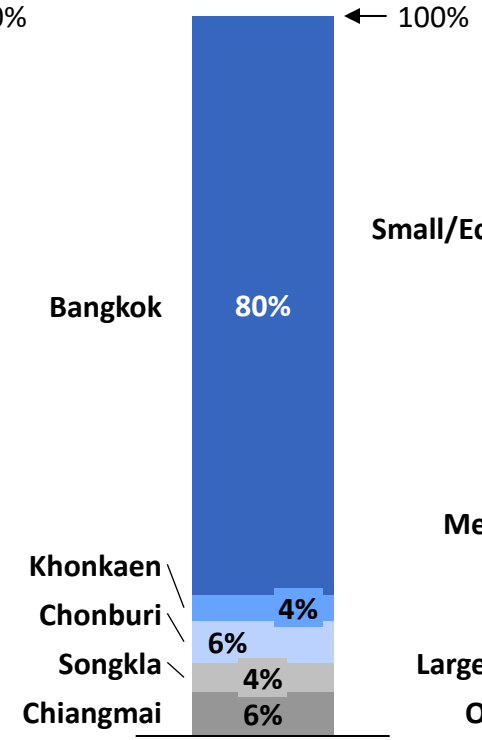
Income (Monthly THB)



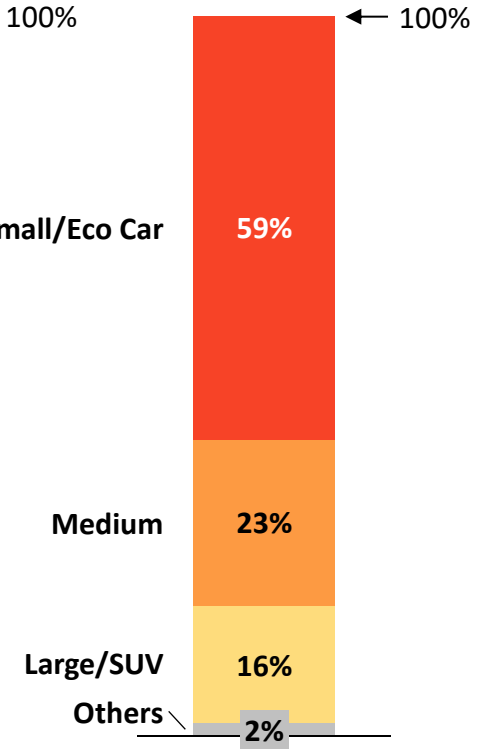
Education



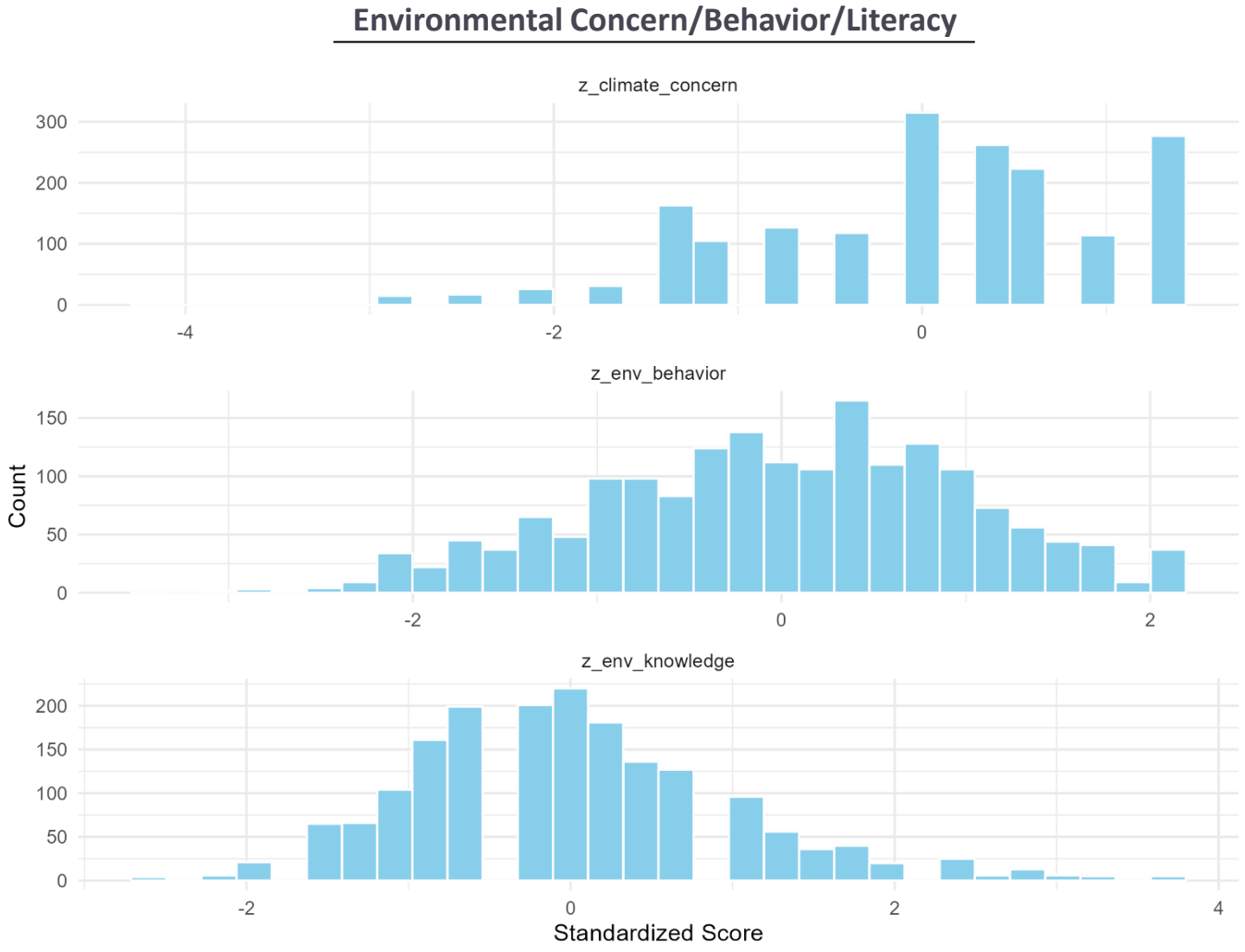
Geography



Car Type



Who are our respondents? (2)

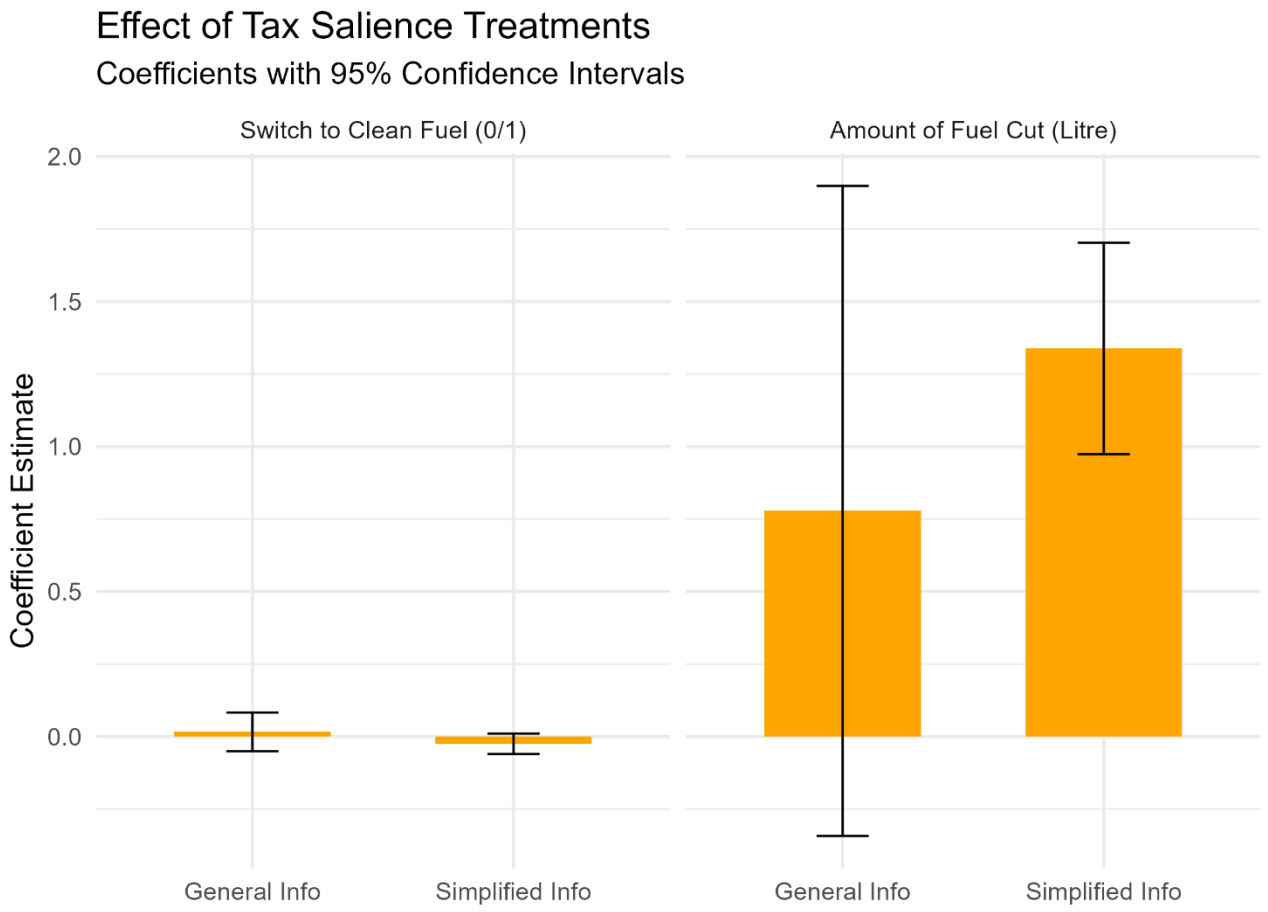


- **Concern:**
  - Based on 4 Likert-scale questions (e.g., seriousness of climate change, personal concern)
  - Most express concern, but the depth of concern varies. Only a minority report actively following climate news or policies. A non-trivial minority show very low concern
- **Behavior:**
  - Combines Daily behaviors (e.g., recycling, using public transit) + Household actions (e.g., switch off appliances)
  - Broad distribution; many show some engagement, fewer practice consistent green behavior
- **Knowledge**:
  - Combines: awareness, meaning, causes, and effects of climate change
  - Distribution is near-normal with a slight right skew; some show high understanding

Summary Statistics of Outcome Variables

Variables	N	Mean	Median	S.D.
Cut Fuel Use (D)	1,800	0.424	0.000	0.494
Amount of Fuel Reduced (Litres)	1,651	3.825	0.000	6.806
Switch to Cleaner Fuel (D)	1,800	0.068	0.000	0.252

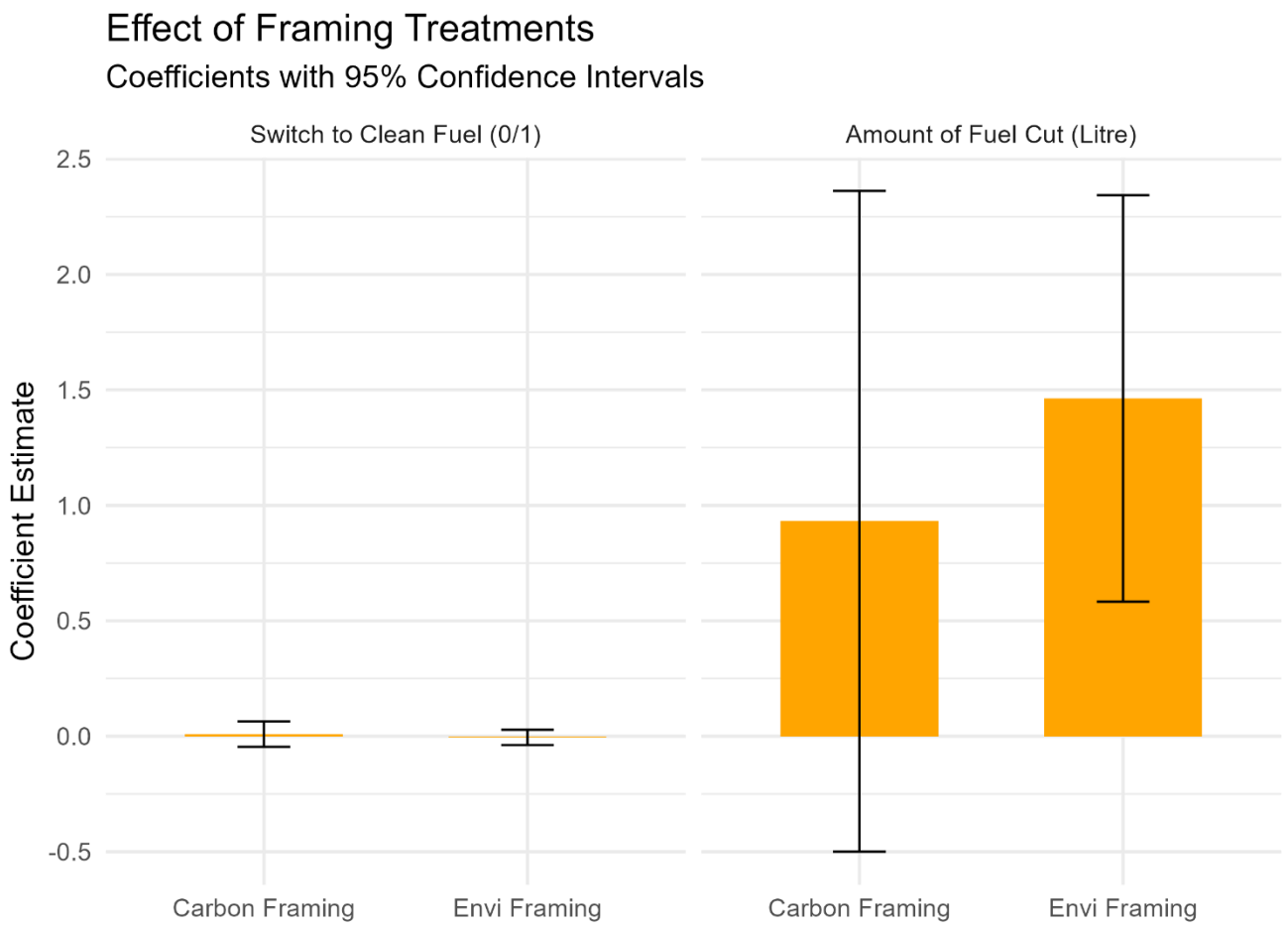
Baseline Effects of Carbon Tax Salience



- **Fuel Switching Decision (Gasohol 95 → E20):**
  - Insignificant impact from either general or simplified carbon tax information
  - Suggests fuel type decisions involve greater inertia and perceived risks (e.g. engine compatibility)
  - Reinforces the limits of nudges for more complex, higher-commitment choices

- **Fuel Cut Decision (Reduce Usage in Liters)**:
  - Simplified info leads to a significant reduction in fuel use (1.3 liters ~ 5% of pre-policy mean)
  - General tax info yields a smaller and statistically insignificant effect
  - Highlights importance of clarity and salience
  - Consistent with behavioral insights that salient tax drives behavior more effectively (Chetty et al., 2009)

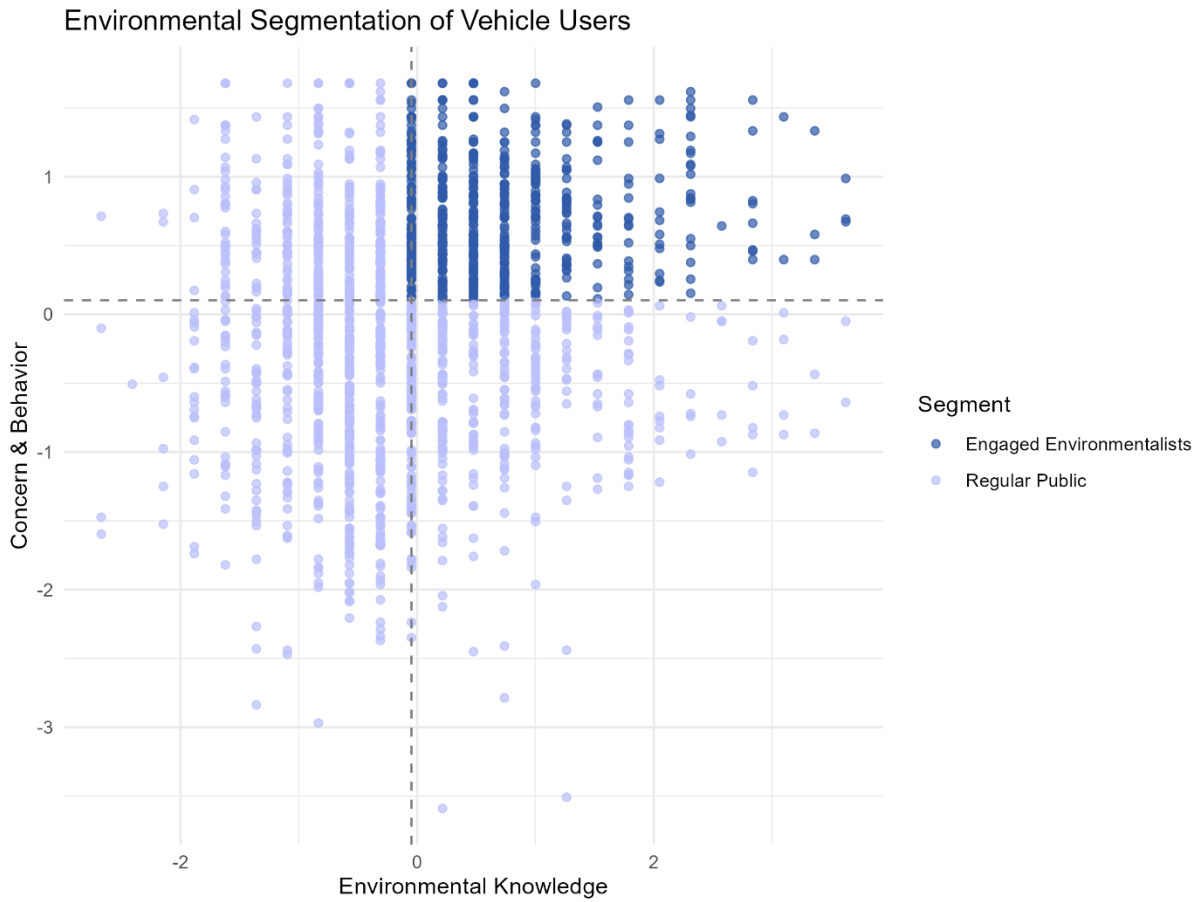
Baseline Effects of Message Framing



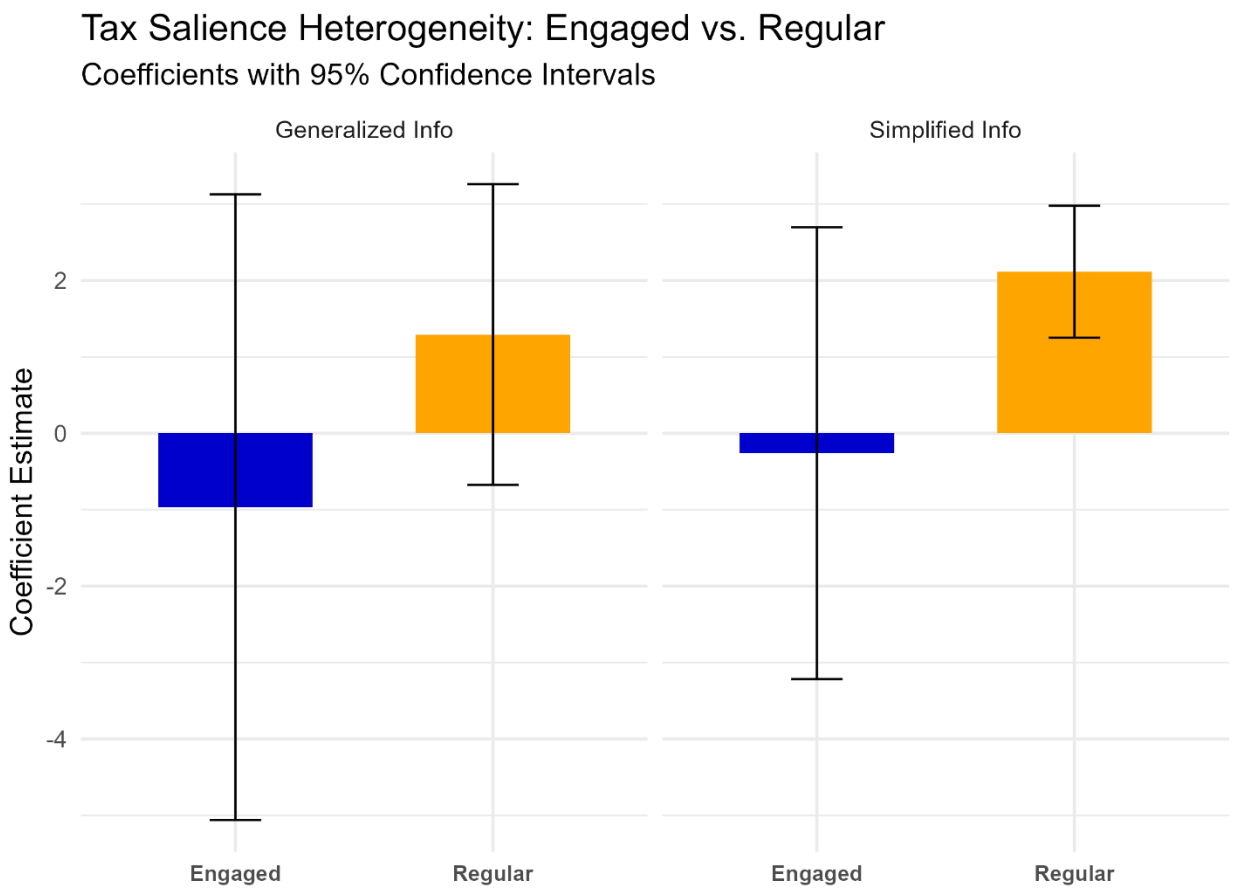
- **Fuel Switching Decision (Gasohol 95 → E20):**
  - No statistically significant impact from either carbon or climate framing
  - Framing messages appear insufficient to alter fuel type choice

- **Fuel Cut Decision (Reduce Usage in Liters)**:
  - Climate Impact Framing (e.g., floods, droughts) significantly reduces fuel use by 1.4 liters (~ 5% of pre-policy mean)
  - Carbon Emission Framing (e.g., tons of CO_2) has no significant effect
  - Highlights the power of emotionally resonant, concrete narratives over abstract carbon metrics in shaping behavior

Heterogeneity: Engaged Environmentalist vs. Regular Public

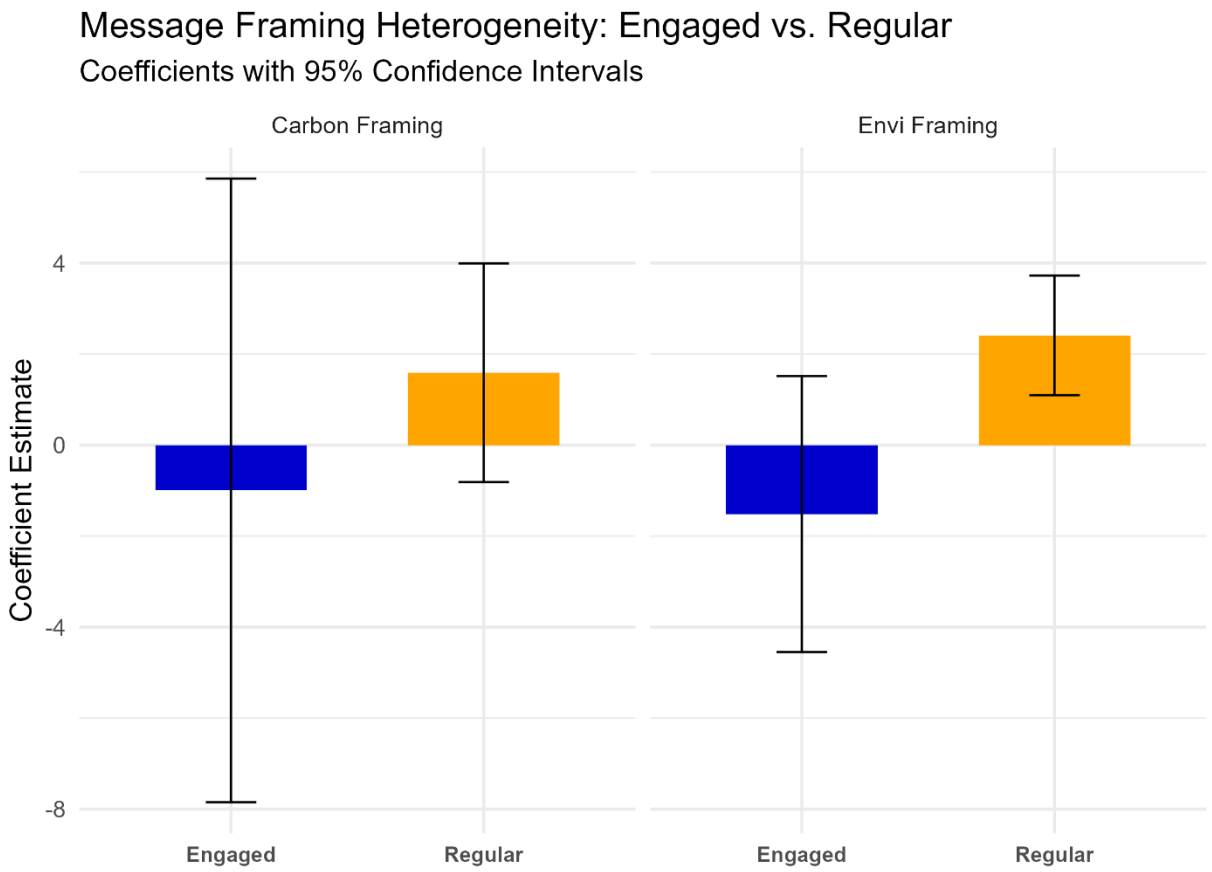


Tax Salience Heterogeneity: Engaged Environmentalist vs. Regular Public



- **Regular Public:**
  - Strong positive response to simplified tax information
  - Reduces fuel use by slightly over 2 liters on average (~ 9% of pre-policy mean)
- **Engaged Environmentalists**:
  - No measurable impact from either salience format
  - Suggests a ceiling effect or possible moral licensing (already doing their part)

Framing Heterogeneity: Engaged Environmentalist vs. Regular Public



- **Regular Public:**
  - Environmental framing leads to large and significant effect (2.5 liters reduction ~ 10% of pre-policy mean)
  - Effect of carbon framing is insignificant
- **Engaged Environmentalists**:
  - Again no measurable impact from either framing
  - Suggests a ceiling effect or possible moral licensing (already doing their part)
- **Tailoring messages by audience type is crucial:**
  - Emotionally resonant messages (climate harms) can motivate behavioral change especially among the less engaged public
  - But expect limited effect on those already climate-conscious.

Extending Collaboration: National-Scale Trial with Fuel Users via Digital Platforms and Gas Stations

Collaboration with the Excise Department, Bangchak Corporation Public Company Limited, and PTT Oil and Retail Business Public Company Limited (PTTOR)

Policy Implications and Key Takeaways

1

Make Carbon Tax Communication Salient and Simple

Present costs in clear, relatable terms to improve behavioral response.

2

Use Climate Framing That Highlights Tangible Environmental Consequences

Messages linking fuel use to real-world harms (e.g., floods) are more effective than abstract carbon metrics.

3

Tailor Communication to Audience Segments

Simplified tax info works best for the general public, while more engaged individuals may require different approaches (e.g., structural incentives).

End of Document