Economics of E-cigarettes: Background, Theory, and Evidence

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Slides updated 5/3/2021 and are "free use." Click here for most up-to-date slides. Please e-mail corrections / suggestions to mpesko@gsu.edu.

No tobacco or pharmaceutical company funding to report.

Dr. Pesko's e-cigarette research summary available here. Dr. Pesko's research goals are to provide causal evidence on the effect of e-cigarette policies, with the goal of reducing tobacco-related disease and death.

Combustible tobacco use is deadly and costly

- **480,000+:** Annual tobacco-related deaths in U.S.
- **$170 billion:** Annual tobacco-related health care costs in U.S.
- **5.6 million:** U.S. kids under 18 alive today who will ultimately die from smoking (unless smoking rates decline)
- **Seven million+:** Annual tobacco-related deaths worldwide
- **$1.4 trillion (USD):** Annual economic costs from smoking worldwide
- **One billion:** Worldwide deaths from tobacco this century unless urgent action is taken

Campaign for Tobacco-Free Kids

An alternative nicotine product

- E-cigarettes are part of a broader class of devices known as electronic nicotine delivery systems (ENDS).
  - Battery-powered devices that deliver nicotine vapor and varying levels of other chemicals and metals.

Are e-cigarettes a safer nicotine product?

- The National Academies of Sciences, Engineering, and Medicine (2018) in the United States state that e-cigarettes are not without risk, but compared to combustible tobacco cigarettes they contain fewer toxicants and are likely to be far less harmful than combustible tobacco cigarettes.
- The Food and Drug Administration does not believe that nicotine itself is harmful for non-pregnant adults besides causing addiction. The FDA states: “nicotine is what addicts and keeps people using tobacco products, but it is not what makes tobacco use so deadly.”
- One government review by Public Health England (2018) finds that e-cigarettes sold in England (which are regulated to a nicotine strength of no more than 20mg/ml) are substantially safer than cigarettes for non-pregnant adults.

Are e-cigarettes a safer nicotine product?

The Surgeon General (2016) warns in a report:

- "E-cigarette aerosol is not harmless. It can contain harmful and potentially harmful constituents, including nicotine."
- "Nicotine exposure during adolescence can cause addiction and can harm the developing adolescent brain."
  - Conclusion that nicotine harms the adolescent brain is based on studies of rodents.

Concerns about e-cigarette or vaping product use-associated lung injury (EVALI).

- Linked to vitamin E acetate mostly from informally-produced THC products.
- EVALI being initially wrongly attributed to e-cigarettes caused sharp increases in risk perception relative to cigarettes (Dave et al. 2020).
- Public risk perceptions of e-cigarettes are over-estimated, though not necessarily due to EVALI (Viscusi 2020).

Are e-cigarettes a safer nicotine product?

- Harm reduction is a standard part of public health policy, though its application to e-cigarettes is controversial.
  - Seat belts for cars
  - Bicycle helmets for bicycles
  - Condoms for risky sex
  - Needle exchange programs and methadone for substance use disorder
  - E-cigarettes for nicotine addiction?

Are e-cigarettes a safer nicotine product?

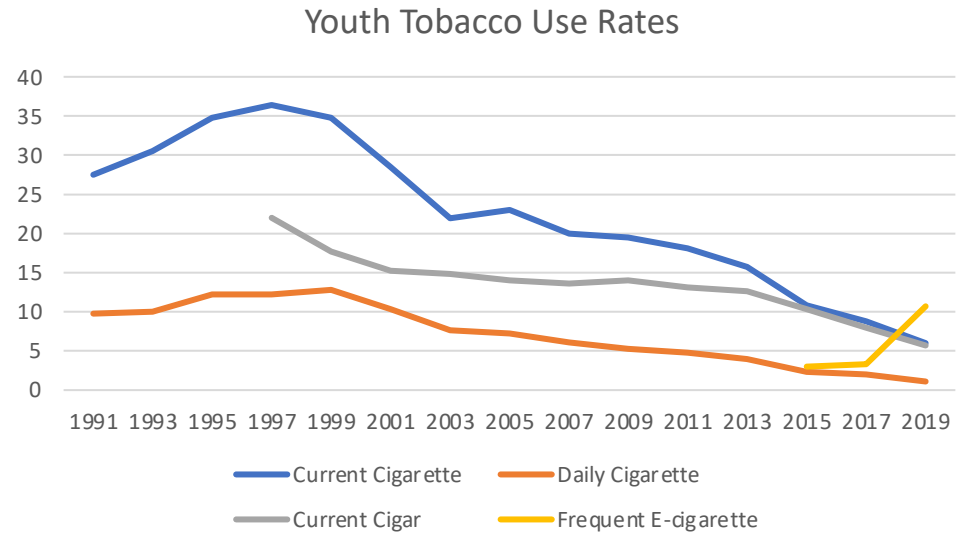
Unfortunately, individuals believe e-cigarettes are more harmful than they are.

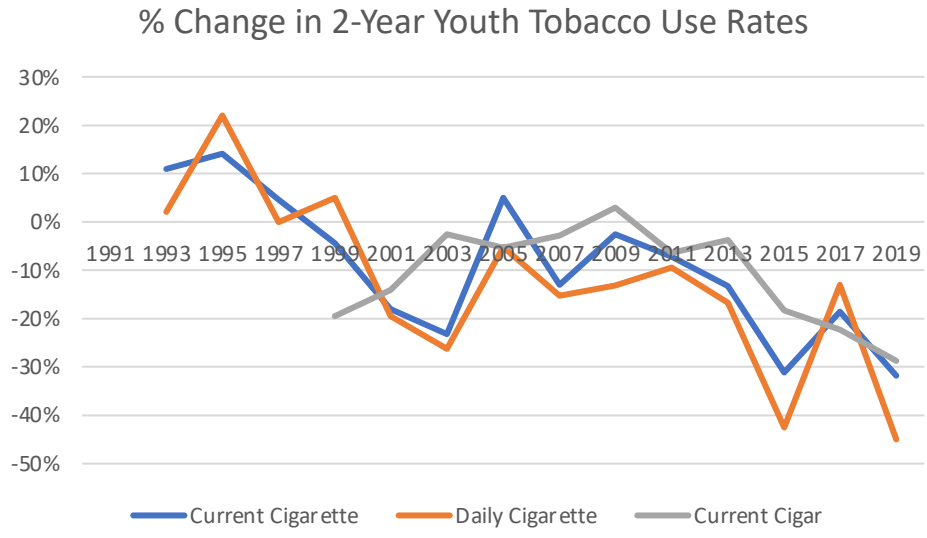
- 80% of U.S. physicians incorrectly believe that nicotine causes cancer (Steinberg 2020).
  - More physicians incorrectly believe that nicotine causes cancer than correctly believe that nicotine causes birth defects.
- 73% of U.S. respondents incorrectly believe that vaping products are as harmful or more harmful than cigarettes (Smoking's Long Decline Is Over – WSJ).

Are e-cigarettes effective smoking cessation products?

- A Cochrane review of the literature found that quit rates were higher in people randomized to nicotine e-cigarettes than to other nicotine replacement therapies, translating to approximately 4 extra quitters per 100 (Hartmann-Boyce 2020).
- One particularly strong study: A clinical trial of 886 smokers in England found that e-cigarettes are twice as effective in smoking cessation than other forms of nicotine replacement therapy (Hajek et al. 2019).

Prevalence



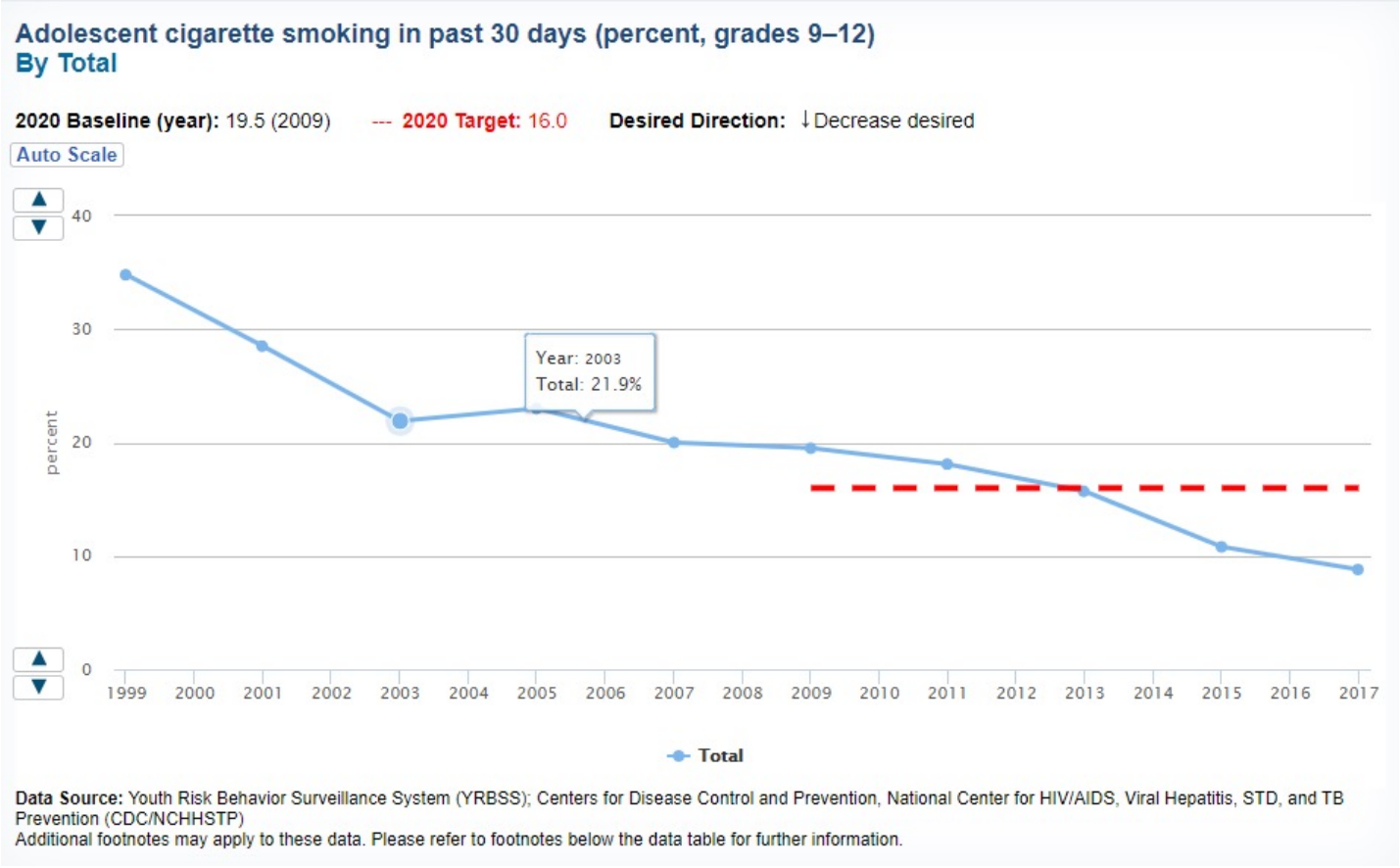


[Trends in the Prevalence of Tobacco Use National YRBS: 1991—2019 | YRBSS | Adolescent and School Health | CDC]

- Youth smoking rates continue declining, contrary to gateway prediction.
- In 2019, 32.9% of youth used an e-cigarette over the past 30 days, but only 10.7% used e-cigarettes frequently (20 or more days over the past 30 days).
- Particularly large declines in smoking in 2015 and 2019.
  - Daily smoking rates fell >40% in 2015 and 2019, compared to two years prior.
  - % change is a useful measure because it compensates for the hardening of smokers as levels fall.
  - E.g. It's easier to reduce smoking by 1 percentage point (pp) when the rate is at 15% than at 5%.

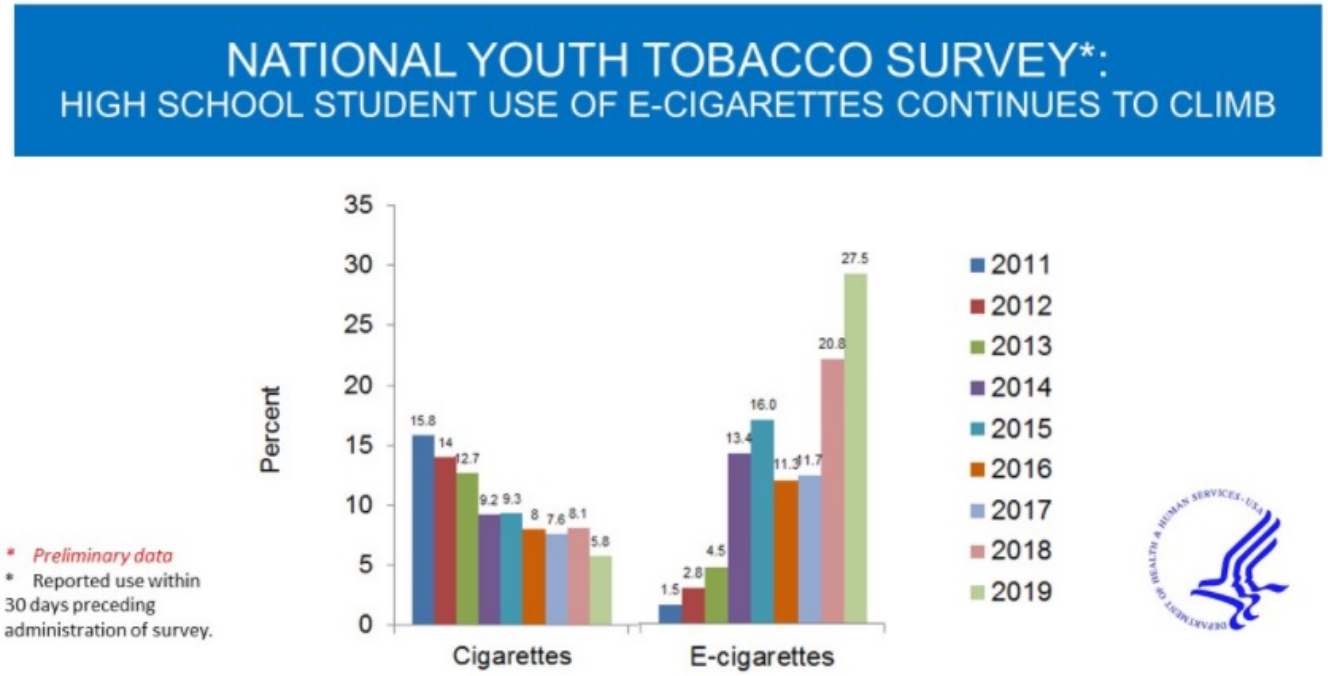
Prevalence

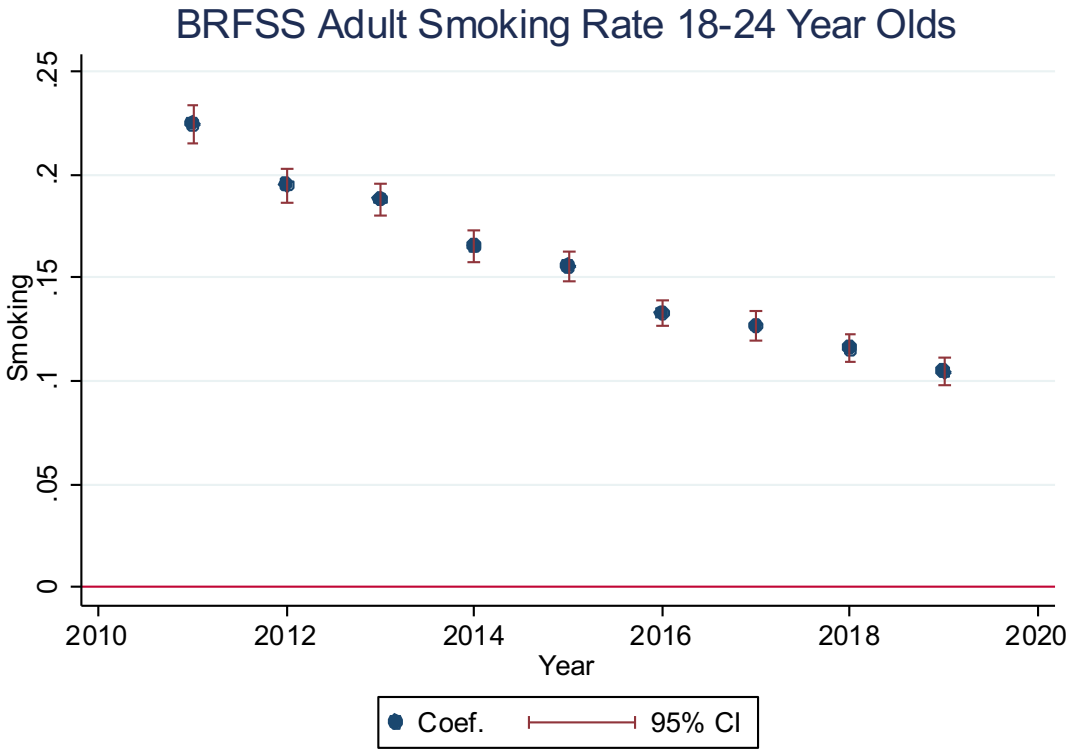
- In 2009, public health leaders in the United States targeted a 16% youth current cigarette use rate as their Healthy People 2020 goal.
- In the 2012 Surgeon General report, DHHS Secretary Kathleen Sebelius stated that "youth and adult smoking rates that had been dropping for many years have stalled."
- By 2019, the youth current cigarette use rate was 6%, thus crushing the Healthy People 2020 goal by 350%.



Data Chart | Healthy People 2020

Prevalence





- Pattern consistent across other data sources and for young adults.

Prevalence

- E-cigarettes are not as regularly used among adults, with adult current use at 4.9% in 2019.
- The adult current smoking rate, at 14% in 2019, has declined by a more modest 27.5% between 2011 to 2019 compared to the more rapid 63.3% decline for youth current cigarette use.
  - Could higher e-cigarette use among adults translate into the larger reductions in smoking seen among youth?
- E-cigarette use may be high among pregnant women smokers: In 2014-17, pregnant smokers were approximately 3x more likely to use e-cigarettes (38.9%) than non-pregnant reproductive age women smokers (Liu et al. 2019).
  - Pregnant women appear to be using e-cigarettes in high numbers for smoking cessation.

Prevalence

- So are e-cigarettes displacing cigarettes then?
- Appears so, but not according to the Surgeon General (2016) and National Academies of Sciences, Engineering, and Medicine (2018).
  - These scientific reports say e-cigarette use is strongly associated with the use of other tobacco products among youth and young adults.
  - Association does not imply causality, but some have used these data points to argue a causal gateway effect from e-cigarettes to cigarettes.
  - But arguing a gateway relationship makes little sense since cigarette use has fallen to record lows.
    - Some argument that declines in smoking follow historical trends, but the continuation of these declines does not support the gateway theory.

Improving Future Scientific Reports on E-cigarettes

- The Surgeon General report only used studies of current e-cigarette use on future cigarette use, without using a source of experimental (or quasi-experimental) variation in current e-cigarette use.
  - Likely large omitted variable bias affecting youths' propensity to vape today and smoke tomorrow.
  - Quasi-experimental studies published at the time of writing were not included in the report. Pesko and Warman 2021
- Click here for a video discussion for how quasi-experimental methods can be used to address methodological shortcomings of prior studies suggesting a gateway effect is present.

Summary: Correcting a Few Misperceptions

- E-cigarettes are more effective for smoking cessation than NRT. Cochrane
- Teen cigarette use continues to fall and is lower than any other point in recent time. YRBSS
- Nicotine alone does not cause cancer. Steinberg 2020
  - Messaging is important to at minimum not accidently communicate incorrect information about NRT.
- E-cigarettes contain fewer toxicants. National Academies of Sciences, Engineering, and Medicine
- Despite it's name, EVALI appears to be mostly due to contaminated, informally-produced THC vapes. CDC
  - Time to change the name to Vitamin E Acetate Lung Injury (VEALI)?
  - Historical precedent: Gay-related immune deficiency (GRID) was fortunately renamed AIDS, which reduced stigma and didn't mislead heterosexuals into feeling safe.
    - Similarly, 'EVALI' may stigmatize e-cigarette users trying to quit smoking, mislead THC users into feeling safe.
  - Accuracy in naming diseases is important to reduce their spread.

How might we think about optimally regulating e-cigarettes?

- *New England Journal of Medicine* perspective pieces suggest:
  - "We believe that national, state, and local policymakers should consider an approach that differentially taxes nicotine products in order to maximize incentives for tobacco users to switch from the most harmful products to the least harmful ones" (Chaloupka, Sweanor, Warner 2015).
  - "Consequently, the tax rate on e-cigarettes should be set so that it is cheaper to vape than to smoke. […]Furthermore, too high a tax on e-cigarettes will encourage vaping of lower-priced or black-market e-cigarettes, thus undermining the benefits of the tax" (Sindelar 2020).

Perhaps this same reasoning can be extended to non-monetary regulations as well (e.g. e-cigarette flavors sold in adult-only stores).

How might we think about optimally regulating e-cigarettes?

- Lillard 2020 provides a theoretical model in which nicotine is the primary object demanded by e-cigarette consumers, though other factors such as health and convenience are demanded as well.
- Demand considerations:
  - The shadow price of nicotine actually delivered into the bloodstream from a particular device
  - Social costs (or benefits) of using a device
  - Mental or health degradation suffered when using a device

- Levy et al. 2021 provide an overview of structural aspects of the e-cigarette marketplace in the United States, particularly as it relates to Altria-JUUL deal.

How might we think about optimally regulating e-cigarettes?

- Economics approach to maximizing social welfare.
  - Used by the FDA in the federal rulemaking process:

  Social benefit of e-cigarette regulation =
  reduced externalities + reduced internalities - lost consumer surplus
  - increased enforcement costs

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  Social benefit of e-cigarette regulation = reduced externalities + reduced internalities - lost consumer surplus - increased enforcement costs

  - Externalities are costs imposed on others, internalities are unrealized costs imposed on oneself.
    - Positive externalities/internalities may also exist, such as if e-cigarettes reduce cigarette use and/or are safer. These would be entered into the equation as a negative number.

How might we think about optimally regulating e-cigarettes?

- Economics approach to maximizing social welfare.
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  Social benefit of e-cigarette regulation = reduced externalities + reduced internalities - lost consumer surplus - increased enforcement costs

  - Consumer surplus is the price that individuals would pay for e-cigarettes beyond what they currently pay.
    - Concept: Consumer surplus monetizes "pleasure" that people receive from using e-cigarettes, which is reduced by regulation.

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  - increased enforcement costs

  - Enforcement costs include youth undercover buyer sting inspection programs, tobacco surveillance activities, and tobacco tax audits.
    - These costs are generally small currently, though attempting to criminalize tobacco would likely result in exploding enforcement costs (e.g. police, jails).

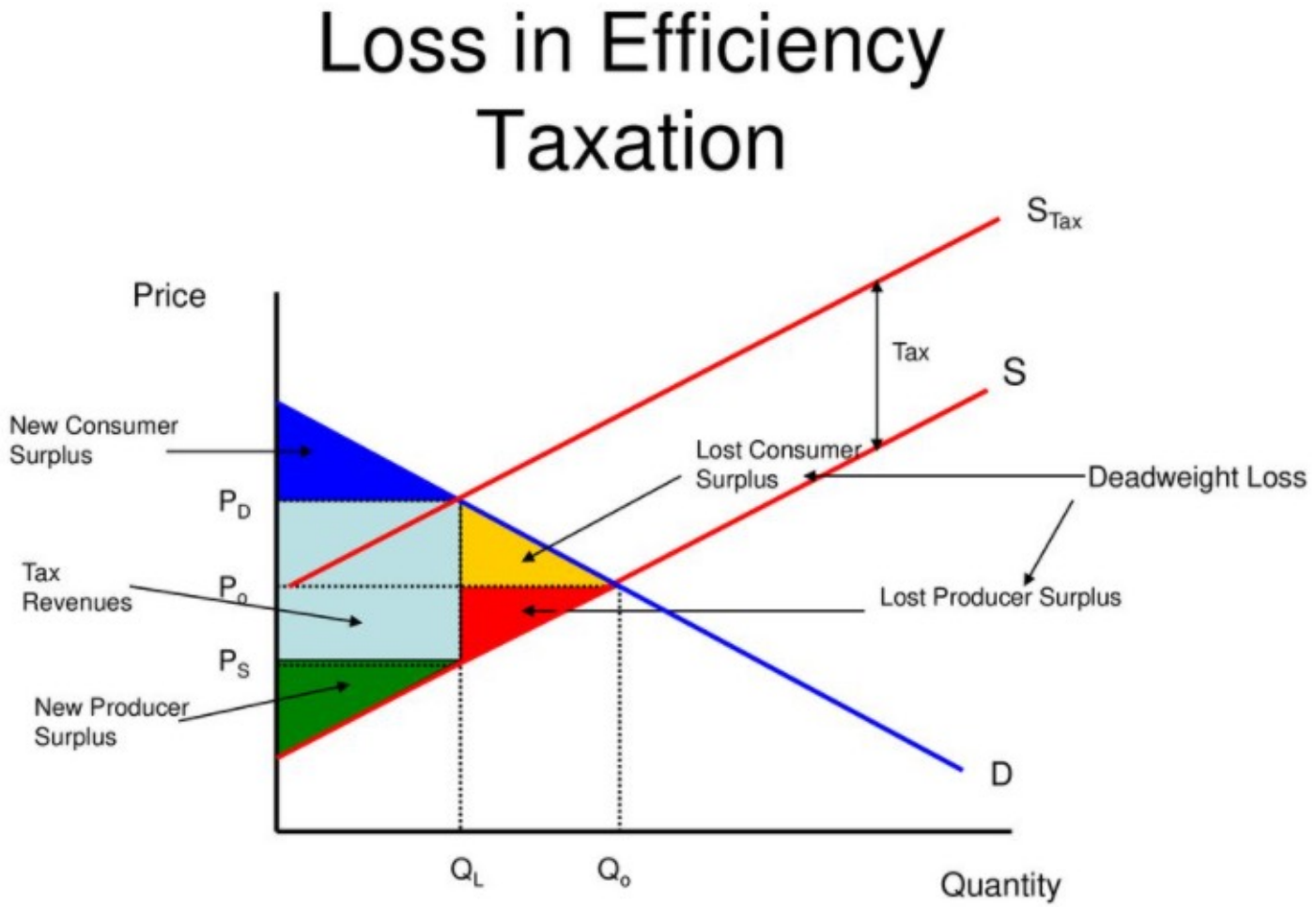
How might we think about optimally regulating e-cigarettes?

- Economics approach to maximizing social welfare.
  - Used by the FDA in the federal rulemaking process.

  Social benefit of e-cigarette regulation =
  reduced externalities + reduced internalities - lost consumer surplus - increased enforcement costs

  - If there is a negative social benefit of e-cigarette regulation, then the optimal policy is a subsidy rather than regulation.
    - Similar in concept to insurance paying for FDA-approved nicotine replacement therapy.

How might we think about optimally regulating e-cigarettes?



[Consumer and Producer Surplus - ppt download (slideplayer.com)]

History of E-cigarette Regulations in the USA

1) 2007: E-cigarettes first enter the United States market.
2) June 2009: Food and Drug Administration's Center for Tobacco Products (FDA-CTP) established by Congress, with broad authority to regulate tobacco products.
3) March 2010: In the absence of immediate e-cigarette regulations from the FDA-CTP, New Jersey implements the first e-cigarette minimum legal sale age (MLSA) and comprehensive indoor use ban (workplaces, restaurants, bars).

History of E-cigarette Regulations in the USA

4) August 2010: Administrative ruling in Minnesota results in the first e-cigarette tax in the nation.
5) April 2014: The FDA proposed new regulations to “deem” e-cigarettes and other tobacco products as subject to regulations by the FDA-CTP.
6) May 2016: FDA-CTP issues its final rule. Among other things, e-cigarettes are required to carry a warning label and a national e-cigarette MLSA of 18 was implemented.
7) August 2016: E-cigarettes on the market are eligible to submit a Pre-Market Tobacco Product Application (PMTA) by 2019 to become legally sold (later extended to 9/2020). Products introduced after this date are illegal, as well as products not submitting a PMTA.

History of E-cigarette Regulations in the USA

8) Dec. 2016: 7 states taxed e-cigarettes, and 11 states had statewide indoor use bans.

9) Nov. 2018: The FDA requests that e-cigarette manufacturers voluntarily comply with requests to not sell e-cigarettes online without strict age verification, limit bulk purchases of e-cigarettes, and remove flavored e-cigarettes from stores that minors can access. FDA threatens to remove e-cigarettes from store shelves if youth e-cigarette use is not lowered.

10) 2019: Under further scrutiny from the FDA and press, Juul voluntarily ceases selling flavors besides tobacco or menthol.

History of E-cigarette Regulations in the USA

11) Dec. 2019: Tobacco-21 law (covering all tobacco products including e-cigarettes) implemented nationally.

12) Jan. 2020:

- An e-cigarette ban goes into effect in San Francisco (although cigarettes remain on the market).
- 20 states have enacted e-cigarette taxes, 16 states have comprehensively banned the indoor use of e-cigarettes, and 8 states have imposed temporary bans on the sale of all e-cigarettes or flavored e-cigarettes.

13) Feb. 2020: FDA bans flavored, cartridge-based e-cigarette products (other than tobacco- or menthol-flavored products).

History of E-cigarette Regulations in the USA

14) July 2020: FDA bans sales by Puff Bar and other disposable closed-system e-cigarette products because they were not complying with FDA requests on flavors and were used in high numbers by youth.

15) Sept. 2020: PMTA applications due that demonstrate appropriateness of e-cigarettes for public health.

16) Feb. 2021: Puff Bar returns to the market with a synthetic “tobacco free nicotine” closed system product.

17) Sept. 2021: FDA scheduled to make decisions about PMTA applications, though this may be delayed.

Literature on Minimum Legal Sale Ages

- Three studies use difference-in-differences models and have found that e-cigarette minimum legal sale age (MLSA) laws increase teen smoking by approximately 0.8 to 1.0 percentage points (pp) (Friedman 2015; Pesko et al. 2016; Dave et al. 2019).
  - Friedman uses the National Survey on Drug Use and Health
  - Other studies use Youth Risk Behavior Surveillance System
- A fourth study also uses a difference-in-differences model and Monitoring the Future data to find that e-cigarette MLSAs decrease high school senior smoking participation by 2.0 pp (Abouk and Adams 2017).
- One study finds that e-cigarette MLSA laws reduce smoking cessation during pregnancy by 0.6 pp among rural, underage pregnant teenagers (Pesko and Currie 2019).

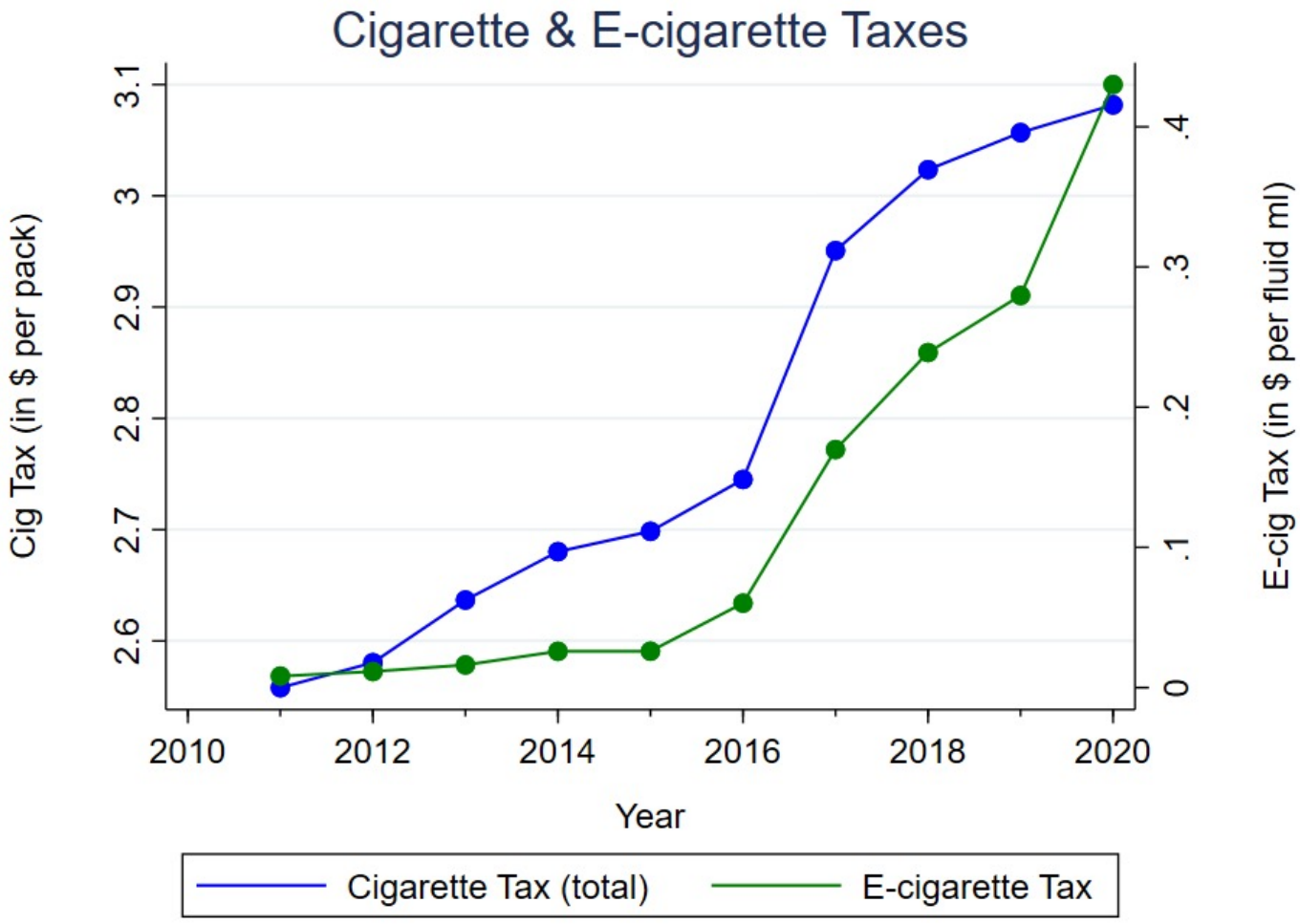
Literature on Minimum Legal Sale Ages

- One study (Nguyen 2020) uses Canadian data on youth e-cigarette use from 2013-17 to study province-level e-cigarette MLSAs.
- Difference-in-differences models suggest MLSAs:
  - Reduce e-cigarette use among youth by 4.3 pp (more than halving the increase that would otherwise occur).
  - Reduce belief that regular e-cigarette use poses no harm by 2.6 pp.
  - Increase self-reported greater difficulty in obtaining e-cigarettes by 6.2 pp.

Literature on E-cigarette Taxes

- Prices could be endogenous because of omitted variables affecting market-level e-cigarette demand and individual-level e-cigarette use.
- Solution is to use an exogenous source of variation in e-cigarette prices.
- One approach is to use a discrete choice experiment with experimental variation in e-cigarette prices (Pesko et al. 2016; Kenkel et al. 2020; Marti at al. 2019; Shang et al. 2020).
- Alternatively, explore the effect of e-cigarette taxes as a plausibly exogenous source of variation for prices.
  - One challenge is that e-cigarette taxes are levied differently across states: unit excise, ad valorem, sales, and two-tier.
  - Possible solution: Attempt to standardize the taxes.

Literature on E-cigarette Taxes



Standardized tax rate using Cotti et al. 2020 methodology.

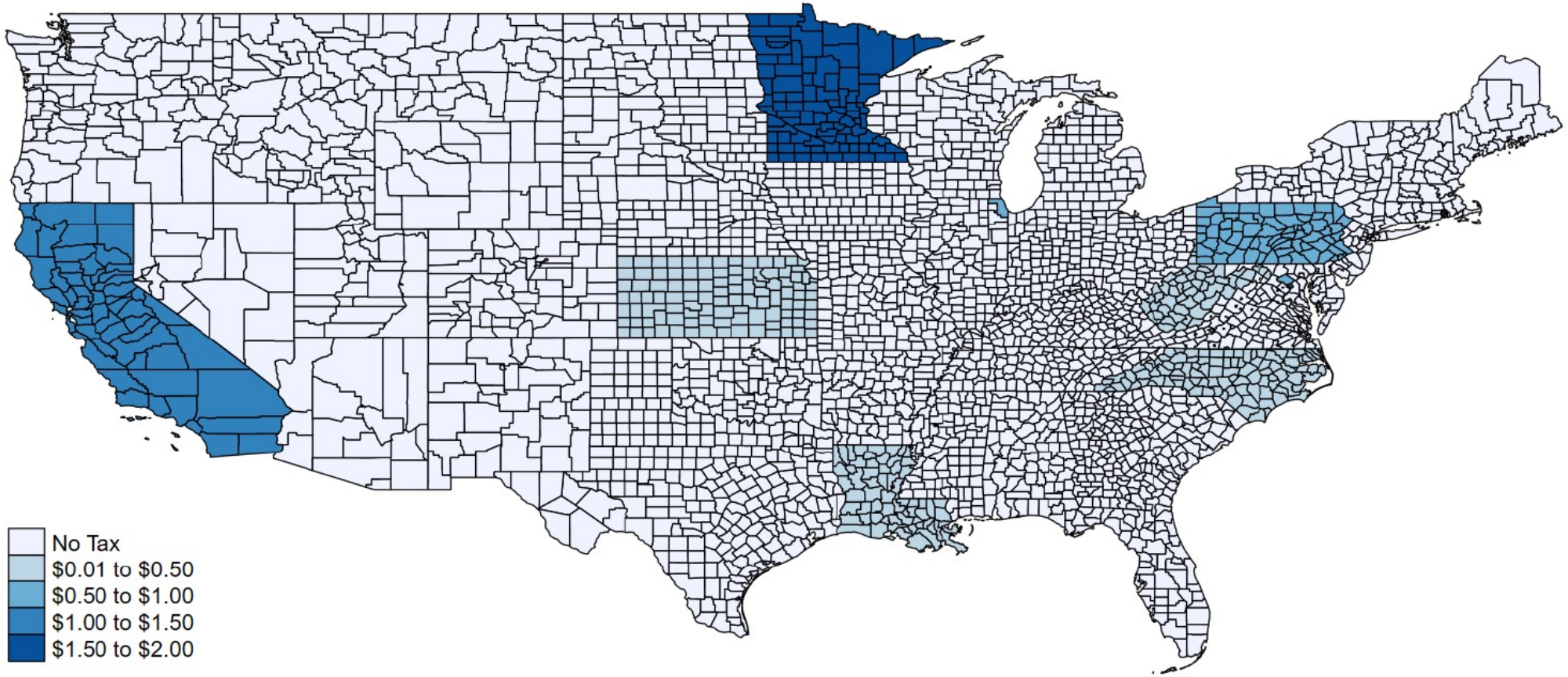
Estimating the Effect of E-cigarette Taxes Using Sales Data

- Study uses Nielsen retail sales data for 35,000 stores from 2011 to 2017 to estimate cigarette and e-cigarette price and tax responsiveness.
- Standardizes e-cigarette taxes by using market-level information and the fact that Washington DC and California equate their ad valorem e-cigarette tax to be equivalent to its cigarette excise tax.
- In 2017, MN had a tax equivalency of $1.85 per fluid ml, CA had a tax equivalency of $1.22 per fluid ml, NC had an excise tax of $0.05 per fluid ml.
- Click here for a presentation of this paper at Tobacco Online Policy Seminar.

Cotti, Courtemanche, Maclean, Nesson, Pesko, Tefft 2021

E-cigarette Taxes through 2017

Figure 1. Map of e-Cigarette taxes per ml of vaping liquid in 4Q 2017



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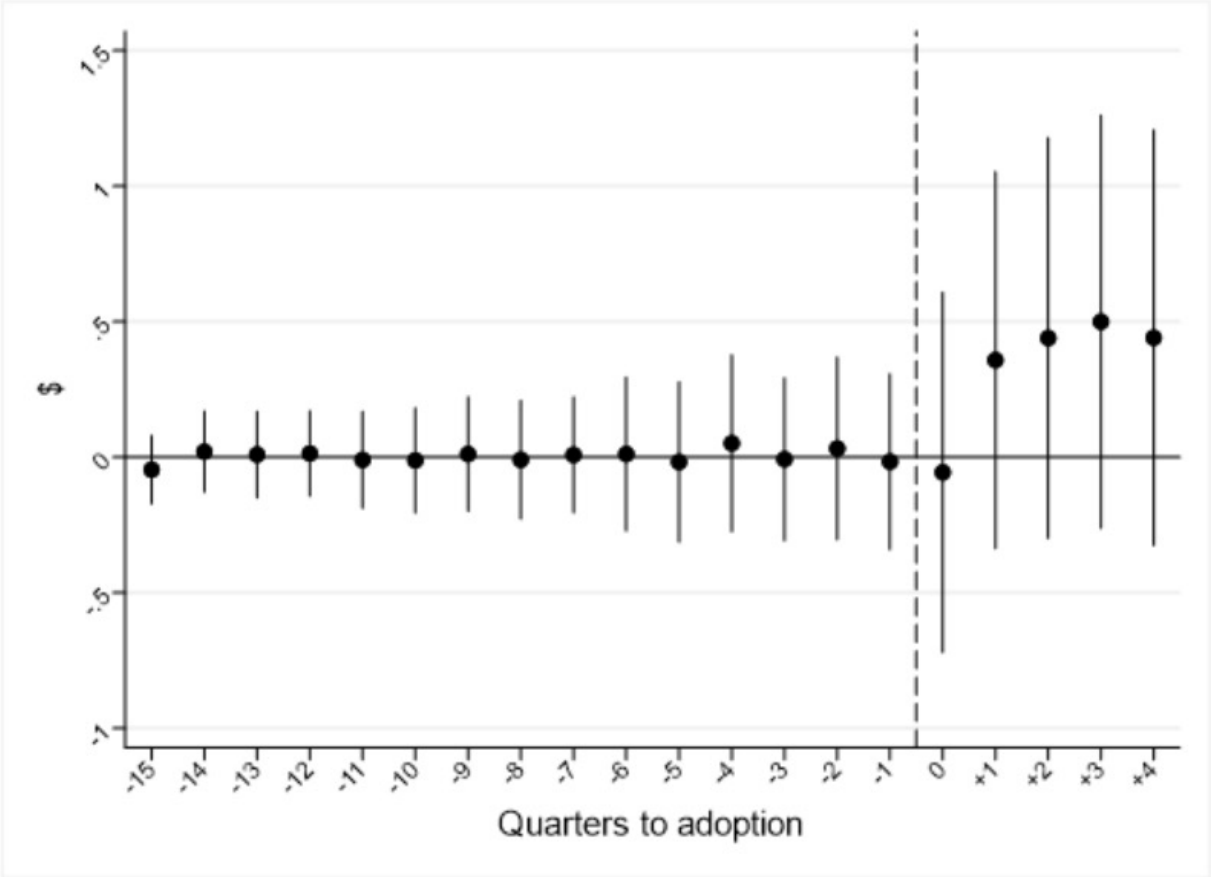
Effect of E-cigarette Tax Adoption on Prices



Notes: The unit of observation is a UPC-code in a locality (state or county) in a quarter (quarter-by-year). The model is estimated by equation (1) except using lag and lead indicators from the first available e-cigarette tax in a given locality. The model is estimated with least squares and controls for time-varying locality characteristics, UPC-by-locality fixed effects, and period (quarter-by-year) fixed effects. Circles reflect the coefficient estimate and vertical solid lines reflect 95% confidence intervals. The omitted category is ≥16 quarters prior to policy adoption.

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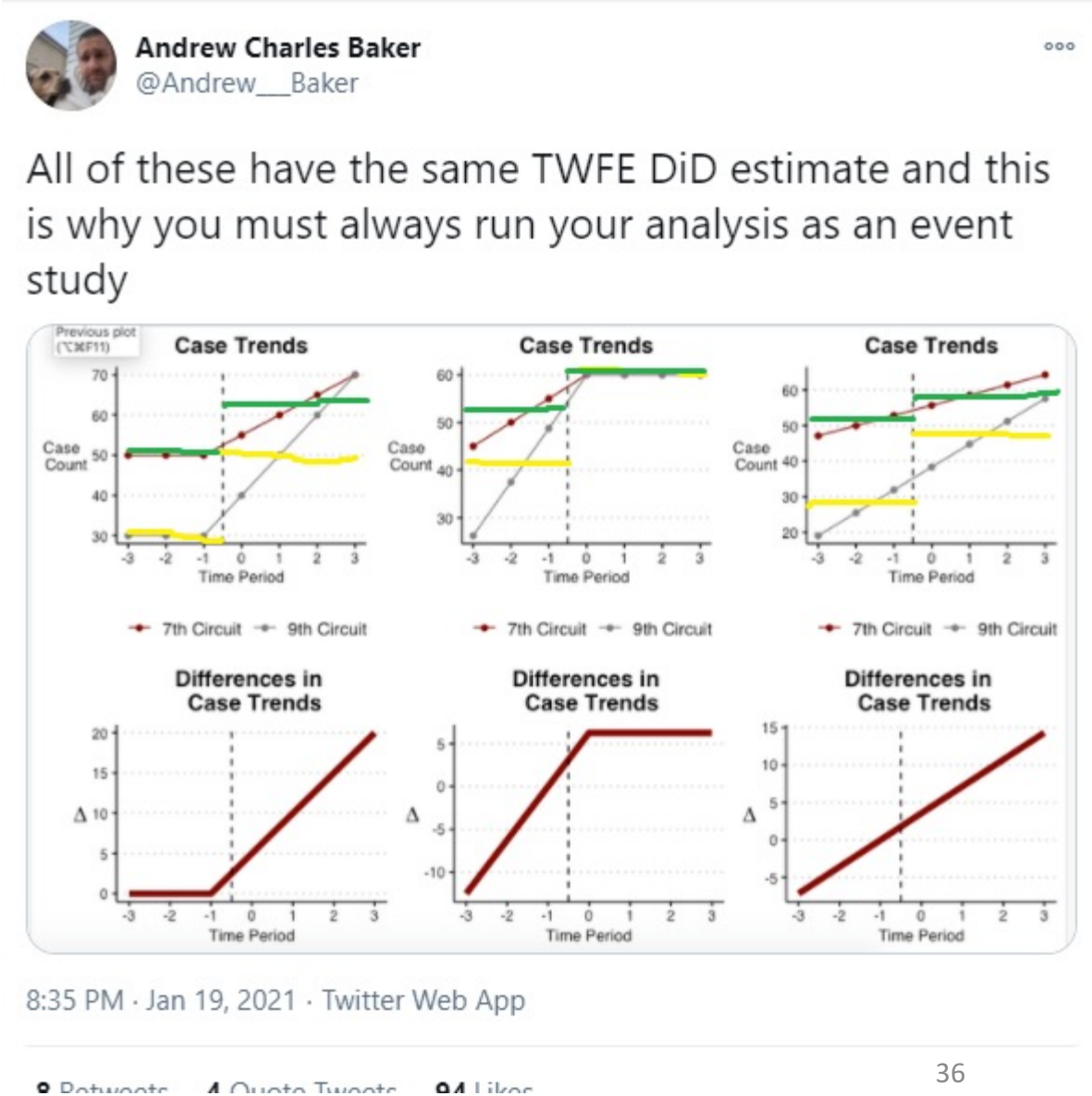
Why Explore the Parallel Trends Assumption?

- This event study figure shows that adopting locations had no changes in e-cigarette taxes *prior* to the adoption, which would otherwise violate the parallel trends assumption and cause a biased difference-in-differences estimate.
  - Trends could be non-parallel due to endogenous policy adoption—e.g. e-cigarette taxes were enacted because of falling e-cigarette prices, for example.
- Example on right:

Diff-in-diff = Δ yellow - Δ green

- Trends are parallel only on left



A $1 rise in the e-cigarette price reduces e-cigarette sales by 29% of the baseline mean.

Table 8. Effect of e-cigarette and cigarette prices on sales per 100,000 adults simultaneously instrumenting e-cigarette and cigarette prices with e-cigarette and cigarette taxes: NielsenIQ state-level sales data 2011-2017

Outcome:	E-cigarettes	Cigarettes
All states (e-cigarette tax rate standardized)		
E-cigarette price ($)	-378***	5,707**
	(104)	(2,251)
Cigarette price ($)	233**	-4,820*
	(91)	(2,492)
Observations	1428	1428
Mean: E-cigarette tax adopting localities, year prior to the tax†	1,307	56,470
Mean: Cigarette tax adopting localities, year prior to the first cigarette tax increase†	1,208	71,042

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The same $1 e-cigarette price rise increases cigarette pack sales by 10%.

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A $1 rise in cigarette price reduces cigarette sales by approximately 7%.

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The same $1 rise in cigarette price increases e-cigarette sales by approximately 19%.

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Neither tax appears to affect sales for cigars, chewing tobacco, or loose tobacco.

Table 10. Effect of e-cigarette and cigarette prices on cigar, chewing tobacco, and loose tobacco sales per 100,000 adults simultaneously instrumenting e-cigarette and cigarette prices with e-cigarette and cigarette taxes: NielsenIQ state-level sales data 2011-2017

Tobacco product:	Cigars	Chewing tobacco	Loose tobacco
E-cigarette price ($)	-259	66	-76
	(298)	(346)	(67)
Cigarette tax ($)	58	-222	-3
	(323)	(266)	(76)
Observations	1428	1428	1428
Mean: E-cigarette tax adopting localities, year prior to the tax	4,382	5,448	557
Mean: Cigarette tax adopting localities, year prior to the first cigarette tax increase	3,961	2,722	580

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Literature on E-cigarette Taxes

- Estimates an e-cigarette tax-to-price pass through rate of approximately 1.4
- Uses an instrumental variable model to estimate:
  - E-cigarette own-price elasticity of -1.3
  - Cigarette cross-price elasticity of 1.1
  - E-cigarette cross-price elasticity of 0.5
- From this, we estimate that for each e-cigarette pod (0.7 ml) no longer purchased due to an e-cigarette tax, the same tax increases cigarette packs purchased many times over.
  - This large substitution may be due to:
    - An e-cigarette typically contains nicotine equivalent to that in 1-2 packs of cigarettes
    - Cigarette market size is 30x e-cigarette market size
    - E-cigarettes are a highly disruptive product that appears to be displacing the combustible cigarette market

Cotti, Courtemanche, Maclean, Nesson, Pesko, Tefft 2021

Literature on E-cigarette Taxes

- Uses National Health Interview Survey (NHIS) and Behavioral Risk Factor Surveillance System (BRFSS) data from 2013-18 to find:
  - Evidence that higher e-cigarette tax rates reduce adult e-cigarette use and increase adult cigarette use (i.e. economic substitution).
  - Symmetrical effects using cigarette tax rates.
  - Results suggest that a proposed national e-cigarette tax of $1.65 per milliliter of vaping liquid would raise the proportion of adults who smoke cigarettes daily by approximately one pp, or 2.5 million extra adult daily smokers.

Pesko, Courtemanche, Maclean 2020

Literature on E-cigarette Taxes

- Uses national birth record data from 2013-18 to find that a $1 increase in the standardized e-cigarette tax:
  - Increases pre-pregnancy and prenatal smoking by ≈ 0.4 pp (7.5% of the mean)
  - Reduces smoking cessation during pregnancy using a panel data model
  - No effect on birth outcomes
- Uses Pregnancy Risk Assessment Monitoring System data from 2016-18 to find that a $1 increase in the standardized e-cigarette tax:
  - Reduces pre-pregnancy vaping by 1.3 pp (31.7%)
  - Reduces 3rd trimester vaping by 0.9 pp (81.8%).
- Approximately 1 in 3 pregnant women that stops using e-cigarettes due to an e-cigarette tax smokes cigarettes instead (through less smoking cessation).

Abouk, Adams, Feng, Maclean, Pesko 2019

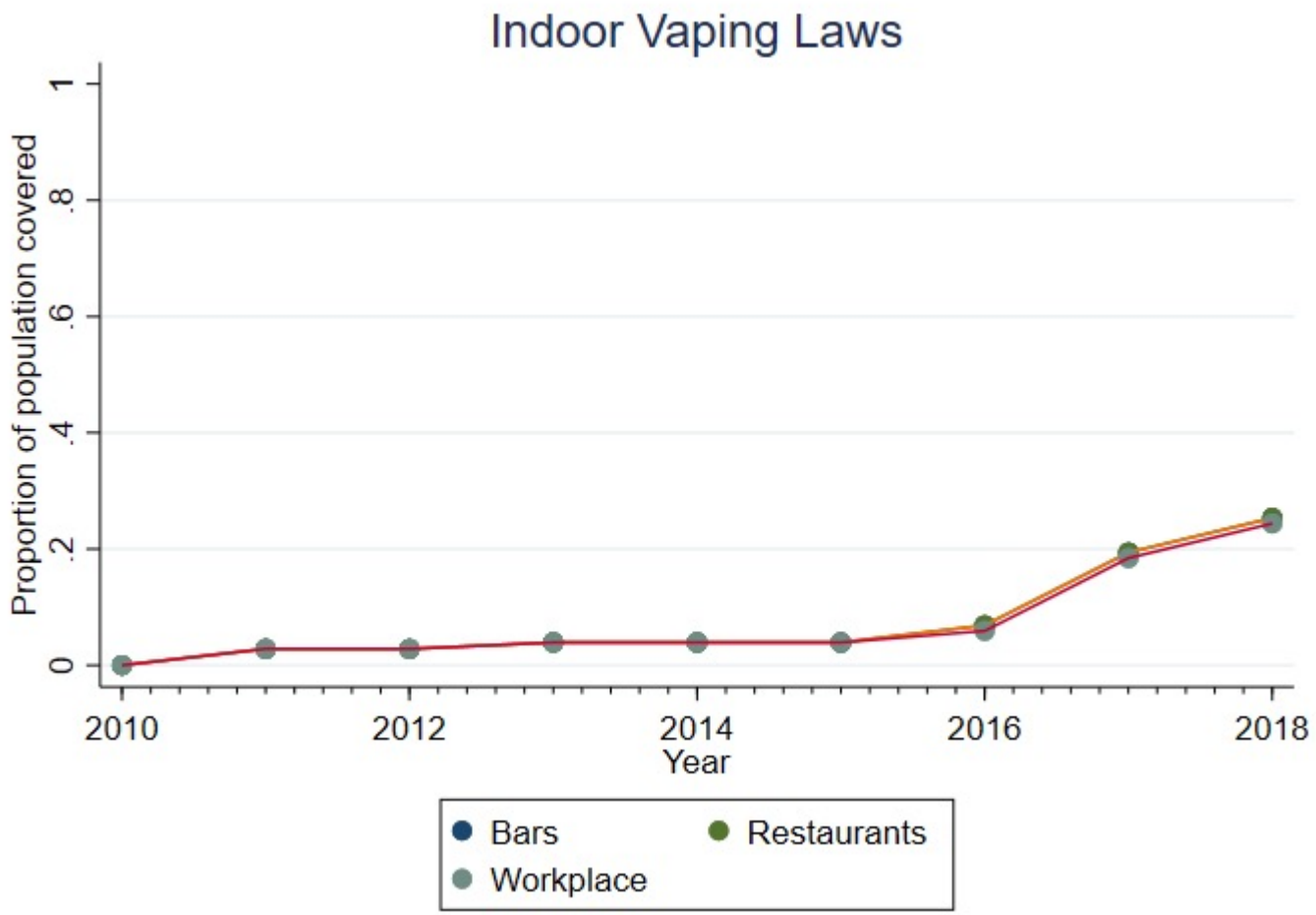
Literature on E-cigarette Taxes

- Saffer et al. 2020 study the effect of e-cigarette taxes in Minnesota using synthetic controls, finding that e-cigarette taxes increase adult smoking and reduce smoking cessation.
  - Smoking participation with respect to e-cigarette prices of 0.13.
- Allcott and Rafkin 2020 use the pre-2013 smoking propensities for 800 adult demographic cells and 56 youth demographic cells to implement a shift-share strategy to examine the impact of wide use of e-cigarettes starting in the year 2013 on smoking rates.
  - Coefficient estimates without time trends suggest substitution
  - Coefficient estimates with time trends suggest no effect
  - Click here for a presentation of this paper at Tobacco Online Policy Seminar.

Literature on E-cigarette Taxes

- Pesko and Warman 2021 use price and tax variation to find evidence of economic substitution among youth through 2015.
- Anand and Kadiyali 2020 explore the effect of e-cigarette taxes on youth social media postings.
  - 388,593 user-posted images on social media from Jan 2016 to Dec 2018 measure the impact of greater taxes on underage posting behavior.
  - Synthetic control group methods.
  - Large e-cigarette taxes in California and Pennsylvania decreased underage postings, but not small e-cigarette taxes in Kansas and West Virginia.

Literature on E-cigarette Indoor Vaping Restrictions



Literature on E-cigarette Indoor Vaping Restrictions

- Cooper and Pesko 2017 use national birth record data from 2010-15 to find that indoor vaping bans:
  - Increase any prenatal smoking by 0.9 pp using a cross-sectional model
  - Increase smoking in a given trimester by 2.0 pp using a panel data model
  - No effect on immediate birth outcomes
  - In a follow-up paper, indoor vaping bans increased infant mortality (Cooper and Pesko 2020).
- Nguyen and Bornstein 2020 use Canadian data and find:
  - No statistically significant change in e-cigarette use (0.004)
  - No statistically significant change in combustible cigarette use, though the coefficient (0.009; 95% CI −0.019 to 0.037) is fairly large

Literature on E-cigarette Indoor Vaping Restrictions

- Friedman, Oliver, Busch 2021 find no added effect of indoor vaping restrictions on e-cigarette use, cigarette use, or smoking cessation beyond that explained by indoor smoking restrictions using NHIS data from 2014-2018.
- Cotti, Nesson, Tefft 2018 find no evidence of e-cigarette indoor vaping restrictions affecting household purchases of e-cigarettes or cigarettes.

Literature on E-cigarette Advertising

- Dave et al. (2019) study the causal effect of whether e-cigarette advertising on television and in magazines encourages adult smokers to quit.
- Authors use detailed information on individual-level TV and magazine viewing patterns in the Simmons National Consumer Survey, which contains information on smoking.
- Authors match this individual-level viewing information to all e-cig ads aired on national and local broadcast and cable stations and all ads published in magazines from Kantar Media.
- Quasi-random variation in advertising exposure provides a credible strategy to identify the causal effects of advertising.
- Authors find TV advertising causally impacts smoking cessation, but magazine advertising does not.
- The results indicate that a policy banning TV advertising of e-cigs would have reduced the number of smokers who quit in the recent past by approximately 3%.

Literature on E-cigarette Advertising

- Tuchman (2019) studies the effects of e-cigarette advertising on e-cigarette, cigarette, and nicotine replacement therapy sales and purchases by exploiting a discontinuity in local advertising markets, using stores and households right along advertising market borders.
- Data:
  - Nielsen retail and household scanner data from 2012-2015.
  - Product level advertising data from Nielsen, showing increases in e-cigarette television advertising mid-2012.
- In the absence of e-cigarette advertising,
  - E-cigarette sales would have been 0.9% lower.
  - Cigarette sales would have been 1.0% higher.
    - 130 million extra packs of cigarettes.
  - Nicotine replacement therapy product sales 1.0% higher.

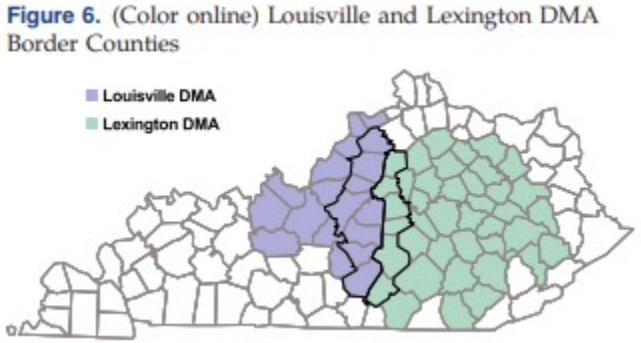


Figure 6. (Color online) Louisville and Lexington DMA Border Counties

Summary of E-cigarette Research

- Using quasi-experimental variation in e-cigarette use from e-cigarette policies, most studies suggest that e-cigarettes reduce smoking.
  - E-cigarette policies studied:
    - MLSAs
    - Taxes
    - Indoor vaping restriction
    - Advertising restrictions
- E-cigarette policies also have the intended effect of reducing e-cigarette use.

Conclusion:
Economics Approach to E-cigarette Regulation

- If e-cigarettes are substantially safer than cigarettes, this would suggest socially optimal e-cigarette policy is low regulation of e-cigarettes or subsidizing e-cigarettes (e.g. free e-cigarettes for adults that want to quit).
  - If youth have time-inconsistent preferences, or nicotine is more dangerous for youth than adults, this could motivate higher regulation for youth.
- Over-regulation of e-cigarettes can have negative unintended consequences.
  - EVALI cases higher in places where residents do not have legal access to marijuana dispensaries (Wing et al. 2020)
  - FDA approval of crush-resistant OxyContin in 2010 did not reduce overall abuse, and increased heroin use and other adverse events.
  - An economics approach to regulation can help avoid unintended and unanticipated harmful events.

If You'd Like to Learn More…

- Tobacco Online Policy Seminar (TOPS)
  - www.tobaccopolicy.org
  - Seminar every two weeks highlighting experimental and quasi-experimental research.
  - Averages >100 attendees per seminar.
  - Submit your research through the TOPS website for consideration.
  - Sign-up for mailing list through the website.

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