Nicotine and Tobacco Product Sales after E-cigarette Flavor Restrictions

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Agenda

- Background
- Research Questions
- Data
- Methods
- Findings
- Discussion, Limitations, & Implications

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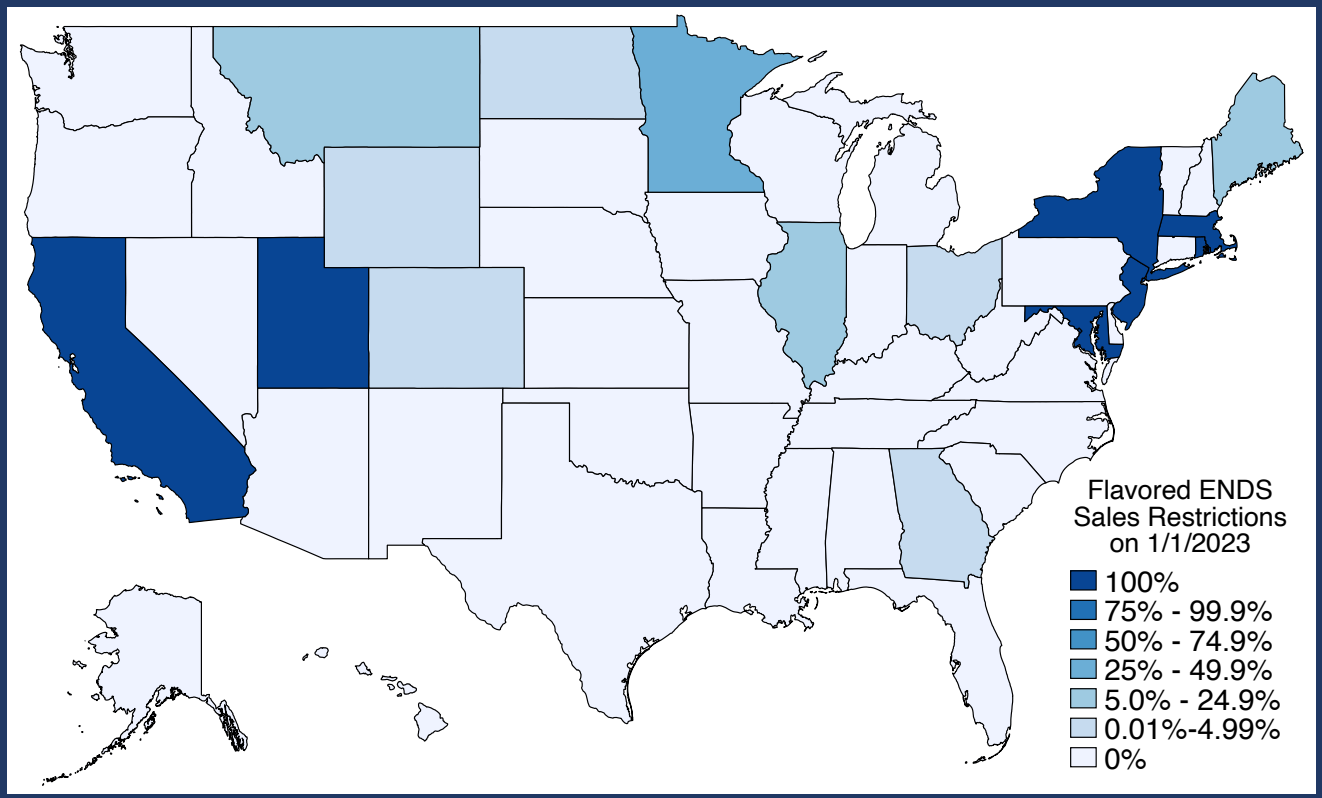
Vocabulary: ENDS = “Electronic Nicotine Delivery Systems”

Percent of State Residents Covered by Flavored ENDS Sales Restrictions



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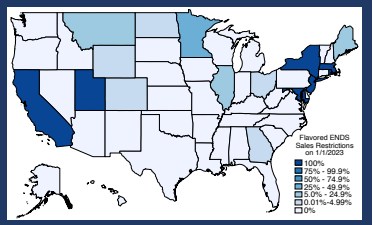
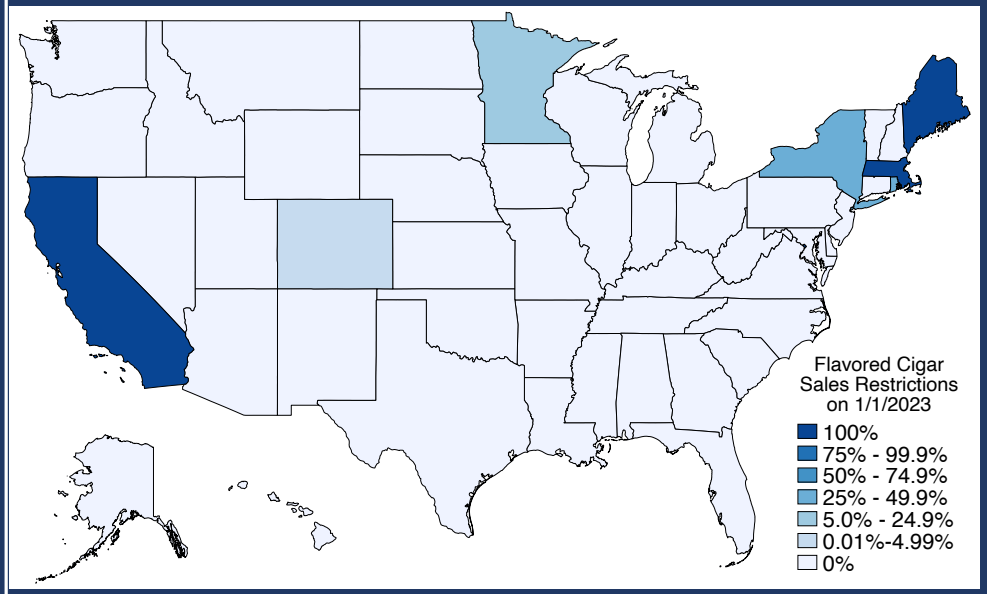
US Tobacco Product Flavor Policies

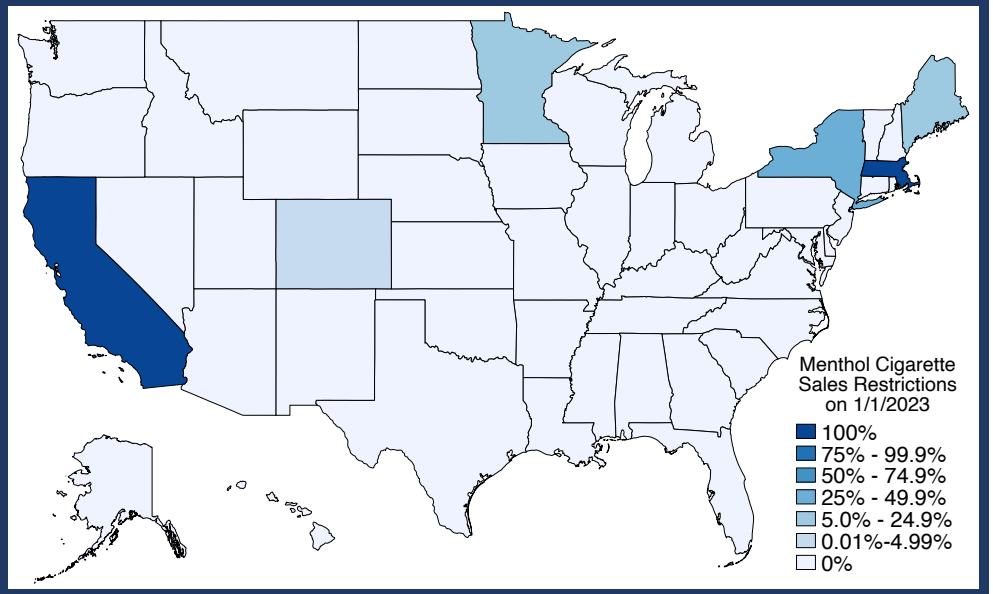


Percent of State Residents Covered by Restrictions on:

Flavored Cigar Sales



Menthol Cigarette Sales



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GRADE Evaluation of Evidence on ENDS Flavor Policies' Effects

Outcome	Quality of Evidence	Supporting Evidence
Sale		
Reduced sales of ENDS	Moderate	Ali (2022), Gammon (2021), Katchmar (2021), Liber (2021) [28–31]
Increased sales of combustible cigarettes	Low	Gammon (2021), Katchmar (2021), Liber (2021), Xu (2022) [28–30, 33]
Behaviour		
Reduced consumption of any tobacco use	Low	Kingsley (2019, 2021), Olsen (2022), Yang (2022) [38–41]
Reduced ENDS consumption	Low	Hawkins (2021), Kingsley (2019), Liu (2022), Yang (2020) [35, 38, 39, 42]
Increased combustible cigarette consumption	Very Low	Friedman (2021), Hawkins (2021), Kingsley (2019), Liu (2022), Yang (2022) [34, 35, 38, 39, 42]

Cadham CJ et al. (2022) *BMC Public Health*

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Concern 1: Substitution towards more Lethal Products

- Myriad evidence links policies making ENDS more expensive or less accessible to increases in cigarette smoking
  - Adults: Saffer et al. 2020; Pesko, Courtemanche, & Maclean, 2020
  - Pregnant women: Abouk et al, 2019
  - Young adults: Friedman & Pesko 2022
  - Youth: Abouk et al 2022, Pesko & Warman, 2021, Friedman 2015; Pesko, Hughes, & Faisal, 2016; Dave, Feng, & Pesko, 2019
- Economic theory: consumption effects from reducing a product's appeal should be in the same direction as policies increasing its price, all else equal

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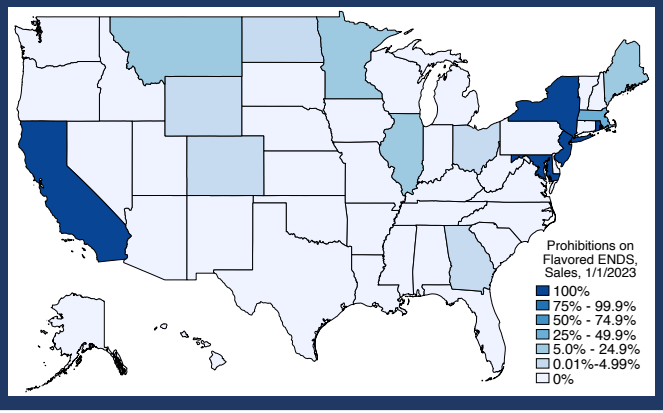
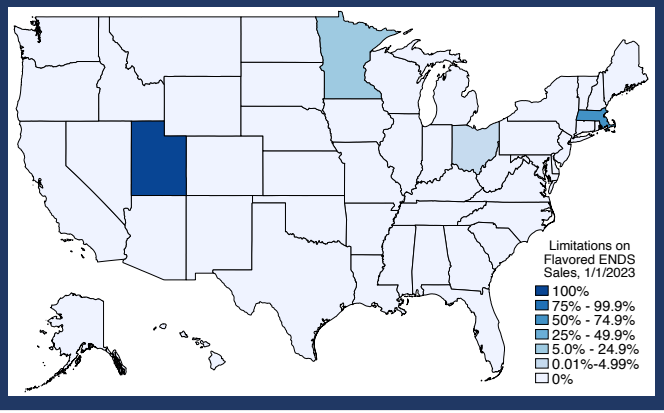
Concern 2: Current Results' Generalizability

- Most prior studies:
  - Assess flavor restrictions' effects in a single jurisdiction or state, or multiple temporary policies;
  - Omit tests required for causal interpretation of quasi-experimental evidence
  - Consider short follow up periods
  - Ignore policy heterogeneity

ENDS Flavor Prohibition



ENDS Flavor Limitations



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Research Question

What are ENDS flavor restrictions' effects on ENDS and cigarette sales?

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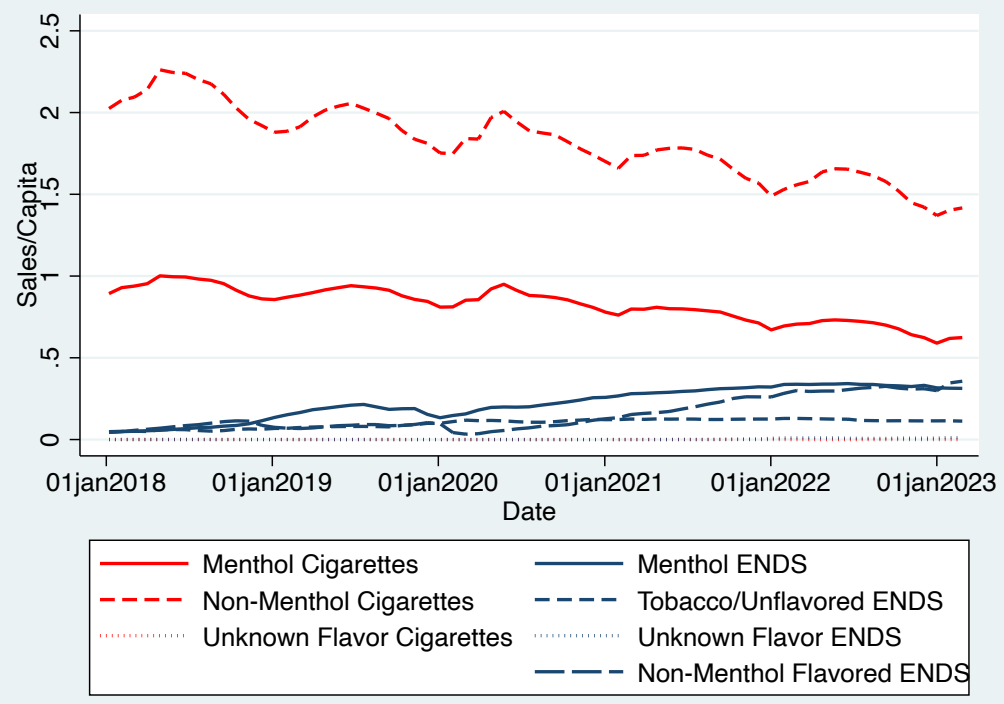
Data

Data: IRI retail sales data for 44 US states (Jan. 2018 –March 2023) + newly compiled data on state & local tobacco flavor policies

Outcomes: ENDS sales/capita; Cigarette sales/capita



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Data & Methods

Exposure: Proportion of state residents covered by ENDS flavor policies

Two-way fixed effects

$$Y_{st} = \beta_0 + \beta_1 Flv_{st} + \lambda \overrightarrow{X_{st}} + \gamma_s + \delta_t \quad (1)$$

$$Y_{st} = \beta_0 + \beta_1 Flv_{st} + \beta_2 Flv_{s,t-13} + \lambda \overrightarrow{X_{st}} + \gamma_s + \delta_t \quad (2)$$

$\overrightarrow{X_{st}}$: Proportion covered by flavored cigar & menthol cigarette sales restrictions, flavor policy interim periods (between passage & effective dates for each flavor policy), other tobacco control policies (tax rates, T21, etc.), beer taxes, medical & recreational cannabis legalization, & environmental controls

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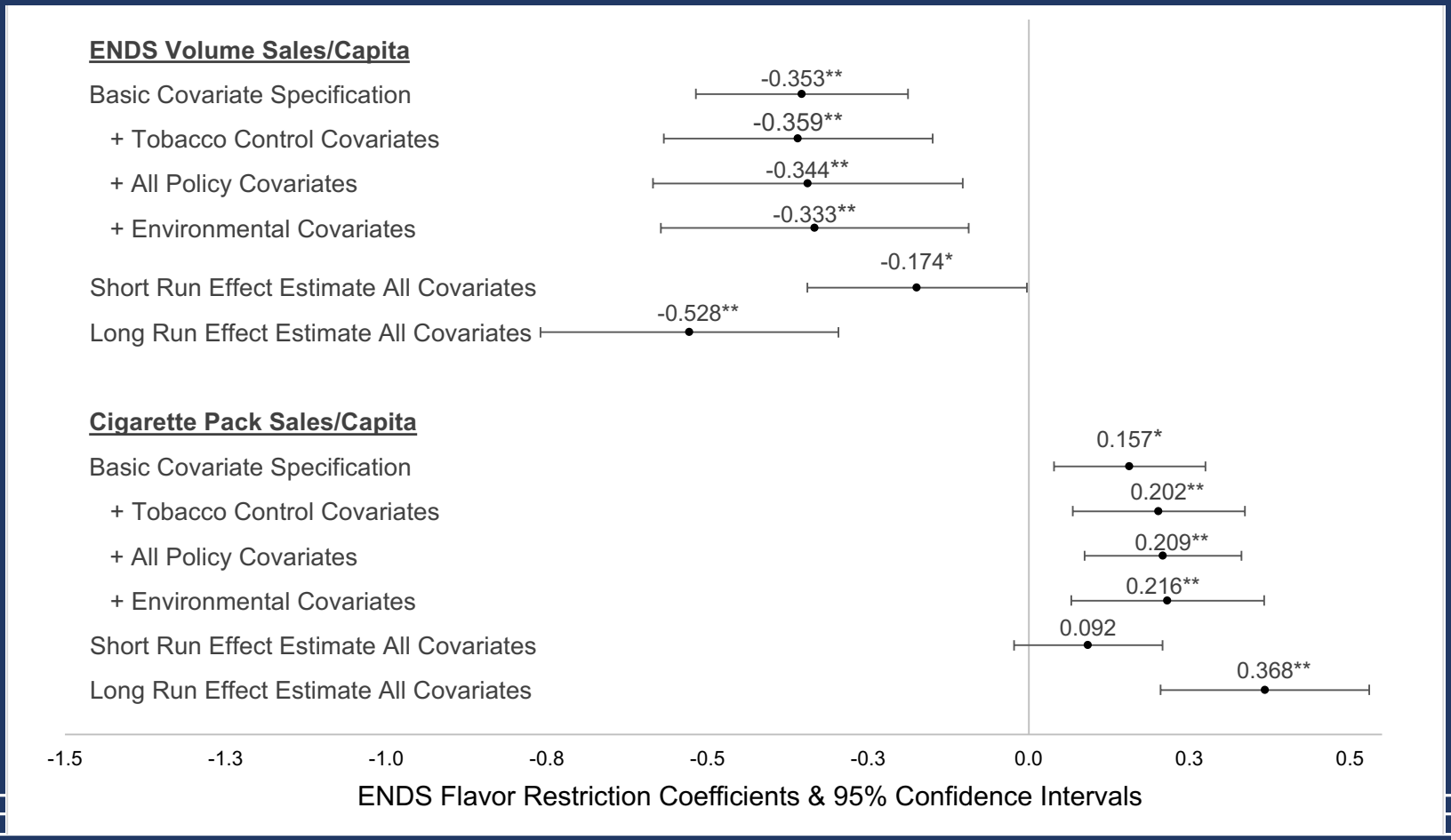
Results: Continuous Flavor Policy Variable



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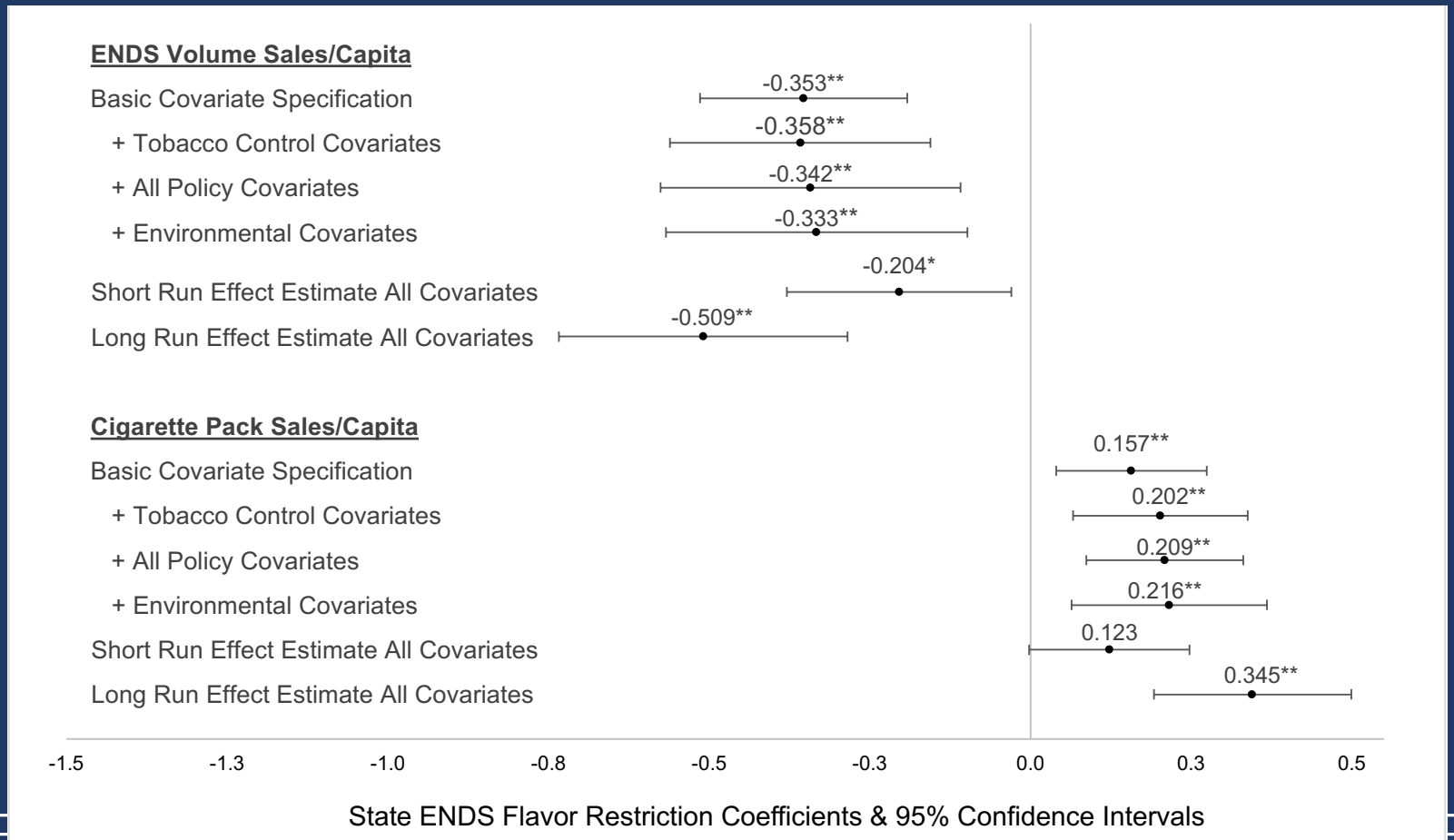
Results: Binary Flavor Policy Variable



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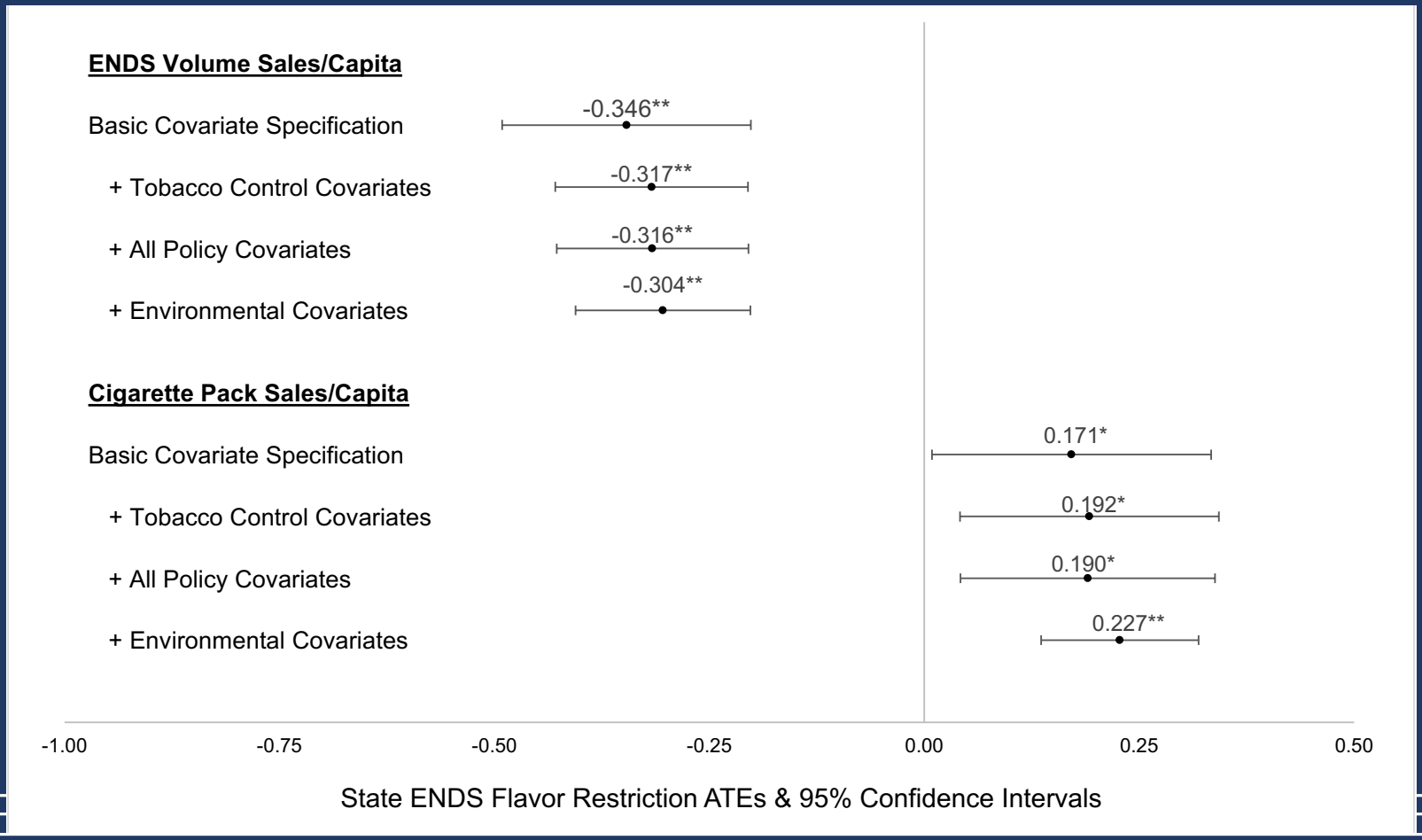
Results: Binary Exposure, de Chaisemartin & d'Haultfoeuille (DCDH, 2022)



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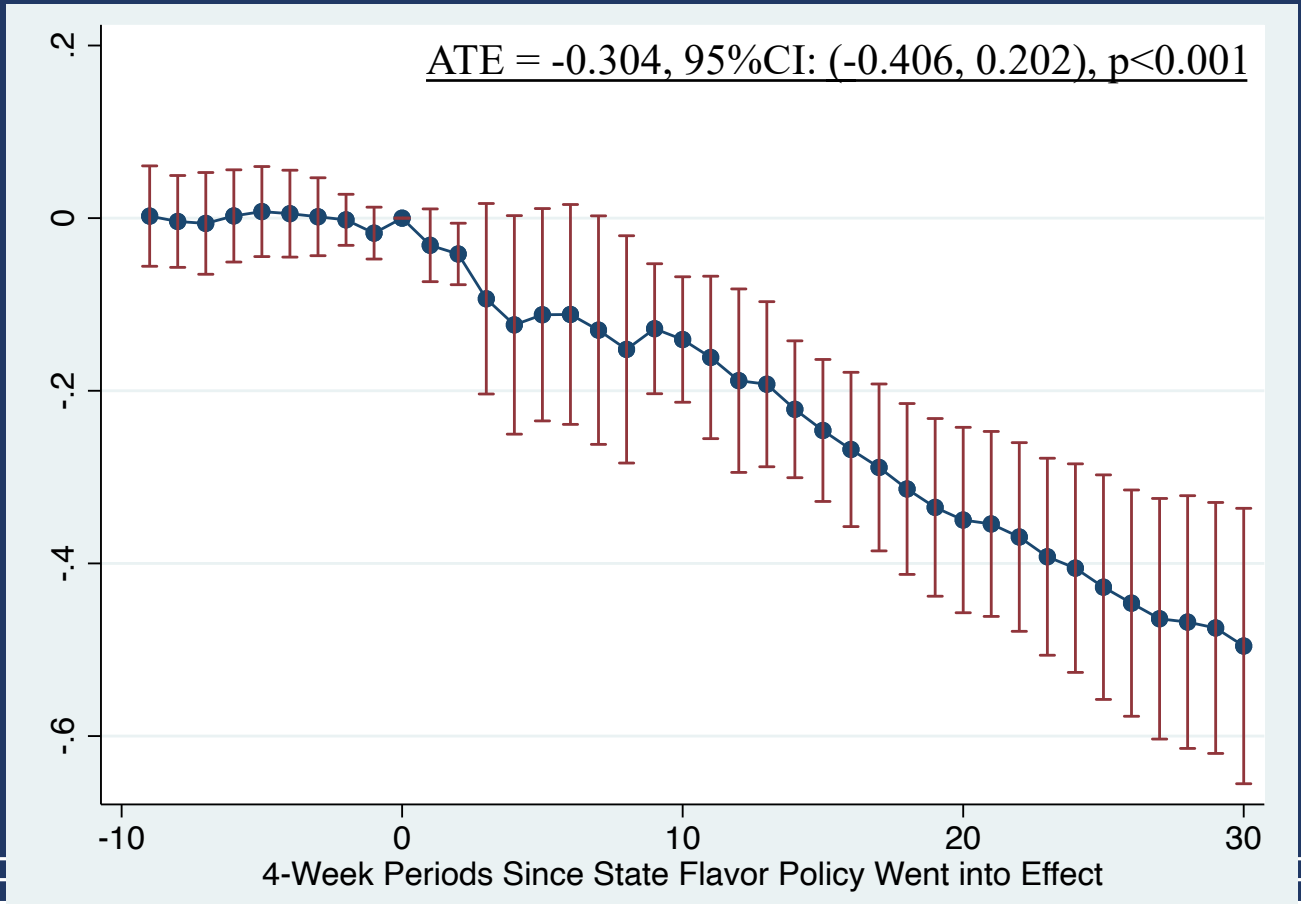
ENDS Sales/Capita analysis using DCDH (2022)



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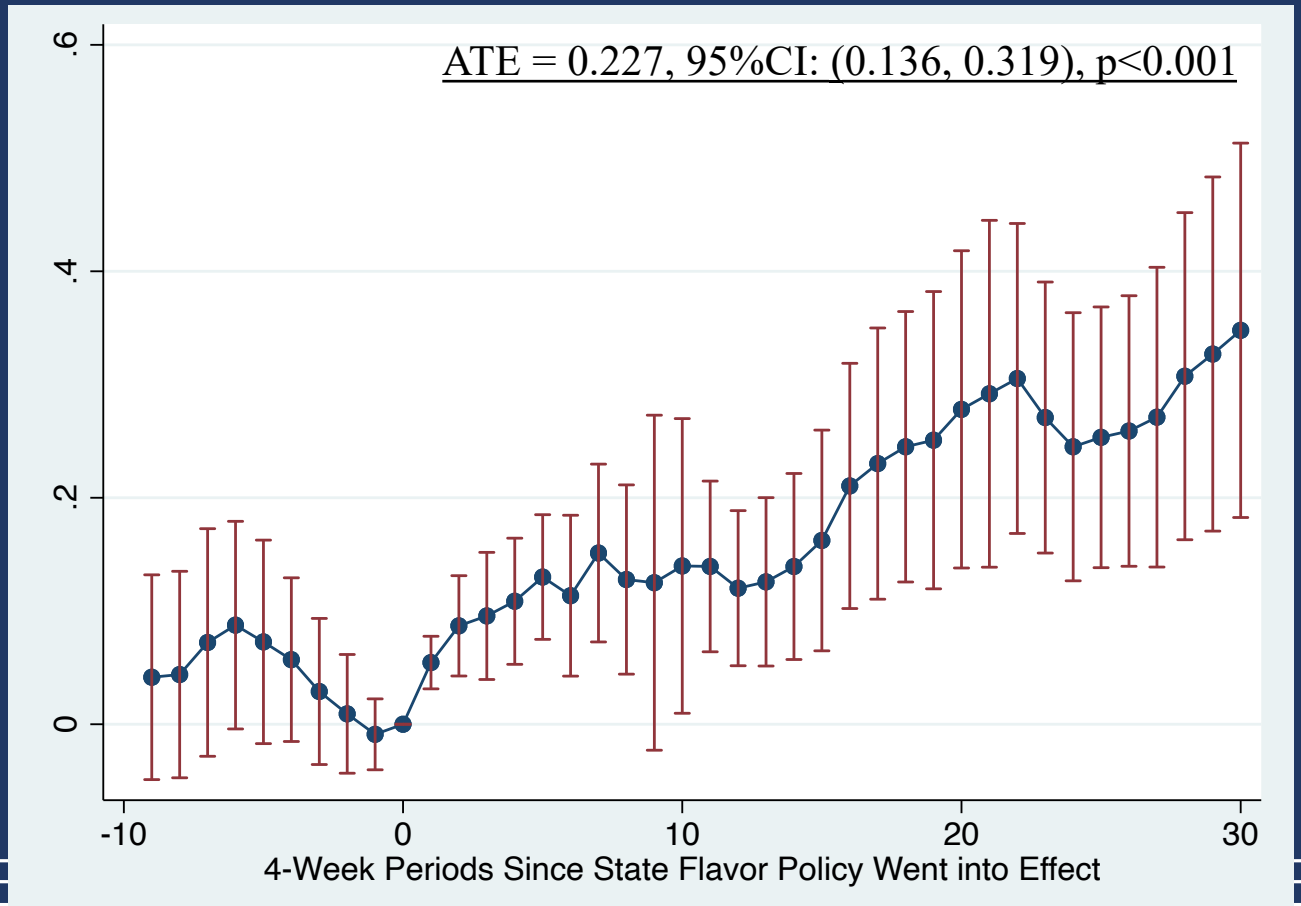
Cigarette Sales/Capita analysis using DCDH (2022)



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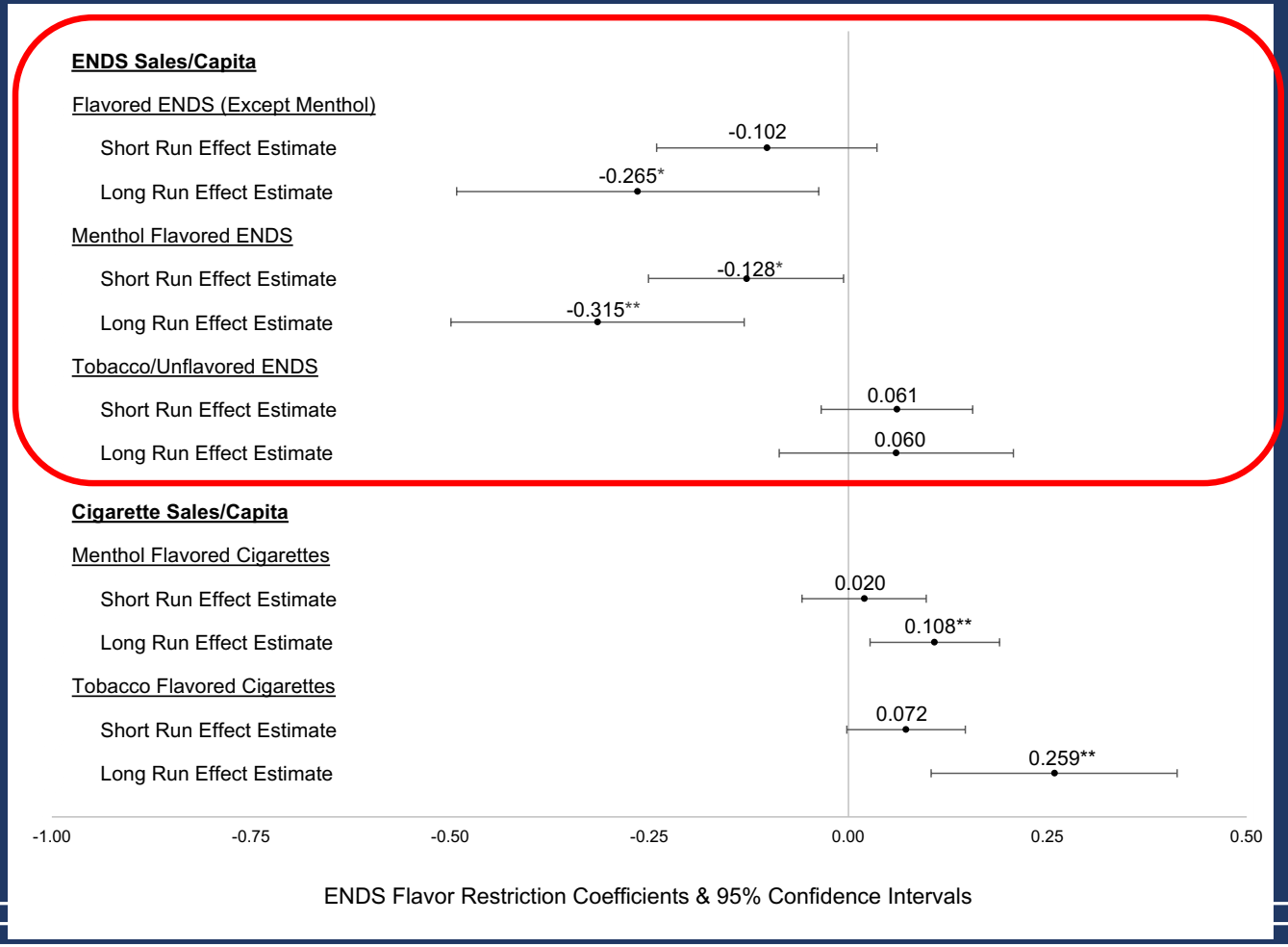
Results



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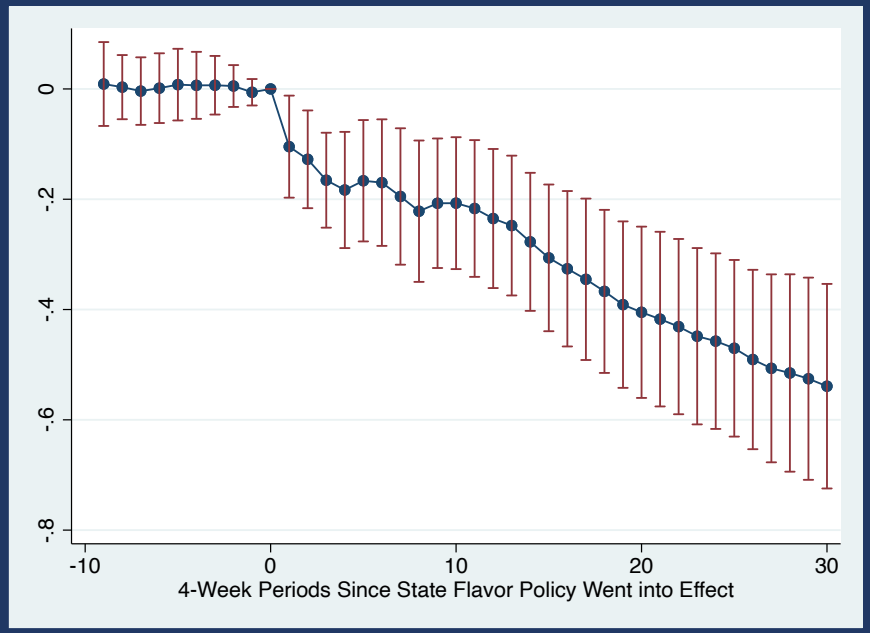
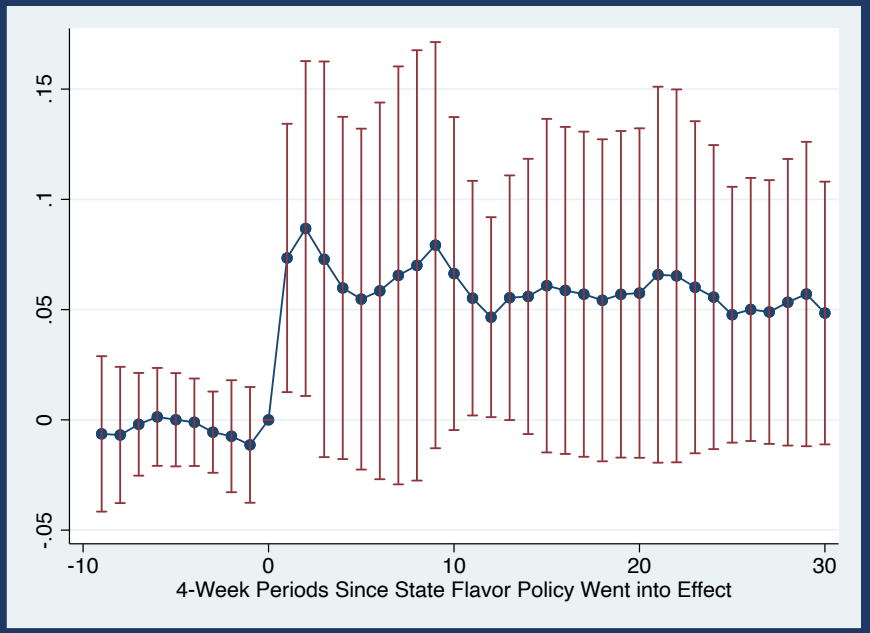
ENDS Sales/Capita by Flavor, DCDH (2022)

Flavored ENDS



ATE = -0.372, 95%CI: -0.521, -0.223), p<0.001

Tobacco or Unflavored ENDS



ATE = 0.070, 95%CI: -0.010, 0.150), p=0.086

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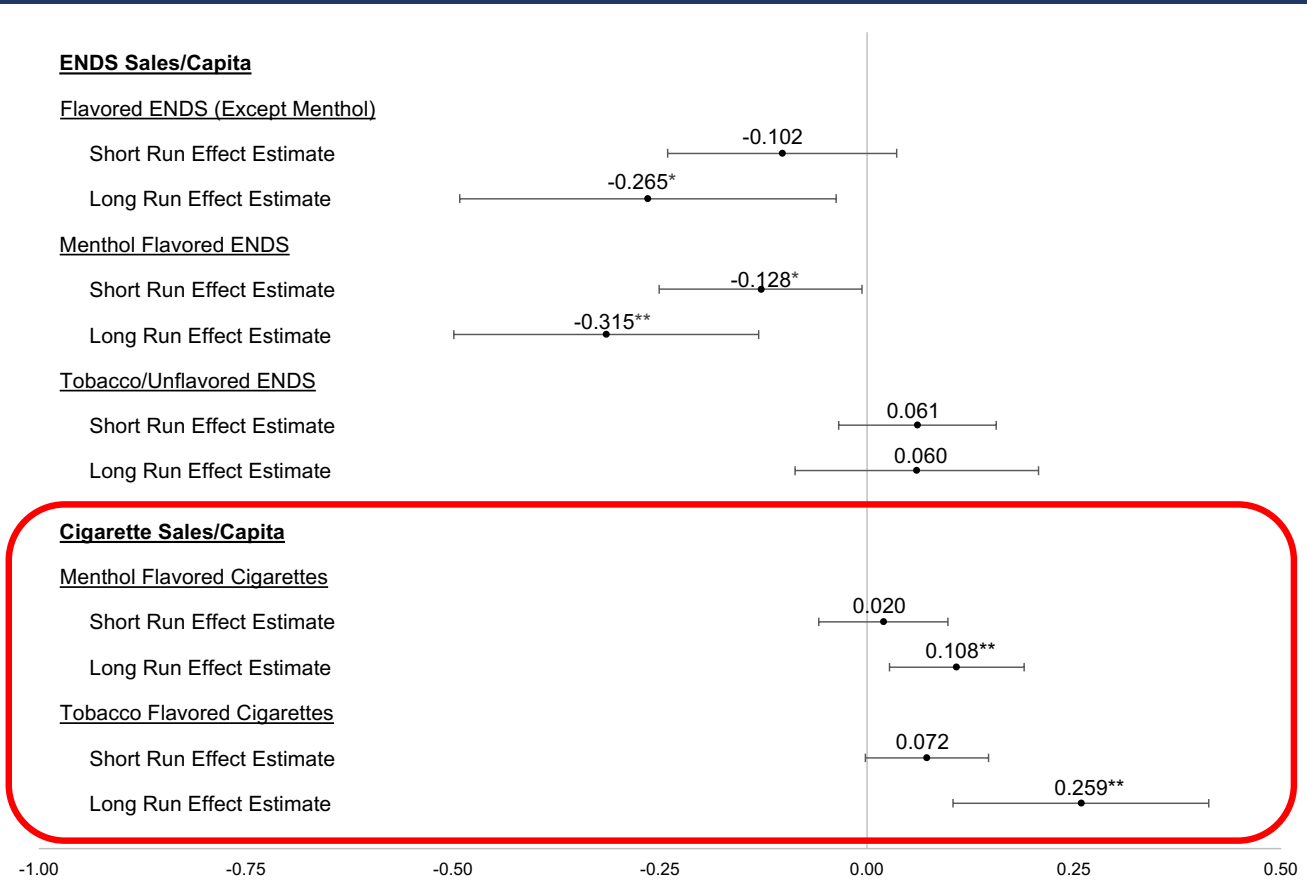
Results



ENDS Flavor Restriction Coefficients & 95% Confidence Intervals

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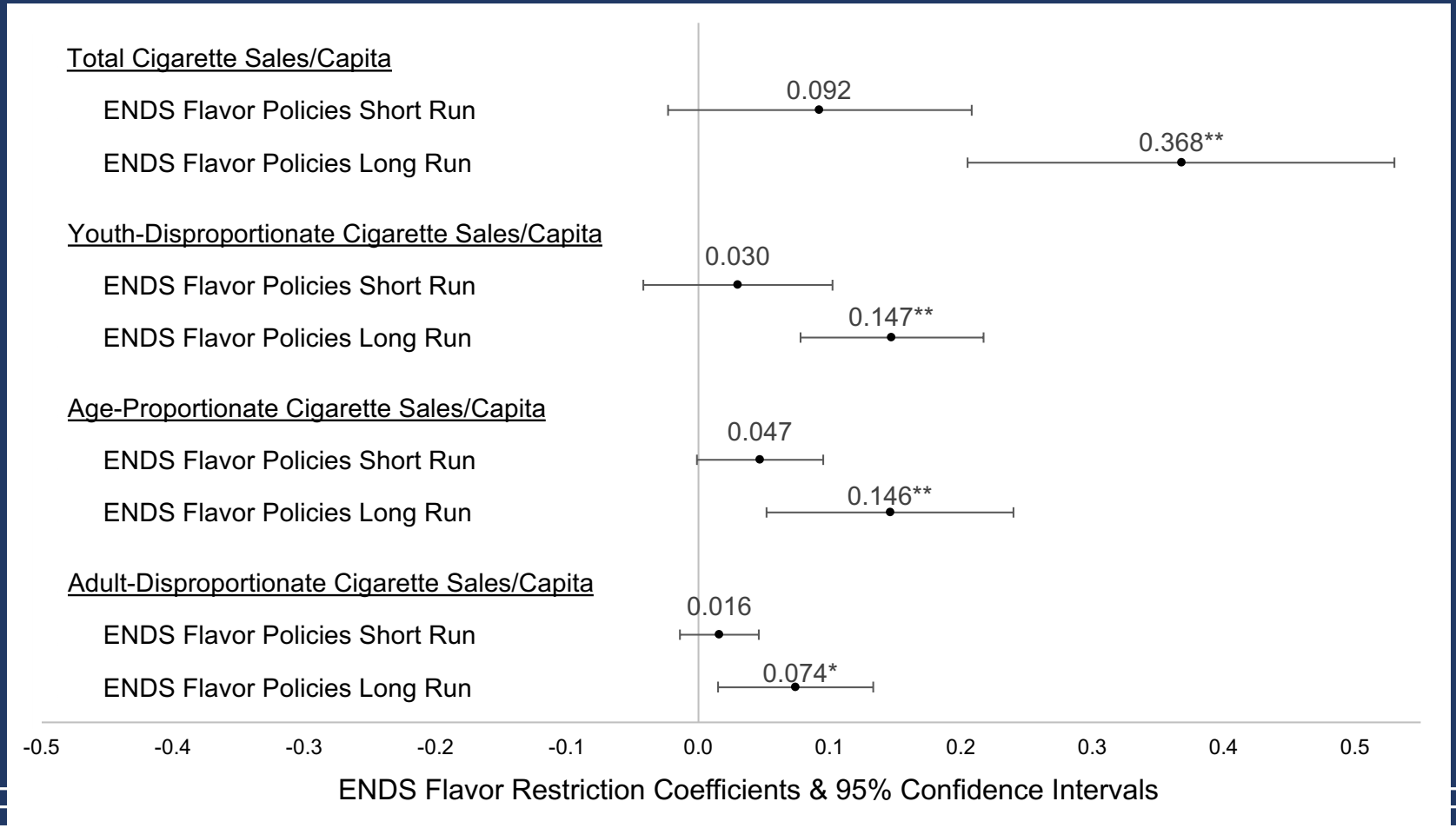
Results by Consumer Base



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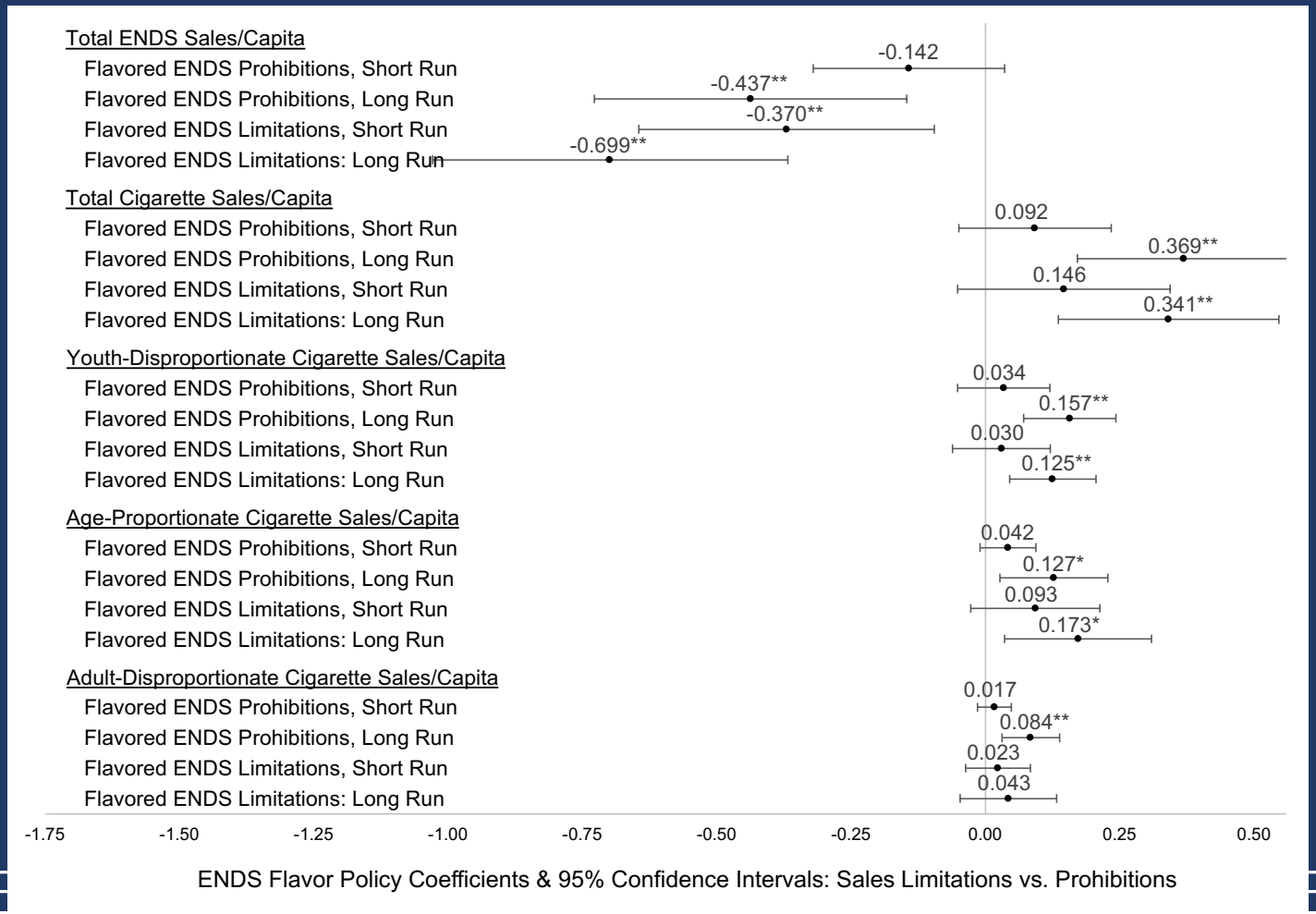
Results: Prohibitions vs Limitations



ENDS Flavor Policy Coefficients & 95% Confidence Intervals: Sales Limitations vs. Prohibitions

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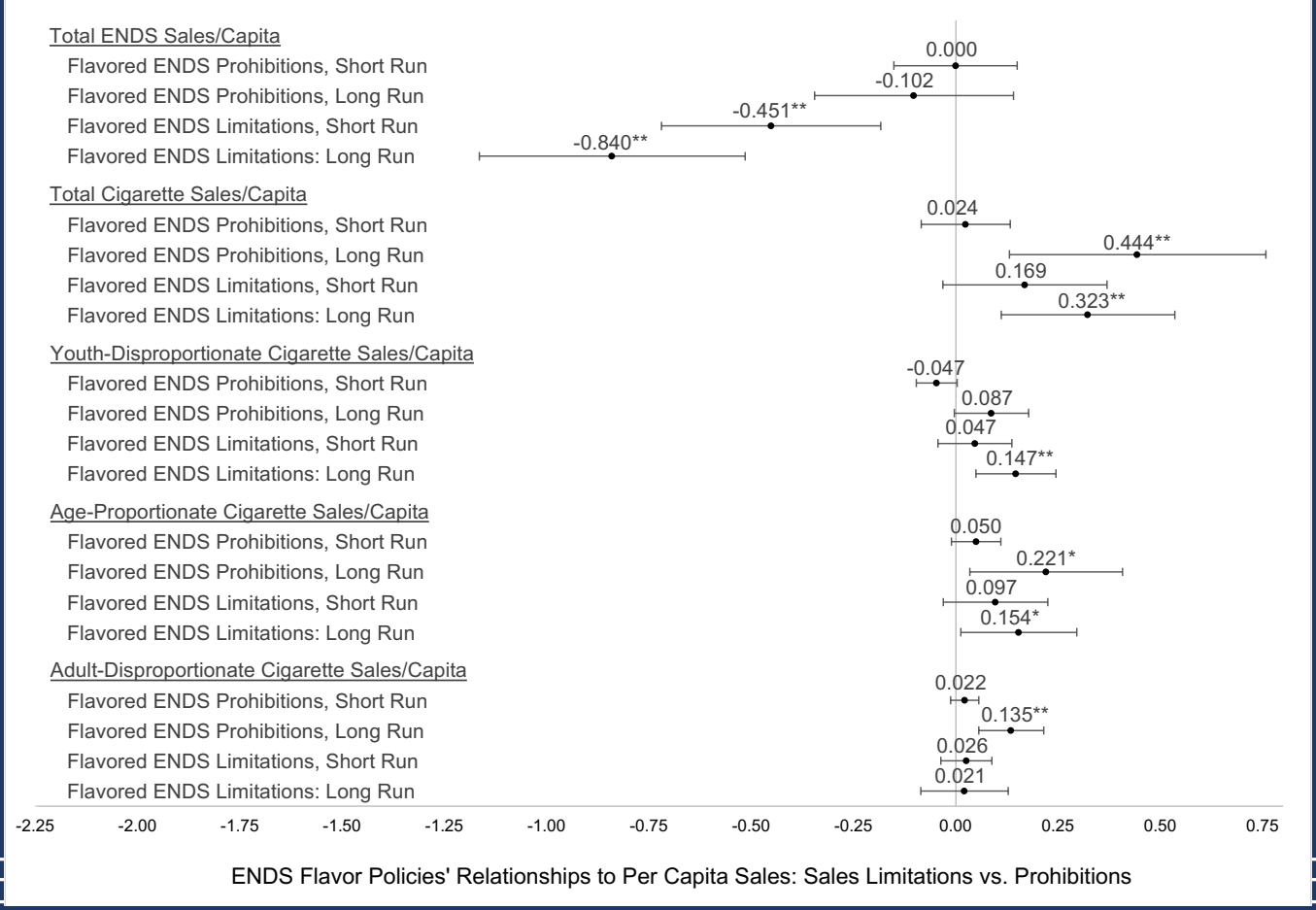
Results: Prohibitions vs Limitations, Omitting MA & RI



ENDS Flavor Policies' Relationships to Per Capita Sales: Sales Limitations vs. Prohibitions

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Findings

- ENDS flavor policies ➔ ⬇ ENDS & ⬆ Cigarette sales
  - + 15 cigarettes purchased for every 1 less 0.7mL ENDS pod sold
  - 70% of the long-run effect on cigarette sales stems from non-menthol cigarettes
  - ≈ 40% of the long-run effect on cigarette sales stems from youth-disproportionate brands
- Flavor Prohibitions vs. Limitations
  - Evidence does not suggest that ENDS flavor prohibitions are more effective at reducing ENDS sales than limitations
  - Only flavor prohibitions ➔ statistically significant increases in sales of adult-disproportionate cigarette brands

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Implications

Any public health benefit of reducing ENDS use by limiting or prohibiting flavors could lead to offsetting public health damage by increasing cigarette sales.

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Limitations

- **Sales ≠ Consumption**. If flavor restrictions lead people to buy ENDS in unrestricted jurisdictions, flavor restrictions' effects on ENDS use will be smaller than estimated by sales data.
- **Blind Spots in Retail Scanner Data**: omits online sales, specialty shops, illicit markets. ➔ sales changes may reflect shifts in sourcing, e.g., from convenience stores to vape shops

IRI's data cover vast majority of cigarette sales ➔ These issues should not impact cigarette results.

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Policy Concerns & Options

1. FDA PMTA review has not authorized a single flavored or menthol ENDS product ➔ de facto flavor prohibition?
   - Could evaluating whether each product independently is "appropriate for the protection of public health" yield a mix of products that make this market inappropriate for public health?

Alternative: Concrete Product Standards + Manufacturer Penalties for Youth Use + Point of Sale Retailer Regulation

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Policy Concerns & Options

2. Misdirection: Is the focus on less lethal tobacco products impeding efforts to reduce combustible product use, the primary driver of tobacco-related disease?

- Critical Challenges:
  - Substantial equivalence allows introduction of new cigarettes that are quite different from predicate products sold pre-February 15, 2007
  - No manufacturer-specific penalties for disproportionate youth consumption
  - No ENDS user fees in FD&C Act ➔FDA is under-resourced

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Questions/Comments?

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