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ABSTRACT

E-cigarette taxes are an active area of legislation and have important regulatory implications by proxying e-cigarette accessibility. We examine the effect of e-cigarette taxes on pre-pregnancy and prenatal smoking using the near-universe of births to mothers conceiving between 2013 and 2019 in the United States. Using fixed effect regressions, we show that e-cigarette taxes increase pre-pregnancy and prenatal smoking. We also find evidence that e-cigarette taxes reduce pre-pregnancy and 3rd trimester e-cigarette use. Finally, we show that e-cigarette taxes increase news coverage of e-cigarettes and raise perceptions of risk of e-cigarettes.

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1. Introduction

Our goal in the current paper is to provide the first evidence on the effect of e-cigarette taxes on pre-pregnancy and prenatal smoking. Prenatal smoking is a major public health concern in the United States (U.S. Department of Health and Human Services, 2022). Using national birth record data, we calculate that in 2019, 7.7% of women smoked pre-pregnancy, 5.8% of women smoked in the 1st trimester, 5.0% of women smoked in the 2nd trimester, and 4.7% of women smoked in the 3rd trimester. These falling rates suggest that pregnant women are potentially highly motivated to quit smoking, with 39.2% of pre-pregnancy smokers able to quit by the 3rd trimester. Pregnant women may be motivated to quit smoking in part to improve birth outcomes. Infants born to women smoking in the 3rd trimester were almost twice as likely to have experienced low birthweight, 48% more likely to have been born prematurely, and 1.5 times less likely to have survived their first year of life, compared to infants born to women who did not smoke during pregnancy.[1] Quasi-experimental evidence using policy variation in cigarette taxes supports descriptive evidence that smoking reduces birth weight (McGeary et al., 2019, Evans and Ringel, 1999, Lien and Evans, 2005), and increases risk for premature birth (McGeary et al., 2019) and infant mortality (Sen and Piérard, 2011, Markowitz, 2008).

According to the 2019 Pregnancy Risk Assessment Monitoring System (PRAMS), 62.4% of nearly 40% of women that quit during pregnancy remained abstinent through four months postpartum. Therefore, while prenatal smoking is a major public health concern, the available evidence also suggests that the prenatal period presents an opportunity for women to successfully quit smoking, both for the duration of the pregnancy and beyond.

[1] Based on our own descriptive calculations using 2019 data.

Using policy tools to raise the direct or indirect costs of smoking, such as cigarette taxes and smoking indoor air laws, has generally been found to reduce prenatal smoking rates (McGeary et al., 2019, Lien and Evans, 2005, Evans and Ringel, 1999, Colman et al., 2003). However, there is concern that traditional tobacco control policies like cigarette taxes have less impact on smoking outcomes among pregnant women now than in earlier time periods (Hoehn-Velasco et al., 2022),[2] thus increasing the importance of identifying alternative strategies to reduce prenatal smoking.

One potential strategy is to encourage, or at least not actively discourage, the use of alternative nicotine products among pregnant women. These alternative products include nicotine replacement therapies (NRT) such as gum, patches, and lozenges; and more recently, electronic cigarettes, or "e-cigarettes." E-cigarettes were first imported to the U.S. in 2006 (Consumer Advocates for Smoke-free Alternatives Association, 2022). The U.S. National Academies of Sciences, Engineering, and Medicine (2018) state that e-cigarettes are not without risk, but compared to cigarettes they contain fewer toxicants and are likely to be far less harmful for non-pregnant adults. Pregnant adults are not included in this relative risk statement because nicotine in both e-cigarettes and combustible tobacco is believed to impair fetal development (Steinberg et al., 2021). However, the United Kingdom's National Health Service state that e-cigarettes are less dangerous than cigarettes for pregnant adults, as they do not produce tar or carbon monoxide, the latter of which is particularly harmful to developing babies (National Health Service, 2023).

[2] Hoehn-Velasco et al. (2022) show evidence that taxes experienced in-utero significantly alters the composition of later-life prenatal smokers, thus potentially contributing to lower prenatal smoking tax responsiveness in recent decades.

Many Americans use e-cigarettes, including pregnant women. According to our own calculations using National Health Interview Survey (NHIS) data, between 2014 and 2019,[3] 28.9% of pregnant smokers used e-cigarettes during their pregnancy versus 12.5% of non-pregnant reproductive age (18-49) women smokers. Over the same time period, e-cigarette use rates among female non-smokers were much lower: 0.3% for pregnant female non-smokers and 2.0% for reproductive-age female non-smokers. According to 2016-19 PRAMS data,[4] 80.1% of 3rd trimester e-cigarette users smoked pre-pregnancy and 61.0% of them smoked in the 3rd trimester. These descriptive statistics provide suggestive evidence that pregnant women smokers use e-cigarettes during pregnancy to try to quit smoking.

As discussed earlier, 39.2% of pre-pregnancy smokers quit smoking in 2019; therefore, these women are plausibly highly motivated to quit. This high motivation may drive interest among prenatal smokers in the use of alternative nicotine products to quit smoking. While some of this demand could be captured by NRT products, healthcare professionals in the U.S. rarely recommend or prescribe NRTs to pregnant women (Kapaya et al., 2015), possibly in part because of accurate perceptions that nicotine is a developmental toxicant and also because of inaccurate perceptions that nicotine causes cancer, chronic obstructive pulmonary disease, and cardiovascular disease (Steinberg et al., 2021). The lack of NRT recommendation/prescribing for pregnant women may help explain why policy evaluation research has found limited effect of expanding NRT coverage during pregnancy to Medicaid recipients (Adams et al., 2013).

There is evidence from randomized controlled trials (RCTs) that show that NRT and e-cigarettes reduce prenatal smoking at least in the short-term and possibly improve the infant's

[3] E-cigarette questions were added to NHIS in 2014.
[4] E-cigarette questions were added to the core PRAMS module in 2016.

early childhood health outcomes. A Cochrane review finds evidence that NRT usage increases the likelihood of smoking abstinence in late pregnancy, but there is insufficient evidence on improving birth outcomes (Claire et al., 2020). One RCT that randomizes nicotine patches versus placebos shows reductions in prenatal smoking that dissipate by delivery (Coleman et al., 2012). Birth outcomes are statistically identical between the treatment and control groups (Coleman et al., 2012), but at two-year follow-up infants born to mothers prescribed nicotine patches are less likely to have impaired development (though postnatal smoking rates were not any different across arms) (Cooper et al., 2014). The finding that reduced smoking during pregnancy leads to improved later-life outcomes for the child has been documented using quasi-experimental evidence as well (Simon, 2016, McGeary et al., 2019, Settele and Ewijk, 2018, Hoehn-Velasco et al., 2022). Together, these findings raise the prospect that short-term reductions in smoking can lead to longer-term improvements in child development that are not captured in birth outcome data.

If motivated pregnant smokers are not encouraged to use NRT products by healthcare professionals, they may look to commercial products, such as e-cigarettes, for help with smoking cessation. There is considerable disagreement regarding whether e-cigarettes should be used among pregnant smokers. The Centers for Disease Control and Prevention's (CDC) messaging is to head off all e-cigarette use during pregnancy, warning that “e-cigarettes and other products containing nicotine are not safe to use during pregnancy” (Centers for Disease Control and Prevention, 2019). In contrast, the United Kingdom’s National Health Services' messaging acknowledges benefits: “If using an e-cigarette helps you to stop smoking, it is much safer for you and your baby than continuing to smoke” (National Health Service, 2023). Clinical trial evidence finds that e-cigarettes are *more* effective for cessation than NRTs for adults generally

(Hajek et al., 2019) and for pregnant women specifically (Hajek et al., 2022). The latter study finds that low birthweight is less common in the e-cigarette trial arm versus the nicotine patch trial arm, but other birth outcomes are similar (Hajek et al., 2022).

Despite healthcare professionals' hesitation, there is emerging evidence that for some mothers both e-cigarettes and NRTs help reduce prenatal smoking, improve birth outcomes, and possibly improve infant health outcomes. This body of work primarily consists of RCTs testing e-cigarettes used in clinical settings; however, the generalizability of RCT findings to e-cigarettes sold as consumer products in real world markets is unclear (Wang et al., 2021). Quasi-experimental work using e-cigarette policy variation can shed light on this important unanswered question in real world settings.[5] This question has timely and important regulatory implications in the U.S. as the Food and Drug Administration's (FDA) Center for Tobacco Products is in the process of evaluating whether individual e-cigarette products have overall benefit to public health, which is necessary for them to be approved for legal sale in the U.S.[6]

2. Background and related literature

As of the end of our study period in 2019, 21 states, counties, and cities with sizable populations (500,000 or more residents) have levied e-cigarette taxes. These taxes are levied in different ways, including through excise taxes on liquid volume and number of containers, ad valorem taxes, and through sales taxes. Cotti et al. (2021) standardize these tax values into excise

[5] If e-cigarettes help mothers quit smoking during pregnancy and post-partem, this could offer important benefits to the mother's own health independent of any effect it has on birth outcomes. Such cessation could also impact the infant's later-life health outcomes such as through less secondhand smoke exposure. Thus, from a policy perspective the effect of e-cigarette taxes on both prenatal smoking and birth outcomes are independently important.

[6] To date, 23 unflavored e-cigarette products from three companies have been approved, thousands of e-cigarette products remain under review, and more than one million e-cigarettes have been denied (U.S. Food & Drug Administration, 2022, U.S. Food & Drug Administration, 2021). Approval can be rescinded at any time if insufficient evidence exists that these products are benefiting public health. E-cigarettes that are under review can be sold through enforcement discretion.

tax per fluid milliliter (ml) equivalency, and show substantial variation across states in the size of these taxes from as low as $0.05 to as high as $2.53 per fluid ml.

A primary mechanism through which e-cigarette taxes can lead to changes in e-cigarette use and cigarette use is by raising the price of e-cigarettes. Cotti et al. (2022) document that e-cigarette taxes are passed through to e-cigarette retail prices at a rate of 0.90, suggesting that a $1.00 tax increase leads to a $0.90 rise in prices.

A small but growing number of studies use e-cigarette tax rates to estimate cigarette own- and cross-tax elasticities. Three studies find evidence that higher e-cigarette tax rates reduce e-cigarette use and increase cigarette use for adults (Pesko et al., 2020),[7] young adults (Friedman and Pesko, 2022), and teenagers (Abouk et al., 2023).[8] From sales data, studies find evidence that e-cigarette taxes reduce e-cigarette sales (Allcott and Rafkin, 2022, Cotti et al., 2022), with one of these also finding evidence that e-cigarette taxes increase cigarette sales (Cotti et al., 2022)[9] and the other finding more limited evidence for this relationship (Allcott and Rafkin, 2022) .[10,11] Recent research shows that Minnesota's 2013 e-cigarette tax increase reduces adult smoking cessation (Saffer et al., 2020) and increases teen smoking (Pesko and Warman, 2022).

[7] Per our calculations, we estimate daily e-cigarette own-tax elasticity of -0.109 and cross-tax elasticity of 0.041.
[8] In Table 3, the authors report an e-cigarette own-tax elasticity on current e-cigarette use of -0.075 using Monitoring the Future (MTF) data and -0.164 using Youth Risk Behavior Surveillance System (YRBSS) data. In Table 5, the authors report an e-cigarette cross-tax elasticity on current cigarette use of 0.123 using MTF data and 0.041 using YRBSS data.
[9] In the Table 2 full specification, the authors find an e-cigarette own-tax elasticity of -0.60 and an e-cigarette cross-tax elasticity of 0.12.
[10] The authors do not report tax elasticities. In Table 1b, they find some evidence that cigarette prices are positively associated with e-cigarette sales (cross-price elasticity = 0.42 in fully-specified model). In Online Appendix Table A3, they examine the effect of e-cigarette prices on the demand for cigarettes. Here, they find evidence that higher e-cigarette prices increase sales of cigarettes (column 5 shows a cross-price elasticity of 0.76), though when area-specific linear trends are added these results switch sign (cross-price elasticity = -0.26 in column 6).
[11] Several studies use price variation (without instrumentation or use of quasi-experimental variation) to document that e-cigarette purchases fall as e-cigarette prices rise (Stoklosa et al., 2016, Huang et al., 2018, Pesko et al., 2018, Zheng et al., 2017, Pesko et al., 2016b, Marti et al., 2019, Cantrell et al., Pesko and Warman, 2022). A number of studies additionally use market-level price variation to study cross-price elasticities of demand, without a consensus

Additionally, several studies use policy variation from e-cigarette minimum legal sale age (MLSA) laws to estimate the relationship between e-cigarettes and cigarettes. MLSAs increase the non-pecuniary (or hassle) cost of e-cigarettes as youth below the MLSA are prohibited from legally purchasing the product. Friedman (2015), Pesko et al. (2016a), Pesko (2023), and Dave et al. (2019) show evidence of substitution: following MLSA passage, youth cigarette use increases. Among subgroups, Pesko and Currie (2019) find similar evidence of substitution among rural pregnant teenagers but Abouk and Adams (2017) find evidence of complementarity among 12th grade students.

E-cigarette indoor air laws have also been found to increase prenatal smoking (Cooper and Pesko, 2017) and infant mortality (Cooper and Pesko, 2022), but without observable effects on birth outcomes (Cooper and Pesko, 2017). Other studies do not find an effect of e-cigarette indoor use restrictions on either e-cigarette or cigarette use outcomes (Friedman et al., 2021, Cotti et al., 2018, Nguyen and Bornstein, 2021), raising the possibility that pregnant women are particularly responsive to e-cigarette policies. The potential unique, and high, tax responsiveness of pregnant women increases the importance of studying the effect of e-cigarette taxation within this population versus more general populations.

A series of studies has investigated the extent to which cigarette taxes and indoor smoking bans, both of which may reduce smoking, influence smoking outcomes among pregnant women using birth record data. Early studies using birth records document that higher cigarette taxes reduce smoking among pregnant women with implied own-tax elasticities of -0.7 to -1.0

reached on whether the products are economic substitutes or complements (Huang et al., 2018, Pesko et al., 2018, Stoklosa et al., 2016, Zheng et al., 2017, Saffer et al., 2020, Pesko and Warman, 2022). Outside of two studies using discrete choice experiment methods to experimentally vary the e-cigarette prices, Pesko et al. (2016b) and Marti et al. (2019), these other studies mentioned do not exploit a plausibly exogenous source of price variation.

(Ringel and Evans, 2001, Colman et al., 2003). While not estimating a prenatal smoking tax elasticity directly, McGeary and colleagues (2019) find evidence consistent with prior literature of the effect of cigarette taxes on birth outcomes using birth certificate data through 2012. Other recent studies suggest cigarette tax-elasticities of demand for pregnant women are lower in recent years (Adams et al. 2012; Hoehn-Velasco et al. 2022).

3. Data

3.1 Data on birth records

We use administrative birth records with geocodes provided by the National Center for Health Statistics (NCHS).[12] In particular, we use the 2003 revised birth record forms rather than the traditional forms, which have been in place since 1988. States transitioned, in a staggered manner, from the traditional to the revised form between 2003 and 2015. We use the revised records because this format includes self-reported smoking information at four points in time: pre-pregnancy (three months prior to pregnancy) and in each trimester. Neither revised nor traditional birth record forms include information on prenatal e-cigarette use. However, in an extension (Section 6) to our main analysis we use PRAMS data to examine e-cigarette use.

As of June 2022, the time of writing, revised birth records are available from the NCHS through the end of 2020. We restrict our analysis sample to births conceived[13] between January

[12] We also estimate the effect of e-cigarette taxes on infant mortality. To do so, we combine the birth record data with administrative data on infant deaths administered by NCHS. As of June 2022, these data are available through 2019 (compared to through 2020 for birth certificate data). Absent the one-year lag compared to standard birth certificate data, the birth/infant death period data are identical except for including an indicator for if the infant died in the same calendar year in which they were born. These data capture approximately 86% of infant mortality, only missing first-year mortality for infants born in one calendar year and dying in the next calendar year.

[13] We assume that the infant was born at the mid-point of the month recorded in the birth record. We then use gestational length in weeks, to identify the estimated point of conception and the start of the three trimesters. The 1st trimester is defined as the point of ovulation that led to pregnancy. The beginning of the 2nd trimester is defined as week 14 of pregnancy (14 weeks after last menstrual period). The beginning of the 3rd trimester is defined as week 28 of pregnancy.

2013 and December 2019 to avoid censoring the data based on gestational length (which could be endogenous to e-cigarette taxes).[14] We begin our study period in 2013 to ensure a representative sample; by this year all but three states (Connecticut, New Jersey, and Rhode Island) had adopted the revised birth record format. Minnesota was the first locality in the U.S. to adopt an e-cigarette tax (August 2010). In robustness checks reported later, we show that our results are insensitive to beginning the sample in 2011 and excluding the 13 states that had not adopted the revised birth record format by that year.

We make several additional exclusions to form our analytic sample. (1) We exclude non-singleton births to reduce potential confounding from fertility treatment availability (Kulkarni et al., 2013). (2) We exclude 1.3% of births with missing smoking information pre-pregnancy and in any of the three trimesters. These exclusions leave us with 24,732,966 births.

We construct cigarette smoking measures for any smoking and the average number of cigarettes smoked during the three months prior to conception ("pre-pregnancy smoking") and during pregnancy ("prenatal smoking"). We also construct a measure for the number of time periods in which the mother smokes from pre-pregnancy to the 3rd trimester, which ranges from zero to four.

3.2 Data on e-cigarette taxes

We use e-cigarette tax values per fluid ml from Cotti et al. (2021),[15] Table 1 lists the localities levying e-cigarette taxes at different points in time through the end of 2019.[16] Table 1

[14] A birth conceived in December 2019 would likely be born in late 2020, hence appear in the 2020 birth certificates.
[15] We use the authors' preferred measure of "35% Retailer Markup" and that uses time-invariant tax units so that only legislated tax changes affect tax rates. The authors do not report separate taxes for Chicago and Cook County, and so we similarly analyze Cook County as a single locality.
[16] For comparison, each JUUL (a leading manufacturer of e-cigarettes in the U.S. at the time of writing) disposable pod contains 0.7 fluid ml of liquid nicotine. A two-pack is currently sold online for $9.99 before taxes are applied

shows that e-cigarette tax variation comes not only from localities adopting e-cigarettes, but also from localities subsequently changing their e-cigarette tax rates. Figure 1 reports the share of the U.S. population exposed to any e-cigarette tax and the unconditional average e-cigarette tax rate over time. Figure 2 graphically depicts e-cigarette tax variation spatially in Q4 2019.

3.3 Data on additional policies

We adjust for other tobacco control policies in our regressions. Specifically, at the county level we control for inflation-adjusted federal, state, and local cigarette taxes (Centers for Disease Control and Prevention, 2022); state and county e-cigarette MLSA laws (Pesko and Currie, 2019);[17] Tobacco 21 law covering the entire state or county (Centers for Disease Control and Prevention, 2022, Abouk et al., 2021); county-level share of the population covered by indoor vaping restrictions and indoor smoking restrictions in bars, restaurants, and private workplaces (Cooper and Pesko, 2017);[18] and e-cigarette sales bans (Xu et al., 2022, Cooper and Pesko, 2017). We also control for an indicator variable for whether a state expanded Medicaid through the Affordable Care Act (ACA) at a given point in time (Maclean et al., 2019, Kaiser Family Foundation, 2022).[19] All monetary values are consumer price index-adjusted to 2010 dollars.

(JUUL, 2022). If the state excise tax is $2.53 per fluid ml this would add $3.54 (0.7 x 2 x $2.53) to the tax-free price, or approximately 35% ($3.54 / 9.99).

[17] We incorporate the adoption of a federal minimum legal purchase age law of 18 in August 2016.

[18] The American Non-Smokers Rights Foundation tracks when municipalities, counties, and states pass indoor air laws for vaping or smoking in different venues. We use this information to create two separate measures for the share of the population in each county living with indoor smoking and indoor vaping restrictions for private workplaces, restaurants, or bars. We weight laws applying to bars, restaurants, and private workplaces equally. For indoor smoking restrictions, we also consider laws applying to only part of the establishment (but not the full establishment) with ½ weight. Partial laws are uncommon for indoor vaping restrictions. See Cooper and Pesko (2017) for more details.

[19] We control for state ACA Medicaid expansion because lower-income women may have gained eligibility for this insurance program prior to conceiving. Medicaid expansion plans covered a range of effective cessation medications and (non-pharmacological) treatments with low cost-sharing for enrollees (Maclean et al., 2019).

4. Methods

We first estimate the effects of e-cigarette taxes on pre-pregnancy and prenatal smoking in a repeated cross-sectional fixed-effect linear regression outlined in Equation (1):

$$(1) \qquad S_{i,c,s,t} = \alpha + \beta ETax_{c,s,t} + TC_{c,s,t}\gamma + X_{i,c,s,t}\theta + \gamma_{c,s} + \omega_t + \mu_{s,y} + \varepsilon_{i,c,s,t}$$

We refer to this analysis as the "cross-sectional analysis." Here, *i* indexes a pregnancy with conception year-month *t* of conception year *y*, in county *c*, in state *s*. $S_{i,c,s,t}$ is one of several possible smoking indicators. $ETax_{c,s,t}$ is either the e-cigarette tax rate or an indicator for any e-cigarette tax . $X_{i,c,s,t}$ includes mother's race/ethnicity (White, non-Hispanic, Black, non-Hispanic, Hispanic, and other), age (separate indicators for ages 14 through 50), primary payment source information on file at birth (Medicaid, private insurance, uninsured, Indian Health Service, military [CHAMPUS/ TRICARE], other government sources, other, and unknown), marital status (married, not married, and unknown), education (less than high school, high school, some college, a college degree or more, and unknown), and birth count (one, two, …, seven, eight or more, and unknown). $TC_{c,s,t}$ includes tobacco control and ACA Medicaid policies.

We control for county fixed effects ($\gamma_{c,s}$), which mitigate potential bias from time-invariant, county-specific factors. Including these fixed effects allows us to leverage within locality (county or state) variation in e-cigarette taxes for identification of treatment effects.

Time controls include month-by-year of conception fixed effects (ω_t) and state-by-year of conception fixed effects ($\mu_{s,y}$). Including month-by-year of conception fixed effects allows us to account for time-varying factors affecting the nation as a whole, such as the increase in the popularity of e-cigarettes that occurred over our study period. Additionally, state-by-year of

conception fixed effects isolate the impact of e-cigarette taxes on smoking outcomes within the conception year in which the e-cigarette tax is levied for that specific state, allowing us to account for other potential sources of omitted variable bias. Including state-by-year fixed effects implies that only tax changes occurring mid-year contribute to identifying variation. As shown in Table 1, the only tax localities without mid-year variation are Delaware and Chicago. We later show in a robustness check that our results are not sensitive to excluding state-by-year fixed effects. Because we include state-by-year fixed effects, we use the e-cigarette tax rate at the time of conception for both pre-pregnancy smoking and prenatal smoking, so that there are not differences in which states contribute identifying variation across outcomes. However, we show that our pre-pregnancy smoking results are not sensitive to using e-cigarette taxes at the start of the pre-pregnancy period versus the start of the conception period.

β is our primary coefficient of interest and captures the effect of e-cigarette taxes on smoking outcomes among pregnant women. We expect β to be positive if e-cigarettes are substitutes for cigarettes among pregnant women. However, if these products are complements, then β will be negative. Finally, the two products may be unrelated goods among pregnant women, suggesting that β will be zero and statistically insignificant.

A necessary assumption to recover causal estimates in Equation (1) is that the treatment (i.e., localities adopting an e-cigarette tax) and the comparison (i.e., localities not adopting an e-cigarette tax) groups would have followed the same trend in pre-pregnancy and prenatal smoking outcomes in the post-treatment period, had the treatment localities not been treated. While this assumption is clearly untestable as adopting localities are treated in the post-period and hence, we cannot observe counterfactual trends, we provide suggestive evidence on whether the parallel trends assumption is satisfied by modifying Equation (1) into an event study design.

To implement the event study, we replace the any e-cigarette tax variable with a set of mutually exclusive and collectively exhaustive e-cigarette tax adoption leads and lags that divide the study period into the following categories:

- conception occurs >18 months before e-cigarette tax adoption effective date
- conception occurs >15 to 18 months before e-cigarette tax adoption effective date
- conception occurs >12 to 15 months before e-cigarette tax adoption effective date
- conception occurs >9 to 12 months before e-cigarette tax adoption effective date (omitted category)
- conception occurs >6 to 9 months before e-cigarette tax adoption effective date (i.e., the e-cigarette tax comes into place during the 3rd trimester)
- conception occurs >3 to 6 months before e-cigarette tax adoption effective date (i.e., the e-cigarette tax comes into place during the 2nd trimester)
- conception occurs >0 to 3 months before e-cigarette tax adoption effective date (i.e., the e-cigarette tax comes into place during the 1st trimester)
- conception occurs 0 to >3 months after e-cigarette tax adoption effective date (i.e., the e-cigarette tax was in place for the full pregnancy)
- conception occurs >3 to 6 months after e-cigarette tax adoption effective date
- conception occurs >6 to 9 months after e-cigarette tax adoption effective date
- conception occurs >9 months after e-cigarette tax adoption effective date .[20]

[20] In 2020, eight additional states enacted new e-cigarette laws (i.e., Kentucky, Maine, Massachusetts, Nevada, New Hampshire, Utah, Virginia, and Wyoming). We use these additional taxes in constructing the policy leads (Schmidheiny and Siegloch, 2020).

Apart from including tax leads and lags instead of a single e-cigarette tax adoption indicator, the event study equation is identical to Equation (1).

In the event study specification, the coefficient estimates on the tax leads can provide evidence of differential pre-trends between the treatment and comparison groups. Differential pre-trends may occur if, for example, localities adopt e-cigarette taxes in response to changes in pre-pregnancy and prenatal smoking outcomes. Anticipatory behaviors on the part of pregnant smokers may also generate coefficient estimates on policy leads that are statistically different from zero. If the coefficient estimates on the tax leads are small in magnitude and statistically indistinguishable from zero, this pattern of null results suggests that the parallel trends assumption is plausibly satisfied and there is no anticipatory behavior, and that our regressions can recover causal estimates of e-cigarette tax effects. The event lag indicators are informative for assessing any dynamics in tax effects that emerge over time in the post-period.

As a secondary analysis, we explore the effect of e-cigarette tax adoption that occurs *during* a mother's pregnancy on within-pregnancy smoking; we refer to this analysis as the "panel analysis." We start with only pregnancies for which smoking information is provided at each of the four periods of time, and afterwards we exclude any periods of time starting beyond the end of 2019 in order that our tax variation is identical between our cross-sectional and panel regressions. We focus on any smoking and number of cigarettes smoked at each time period in the panel analysis. We estimate the regression outlined in Equation (2):

$$(2) \qquad S_{i,c,s,p,z} = \rho + \pi Tax_{c,s,z} + TP_{c,s,z}\phi + \delta_i + \rho_p + \vartheta_{i,c,s,p,z},$$

where i is a mother in period p (either in the three months prior to pregnancy or in each of the three trimesters) and z indexes year-by-month of the start of each period p. Pregnancy fixed

effects (δ_i) incorporate locality fixed effects, year-month of conception fixed effects, and mother demographic characteristics, since these do not vary within a given pregnancy in our data.

All regressions are estimated with linear probability models when the outcome is binary and least squares when the outcome is continuous. Since e-cigarette taxes are levied at both state and county levels, we cluster standard errors at the locality level (thus separating Cook County and Montgomery County from Illinois and Maryland, respectively).

5. Results

5.1 Summary statistics

Table 2 reports summary statistics for smoking outcomes and e-cigarette taxes for the full estimation sample, the sample of counties that levy an e-cigarette tax, and the sample of counties that do not levy an e-cigarette tax by the end of 2019. Online Appendix A additionally shows summary statistics for demographics and other policies. We observe that 7.1% and 9.2% of the full sample reports any smoking while pregnant and any smoking in the three months prior to conception, respectively. In the full sample, the unconditional average number of cigarettes smoked per day in the three months before pregnancy is 1.21. For all smoking variables that we consider, smoking is less than or equal in counties that levy vs. do not levy an e-cigarette tax. For example, while the average pre-pregnancy daily unconditional number of cigarettes smoked in counties that levy an e-cigarette tax is 1.11, this average is 1.29 in counties that do not levy such a tax. The e-cigarette tax rate in the overall sample has a mean of $0.16 and in the sample of e-cigarette tax adopting counties the mean is $0.37 ($1.13 conditional). However, as shown in Table 1 there is considerable heterogeneity in tax rates by state or county ranging from $0.05 to $2.53. Also, Online Appendix A shows that tobacco policies such as e-cigarette MLSA and Tobacco 21 policies are more prevalent in counties adopting an e-cigarette tax.

The racial/ethnic breakdown of the sample is 52% non-Hispanic White, 14% non-Hispanic Black, 24% Hispanic, and 10% other race. The average age of mothers at time of delivery is 28.7 years. Private insurance finances 48% (the plurality) of all births in the sample and Medicaid finances 43%.

Demographics and policies vary somewhat across counties that levy and do not levy an e-cigarette tax. We control for these differences in regressions.

5.2 Main results from the cross-sectional analysis

In Table 3, we report the effect of e-cigarette tax rates on six smoking outcomes of interest inclusive of the pre-pregnancy and prenatal periods. Each regression controls for the full set of demographics, time-varying policy controls, and fixed effects for county, conception year-by-month, and state-by-conception year. In Online Appendix B, we start by estimating a regression with only county and conception year-by-month fixed effects, and then show little effect of iteratively adding state-by-conception year fixed effects, demographics, and time-varying policy controls. Online Appendix B Tables 4 and 8 show a full set of coefficient estimates.

In column (1) of Table 3, the coefficient estimate suggests a $1.00 increase in the e-cigarette tax increases the probability of pre-pregnancy smoking by 0.5 percentage points ("ppts"). Comparing this coefficient estimate to the pre-pregnancy smoking proportion in localities that levy e-cigarette taxes prior to the tax adoption (all coefficient estimates are compared to this baseline henceforth), the relative effect size is 5.7% or an elasticity of 0.06.[21] Although this finding suggests that there is an increase in pre-pregnancy smoking at the

[21] Elasticities = [e-cigarette tax rate coefficient] x [estimation sample conditionally-positive e-cigarette tax rate] / [estimation sample outcome mean for treated localities, pre-tax].

extensive margin from the e-cigarette tax rate, column (2) shows no statistically significant effect on the intensive margin. This pattern of results implies that despite affecting smoking participation, e-cigarette taxes did not affect the composition of smoking intensity among remaining smokers.[22]

The prenatal smoking results of the effects of the e-cigarette tax rate are reported in columns (3) to (5) of Table 3. Column (3) shows that a $1.00 increase in the e-cigarette tax increases prenatal smoking by 0.4 ppts (a 5.7% change or 0.06 elasticity). The effects on smoking intensity (cigarettes smoked per day) suggest a non-significant effect for smokers (column 4) but a positive effect for the full sample (column [5]).

In column (6), we show that the number of periods smoked increases by 0.01 with a $1.00 increase in e-cigarette taxes. This coefficient estimate represents a 5.7% increase and a 0.6 elasticity.[23]

In Table 4, we estimate effects for any e-cigarette tax. The estimated effects track closely to the coefficient estimates reported in Table 3. For example, the presence of any e-cigarette tax increases prenatal smoking by 0.3 ppts, mirroring the result that a $1.00 change in e-cigarette taxes increases prenatal smoking by 0.4 ppts.

5.3 Internal validity of the research design

[22] We note that conditional measures (column 2 and 4) now captures both changes on the extensive and intensive margin, so we interpret generally statistically insignificant results for these columns (but statistically significant results for the other columns) as evidence that e-cigarette taxes increase participation but that the marginal smoker is either evenly distributed across the smoking spectrum or that marginal smoker is for example light-smokers but this is offset by movement of remaining smokers into higher-intensity forms of smoking. Either could explain our pattern of results.

[23] For Table 3, we have also applied a wild cluster bootstrap (WCBS) approach that is robust to a small cluster setting. For the outcomes where we observe statistically significant coefficients using standard errors clustered at the level of the tax locality, we used a 10% sample to reduce computation burden and the WCBS produces t-statistics that suggest these estimates are statistically significant at 2.5% or lower levels. We expect these significance levels to be lower for a full sample. We use 400 repetitions in our bootstrap procedure.

Event study coefficient estimates, along with 95% standard error bars, are reported in Figure 3 for each smoking outcome. These are estimated as the effects of the implementation of an e-cigarette tax on the smoking outcomes in three-month bins before and after the point of conception. Negative numbers on the horizontal axis indicate that a tax was implemented after conception; positive numbers indicate that a tax was implemented before conception. The period of time between -9 and -1 can be interpreted as a transition period, in which e-cigarette taxes are adopted at some point during pregnancy (for full length pregnancies).

The event study results provide suggestive evidence of parallel pre-trends in our outcomes between localities that levy and do not levy an e-cigarette tax by 2019. For non-conditional cigarette use measures for which we estimate increases in response to e-cigarette tax adoption, all pre-period coefficients are smaller in absolute value than for post-period coefficients for conceiving three or more months after e-cigarette tax adoption. The transition period coefficient estimates are also generally small in magnitude relative to the post-period coefficients. The effect in the post-period appears with a delay of approximately three months, and then appears to grow over time.

For pre-pregnancy smoking, 10 to 12 months prior to the e-cigarette tax may not be an appropriate reference group because that includes the period of time in which pre-pregnancy smoking behaviors may be affected by the tax. For that reason, we alternatively use 13 to 15 months prior as a reference as well. Online Appendix C shows event study results are not materially different regardless of the reference group used.

Additionally, we test the internal validity of the cross-sectional fixed effects models by exploring whether e-cigarette taxes influence birth rates. If e-cigarette taxes affect birth rates through changes in conception or fetal death, then our regression coefficients may be vulnerable

to conditional-on-positive (COP) bias (Angrist and Pischke, 2009). To explore this hypothesis, we estimate a regression including county-by-conception year/month counts as the dependent variable and controlling for aggregated demographics and all Equation (1) time-varying controls and fixed effects. We report findings from this analysis in Online Appendix D: Table 1, first for all mothers and then for mothers of different ages, education levels, insurance types, and birth orders. While our coefficient estimate implies that a $1.00 increase in the e-cigarette tax rate reduces birth counts by less than 1% of the mean, as a percent of the mean these effects are sometimes large for subgroups though none are statistically significant different from zero. Thus, we find no evidence of substantial COP bias stemming from birth rates changing in response to e-cigarette taxes for all mothers, though we cannot rule this out for certain subgroups. Online Appendix D: Tables 2-4 shows similar results when using any e-cigarette tax and using the share of births in each demographic group rather than raw counts.

We also test for balance in observable characteristics across treatment and comparison groups following Pei et al. (2018). Specifically, we regress the e-cigarette tax rate on tobacco control policies, mothers' demographics from the birth records (aggregated to the county-year level), and various fixed effects reported in Equation (1).[24] Results are reported in Online Appendix E. We find that cigarette taxes ($p<0.01$) are highly correlated with e-cigarette taxes. There are also moderately significant correlations ($p<0.10$) for e-cigarette sales bans and several mother demographic characteristics (age, race/ethnicity, and unmarried). We take this as evidence that e-cigarette taxes are not adopted at random and appear to be passed in localities that are more aggressive in regulating tobacco in other ways as well as demographically

[24] Because our outcome variable in this regression is the e-cigarette tax rate, we are testing for balance across localities with different levels of treatment (i.e., the e-cigarette tax rate) intensity. Results are similar if we instead use the any e-cigarette tax rate indicator as our outcome variable (available on request).

different. The results of this analysis raise the importance of controlling for these variables in our regression.

Recent econometric developments in difference-in-differences methods using binary treatments documents that application of TWFE regression with a staggered policy rollout can return biased estimates of the average treatment effect (ATT) if there are dynamics in treatment effects. Briefly, with a binary treatment variable, TWFE compares all possible two-by-two comparisons. With a staggered treatment rollout, some of these comparisons will be "reasonable:" comparing treated units to never treated units and comparing early treated units to units that eventually receive treatment. However, other possible comparisons may be "forbidden": comparing later treated units to earlier treated units. In this final type of comparison, dynamics can lead to sign reversals and negative weighting. To assess potential bias, in Table 5 we present results from a Goodman-Bacon decomposition using our binary e-cigarette tax measure.[25] This diagnostic demonstrates that most of our ATT estimate (i.e., 16.7% + 77.1% = 93.8%) is comprised of reasonable comparisons. This finding is perhaps not surprising as we have a large comparison group and there are fewer "forbidden" comparisons to be made. We interpret these findings to imply that bias from treatment effect dynamics does not drive our findings (Goodman-Bacon, 2021, Callaway and Sant'Anna, 2021). We acknowledge that our main e-cigarette tax rate variable is continuous and using such a variable adds a layer of

[25] To use the Goodman-Bacon decomposition, we collapse individual observations to the state-county-year-month levels. The treatment variable is an indicator for any e-cigarette tax. Data are unweighted and we include no other covariates.

complexity to our analysis and our decomposition analysis only applies to binary treatment variables.[26]

5.4 Heterogeneity in e-cigarette tax effects across mother characteristics

Perceptions about the relative harm of e-cigarettes compared to cigarettes may vary by socio-demographic factors, thereby affecting the degree to which individuals may view e-cigarettes and cigarettes as substitutable products. For example, more educated and younger adults consider e-cigarettes to be less harmful than cigarettes (Viscusi, 2016, Pearson et al., 2012, Chivers et al., 2016). Further, smoking while pregnant is more common among younger, Medicaid enrolled, and less educated women (Centers for Disease Control and Prevention, 2016). These differences in risk perceptions and product use open the door to the possibility of heterogeneous e-cigarette tax effects across demographic groups. With this background, we next explore the extent to which e-cigarette tax effects vary across maternal characteristics.

We estimate separate regressions by maternal age (30 years or less vs. older than 30 years), educational attainment (high school education or less vs. some college or more), and primary payer for pregnancy healthcare (Medicaid and private insurance; we lack sufficient sample size to estimate separate regressions for other payment sources). We also separately examine mothers who are having their first birth from those with higher-order births.

Results from heterogeneity analyses are reported in Table 6 for pre-pregnancy smoking outcomes. Results are broadly similar across age, education, and parity groups. While coefficient

[26] Using a continuous variable requires additional assumptions relative to a binary treatment. We must assume "strong" parallel trends (Callaway et al, 2021): units treated with different doses (i.e., e-cigarette tax ratees) would have followed the same trends in outcomes had they received the same dose. That is, we must place restrictions on untreated and treated potential outcomes. With this assumption in hand, we can recover an estimate of the average causal response (which is akin to the average treatment effect in the binary setting). A further assumption (no selection into treatment dose, or e-cigarette tax rate in our setting) is required to estimate the average causal response on the treated (similar to the ATT in the binary case). We make these assumptions.

estimates do vary across sub-samples, we note that 95% confidence intervals overlap, preventing us from drawing strong conclusions regarding heterogeneous treatment effects. For example, among younger mothers (ages 18-30), the probability of pre-pregnancy smoking stemming from a $1.00 increase in e-cigarette taxes increases by 0.6 ppts (4.9%) while the corresponding increase among older mothers (ages 31+) is 0.3 ppts (5.1%).

A similar pattern emerges in the estimated e-cigarette tax effects on prenatal smoking. These results are reported in Table 7. The general takeaway from this section is we find no evidence of strong differences in smoking effects, either pre-pregnancy or prenatal, by age, education, or whether this is first birth. There is perhaps one outlier to this pattern in that the effects on very young mothers (under 18 years) are nearest to zero for both pre-pregnancy and prenatal smoking. Please see Online Appendix F for heterogeneity results for other outcomes and for any e-cigarette tax.

5.5 Panel analysis

We next report results from our Equation (2) panel data analysis. More specifically, we use up to four observations per pregnancy (one pre-pregnancy and one for each trimester of the pregnancy) rather than one observation overall, along with pregnancy and trimester fixed effects. Results for e-cigarette tax rates are reported in Table 8 and for any tax are in Online Appendix G.

In column (1) of Table 8, we find that a $1.00 increase in the e-cigarette tax rate raises period-specific (the pre-pregnancy period or each individual trimester) smoking by 0.7 ppts (9.9% or a cross-tax elasticity of 0.11). In column (3), combining smokers and nonsmokers, there is an increase of nearly 24% in the period-specific number of cigarettes smoked per day. In columns (4) to (6) we use only smoking in each of the three trimesters (dropping pre-pregnancy smoking). Here we continue to find that e-cigarette taxes enacted during pregnancy raise prenatal

smoking by 0.3 ppts (4.8%, or 0.05 cross-tax elasticity) and cigarettes per day (among all) by 0.07 (12.1%, or 0.13 cross-tax elasticity).

In Figure 4 and Online Appendix H, we present the panel event study. We find evidence similar to that shown in the cross-sectional event studies of parallel trends in the pre-period and increases in within-pregnancy smoking for women that conceived after e-cigarette taxes are implemented.

We explore heterogenous responses with the panel data analysis in Online Appendix I. As a percent of the mean, there is some evidence that e-cigarette taxes have larger effects in changing smoking during pregnancy for more highly educated women and women having their first child. The latter result may reflect the possibility that women having their first child are particularly interested in smoking cessation, and hence disproportionately responsive to e-cigarette taxes.

Our results are stable across several alternative samples. First, we begin the sample in 2011 and exclude 13 states that had not adopted revised birth records by 2011 from the analysis sample to leverage a balanced cohort of states.[27] These results are reported in Online Appendix J Tables 1 and 2 for the e-cigarette tax rate and any e-cigarette tax, respectively, and are virtually unchanged from those reported in Table 3.

Second, we also sequentially drop each treatment locality and re-estimate Equation (1) (i.e., "leave-one-out") to test whether our main findings are driven by the unique experiences of particular localities. Results, reported in Online Appendix K, are always positive in sign. They

[27] We cannot explore the effect of the original Minnesota e-cigarette tax in 2010 using revised birth records because Minnesota adopted the new form in 2011.

are also relatively stable across different leave-one-out samples, with the possible exception that dropping Illinois and Cook County leads to attenuated tax responsiveness.[28]

Third, we re-explore the effect of e-cigarette taxes on pre-pregnancy smoking by merging to the three months prior to pregnancy rather than the date of conception (Online Appendix L).[29] This alternative linking procedure results in a reassignment of some mothers who are assigned to the pre-e-cigarette tax comparison group in the main specification to the post-e-cigarette tax treatment group. The tax rate coefficient estimates remain similar to those generated in our main specification (0.4 ppts versus 0.5 ppts, see Table 3).

Fourth, we explore whether missing smoking status changes in response to e-cigarette tax rates in Online Appendix M. Coefficient estimates here are small in magnitude and statistically indistinguishable from zero, suggesting that the propensity to not report smoking status is uncorrelated with our treatment variable. However, while we find that women do not change whether they respond to smoking questions following e-cigarette taxes, we are unable to test whether women are more or less accurate in their responses following taxes. Any systematic changes in accuracy will bias the overall estimated effect of e-cigarette taxes.

6. Pre-pregnancy and prenatal e-cigarette use

The results of Section 5 suggest that fewer pregnant women replace cigarettes with e-cigarettes when taxes on the latter product are imposed. Our birth record data do not include e-

[28] Cotti et al. (2022) also finds that Cook County has sizable influence on e-cigarette tax responsiveness results when using sales data. Cook County could have large importance given that Cook County experiences four tax changes during the study period (due to a combination of state, county, and Chicago-specific taxes) and the combined Cook County tax is relatively large in magnitude compared to other taxes. Additionally, Cook County is a relatively large county (5.2 million individuals) and with birth counts that exceed many states. The Illinois tax attenuation may be on account of dropping Cook County.

[29] To reduce changes in our identifying variation due to our inclusion of conception year-by-state fixed effects, we use tax rates here, which have more variation within tax localities, than any tax.

cigarette use which prevents us from estimating the "first stage" effect of e-cigarette taxes: i.e., e-cigarette own-tax elasticities among pregnant women. We next attempt to shed light on this important question. To this end, we use data from the PRAMS, which collect information on maternal attitudes and experiences before, during, and shortly after pregnancy for randomly-sampled pregnant women (Centers for Disease Control and Prevention, 2020). Between 2016 and 2019, the PRAMS core module includes separate questions on how often the respondent uses e-cigarettes in the three months before becoming pregnant and in the last three months of pregnancy. Individuals can respond with the following options: more than once a day, once a day, two-to-six days a week, one day a week or less, or none. We use these questions to create outcomes of any pre-pregnancy e-cigarette use, any 3rd trimester e-cigarette use, weekly frequency before becoming pregnant, and weekly frequency in the 3rd trimester.[30] Of note, some states do not participate in PRAMS at all, other states do not participate in all years, and sample sizes are small. However, to the best of our knowledge PRAMS is the largest data source containing information about e-cigarette use among pregnant women over time and across multiple states. We estimate a regression comparable to Equation (1) with a few changes based on the information that is contained in the PRAMS. In particular, we (1) exclude Illinois and Maryland since sub-state taxes are present in these states and sub-state identifiers are not available in PRAMS; (2) include Connecticut, New Jersey, and Rhode Island (these states are excluded from our main analysis as they not have revised birth records as of 2013 in the NCHS data); (3) do not control for state-by-conception year fixed effects because of limited time horizon and smaller sample sizes in PRAMS;[31] (4) use state fixed effects and state-level

[30] We use values of 0, 0.5, 4, 7, and 14 for estimated weekly frequency.
[31] However, we do continue to control for conception year-by-month fixed effects.

population-weighted variables otherwise at the county level; and (5) match the timing of the e-cigarette tax to either three months before conception or the start of the 3rd trimester depending on the outcome.

Our results are presented in Table 9. We find that a $1.00 increase in the e-cigarette tax leads to a reduction in pre-pregnancy e-cigarette use of 1.8 ppts ($p<0.05$). This coefficient estimate reflects a 45% reduction in e-cigarette use or a -0.28 own-tax elasticity. The same $1.00 increase in the e-cigarette tax has a reduction in the probability of 3rd trimester e-cigarette use of 0.7 ppts ($p<0.01$) or an own-tax elasticity of -0.29. Turning to measures of e-cigarette usage per month, the pre-pregnancy and 3rd trimester effects suggest significant reductions in the number of e-cigarettes consumed, with own-tax elasticities of -0.40 and -0.49, respectively.

In the last two columns, we use two observations per person to estimate the panel analysis comparable to that shown in Equation (2). We find some evidence of larger effects on period-specific e-cigarette use, which is similar to the larger effects we observe in the panel data analysis compared to the cross-sectional analysis for cigarette use using birth record data. In Online Appendix N, Table 1, we re-produce Table 9 using e-cigarette tax adoption (thus ignoring the large variation in magnitudes of the original tax rates and subsequent changes) and do not find statistically significant effects.

In Online Appendix N, Tables 2 and 3 we show additional PRAMS results for cigarette use outcomes, use of either e-cigarettes or cigarettes (any use), and use of both e-cigarettes and cigarettes (dual use).[32] We find statistically insignificant negative effects of e-cigarette taxes on prenatal and pre-pregnancy smoking outcomes in PRAMS, in contrast to the positive statistically

[32] PRAMS smoking results use smoking information from linked birth certificates to allow more direct comparison with birth certificate results.

significant effects found using national birth record data. When we use birth records data for only the state-year pairs surveyed in PRAMS and using the exact same regression specification (e.g., state fixed effects instead of state-by-year fixed effects), the e-cigarette tax effects on pre-pregnancy and prenatal smoking are somewhat larger at 0.8 ppts increase (Online Appendix N, Table 2, columns [3] and [4]), though less precisely estimated,[33] than the Table 3 baseline result of a 0.4 to 0.5 ppts increase. It is therefore unclear what drives the statistically insignificant, negative-signed results of e-cigarette taxes on pre-pregnancy and prenatal smoking in the PRAMS data (Online Appendix N, Table 2, columns 1 and 2). While we cannot fully explain this discordance, we hypothesize that the PRAMS sampling process results in systematic bias for our particular research question.[34] We therefore encourage caution in interpreting effects of e-cigarette taxes on e-cigarette use in PRAMS, but reiterate that we are unaware of any better data on this question.

7. Attitudes toward relative risk, and e-cigarette media coverage

Two other mechanisms besides the effect of e-cigarette taxes on e-cigarette prices (Cotti et al., 2022) could explain the relationship between e-cigarette taxes and pregnancy-related smoking outcomes. (1) E-cigarette taxes could cause changes in the perception of the risk of e-cigarettes, which could reduce e-cigarette use. Women who are pregnant or intending to become pregnant may be more health conscious than other populations, and hence adjust risk perceptions

[33] Sample sizes decline over 60% when using only birth records for state-years surveyed by PRAMS, which may contribute to less precision.

[34] Online Appendix N, Table 2, columns 1 and 3 suggest that keeping the state-year pairs consistent, there are 7,393,465 birth records versus 126,355 PRAMS records, suggesting PRAMS surveys approximately 1.7% of all births in locations-years where the survey is fielded. These factors open the door to potential systematic bias. We compare descriptive statistics for these two samples and find that PRAMS mothers are 0.7 years older, 3.0 ppts more likely to have Medicaid, 9.0 ppts more likely to be non-White or Hispanic, and 1.1 ppts more likely to prenatally smoke.

by more than other populations in response to policy changes like e-cigarette taxes. (2) E-cigarette taxes could generate media attention on harms of these products, which could independently reduce e-cigarette use (possibly through e-cigarette risk perceptions, or through other mechanisms such as changing public sentiment regarding e-cigarette use). We next offer suggestive evidence on both potential mechanisms.

If e-cigarette taxes cause a reevaluation of e-cigarette risks, we would suspect that there might be evidence of an increase in the belief that e-cigarettes are relatively harmful following the imposition of an e-cigarette tax. We test this possibility using the Health Information National Trends Survey (HINTS).

From the HINTS, we extract individuals 18-44 years interviewed between 2013 and 2019. The item of interest reads, "Compared to smoking cigarettes, would you say that electronic cigarettes are... (1) much less harmful, (2) less harmful, (3) just as harmful, (4) more harmful, and (5) much more harmful." The unit of observation is an individual in a locality (e.g., state except separating Cook County and Montgomery County from their respective states).[35] We include controls for race/ethnicity and age, locality fixed effects, and year-quarter fixed effects. We cluster standard errors at the locality level. Results reported in Table 10 suggest that there is an increase of 0.25 on the scale of relative risk stemming from a $1.00 increase in the e-cigarette tax. This coefficient estimate implies a 9.3% increase that is statistically significant. However, the effect for any e-cigarette tax is relatively smaller and not statistically significant. Taken together, these results suggest it is more the size, or dose, of the tax that changes perception than the mere existence of a tax.

[35] We keep Illinois and Maryland in this analysis, matching our birth records analysis, since HINTS provides county-level data.

To study the effect of e-cigarette taxes on news media attention, we construct a database of the frequency of news media mentions containing the word "vape" or "electronic cigarette" at the year-month-state level for the 2013-2019 period from LexisNexis.[36] Table 11 reports the effect of e-cigarette taxes on this outcome per 100,000 state residents.[37] Results suggest that a $1.00 increase in e-cigarette tax leads to a statistically significant 0.51 (or 202%) increase in mentions per 100,000 state population. However, no statistically significant effect is observed for any e-cigarette tax, which also suggests (like HINTS) the size of the tax matters for this particular outcome.

8. Birth outcomes

If e-cigarette taxes result in fewer pregnant women using e-cigarettes and more using cigarettes, this could affect birth outcomes. To explore this possibility, we use the birth record data to study the effect of e-cigarette taxes on birth outcomes.[38] Table 12 shows that there are no statistically significant effects of e-cigarette tax rates on birth outcomes (and Online Appendix O shows the same for any tax). We offer two possible explanations for these null findings. First, while e-cigarettes do not contain carbon monoxide that is particularly harmful to developing fetuses (National Health Service, 2023), they do contain nicotine that is believed to impair fetal development (Steinberg et al., 2021). Therefore, substituting one relatively more dangerous

[36] Records are identifiable down to the state level in LexisNexis and no city or county identifiers are reported for news media mentions.

[37] The regression controls for policy controls, state fixed effects, and year-month fixed effects. Observations from Illinois and Maryland are dropped due to the presence of local taxes and no sub-state information being available in LexisNexis.

[38] We construct the following birth outcomes to study the health effects of e-cigarette taxes: gestational length (weeks), premature birth (<37 weeks), birthweight (grams), low birthweight (<2,500 grams), small-for-gestational age ($\leq 25^{th}$ percentile), extra small-for-gestational age ($\leq 10^{th}$ percentile), Apgar 5 score, and first-year infant mortality. The Apgar 5 is an index used by healthcare professionals to evaluate the condition of a newborn along five dimensions, and this variable ranges from a minimum of zero (very poor health) to a maximum of ten (excellent health). These measures are established markers of fetal development commonly used in economics (Cooper and Pesko, 2017, Evans and Ringel, 1999, Pesko and Currie, 2019).

source of nicotine for another less dangerous source is not anticipated to improve birth outcomes as much as discontinuing use of nicotine completely. Second, our estimated effects of e-cigarette taxes on cigarette and e-cigarette use among pregnant women are relatively modest and so we would not expect sizable downstream effects on birth outcomes even without the potentially offsetting effects of the two tobacco products.

9. Conclusion

This study offers the first evidence on the effects of e-cigarette taxation on smoking outcomes among pregnant women. Our main findings show that a $1.00 increase in the e-cigarette tax rate increases pre-pregnancy smoking by 0.5 ppts and prenatal smoking by 0.4 ppts using birth record data, which suggests that e-cigarette taxes have equal effect on extensive margin pre-pregnancy and prenatal smoking probability. The conditional e-cigarette tax mean during our sample is $1.13, so our marginal effects closely approximate the effect of the average tax. One limitation of this analysis is that it treats all prenatal smoking equally, when it is better from a public health standpoint for a woman to quit early or even midway through her pregnancy compared to not at all. We estimate prenatal smoking intensive margin effects using our panel data analysis, which finds that a $1.00 increase in e-cigarette taxes during the 12-months prior to pregnancy increases smoking in a given period by 0.7 ppts (including the pre-pregnancy period) and by 0.3 ppts (not including the pre-pregnancy period). Additionally, our cross-sectional modelling finds that e-cigarette taxes increase the number of cigarettes smoked during pregnancy, averaged across the three trimesters, among both smokers and non-smokers.[39] Collectively, we find that e-cigarette taxes increase pre-pregnancy and prenatal smoking equally

[39] See Table 3, column 5.

along the extensive margin, and e-cigarette taxes additionally increase prenatal smoking along the prenatal smoking intensive margin.

We use the PRAMS data and find that a $1.00 increase in e-cigarette taxes leads to a 1.8 ppts reduction in pre-pregnancy e-cigarette use. Therefore approximately 28% (= 0.5 / 1.8) of women that stop e-cigarette use pre-pregnancy due to an e-cigarette tax smoke cigarettes pre-pregnancy instead.

Across our PRAMS and birth record analyses, we estimate pre-pregnancy own- [cross-] tax elasticities of -0.28 [0.06]. These estimates compare to own- [cross-] tax elasticities of -0.11 [0.04] for adults (Pesko et al., 2020), -0.08 [0.12] for teens in the Monitoring the Future Survey (MTF) (Abouk et al., 2023) and -0.16 [0.04] for teens in the Youth Risk Behavior Surveillance Survey (YRBSS) (Abouk et al., 2023).[40] Therefore, pre-pregnancy women appear to have higher own-tax elasticities than teens and general adults, and similar cross-tax elasticities. A recent review finds cigarette tax elasticity estimates usually fall within the range of -0.1 to -0.3 (DeCicca et al., 2022), suggesting that pregnant women reduce their e-cigarette use in response to e-cigarette taxes similarly to a general population of people reducing cigarette use in response to cigarette taxes.

Our results suggest that e-cigarettes are economic substitutes for cigarettes among women who are pregnant or soon to be pregnant, which is in line with two studies that document that policies that raise the non-financial price of e-cigarettes (indoor vaping bans and MLSA laws) increase prenatal smoking (Cooper and Pesko, 2017, Pesko and Currie, 2019). For

[40] E-cigarette elasticities are larger in absolute value when using sales data (own-tax elasticity = -0.60; cross-tax elasticity = 0.12) (Cotti et al., 2022). Sales data elasticities are generally larger in absolute value because they likely overstate consumption in states with low (or no) taxes and underestimate it in states with high taxes due to cross-border purchasing and organized smuggling (Chaloupka and Warner, 2000).

example, Cooper and Pesko (2017) show that adoption of an e-cigarette indoor vaping ban increases any prenatal smoking by 0.9 ppts, or 14.7%. Thus, our effect sizes for a $1.00 change in e-cigarette taxes are about half the size of the findings for indoor vaping ban adoption of Cooper and Pesko (2017). While the different policies make effect size comparisons difficult, one possible explanation is that since e-cigarette indoor vaping restrictions generally pre-date e-cigarette taxes, pregnant women may have been more responsive to e-cigarette policies in earlier years as there was less information available on the health risks of e-cigarettes, so the e-cigarette policies may have had an extra impact through health signaling.

Our study has limitations. (1) Our findings are specific to a time period in which e-cigarette tax rates affect news coverage and drive perceptions of risk. If future e-cigarette tax rate changes fail to do either, then our estimates may not be as generalizable to those future time periods. (2) Our findings are also generalizable to the populations residing in seventeen states, Washington DC, two counties, and one city. Although the localities are diverse in size, geography, and smoking prevalence, our results may not be as generalizable to other populations experiencing e-cigarette taxes in the future. (3) Our measures of smoking are self-reported and could therefore be measured with error. While we do not find evidence of systematic bias in cigarette missingness (Online Appendix M), if smoking is under-reported generally in birth records (Howland et al., 2015) this could cause bias compared to a counterfactual world in which everybody reports cigarette use accurately. (4) We document possible systematic bias in e-cigarette tax effects on cigarette use in PRAMS, which could in turn also bias our first-stage e-cigarette use results. (5) We study the effect of e-cigarette taxes on only birth outcomes and first-year infant mortality, and do not study the effect of e-cigarette taxes on maternal health outcomes

that could quite plausibly deteriorate as a result of higher prenatal smoking rates caused by e-cigarette taxes.

Our study contributes timely evidence that the FDA can use in their current regulatory processes to determine whether e-cigarettes should be approved for legal sale or not. RCT evidence that is otherwise generally supportive of e-cigarettes as successful smoking cessation products (Hartmann-Boyce et al., 2022) are argued by some to be inadmissible by the FDA in evaluating e-cigarette applications on grounds that these beneficial effects are identified (under careful oversight and with instruction from a physician, for example) instead of as commercial products (Glantz, 2022). By using e-cigarette taxes to proxy variation in consumer accessibility to e-cigarettes, we contribute evidence to the question of if commercial e-cigarettes (rather than medical e-cigarettes) have public health benefit (or not) in terms of prenatal smoking and birth outcomes. Our results find that commercial availability of e-cigarettes does have a public health benefit (lower prenatal smoking) and no documented public health harms, at least on newborns (no change in birth outcomes). Our study therefore contributes data-driven evidence in favor of the FDA approving e-cigarette products and/or allowing them to remain on the market once approved.

E-cigarette taxes remain an active area of legislation. At the end of our study period in 2019, 18 states (including Washington DC) had e-cigarette taxes in place, and 13 additional states adopted e-cigarette taxes as of March 2022 (Public Health Law Center, 2022). In November 2021, the House of Representatives passed a version of the “Build Back Better Act” that increased the e-cigarette tax roughly proportionate to the federal cigarette tax of $1.01 per pack. Our marginal effect estimates are therefore very similar to what we could expect if this bill were to become law. Rather than taxing e-cigarettes at the same rate as cigarettes, our results

lend support to an alternative argument made by many leading national experts (Chaloupka et al., 2015, Sindelar, 2020, Balfour et al., 2021) to tax tobacco products proportionate to risk.

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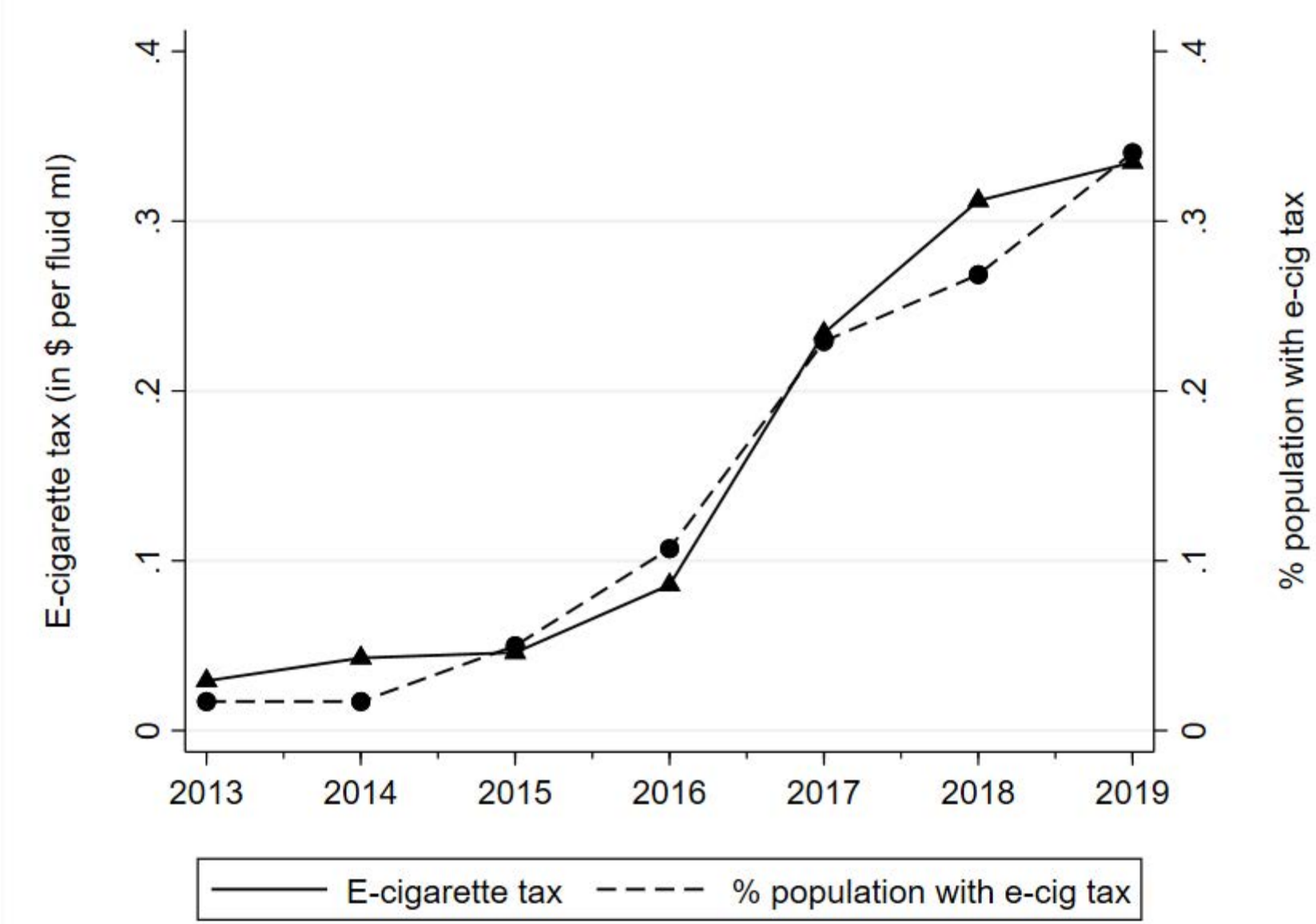
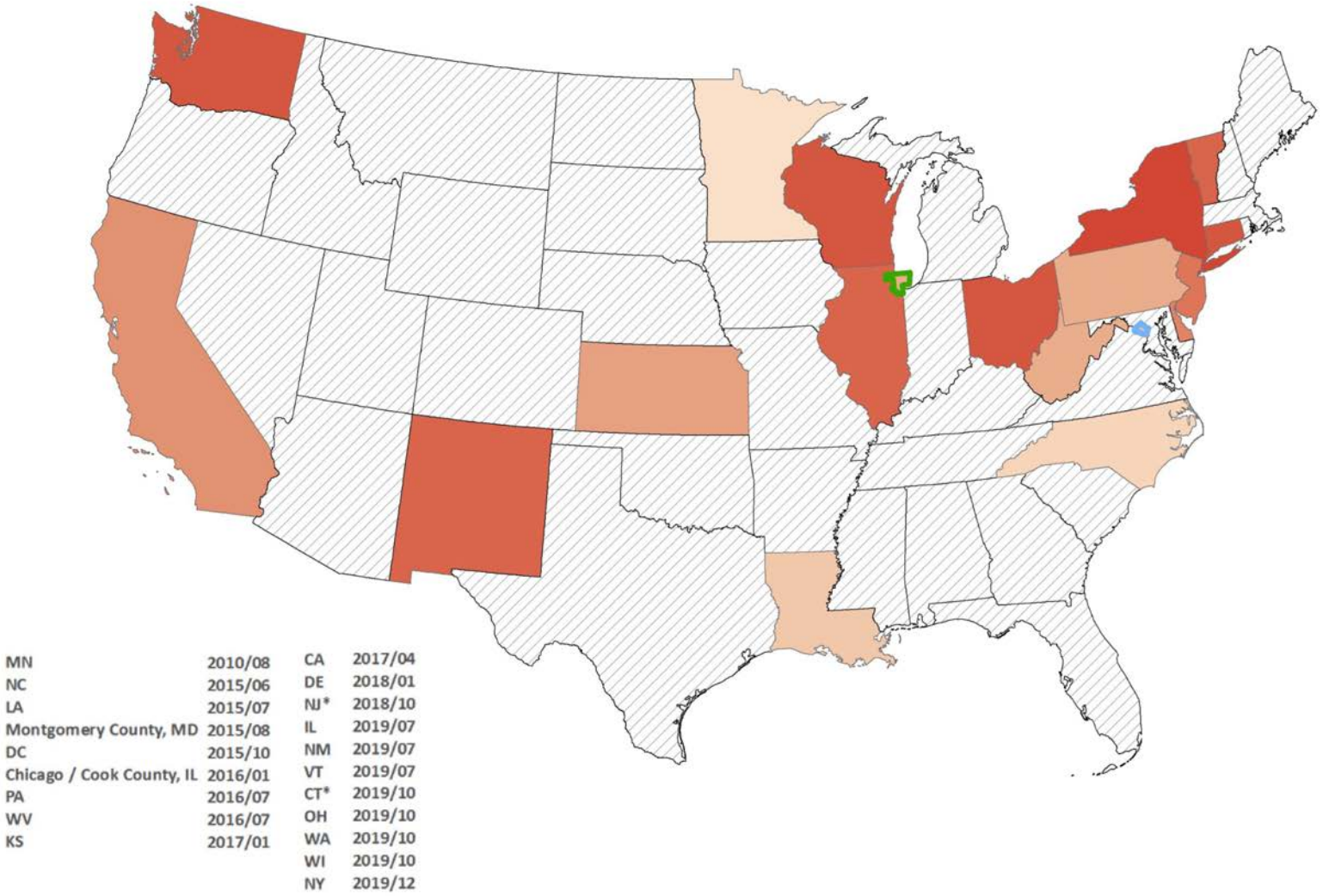
Figure 1: E-cigarette taxes from 2013 to 2019



Notes: National population-weighted state and local e-cigarette taxes reported in dollars per fluid mL.

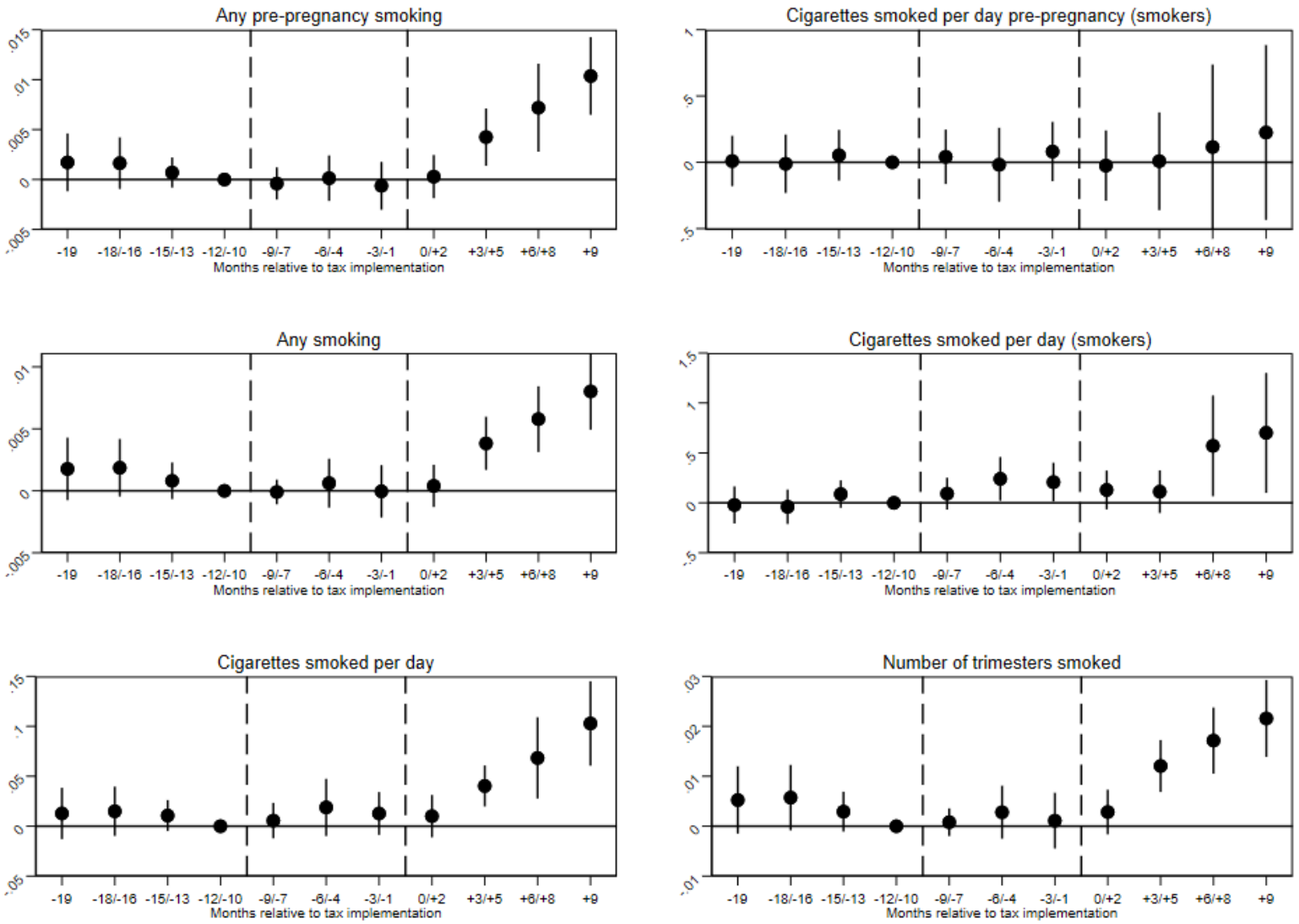
Figure 2: Localities and dates of e-cigarette taxes effective by end of 2019



MN	2010/08	CA	2017/04
NC	2015/06	DE	2018/01
LA	2015/07	NJ*	2018/10
Montgomery County, MD	2015/08	IL	2019/07
DC	2015/10	NM	2019/07
Chicago / Cook County, IL	2016/01	VT	2019/07
PA	2016/07	CT*	2019/10
WV	2016/07	OH	2019/10
KS	2017/01	WA	2019/10
		WI	2019/10
		NY	2019/12

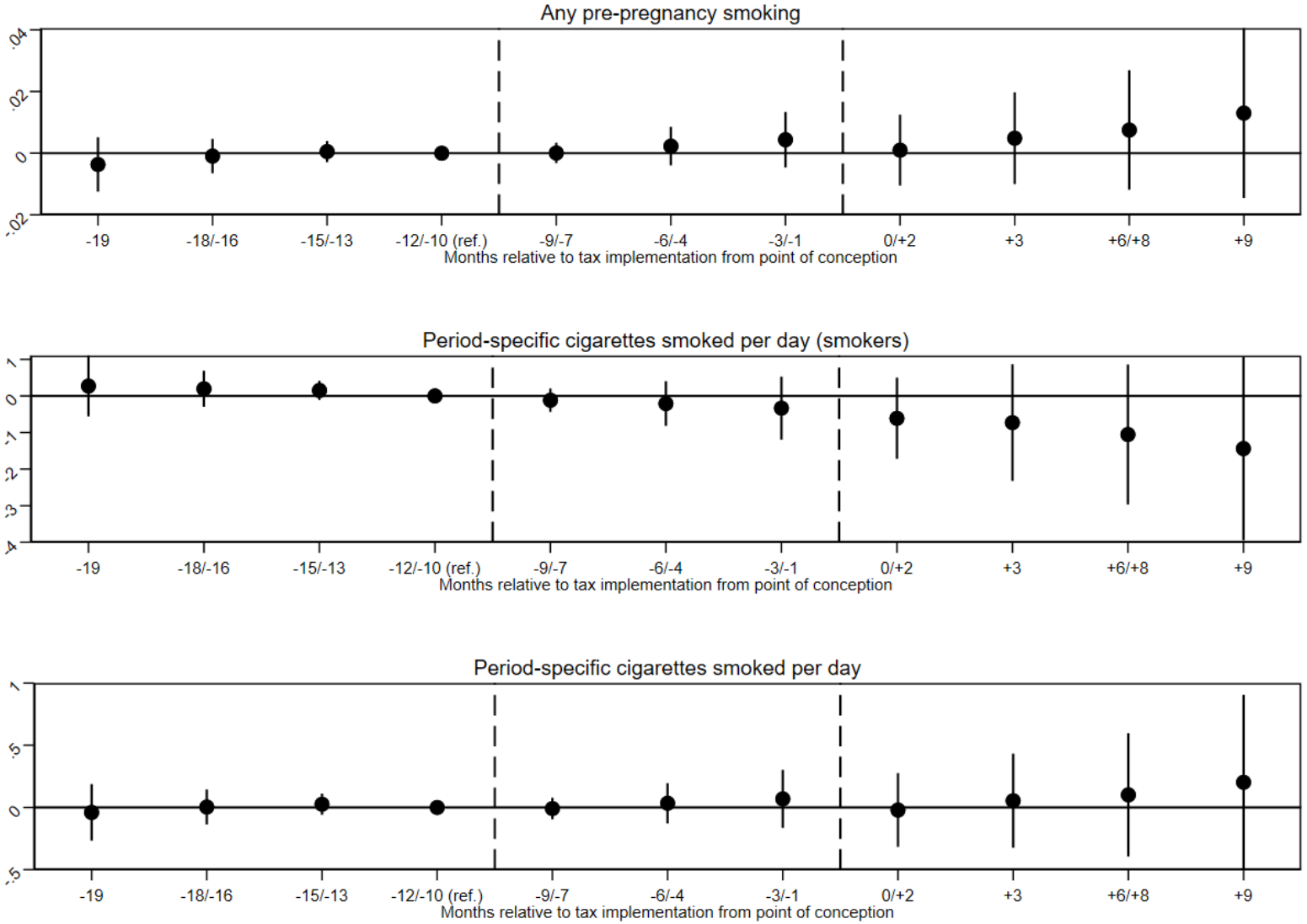
Notes: * indicates states not used in the birth records analysis due to the states not using revised birth certificate forms by 2013. Lighter colors represent earlier adoption dates, and darker colors represent later adoption dates.

Figure 3: Cross-sectional event studies



Notes: Negative numbers indicate a tax was implemented after conception; positive numbers indicate a tax was implemented before conception. Endpoints are "catch-all" for all remaining values. The period of time -9 to -1 can be interpreted as a transition period, in which e-cigarette taxes are adopted at some point during pregnancy (for full length pregnancies). -12/-10 time period is the reference group. 95% confidence intervals reported.

Figure 4: Panel data event studies



Notes: Negative numbers indicate a tax was implemented after conception; positive numbers indicate a tax was implemented before conception. Endpoints are "catch-all" for all remaining values. Coefficients between -9 to +2 show changes in smoking from taxes adopted between the end of pregnancy (for full-length pregnancies) to the three-months prior to pregnancy. 95% confidence intervals reported.

Table 1: E-cigarette tax changes through the end of 2019

Tax locality	Effective date	Unit taxed	Tax amount	Tax value in 2019 Q4 ($)
District/State				
California	4/2017, 7/2017, 7/2018, 7/2019	Wholesale price	27.3%, 65.1%, 62.8%, 59.3%	1.56
Connecticut*	10/2019	Per fluid milliliter	$0.40	0.40
Delaware	1/2018	Per fluid milliliter	$0.05	0.05
Illinois	7/2019	Wholesale price	15%	0.39
Kansas	1/2017, 7/2017	Per fluid milliliter	$0.20, $0.05	0.05
Louisiana	7/2015	Per fluid milliliter	$0.05	0.05
Minnesota	8/2010, 7/2013	Wholesale price	35.0%, 95.0%	2.50
North Carolina	6/2015	Per fluid milliliter	$0.05	0.05
New Jersey*	10/2018, 11/2019	Per fluid milliliter, Sales tax	$0.10, 10%	0.30
New Mexico	7/2019	Per container	$0.50	0.49
New York	12/2019	Sales tax	20%	0.27
Ohio	10/2019	Per fluid milliliter	$0.10	0.10
Pennsylvania	7/2016	Wholesale price	40.0%	1.05
Vermont	7/2019	Wholesale price	92.0%	2.42
Washington, DC	10/2015, 10/2016, 10/2017, 10/2018	Wholesale price	67.0%, 65.0%, 60%, 96%	2.53
Washington	10/2019	Per fluid milliliter	$0.27	0.27
West Virginia	7/2016	Per fluid milliliter	$0.075	0.075
Wisconsin	10/2019	Per fluid milliliter	$0.05	0.05
County/City				
Chicago, Illinois	1/2016, 1/2019	Per container / per fluid milliliter^	$0.80 / $0.55, $1.50 / $1.20	1.84
Cook County, Illinois	5/2016	Per fluid milliliter^	$0.20	1.84
Montgomery County, Maryland	8/2015	Wholesale price	30.0%	0.79

Notes: Tax values are provided from Cotti et al. (2021)'s preferred standardized tax using a 35% retailer markup and time invariant units. ^ Following Cotti et al. (2021), the Chicago tax is added to the Cook County tax based on the share of the population residing in Chicago. * Indicates states not used in the birth records analysis due to the states not using revised birth certificate forms by 2013.

Table 2

Summary statistics			
	(1) All mean	(2) Tax adopters mean	(3) Non-tax adopters mean
Prob. of smoking cigarettes during 3 months before pregnancy	0.092	0.084	0.098
Number of cigarettes smoked per day during 3 months before pregnancy	1.21	1.11	1.29
Number of cigarettes smoked per day during 3 months before pregnancy (among smokers)	13.2	13.2	13.2
Prob. of smoking cigarettes during pregnancy	0.071	0.065	0.076
Number of cigarettes smoked per day during pregnancy	0.60	0.53	0.66
Number of cigarettes smoked per day during pregnancy (among smokers)	8.47	8.27	8.61
Number of periods smoked	0.19	0.17	0.20
Number of cigarettes smoked on an average day during 1st trimester	0.75	0.67	0.81
Number of cigarettes smoked on an average day during 2nd trimester	0.56	0.50	0.62
Number of cigarettes smoked on an average day during 3rd trimester	0.50	0.44	0.55
Standardized e-cigarette tax rate (county/quarter); Inflation-adj. to 2020 Q1 dollar	0.16	0.37	0
Any e-cigarette tax (county/quarter)	0.14	0.32	0
Unique counties	2,739	866	1,873
Observations	24,732,966	11,004,078	13,728,888

Table 3

Effect of standardized e-cigarette tax rate on smoking outcomes: Mother demographic characteristics, policy controls, County FEs, Conception (year-by-month) FEs, and State-by-conception year FEs						
	(1)	(2)	(3)	(4)	(5)	(6)
	Any pre-pregnancy smoking	Pre-pregnancy cigarettes smoked per day (among smokers)	Any prenatal smoking	Prenatal smoking cigarettes smoked per day (among smokers)	Prenatal smoking cigarettes smoked per day (among all)	Number of periods smoked
	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)
Standardized E-cigarette Tax Rate	0.005**	-0.033	0.004**	0.118	0.041*	0.010**
	(0.002)	(0.187)	(0.002)	(0.196)	(0.023)	(0.004)
Observations	24,730,930	2,272,024	24,730,930	1,757,562	24,730,930	24,730,930
Adjusted R^2	0.15	0.08	0.14	0.09	0.10	0.14
Number of localities	50	50	50	50	50	50
Mean DV among tax adopters during pre-treatment period	0.090	13.185	0.069	8.286	0.571	0.179
Percent change (%)	5.71	-0.25	5.73	1.43	7.26	5.74
Elasticity	0.06	-0.00	0.06	0.01	0.08	0.06

Notes: The unit of observation is a birth conception in a state-county-year-month. Model estimated with OLS and controlled for mother demographic characteristics, policy controls, county fixed effects, conception (year-by-month) fixed effects, and state-by-conception year fixed effects. 95% confidence intervals accounting for within e-cigarette tax locality clustering are shown in parenthesis. Pre-pregnancy denotes three months before pregnancy.
*** p < 0.01, ** p < 0.05, * p < 0.10

Table 4

Effect of any e-cigarette tax on smoking outcomes: Mother demographic characteristics, Policy controls, County FEs, Conception (year-by-month) FEs, and State-by-conception year FEs						
	(1)	(2)	(3)	(4)	(5)	(6)
	Any pre-pregnancy smoking	Pre-pregnancy cigarettes smoked per day (among smokers)	Any prenatal smoking	Prenatal smoking cigarettes smoked per day (among smokers)	Prenatal smoking cigarettes smoked per day (among all)	Number of periods smoked
	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)
Any e-cigarette tax	0.004**	-0.017	0.003**	0.009	0.027*	0.008**
	(0.001)	(0.112)	(0.001)	(0.109)	(0.016)	(0.003)
Observations	24,730,930	2,272,024	24,730,930	1,757,562	24,730,930	24,730,930
Adjusted R^2	0.15	0.08	0.14	0.09	0.10	0.14
Number of localities	50	50	50	50	50	50
Mean DV among tax adopters during pre-treatment period	0.090	13.185	0.069	8.286	0.571	0.179
Percent change (%)	4.13	-0.13	4.05	0.11	4.82	4.21
Elasticity	0.04	-0.00	0.04	0.00	0.05	0.04

Notes: The unit of observation is a birth conception in a state-county-year-month. Model estimated with OLS and controlled for mother demographic characteristics, policy controls, county fixed effects, conception (year-by-month) fixed effects, and state-by-conception year fixed effects. 95% confidence intervals accounting for within e-cigarette tax locality clustering are shown in parenthesis. Pre-pregnancy denotes three months before pregnancy.
*** p < 0.01, ** p < 0.05, * p < 0.10

Table 5

Goodman-Bacon decomposition							
	(1) Any pre-pregnancy smoking	(2) Pre-pregnancy cigarettes smoked per day (among smokers)	(3) Any prenatal smoking	(4) Prenatal smoking cigarettes smoked per day (among smokers)	(5) Prenatal smoking cigarettes smoked per day (among all)	(6) Number of periods smoked	**(7) Weight**
Always_v_timing	0.006	-2.352	0.006	-0.549	-0.005	0.020	**0.025**
Early_v_Late	0.003	-0.626	0.004	-0.278	0.415	0.008	**0.167**
Late_v_Early	0.002	0.270	-0.001	0.197	-0.001	0.000	**0.037**
Never_v_timing	0.011	-0.458	0.008	-0.143	0.053	0.021	**0.771**
Re-weighted ATT	0.009	-0.506	0.007	-0.773	0.110	0.018	--
Observations	4,116	4,116	4,116	4,116	4,116	4,116	--
Adjusted R^2	0.15	0.08	0.14	0.09	0.10	0.14	--
Number of localities	49	49	49	49	49	49	--
Mean DV among tax adopters during pre-treatment period	0.090	13.185	0.069	8.286	0.571	0.179	--
Notes: The unit of observation is a tax locality-year-month. The treatment variable is an indicator for any e-cigarette tax. Data are unweighted. No covariates included to isolate the variation from policy changes. The weight reported in Column (7) is constant across outcomes as the source of variation (i.e., e-cigarette taxes) is constant across outcomes. We excluded Hawaii as that state does not appear in all periods of the birth record data due to missing smoking information.							

Table 6

Effect of the standardized e-cigarette tax rate on pre-pregnancy smoking using a fixed-effects regression model: Heterogeneity in tax effects by mother's demographics									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	< 18 years old	18 to 30 years old	≥ 31 years old	High School or less	More than HS	Medicaid	Private	1st birth	2nd+ birth
	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)
Standardized E-cigarette Tax Rate	0.002	0.006*	0.003***	0.006**	0.004**	0.006	0.003	0.005	0.005***
	(0.007)	(0.003)	(0.001)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)
Observations	359,218	14,842,946	9,528,680	9,642,581	14,759,342	10,615,853	11,966,009	7,849,961	16,744,135
Adjusted R^2	0.12	0.16	0.14	0.19	0.11	0.18	0.09	0.13	0.16
Number of localities	50	50	50	50	50	50	50	50	50
Mean DV among tax adopters during pre-treatment period	0.080	0.115	0.057	0.145	0.057	0.139	0.049	0.073	0.098
Percent change (%)	2.06	4.88	5.09	4.15	7.26	4.03	5.82	7.25	5.08
Elasticity	0.02	0.05	0.06	0.04	0.08	0.04	0.07	0.08	0.06

Notes: The unit of observation is a birth conception in a state-county-year-month for a particular subpopulation. Model estimated with OLS and controlled for mother demographic characteristics, policy controls, county fixed effects, conception (year-by-month) fixed effects, and state-by-conception year fixed effects. 95% confidence intervals accounting for within e-cigarette tax locality clustering are shown in parenthesis. Pre-pregnancy denotes three months before pregnancy.
*** p < 0.01, ** p < 0.05, * p < 0.10

Table 7

Effect of the standardized e-cigarette tax rate on prenatal smoking using a fixed-effects regression model: Heterogeneity in tax effects by mother's demographics									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	< 18 years old	18 to 30 years old	≥ 31 years old	High School or less	More than HS	Medicaid	Private	1st birth	2nd+ birth
	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)
Standardized E-cigarette Tax Rate	0.001	0.004*	0.002***	0.006**	0.002*	0.004	0.002	0.004	0.004**
	(0.007)	(0.002)	(0.001)	(0.003)	(0.001)	(0.003)	(0.001)	(0.002)	(0.002)
Observations	359,218	14,842,946	9,528,680	9,642,581	14,759,342	10,615,853	11,966,009	7,849,961	16,744,135
Adjusted R^2	0.10	0.15	0.13	0.17	0.10	0.17	0.07	0.11	0.15
Number of localities	50	50	50	50	50	50	50	50	50
Mean DV among tax adopters during pre-treatment period	0.060	0.088	0.043	0.119	0.038	0.114	0.031	0.048	0.078
Percent change (%)	1.96	5.01	4.72	4.71	6.26	3.43	4.89	7.87	5.03
Elasticity	0.02	0.05	0.05	0.05	0.07	0.03	0.06	0.09	0.05

Notes: The unit of observation is a birth conception in a state-county-year-month for a particular subpopulation. Model estimated with OLS and controlled for mother demographic characteristics, policy controls, county fixed effects, conception (year-by-month) fixed effects, and state-by-conception year fixed effects. 95% confidence intervals accounting for within e-cigarette tax locality clustering are shown in parenthesis.
*** p < 0.01, ** p < 0.05, * p < 0.10

Table 8

Effect of the standardized e-cigarette tax rate on prenatal smoking using a fixed-effects regression model: Panel model						
	(1)	(2)	(3)	(4)	(5)	(6)
	Any period-specific smoking	Period-specific cigarettes smoked per day (among smokers)	Period-specific cigarettes smoked per day	Any trimester-specific smoking	Trimester-specific cigarettes smoked per day (among smokers)	Trimester-specific cigarettes smoked per day
	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)
Standardized E-cigarette Tax Rate	0.007**	-0.029	0.174**	0.003**	-0.074	0.070**
	(0.003)	(0.454)	(0.075)	(0.001)	(0.224)	(0.032)
Time Periods Included:						
Pre-Pregnancy	Y	Y	Y	N	N	N
Prenatal	Y	Y	Y	Y	Y	Y
Observations	95,977,267	6,143,349	95,977,267	70,537,635	4,133,125	70,537,635
Adjusted R^2	0.84	0.72	0.73	0.91	0.82	0.85
Number of localities	50	50	50	50	50	50
Mean DV among tax adopters during pre-treatment period	0.068	10.939	0.740	0.060	9.719	0.578
Percent change (%)	9.95	-0.27	23.58	4.84	-0.76	12.07
Elasticity	0.11	-0.00	0.26	0.05	-0.01	0.13

Notes: The unit of observation is at the birth-trimester level, where trimester also includes the period of 3 months before pregnancy. Model estimated with OLS and controlled for policy controls, birth fixed effects, and trimester fixed effects. 95% confidence intervals accounting for within e-cigarette tax locality clusteringe-cigarette tax locality clustering are shown in parenthesis.

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

Table 9

Effect of the standardized e-cigarette tax rate on e-cigarette use outcomes						
	(1) Any pre-pregnancy e-cig use Coef. (Std.Errs)	(2) Any 3rd trimester e-cig use Coef. (Std.Errs)	(3) E-cig use per month pre-pregnancy Coef. (Std.Errs)	(4) E-cig use per month 3rd trimester Coef. (Std.Errs)	(5) Any e-cig use Coef. (Std.Errs)	(6) E-cig use per month Coef. (Std.Errs)
Standardized E-cigarette Tax Rate	-0.018**	-0.007***	-0.162***	-0.073**	-0.022**	-0.168**
	(0.009)	(0.002)	(0.056)	(0.03)	(0.01)	(0.076)
Model:						
Cross-Sectional (equation 1)	X	X	X	X		
Panel (equation 2)					X	X
Observations	126,355	126,355	126,355	126,355	181,628	181,628
Adjusted R2	0.03	0.02	0.02	0.01	0.4	0.38
Number of localities	40	40	40	40	22	22
Mean DV among tax adopters during pre-treatment period	0.041	0.011	0.244	0.066	0.021	0.128
Percent change (%)	-44.78	-60.41	-66.13	-111.25	-104.66	-130.75
Elasticity	-0.28	-0.29	-0.40	-0.49	-0.41	-0.5

Notes: Data source is the Pregnancy Risk Assessment Monitoring System for all completing interviews by 2019. The unit of observation is an individual in a state-year-month. Model estimated with OLS and controlled for policy controls, demographics, state fixed effects, and conception year-month FE. Observations from Illinois and Maryland are dropped due to the presence of local taxes and no sub-state information being available in PRAMS. 95% confidence intervals accounting for within state clustering are shown in parenthesis. Models 1 through 4 were from the cross-sectional analyses (equation 1). Models 5 and 6 were from the panel analyses (equation 2). PRAMS smoking results use birth certificate smoking information to allow comparison with birth certificate results.

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

Table 10

Effect of e-cigarette taxes on e-cigarette perceptions of relative risk		
	(1) E-cigarette relative risk (1-5) Coef. (Std.Errs)	(2) E-cigarette relative risk (1-5) Coef. (Std.Errs)
Standardized E-cigarette Tax Rate	0.245*** (0.068)	
Any E-cigarette Tax		0.097 (0.100)
Observations	3,028	3,028
Number of localities	53	53
Mean DV among tax adopters during pre-treatment period	2.634	2.634
Percent change (%)	9.3%	3.7%

Notes: Data source is the Health Information National Trends Survey (HINTS) for all women 18-44 years of age between 2013 to 2019. The unit of observation is an individual in a locality-year-quarter. The question asks "Compared to smoking cigarettes, would you say that electronic cigarettes are" ... 1) much less harmful, 2) less harmful, 3) just as harmful, 4) more harmful, and 5) much more harmful. Model estimated with OLS and controlled for policy controls, available demographics in HINTS (age and race/ethnicity), locality fixed effects, and year-quarter fixed effects. 95% confidence intervals accounting for within e-cigarette tax locality clustering are shown in parenthesis.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Table 11

Effect of e-cigarette taxes on news mentions per 100,000 population		
	(1) News mentions / 100,000 people Coef. (Std.Errs)	(2) News mentions / 100,000 people Coef. (Std.Errs)
Standardized E-cigarette Tax Rate	0.508**	
	(0.196)	
Any E-cigarette Tax		-0.075
		(0.145)
Observations	4,116	4,116
Number of localities	49	49
Mean DV among tax adopters during pre-treatment period	0.251	0.251
Percent change (%)	202.4%	-29.9%

Notes: Data source is the LexisNexis between 2013 to 2019. The outcome is the number of vape or 'electronic cigarette' mentions per 100,000 state population in a given year-month. Model estimated with OLS and controlled for policy controls, state fixed effects, and year-month fixed effects. Observations from Illinois and Maryland are dropped due to the presence of local taxes and no sub-state information being available in LexisNexis. 95% confidence intervals accounting for within e-cigarette tax state clustering are shown in parenthesis.

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

Table 12

Effect of the standardized e-cigarette tax rate on birth outcomes								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Gestation length	Premature	Birthweight	Low birthweight	Small-for-gestational age	Extra-small-for-gestational age	Apgar 5	One-year mortality
	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)
Standardized E-cigarette Tax Rate	0.000	-0.000	-0.743	0.000	0.000	-0.000	-0.000	-0.000
	(0.007)	(0.001)	(0.862)	(0.001)	(0.001)	(0.001)	(0.007)	(0.000)
Observations	24,730,930	24,730,930	24,717,465	24,717,465	24,717,465	24,717,465	24,642,078	18,767,811
Adjusted R^2	0.02	0.02	0.05	0.01	0.03	0.02	0.03	0.00
Number of localities	50	50	50	50	50	50	50	50
Mean DV among tax adopters during pre-treatment period	38.826	0.088	3315.973	0.060	0.236	0.090	8.844	0.004
Percent change (%)	0.00	-0.30	-0.02	0.81	0.12	-0.28	-0.01	-1.47
Elasticity	0.00	-0.00	-0.00	0.01	0.00	-0.00	-0.00	-0.02

Notes: The unit of observation is a birth delivery in a state-county-year-month. Model estimated with OLS and controlled for mother demographic characteristics, policy controls, county fixed effects, conception (year-by-month) fixed effects, and state-by-conception year fixed effects. 95% confidence intervals accounting for within e-cigarette tax locality clustering are shown in parenthesis.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Online Appendix Contents

Online Appendix A: Table 1

Summary statistics			
	(1) All mean	(2) Tax adopters mean	(3) Non-tax adopters mean
Prob. of smoking cigarettes during 3 months before pregnancy	0.092	0.084	0.098
Number of cigarettes smoked per day during 3 months before pregnancy	1.21	1.11	1.29
Number of cigarettes smoked per day during 3 months before pregnancy (among smokers)	13.2	13.2	13.2
Prob. of smoking cigarettes during pregnancy	0.071	0.065	0.076
Number of cigarettes smoked per day during pregnancy	0.60	0.53	0.66
Number of cigarettes smoked per day during pregnancy (among smokers)	8.47	8.27	8.61
Number of periods smoked	0.19	0.17	0.20
Number of cigarettes smoked on an average day during 1st trimester	0.75	0.67	0.81
Number of cigarettes smoked on an average day during 2nd trimester	0.56	0.50	0.62
Number of cigarettes smoked on an average day during 3rd trimester	0.50	0.44	0.55
Standardized e-cigarette tax rate (county/quarter); Inflation-adj. to 2020 Q1 dollar	0.16	0.37	0
Any e-cigarette tax (county/quarter)	0.14	0.32	0
Cigarette tax rate (county/quarter); Inflation-adj. to 2020 Q1 dollar	2.75	3.37	2.25
Index of indoor smoking restrictions (county/quarter)	0.79	0.93	0.68
Index of indoor vaping restrictions (county/quarter)	0.21	0.32	0.12
Any e-cigarette MLSA Law (county/quarter)	0.84	0.91	0.78
Tobacco 21 (county/quarter)	0.12	0.23	0.041
Share of a given quarter with temporary e-cig sales ban (state/quarter)	0.0016	0.0017	0.0015
Share of a given quarter with ACA Medicaid expansion (state/quarter)	0.49	0.71	0.31
Race: Non-Hispanic White	0.52	0.50	0.54
Race: Non-Hispanic Black	0.14	0.12	0.16
Race: Hispanic	0.24	0.25	0.22
Race: Non-Hispanic Other	0.10	0.13	0.078
Mother's age (single years) at the time of delivery	28.7	29.1	28.3
Primary source of payer: Medicaid	0.43	0.42	0.44
Primary source of payer: Private Insurance	0.48	0.50	0.47
Primary source of payer: Self-Pay	0.040	0.034	0.046
Primary source of payer: Indian Health Service	0.00084	0.00025	0.0013
Primary source of payer: CHAMPUS/TRICARE	0.012	0.0096	0.014
Primary source of payer: Other Government (Federal, State, Local)	0.0083	0.012	0.0054
Primary source of payer: Other	0.018	0.015	0.021

Primary source of payer: Unknown	0.0070	0.0063	0.0075
Marital status: Unmarried	0.38	0.34	0.41
Marital status: Married	0.56	0.51	0.59
Marital status: Unknown	0.065	0.15	0.00020
Education status: Less than high school	0.14	0.13	0.14
Education status: High school graduate	0.25	0.24	0.27
Education status: Some college	0.29	0.28	0.30
Education status: Bachelor or more	0.31	0.33	0.29
Education status: Unknown	0.012	0.019	0.0065
Mother's total birth count (living and dead)	2.51	2.51	2.51
Mother's total birth count (unknown)	0.0055	0.0048	0.0061
Unique counties	2,739	866	1,873
Observations	24,732,966	11,004,078	13,728,888

Online Appendix B: Table 1

Effect of standardized e-cigarette tax rate on smoking outcomes: County FEs and Conception (year-by-month) FEs						
	(1)	(2)	(3)	(4)	(5)	(6)
	Any pre-pregnancy smoking	Pre-pregnancy cigarettes smoked per day (among smokers)	Any prenatal smoking	Prenatal smoking cigarettes smoked per day (among smokers)	Prenatal smoking cigarettes smoked per day (among all)	Number of periods smoked
	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)
Standardized E-cigarette Tax Rate	0.007***	-0.175	0.006**	-0.048	0.045***	0.015***
	(0.003)	(0.206)	(0.002)	(0.108)	(0.016)	(0.005)
Observations	24,730,989	2,272,032	24,730,989	1,757,569	24,730,989	24,730,989
Adjusted R2	0.07	0.06	0.06	0.05	0.05	0.06
Number of localities	50	50	50	50	50	50
Mean DV among tax adopters during pre-treatment period	0.090	13.185	0.069	8.286	0.571	0.179
Percent change (%)	8.03	-1.32	8.03	-0.58	7.82	8.46
Elasticity	0.09	-0.01	0.09	-0.01	0.08	0.09

Notes: The unit of observation is a birth conception in a state-county-year-month. Model estimated with OLS and controlled for county fixed effects and conception (year-by-month) fixed effects. 95% confidence intervals accounting for within e-cigarette tax locality clustering are shown in parenthesis. Pre-pregnancy denotes three months before pregnancy.

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

Online Appendix B: Table 2

Effect of standardized e-cigarette tax rate on smoking outcomes: County FEs, Conception (year-by-month) FEs, and State-by-conception year FEs						
	(1)	(2)	(3)	(4)	(5)	(6)
	Any pre-pregnancy smoking	Pre-pregnancy cigarettes smoked per day (among smokers)	Any prenatal smoking	Prenatal smoking cigarettes smoked per day (among smokers)	Prenatal smoking cigarettes smoked per day (among all)	Number of periods smoked
	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)
Standardized E-cigarette Tax Rate	0.004**	-0.025	0.003***	0.125	0.031**	0.007***
	(0.001)	(0.153)	(0.001)	(0.151)	(0.015)	(0.002)
Observations	24,730,989	2,272,032	24,730,989	1,757,569	24,730,989	24,730,989
Adjusted R^2	0.07	0.06	0.06	0.05	0.05	0.06
Number of localities	50	50	50	50	50	50
Mean DV among tax adopters during pre-treatment period	0.090	13.185	0.069	8.286	0.571	0.179
Percent change (%)	3.91	-0.19	4.01	1.50	5.48	4.06
Elasticity	0.04	-0.00	0.04	0.01	0.06	0.04

Notes: The unit of observation is a birth conception in a state-county-year-month. Model estimated with OLS and controlled for county fixed effects, conception (year-by-month) fixed effects, and state-by-conception year fixed effects. 95% confidence intervals accounting for within e-cigarette tax locality clustering are shown in parenthesis. Pre-pregnancy denotes three months before pregnancy.
*** p < 0.01, ** p < 0.05, * p < 0.10

Online Appendix B: Table 3

Effect of standardized e-cigarette tax rate on smoking outcomes: County FEs, Conception (year-by-month) FEs, State-by-conception year FEs, and Mother demographic characteristics

	(1)	(2)	(3)	(4)	(5)	(6)
	Any pre-pregnancy smoking	Pre-pregnancy cigarettes smoked per day (among smokers)	Any prenatal smoking	Prenatal smoking cigarettes smoked per day (among smokers)	Prenatal smoking cigarettes smoked per day (among all)	Number of periods smoked
	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)
Standardized E-cigarette Tax Rate	0.004**	-0.034	0.003**	0.112	0.033*	0.008**
	(0.002)	(0.155)	(0.001)	(0.154)	(0.017)	(0.003)
Observations	24,730,989	2,272,032	24,730,989	1,757,569	24,730,989	24,730,989
Adjusted R^2	0.15	0.08	0.14	0.09	0.10	0.14
Number of localities	50	50	50	50	50	50
Mean DV among tax adopters during pre-treatment period	0.090	13.185	0.069	8.286	0.571	0.179
Percent change (%)	4.11	-0.26	4.27	1.35	5.77	4.34
Elasticity	0.05	-0.00	0.05	0.01	0.06	0.05

Notes: The unit of observation is a birth conception in a state-county-year-month. Model estimated with OLS and controlled for mother demographic characteristics, county fixed effects, conception (year-by-month) fixed effects, and state-by-conception year fixed effects. 95% confidence intervals accounting for within e-cigarette tax locality clustering are shown in parenthesis. Pre-pregnancy denotes three months before pregnancy.

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

Online Appendix B: Table 4

Effect of standardized e-cigarette tax rate on smoking outcomes: County FEs, Conception (year-by-month) FEs, State-by-conception year FEs, Mother demographic characteristics, and Policy variables (Full results)

	(1)	(2)	(3)	(4)	(5)	(6)
	Any pre-pregnancy smoking	Pre-pregnancy cigarettes smoked per day (among smokers)	Any prenatal smoking	Prenatal smoking cigarettes smoked per day (among smokers)	Prenatal smoking cigarettes smoked per day (among all)	Number of periods smoked
	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)
Standardized E-cigarette Tax Rate	0.005**	-0.033	0.004**	0.118	0.041*	0.010**
	(0.002)	(0.187)	(0.002)	(0.196)	(0.023)	(0.004)
Mom's age indicators (controlled for in the model but are omitted here for brevity)						
Non-Hispanic Black	-0.110***	-3.570***	-0.092***	-2.632***	-0.956***	-0.252***
	(0.012)	(0.125)	(0.011)	(0.107)	(0.121)	(0.030)
Hispanic	-0.127***	-2.720***	-0.110***	-2.003***	-1.024***	-0.297***
	(0.013)	(0.214)	(0.012)	(0.105)	(0.132)	(0.034)
Non-Hispanic Other	-0.042***	-1.616***	-0.035***	-1.200***	-0.368***	-0.096***
	(0.005)	(0.098)	(0.004)	(0.054)	(0.051)	(0.012)
Primary source of payer: Private Insurance	-0.060***	-1.001***	-0.058***	-0.894***	-0.564***	-0.160***
	(0.008)	(0.066)	(0.008)	(0.052)	(0.086)	(0.022)
Primary source of payer: Self-Pay	-0.069***	-0.185**	-0.059***	0.505***	-0.535***	-0.158***
	(0.013)	(0.080)	(0.012)	(0.084)	(0.122)	(0.033)
Primary source of payer: Indian Health Service	-0.022	-1.299***	-0.026	-0.614**	-0.370**	-0.078
	(0.026)	(0.412)	(0.023)	(0.253)	(0.156)	(0.061)
Primary source of payer: CHAMPUS/TRICARE	-0.052***	-0.620*	-0.053***	-1.239***	-0.507***	-0.148***
	(0.005)	(0.319)	(0.005)	(0.147)	(0.051)	(0.013)
Primary source of payer: Other Government (Federal, State, Local)	-0.015**	0.392	-0.017**	0.237	-0.128*	-0.049***
	(0.007)	(0.385)	(0.006)	(0.403)	(0.075)	(0.017)
Primary source of payer: Other	-0.048***	-0.092	-0.044***	-0.298***	-0.410***	-0.122***
	(0.008)	(0.156)	(0.007)	(0.091)	(0.071)	(0.019)

Primary source of payer: Unknown	-0.036***	0.064	-0.034***	0.291*	-0.284***	-0.092***
	(0.006)	(0.168)	(0.006)	(0.153)	(0.062)	(0.016)
Unmarried	-0.100***	-0.420***	-0.083***	-0.174***	-0.715***	-0.218***
	(0.011)	(0.047)	(0.010)	(0.021)	(0.090)	(0.025)
Marital status unknown	-0.068***	-0.505***	-0.056***	-0.265***	-0.474***	-0.146***
	(0.007)	(0.149)	(0.006)	(0.090)	(0.052)	(0.015)
High school graduate	-0.024***	-0.566***	-0.030***	-0.806***	-0.344***	-0.090***
	(0.007)	(0.044)	(0.007)	(0.044)	(0.083)	(0.021)
Some college	-0.060***	-0.959***	-0.066***	-1.480***	-0.709***	-0.194***
	(0.011)	(0.077)	(0.012)	(0.064)	(0.138)	(0.035)
Bachelor or more	-0.109***	-2.893***	-0.097***	-2.529***	-0.946***	-0.269***
	(0.015)	(0.173)	(0.015)	(0.108)	(0.160)	(0.041)
Education unknown	-0.072***	-0.584***	-0.066***	0.549***	-0.606***	-0.181***
	(0.011)	(0.181)	(0.010)	(0.172)	(0.099)	(0.027)
Total birth counts: 2	0.004***	-0.188***	0.008***	0.449***	0.080***	0.026***
	(0.001)	(0.035)	(0.001)	(0.022)	(0.013)	(0.004)
Total birth counts: 3	0.012***	0.036	0.017***	0.809***	0.176***	0.052***
	(0.002)	(0.036)	(0.002)	(0.026)	(0.027)	(0.007)
Total birth counts: 4	0.020***	0.192***	0.027***	1.046***	0.282***	0.080***
	(0.003)	(0.049)	(0.003)	(0.036)	(0.041)	(0.010)
Total birth counts: 5	0.031***	0.344***	0.038***	1.269***	0.406***	0.113***
	(0.003)	(0.051)	(0.004)	(0.035)	(0.052)	(0.013)
Total birth counts: 6	0.041***	0.497***	0.049***	1.405***	0.517***	0.143***
	(0.004)	(0.069)	(0.004)	(0.048)	(0.057)	(0.013)
Total birth counts: 7	0.048***	0.704***	0.058***	1.596***	0.630***	0.171***
	(0.004)	(0.068)	(0.004)	(0.044)	(0.060)	(0.013)
Total birth counts: 8	0.052***	1.097***	0.064***	1.898***	0.725***	0.189***
	(0.004)	(0.067)	(0.004)	(0.045)	(0.057)	(0.012)
Total birth counts: 9	0.010**	0.667***	0.018***	1.449***	0.243***	0.057***
	(0.004)	(0.218)	(0.003)	(0.199)	(0.044)	(0.009)
Cigarette tax rate; Inflation-adj. to 2020 Q1 dollar	-0.002	-0.020	-0.002	0.009	-0.015	-0.004
	(0.002)	(0.101)	(0.001)	(0.096)	(0.017)	(0.004)
Index of indoor smoking restrictions (county/quarter)	0.018**	-0.047	0.011	-0.095	0.068	0.032
	(0.008)	(0.357)	(0.008)	(0.424)	(0.070)	(0.020)
Index of indoor vaping restrictions	0.005**	0.014	0.004*	0.019	0.041*	0.010

(county/quarter)						
	(0.002)	(0.150)	(0.002)	(0.141)	(0.022)	(0.006)
Any e-cigarette MLSA Law (county/quarter)	-0.002***	0.084	-0.002***	0.013	-0.017**	-0.005***
	(0.001)	(0.066)	(0.001)	(0.052)	(0.007)	(0.002)
Any Tobacco 21 Law (county/quarter)	0.004***	0.074	0.004***	-0.154*	0.028***	0.010**
	(0.001)	(0.185)	(0.001)	(0.079)	(0.009)	(0.004)
Share of a given quarter with temporary e-cig sales ban (state/quarter)	0.001	0.010	0.001	-0.473***	-0.012	-0.000
	(0.002)	(0.243)	(0.001)	(0.139)	(0.009)	(0.003)
Share of a given quarter with ACA Medicaid expansion (state/quarter)	-0.003	-0.223**	-0.003	-0.095**	-0.037	-0.007
	(0.004)	(0.099)	(0.002)	(0.046)	(0.024)	(0.007)
Observations	24,730,930	2,272,024	24,730,930	1,757,562	24,730,930	24,730,930
Adjusted R^2	0.15	0.08	0.14	0.09	0.10	0.14
Number of localities	50	50	50	50	50	50
Mean DV among tax adopters during pre-treatment period	0.090	13.185	0.069	8.286	0.571	0.179
Percent change (%)	5.71	-0.25	5.73	1.43	7.26	5.74
Elasticity	0.06	-0.00	0.06	0.01	0.08	0.06

Notes: The unit of observation is a birth conception in a state-county-year-month. Model estimated with OLS and controlled for mother demographic characteristics, policy controls, county fixed effects, conception (year-by-month) fixed effects, and state-by-conception year fixed effects. 95% confidence intervals accounting for within e-cigarette tax locality clustering are shown in parenthesis. Pre-pregnancy denotes three months before pregnancy.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Online Appendix B: Table 5

Effect of any e-cigarette tax on smoking outcomes: County FEs and Conception (year-by-month) FEs						
	(1)	(2)	(3)	(4)	(5)	(6)
	Any pre-pregnancy smoking	Pre-pregnancy cigarettes smoked per day (among smokers)	Any prenatal smoking	Prenatal smoking cigarettes smoked per day (among smokers)	Prenatal smoking cigarettes smoked per day (among all)	Number of periods smoked
	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)
Any E-cigarette Tax	0.007***	-0.175	0.006**	-0.048	0.045***	0.015***
	(0.003)	(0.206)	(0.002)	(0.108)	(0.016)	(0.005)
Observations	24,730,989	2,272,032	24,730,989	1,757,569	24,730,989	24,730,989
Adjusted R^2	0.07	0.06	0.06	0.05	0.05	0.06
Number of localities	50	50	50	50	50	50
Mean DV among tax adopters during pre-treatment period	0.090	13.185	0.069	8.286	0.571	0.179
Percent change (%)	8.03	-1.32	8.03	-0.58	7.82	8.46
Elasticity	0.09	-0.01	0.09	-0.01	0.08	0.09

Notes: The unit of observation is a birth conception in a state-county-year-month. Model estimated with OLS and controlled for county fixed effects and conception (year-by-month) fixed effects. 95% confidence intervals accounting for within e-cigarette tax locality clustering are shown in parenthesis. Pre-pregnancy denotes three months before pregnancy.

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

Online Appendix B: Table 6

Effect of any e-cigarette tax on smoking outcomes: County FEs, Conception (year-by-month) FEs, and State-by-conception year FEs						
	(1)	(2)	(3)	(4)	(5)	(6)
	Any pre-pregnancy smoking	Pre-pregnancy cigarettes smoked per day (among smokers)	Any prenatal smoking	Prenatal smoking cigarettes smoked per day (among smokers)	Prenatal smoking cigarettes smoked per day (among all)	Number of periods smoked
	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)
Any e-cigarette tax	0.003***	0.009	0.003***	0.007	0.028**	0.007***
	(0.001)	(0.094)	(0.001)	(0.098)	(0.012)	(0.002)
Observations	24,730,989	2,272,032	24,730,989	1,757,569	24,730,989	24,730,989
Adjusted R^2	0.07	0.06	0.06	0.05	0.05	0.06
Number of localities	50	50	50	50	50	50
Mean DV among tax adopters during pre-treatment period	0.090	13.185	0.069	8.286	0.571	0.179
Percent change (%)	3.87	0.07	3.92	0.09	4.90	4.01
Elasticity	0.04	0.00	0.04	0.00	0.05	0.04

Notes: The unit of observation is a birth conception in a state-county-year-month. Model estimated with OLS and controlled for county fixed effects, conception (year-by-month) fixed effects, and state-by-conception year fixed effects. 95% confidence intervals accounting for within e-cigarette tax locality clustering are shown in parenthesis. Pre-pregnancy denotes three months before pregnancy.

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

Online Appendix B: Table 7

Effect of any e-cigarette tax on smoking outcomes: County FEs, Conception (year-by-month) FEs, State-by-conception year FEs, and Mother demographic characteristics						
	(1)	(2)	(3)	(4)	(5)	(6)
	Any pre-pregnancy smoking	Pre-pregnancy cigarettes smoked per day (among smokers)	Any prenatal smoking	Prenatal smoking cigarettes smoked per day (among smokers)	Prenatal smoking cigarettes smoked per day (among all)	Number of periods smoked
	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)
Any e-cigarette tax	0.004***	-0.007	0.003***	-0.003	0.031**	0.008***
	(0.001)	(0.096)	(0.001)	(0.100)	(0.014)	(0.002)
Observations	24,730,989	2,272,032	24,730,989	1,757,569	24,730,989	24,730,989
Adjusted R^2	0.15	0.08	0.14	0.09	0.10	0.14
Number of localities	50	50	50	50	50	50
Mean DV among tax adopters during pre-treatment period	0.090	13.185	0.069	8.286	0.571	0.179
Percent change (%)	4.31	-0.05	4.46	-0.04	5.49	4.58
Elasticity	0.04	-0.00	0.04	-0.00	0.05	0.04

Notes: The unit of observation is a birth conception in a state-county-year-month. Model estimated with OLS and controlled for mother demographic characteristics, county fixed effects, conception (year-by-month) fixed effects, and state-by-conception year fixed effects. 95% confidence intervals accounting for within e-cigarette tax locality clustering are shown in parenthesis. Pre-pregnancy denotes three months before pregnancy.

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

Online Appendix B: Table 8

Effect of any e-cigarette tax on smoking outcomes: County FEs, Conception (year-by-month) FEs, State-by-conception year FEs, Mother demographic characteristics, and Policy variables (Full results)						
	(1)	(2)	(3)	(4)	(5)	(6)
	Any pre-pregnancy smoking	Pre-pregnancy cigarettes smoked per day (among smokers)	Any prenatal smoking	Prenatal smoking cigarettes smoked per day (among smokers)	Prenatal smoking cigarettes smoked per day (among all)	Number of periods smoked
	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)
Any e-cigarette tax	0.004**	-0.017	0.003**	0.009	0.027*	0.008**
	(0.001)	(0.112)	(0.001)	(0.109)	(0.016)	(0.003)
Mom's age indicators (controlled for in the model but are omitted here for brevity)						
Non-Hispanic Black	-0.110***	-3.570***	-0.092***	-2.631***	-0.956***	-0.252***
	(0.012)	(0.125)	(0.011)	(0.107)	(0.121)	(0.030)
Hispanic	-0.127***	-2.720***	-0.110***	-2.003***	-1.024***	-0.297***
	(0.013)	(0.214)	(0.012)	(0.105)	(0.132)	(0.034)
Non-Hispanic Other	-0.042***	-1.616***	-0.035***	-1.199***	-0.368***	-0.096***
	(0.005)	(0.098)	(0.004)	(0.054)	(0.051)	(0.012)
Primary source of payer: Private Insurance	-0.060***	-1.001***	-0.058***	-0.894***	-0.564***	-0.160***
	(0.008)	(0.066)	(0.008)	(0.052)	(0.086)	(0.022)
Primary source of payer: Self-Pay	-0.069***	-0.185**	-0.059***	0.505***	-0.535***	-0.158***
	(0.013)	(0.080)	(0.012)	(0.084)	(0.122)	(0.033)
Primary source of payer: Indian Health Service	-0.022	-1.299***	-0.026	-0.614**	-0.370**	-0.078
	(0.026)	(0.412)	(0.023)	(0.253)	(0.156)	(0.061)
Primary source of payer: CHAMPUS/TRICARE	-0.052***	-0.620*	-0.053***	-1.239***	-0.507***	-0.148***
	(0.005)	(0.319)	(0.005)	(0.147)	(0.051)	(0.013)
Primary source of payer: Other Government (Federal, State, Local)	-0.015**	0.392	-0.017**	0.237	-0.128*	-0.049***
	(0.007)	(0.385)	(0.006)	(0.403)	(0.075)	(0.017)
Primary source of payer: Other	-0.048***	-0.092	-0.044***	-0.298***	-0.410***	-0.122***
	(0.008)	(0.156)	(0.007)	(0.091)	(0.071)	(0.019)
Primary source of payer: Unknown	-0.036***	0.064	-0.034***	0.291*	-0.284***	-0.092***
	(0.006)	(0.168)	(0.006)	(0.153)	(0.062)	(0.016)
Unmarried	-0.100***	-0.420***	-0.083***	-0.174***	-0.715***	-0.218***
	(0.011)	(0.047)	(0.010)	(0.021)	(0.090)	(0.025)

Marital status unknown	-0.068***	-0.506***	-0.056***	-0.267***	-0.473***	-0.146***
	(0.007)	(0.159)	(0.006)	(0.089)	(0.051)	(0.015)
High school graduate	-0.024***	-0.566***	-0.030***	-0.806***	-0.344***	-0.090***
	(0.007)	(0.044)	(0.007)	(0.044)	(0.083)	(0.021)
Some college	-0.060***	-0.959***	-0.066***	-1.480***	-0.709***	-0.194***
	(0.011)	(0.077)	(0.012)	(0.064)	(0.138)	(0.035)
Bachelor or more	-0.109***	-2.893***	-0.097***	-2.528***	-0.946***	-0.269***
	(0.015)	(0.173)	(0.015)	(0.108)	(0.160)	(0.041)
Education unknown	-0.072***	-0.584***	-0.066***	0.549***	-0.606***	-0.181***
	(0.011)	(0.181)	(0.010)	(0.173)	(0.099)	(0.027)
Total birth counts: 2	0.004***	-0.188***	0.008***	0.449***	0.080***	0.026***
	(0.001)	(0.035)	(0.001)	(0.022)	(0.013)	(0.004)
Total birth counts: 3	0.012***	0.036	0.017***	0.809***	0.176***	0.052***
	(0.002)	(0.036)	(0.002)	(0.026)	(0.027)	(0.007)
Total birth counts: 4	0.020***	0.192***	0.027***	1.046***	0.282***	0.080***
	(0.003)	(0.049)	(0.003)	(0.036)	(0.041)	(0.010)
Total birth counts: 5	0.031***	0.344***	0.038***	1.269***	0.406***	0.113***
	(0.003)	(0.051)	(0.004)	(0.035)	(0.052)	(0.013)
Total birth counts: 6	0.041***	0.497***	0.049***	1.405***	0.517***	0.143***
	(0.004)	(0.069)	(0.004)	(0.048)	(0.057)	(0.013)
Total birth counts: 7	0.048***	0.704***	0.058***	1.596***	0.630***	0.171***
	(0.004)	(0.068)	(0.004)	(0.044)	(0.060)	(0.013)
Total birth counts: 8	0.052***	1.097***	0.064***	1.898***	0.725***	0.189***
	(0.004)	(0.067)	(0.004)	(0.045)	(0.057)	(0.012)
Total birth counts: 9	0.010**	0.667***	0.018***	1.449***	0.243***	0.057***
	(0.004)	(0.218)	(0.003)	(0.199)	(0.044)	(0.009)
Cigarette tax rate; Inflation-adj. to 2020 Q1 dollar	-0.001	-0.031	-0.000	0.067	-0.000	-0.001
	(0.001)	(0.086)	(0.001)	(0.068)	(0.009)	(0.002)
Index of indoor smoking restrictions (county/quarter)	0.018**	-0.047	0.011	-0.090	0.068	0.032
	(0.008)	(0.357)	(0.008)	(0.424)	(0.071)	(0.020)
Index of indoor vaping restrictions (county/quarter)	0.005**	0.015	0.004*	0.015	0.041*	0.010
	(0.002)	(0.147)	(0.002)	(0.139)	(0.022)	(0.006)
Any e-cigarette MLSA Law (county/quarter)	-0.002***	0.084	-0.002***	0.013	-0.018**	-0.005***
	(0.001)	(0.066)	(0.001)	(0.052)	(0.007)	(0.002)
Any Tobacco 21 Law (county/quarter)	0.004***	0.077	0.004***	-0.152*	0.026**	0.010**
	(0.001)	(0.197)	(0.001)	(0.085)	(0.010)	(0.004)
Share of a given quarter with temporary e-cig sales	0.000	0.013	0.000	-0.457***	-0.019	-0.002

ban (state/quarter)						
	(0.003)	(0.266)	(0.002)	(0.153)	(0.015)	(0.004)
Share of a given quarter with ACA Medicaid expansion (state/quarter)	-0.003	-0.223**	-0.003	-0.097**	-0.037	-0.007
	(0.004)	(0.098)	(0.002)	(0.045)	(0.023)	(0.007)
Observations	24,730,930	2,272,024	24,730,930	1,757,562	24,730,930	24,730,930
Adjusted R^2	0.15	0.08	0.14	0.09	0.10	0.14
Number of localities	50	50	50	50	50	50
Mean DV among tax adopters during pre-treatment period	0.090	13.185	0.069	8.286	0.571	0.179
Percent change (%)	4.13	-0.13	4.05	0.11	4.82	4.21
Elasticity	0.04	-0.00	0.04	0.00	0.05	0.04

Notes: The unit of observation is a birth conception in a state-county-year-month. Model estimated with OLS and controlled for mother demographic characteristics, policy controls, county fixed effects, conception (year-by-month) fixed effects, and state-by-conception year fixed effects. 95% confidence intervals accounting for within e-cigarette tax locality clustering are shown in parenthesis. Pre-pregnancy denotes three months before pregnancy.
*** p < 0.01, ** p < 0.05, * p < 0.10

Online Appendix C: Table 1

Effect of any e-cigarette tax on smoking outcomes using an event study study (reference group: Pregnancy 9-12 Months before e-cigarette tax effective date)						
	(1)	(2)	(3)	(4)	(5)	(6)
	Any pre-pregnancy smoking	Pre-pregnancy cigarettes smoked per day (among smokers)	Any prenatal smoking	Prenatal smoking cigarettes smoked per day (among smokers)	Prenatal smoking cigarettes smoked per day (among all)	Number of periods smoked
Relative to the e-cigarette effective date	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)
Pregnancy 18+ months before	0.002	0.010	0.002	-0.022	0.013	0.005
	(0.001)	(0.095)	(0.001)	(0.092)	(0.013)	(0.003)
Pregnancy 15-18 months before	0.002	-0.011	0.002	-0.039	0.015	0.006
	(0.001)	(0.110)	(0.001)	(0.086)	(0.012)	(0.003)
Pregnancy 12-15 months before	0.001	0.053	0.001	0.087	0.011	0.003
	(0.001)	(0.095)	(0.001)	(0.068)	(0.008)	(0.002)
Pregnancy 9-12 months before	–	–	–	–	–	–
	–	–	–	–	–	–
Pregnancy 6-9 months before	0.000	0.042	0.000	0.092	0.006	0.001
	(0.001)	(0.102)	(0.000)	(0.079)	(0.009)	(0.001)
Pregnancy 3-6 months before	0.000	-0.019	0.001	0.240**	0.019	0.003
	(0.001)	(0.1397)	(0.001)	(0.109)	(0.014)	(0.003)
Pregnancy less than 3 months before	-0.001	0.081	0.000	0.207**	0.013	0.001
	(0.001)	(0.111)	(0.001)	(0.097)	(0.011)	(0.003)
Pregnancy 0-3 months after	0.000	-0.025	0.000	0.129	0.010	0.003*
	(0.001)	(0.132)	(0.001)	(0.097)	(0.011)	(0.002)
Pregnancy 3-6 months after	0.004***	0.008	0.004***	0.112	0.040***	0.012***
	(0.001)	(0.183)	(0.001)	(0.106)	(0.010)	(0.003)
Pregnancy 6-9 months after	0.007***	0.115	0.006	0.571**	0.068***	0.017***
	(0.002)	(0.309)	(0.001***)	(0.251)	(0.020)	(0.003)
Pregnancy 9+ months after	0.010***	0.224	0.008***	0.701***	0.103***	0.022***
	(0.002)	(0.328)	(0.002)	(0.299)	(0.021)	(0.004)
Observations	24,732,907	2,272,654	24,732,907	1,757,896	24,732,907	24,732,907
Adjusted R^2	0.15	0.08	0.14	0.09	0.10	0.14
Number of localities	50	50	50	50	50	50
Mean DV among tax adopters during pre-treatment period	0.090	13.185	0.069	8.286	0.571	0.179
Notes: The unit of observation is a birth conception in a state-county-year-month. Model estimated with OLS and controlled for mother demographic characteristics, policy						

controls, county fixed effects, conception (year-by-month) fixed effects, and state-by-conception year fixed effects. 95% confidence intervals accounting for within e-cigarette tax locality clustering are shown in parenthesis. Pre-pregnancy denotes three months before pregnancy.*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Online Appendix C: Table 2

Effect of any e-cigarette tax on smoking outcomes using an event study (reference group: Pregnancy 13-15 Months before e-cigarette tax effective date)						
	(1)	(2)	(3)	(4)	(5)	(6)
	Any pre-pregnancy smoking	Pre-pregnancy cigarettes smoked per day (among smokers)	Any prenatal smoking	Prenatal smoking cigarettes smoked per day (among smokers)	Prenatal smoking cigarettes smoked per day (among all)	Number of periods smoked
Relative to the e-cigarette effective date	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)
Pregnancy 18+ months before	0.001	-0.044	0.001	-0.109	0.002	0.002
	(0.001)	(0.095)	(0.001)	(0.076)	(0.012)	(0.003)
Pregnancy 15-18 months before	0.001	-0.064	0.001	-0.127***	0.004	0.003
	(0.001)	(0.094)	(0.001)	(0.045)	(0.009)	(0.002)
Pregnancy 12-15 months before	–	–	–	–	–	–
	–	–	–	–	–	–
Pregnancy 9-12 months before	-0.001	-0.053	-0.001	-0.087	-0.011	-0.003
	(0.001)	(0.095)	(0.001)	(0.068)	(0.008)	(0.002)
Pregnancy 6-9 months before	-0.001	-0.012	-0.001	0.005	-0.005	-0.002
	(0.001)	(0.083)	(0.001)	(0.066)	(0.008)	(0.002)
Pregnancy 3-6 months before	-0.001	-0.072	0.000	0.153	0.008	0.000
	(0.001)	(0.125)	(0.001)	(0.113)	(0.011)	(0.003)
Pregnancy less than 3 months before	-0.001	0.028	-0.001	0.120	0.002	-0.002
	(0.001)	(0.126)	(0.001)	(0.106)	(0.008)	(0.003)
Pregnancy 0-3 months after	0.000	-0.078	0.000	0.042	-0.001	0.000
	(0.001)	(0.141)	(0.001)	(0.110)	(0.013)	(0.003)
Pregnancy 3-6 months after	0.004**	-0.045	0.003**	0.024	0.030***	0.009***
	(0.002)	(0.203)	(0.001)	(0.133)	(0.012)	(0.003)
Pregnancy 6-9 months after	0.006***	0.062	0.005***	0.484**	0.058***	0.014***
	(0.002)	(0.299)	(0.001)	(0.238)	(0.017)	(0.004)
Pregnancy 9+ months after	0.010***	0.171	0.007***	0.614**	0.092***	0.019***
	(0.002)	(0.325)	(0.002)	(0.302)	(0.020)	(0.004)
Observations	24,732,907	2,272,654	24,732,907	1,757,896	24,732,907	24,732,907
Adjusted R^2	0.15	0.08	0.14	0.09	0.10	0.14
Number of localities	50	50	50	50	50	50
Mean DV among tax adopters during pre-treatment period	0.090	13.185	0.069	8.286	0.571	0.179
Notes: The unit of observation is a birth conception in a state-county-year-month. Model estimated with OLS and controlled for mother demographic characteristics, policy						

controls, county fixed effects, conception (year-by-month) fixed effects, and state-by-conception year fixed effects. 95% confidence intervals accounting for within e-cigarette tax locality clustering are shown in parenthesis. Pre-pregnancy denotes three months before pregnancy.*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Online Appendix D: Table 1

Effect of the standardized e-cigarette tax rate on birth counts using a fixed-effects regression model										
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	All	< 18 years old	18 to 30 years old	≥ 31 years old	High School or less	More than HS	Medicaid	Private	1st birth	2nd+ birth
	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)
Standardized E-cigarette Tax Rate	-1.508	0.532	-5.244	3.204	-10.422	0.444	-5.830	3.799	0.758	-12.040
	(34.686)	(3.650)	(32.267)	(9.417)	(25.870)	(12.590)	(37.354)	(16.935)	(12.502)	(15.771)
Observations	255,726	255,726	255,726	255,726	255,726	255,726	255,726	255,726	255,726	255,726
Adjusted R^2	0.99	0.92	0.99	1.00	0.98	0.99	0.99	0.99	0.99	0.99
Number of localities	50	50	50	50	50	50	50	50	50	50
Mean DV among tax adopters during pre-treatment period	152.897	2.023	87.407	63.468	57.839	92.483	65.519	76.091	48.291	103.723
Percent change (%)	-0.99	26.28	-6.00	5.05	-18.02	0.48	-8.90	4.99	1.57	-11.61
Elasticity	-0.01	0.35	-0.08	0.08	-0.25	0.01	-0.13	0.07	0.02	-0.17

Notes: The unit of observation is the total number of births in a county-year-month. Model estimated with OLS and controlled for county fixed effects, conception (year-by-month) fixed effects, and state-by-conception year fixed effects. Policy variables shown in the summary statistics table are averaged at this level and their mean values are controlled for. The model further controls for the proportion of moms who are NH-Whites, the proportion of moms who are Hispanics, the proportion of moms who are unmarried, and the proportion of moms whose marital status is unknown. Regression is weighted by the total number of births in a county-year-month. 95% confidence intervals accounting for within e-cigarette tax locality clustering are shown in parenthesis.

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

Online Appendix D: Table 2

Effect of the standardized e-cigarette tax rate on the share of total birth counts in a county-year-month using a fixed-effects regression model										
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	All	< 18 years old	18 to 30 years old	≥ 31 years old	High School or less	More than HS	Medicaid	Private	1st birth	2nd+ birth
	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)
Standardized E-cigarette Tax Rate	–	0.001*	-0.004*	0.003*	-0.004	0.002	0.004	-0.013	0.001	-0.004
	–	(0.001)	(0.002)	(0.002)	(0.004)	(0.003)	(0.009)	(0.010)	(0.002)	(0.003)
Observations	255,726	255,726	255,726	255,726	255,726	255,726	255,726	255,726	255,726	255,726
Adjusted R^2	–	0.30	0.91	0.94	0.85	0.84	0.87	0.89	0.40	0.36
Number of localities	50	50	50	50	50	50	50	50	50	50
Mean DV among tax adopters during pre-treatment period	–	0.016	0.672	0.313	0.415	0.579	0.429	0.482	0.298	0.696
Percent change (%)	–	6.71	-0.57	0.89	-1.02	0.27	0.94	-2.59	0.28	-0.53
Elasticity	–	0.06	-0.01	0.01	-0.01	0.00	0.01	-0.03	0.00	-0.00

Notes: The unit of observation is the total number of births in a county-year-month. Model estimated with OLS and controlled for county fixed effects, conception (year-by-month) fixed effects, and state-by-conception year fixed effects. Policy variables shown in the summary statistics table are averaged at this level and their mean values are controlled for. The model further controls for the proportion of moms who are NH-Whites, the proportion of moms who are Hispanics, the proportion of moms who are unmarried, and the proportion of moms whose marital status is unknown. Regression is weighted by the total number of births in a county-year-month. 95% confidence intervals accounting for within e-cigarette tax locality clustering are shown in parenthesis.

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

Online Appendix D: Table 3

Effect of any e-cigarette tax on birth counts using a fixed-effects regression model										
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	All	< 18 years old	18 to 30 years old	≥ 31 years old	High School or less	More than HS	Medicaid	Private	1st birth	2nd+ birth
	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)
Any E-cigarette Tax	22.742	3.092	22.807	-3.157	19.453	2.200	15.865	-6.895	10.380	6.644
	(24.968)	(2.069)	(22.286)	(3.841)	(16.702)	(8.778)	(24.074)	(6.113)	(9.429)	(12.267)
Observations	255,726	255,726	255,726	255,726	255,726	255,726	255,726	255,726	255,726	255,726
Adjusted R^2	0.99	0.92	0.99	1.00	0.98	0.99	0.99	0.99	0.99	0.99
Number of localities	50	50	50	50	50	50	50	50	50	50
Mean DV among tax adopters during pre-treatment period	155.944	2.063	89.095	64.786	59.006	94.301	66.907	77.565	49.270	105.770
Percent change (%)	14.58	149.85	25.60	-4.87	32.97	2.33	23.71	-8.89	21.07	6.28
Elasticity	0.24	2.20	0.39	-0.08	0.52	0.04	0.38	-0.15	0.34	0.10

Notes: The unit of observation is the total number of births in a county-year-month. Model estimated with OLS and controlled for county fixed effects, conception (year-by-month) fixed effects, and state-by-conception year fixed effects. Policy variables shown in the summary statistics table are averaged at this level and their mean values are controlled for. The model further controls for the proportion of moms who are NH-Whites, the proportion of moms who are Hispanics, the proportion of moms who are unmarried, and the proportion of moms whose marital status is unknown. Regression is weighted by the total number of births in a county-year-month. 95% confidence intervals accounting for within e-cigarette tax locality clustering are shown in parenthesis.

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

Online Appendix D: Table 4

Effect of any e-cigarette tax on the share of total birth counts in a county-year-month using a fixed-effects regression model										
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	All	< 18 years old	18 to 30 years old	≥ 31 years old	High School or less	More than HS	Medicaid	Private	1st birth	2nd+ birth
	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)
Any E-cigarette Tax	–	-0.000	0.001	-0.001	0.001	-0.001	-0.004	-0.003	0.004**	-0.003
	–	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.006)	(0.010)	(0.002)	(0.003)
Observations	255,726	255,726	255,726	255,726	255,726	255,726	255,726	255,726	255,726	255,726
Adjusted R^2	–	0.30	0.91	0.94	0.85	0.84	0.87	0.89	0.40	0.36
Number of localities	50	50	50	50	50	50	50	50	50	50
Mean DV among tax adopters during pre-treatment period	–	0.016	0.671	0.313	0.417	0.578	0.431	0.480	0.299	0.695
Percent change (%)	–	-1.95	0.13	-0.17	0.16	-0.25	-0.90	-0.52	1.28	-0.42
Elasticity	–	-0.02	0.00	-0.00	0.00	-0.00	-0.01	-0.01	0.01	-0.00

Notes: The unit of observation is the total number of births in a county-year-month. Model estimated with OLS and controlled for county fixed effects, conception (year-by-month) fixed effects, and state-by-conception year fixed effects. Policy variables shown in the summary statistics table are averaged at this level and their mean values are controlled for. The model further controls for the proportion of moms who are NH-Whites, the proportion of moms who are Hispanics, the proportion of moms who are unmarried, and the proportion of moms whose marital status is unknown. Regression is weighted by the total number of births in a county-year-month. 95% confidence intervals accounting for within e-cigarette tax locality clustering are shown in parenthesis.

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

Online Appendix E: Table 1

Correlates of e-cigarette taxes		
	(1) E-cigarette tax Coef. (Std.Errs)	(2) Any e-cigarette tax Coef. (Std.Errs)
(mean) Cigarette tax rate; Inflation-adj. to 2020 Q1 dollar	0.579***	0.379***
	(0.099)	(0.075)
(mean) Index of indoor smoking restrictions (county/quarter)	0.058	0.056
	(0.064)	(0.067)
(mean) Index of indoor vaping restrictions (county/quarter)	-0.043	-0.019
	(0.048)	(0.041)
(mean) Any e-cigarette MLSA Law (county/quarter)	0.001	0.006
	(0.012)	(0.012)
(mean) Any Tobacco 21 Law (county/quarter)	-0.006	0.071
	(0.022)	(0.069)
(mean) Percent of quarter with temporary e-cig sales ban (state/quarter)	0.193*	0.578
	(0.097)	(0.369)
(mean) Percent of quarter with ACA Medicaid expansion (state/quarter)	-0.029	-0.034
	(0.027)	(0.026)
(mean) Mom's age at the time of delivery	-0.001*	-0.001
	(0.001)	(0.001)
Proportion of Non-Hispanic White	-0.048*	-0.032*
	(0.027)	(0.019)
Proportion of Hispanic	-0.067*	-0.039
	(0.035)	(0.024)
Proportion of Unmarried	-0.014*	-0.010**
	(0.008)	(0.004)
Proportion of Marital status unknown	-0.000	-0.093
	(0.026)	(0.070)
Observations	255,726	255,726
Adjusted R^2	0.97	0.94
Number of localities	50	50
Mean of dependent variable	0.152	0.134

Notes: The unit of observation is at the county-year-month level. Model estimated with OLS and controlled for county fixed effects, month, and state-by-year fixed effects. Policy variables shown in the summary statistics table are averaged at this level and their mean values are controlled for. Regression is weighted by the total number of births in a county-year-month. 95% confidence intervals accounting for within e-cigarette tax locality clustering are shown in parenthesis.

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

Online Appendix F: Table 1

Effect of the standardized e-cigarette tax rate on number of cigarettes smoked per day during 3 months before pregnancy (among smokers) using a fixed-effects regression model: Heterogeneity in tax effects by mother's demographics									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	< 18 years old	18 to 30 years old	≥ 31 years old	High School or less	More than HS	Medicaid	Private	1st birth	2nd+ birth
	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)
Standardized E-cigarette Tax Rate	-0.064	-0.092	0.096	-0.012	-0.109	0.002	-0.057	-0.005	-0.072
	(1.022)	(0.219)	(0.220)	(0.193)	(0.179)	(0.316)	(0.119)	(0.303)	(0.179)
Observations	25,137	1,673,142	573,343	1,410,673	846,514	1,575,446	554,405	582,629	1,676,019
Adjusted R^2	0.06	0.07	0.08	0.08	0.07	0.08	0.06	0.07	0.08
Number of localities	50	50	50	50	50	50	50	50	50
Mean DV among tax adopters during pre-treatment period	12.377	13.234	13.086	13.604	12.536	13.509	12.326	12.915	13.270
Percent change (%)	-0.51	-0.69	0.73	-0.09	-0.87	0.01	-0.46	-0.04	-0.54
Elasticity	-0.00	-0.01	0.01	-0.00	-0.01	0.00	-0.01	-0.00	-0.00

Notes: The unit of observation is a birth conception in a state-county-year-month for a particular subpopulation. Model estimated with OLS and controlled for mother demographic characteristics, policy controls, county fixed effects, conception (year-by-month) fixed effects, and state-by-conception year fixed effects. 95% confidence intervals accounting for within e-cigarette tax locality clustering are shown in parenthesis. Pre-pregnancy denotes three months before pregnancy.
*** p < 0.01, ** p < 0.05, * p < 0.10

Online Appendix F: Table 2

Effect of the standardized e-cigarette tax rate on number of cigarettes smoked per day during pregnancy (among smokers) using a fixed-effects regression model: Heterogeneity in tax effects by mother's demographics

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	< 18 years old	18 to 30 years old	≥ 31 years old	High School or less	More than HS	Medicaid	Private	1st birth	2nd+ birth
	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)
Standardized E-cigarette Tax Rate	-0.731	0.048	0.297	0.130	0.052	0.190	0.127	-0.011	0.127
	(0.469)	(0.198)	(0.218)	(0.230)	(0.127)	(0.265)	(0.121)	(0.242)	(0.187)
Observations	18,761	1,291,049	447,271	1,165,672	579,654	1,299,888	349,198	389,814	1,356,637
Adjusted R^2	0.05	0.08	0.09	0.09	0.08	0.09	0.07	0.07	0.08
Number of localities	50	50	50	50	50	50	50	50	50
Mean DV among tax adopters during pre-treatment period	6.589	8.138	8.783	8.610	7.647	8.567	7.302	7.132	8.606
Percent change (%)	-11.10	0.59	3.39	1.51	0.68	2.21	1.73	-0.15	1.47
Elasticity	-0.10	0.01	0.03	0.01	0.01	0.02	0.02	-0.00	0.01

Notes: The unit of observation is a birth conception in a state-county-year-month for a particular subpopulation. Model estimated with OLS and controlled for mother demographic characteristics, policy controls, county fixed effects, conception (year-by-month) fixed effects, and state-by-conception year fixed effects. 95% confidence intervals accounting for within e-cigarette tax locality clustering are shown in parenthesis.
*** p < 0.01, ** p < 0.05, * p < 0.10

Online Appendix F: Table 3

Effect of the standardized e-cigarette tax rate on number of cigarettes smoked per day during pregnancy using a fixed-effects regression model: Heterogeneity in tax effects by mother's demographics

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	< 18 years old	18 to 30 years old	≥ 31 years old	High School or less	More than HS	Medicaid	Private	1st birth	2nd+ birth
	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)
Standardized E-cigarette Tax Rate	-0.023	0.046	0.029***	0.064	0.023*	0.052	0.014	0.029	0.046*
	(0.037)	(0.032)	(0.011)	(0.044)	(0.012)	(0.044)	(0.012)	(0.024)	(0.024)
Observations	359,218	14,842,946	9,528,680	9,642,581	14,759,342	10,615,853	11,966,009	7,849,961	16,744,135
Adjusted R^2	0.06	0.11	0.10	0.12	0.07	0.12	0.05	0.07	0.11
Number of localities	50	50	50	50	50	50	50	50	50
Mean DV among tax adopters during pre-treatment period	0.396	0.714	0.377	1.024	0.294	0.979	0.225	0.343	0.675
Percent change (%)	-5.90	6.46	7.64	6.30	7.99	5.31	6.09	8.58	6.76
Elasticity	-0.06	0.07	0.08	0.06	0.09	0.05	0.08	0.09	0.07

Notes: The unit of observation is a birth conception in a state-county-year-month for a particular subpopulation. Model estimated with OLS and controlled for mother demographic characteristics, policy controls, county fixed effects, conception (year-by-month) fixed effects, and state-by-conception year fixed effects. 95% confidence intervals accounting for within e-cigarette tax locality clustering are shown in parenthesis.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Online Appendix F: Table 4

Effect of the standardized e-cigarette tax rate on number of periods smoked using a fixed-effects regression model: Heterogeneity in tax effects by mother's demographics									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	< 18 years old	18 to 30 years old	≥ 31 years old	High School or less	More than HS	Medicaid	Private	1st birth	2nd+ birth
	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)
Standardized E-cigarette Tax Rate	0.002	0.012*	0.005***	0.015**	0.006*	0.010	0.004	0.010	0.010**
	(0.014)	(0.006)	(0.002)	(0.007)	(0.003)	(0.007)	(0.004)	(0.006)	(0.004)
Observations	359,218	14,842,946	9,528,680	9,642,581	14,759,342	10,615,853	11,966,009	7,849,961	16,744,135
Adjusted R^2	0.09	0.15	0.13	0.17	0.09	0.17	0.07	0.11	0.15
Number of localities	50	50	50	50	50	50	50	50	50
Mean DV among tax adopters during pre-treatment period	0.145	0.227	0.113	0.315	0.096	0.302	0.076	0.116	0.208
Percent change (%)	1.49	5.09	4.76	4.76	6.20	3.38	4.91	8.37	4.97
Elasticity	0.02	0.05	0.05	0.05	0.07	0.03	0.06	0.09	0.05

Notes: The unit of observation is a birth conception in a state-county-year-month for a particular subpopulation. Model estimated with OLS and controlled for mother demographic characteristics, policy controls, county fixed effects, conception (year-by-month) fixed effects, and state-by-conception year fixed effects. 95% confidence intervals accounting for within e-cigarette tax locality clustering are shown in parenthesis.
*** p < 0.01, ** p < 0.05, * p < 0.10

Online Appendix F: Table 5

Effect of any e-cigarette tax on pre-pregnancy smoking using a fixed-effects regression model: Heterogeneity in tax effects by mother's demographics									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	< 18 years old	18 to 30 years old	≥ 31 years old	High School or less	More than HS	Medicaid	Private	1st birth	2nd+ birth
	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)
Any E-cigarette Tax	-0.004	0.004**	0.002**	0.004**	0.003**	0.006**	0.001	0.004	0.003***
	(0.005)	(0.002)	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)	(0.003)	(0.001)
Observations	359,218	14,842,946	9,528,680	9,642,581	14,759,342	10,615,853	11,966,009	7,849,961	16,744,135
Adjusted R^2	0.12	0.16	0.14	0.19	0.11	0.18	0.09	0.13	0.16
Number of localities	50	50	50	50	50	50	50	50	50
Mean DV among tax adopters during pre-treatment period	0.080	0.115	0.057	0.145	0.057	0.139	0.049	0.073	0.098
Percent change (%)	-4.81	3.61	3.46	3.01	4.98	3.96	1.99	5.54	3.54
Elasticity	-0.05	0.04	0.03	0.03	0.05	0.04	0.02	0.05	0.03

Notes: The unit of observation is a birth conception in a state-county-year-month for a particular subpopulation. Model estimated with OLS and controlled for mother demographic characteristics, policy controls, county fixed effects, conception (year-by-month) fixed effects, and state-by-conception year fixed effects. 95% confidence intervals accounting for within e-cigarette tax locality clustering are shown in parenthesis. Pre-pregnancy denotes three months before pregnancy.
*** p < 0.01, ** p < 0.05, * p < 0.10

Online Appendix F: Table 6

Effect of any e-cigarette tax on number of cigarettes smoked per day during 3 months before pregnancy (among smokers) using a fixed-effects regression model: Heterogeneity in tax effects by mother's demographics

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	< 18 years old	18 to 30 years old	≥ 31 years old	High School or less	More than HS	Medicaid	Private	1st birth	2nd+ birth
	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)
Any E-cigarette Tax	0.926	-0.055	0.060	-0.010	-0.093	-0.040	0.077	-0.040	-0.027
	(0.927)	(0.113)	(0.158)	(0.127)	(0.126)	(0.168)	(0.117)	(0.128)	(0.146)
Observations	25,137	1,673,142	573,343	1,410,673	846,514	1,575,446	554,405	582,629	1,676,019
Adjusted R^2	0.06	0.07	0.08	0.08	0.07	0.08	0.06	0.07	0.08
Number of localities	50	50	50	50	50	50	50	50	50
Mean DV among tax adopters during pre-treatment period	12.377	13.234	13.086	13.604	12.536	13.509	12.326	12.915	13.270
Percent change (%)	7.48	-0.42	0.46	-0.07	-0.74	-0.29	0.62	-0.31	-0.21
Elasticity	0.08	-0.00	0.00	-0.00	-0.01	-0.00	0.01	-0.00	-0.00

Notes: The unit of observation is a birth conception in a state-county-year-month for a particular subpopulation. Model estimated with OLS and controlled for mother demographic characteristics, policy controls, county fixed effects, conception (year-by-month) fixed effects, and state-by-conception year fixed effects. 95% confidence intervals accounting for within e-cigarette tax locality clustering are shown in parenthesis. Pre-pregnancy denotes three months before pregnancy.
*** p < 0.01, ** p < 0.05, * p < 0.10

Online Appendix F: Table 7

Effect of any e-cigarette tax on prenatal smoking using a fixed-effects regression model: Heterogeneity in tax effects by mother's demographics									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	< 18 years old	18 to 30 years old	≥ 31 years old	High School or less	More than HS	Medicaid	Private	1st birth	2nd+ birth
	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)
Any E-cigarette Tax	-0.001	0.003**	0.001*	0.004**	0.001*	0.004*	0.000	0.003	0.003**
	(0.005)	(0.001)	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)
Observations	359,218	14,842,946	9,528,680	9,642,581	14,759,342	10,615,853	11,966,009	7,849,961	16,744,135
Adjusted R^2	0.10	0.15	0.13	0.17	0.10	0.17	0.07	0.11	0.15
Number of localities	50	50	50	50	50	50	50	50	50
Mean DV among tax adopters during pre-treatment period	0.060	0.088	0.043	0.119	0.038	0.114	0.031	0.048	0.078
Percent change (%)	-2.15	3.61	3.01	3.55	3.70	3.40	0.91	6.22	3.39
Elasticity	-0.02	0.04	0.03	0.03	0.04	0.03	0.01	0.06	0.03

Notes: The unit of observation is a birth conception in a state-county-year-month for a particular subpopulation. Model estimated with OLS and controlled for mother demographic characteristics, policy controls, county fixed effects, conception (year-by-month) fixed effects, and state-by-conception year fixed effects. 95% confidence intervals accounting for within e-cigarette tax locality clustering are shown in parenthesis.
*** p < 0.01, ** p < 0.05, * p < 0.10

Online Appendix F: Table 8

Effect of any e-cigarette tax on number of cigarettes smoked per day during pregnancy (among smokers) using a fixed-effects regression model: Heterogeneity in tax effects by mother's demographics

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	< 18 years old	18 to 30 years old	≥ 31 years old	High School or less	More than HS	Medicaid	Private	1st birth	2nd+ birth
	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)
Any E-cigarette Tax	0.582	-0.074	0.189	-0.006	-0.019	0.028	0.029	-0.034	0.007
	(0.423)	(0.103)	(0.150)	(0.112)	(0.113)	(0.137)	(0.121)	(0.165)	(0.112)
Observations	18,761	1,291,049	447,271	1,165,672	579,654	1,299,888	349,198	389,814	1,356,637
Adjusted R^2	0.05	0.08	0.09	0.09	0.08	0.09	0.07	0.07	0.08
Number of localities	50	50	50	50	50	50	50	50	50
Mean DV among tax adopters during pre-treatment period	6.589	8.138	8.783	8.610	7.647	8.567	7.302	7.132	8.606
Percent change (%)	8.83	-0.91	2.16	-0.07	-0.25	0.32	0.40	-0.48	0.08
Elasticity	0.09	-0.01	0.02	-0.00	-0.00	0.00	0.00	-0.00	0.00

Notes: The unit of observation is a birth conception in a state-county-year-month for a particular subpopulation. Model estimated with OLS and controlled for mother demographic characteristics, policy controls, county fixed effects, conception (year-by-month) fixed effects, and state-by-conception year fixed effects. 95% confidence intervals accounting for within e-cigarette tax locality clustering are shown in parenthesis.

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

Online Appendix F: Table 9

Effect of any e-cigarette tax on number of cigarettes smoked per day during pregnancy using a fixed-effects regression model: Heterogeneity in tax effects by mother's demographics									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	< 18 years old	18 to 30 years old	≥ 31 years old	High School or less	More than HS	Medicaid	Private	1st birth	2nd+ birth
	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)
Any E-cigarette Tax	0.003	0.025	0.024**	0.044	0.013	0.039	0.005	0.024	0.027
	(0.037)	(0.020)	(0.011)	(0.029)	(0.009)	(0.029)	(0.009)	(0.018)	(0.017)
Observations	359,218	14,842,946	9,528,680	9,642,581	14,759,342	10,615,853	11,966,009	7,849,961	16,744,135
Adjusted R^2	0.06	0.11	0.10	0.12	0.07	0.12	0.05	0.07	0.11
Number of localities	50	50	50	50	50	50	50	50	50
Mean DV among tax adopters during pre-treatment period	0.396	0.714	0.377	1.024	0.294	0.979	0.225	0.343	0.675
Percent change (%)	0.68	3.52	6.49	4.29	4.49	3.99	2.41	7.02	4.07
Elasticity	0.01	0.03	0.06	0.04	0.04	0.04	0.02	0.07	0.04

Notes: The unit of observation is a birth conception in a state-county-year-month for a particular subpopulation. Model estimated with OLS and controlled for mother demographic characteristics, policy controls, county fixed effects, conception (year-by-month) fixed effects, and state-by-conception year fixed effects. 95% confidence intervals accounting for within e-cigarette tax locality clustering are shown in parenthesis.

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

Online Appendix F: Table 10

Effect of any e-cigarette tax on number of periods smoked using a fixed-effects regression model: Heterogeneity in tax effects by mother's demographics									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	< 18 years old	18 to 30 years old	≥ 31 years old	High School or less	More than HS	Medicaid	Private	1st birth	2nd+ birth
	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)
Any E-cigarette Tax	0.010	0.009**	0.003	0.013**	0.003	0.011*	0.001	0.009*	0.007**
	(0.011)	(0.004)	(0.002)	(0.005)	(0.002)	(0.005)	(0.003)	(0.005)	(0.003)
Observations	359,218	14,842,946	9,528,680	9,642,581	14,759,342	10,615,853	11,966,009	7,849,961	16,744,135
Adjusted R^2	0.09	0.15	0.13	0.17	0.09	0.17	0.07	0.11	0.15
Number of localities	50	50	50	50	50	50	50	50	50
Mean DV among tax adopters during pre-treatment period	0.145	0.227	0.113	0.315	0.096	0.302	0.076	0.116	0.208
Percent change (%)	7.01	3.80	2.89	4.04	3.18	3.61	0.84	8.02	3.16
Elasticity	0.08	0.04	0.03	0.04	0.03	0.03	0.01	0.08	0.03

Notes: The unit of observation is a birth conception in a state-county-year-month for a particular subpopulation. Model estimated with OLS and controlled for mother demographic characteristics, policy controls, county fixed effects, conception (year-by-month) fixed effects, and state-by-conception year fixed effects. 95% confidence intervals accounting for within e-cigarette tax locality clustering are shown in parenthesis.
*** p < 0.01, ** p < 0.05, * p < 0.10

Online Appendix G: Table 1

Effect of any e-cigarette tax on prenatal smoking using a fixed-effects regression model: Panel model			
	(1)	(2)	(3)
	Any period-specific smoking	Period-specific cigarettes smoked per day (among smokers)	Period-specific cigarettes smoked per day
	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)
Any E-cigarette Tax	0.000	-0.396	-0.019
	(0.003)	(0.286)	(0.073)
Observations	95,977,267	6,143,349	95,977,267
Adjusted R^2	0.84	0.72	0.73
Number of localities	50	50	50
Mean DV among tax adopters during pre-treatment period	0.068	10.939	0.740
Percent change (%)	0.03	-3.62	-2.54
Elasticity	0.00	-0.04	-0.02

Notes: The unit of observation is at the birth-trimester level, where trimester also includes the period of 3 months before pregnancy. Model estimated with OLS and controlled for policy controls, birth fixed effects, and trimester fixed effects. 95% confidence intervals accounting for within e-cigarette tax locality clustering are shown in parenthesis.
*** p < 0.01, ** p < 0.05, * p < 0.10

Online Appendix H: Table 1

Effect of any e-cigarette tax on smoking outcomes using an event study: Panel Model			
	(1)	(2)	(3)
	Any period-specific smoking	Period-specific cigarettes smoked per day (among smokers)	Period-specific cigarettes smoked per day
Relative to the e-cigarette effective date	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)
Pregnancy 18+ months before	-0.004	0.272	-0.040
	(0.004)	(0.413)	(0.113)
Pregnancy 15-18 months before	-0.001	0.195	0.004
	(0.003)	(0.245)	(0.070)
Pregnancy 12-15 months before	0.001	0.152	0.026
	(0.002)	(0.130)	(0.042)
Pregnancy 9-12 months before	–	–	–
	–	–	–
Pregnancy 6-9 months before	0.000	-0.116	-0.009
	(0.002)	(0.159)	(0.043)
Pregnancy 3-6 months before	0.002	-0.208	0.034
	(0.003)	(0.304)	(0.081)
Pregnancy less than 3 months before	0.004	-0.333	0.069
	(0.004)	(0.428)	(0.116)
Pregnancy 0-3 months after	0.001	-0.612	-0.021
	(0.006)	(0.552)	(0.147)
Pregnancy 3-6 months after	0.005	-0.729	0.054
	(0.007)	(0.794)	(0.188)
Pregnancy 6-9 months after	0.008	-1.053	0.101
	(0.010)	(0.951)	(0.247)
Pregnancy 9+ months after	0.013	-1.438	0.202
	(0.014)	(1.248)	(0.350)
Observations	95,984,975	6,144,381	95,984,975
Adjusted R^2	0.84	0.72	0.73
Number of localities	50	50	50
Mean DV among tax adopters during pre-treatment period	0.068	10.939	0.740

Notes: The unit of observation is at the birth-trimester level, where trimester also includes 3 months before pregnancy. Model estimated with OLS and controlled for policy controls, birth fixed effects, and trimester fixed effects. 95% confidence intervals accounting for within e-cigarette tax locality clusteringe-cigarette tax locality clustering are shown in parenthesis.

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

Online Appendix I: Table 1

Effect of the standardized e-cigarette tax rate on any prenatal smoking using a fixed-effects regression model: Panel model; Heterogeneity by mother's characteristic									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	< 18 years old	18 to 30 years old	≥ 31 years old	High School or less	More than HS	Medicaid	Private	1st birth	2nd+ birth
	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)
Standardized E-cigarette Tax Rate	0.003	0.008*	0.004**	0.008*	0.005**	0.010**	0.004	0.007**	0.007**
	(0.005)	(0.004)	(0.002)	(0.004)	(0.002)	(0.004)	(0.003)	(0.004)	(0.003)
Observations	1,399,868	57,659,793	36,917,606	37,437,191	57,377,058	42,024,226	46,404,207	30,454,002	64,987,063
Adjusted R^2	0.79	0.83	0.86	0.87	0.79	0.86	0.75	0.76	0.86
Number of localities	50	50	50	50	50	50	50	50	50
Mean DV among tax adopters during pre-treatment period	0.057	0.086	0.043	0.116	0.039	0.111	0.032	0.048	0.077
Percent change (%)	5.43	8.78	8.93	7.07	14.00	9.35	12.40	15.44	8.47
Elasticity	0.06	0.09	0.10	0.07	0.16	0.09	0.16	0.17	0.09

Notes: The unit of observation for a given subpopulation is at the birth-trimester level, where trimester also includes the period of 3 months before pregnancy. Model estimated with OLS and controlled for policy controls, birth fixed effects, and trimester fixed effects. 95% confidence intervals accounting for within e-cigarette tax locality clustering are shown in parenthesis.

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

Online Appendix I: Table 2

Effect of the standardized e-cigarette tax rate on the number of cigarettes smoked per day during pregnancy (among smokers) using a fixed-effects regression model: Panel model; Heterogeneity by mother's characteristic									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	< 18 years old	18 to 30 years old	≥ 31 years old	High School or less	More than HS	Medicaid	Private	1st birth	2nd+ birth
	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)
Standardized E-cigarette Tax Rate	-1.173	-0.061	0.008	-0.175	0.241	-0.080	0.312	-0.178	0.022
	(0.725)	(0.502)	(0.352)	(0.468)	(0.447)	(0.426)	(0.544)	(0.584)	(0.423)
Observations	63,865	4,503,480	1,576,004	4,128,779	1,975,228	4,656,119	1,171,454	1,299,182	4,804,269
Adjusted R^2	0.70	0.71	0.75	0.72	0.71	0.72	0.71	0.68	0.73
Number of localities	50	50	50	50	50	50	50	50	50
Mean DV among tax adopters during pre-treatment period	9.669	10.847	11.253	11.085	10.647	11.061	10.424	10.567	11.032
Percent change (%)	-12.14	-0.56	0.07	-1.58	2.26	-0.72	3.00	-1.68	0.20
Elasticity	-0.11	-0.00	0.00	-0.01	0.02	-0.01	0.03	-0.02	0.00

Notes: The unit of observation for a given subpopulation is at the birth-trimester level, where trimester also includes the period of 3 months before pregnancy. Model estimated with OLS and controlled for policy controls, birth fixed effects, and trimester fixed effects. 95% confidence intervals accounting for within e-cigarette tax locality clustering are shown in parenthesis.
*** p < 0.01, ** p < 0.05, * p < 0.10

Online Appendix I: Table 3

Effect of the standardized e-cigarette tax rate on the number of cigarettes smoked per day during pregnancy using a fixed-effects regression model: Panel model; Heterogeneity by mother's characteristic

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	< 18 years old	18 to 30 years old	≥ 31 years old	High School or less	More than HS	Medicaid	Private	1st birth	2nd+ birth
	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)
Standardized E-cigarette Tax Rate	0.060	0.200*	0.104**	0.240*	0.120**	0.290**	0.079*	0.160**	0.183**
	(0.108)	(0.102)	(0.040)	(0.131)	(0.048)	(0.119)	(0.046)	(0.075)	(0.076)
Observations	1,399,868	57,659,793	36,917,606	37,437,191	57,377,058	42,024,226	46,404,207	30,454,002	64,987,063
Adjusted R^2	0.63	0.72	0.77	0.75	0.68	0.75	0.64	0.62	0.76
Number of localities	50	50	50	50	50	50	50	50	50
Mean DV among tax adopters during pre-treatment period	0.558	0.933	0.477	1.285	0.408	1.220	0.328	0.507	0.846
Percent change (%)	10.70	21.49	21.85	18.69	29.27	23.78	24.11	31.49	21.62
Elasticity	0.11	0.23	0.24	0.19	0.33	0.23	0.31	0.35	0.23

Notes: The unit of observation for a given subpopulation is at the birth-trimester level, where trimester also includes the period of 3 months before pregnancy. Model estimated with OLS and controlled for policy controls, birth fixed effects, and trimester fixed effects. 95% confidence intervals accounting for within e-cigarette tax locality clustering are shown in parenthesis.

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

Online Appendix I: Table 4

Effect of any e-cigarette tax on any prenatal smoking using a fixed-effects regression model: Panel model; Heterogeneity by mother's characteristic									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	< 18 years old	18 to 30 years old	≥ 31 years old	High School or less	More than HS	Medicaid	Private	1st birth	2nd+ birth
	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)
Any E-cigarette Tax	-0.001	-0.000	-0.000	-0.001	0.001	-0.000	0.001	0.001	-0.000
	(0.004)	(0.004)	(0.002)	(0.004)	(0.002)	(0.005)	(0.002)	(0.004)	(0.003)
Observations	1,399,868	57,659,793	36,917,606	37,437,191	57,377,058	42,024,226	46,404,207	30,454,002	64,987,063
Adjusted R^2	0.79	0.83	0.86	0.87	0.79	0.86	0.75	0.76	0.86
Number of localities	50	50	50	50	50	50	50	50	50
Mean DV among tax adopters during pre-treatment period	0.057	0.086	0.043	0.116	0.039	0.111	0.032	0.048	0.077
Percent change (%)	-1.87	-0.48	-0.79	-1.28	2.15	-0.42	1.97	1.89	-0.48
Elasticity	-0.02	-0.00	-0.01	-0.01	0.02	-0.00	0.02	0.02	-0.00

Notes: The unit of observation for a given subpopulation is at the birth-trimester level, where trimester also includes the period of 3 months before pregnancy. Model estimated with OLS and controlled for policy controls, birth fixed effects, and trimester fixed effects. 95% confidence intervals accounting for within e-cigarette tax locality clustering are shown in parenthesis.

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

Online Appendix I: Table 5

Effect of any e-cigarette tax on the number of cigarettes smoked per day during pregnancy (among smokers) using a fixed-effects regression model: Panel model; Heterogeneity by mother's characteristic

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	< 18 years old	18 to 30 years old	≥ 31 years old	High School or less	More than HS	Medicaid	Private	1st birth	2nd+ birth
	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)
Any E-cigarette Tax	-0.980*	-0.446	-0.288	-0.396	-0.424	-0.368	-0.418	-0.682**	-0.338
	(0.571)	(0.302)	(0.245)	(0.288)	(0.298)	(0.284)	(0.353)	(0.335)	(0.273)
Observations	63,865	4,503,480	1,576,004	4,128,779	1,975,228	4,656,119	1,171,454	1,299,182	4,804,269
Adjusted R^2	0.70	0.71	0.75	0.72	0.71	0.72	0.71	0.68	0.73
Number of localities	50	50	50	50	50	50	50	50	50
Mean DV among tax adopters during pre-treatment period	9.669	10.847	11.253	11.085	10.647	11.061	10.424	10.567	11.032
Percent change (%)	-10.13	-4.11	-2.56	-3.57	-3.98	-3.33	-4.01	-6.46	-3.07
Elasticity	-0.10	-0.04	-0.03	-0.04	-0.04	-0.03	-0.04	-0.06	-0.03

Notes: The unit of observation for a given subpopulation is at the birth-trimester level, where trimester also includes the period of 3 months before pregnancy. Model estimated with OLS and controlled for policy controls, birth fixed effects, and trimester fixed effects. 95% confidence intervals accounting for within e-cigarette tax locality clustering are shown in parenthesis.

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

Online Appendix I: Table 6

Effect of any e-cigarette tax on the number of cigarettes smoked per day during pregnancy using a fixed-effects regression model: Panel model; Heterogeneity by mother's characteristic									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	< 18 years old	18 to 30 years old	≥ 31 years old	High School or less	More than HS	Medicaid	Private	1st birth	2nd+ birth
	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)
Any E-cigarette Tax	-0.048	-0.037	-0.014	-0.071	0.008	-0.036	-0.001	0.000	-0.027
	(0.085)	(0.090)	(0.044)	(0.125)	(0.045)	(0.134)	(0.041)	(0.075)	(0.073)
Observations	1,399,868	57,659,793	36,917,606	37,437,191	57,377,058	42,024,226	46,404,207	30,454,002	64,987,063
Adjusted R^2	0.63	0.72	0.77	0.75	0.68	0.75	0.64	0.62	0.76
Number of localities	50	50	50	50	50	50	50	50	50
Mean DV among tax adopters during pre-treatment period	0.558	0.933	0.477	1.285	0.408	1.220	0.328	0.507	0.846
Percent change (%)	-8.57	-3.97	-2.91	-5.53	1.90	-2.91	-0.22	0.08	-3.15
Elasticity	-0.10	-0.04	-0.03	-0.05	0.02	-0.03	-0.00	0.00	-0.03

Notes: The unit of observation for a given subpopulation is at the birth-trimester level, where trimester also includes the period of 3 months before pregnancy. Model estimated with OLS and controlled for policy controls, birth fixed effects, and trimester fixed effects. 95% confidence intervals accounting for within e-cigarette tax locality clustering are shown in parenthesis.

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

Online Appendix J: Table 1

Effect of the standardized e-cigarette tax rate on smoking outcomes, begin the study period in 2011						
	(1)	(2)	(3)	(4)	(5)	(6)
	Any pre-pregnancy smoking	Pre-pregnancy cigarettes smoked per day (among smokers)	Any prenatal smoking	Prenatal smoking cigarettes smoked per day (among smokers)	Prenatal smoking cigarettes smoked per day (among all)	Number of periods smoked
	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)
Standardized E-cigarette Tax Rate	0.005*	-0.052	0.004**	0.116	0.035	0.009**
	(0.002)	(0.183)	(0.002)	(0.170)	(0.022)	(0.004)
Observations	31,092,559	2,991,998	31,092,559	2,310,100	31,092,559	31,092,559
Adjusted R^2	0.16	0.07	0.14	0.09	0.10	0.14
Number of localities	50	50	50	50	50	50
Mean DV among tax adopters during pre-treatment period	0.094	13.203	0.071	8.244	0.589	0.185
Percent change (%)	4.90	-0.39	4.97	1.40	6.01	5.08
Elasticity	0.05	-0.00	0.05	0.01	0.06	0.05

Notes: The unit of observation is a birth conception in a state-county-year-month. Model estimated with OLS and controlled for mother demographic characteristics, policy controls, county fixed effects, conception (year-by-month) fixed effects, and state-by-conception year fixed effects. 95% confidence intervals accounting for within e-cigarette tax locality clustering are shown in parenthesis. Pre-pregnancy denotes three months before pregnancy.

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

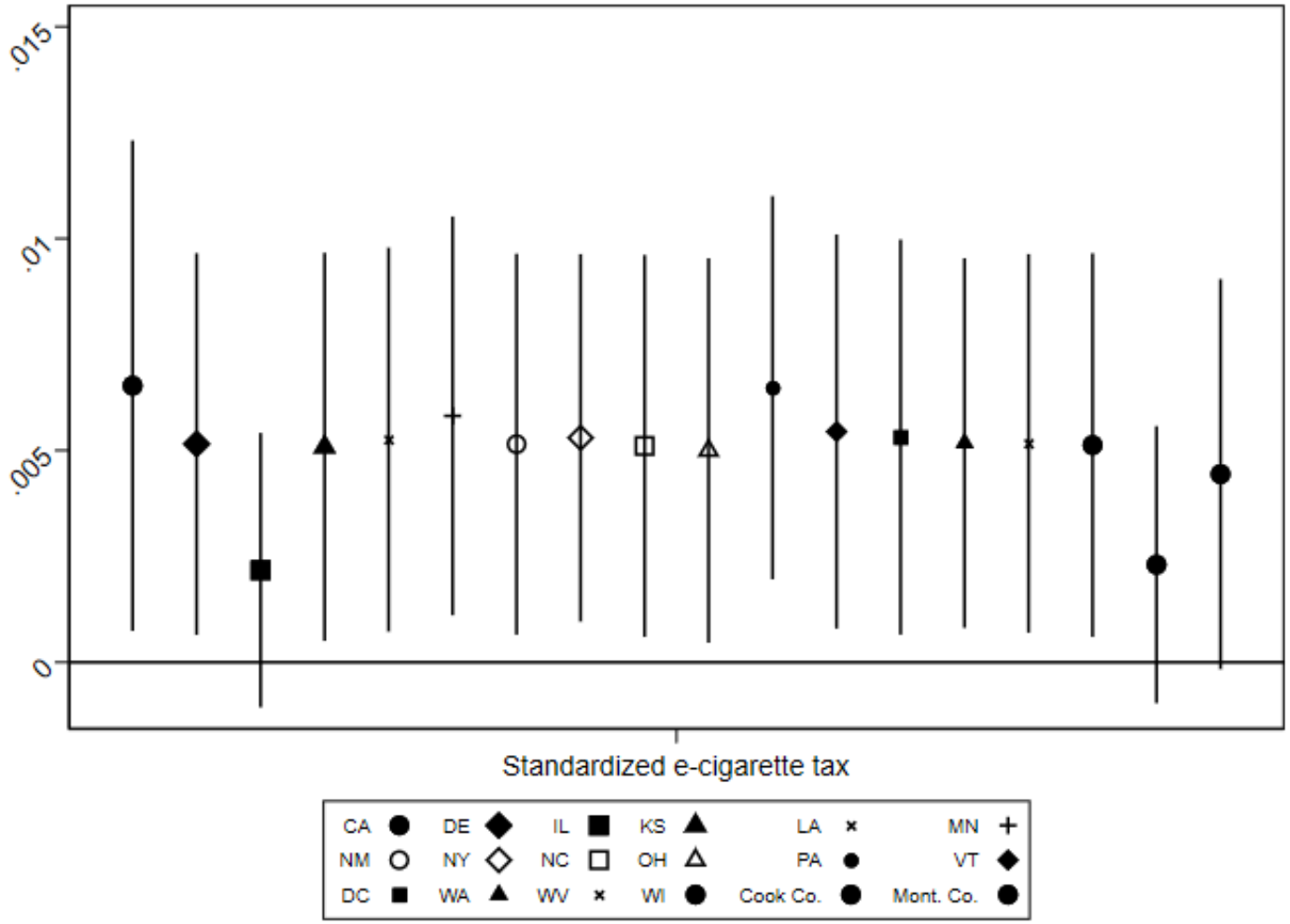
Online Appendix J: Table 2

Effect of any e-cigarette tax on smoking outcomes, begin the study period in 2011						
	(1)	(2)	(3)	(4)	(5)	(6)
	Any pre-pregnancy smoking	Pre-pregnancy cigarettes smoked per day (among smokers)	Any prenatal smoking	Prenatal smoking cigarettes smoked per day (among smokers)	Prenatal smoking cigarettes smoked per day (among all)	Number of periods smoked
	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)
Any E-cigarette Tax	0.003*	-0.002	0.003*	0.034	0.027	0.007*
	(0.002)	(0.119)	(0.001)	(0.111)	(0.017)	(0.004)
Observations	31,092,559	2,991,998	31,092,559	2,310,100	31,092,559	31,092,559
Adjusted R^2	0.16	0.07	0.14	0.09	0.10	0.14
Number of localities	50	50	50	50	50	50
Mean DV among tax adopters during pre-treatment period	0.094	13.203	0.071	8.244	0.589	0.185
Percent change (%)	3.73	-0.01	3.69	0.41	4.52	3.91
Elasticity	0.04	-0.00	0.04	0.00	0.04	0.04

Notes: The unit of observation is a birth conception in a state-county-year-month. Model estimated with OLS and controlled for mother demographic characteristics, policy controls, county fixed effects, conception (year-by-month) fixed effects, and state-by-conception year fixed effects. 95% confidence intervals accounting for within e-cigarette tax locality clustering are shown in parenthesis. Pre-pregnancy denotes three months before pregnancy.

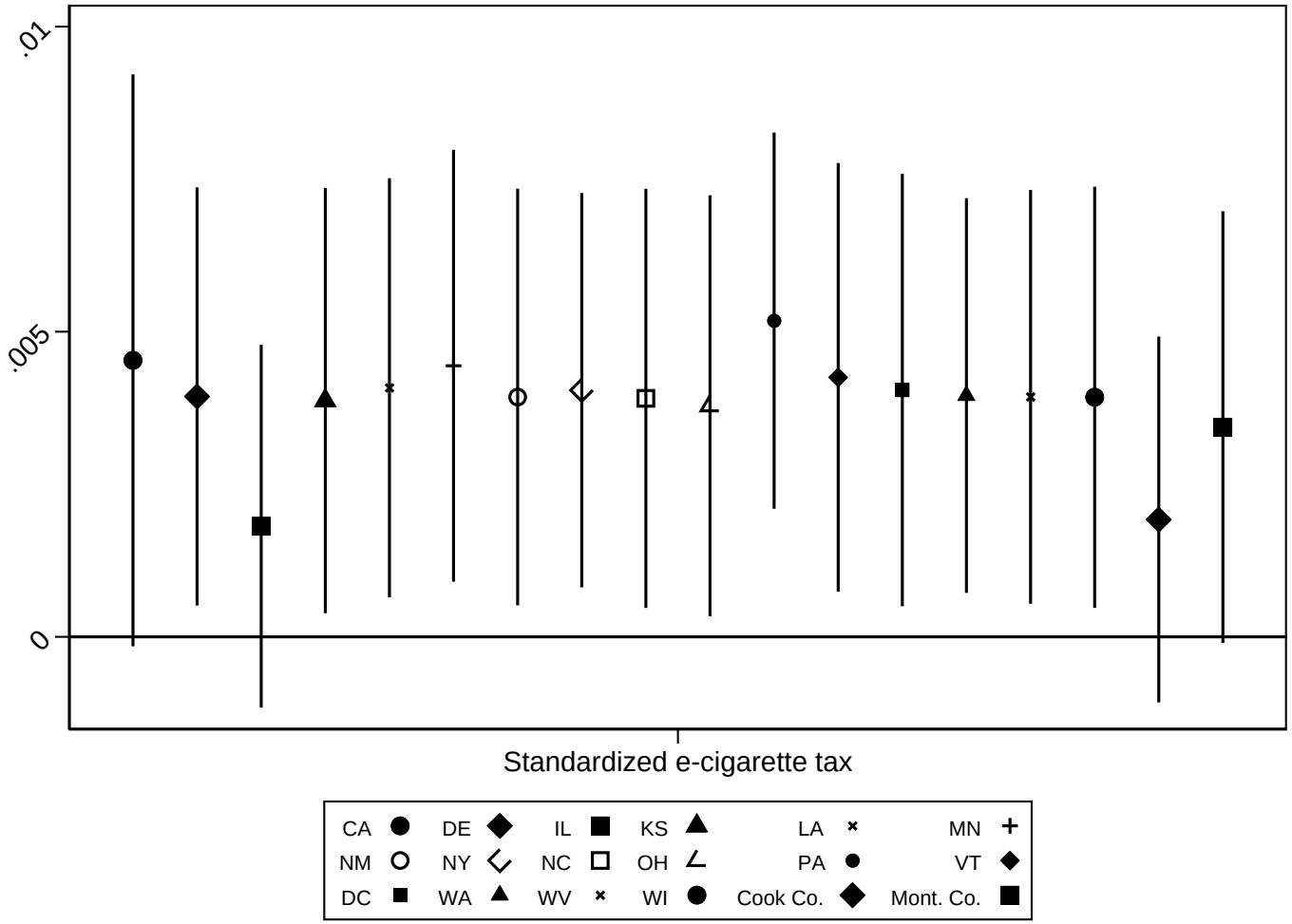
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Online Appendix K: Figure 1, Leave-One-Out Analysis, Pre-Pregnancy Smoking (Tax Rate)



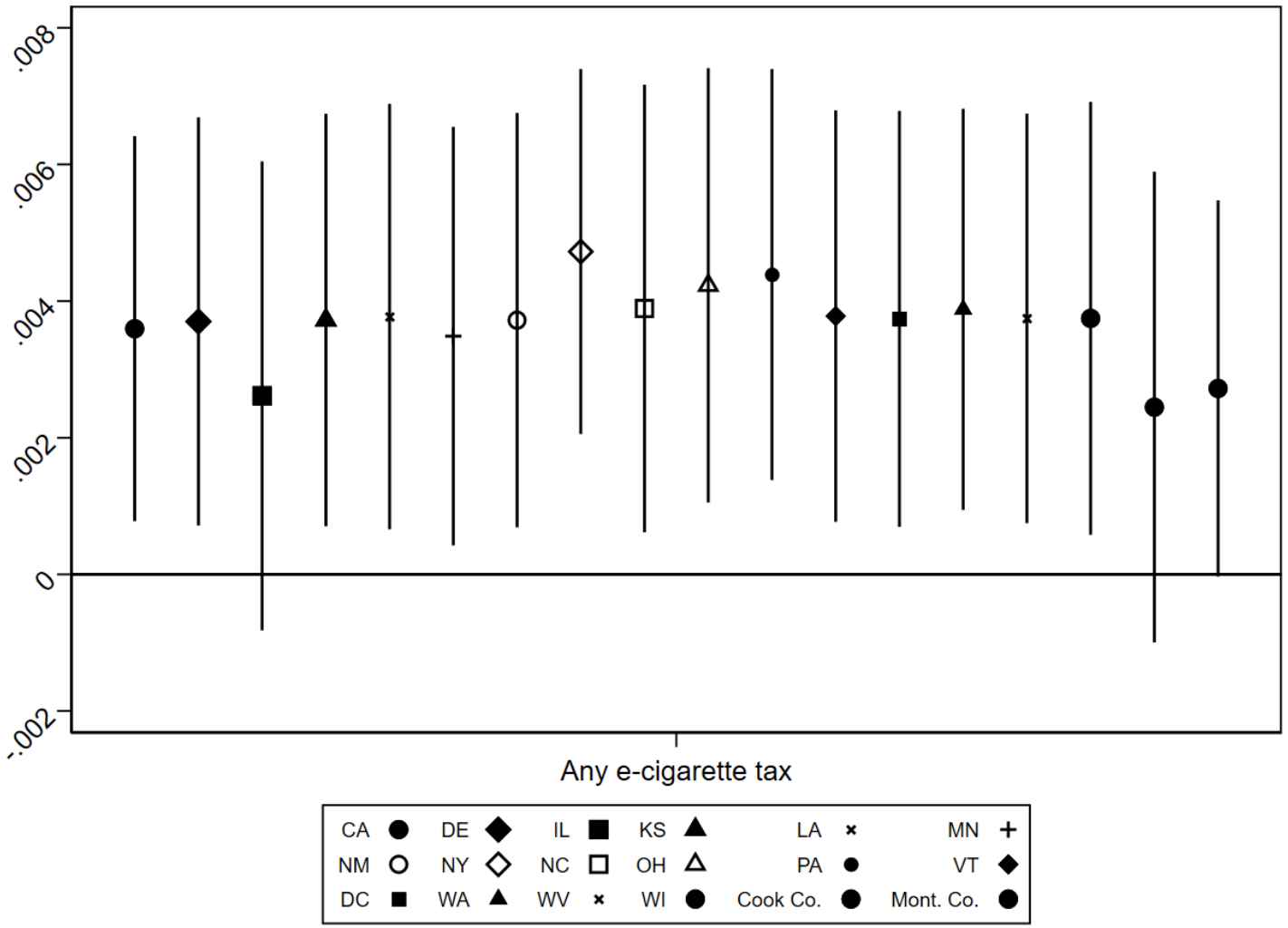
Note: Symbols are used in the order shown in the legend, from left to right. 95% confidence intervals reported.

Online Appendix K: Figure 2, Leave-One-Out Analysis, Prenatal Smoking (Tax Rate)



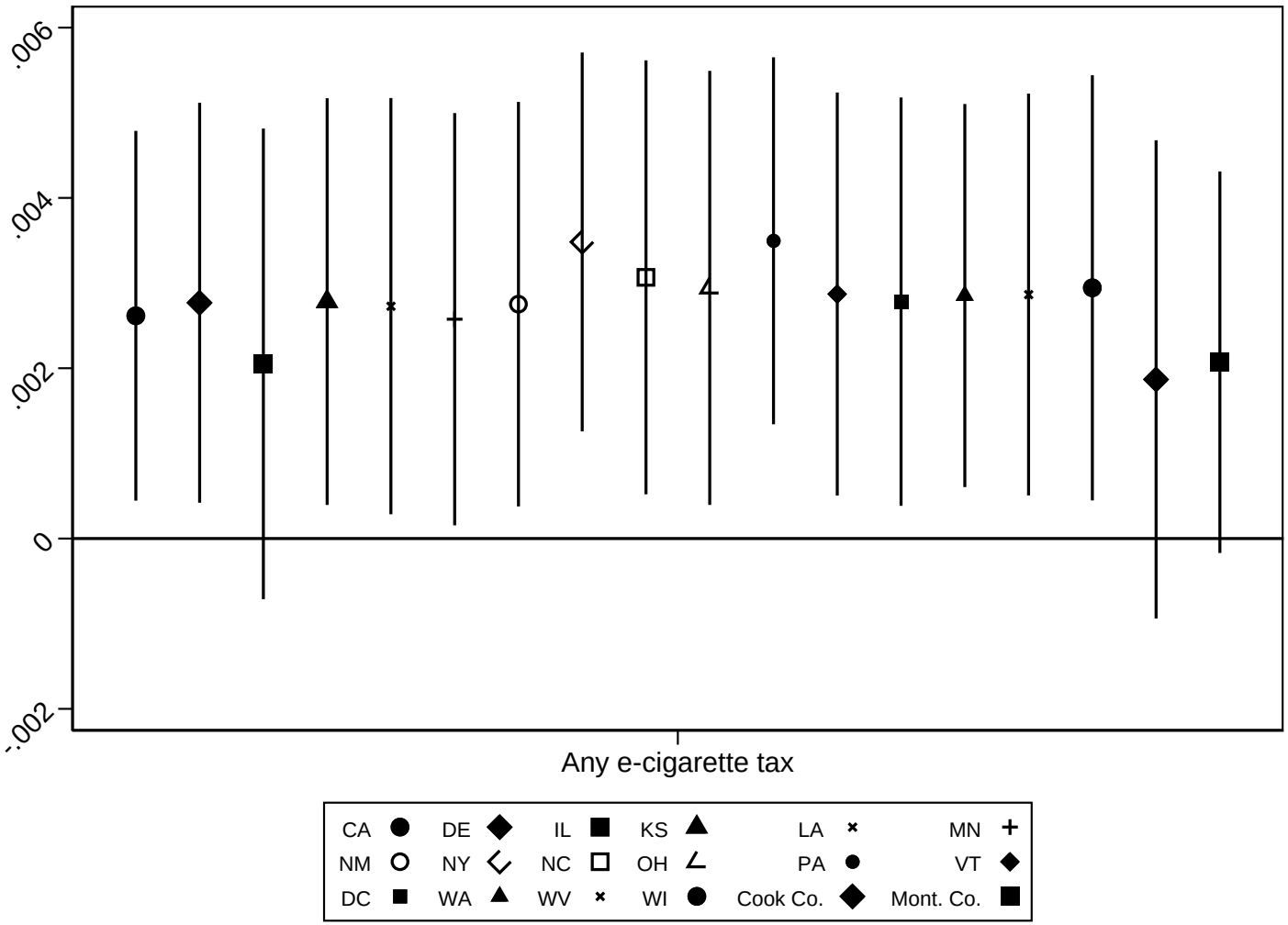
Note: Symbols are used in the order shown in the legend, from left to right. 95% confidence intervals reported.

Online Appendix K: Figure 3, Leave-One-Out Analysis, Pre-Pregnancy Smoking (Any Tax)



Note: Symbols are used in the order shown in the legend, from left to right. 95% confidence intervals reported.

Online Appendix K: Figure 4, Leave-One-Out Analysis, Prenatal Smoking (Any Tax)



Note: Symbols are used in the order shown in the legend, from left to right. 95% confidence intervals reported.

Online Appendix L: Table 1

Effect of standardized e-cigarette tax rate (merged to the point of three-months before pregnancy) on any pre-pregnancy smoking: Mother demographic characteristics, policy controls, County FEs, Conception (year-by-month) FEs, and State-by-conception year FEs		
	Any pre-pregnancy smoking	Pre-pregnancy cigarettes smoked per day (among smokers)
	(1) Coef. (Std.Errs)	(2) Coef. (Std.Errs)
Standardized E-cigarette Tax Rate	0.004**	0.041
	(0.002)	(0.187)
Observations	24,730,930	2,272,024
Adjusted R^2	0.15	0.08
Number of localities	50	50
Mean DV among tax adopters during pre-treatment period	0.089	13.188
Percent change (%)	4.83	0.31
Elasticity	0.05	0.00

Notes: The unit of observation is a birth conception in a state-county-year-month. Model estimated with OLS and controlled for mother demographic characteristics, policy controls, county fixed effects, conception (year-by-month) fixed effects, and state-by-conception year fixed effects. 95% confidence intervals accounting for within e-cigarette tax locality clustering are shown in parenthesis. Pre-pregnancy denotes three months before pregnancy. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Online Appendix M: Table 1

Effect of e-cigarette taxes on the probability that mother did not report prenatal smoking (missing): Mother demographic characteristics, policy controls, County FEs, Conception (year-by-month) FEs, and State-by-conception year FEs

	(1) Prob. of not reporting Coef. (Std.Errs	(2) Prob. of not reporting Coef. (Std.Errs)
Standardized E-cigarette Tax Rate	-0.001	
	(0.001)	
Any E-cigarette Tax		-0.003
		(0.002)
Observations	25,062,103	25,060,103
Adjusted R^2	0.30	0.30
Number of localities	50	50
Mean DV among tax adopters during pre-treatment period	0.007	0.007
Percent change (%)	-7.49	-36.25
Elasticity	-0.05	-0.20

Notes: The unit of observation is a birth conception in a state-county-year-month. Model estimated with OLS and controlled for mother demographic characteristics, policy controls, county fixed effects, conception (year-by-month) fixed effects, and state-by-conception year fixed effects. 95% confidence intervals accounting for within e-cigarette tax locality clustering are shown in parenthesis. Pre-pregnancy denotes three months before pregnancy. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Online Appendix M: Table 2

Effect of e-cigarette taxes on the probability that mother did not report pre-pregnancy cigarette use (missing): Mother demographic characteristics, policy controls, County FEs, Conception (year-by-month) FEs, and State-by-conception year FEs		
	(1) Prob. of not reporting Coef. (Std.Errs)	(2) Prob. of not reporting Coef. (Std.Errs)
Standardized E-cigarette Tax Rate	-0.000 (0.001)	
Any E-cigarette Tax		-0.002 (0.002)
Observations	25,062,103	25,062,103
Adjusted R^2	0.34	0.34
Number of localities	50	50
Mean DV among tax adopters during pre-treatment period	0.006	0.006
Percent change (%)	-7.22	-37.32
Elasticity	-0.04	-0.20

Notes: The unit of observation is a birth conception in a state-county-year-month. Model estimated with OLS and controlled for mother demographic characteristics, policy controls, county fixed effects, conception (year-by-month) fixed effects, and state-by-conception year fixed effects. 95% confidence intervals accounting for within e-cigarette tax locality clustering are shown in parenthesis. Pre-pregnancy denotes three months before pregnancy. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Online Appendix N: Table 1

Effect of any e-cigarette tax on e-cigarette use outcomes						
	(1)	(2)	(3)	(4)	(5)	(6)
	Any pre-pregnancy e-cig use	Any 3rd trimester e-cig use	E-cig use per month pre-pregnancy	E-cig use per month 3rd trimester	Any e-cig use	E-cig use per month
	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)
Any E-cigarette Tax	-0.005	0.002	-0.061	0.001	-0.006	-0.087
	(0.007)	(0.004)	(0.069)	(0.033)	(0.007)	(0.055)
Observations	126,355	126,355	126,355	126,355	181,628	181,628
Adjusted R2	0.03	0.02	0.02	0.01	0.4	0.38
Number of localities	40	40	40	40	22	22
Mean DV among tax adopters during pre-treatment period	0.041	0.011	0.244	0.066	0.021	0.128
Percent change (%)	-12.14	17.21	-25.14	1.62	-26.53	-67.67
Elasticity	-0.13	0.15	-0.25	0.01	-0.24	-0.58

Notes: Data source is the Pregnancy Risk Assessment Monitoring System for all completing interviews by 2019. The unit of observation is an individual in a state year-month. Model estimated with OLS and controlled for policy controls, demographics, state FE, and conception year-month FEs. Observations from Illinois and Maryland are dropped due to the presence of local taxes and no sub-state information being available in PRAMS. 95% confidence intervals accounting for within state clustering are shown in parenthesis. Models 1 through 4 were from the cross-sectional analyses (equation 1). Models 5 and 6 were from the panel analyses (equation 2). PRAMS smoking results use birth certificate smoking information to allow comparison with birth certificate results.

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

Online Appendix N: Table 2

Effect of the standardized e-cigarette tax rate on smoking outcomes in the PRAMS and birth certificates								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Any pre-pregnancy smoking Coef. (Std.Errs)	Any prenatal smoking Coef. (Std.Errs)	Any pre-pregnancy smoking Coef. (Std.Errs)	Any prenatal smoking Coef. (Std.Errs)	Any use pre-pregnancy Coef. (Std.Errs)	Dual use pre-pregnancy Coef. (Std.Errs)	Any use 3rd trimester Coef. (Std.Errs)	Dual use 3rd trimester Coef. (Std.Errs)
Standardized E-cigarette Tax Rate	-0.003 (0.03)	-0.001 (0.015)	0.008 (0.007)	0.008 (0.007)	-0.021** (0.009)	-0.001** (0.000)	-0.025*** (0.007)	-0.002 (0.003)
Date Source:								
PRAMS	X	X			X	X	X	X
Birth Records			X	X				
Observations	126,355	126,355	7,393,465	7,393,465	126,355	126,355	126,355	126,355
Adjusted R2	0.15	0.14	0.14	0.13	0.03	0	0.12	0.01
Number of localities	40	40	40	40	40	40	40	40
Mean DV among tax adopters during pre-treatment period	0.145	0.128	0.084	0.061	0.044	0	0.099	0.006
Percent change (%)	-2.03	-0.93	9.90	12.93	-47.45	-361.02	-25.15	-27.98
Elasticity	-0.02	-0.01	0.05	0.07	-0.3	-1.48	-0.18	-0.17

Notes: Data source for columns 1, 2, and 5 through 8 is the Pregnancy Risk Assessment Monitoring System for all completing interviews by 2019. The unit of observation is an individual in a state-year-month. Model estimated with OLS and controlled for policy controls, demographics, state FE, and conception year-month FEs. Observations from Illinois and Maryland are dropped due to the presence of local taxes and no sub-state information being available in PRAMS. 95% confidence intervals accounting for within state clustering are shown in parenthesis. PRAMS smoking results use birth certificate smoking information to allow comparison with birth certificate results. Birth certificate results are shown in columns 3 and 4 for the same state-year pairs as are used in the PRAMS analysis and using identical model specification (e.g. state-level controls, state fixed effects).

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

Online Appendix N: Table 3

Effect of the any e-cigarette tax rate on smoking outcomes in the PRAMS and birth certificates								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Any pre-pregnancy smoking	Any prenatal smoking	Any pre-pregnancy smoking	Any prenatal smoking	Any use pre-pregnancy	Dual use pre-pregnancy	Any use 3rd trimester	Dual use 3rd trimester
	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)
Any E-cigarette Tax	0.027	0.013	0.018**	0.014**	-0.004	0	0.007	0
	(0.019)	(0.011)	(0.007)	(0.007)	(0.006)	(0.000)	(0.008)	(0.003)
Date Source:								
PRAMS	X	X			X	X	X	X
Birth Records			X	X				
Observations	126,355	126,355	7,393,465	7,393,465	126,355	126,355	126,355	126,355
Adjusted R2	0.15	0.14	0.14	0.13	0.03	0	0.12	0.01
Number of localities	40	40	40	40	40	40	40	40
Mean DV among tax adopters during pre-treatment period	0.145	0.128	0.084	0.061	0.044	0	0.099	0.006
Percent change (%)	18.78	9.94	21.15	22.45	-9.9	-17.84	6.97	2.9
Elasticity	0.25	0.15	0.18	0.18	-0.1	-0.12	0.09	0.03

Notes: Data source for columns 1, 2, and 5 through 8 is the Pregnancy Risk Assessment Monitoring System data between 2016 to interview completion by 2019. The unit of observation is an individual in a state -year-month. Model estimated with OLS and controlled for policy controls, demographics, state FE, and year FE. Observations from Illinois and Maryland are dropped due to the presence of local taxes and no sub-state information being available in PRAMS. 95% confidence intervals accounting for within state clustering are shown in parenthesis. PRAMS smoking results use birth certificate smoking information to allow comparison with birth certificate results. Birth certificate results are shown in columns 3 and 4 for the same state-year pairs as are used in the PRAMS analysis and using identical model specification (e.g. state-level.
*** p < 0.01, ** p < 0.05, * p < 0.10

Online Appendix O: Table 1

Effect of any e-cigarette tax on birth outcomes								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Gestation length	Premature	Birthweight	Low birthweight	Small-for-gestational age	Extra-small-for-gestational age	Apgar 5	One-year mortality
	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)	Coef. (Std.Errs)
Any E-cigarette Tax	0.004	-0.001	2.219	-0.001	0.000	0.000	-0.001	0.000
	(0.018)	(0.002)	(2.782)	(0.001)	(0.001)	(0.001)	(0.005)	(0.000)
Observations	24,730,930	24,730,930	24,717,465	24,717,465	24,717,465	24,717,465	24,642,078	18,767,811
Adjusted R^2	0.02	0.02	0.05	0.01	0.03	0.02	0.03	0.00
Number of localities	50	50	50	50	50	50	50	50
Mean DV among tax adopters during pre-treatment period	38.826	0.088	3315.973	0.060	0.236	0.090	8.844	0.004
Percent change (%)	0.01	-0.57	0.07	-1.78	0.06	0.31	-0.02	2.47
Elasticity	0.00	-0.01	0.00	-0.02	0.00	0.00	-0.00	0.02

Notes: The unit of observation is a birth delivery in a state-county-year-month. Model estimated with OLS and controlled for mother demographic characteristics, policy controls, county fixed effects, conception (year-by-month) fixed effects, and state-by-conception year fixed effects. 95% confidence intervals accounting for within e-cigarette tax locality clustering are shown in parenthesis.
*** p < 0.01, ** p < 0.05, * p < 0.10