

The Effect of Cigarette Taxes on Expenditures, Income, and Savings

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Research Question

- **Research Question:** Do cigarette expenditures increase as a result of cigarette excise tax increases, and if so, what is the source of these extra dollars now spent on cigarettes?
- **What We Do:** Use plausibly exogenous variation in state cigarette taxes to estimate effects on various consumer expenditures, income, and savings.

Why This Matters

- The majority of tobacco consumption is in the form of cigarettes.
- Previous literature estimates the pass-through of cigarette taxes is between 80% and 120%.¹
- If households are budget constrained, increased cigarette taxes may lead these households to cut spending elsewhere, affecting overall consumption patterns.
- Depending on where cuts occur, this could have unintended negative or positive effects.
- Understanding these consumption patterns is critical for modelling the holistic effects of tobacco taxation.

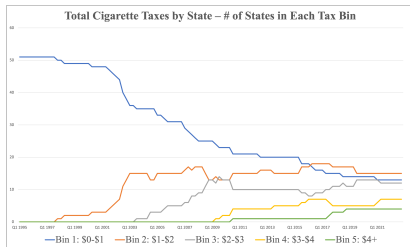
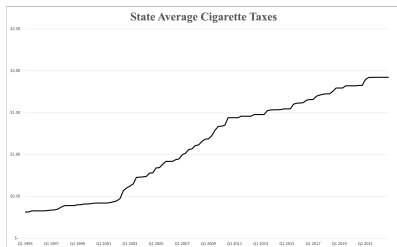
¹Hanson and Sullivan, 2009; Harding et al., 2012; DeCicca et al., 2013; Lillard and Sfekas, 2013; Rozema and Ziebarth, 2017; Hoehn-Velasco et al., 2022

Motivation

- For budget constrained households who buy cigarettes, when taxes increase, there are the following options:
 - 1.) Continue normal purchases (i.e., pay the tax)
 - 2.) Reduce purchases of cigarettes
 - 3.) Maintain normal purchase quantity, but purchase cheaper cigarettes or purchase from reduced-tax sources
 - 4.) Reduce expenditures of other tobacco products
 - 5.) Reduce expenditures of other household items
 - 6.) Reduce savings
 - 7.) Increase income/work more hours
- With full information about household expenditures, we can observe whether/to what extent households engage in all of these spending decisions.

Setting

- From Q1 1996 to Q4 2022, there were 227 different cigarette state-level excise tax changes in the US.
- State cigarette taxes in Q4 2022 range from \$0.17 to \$5.01.
- Within state cumulative tax changes range from \$0.00 to \$4.36.



What Do Cigarette Taxes Have to do With Non-Tobacco Spending?

- Certain spending categories are more flexible than others.
- May be easier to adjust spending on food or clothing than more rigid expenses like housing, which may be locked in to a contract like a mortgage or rental agreement.
- Spending diverted from some categories (e.g., entertainment) is less likely to impact human capital formation than spending from other categories (e.g., education, health care).
- Theoretically ambiguous which spending categories households will substitute from.

Contribution

- This paper is the first to utilize a comprehensive account of household spending in the analysis of cigarette taxes.
- This allows us to not only look at direct household effects on cigarette spending but also evaluate changes in other parts of the household budget.

Data: BLS Consumer Expenditure Survey (1)

- Household expenditure data from the Consumer Expenditure (CE) Interview Survey from 1996 to 2022.
- The CE is a nationally representative rotating panel survey collecting expenditure data on over 600 different categories of goods and services, conducted by the Bureau of Labor Statistics.
- Primarily used to calculate inflation levels.
- Each household is tracked up to four times at 3-month intervals to obtain a total of 12 months of expenditure data; the household is then dropped from the survey and is replaced by a new unit.

Data: BLS Consumer Expenditure Survey (2)

- Households are pre-screened and contacted by BLS to ensure a qualified adult respondent will be present for each survey appointment. Interviews are typically in-person and last an average of 67 minutes.
- Due to sparse responses in data, focus on 35 states and DC.²

Examples of CE interview questions:

“Since the first of (reference month), not including this month, have (you/you or any members of your household) paid for any babysitting, nanny services, or other childcare inside or outside your home?”

“How much (do/does) (you/your household) USUALLY spend each week for cigarettes?”

²We omit AR, MT, NM, ND, SD, VT, WY, ID, IA, ME, MS, NC, OK, RI, WV.

Data: BLS Consumer Expenditure Survey (3)

The CE does have some specific limitations:

- Of ~13,000 households contacted, BLS receives 5-6,000 usable interviews per quarter (20,000-24,000 per year).
- Heavily urban-focused.
- One reference person reports expenditures for the whole household over the past quarter.

However,

- Our identification strategy reduces the potential for measurement error to bias our results.
- The CE has consistent measures of expenditures, income, and savings, spanning the entire period from 1996 to 2022.

Descriptive Statistics (CE)

- 50.6% Female
- 80.4% White, 13.4% Black
- 98% Urban
- 2.5 people in household
- \$74.17 on tobacco
- \$67.80 on cigarettes (18% report spending >\$0)
- \$375.44 on cigarettes (conditional on any spending)
- N=588,558

Note that all spending is quarterly. Estimates cover 1996-2022 BLS CE data.

CE Spending Categories

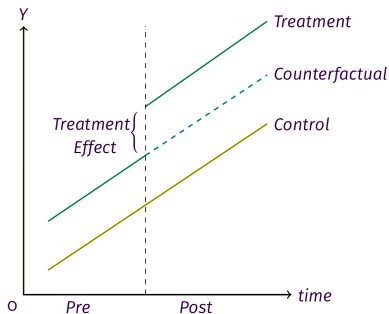
Food away from home	545.88
Food at home	1204.18
Housing	4092.80
Apparel and services	304.69
Transportation	2110.18
Entertainment	583.38
Personal care	81.29
Education	239.15
Miscellaneous	145.10
Cash contributions	392.17
Health care	785.78
Reading	30.53
Life and other personal insurance	99.64
Retirement, pensions, and Social Security	1292.72

Note that categories are defined by the BLS and composed of more granular data.

Data: Tax Burden on Tobacco (2022)

- We also use data from the Tax Burden on Tobacco report (TBOT) from 2000 to 2020.
- Data include federal and state-level information regarding taxes, prices and tax-paid sales of cigarettes, reported on an annual basis.
- Weighted Average Price Per Package (mean \$5.42 since 2000).
- Taxes as a Percentage of Average Retail Price (mean 35.5% since 2000).
- State Tax-Paid Cigarette Sales (mean 307 million packs, Std. Dev. = 286m).

Difference-in-differences



$$Y_{ist} = \alpha + \beta T A X_{st} + \gamma X_{ist} + \delta_t + \eta_s + \epsilon_{ist}$$

- Standard method relies on parallel trends and single-period binary treatment.
- Our environment has staggered and multiple treatment adoption.

Methodology (DCDH)

de Chaisemartin and D'Haultfoeuille (2022) Dynamic Difference-in-Differences Estimator

- Categorize nominal excise taxes at \$1 thresholds, up to \$4+
- Examines units switching from one treatment category to another by comparing to those formerly in the same treatment group as controls.
- Designed to account for staggered adoption as well as continuous variation in treatment.
- Categorizing taxes comes at the cost of losing some variation (145 of 227 tax changes).
- State as unit of analysis, with year-quarter time variation.
- Policy controls: cigar taxes.
- Demographic controls: sex, race, urban status, family size.

Cigarette Spending Estimate Table

Table 1: Average Treatment Effects of an Additional \$1 of Cigarette Taxes on Cigarette Spending

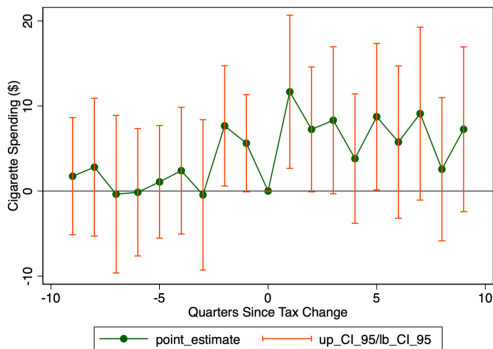
	(1)	(2)	(3)
Cigarette Tax (\$1)	8.130** (3.941) [0.131]	8.540** (4.172) [0.103]	7.181** (3.505) [0.131]
Policy Controls	No	Yes	Yes
Weighted	No	No	Yes
Observations	572,026	572,026	572,026

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

- Households in states with a \$1 increase in cigarette taxes raised their spending on cigarettes by approximately 10%, from a baseline of \$67.75 for an additional \$7.18 per quarter.
- This corresponds to roughly 11% decrease in units purchased (1.6 packs).

Cigarette Spending Event Study

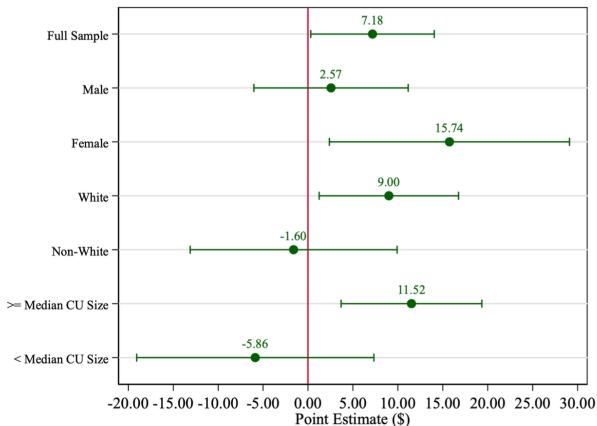
Figure 1: Event Studies For Average Treatment Effects of an Additional \$1 of Cigarette Taxes on Cigarette Spending



- ATE: \$7.18 (Std. Err. = 3.505)
- Mean spending of \$67.75

Heterogeneity

Figure 4: Average Treatment Effects of an Additional \$1 of Cigarette Taxes on Cigarette Spending, Heterogeneity.



- We do not stratify using income due to endogeneity concerns.

Plausible Household Responses to Cigarette Tax Increase:

- 1.) Continue normal purchases (i.e., pay the tax) - *Higher spending implies some people continue normal purchases and pay higher taxes.*
- 2.) Reduce purchases of cigarettes
- 3.) Maintain normal purchase quantity, but purchase cheaper cigarettes or purchase from reduced-tax sources
- 4.) Reduce expenditures of other tobacco products
- 5.) Reduce expenditures of other household items
- 6.) Reduce savings
- 7.) Increase income/work more hours

Cigarette Unit Sales Table

Table 2: Average Treatment Effects of an Additional \$1 of Cigarette Taxes on Cigarette Unit Sales.

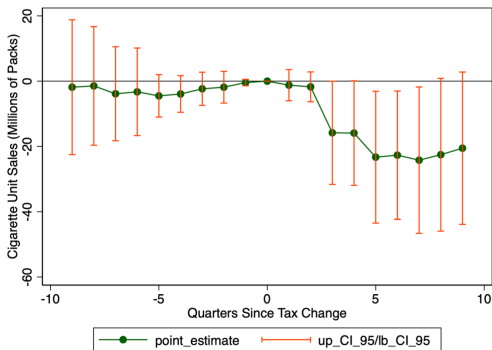
	(1)	(2)	(3)
Cigarette Tax (\$1)	-14.385** (7.016) [0.417]	-14.427** (7.017) [0.409]	-16.016** (7.736) [0.158]
Policy Controls	No	Yes	Yes
Weighted	No	No	Yes
Observations	144,884	144,884	144,884

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

- A \$1 increase in cigarette taxes corresponds to a ~16 million pack reduction in quarterly state cigarette sales from a mean of 307 million, approximately a 5% decrease.

Cigarette Unit Sales Event Study

Figure 2: Event Studies for Effects of an Additional \$1 of Cigarette Taxes on Cigarette Unit Sales.



- ATE: -16.016m packs (Std. Err. = 7.736).
- Mean sales of 307 million implies decrease of $\sim 5\%$.

Plausible Household Responses to Cigarette Tax Increase:

- 1.) Continue normal purchases (i.e., pay the tax) - *Higher spending implies some people continue normal purchases and pay higher taxes.*
- 2.) Reduce purchases of cigarettes - *Evidence of decreased cigarette unit sales*
- 3.) Maintain normal purchase quantity, but purchase cheaper cigarettes or purchase from reduced-tax sources
- 4.) Reduce expenditures of other tobacco products
- 5.) Reduce expenditures of other household items
- 6.) Reduce savings
- 7.) Increase income/work more hours

Other Tobacco Spending Estimates

Table 3: Average Treatment Effects of an Additional \$1 of Cigarette Taxes on Other Tobacco Spending

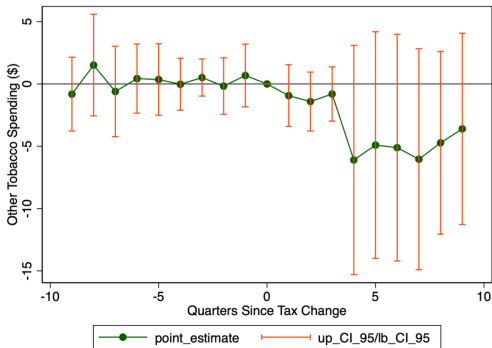
	(1)	(2)	(3)
Cigarette Tax (\$1)	1.023* (0.595) [0.751]	-5.664 (3.882) [0.665]	-4.201 (5.585) [0.376]
Policy Controls	No	Yes	Yes
Weighted	No	No	Yes
Observations	572,026	572,026	572,026

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

- A \$1 increase in cigarette taxes has no statistically significant effect on other tobacco spending, but it does suggest an economically significant negative effect.
- Mean other tobacco spending is \$6.73.

Other Tobacco Spending Event Study

Figure 3: Event Studies for Effects of an Additional \$1 of Cigarette Taxes on Other Tobacco Spending



- ATE: $-\$4.20$ (Std. Err. = 5.585).
- Mean other tobacco spending is $\$6.73$.

Plausible Household Responses to Cigarette Tax Increase:

- 1.) Continue normal purchases (i.e., pay the tax) - *Higher spending implies some people continue normal purchases and pay higher taxes.*
- 2.) Reduce purchases of cigarettes - *Evidence of decreased cigarette unit sales*
- 3.) Maintain normal purchase quantity, but purchase cheaper cigarettes or purchase from reduced-tax sources
- 4.) Reduce expenditures of other tobacco products - *Plausible, but our estimates are not statistically significant at conventional levels*
- 5.) Reduce expenditures of other household items
- 6.) Reduce savings
- 7.) Increase income/work more hours

Effect on Other Select Spending Categories

Appendix Table 7: Average Treatment Effects of an Additional \$1 of Cigarette Taxes on Other Outcomes

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Cigarette Tax (\$1)	-12.01	25.25	47.29	-33.24*	57.04	-8.62	-0.23	7.06	29.98	-37.45*	12.80	-0.07	5.98	31.57
SE	(28.59)	(19.15)	(99.05)	(18.24)	(131.17)	(33.00)	(2.06)	(31.48)	(28.21)	(21.14)	(28.47)	(1.98)	(7.03)	(37.22)
JointNull	[0.646]	[0.234]	[0.121]	[0.114]	[0.714]	[0.693]	[0.845]	[0.135]	[0.156]	[0.052]	[0.140]	[0.104]	[0.168]	[0.852]
Policy Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Weights	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	588,558	588,558	588,558	588,558	588,558	588,558	588,558	588,558	588,558	588,558	588,558	588,558	588,558	588,558
Mean	570.19	1,237.87	4,182.32	295.42	2,160.61	587.65	82.88	245.07	141.60	402.91	824.52	28.22	98.26	1,346.75

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Outcomes are expenditure categories as follows: (1) Food away from home, (2) Food at home, (3) Housing, (4) Apparel, (5) Transportation, (6) Entertainment, (7) Personal Care, (8) Education, (9) Miscellaneous, (10) Cash Contributions, (11) Health, (12) Reading, (13) Life Insurance, (14) Retirement and Pension Contributions.

- We find significant decreases in spending for apparel (\$-33.24) and cash contributions (\$-37.45).
- Mean apparel spending \$295.41, mean cash contributions \$402.91.
- No other changes appear statistically significant or economically meaningful.

Plausible Household Responses to Cigarette Tax Increase:

- 1.) Continue normal purchases (i.e., pay the tax) - *Higher spending implies some people continue normal purchases and pay higher taxes.*
- 2.) Reduce purchases of cigarettes - *Evidence of decreased cigarette unit sales*
- 3.) Maintain normal purchase quantity, but purchase cheaper cigarettes or purchase from reduced-tax sources
- 4.) Reduce expenditures of other tobacco products - *Plausible, but our estimates are not statistically significant at conventional levels*
- 5.) Reduce expenditures of other household items - *Apparel and cash contributions reduced by 10%*
- 6.) Reduce savings
- 7.) Increase income/work more hours

Effect on Savings

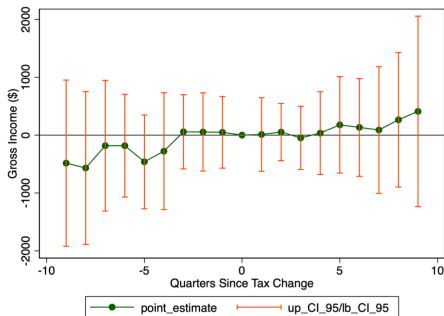
Figure 5: Event Studies For Average Treatment Effects of an Additional \$1 of Cigarette Taxes on Household Savings



- ATE: $-\$1,269.65$ (Std. Err. = $1,959.75$).
- Mean savings amount $\$17,008.85$.

Effect on Income

Figure 6: Event Studies For Average Treatment Effects of an Additional \$1 of Cigarette Taxes on Gross Income



- ATE: \$122.80 (Std. Err. = 389.76).
- Mean income \$56,019.12.

Plausible Household Responses to Cigarette Tax Increase:

- 1.) Continue normal purchases (i.e., pay the tax) - *Higher spending implies some people continue normal purchases and pay higher taxes.*
- 2.) Reduce purchases of cigarettes - *Evidence of decreased cigarette unit sales*
- 3.) Maintain normal purchase quantity, but purchase cheaper cigarettes or purchase from reduced-tax sources
- 4.) Reduce expenditures of other tobacco products - *Plausible, but our estimates are not statistically significant at conventional levels*
- 5.) Reduce expenditures of other household items - *Apparel and cash contributions reduced by 10%*
- 6.) Reduce savings - *No significant effect*
- 7.) Increase income/work more hours - *No significant effect*

Cheaper Cigarettes or Reduced-tax Sources?

- Direct examination of consumer behavior regarding brand switching or seeking lower-cost cigarette purchasing methods is beyond our capability using CE data.
- But existing research shows evidence that consumers may engage in the following behavior:
 - Purchase by carton rather than by pack³
 - Choose cheaper brands^{3,4}
 - Use coupons⁴
 - Utilize low or non-tax sourcing (e.g., cross-state purchases)^{3,5}

³White et al. 2005

⁴Choi et al. 2012

⁵Lovenheim 2008, Nicholson and Turner 2016, Bishop 2018

Plausible Household Responses to Cigarette Tax Increase:

- 1.) Continue normal purchases (i.e., pay the tax) - *Higher spending implies some people continue normal purchases and pay higher taxes.*
- 2.) Reduce purchases of cigarettes - *Evidence of decreased cigarette unit sales*
- 3.) Maintain normal purchase quantity, but purchase cheaper cigarettes or purchase from reduced-tax sources - *Unable to determine with current data, but evidence of this behavior in existing literature*
- 4.) Reduce expenditures of other tobacco products - *Plausible, but our estimates are not statistically significant at conventional levels*
- 5.) Reduce expenditures of other household items - *Apparel and cash contributions reduced by 10%*
- 6.) Reduce savings - *No significant effect*
- 7.) Increase income/work more hours - *No significant effect*

Summary

- Preliminary evidence highlights a nuanced response among consumers.
- Following a \$1 tax increase, there was a notable 10% rise in quarterly spending on cigarettes by consumers, moving from a pre-treatment average of \$67.75 to \$74.93.
- This increase in spending is observed alongside a 5% decrease in cigarette unit sales, suggesting that while consumers are spending more money due to the tax, they are likely purchasing fewer cigarettes overall.
- We also find a decrease in non-cigarette tobacco spending. While statistically insignificant, it may suggest an economically significant negative effect.
- Additionally, we have run our DCDH models incorporating household fixed effects – these results are quite similar to those presented.

Summary

- We find no noticeable change in household savings or gross income levels post tax increase, indicating that the additional tax burden has not significantly altered these broader financial indicators.
- We also find that critical human capital building expenditures, such as food, housing, education, and healthcare remain largely unaffected by cigarette tax increases.
- However, there appear to be some adjustments within more flexible household expenditure categories, such as apparel and cash contributions. These shifts may reflect consumers' efforts to reallocate their spending in response to the increased cost of cigarettes.

Future Research

- Dis-aggregate current spending categories in ways that may more appropriately group together human capital formation activities.
- Explore a household fixed effect model specification stratifying by baseline smoking status and initial-interview income.

Thanks!

- For further questions/comments, please reach out to:

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