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DISCUSSION PAPER SERIES

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ABSTRACT

Cigarette Taxes and Smoking in the Long Run*

Researchers have focused on the contemporaneous relationship between cigarette taxes and smoking, while the longer-run effects of cigarette taxes have received little attention. Using individual-level panel data from 1970-2017, we estimate the effects of cigarette taxes experienced as a teenager on smoking later in life. We find that a one-dollar increase in the cigarette tax experienced between the ages of 12 and 17 is associated with substantial reductions in smoking participation and intensity among adults in their 20s through mid-60s. Among first-time mothers, it is associated with a reduction in the likelihood of smoking the year of giving birth.

JEL Classification: H2, I10, I12
Keywords: smoking, cigarette taxes, long run

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1. INTRODUCTION

According to the Centers for Disease Control and Prevention, smoking is the leading cause of preventable death in the United States, costing the economy between $289 and $333 billion per year (U.S. Department of Health and Human Services 2014). Although a wide variety of anti-smoking policies have been adopted by state and local governments, increasing the excise tax on cigarettes is viewed by public health experts as being the most effective (World Health Organization 2015; Guindon, Paraje and Chaloupka 2018).

The literature on cigarette taxes and smoking is already quite extensive and is still growing at a rapid pace. Previous studies in this literature provide estimates of the effects of cigarette taxes on smoking participation, cessation, and intensity (Carpenter and Cook 2008; DeCicca, Kenkel and Mathios 2008; DeCicca and McLeod 2008; Lillard, Molloy and Sfekas 2013; Callison and Kaestner 2014; Cotti, Nesson and Tefft 2016; Hansen, Sabia and Rees 2017; Nesson 2017), the tar and nicotine content of cigarettes (Evans and Farrelly 1998; Farrelly et al. 2004; Adda and Cornaglia 2006; Abrevaya and Puzzello 2012; Adda and Cornaglia 2013; Cotti, Nesson and Tefft 2016; Nesson 2017), and substitution across different types of tobacco- and nicotine-based products (Oshfeldt, Boyle and Capilouto 1997; Cotti, Nesson and Tefft 2016; Pesko, Courtemanche and Maclean 2019; Cotti et al. 2020). These studies, however, focus on gauging the contemporaneous relationship between cigarette taxes and behavior; the longer-run effects of cigarette taxes have received little attention from researchers.

Ours is the first study to estimate the effects of cigarette taxes experienced as a teenager on adult smoking participation and intensity. Using individual-level data from the Panel Study of Income Dynamics for the period 1970-2017 and leveraging within-state variation in cigarette taxes, we find that a one-dollar tax increase experienced between the ages of 12 and 17 is

associated with substantial reductions in smoking participation and intensity among adults in their 20s through mid-60s; among first-time mothers, it is associated with a reduction in the likelihood of smoking the year of giving birth. These results complement those of Darden (2017) and Darden, Gilleskie, and Strumpf (2018), who explore the long-run effects of smoking on health using dynamic structural models that incorporate learning and addiction. They suggest that, because most smokers take up the habit as a teenager, and because nicotine is highly addictive, policy decisions made today will have important consequences on smoking behaviors and health outcomes decades into the future.

2. BACKGROUND

Cigarette taxes serve multiple purposes. In addition to generating revenue for the government, they, along with other so-called "sin" taxes, can be welfare improving for individuals who have time-inconsistent preferences (Gruber and Kőszegi 2004; O'Donoghue and Rabin 2006). Among public health experts and policymakers, cigarette taxes are viewed as a crucial component of the ongoing campaign to discourage tobacco use and reduce exposure to second-hand smoke, both of which are associated with a wide array of maladies including, but certainly not limited to, asthma, emphysema, heart disease, and stroke (U.S. Department of Health and Human Services 2006; Fischer and Kraemer 2015).

With only a few exceptions, previous studies in this literature provide estimates of the immediate impact of cigarette taxes and/or prices on consumption—what we are characterizing as the "contemporaneous relationship".[1] By contrast, our focus is on cigarette taxes experienced

[1] Among these exceptions, Chaloupka (1991) and Becker, Grossman and Murphy (1994) explore whether cigarette demand is sensitive to changes in past and future prices. Using individual-level data from the Second National Health and Nutrition Examination Survey for the period 1976-1980, Chaloupka (1991) finds that, controlling for lagged and future consumption, smoking in year *t* is positively related to prices in year *t*-1 and year *t*+1. Using

as a teenager and smoking behaviors later in life. Most adult smokers report having taken up the habit before reaching the age of 20 (Lillard, Molloy and Sfekas 2013; Holford et al. 2014) and, at least in part because nicotine is so addictive, smoking as a teenager is strongly correlated with smoking later in life (Chassin et al. 1996).[2]

Economists have long recognized that, when the good in question is addictive, the immediate and longer-run responses to price and policy changes are likely to be different. For example, Becker and Murphy's (1988) theory of rational addiction predicts that the long-run price elasticity of an addictive good will be greater than its short-run elasticity.[3] Darden (2017) and Darden, Gilleskie and Strumpf (2018) model smoking behaviors and health over the life cycle. According to these researchers, small differences in initial conditions (e.g., exposure to more intense advertising by tobacco companies or an increase in the price of cigarettes) can have important, long-run effects on a wide variety of outcomes, including smoking participation and intensity, the likelihood of quitting, the likelihood of relapsing, morbidity, and longevity.[4]

Understanding how cigarette taxes experienced as a teenager are related to smoking behaviors in the long run is an important first step for gaining a better understanding of how anti-tobacco policies will affect health over the life cycle. Discouraging teenagers from smoking

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state-level data for the period 1955-1985, Becker, Grossman and Murphy (1994) find that cigarette sales in year *t* are negatively related to prices in year *t*+1 and year *t*-1. See also Chaloupka (1992) and Wan (2006).

[2] Nicotine, the compound found in tobacco that gives it addictive properties is extremely potent: laboratory experiments have shown nicotine to have similar neurochemical and metabolic effects to cocaine, amphetamine, and morphine (Pontieri et al. 1996; Pich et al. 1997).

[3] See Cawley and Ruhm (2012) for descriptions of several theories of addiction and their implications for short- versus long-run decision making and risky behavior.

[4] Darden (2017) and Darden, Gilleskie and Strumpf (2018) used data from the Framingham Heart Study (FHS), which began in 1948 with a sample approximately 5,000 respondents all of whom lived in Framingham, Massachusetts. Darden (2017) focused on the offspring of these original FHS participants, while Darden, Gilleskie and Strumpf (2018) focused on male participants in the original cohort. By contrast, our data come from the Panel Study of Income Dynamics, which covers a much broader population and, when weighted, can be used to produce nationally representative statistics.

could permanently shift their lifetime trajectory of cigarette consumption; the health ramifications of such a shift may not be felt until much later in life because many smoking-related illnesses often take decades to manifest.[5]

3. DATA AND METHODS

Our primary source of data is the Panel Study of Income Dynamics (PSID). The PSID collects economic-, social-, and health-related information from thousands of American families over multiple generations. Its surveys were conducted annually from 1968 through 1997, and then biennially through 2017.[6]

Most salient to our analysis, since 1986 the PSID has periodically asked heads of household and their spouses about current and past smoking behaviors. For instance, it asks whether the respondent currently smokes, the number of cigarettes smoked per day, when they first began smoking, and when they last smoked regularly.[7] Our sample is composed of PSID respondents who were at least 30 years of age in 2017 and were interviewed at least once as a teenager (i.e., between the ages of 12 and 19). The oldest respondents in our sample were 66 in 2017, the most recent year for which PSID data are publicly available.[8]

We assign cigarette taxes (measured in 2010 dollars) to respondents based on their state of residence as a teenager. Historical data on state cigarette taxes come from Orzechowski and

[5] For example, chronic obstructive pulmonary disease is two to three times more prevalent among smokers ages 55-64 than among smokers ages 25-44 (Akinbami and Liu 2011).

[6] The PSID is conducted by the Survey Research Center at the University of Michigan. It began with a nationally representative sample of 18,230 individuals from 4,802 families. For more on the structure of the PSID and how it is conducted, see https://psidonline.isr.umich.edu/.

[7] The smoking questions were first asked in 1986. Between 1999 and 2017, PSID respondents were regularly asked about their current smoking status and their smoking history.

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[8] Only 29 out of 10,756 of PSID respondents in our sample did not answer the smoking questions in 2017.

Walker (2018). During the period 1970-2007, when the respondents in our sample were between the ages of 12 and 19, there were a total of 482 changes in state cigarette taxes stemming from legislation.[9] Most of these changes were modest in terms of magnitude. The interquartile range is from \$0.045 to \$0.29 per pack (Appendix Figure 1). However, there is a long right-hand tail to this distribution: there were 39 changes in the per-pack cigarette tax stemming from legislation between \$0.29 and \$0.50; there were 82 changes between \$0.50 and \$1.00; and there were 20 changes between \$1.00 and \$1.74.

Our identification is strategy is similar to that used by researchers interested in the contemporaneous relationship between cigarette taxes and smoking (e.g., Carpenter and Cook 2008, Callison and Kaestner 2014, and Cotti, Nesson and Tefft 2016). The key difference is that we allow more time between exposure to the cigarette tax and when the respondent's smoking is observed.

Specifically, we estimate separate regressions based on how exposure to the cigarette tax is measured. Each regression corresponds to an age of exposure, which is indexed by *j* and runs from 12 to 19:

$$(1)\quad Smoke_{i,a,s_{2017},s_j} = \alpha + \beta_1 Tax_{a,s_j} + \boldsymbol{\beta}_2 \boldsymbol{X}_{i,a,s_{2017},s_j} + \boldsymbol{\beta}_3 \boldsymbol{Z}_{a,s_j} + \gamma_a + \tau_{s_j} + \theta_{s_{2017}} + \varepsilon_{i,a,s_{2017},s_j};$$
$$j = 12, \ldots, 19,$$

where the dependent variable, $Smoke_{i,a,s_{2017},s_j}$, is the relevant smoking behavior for respondent *i*, who, when interviewed in 2017, was *a* years of age and resided in state s_{2017}. Tax_{a,s_j} is the

[9] We observe PSID respondents as teenagers before and after each one of these 482 changes in the state nominal cigarette tax.

real cigarette tax that *i* was exposed to at age *j*, which depends upon their state of residence at age *j*, s_j. Our focus throughout is on the coefficient β_1, the effect of a one-dollar increase in the cigarette tax on smoking later in life.

The vector $\boldsymbol{X}_i$ is a composed of individual characteristics, all which are measured in 2017, such as gender, race, ethnicity, and educational attainment. The vector $\boldsymbol{Z}_{a,s_j}$ is composed of state-level variables intended to capture the influence of other factors potentially affecting individual *i*'s choice to smoke at age *j*, including the unemployment rate in s_j, the state minimum legal purchase age (MLPA) for cigarettes in s_j, and whether there was a comprehensive smoke-free law in effect. The age effects, γ_a, are for 5-year bins (e.g., ages 30-34, 35-39, 40-44, 45-49, etc.).[10]

Fixed effects for *i*'s state of residence at *j* years of age are represented by τ_{s_j}. Their inclusion on the right-hand side of the regression ensures that our estimates of β_1 are identified off of within-state changes in the real cigarette tax. Note that two respondents who lived in the same state at age *j* could easily have been exposed to different values of Tax_{a,s_j}. For instance, if they were born 10 years apart, then they would have likely experienced different tax environments either because of inflation or legislation (or both).[11] Finally, state-of-residence

[10] MLPAs for the period 1970-2007 (when the respondents in our sample were between the ages of 12 and 19) are from Downey (1981), Unknown Author (1996), Yan (2014), and Committee on the Public Health Implications of Raising the Minimum Age for Purchasing Tobacco Products (2015). We constructed 6 mutually exclusive indicator variables (*MLPA15*, *MLPA16*, *MLPA17*, *MLPA18*, *MLPA19*, *MLPA21*) based on the MLPA in s_j. The MLPA of 20, the most common historically, was used as the omitted category. State unemployment rates for the period 1976-2007 are from the U.S. Bureau of Labor Statistics' *Local Area Unemployment Statistics* (https://www.bls.gov/lau/). State unemployment rates for the period 1970-1975 come from U.S. Bureau of the Census (1974, 1977) and United States (1975). Information on comprehensive smoke-free laws for worksites, restaurants, and bars comes from the Center for Disease Control and Prevention (2011).

[11] For example, 14-year-old living in California would have experienced a nominal per-pack cigarette tax of $0.18 in 1980. Ten years later, a 14-year-old living in California would have experienced a nominal per-pack cigarette tax of $0.51. Of course, two individuals who were both *a* years of age in 2017 and living in the same state at age *j* would have been exposed to precisely the same tax environment.

fixed effects for 2017 are represented by $\theta_{s_{2017}}$. They are intended to capture the influence of policies (including the cigarette tax) and other contemporaneous factors that could have influenced *i*'s behavior when observed in 2017.[12]

4. MAIN RESULTS

We begin our exploration of whether cigarette taxes experienced as a teenager affect smoking behavior later in life by considering three dichotomous outcomes, each of which is measured in 2017 when our respondents were between the ages of 30 and 66:

1. *Smoked*, equal to 1 if respondent *i* reported being a current smoker (and equal to 0 otherwise);
2. *One pack per week*, equal to 1 if respondent *i* reported smoking at least one pack per week (and equal to 0 otherwise); and
3. *Two packs per week*, equal to 1 if respondent *i* reported smoking at least two packs per week (and equal to 0 otherwise).

Unweighted ordinary least squares (OLS) estimates of marginal effects, $\delta\Pr(Smoked = 1)/\delta Tax$, are reported in Table 1. Standard errors, corrected for clustering at the state level, are reported in parentheses and sample sizes are reported in brackets.[13]

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[12] One concern with this strategy is that attrition from the sample could be correlated with the cigarette tax, leading to selection based on treatment. Estimating equation (1) with an indicator for not observing a respondent in 2017 on the left-hand side yields small and statistically insignificant estimates.

[13] Specifically, standard errors are corrected for clustering based on the state of residence in which the respondent lived as a teenager, s_j. Clustering on state of residence in 2017 produced very similar results to those reported. The sample sizes in Table 1 range from 6,632 to 7,061. In order to be in our analysis, a respondent must have answered the smoking questions in 2017. In addition, we needed to know their state of residence as a teenager in order to assign the correct cigarette tax. Respondents who were first interviewed by the PSID at age 13 could not be assigned a cigarette tax at age 12; respondents who were first interviewed at age 14 could not be assigned cigarette taxes at ages 12-13; and so forth. As noted above, the PSID was conducted biennially from 1997 onwards. After the PSID became biennial, we did not observe state of residence, and therefore could not assign cigarette taxes, in "off years" for respondents between ages of 12 and 19. In the 2017 PSID, there were fewer than 40 respondents who reported having smoked but did not report any information about smoking intensity.

We find evidence that exposure to higher cigarette taxes as a teenager reduces the likelihood of smoking later in life. Estimates of β_1 are negative across all ages, although they are only statistically significant at ages 14 and 16. A one-dollar increase in the cigarette tax at age 14 is associated with a .086 reduction in the probability of participation in 2017, or 46 percent of the sample mean (.188); a one-dollar increase in the cigarette tax at age 16 is associated with a .053 reduction in the probability of participation in 2017, or 29 percent of the sample mean (.184).

These estimates suggest that the long-run response to cigarette taxes experienced as a teenager may be at least as large, if not larger, than the short-run response. Using data on U.S. high school students from Youth Risk Behavior Surveys (YRBS) for the period 1991-2005, Hansen et al. (2017) found that a one-dollar increase in the cigarette tax was associated with a contemporaneous reduction in the probability of smoking of .031, or 12 percent relative to the mean.[14] Carpenter and Cook (2008), who also used data on U.S. high school students from the YRBS, found that the contemporaneous relationship between taxes and participation (i.e., $\delta \Pr(Smoke = 1)/\delta Tax$) ranged from -.027 to -.059.[15]

When smoking participation in 2017 is replaced by either the one-pack indicator or the two-packs indicator, estimates of β_1 are, without exception, negative and are generally more

[14] The Hansen et a. (2017) estimate was based on combined state and national YRBS data; cigarette taxes were measured in 2005 dollars. Using YRBS data for the period 2007-2013, Hansen et al. (2017) found that a one-dollar increase in the cigarette tax was associated with (statistically insignificant) changes in the probability of having smoked in the past 30 days ranging from -.010 to .007.

[15] The Carpenter and Cook (2008) estimates were based on state and national YRBS data; cigarette taxes were measured in 2005 dollars. Measuring cigarette taxes in 2008 dollars and using PSID data, Lillard, Molloy, and Sfekas (2013) found that a one-dollar increase in the cigarette tax was associated with a .031 reduction in the probability that 13- through 17-year-olds smoked regularly. Measuring cigarette taxes in 2010 dollars and using PSID data, we find that that a one-dollar increase in the cigarette tax is associated with a .016 to .051 reduction in the probability that 13- through 17-year-olds smoke. DeCicca, Kenkel, and Lovenheim (2020) review the literature on cigarette taxes and smoking. Citing the results of Carpenter and Cook (2008), Lillard, Molloy, and Sfekas (2013) and Hansen et al. (2017), these authors conclude that teenagers are not particularly responsive to changes in the cigarette tax, at least in the short run (DeCicca, Kenkel, and Lovenheim 2020, p. 46).

precise. The largest effects are observed at ages 14-16. For instance, a one-dollar increase in the cigarette tax at age 14 is associated with a .078 reduction in the probability of smoking one pack per week in 2017, or a 45 percent reduction relative to the mean; a one-dollar increase in the cigarette tax at age 16 is associated with a .080 reduction in the probability of smoking two packs per week in 2017, or 61 percent of the mean.[16]

In Table 2, we turn our attention to smoking duration. Specifically, we examined three new outcomes: an indicator for whether the respondent reported having smoked for a total of 5 or more years during their lifetime; an indicator for having smoked 10 or more years; and an indicator for having smoked 15 or more years. It is important to note that many (40.7 percent of) PSID respondents who did not smoke in 2017 reported that they did smoke earlier in their lives, so these outcomes are distinct from the outcomes considered in Table 1.[17]

Again, the estimates of β_1 are uniformly negative and are typically larger (in absolute value) for cigarette taxes experienced before the age of 17. In fact, the largest estimated effects reported in Table 2 are for taxes experienced at age 12. A one-dollar increase in the cigarette tax at age 12 is associated with a .128 reduction in the probability of smoking for 5 or more years (or 33 percent of the mean), a .120 reduction in the probability of smoking 10 or more years (or 38 percent of the mean), and a .102 reduction in the probability of smoking 15 or more years (or 42 percent of the mean).

[16] We also estimated the effects of cigarette taxes experienced as a teenager on *Smoked*, *One pack per week*, and *Two packs per week* using the 2017 PSID cross-sectional weights. The weighted OLS estimates, which are reported in Appendix Table 1, are similar to the unweighted estimates in Table 1.

[17] If a respondent smoked in 2017, then we subtracted the age at which they started smoking from their age in 2017 to construct the three duration outcomes. If a respondent quit prior to the 2017 survey, then we subtracted the age at which they started smoking from the age at which they quit. The ages at which ex-smokers started and quit were based on answers to the smoking history questions asked in the 1986 and 1999-2017 PSIDs. We do not observe the exact month in which respondents began smoking nor the month in which they quit. Never-smokers were assigned a smoking duration of zero. In 2017, 5,516 of the respondents in our sample (51 percent) were never-smokers, 1,686 (16 percent) were current smokers, and the 3,616 (33 percent) were quitters.

5. EXTENSIONS

5.1. Smoking over the course of the lifecycle

In this section, we explore the relationship between cigarette taxes experienced as a teenager and smoking over the course of the lifecycle. We begin by examining whether respondents smoked in their 20s, whether they smoked in their 30s, and whether they smoked in their 20s and 30s.[18] The estimates of β_1 are consistently negative (Table 3). Although roughly comparable in terms of magnitude across all three outcomes, these estimates provide additional evidence that adult smoking is most sensitive to cigarette taxes experienced before the age of 17. In fact, the largest estimates are for taxes experienced at ages 12-14. For instance, a one-dollar increase in the cigarette tax experienced at age 12 is associated with a .133 reduction in the probability that the respondent smoked in their 20s, a .144 reduction in the probability that the respondent smoked in their 30s, and a .130 reduction in the probability that the respondent smoked in their 20s and 30s.[19]

Appendix Figure 2 shows the evolution of real state cigarette taxes from 1970 to 2005 (when our respondents were in their teens).[20] The national average fell from $1.07 per pack in 1970 to a low of 51 cents per pack in 1982. During the 1990s and 2000s, states quickly ratcheted

[18] To determine if a respondent smoked in their 20s or 30s, we utilized the answers to smoking questions asked in 1986 and 1999-2017.

[19] As noted above, the results reported in Tables 1-3 are robust to using different age-bin widths. Results controlling for one-year age bins are reported in Appendix Tables 2-4. In Appendix Table 5, we examine three outcomes that are intended to simultaneously capture smoking duration and intensity: an indicator for whether the respondent smoked at least one pack per week and smoked for 5 or more years; an indicator for whether the respondent smoked one pack per week and smoked for 10 or more years; and an indicator for whether the respondent smoked one pack per week and smoked for 15 or more years. The estimates of β_1 reported in Appendix Table 5 are uniformly negative, are often statistically significant at conventional levels, and quite large as compared to the mean. We interpret these estimates as providing additional evidence that cigarette taxes experienced as a teenager have long-lasting effects on both duration and intensity.

[20] State cigarette taxes are measured in 2010 dollars. We weighted by state population to obtain the national average.

up their cigarette taxes, arguably exposing the oldest PSID respondents in our sample to a much different tax environment than their younger counterparts. In Table 4, we report estimates of β_1 restricting the sample to respondents who were teenagers in the 1970s through the early 1980s. The outcomes, all of which pertain to 2017, are the same as those considered in Table 1 (i.e., *Smoked*, *One pack per week*, and *Two packs per week*).

The results provide evidence that state cigarette taxes in the 1970s and early 1980s were especially effective. After age 14, the estimates of β_1 are consistently negative and often large and statistically significant. Consistent with evidence that the average age of initiation was steadily falling throughout the period under study (Holford et al. 2014), the largest estimates are for taxes at ages 17 through 19. In Appendix Table 6, we report estimates of β_1 restricting the sample to respondents who were teenagers during the period 1983-2007. Consistent with evidence that teenagers are becoming less responsive to cigarette tax increases over time (Hansen et al. 2017), these estimates tend to be smaller, less precise, and are even occasionally positive.

5.2 Cigarette taxes experienced as a teenager and smoking among mothers

Smoking during pregnancy in the United States has been slowly trending downwards for the past several decades (Meernik and Goldstein 2015; Azagba et al. 2020). Nevertheless, a substantial number of American women still smoke for some portion of their pregnancy (Azagba et al. 2020), risking premature delivery, low birth weight, and congenital defects (Scherman et al. 2018).

Evidence of a negative contemporaneous relationship between cigarette taxes and smoking during pregnancy comes from several studies, including Evans and Ringel (1999), Lien

and Evans (2005), Levy and Meara (2006), and Simon (2016). Ours is the first study to estimate the effects of cigarette taxes experienced as a teenager on the likelihood that mothers smoked later in life.[21]

The PSID Childbirth and Adoption History File (CAHF) contains complete childbirth and adoption histories for PSID respondents surveyed between 1985 and 2017. We identified the first childbirth of every female head of household and spouse in the CAHF, her state of residence when she gave birth to her first child, and the year in which the birth occurred. Then, using the answers to the smoking questions asked in 1986 and 1999-2017, we constructed two outcomes: an indicator for whether the mother smoked the year in which her first child was born and an indicator for whether she smoked the year before the year in which her first child was born. Because the PSID does not provide information on the month in which respondents began smoking (or the month in which they quit), it is not possible to accurately measure smoking during pregnancy.

To explore the effects of cigarette taxes experienced as a teenager on the two outcomes described above, we estimate a modified version of equation (1) that includes fixed effects for state of residence at first birth.[22] Our attention is restricted to cigarette taxes experienced between the ages of 12 and 15; mothers who were less than 15 years of age when they first gave

[21] Simon (2016) explored whether cigarette taxes experienced in the two years before becoming pregnant affected smoking during pregnancy. He found no evidence that per-pack tax increases of at least 25 cents were related to smoking during pregnancy. Likewise, he found no evidence that per-pack tax increases of at least 72 cents were related to smoking during pregnancy.

[22] These replace the 2017 state of residence fixed effects. Standard errors are corrected for clustering on the state of residence in which the first birth occurred.

birth were not included in the analysis.[23] Approximately one quarter of the first-time mothers who compose our sample smoked.[24]

There is strong evidence that cigarette taxes experienced at ages 13 and 14 were effective at reducing the incidence of smoking among these mothers (Table 5). For instance, a one-dollar increase in the cigarette tax at age 13 is associated with a .057 reduction in the probability of smoking the year in which the birth occurred, or 23 percent of the mean; it is associated with a .078 reduction in the probability of smoking the year before, or 32 percent of the mean. Similarly, a one-dollar increase in the cigarette tax at age 14 is associated with a .081 reduction in the probability of smoking the year before giving birth, or 33 percent of the mean. Although the other estimated coefficients reported in Table 5 are not statistically significant at conventional levels, they are negative and large relative to the mean.[25]

6. CONCLUSION

Economic models predict that changes in the price of cigarettes should have powerful effects on smoking behavior over the long-run (Becker and Murphy 1988; Darden 2017; Darden, Gilleskie and Strumpf 2018). Ours is the first study in this literature to estimate the impact of cigarette taxes experienced as a teenager on the smoking behavior of adults.

[23] Specifically, 43 mothers who gave birth before the age of 15 were not included in the analysis. If we only exclude mothers who first gave birth before the age of 14 from the analysis, the estimated coefficients on cigarette taxes at ages 12-14 are very similar to those discussed below.

[24] By comparison, roughly one third of pregnant women smoked in the 1980s (Kleinman and Kopstein 1987; Fingerhut et al. 1990; Floyd et al. 1993). By 2017, only 7 percent of pregnant women in the United States reported smoking (Azagba et al. 2017).

[25] The estimates of β_1 reported in Table 5 are generally smaller and quite a bit noisier when we include indicators for one-year age bins on the right-hand side of the regression as opposed to indicators for 5-year age bins.

We find cigarette taxes experienced as teenager can have substantial effects on smoking participation, duration and intensity among adults ages 30-66. For instance, a one-dollar increase in the cigarette tax at age 14 is associated with a 46 percent reduction in the probability of smoking as an adult and a 45 percent reduction in the probability of smoking at least one pack per week. Among first-time mothers, a one-dollar increase in the cigarette tax at age 13 is associated with a 23 percent reduction in the probability of smoking in the year of birth.

As a general rule, we find that cigarette taxes experienced before the age of 17 are the most effective at altering long-run smoking patterns. Although negative, the estimated effects of cigarette taxes experienced at ages 18 and 19 tend to be smaller and less precisely estimated, which is consistent with the fact that most smokers take up the habit before reaching the age of 18 (Lillard, Molloy, and Sfekas 2013; Holford et al. 2014).

The results described above carry with them important policy and public-health implications. First, they complement those of Darden (2017) and Darden, Gilleskie and Strumpf (2018), who emphasize the importance of lifetime smoking trajectories on a variety of health outcomes including mortality and onset of chronic illness. Second, they provide evidence that recently enacted cigarette tax increases may have profound effects on the smoking behavior and health of Americans decades into the future. Between 2000 and 2010, there were 41 legislative increases in state cigarette taxes greater than $0.75, and 18 of these tax increases were greater than $1.00. Our results suggest that teenagers who were exposed to these recently enacted higher cigarette taxes will be less likely to smoke in their 20s, 30s and beyond, while those who do smoke will, on average, smoke less. From a public health perspective, this means that the largest health benefits from recently enacted cigarette taxes have yet to accrue: many of those who were exposed in their teens have not reached the age at which the most severe tobacco-

related illnesses typically manifest. As the exposed cohorts become older, researchers will be in a position to use cigarette taxes experienced as a teenager to instrument for smoking behaviors later in life and produce causal estimates of the effects of these behaviors on health and mortality.

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Table 1. Cigarette Taxes at Ages 12-19 and Adult Smoking

	Cigarette Tax							
	Age 12	Age 13	Age 14	Age 15	Age 16	Age 17	Age 18	Age 19
Smoked	-.060	-.023	-.086**	-.061	-.053*	-.032	-.021	-.011
	(.038)	(.039)	(.035)	(.043)	(.031)	(.032)	(.023)	(.020)
	[6716]	[6649]	[6827]	[6783]	[6972]	[6895]	[7061]	[6958]
Mean of dep. var.	.188	.187	.188	.184	.184	.182	.181	.176
One pack per week	-.061	-.030	-.078**	-.072*	-.059**	-.048*	-.029	-.015
	(.037)	(.038)	(.035)	(.040)	(.029)	(.027)	(.026)	(.020)
	[6701]	[6632]	[6811]	[6764]	[6955]	[6877]	[7044]	[6940]
Mean of dep. var.	.174	.171	.174	.168	.170	.167	.167	.161
Two packs per week	-.077**	-.052	-.079**	-.071**	-.080***	-.042*	-.046*	-.007
	(.029)	(.031)	(.031)	(.030)	(.025)	(.022)	(.024)	(.017)
	[6701]	[6632]	[6811]	[6764]	[6955]	[6877]	[7044]	[6940]
Mean of dep. var.	.134	.132	.134	.129	.132	.129	.128	.124

*Statistically significant at 10% level; ** at 5% level; *** at 1% level.

Notes: The sample is composed of PSID respondents ages 30-66 in 2017. Each cell represents the results from a separate unweighted OLS regression. Standard errors are reported in parentheses and are corrected for clustering based on the state of residence in which the respondent lived as a teenager. Sample sizes are reported in brackets. All regressions include fixed effects for state of residence in 2017 and fixed effects for the state in which the respondent lived as a teenager. Controls include 5-year age bin indicators, gender, race, ethnicity, educational attainment, the unemployment rate in the state where the respondent lived as a teenager, an indicator for whether the state where the respondent lived as a teenager had passed a comprehensive smoke-free law, and indicators for the MLPA in the state where the respondent lived as a teenager.

Table 2. Cigarette Taxes at Ages 12-19 and Smoking Duration

	Cigarette Tax							
	Age 12	Age 13	Age 14	Age 15	Age 16	Age 17	Age 18	Age 19
Smoked 5+ years	-.128**	-.066	-.114**	-.050	-.090***	-.047	-.043	-.018
	(.053)	(.046)	(.043)	(.041)	(.032)	(.039)	(.029)	(.025)
	[6735]	[6668]	[6856]	[6801]	[6998]	[6922]	[7103]	[6992]
Mean of dep. var.	.384	.388	.391	.393	.395	.395	.396	.397
Smoked 10+ years	-.120**	-.100*	-.109***	-.059	-.105***	-.054*	-.046*	-.017
	(.054)	(.052)	(.038)	(.043)	(.025)	(.029)	(.026)	(.019)
	[6735]	[6668]	[6856]	[6801]	[6998]	[6922]	[7103]	[6992]
Mean of dep. var.	.313	.320	.321	.326	.325	.331	.329	.333
Smoked 15+ years	-.102**	-.067	-.074*	-.017	-.084***	-.035	-.047	-.011
	(.043)	(.051)	(.042)	(.040)	(.026)	(.022)	(.029)	(.021)
	[6735]	[6668]	[6856]	[6801]	[6998]	[6922]	[7103]	[6992]
Mean of dep. var.	.243	.254	.255	.262	.264	.270	.269	.273

*Statistically significant at 10% level; ** at 5% level; *** at 1% level.

Notes: The sample is composed of PSID respondents ages 30-66 in 2017. Each cell represents the results from a separate unweighted OLS regression. Standard errors are reported in parentheses and are corrected for clustering based on the state of residence in which the respondent lived as a teenager. Sample sizes are reported in brackets. All regressions include fixed effects for state of residence in 2017 and fixed effects for the state in which the respondent lived as a teenager. Controls include 5-year age bin indicators, gender, race, ethnicity, educational attainment, the unemployment rate in the state where the respondent lived as a teenager, an indicator for whether the state where the respondent lived as a teenager had passed a comprehensive smoke-free law, and indicators for the MLPA in the state where the respondent lived as a teenager.

Table 3. Cigarette Taxes at Ages 12-19 and Smoked in 20s and 30s

	Cigarette Tax							
	Age 12	Age 13	Age 14	Age 15	Age 16	Age 17	Age 18	Age 19
Smoked in 20s	-.133**	-.062	-.116**	-.010	-.100**	-.034	-.052**	-.007
	(.051)	(.050)	(.050)	(.059)	(.040)	(.045)	(.024)	(.032)
	[6876]	[6803]	[6988]	[6936]	[7125]	[7045]	[7215]	[7111]
Mean of dep. var.	.425	.428	.428	.430	.430	.431	.430	.431
Smoked in 30s	-.144***	-.113***	-.103***	-.080**	-.087***	-.077**	-.052*	-.011
	(.050)	(.042)	(.034)	(.038)	(.029)	(.030)	(.027)	(.020)
	[6961]	[6878]	[7071]	[7016]	[7218]	[7133]	[7303]	[7198]
Mean of dep. var.	.328	.335	.335	.339	.340	.343	.342	.344
Smoked in 20s and 30s	-.130***	-.095**	-.097**	-.054	-.081***	-.058*	-.046	-.008
	(.047)	(.040)	(.039)	(.042)	(.029)	(.034)	(.030)	(.022)
	[6852]	[6779]	[6969]	[6912]	[7108]	[7023]	[7196]	[7088]
Mean of dep. var.	.307	.313	.313	.316	.317	.320	.319	.320

*Statistically significant at 10% level; ** at 5% level; *** at 1% level.

Notes: The sample is composed of PSID respondents ages 30-66 in 2017. Each cell represents the results from a separate unweighted OLS regression. Standard errors are reported in parentheses and are corrected for clustering based on the state of residence in which the respondent lived as a teenager. Sample sizes are reported in brackets. All regressions include fixed effects for state of residence in 2017 and fixed effects for the state in which the respondent lived as a teenager. Controls include 5-year age bin indicators, gender, race, ethnicity, educational attainment, the unemployment rate in the state where the respondent lived as a teenager, an indicator for whether the state where the respondent lived as a teenager had passed a comprehensive smoke-free law, and indicators for the MLPA in the state where the respondent lived as a teenager.

Table 4. Restricting Sample to Respondents who were Teenagers 1970-1982

Cigarette Tax

	Age 12	Age 13	Age 14	Age 15	Age 16	Age 17	Age 18	Age 19
Smoked	.031	.020	.033	-.047	-.072*	-.102**	-.137***	-.149***
	(.044)	(.042)	(.047)	(.045)	(.038)	(.045)	(.040)	(.045)
	[2517]	[2549]	[2562]	[2604]	[2642]	[2685]	[2671]	[2641]
Mean of dep. var.	.192	.192	.192	.184	.184	.178	.173	.168
One pack per week	.042	.038	.011	-.038	-.076*	-.099**	-.135***	-.139***
	(.043)	(.043)	(.047)	(.045)	(.040)	(.045)	(.041)	(.047)
	[2506]	[2540]	[2552]	[2594]	[2633]	[2676]	[2661]	[2631]
Mean of dep. var.	.179	.178	.177	.170	.170	.164	.159	.154
Two packs per week	.001	.000	-.001	-.032	-.073*	-.078*	-.106**	-.113**
	(.041)	(.041)	(.046)	(.045)	(.040)	(.045)	(.045)	(.045)
	[2506]	[2540]	[2552]	[2594]	[2633]	[2676]	[2661]	[2631]
Mean of dep. var.	.142	.139	.136	.130	.130	.126	.123	.120

*Statistically significant at 10% level; ** at 5% level; *** at 1% level.

Notes: The sample is composed of PSID respondents ages 47-66 in 2017. Each cell represents the results from a separate unweighted OLS regression. Standard errors are reported in parentheses and are corrected for clustering based on the state of residence in which the respondent lived as a teenager. Sample sizes are reported in brackets. All regressions include fixed effects for state of residence in 2017 and fixed effects for the state in which the respondent lived as a teenager. Controls include 5-year age bin indicators, gender, race, ethnicity, educational attainment, the unemployment rate in the state where the respondent lived as a teenager, an indicator for whether the state where the respondent lived as a teenager had passed a comprehensive smoke-free law, and indicators for the MLPA in the state where the respondent lived as a teenager.

Table 5. Cigarette Taxes at Ages 12-19 and Smoking Before and After Giving Birth

	Cigarette Tax			
	Age 12	Age 13	Age 14	Age 15
Smoked Year of Birth	-.029	-.057**	-.053	-.017
	(.034)	(.024)	(.033)	(.048)
	[3137]	[3146]	[3248]	[3240]
Mean of dep. var.	.244	.247	.247	.245
Smoked Year Before	-.048	-.078**	-.081**	-.036
	(.032)	(.030)	(.034)	(.046)
	[3137]	[3146]	[3248]	[3240]
Mean of dep. var.	.241	.242	.242	.241

*Statistically significant at 10% level; ** at 5% level; *** at 1% level.

Notes: The sample is composed of female PSID respondents who were at least 30 years of age in 2017 and gave birth between 1973 and 2017. Each cell represents the results from a separate unweighted OLS regression. Standard errors are reported in parentheses and are corrected for clustering based on the state of residence in which the respondent lived when they gave birth. Sample sizes are reported in brackets. All regressions include fixed effects for state of residence the year of giving birth and fixed effects for the state in which the respondent lived as a teenager. Controls include 5-year age bin indicators, gender, race, ethnicity, educational attainment, the unemployment rate in the state where the respondent lived as a teenager, an indicator for whether the state where the respondent lived as a teenager had passed a comprehensive smoke-free law, and indicators for the MLPA in the state where the respondent lived as a teenager.

Appendix Table 1. Weighted OLS Estimates of the Effects of Cigarette Taxes at Ages 12-19 on Adult Smoking

	Cigarette Tax							
	Age 12	Age 13	Age 14	Age 15	Age 16	Age 17	Age 18	Age 19
Smoked	-.034	.007	-.070*	-.079	-.058*	-.019	-.013	-.019
	(.50)	(.047)	(.037)	(.049)	(.034)	(.046)	(.027)	(.031)
	[6716]	[6649]	[6827]	[6783]	[6972]	[6895]	[7061]	[6958]
Mean of dep. var.	.188	.187	.188	.184	.184	.182	.181	.176
One pack per week	-.033	.005	-.065*	-.082*	-.071**	-.031	-.027	-.021
	(.049)	(.045)	(.036)	(.045)	(.033)	(.042)	(.030)	(.028)
	[6701]	[6632]	[6811]	[6764]	[6955]	[6877]	[7044]	[6940]
Mean of dep. var.	.174	.171	.174	.168	.170	.167	.167	.161
Two packs per week	-.084**	-.054	-.072*	-.098**	-.081***	-.045	-.024	-.018
	(.041)	(.039)	(.040)	(.039)	(.028)	(.034)	(.030)	(.025)
	[6701]	[6632]	[6811]	[6764]	[6955]	[6877]	[7044]	[6940]
Mean of dep. var.	.134	.132	.134	.129	.132	.129	.128	.124

*Statistically significant at 10% level; ** at 5% level; *** at 1% level.

Notes: The sample is composed of PSID respondents ages 30-66 in 2017. Each cell represents the results from a separate OLS regression weighted using the 2017 PSID cross-sectional weights. Standard errors are reported in parentheses and are corrected for clustering based on the state of residence in which the respondent lived as a teenager. Sample sizes are reported in brackets. All regressions include fixed effects for state of residence in 2017 and fixed effects for the state in which the respondent lived as a teenager. Controls include 5-year age bin indicators, gender, race, ethnicity, educational attainment, the unemployment rate in the state where the respondent lived as a teenager, an indicator for whether the state where the respondent lived as a teenager had passed a comprehensive smoke-free law, and indicators for the MLPA in the state where the respondent lived as a teenager.

Appendix Table 2. Cigarette Taxes at Ages 12-19 and Adult Smoking: One-Year Age Bins

	Cigarette Tax							
	Age 12	Age 13	Age 14	Age 15	Age 16	Age 17	Age 18	Age 19
Smoked	-.074*	-.026	-.086**	-.076*	-.068**	-.037	-.022	-.009
	(.040)	(.042)	(.035)	(.044)	(.033)	(.036)	(.023)	(.021)
	[6716]	[6649]	[6827]	[6783]	[6972]	[6895]	[7061]	[6958]
Mean of dep. var.	.188	.187	.188	.184	.184	.182	.181	.176
One pack per week	-.077*	-.039	-.078**	-.091**	-.077**	-.057*	-.033	-.016
	(.040)	(.043)	(.035)	(.042)	(.029)	(.030)	(.025)	(.020)
	[6701]	[6632]	[6811]	[6764]	[6955]	[6877]	[7044]	[6940]
Mean of dep. var.	.174	.171	.174	.168	.170	.167	.167	.161
Two packs per week	-.082**	-.058	-.079**	-.087***	-.084***	-.050*	-.045*	-.008
	(.032)	(.036)	(.031)	(.031)	(.027)	(.025)	(.025)	(.018)
	[6701]	[6632]	[6811]	[6764]	[6955]	[6877]	[7044]	[6940]
Mean of dep. var.	.134	.132	.134	.129	.132	.129	.128	.124

*Statistically significant at 10% level; ** at 5% level; *** at 1% level.

Notes: The sample is composed of PSID respondents ages of 30-66 in 2017. Each cell represents the results from a separate unweighted OLS regression. Standard errors are reported in parentheses and are corrected for clustering based on the state of residence in which the respondent lived as a teenager. Sample sizes are reported in brackets. All regressions include fixed effects for state of residence in 2017 and fixed effects for the state in which the respondent lived as a teenager. Controls include 1-year age bin indicators, gender, race, ethnicity, educational attainment, the unemployment rate in the state where the respondent lived as a teenager, an indicator for whether the state where the respondent lived as a teenager had passed a comprehensive smoke-free law, and indicators for the MLPA in the state where the respondent lived as a teenager.

Appendix Table 3. Cigarette Taxes at Ages 12-19 and Smoking Duration: One-Year Age Bins

	Cigarette Tax							
	Age 12	Age 13	Age 14	Age 15	Age 16	Age 17	Age 18	Age 19
Smoked 5+ years	-.138**	-.075*	-.114**	-.063	-.104***	-.045	-.045	-.023
	(.055)	(.044)	(.043)	(.038)	(.035)	(.042)	(.028)	(.026)
	[6735]	[6668]	[6856]	[6801]	[6998]	[6922]	[7103]	[6992]
Mean of dep. var.	.384	.388	.391	.393	.395	.395	.396	.397
Smoked 10+ years	-.119**	-.101*	-.109***	-.062	-.100***	-.043	-.032	-.017
	(.055)	(.051)	(.038)	(.039)	(.024)	(.032)	(.025)	(.022)
	[6735]	[6668]	[6856]	[6801]	[6998]	[6922]	[7103]	[6992]
Mean of dep. var.	.313	.320	.321	.326	.325	.331	.329	.333
Smoked 15+ years	-.079*	-.053	-.074*	-.020	-.059**	-.001	-.015	-.003
	(.043)	(.048)	(.042)	(.035)	(.029)	(.024)	(.030)	(.023)
	[6735]	[6668]	[6856]	[6801]	[6998]	[6922]	[7103]	[6992]
Mean of dep. var.	.243	.254	.255	.262	.264	.270	.269	.273

*Statistically significant at 10% level; ** at 5% level; *** at 1% level.

Notes: The sample is composed of PSID respondents ages 30-66 in 2017. Each cell represents the results from a separate unweighted OLS regression. Standard errors are reported in parentheses and are corrected for clustering based on the state of residence in which the respondent lived as a teenager. Sample sizes are reported in brackets. All regressions include fixed effects for state of residence in 2017 and fixed effects for the state in which the respondent lived as a teenager. Controls include 1-year age bin indicators, gender, race, ethnicity, educational attainment, the unemployment rate in the state where the respondent lived as a teenager, an indicator for whether the state where the respondent lived as a teenager had passed a comprehensive smoke-free law, and indicators for the MLPA in the state where the respondent lived as a teenager.

Appendix Table 4. Cigarette Taxes at Ages 12-19 and Smoked in 20s and 30s: One-Year Age Bins

	Cigarette Tax							
	Age 12	Age 13	Age 14	Age 15	Age 16	Age 17	Age 18	Age 19
Smoked in 20s	-.142***	-.075	-.116**	-.024	-.114***	-.027	-.050*	-.010
	(.052)	(.048)	(.050)	(.054)	(.041)	(.047)	(.025)	(.036)
	[6876]	[6803]	[6988]	[6936]	[7125]	[7045]	[7215]	[7111]
Mean of dep. var.	.425	.428	.428	.430	.430	.431	.430	.431
Smoked in 30s	-.133**	-.109**	-.103***	-.080**	-.073**	-.065*	-.033	-.010
	(.051)	(.045)	(.034)	(.036)	(.031)	(.033)	(.028)	(.021)
	[6961]	[6878]	[7071]	[7016]	[7218]	[7133]	[7303]	[7198]
Mean of dep. var.	.328	.335	.335	.339	.340	.343	.342	.344
Smoked in 20s and 30s	-.114**	-.091**	-.097**	-.054	-.069**	-.045	-.026	-.007
	(.048)	(.042)	(.039)	(.038)	(.029)	(.037)	(.030)	(.022)
	[6852]	[6779]	[6969]	[6912]	[7108]	[7023]	[7196]	[7088]
Mean of dep. var.	.307	.313	.313	.316	.317	.320	.319	.320

*Statistically significant at 10% level; ** at 5% level; *** at 1% level.

Notes: The sample is composed of PSID respondents ages 30-66 in 2017. Each cell represents the results from a separate unweighted OLS regression. Standard errors are reported in parentheses and are corrected for clustering based on the state of residence in which the respondent lived as a teenager. Sample sizes are reported in brackets. All regressions include fixed effects for state of residence in 2017 and fixed effects for the state in which the respondent lived as a teenager. Controls include 1-year age bin indicators, gender, race, ethnicity, educational attainment, the unemployment rate in the state where the respondent lived as a teenager, an indicator for whether the state where the respondent lived as a teenager had passed a comprehensive smoke-free law, and indicators for the MLPA in the state where the respondent lived as a teenager.

Appendix Table 5. Cigarette Taxes at Ages 12-19 and Smoking Duration/Intensity

	Cigarette Tax							
	Age 12	Age 13	Age 14	Age 15	Age 16	Age 17	Age 18	Age 19
Smoked 1 pack per week	-.148***	-.097*	-.119***	-.072	-.099***	-.078**	-.048*	-.024
5+ years	(.055)	(.051)	(.042)	(.044)	(.035)	(.035)	(.026)	(.026)
	[5803]	[5738]	[5928]	[5857]	[6057]	[5974]	[6159]	[6046]
Mean of dep. var.	.387	.390	.394	.395	.398	.400	.398	.400
Smoked 1 pack per week	-.161***	-.123**	-.131***	-.077	-.131***	-.074**	-.060**	-.025
10+ years	(.057)	(.059)	(.046)	(.050)	(.031)	(.033)	(.029)	(.024)
	[5444]	[5409]	[5576]	[5529]	[5700]	[5645]	[5806]	[5718]
Mean of dep. var.	.346	.353	.355	.359	.360	.365	.362	.365
Smoked 1 pack per week	-.152***	-.105*	-.117**	-.057	-.131***	-.056*	-.067*	-.013
15+ years	(.056)	(.062)	(.052)	(.052)	(.036)	(.031)	(.034)	(.027)
	[5054]	[5046]	[5193]	[5168]	[5336]	[5296]	[5449]	[5368]
Mean of dep. var.	.296	.306	.308	.314	.316	.323	.320	.324

*Statistically significant at 10% level; ** at 5% level; *** at 1% level.

Notes: The sample is composed of PSID respondents ages 30-66 in 2017. Each cell represents the results from a separate unweighted OLS regression. Standard errors are reported in parentheses and are corrected for clustering based on the state of residence in which the respondent lived as a teenager. Sample sizes are reported in brackets. All regressions include fixed effects for state of residence in 2017 and fixed effects for the state in which the respondent lived as a teenager. Controls include 5-year age bin indicators, gender, race, ethnicity, educational attainment, the unemployment rate in the state where the respondent lived as a teenager, an indicator for whether the state where the respondent lived as a teenager had passed a comprehensive smoke-free law, and indicators for the MLPA in the state where the respondent lived as a teenager.

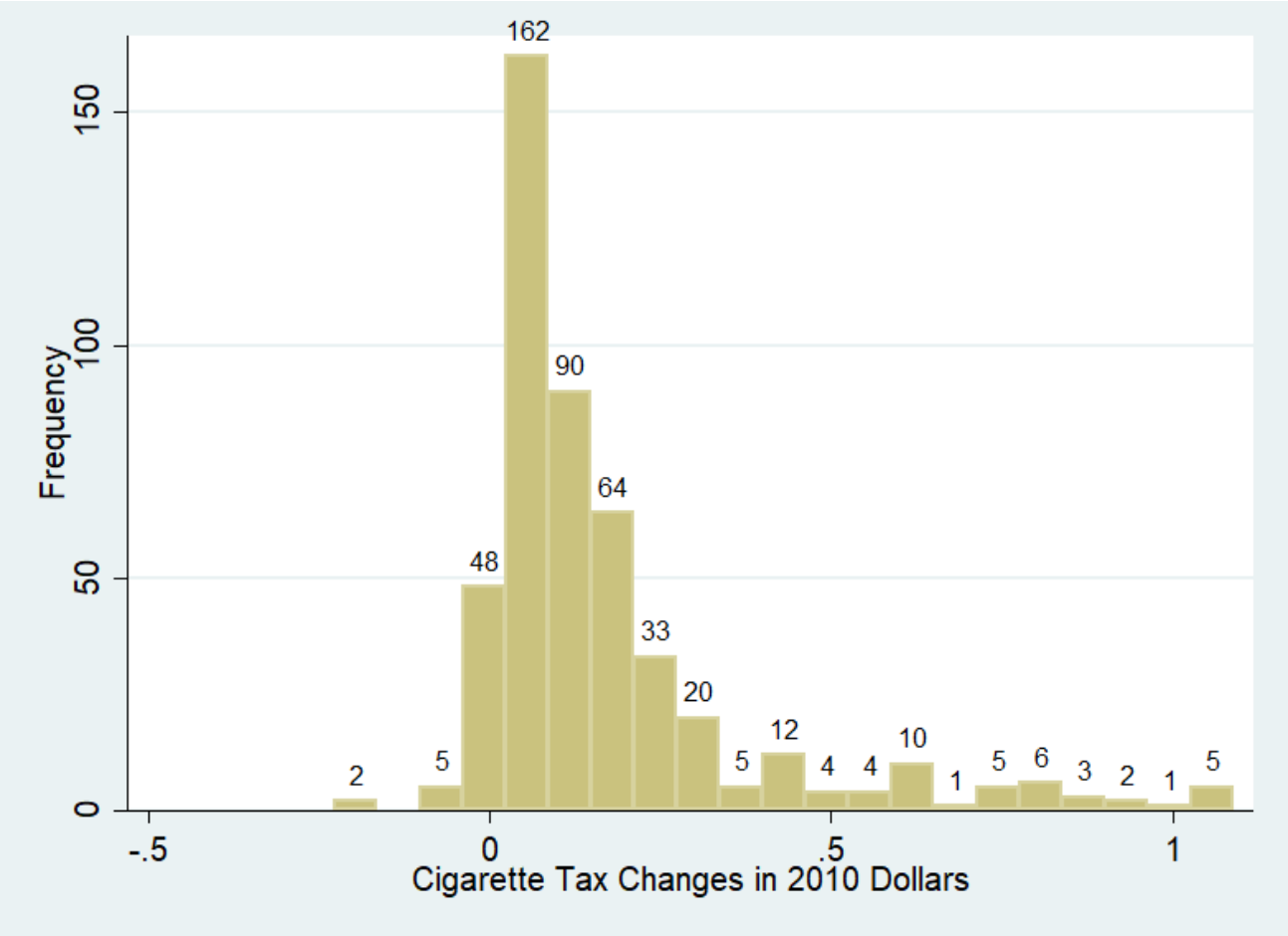
Appendix Table 6. Restricting Sample to Respondents who were Teenagers 1983-2007

	Cigarette Tax							
	Age 12	Age 13	Age 14	Age 15	Age 16	Age 17	Age 18	Age 19
Smoked	.009	.066*	-.024	.020	.008	.024	.027	.029*
	(.047)	(.033)	(.042)	(.050)	(.031)	(.030)	(.017)	(.015)
	[4199]	[4100]	[4265]	[4179]	[4330]	[4210]	[4390]	[4317]
Mean of dep. var.	.186	.183	.185	.184	.185	.185	.185	.180
One pack per week	.005	.043	-.014	-.011	.003	-.007	.019	.009
	(.044)	(.042)	(.044)	(.053)	(.027)	(.027)	(.020)	(.019)
	[4195]	[4092]	[4259]	[4170]	[4322]	[4201]	[4383]	[4309]
Mean of dep. var.	.170	.167	.172	.166	.170	.169	.171	.165
Two packs per week	.003	-.010	-.010	-.012	-.021	-.020	-.010	-.002
	(.033)	(.033)	(.033)	(.039)	(.017)	(.024)	(.014)	(.014)
	[4195]	[4092]	[4259]	[4170]	[4322]	[4201]	[4383]	[4309]
Mean of dep. var.	.129	.132	.132	.128	.133	.130	.132	.127

*Statistically significant at 10% level; ** at 5% level; *** at 1% level.

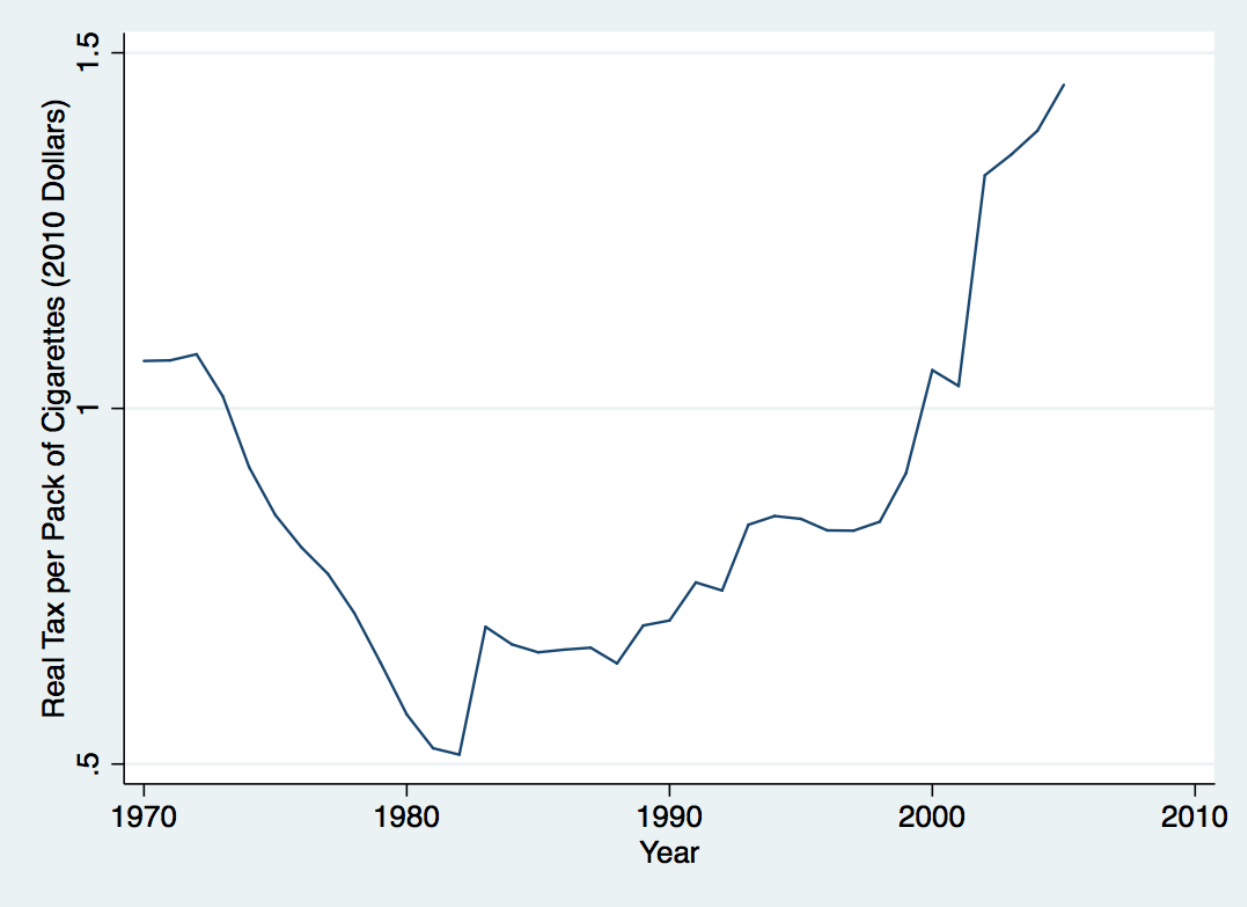
Notes: The sample is composed of PSID respondents ages 30-53 in 2017. Each cell represents the results from a separate unweighted OLS regression. Standard errors are reported in parentheses and are corrected for clustering based on the state of residence in which the respondent lived as a teenager. Sample sizes are reported in brackets. All regressions include fixed effects for state of residence in 2017 and fixed effects for the state in which the respondent lived as a teenager. Controls include 5-year age bin indicators, gender, race, ethnicity, educational attainment, the unemployment rate in the state where the respondent lived as a teenager, an indicator for whether the state where the respondent lived as a teenager had passed a comprehensive smoke-free law, and indicators for the MLPA in the state where the respondent lived as a teenager.

Appendix Figure 1. Real Cigarette Tax Changes Stemming from Legislation, 1970-2007



Note: Cigarette tax data are from Orzechowski and Walker (2018).

Appendix Figure 2. Average Real Cigarette Tax (population weighted), 1970-2005



Note: Cigarette tax data are from Orzechowski and Walker (2018), states populations come from the U.S. Census Bureau State Intercensal Population Tables (available at https://www.census.gov/data/tables/time-series/demo/popest/1970s-state.html).