

Estimating the effect of e-cigarette taxes on e-cigarette and cigarette sales in Canada

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Disclaimer

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These results are not yet published, and so subject to change. We thank you for your feedback to help us make our study stronger. We plan to submit for publication in spring 2024.

E-cigarette Taxes

- E-cigarette taxes are a potential policy tool to reduce e-cigarette use.
 - Do taxes pass-on to consumer prices? Not guaranteed and depends on market structure and elasticities of supply and demand.
 - How much (or little) do consumers respond to e-cigarette taxes?
 - In economics terms: is the demand for e-cigarettes elastic or inelastic?
 - Could e-cigarette taxes have unintended negative effects in terms of increasing more harmful cigarette use?
 - In economics terms: are cigarettes and e-cigarettes economic substitutes or complements?

E-cigarette Tax Rates on E-cigarette Prices

- To date, three studies have used sales data to study the effect of e-cigarette taxes, all in the United States.
- E-cigarette taxes increase e-cigarette prices.
 - A \$1 increase in e-cigarette taxes increases e-cigarette prices by \$0.49 (Diaz et al. 2023)
 - A \$1 increase in e-cigarette taxes increases e-cigarette prices by \$0.90 (Cotti et al. 2022)

E-cigarette Tax Rates on E-cigarette Sales

- E-cigarette taxes reduce e-cigarette sales:
 - A 10% increase in e-cigarette taxes reduces e-cigarette sales by 0.4% (Diaz et al. 2023)
 - A 10% increase in e-cigarette taxes reduces e-cigarette sales by 6.3% (Cotti et al. 2022)
 - A 10% increase in e-cigarette *prices* reduces e-cigarette sales by 13.2% (Allcott and Rafkin 2022)

E-cigarette Tax Rates on Cigarette Sales

- E-cigarette taxes increase cigarette sales.
 - A 10% increase in e-cigarette taxes increases cigarette sales by 0.1% (Diaz et al. 2023)
 - A 10% increase in e-cigarette taxes increases cigarette sales by 1.2% (Cotti et al. 2022)
 - Allcott and Rafkin (2022) find similar results to Cotti et al. (2022)

Evidence from Survey Data

A \$1 e-cigarette tax increase has the following effects:

- Adults <40 years of age (Pesko, Courtemanche, Maclean 2020):
 - Reduces current e-cigarette use by 3.6 percentage points (ppts)
 - 2 in 3 substitute to or remain daily smokers
- Young adults <25 years of age (Friedman and Pesko 2023)
 - Reduces recent e-cigarette use by 4.9 ppts
 - 9 in 10 substitute to or remain recent smokers

Evidence from Survey Data

A \$1 e-cigarette tax increase has the following effects:

- Teens (Abouk et al. 2023a):
 - Reduces current e-cigarette use by 1.9 pts using Monitoring the Future data
 - 7 in 10 substitute to or remain current smokers
 - Lower estimates of substitution when using Youth Risk Behavior Surveillance System data
- Pregnant women (Abouk et al. 2023b):
 - Reduces pre-pregnancy e-cigarette use by 1.7 pts and 3rd trimester e-cigarette use by 0.7 pts
 - 1 in 4 substitute to or remain prenatal smokers

Contribution

- Current study is the first to study the effect of e-cigarette tax rates on tobacco product sales outside the United States.
- Canada primarily uses e-cigarette sales taxes applied at the cash register, in contrast to the United States that predominately uses e-cigarette taxes incorporated in the listed price.
 - Behavioral responses may differ due to tax saliency, particularly for lower-educated individuals (Goldin and Homonoff 2023)
- Several provinces do not have e-cigarette taxes currently and are considering adopting; our results provide evidence on what to expect.

E-cigarette Taxes in Canada through 2021

- January 1, 2020: British Columbia adopted the equivalent of a 13% e-cigarette sales tax.
- Sept. 15, 2020: Nova Scotia adopted an e-cigarette tax on wholesalers (\$0.50 per fluid milliliter (ml) for products with e-liquid; or 20% of the price for devices/accessories).
- January 1, 2021: Newfoundland adopted the equivalent of a 20% e-cigarette sales tax.
- Sept. 1, 2021: Saskatchewan adopted the equivalent of a 14% e-cigarette sales tax.
- No national e-cigarette tax until Oct. 2022.

Source:
<https://www.smoke-free.ca/SUAP/2020/e-cigarette-tax.pdf>

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Pause for Discussion

E-cigarette Sales Data

- UPC-level (e.g., barcode-level) e-cigarette monthly sales data for NielsenIQ-tracked stores.
 - Dec. 2017 and extending through the end of 2021.
 - Six province groups
 - In this analysis we use only Nielsen-tracked gas & convenience stores, which account for 99% of e-cigarette sales tracked by Nielsen and approximately 1/3 of all sales in Canada (remainder: vape shops and online).

E-cigarette Sales Data

- We identified liquid volume for 99.7% of sales using hand-collected UPC-level information on liquid volume.
- Sales and e-cigarette prices are aggregated to the province group level.
 - Nielsen IQ e-cigarette prices are inclusive of anything in the listed price.
 - Excise taxes included
 - Sales taxes and coupons not included
 - Average price per fluid ml = \$3.91
 - Average monthly sales per 1,000 people:
 - 2018-2021: 6.5 fluid ml
 - 2021: 13.6 fluid ml

Cigarette Sales Data

- Province-level shipments of cigarette sticks directly to wholesalers and retailers.
 - Tobacco companies report sales under Health Canada's Tobacco Reporting Regulations, Section 13 (Sales).
- 2018-2022, monthly (one extra year)
- Contains all provinces and territories (unlike e-cigarette sales data that is missing some provinces and groups others).
- Assuming a 10% smoking rate, the average smoker consumes 500 cigarettes monthly.

Methods

- Two-way fixed effect model:
 - Treatment variables are e-cigarette sales tax rates and Nova Scotia's e-cigarette tax.
 - Fixed effects reduce potential confounding.
 - Unit fixed effect for province or province group.
 - Time fixed effect for year-by-month.
 - Remaining potential confounding is from time-varying, within-province sources.
 - Control for time-varying, province-level cigarette taxes and e-cigarette flavor restrictions.
 - Province-specific monthly time trend accounts for differential growth in provinces over time.

Methods

- Perform sensitivity checking dropping the primary COVID year of 2020.
 - E.g., avoids confounding from trade bubbles, store restrictions, etc.
- Sales outcomes are logged so that coefficients can be interpreted as % change.
- Regressions are weighted by 2019 population.
- Standard errors clustered at the province (or province group) level.

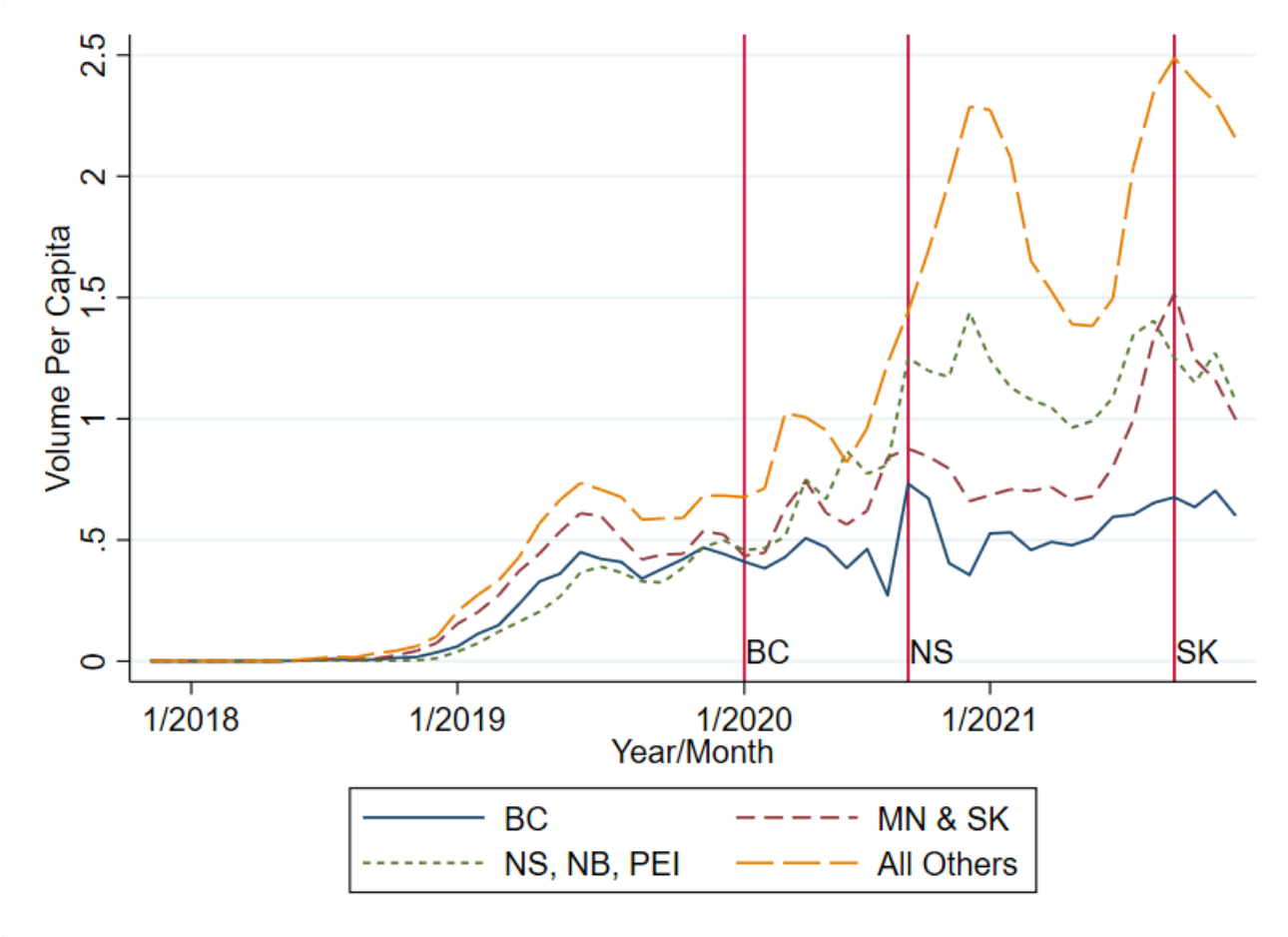
Pause for Discussion

Unadjusted trends over time do not support e-cigarette prices increasing in Nova Scotia in the post-tax period, relative to other provinces.

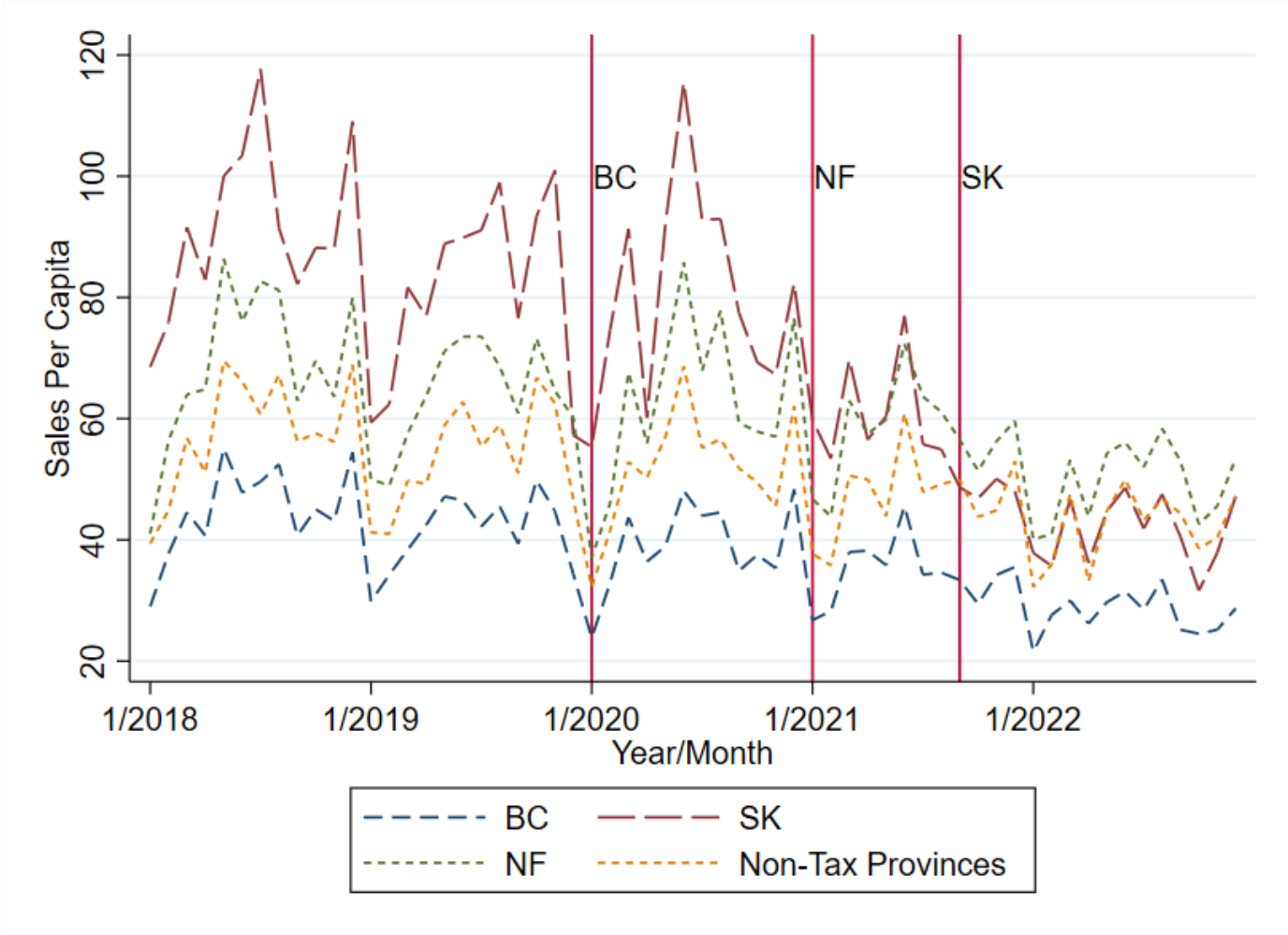


Note: Average prices per ml for “All Others” are weighted by population.

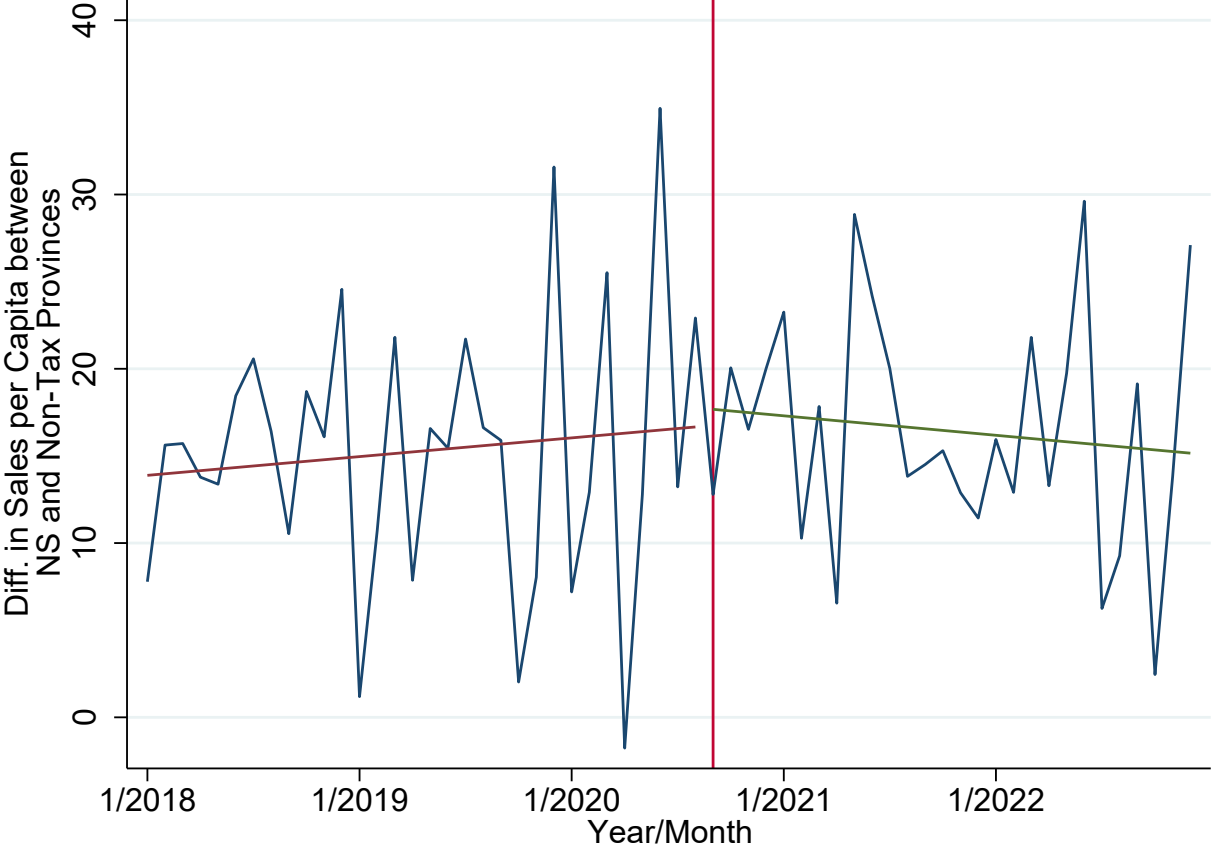
Unadjusted trends do suggest that e-cigarette sales decreased (or did not increase as quickly) due to e-cigarette taxes.



No obvious increase in cigarette sales in the three provinces using e-cigarette sales taxes.



Focusing on Nova Scotia's e-cigarette tax, the unadjusted difference between cigarette sales in Nova Scotia and non-tax provinces indicates a possible small increase in cigarette sales.



Adjusted Results

- Adjusted results largely follow the unadjusted pattern of results.
- We do not find evidence of Nova Scotia's e-cigarette tax increasing e-cigarette prices.
 - This is a surprising result.
 - We speculate possible reasons for this in the discussion.

Adjusted Results

- A 100% e-cigarette sales tax reduces e-cigarette sales volume (in fluid ml) by 4.1% ($p > 0.10$).
 - One-year lead statistically insignificant, providing evidence of parallel trends.
 - Association remains similar and statistically insignificant when dropping year 2020 to reduce COVID-related confounding.
 - No statistical or economic relationship with cigarette sales.

Adjusted Results

- Nova Scotia's e-cigarette tax reduced e-cigarette sales by 39.7% ($p=0.099$) in the Maritimes region.
 - One-year lead statistically insignificant, providing evidence of parallel trends.
- Nova Scotia's tax also increased cigarette sales by 5.6% ($p<0.001$) in Nova Scotia.
 - One-year lead statistically insignificant, providing evidence of parallel trends.
- Both estimated associations increase in magnitude when dropping year 2020 to reduce COVID-related confounding.

Discussion

- Some results from Canada match the United States.
 - E-cigarette taxes have the intended effect of reducing e-cigarette sales.
 - Large effects in NS, small statistically insignificant effects in sales tax provinces.
 - Evidence from NS that e-cigarette taxes have an unintended effect of raising cigarette sales modestly.
 - Supports e-cigarettes and cigarettes being economic substitutes.

Discussion

- Excise taxes appear to elicit far greater changes in consumer responsiveness than sales taxes.
 - This could be related to “tax saliency,” as consumers do not see sales taxes in the retail prices but do see excise taxes in the retail prices.
 - Evidence of this from cigarette marketplace (Goldin and Homonoff 2023).

Discussion

- No evidence that NS tax increases e-cigarette prices.
 - E-cigarette companies exist in a competitive marketplace?
 - E-cigarette prices could have been more affected in vape shops, which we do not have information for.
- But what explains the reduction in sales if prices haven't increased?
 - One potential explanation is that manufacturers used fewer coupons after the tax, which are not reflected in Nielsen IQ prices.
 - Another potential explanation is that perceptions of risk changed after e-cigarette taxes, as has been shown previously (Abouk et al. 2023a,b).
 - These are potentially interesting future research projects.

Discussion

- Limitations:
 - Few clusters, even fewer treated clusters causes concern regarding accuracy of standard errors.
 - E-cigarette sales only capture approximately 1/3 of the marketplace and miss online and vape shop sales.
 - If tax compliance is different for different types of retailers, e-cigarette results could be over-estimated or under-estimated.
 - We study sales, and do not know how these products are used.

Thank You

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