Do Beer Taxes Affect Birth Rates Among Teens and Young Women in the United States?

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Abstract

Alcohol abuse and underage drinking in the United States lead to many adverse outcomes, including unintended pregnancy. One way to reduce alcohol abuse – and therefore its negative outcomes – is to raise the price of beer consumers face. Using state-level data, this paper contributes to the literature by providing the first analysis of the effect of beer taxes on birth rates for 15-19 and 20-24 year old women overall, by race, and by race where the father is not reported. Results provide evidence for the hypothesis that increasing the beer tax decreases birth rates among teens and young women in the United States.

Keywords: Beer tax, alcohol, teenage pregnancy

I. Introduction

It is well documented that alcohol consumption impairs the decision-making process, and that alcohol abuse among young people and underage drinking in the U.S. lead to many adverse outcomes. These outcomes include unintended and unprotected sexual activity – which Sen (2003) calls 'pregnancy risk' behavior, as well as sexual coercion or assault and rape victimization (Perkins 2002). Considering that teen pregnancy rates are significantly higher in the U.S. than in other developed countries, and that about half of all babies born in the U.S. are the result of unintended pregnancies, the relationship between pregnancy outcomes and alcohol consumption is one that deserves further study (Sen 2003, Naimi, Lipscomb, Brewer, and Gilbert 2003).[1]

Sen (2003) points out that it is generally assumed that the most commonly consumed alcoholic beverage among teens and young adults in the U.S. is beer.[2] Beer consumption has been shown to be responsive to price changes, even among people who consume large amounts of alcohol (Chaloupka and Wechsler 1996). For young adults, studies have shown that increasing the price leads to a larger decrease in alcohol consumption among moderate-heavy drinkers than among light drinkers (Xu and Chaloupka 2011). Given this evidence, I posit that a higher beer tax would lead to lower alcohol consumption among young people. A policy that increases the price of beer (decreasing beer consumption) could decrease alcohol abuse among young adults in the U.S., which could also lead to lower levels of adverse outcomes associated with alcohol abuse.

Sen (2003) considers the relationship between the beer tax and birth and abortion rates among 15-19 year olds overall. This paper expands on her findings and contributes to existing literature by providing the first analysis of the effect of beer taxes on birth rates for 15-19 and 20-24 year olds overall, by race, and where the father is not reported from 1985-2002. I consider teens and young adults because I expect the effect of beer taxes will differ by age of the mother.

This paper is structured as follows. In Section II, I review the existing literature on alcohol consumption and its consequences, beer taxes, and birth rates among young women in the United States. In Section III, I offer a brief discussion of theory to explain expected relationships. I then present the data and summary statistics in Section IV. The empirical model is introduced in Section

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[1] Unintended pregnancy is defined here as pregnancy that is either sooner than desired or not desired at all.

[2] While it is difficult to sort out beer consumption by age group, a Gallup poll shows that beer was chosen as by far the most popular alcoholic beverage among 18-29 year olds in 1992-1994. In 2012-2013, it was still the preferred alcoholic beverage of this age group (although by a smaller margin) (Jones 2013).

V, and the results are reported and discussed in Section VI. Finally, in Section VII, I review the main takeaways and suggest policy implications.

II. Literature Review

There does not appear to be extensive research on the relationship between beer taxes and birth outcomes. However, Sen (2003) offers one examination of this relationship. She considers the relationship between the beer tax and birth and abortion rates for teens (age 15-19) across the United States. Sen makes clear that teen pregnancy rates remain much higher in the U.S. than in other developed countries, and that teen pregnancy often has large and lasting educational, economic, and maybe psychological consequences for the mother that then affect the child's future outcomes. She points to several studies finding evidence that high levels of alcohol use are associated with 'pregnancy-risk' behavior (such as more sexual activity and less contraceptive use) and pregnancies among teens (Butcher, Thompson, and O'Neal 1991; Cooper, Peirce, and Huselid 1994; Shrier et al. 1996; Bentler and Newcomb 1986; Mott and Haurin 1988; Staton et al. 1999; Mensch and Kandel 1992). Sen emphasizes that there could be endogeneity here; it could be that some teens are riskier than their peers by nature, and these teens could be prone to engage in 'pregnancy-risk' behaviors but could also be prone to consume alcohol due to their risky natures (Sen 2003).

Sen studies the effect of statewide alcohol taxes on birth and abortion rates per 1,000 teen women (age 15-19). She uses beer tax as opposed to liquor tax, as these tax data were available for all states, whereas liquor data were not. Sen cites literature with evidence that alcohol taxes are passed onto consumers, although she notes that the average real beer tax has been declining in many cases.[3] She points out that teen pregnancies were declining throughout the 1990s, but this was mostly due to increased contraception use. Overall, she finds evidence to support the hypothesis that an increase in the beer tax could lead to a decrease in the teen abortion rate, but she finds little evidence supporting the hypothesis that increasing the beer tax could reduce teen birth rates.

Other related literature deals with the history of beer tax changes and other policies. Xu and Chaloupka (2011) note that minimum drinking age laws, zero tolerance laws, and less leisure time lead to reduced alcohol consumption among adolescents, as well as lower levels of driving under the influence of alcohol. Restricting the places and times when alcohol can be sold, as well as increasing liabilities for establishments that sell alcohol also leads to lower levels of alcohol use.

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[3] See Figures 5-8 in *Data Appendix I* for the average real beer taxes by state from 1985-2002.

The authors point out that the federal excise tax on beer and wine has only increased once since 1951 (in 1991), so the real tax rate has declined substantially over the years. State taxes have followed a similar pattern, with only 30 states raising their beer taxes at all from 1991 to 2011, and only 10 states raising them between 2001 and 2011. In many states, the real beer tax has fallen to basically zero, and the average real tax on beer fell from $0.42 per gallon (about $0.23 per 6 pack of beer) in 1951 to $0.11 per gallon ($0.06 per six pack) in 2009. However, the authors find that the excise taxes are mostly passed onto consumers.

Xu and Chaloupka (2011) also study how sensitive consumers are to beer price changes. They highlight that, even among heavy and moderate alcohol consumers, an increase in alcohol price has been shown to significantly reduce alcohol use. For young adults, studies have shown that increasing the price leads to a larger decrease in alcohol consumption among moderate-heavy drinkers than among light drinkers (and the opposite is true for the total population of alcohol consumers). The authors state that alcohol price changes lead to lower demand in the long run – since alcohol is addictive and therefore the effect compounds over time – and that younger people are more price sensitive than older people. They conclude by pointing out a study that shows that an increase in the beer tax was associated with an increase in contraceptive use among teenagers.

There is much research dealing with alcohol consumption and different birth outcomes. In one such study, Naimi et al. (2003) emphasize that about half of the babies born in the U.S. are the result of unintended pregnancy.[4] These unintended pregnancies often lead to negative health outcomes of the baby and mother, as well as less educational and career opportunities for young mothers. The authors consider the relationship between unintended pregnancies and binge drinking in the three months before the beginning of the mother's pregnancy, which they refer to as the 'preconception period.'[5] They find in the raw data of their sample of 72,907 respondents from 15 states that those with unintended pregnancies were more likely to be young, black, have relatively low levels of educational attainment, be unmarried, and to report binge drinking in the preconception period. After including a multitude of control variables, binge drinking in the preconception period was associated with unintended pregnancy for white women, but not black women. Those who drank large amounts of alcohol in the preconception period were more likely than others to be unmarried, white, to smoke, to be exposed to violence in that same time period, and to consume alcohol, binge drink, and smoke during their pregnancy.

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[4] Unintended pregnancy is defined here as pregnancy that is either sooner than desired or not desired at all.
[5] Binge drinking is defined here as drinking five or more drinks on one occasion.

Naimi et al. (2003) also find that the proportion of unintended pregnancies among women who drank alcoholic beverages in the preconception period "increased with the number of preconception binge drinking episodes," so the more binge drinking episodes one had in the three months before pregnancy, the more likely she was to become pregnant unintentionally. Also of note is that women with unintended pregnancies often did not notice they were pregnant until five or more weeks after conception, which could have very important implications for their alcohol consumption and other health behaviors during those weeks. The authors note that around 40% of unintended pregnancies end in abortion (and abortions are most common among young white adults, who as a demographic typically have high levels of binge drinking), so the effect of binge drinking on unintended pregnancies is underestimated in their findings.

For my analysis, the literature on alcohol consumption and its adverse effects on young people is also important. Perkins (2002) asserts that alcohol misuse is a pervasive problem on college campuses that has many adverse consequences. He divides the consequences into different types, the first of which is 'damage to self.' This type includes health, academic, athletic, and legal outcomes. Unintended and unprotected sexual activity is also a very common consequence of heavy drinking, as well as sexual coercion or assault and rape victimization. Perkins discusses in detail the damage done to other people, and to the well-being of the college as a whole, as other consequences of alcohol misuse. He goes on to look at gender differences in consequences and notes that males seem to do relatively more damage to other people due to their drinking, but males and females seem to experience roughly the same amount of consequences in terms of negative personal health outcomes and unintended sexual activity. Perkins points out that comparing traditional college age students to their same-age peers who are not in college, those who are in college tend to have substantially higher rates of binge drinking, so the college context is important for alcohol consumption behavior. College women tend to consume more alcohol and binge drink significantly more than their same age peers who are not in college. Perkins concludes by noting that the prevalence rates for most of the negative consequences associated with alcohol misuse on college campuses do not seem to be declining nationally.[6]

Chaloupka and Wechsler (1996) also examine the alcohol consumption patterns among young people. The authors point out that alcohol abuse in youth and young adulthood appears to

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[6] For more on the adverse effects of drinking among teens and young adults in the U.S., see www.niaaa.nih.gov/alcohol-health/overview-alcohol-consumption/alcohol-facts-and-statistics .

lead to subsequent alcohol abuse later in life, so reducing excessive drinking could lead to long term reductions in alcohol abuse. They note that raising the minimum drinking age, increasing the quantity of labels stating the dangers of drinking and driving and drinking while pregnant, and raising penalties for drinking and driving are policies discouraging drinking and binge drinking. They also state that the nominal price of alcohol has not changed much over the years, so if alcohol consumption is sensitive to price, this could exacerbate the problem of youth and young adult alcohol abuse and misuse.

Chaloupka and Wechsler (1996) point to a multitude of studies that find evidence that youths and young adults' consumption decisions are sensitive to beer price, with those who consumed more alcohol being more sensitive to price than those who consumed little. In their analysis, the authors find that while the drinking habits of male college students in the 1980s-1990s are not necessarily sensitive to the price of beer, underage drinking and binge drinking by female students are sensitive to price (but both are relatively inelastic).[7] They also note that drinking and binge drinking among male students is significantly reduced when strong drunk driving policies target youths and young adults. The authors find that elements of campus life such as participation in a Greek organization, living on campus, and the availability of alcohol are among the most important determinants of drinking and binge drinking among college students. They acknowledge that these results may be due to measurement error in the price variable, as it could be that most college students consume alcohol at parties where it is free, or it could be that alcohol retailers around colleges reduce prices to attract college students.

Overall, the relationship between the beer tax and the price young people pay for beer may be more complex than it first appears. The relationship between the beer tax and birth outcomes among teens and young adults is therefore complicated and deserves attention. As stated above, this paper contributes to the literature by using state level data to provide the first analysis of the effect of beer taxes on birth rates for 15-19 and 20-24 year olds overall, by race, and where the father is not reported.

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[7] The authors define binge drinking for females as four or more drinks in one occasion, and five or more drinks for males. Their dummy variable indicating whether or not one binge drank was only equal to one if the person had binge drank in the two weeks prior to the survey.

III. Theory

The beer tax should have a different effect on those who are old enough to legally purchase and consume alcohol than for those who are too young. Teens who consume alcohol take relatively more risks than their peers, and since they are not deterred by the law that prohibits their alcohol consumption, they are potentially also less deterred by facing a higher price. On the other hand, teens have less money than people in their twenties, so they may be more sensitive to the price of beer. It is therefore unclear what relationship will be found between the beer tax and birth rates for 15-19 year old women.

Women in their early 20s are much more likely than teens to not be living with their parents, so they may be more responsible with their alcohol consumption habits since they are presumably held more responsible for their own actions (Arnett 2000). They generally drink more alcohol than their younger peers since they can legally purchase it, and it may be that since it is legal for women in this age group to legally purchase alcohol, they are more affected by the price than younger women are. I hypothesize that a higher beer tax will lead to lower levels of 'pregnancy risk' behaviors and therefore fewer births among young women who are old enough to legally purchase alcohol.

I believe that the race of the mother, as well as whether or not the father is reported, may also play an important role in how the beer tax affects the birth rate. I expect a higher beer tax to have a bigger effect among young black women than young white women since race is a rough proxy for income, and the beer tax likely has more of an effect on people with lower income. Presumably, births where the father is not reported are more often unintended births than those where the father is reported. I believe a higher beer tax will lead to fewer unintended pregnancies, so I hypothesize that an increase in the beer tax will lead to lower birth rates where the father is not reported.

IV. Data and Summary Statistics

Beer Tax:

The beer tax data are from the Distilled Spirits Council of the US (DISCUS). These data include all federal and state beer taxes going back to 1968, as well as all changes that occurred at

the national and state levels. I convert all taxes to dollars per gallon.[8] One limitation of these data is that each state reports its beer taxes differently.[9] The varying reported measures makes it difficult to compare the actual final taxes. Nonetheless, these data appear to be the best available for beer taxes in the United States.[10]

Using the Bureau of Labor Statistics' CPI Inflation Calculator, I convert all nominal beer taxes to real beer taxes.[11] The smallest real beer tax over the time frame 1985-2002 is $0.38 per gallon ($0.21 per six pack) in California in 1985. The largest real beer tax, $1.99 per gallon ($1.12 per six pack), is in Hawaii in 1991. Figure 1 shows the average real beer tax across all states (as well as birth rate data, which is described below). Figures 5-8 in *Data Appendix I* depict average state level beer taxes from 1985-2002. The only federal tax change during this time occurred in 1991, which accounts for the large change across states in that year.

Birth Rates:

I use individual level natality data from the National Center for Health Statistics' (NCHS) Vital Statistics Natality Birth Data to determine number of births to 15-19 and 20-24 year olds overall, by race, and where the father is not reported.[12] These individual level natality data include mother's state of residence and the state in which the birth occurred, mother's and father's age, race, education level, and marital status. These data were collected yearly from 1968 to the present in the United States. Very few births occurred in a different state than the state in which the mother was a resident. Before 1972, these data are based on a 50% sample for all states. From 1972-1985, the data include a full sample for some states and a 50% sample from the others. By 1985, 100% of birth certificates from all states and Washington, D.C. are included in the data. The variables collected change significantly in 2003, and the last year in which the data have state-level identifiers is 2004. I therefore use 1985-2002 as my time frame of interest.

I construct state level birth rates per 1,000 women in each demographic group by state of residence. To do this, I use the individual level natality data from the NCHS in conjunction with

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[8] A barrel of beer is defined as 31 gallons, so I use this value to convert dollars per barrel to dollars per gallon for all states, except Arkansas, with dollar per barrel listed. In Arkansas, a barrel of beer has 32 gallons, so I use this value for converting the excise tax for Arkansas.

[9] For more information on the limitations of these data, see *Data Appendix I.*

[10] I use the real federal beer tax plus the state sales and excise tax as my final measure of the beer tax.

[11] I convert all beer taxes to real dollars in January 2002.

[12] Any analyses, interpretations, beliefs or conclusions reached in this paper are based on the author's work. The NCHS and other data sources are only responsible for the initial data.

state-level population by age and race data from the National Bureau of Economics' Survey of Epidemiology and End Results (SEER) U.S. State Population Data. One limitation of these data is that they only include the population of specified age groups, so I could only construct birth rates for 15-19 year olds and 20-24 year olds. Average birth rates across all states for 15-19 and 20-24 year old women overall and by race (as well as the average real beer tax across all states) are depicted in Figure 1. Figures 2 and 3 show birth rates where the father is not reported for white and black women, respectively (as well as the average real beer tax across all states).[13]

As explained in Section V, I consider birth rates to correspond with the beer tax in the previous year. I therefore have 17 years of data, and I use state level birth rates (with 50 states), so my sample consists of 850 observations (17 x 50).

Controls:

Annual state-level unemployment rates are available from 1985-2016 from the Bureau of Labor Statistics (BLS). People age 16 and over are considered unemployed if they did not work for any pay or profit during the survey period, and the survey excludes those living in any kind of institution, as well as active duty members of the military.

Other state level data are from the U.S. Decennial Census and are available through Social Explorer. These data include: the percent of people living in an urban area, population density, percent of people in the state who are black, marital status for people age 15 and over, high school dropout rate for the population age 16-19, median real household income in dollars, average income by race, and percent of people living below the poverty line. These data are available for each decade (1990 and 2000). I do not have these data for each individual year, so I interpolate the missing data.

Access to abortion may affect a woman's decision to give birth or obtain an abortion. I use the percent of women age 15-44 living in a county without an abortion provider as a proxy for access to abortion in a given state and year. [14] These data are available from the Guttmacher Institute for various years from 1988-2011. Again, missing data are interpolated.

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[13] Birth rates where the father is not reported follow a pattern similar to the other birth rates. They are on separate figures so the figures would not get too crowded and because the birth rate for white women where the father is not reported is much lower than all the other rates in Figure 1.

[14] Figure 9 in *Data Appendix I* shows the average percent of women (across all states) living in a county without an abortion provider from 1988-2011. The lowest percent is 0 in Hawaii for all the years in the range, as well as for Delaware in 1988 and Massachusetts in 1996. The highest percent is Wyoming, with 88% of women living in a county without an abortion provider in 2000.

V. Empirical Model

I use OLS regression analysis to investigate the relationship between the real beer tax and birth rates among teenagers and young women (ages 15-19 and 20-24) in the United States from 1985-2002. I regress the birth rate in year t on the real beer tax the previous year, t-1, as births should be affected by the tax around 9-10 months before (Sen 2003). I use the real federal beer tax plus the state excise and sales tax as my final measure of the beer tax in each state. Following Sen (2003), I take the logarithm of birth rates and the real beer tax in all specifications, so my coefficients correspond to percentage changes in the respective dependent and independent variables. Thus, in each specification, β_1 represents the elasticity of births with respect to the real beer tax. State fixed effects, δ_s, are included in all specifications and control for time invariant differences in birth rates across states. In my first specification, I also control for a linear time trend, which picks up shared changes in birth rates over time.

$$\ln(birth\ rate)_{t,s} = \beta_0 + \beta_1(\ln(beer\ tax)_{t-1}) + \beta_2(year) + \delta_s + \varepsilon_{t,s} \qquad (1)$$

As robustness checks, I also estimate several different specifications. In my second specification, equation (2), I include a quadratic time trend. Next, I interact the quadratic time trend with state fixed effects in equation (3), allowing each state to have its own quadratic trend over time.

$$\ln(birth\ rate)_{t,s} = \beta_0 + \beta_1(\ln(beer\ tax)_{t-1}) + \beta_2(year) + \beta_3(year^2) + \delta_s + \varepsilon_{t,s} \qquad (2)$$

$$\ln(birth\ rate)_{t,s} = \beta_0 + \beta_1(\ln(beer\ tax)_{t-1}) + \beta_2(year + year^2) * \delta_s + \delta_s + \varepsilon_{t,s} \qquad (3)$$

Finally, in equation (4) I include state-level controls, **X**, which include the log of population density, log of median real household income, and log of average income by race, as well as the percent of women age 15-44 living in a county without an abortion provider, unemployment rate, percent of people who live in urban areas, percent of the state's population that is black, percent of people age 15 and over who are married, percent of people below the poverty line, and school dropout rate for the population age 16-19.

$$\ln(birth\ rate)_{t,s} = \beta_0 + \beta_1(\ln(beer\ tax)_{t-1}) + \beta_2(year + year^2) * \delta_s + \delta_s + X'\sigma + \varepsilon_{t,s} \ (4)$$

VI. Results and Discussion

Equation (1) Results:

Column (1) of Table 1 reports coefficient estimates for the real beer tax in equation (1) with birth rates for 15-19 and 20-24 year olds overall, by race, and where the father is not reported by race. Results for 15-19 year olds are large in magnitude with an unexpected sign. The coefficients are statistically significant and range from 0.167 for the black birth rate to 0.350 for the black birth rate where the father is not reported, which would imply that a one percent increase in the beer tax would be associated with an increase of 0.167 to 0.350 percent in various birth rates for 15-19 year old women. Results for 20-24 year old birth rates fit more in line with my theory, as there is a negative and statistically significant relationship between the beer tax and birth rates for 20-24 year olds overall, for whites, and for blacks. The coefficient estimates would imply that a one percent increase in the beer tax is associated with a 0.072, 0.047, and 0.166 percent decrease in the beer tax, respectively.

Equation (2) Results:

Column (2) of Table 1 reports coefficient estimates for the real beer tax in equation (2). Here, there are no unexpected signs, as the beer tax has a negative relationship with birth rates in each case. For 15-19 year olds, there is a statistically significant relationship for birth rates overall, for whites where the father is not reported, and for blacks. Coefficient estimates would imply that a one percent increase in the beer tax is associated with a 0.075 percent decrease in birth rates for 15-19 year olds overall, a 0.110 percent decrease in birth rates for whites where the father is not reported, and a 0.179 percent decrease for blacks. For 20-24 year olds, the negative relationship between the beer tax and birth rates is statistically significant for each demographic group. Coefficient estimates range from -0.068 for the white birth rate to -0.336 for the black birth rate where the father is not reported, and would suggest that a one percent increase in the beer tax is associated with a 0.068 to 0.336 percent decrease in the birth rates for 20-24 year olds.

Equation (3) Results:

The third column of Table 1 presents coefficient estimates for the real beer tax for equation (3). Once again, the sign of the coefficient is negative in every case. In this specification, all coefficients are statistically significant. The absolute magnitude of the coefficients is also slightly larger in all cases than in the results for equation (2), except for the 15-19 year old black birth rate.

For 15-19 year olds, the coefficients range from -0.089 for the white birth rate to -0.275 for the black birth rate where the father is not reported. These estimates imply that a one percent increase in the beer tax is associated with a 0.089 to 0.275 percent decrease in various birth rates for 15-19 year olds. Results for 20-24 year old women range from -0.098 for the white birth rate to -0.444 for the black birth rate where the father is not reported, implying that a one percent increase in the beer tax would be associated with a 0.098 to 0.444 percent decrease in various birth rates for 20-24 year old women.

Equation (4) Results:

   Finally, column (4) of Table 1 reports coefficient estimates for the real beer tax for equation (4). Again, the sign of each coefficient is negative. The absolute magnitude of the coefficients are smaller than in equation (3) in all cases except for the white 15-19 birth rate where the father is not reported. All coefficients are statistically significant except for the black 15-19 birth rate and the white 20-24 birth rate. For 15-19 year olds, the statistically significant coefficient estimates range from -0.068 to -0.269, which would mean that a one percent increase in the beer tax would be expected to lead to a 0.068 to 0.269 percent decrease in various birth rates for 15-19 year olds. For 20-24 year olds, the statistically significant results range from -0.041 for birth rates overall to -0.327 for black birth rates where the father is not reported. These results imply that a one percent increase in the beer tax would be expected to lead to a 0.041 to 0.327 percent decrease in various birth rates for 20-24 year olds.

Discussion:

   Overall, these results provide evidence for the hypothesis that increasing the beer tax would lead to a decrease in birth rates among teens and young women. As one moves from column (1) to column (4) of Table 1, the adjusted R^2 values increase in every case, which leads me to believe the quadratic time trend, as opposed to the linear time trend, is a better fit for birth rates.[15] Since all the coefficients in column (4) – which includes state fixed effects, a quadratic time trend for each state, and other state level controls – are negative, and all but two are statistically significant, the negative relationship found between the beer tax and birth rates is very robust.

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[15] The only exception is moving from column (1) to (2) for the white 20-24 birth rate, where the adjusted R^2 value stays constant at 0.942.

It appears that the absolute magnitude of the relationship is larger for black birth rates than white birth rates, meaning that increasing the beer tax would be expected to lead to a larger decrease in birth rates for blacks than whites. In 1990 and 2000, the average difference across all states between the average income for whites and average income for blacks was around $10,000. Therefore, race presumably serves as a very rough proxy for income. Different income groups are likely affected differently by the tax, with lower income groups being more sensitive to the tax, and this could explain why the coefficient estimates for the effect of the beer tax appears to have a larger effect on black birth rates than white birth rates.

For blacks overall and blacks and whites where the father is not reported, the beer tax appears to have a larger effect on birth rates for 20-24 year olds than 15-19 year olds. As mentioned above, the fact that teens who consume alcohol take relatively more risks than their peers and are not deterred by the law that prohibits their alcohol consumption may mean that they are not deterred by facing a higher price, and this may play a role in the relationship found here. It may also be that since it is legal for women in this age group to legally purchase alcohol, they purchase more of it and are thus more affected by the price than teenage women are.

In every case in columns (2) – (4) except for black 15-19 year olds, the beer tax coefficient's absolute magnitude is much greater for birth rates where the father is not reported than for birth rates overall. In other words, increasing the beer tax would be expected to have more of an effect on birth rates where the father is not reported than on birth rates overall. This result fits well with my theory, as birth rates where the father is not reported presumably represent unintended births, which suggests that increasing the beer tax would have a bigger effect on unintended birth rates than overall birth rates.

A potential confounding variable is the choice of women to obtain an abortion. Given that higher alcohol consumption is associated with higher numbers of unintended pregnancies, it is also plausibly correlated with the number of abortions. The number of women who choose to get an abortion affects the number of births, so while the beer tax may have a large negative effect on the number of pregnancies, this effect may not manifest itself much on birth rates. In the case of unintended pregnancy, women with higher incomes are more likely to get an abortion than their lower income peers, which may also lead to bias in the estimated beer tax coefficients (White 2015).[16]

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[16] See Figure 4 for the abortion rate for unintended pregnancies by the income group of the mother.

The magnitude, sign, and significance of the coefficients reported above have clinical significance in that increasing the beer tax a few percent would be expected to lead to a sizeable decrease in births among young women in the United States.[17] However, the magnitudes of the coefficients seem almost too large to be believable. For example, in column (4) of Table 1, the smallest real beer tax coefficient estimate, -0.041, is for the overall 20-24 birth rate. To get an idea of what this estimate would imply, the overall birth rate per 1,000 women age 20-24 in Alabama in 2002 is 114.71, and the real beer tax in Alabama in the previous year is $1.16 per gallon ($0.65 per six pack).[18] A one percent increase in the real beer tax, or increasing the real beer tax to $1.17 per gallon ($0.66 per six pack), would be expected to lead to a decrease of 0.041 percent in overall birth rates. With everything else held constant, the expected birth rate would therefore be 114.66 births per 1,000 women age 20-24. There were 162,619 women age 20-24 in Alabama in 2002, so decreasing the birth rate from 114.71 to 114.66 births per 1,000 women would mean decreasing the number of births to 20-24 year olds from 18,654 to 18,646, or decreasing the number of births by 8. Across states, beer tax changes have historically increased the beer tax by about $0.04 ($0.02 per six pack) to $0.08 per gallon ($0.05 per six pack) at a time. In Alabama in 2002, a 7 percent increase in the beer tax would be an increase of $0.08 per gallon ($0.05 per six pack). Holding all else constant, this would be expected to lead to a decrease in births by 54.

The largest absolute magnitude of a real beer tax coefficient in column (4) of Table 1 is 0.327 for the 20-24 black birth rate where the father is not reported. Using the same method as above, increasing the beer tax by one percent in Alabama in 2002 would be expected to lead to a decrease of 11 births to black 20-24 year old women where the father is not reported.[19] Increasing the real beer tax by 7 percent would be expected to lead to a decrease of 80 births to black 20-24 year old women where the father is not reported.

Overall, the magnitude of the coefficients in all specifications should be regarded with a fair degree of skepticism, as it is unlikely that just changing a beer tax by a few percent would have this large of effects on births. However, the negative relationship found between the beer tax and birth rates suggests that increasing the beer tax may be an effective way to lower beer consumption and

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[17] Even if the real beer tax did have a positive relationship with birth rates for 15-19 year olds as the coefficient estimates in column (1) might suggest (perhaps through the channel of teenagers using liquor as a substitute for beer when the price of beer is raised), it is extremely unlikely that increasing the beer tax would increase birth rates by the magnitudes these coefficient estimates would suggest.

[18] For precision, the unrounded birth rate, 114.709843253248, is used in these calculations.

[19] Alabama's black female 20-24 year old population in 2002 was 53,140.

therefore one of its potential negative consequences, unintended pregnancy among young women. More research needs to be conducted to further elucidate the relationships, but the results provide evidence that more research on the effect of the beer tax on birth rates among teens and young women in the U.S. is worthwhile.

VII. Conclusion

This paper contributes to the literature by providing the first analysis of the effect of beer taxes on birth rates for 15-19 and 20-24 year olds overall, by race, and where the father is not reported from 1985-2002. Overall, the magnitudes of the coefficients should be regarded with a degree of skepticism. However, results provide evidence supporting the hypothesis that increasing the beer tax is associated with a decrease in birth rates among young women in the U.S., as there is a statistically significant negative relationship between the real beer tax and birth rates, and this relationship is quite robust.

Given the negative consequences of alcohol abuse and the consequences of unintended pregnancies on the mother and child, alcohol consumption and its relationship with unintended pregnancy deserves further study and is important for policy makers to keep in mind. Studies have shown that, for young adults, increasing the price of alcohol leads to a larger decrease in alcohol consumption among moderate-heavy drinkers than among light drinkers. Therefore, increasing the price these young adults face may serve as an effective policy measure to decrease negative consequences – specifically, in terms of unintended pregnancy outcomes – from alcohol abuse (Xu and Chaloupka 2011).

There are many potential factors that could be confounding the results of the relationship found between the beer tax and the birth rates for women age 15-24 in the United States. As Chaloupka, and Wechsler (1996) point out, there may be substantial measurement error in the price that young women and teenagers face when purchasing alcohol, as it could be that most teens and young women consume alcohol at parties where it is free, or it could be that alcohol retailers around colleges reduce prices to attract these young people. Another variable that is not accounted for here and that may play an important role when considering the effect of beer taxes on births is the extent to which abortion is socially acceptable. Although the beer tax may be correlated with unintended pregnancies, this relationship may not manifest itself much in the relationship between the beer tax and the number of births due to the alternative pregnancy outcome of abortion. As another potential factor, Sen (2003) notes that there could also be some inherent level of risk that differs between

people, and it could be that relatively riskier teens and young adults are prone to engage in 'pregnancy-risk' behaviors but also may be prone to consume alcohol due to their risky natures. Finally, I do not control for increased contraceptive use throughout the 1990s, and there may also be other factors that are not considered here that play a role in the relationship between the beer tax and birth rates.

The relationship between the beer tax and birth outcomes is a very complicated one. There are many potential confounding factors, so my analysis does not prove causality, but rather provides evidence for the hypothesis that a causal relationship exists between the beer tax and the birth rates for 15-24 year old women in the United States. Given the robust and statistically significant negative relationship between the beer tax and birth rates among teens and young women in the U.S., further research is warranted.

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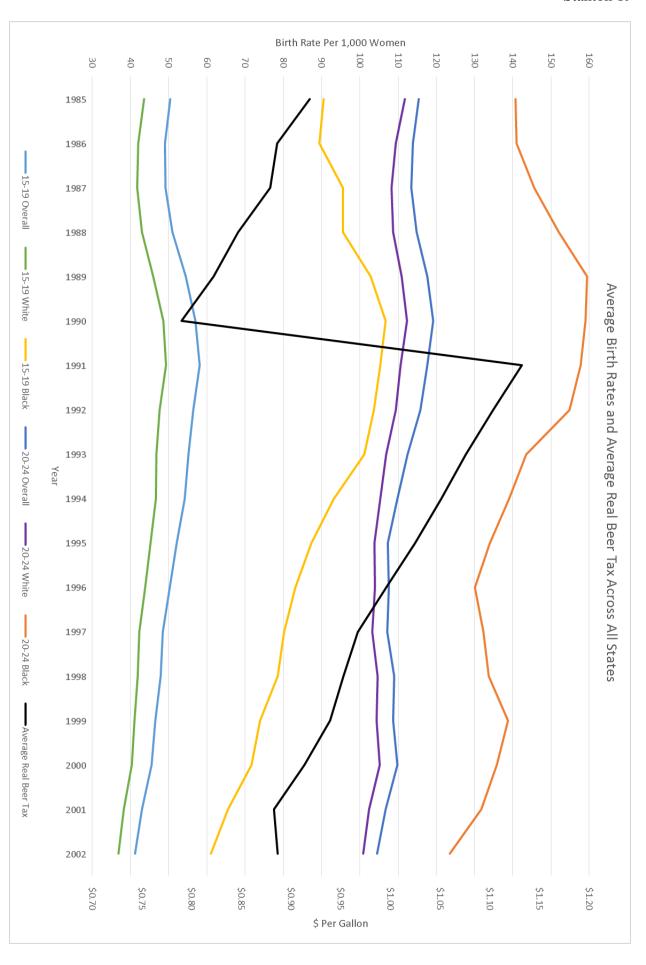
Figure 1

Average Birth Rates and Average Real Beer Tax Across All States

Figure 2

White Birth Rates Where the Father is Not Reported and Average Real Beer Tax

Figure 3

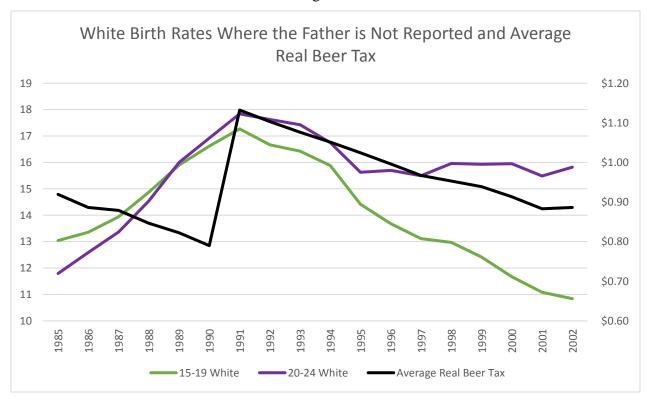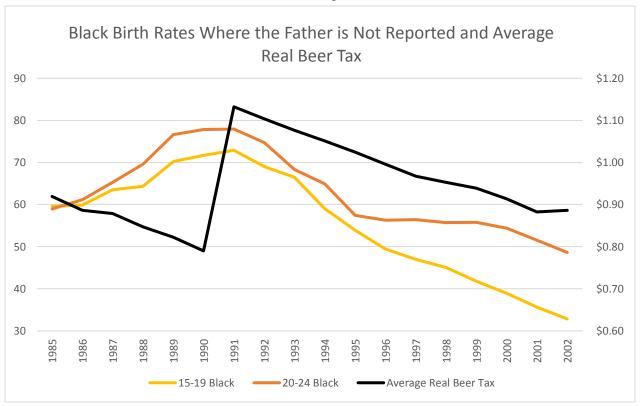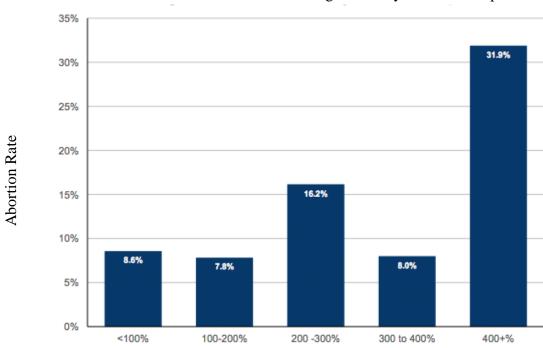Black Birth Rates Where the Father is Not Reported and Average Real Beer Tax

Figure 4
Abortion Rate for Unintended Pregnancies by Income Group

Income group, where 100% denotes the Federal Poverty Line

*This figure is from the Brookings Institution and is in the article "Unplanned Births: Another Outcome of Economic Inequality?" (White 2015).

Table 1 – Real Beer Tax Coefficients

Birth Rates	(1)	(2)	(3)	(4)
15-19 Overall (n=850)	0.192*** [0.028]	-0.075*** [0.018]	-0.103*** [0.020]	-0.085*** [0.022]
White (n=850)	0.203*** [0.029]	-0.036 [0.023]	-0.089*** [0.021]	-0.068*** [0.025]
Father Not Reported (n=850)	0.255*** [0.061]	-0.110* [0.058]	-0.160*** [0.050]	-0.206*** [0.061]
Black (n=848)	0.167*** [0.047]	-0.179*** [0.044]	-0.126** [0.049]	-0.083 [0.068]
Father Not Reported (n=844)	0.350*** [0.085]	-0.119 [0.079]	-0.275*** [0.081]	-0.269*** [0.102]
20-24 Overall (n=850)	-0.072*** [0.014]	-0.111*** [0.015]	-0.128*** [0.015]	-0.041** [0.018]
White (n=850)	-0.047*** [0.015]	-0.068*** [0.016]	-0.098*** [0.016]	-0.018 [0.018]
Father Not Reported (n=850)	0.042 [0.061]	-0.240*** [0.061]	-0.252*** [0.051]	-0.236*** [0.059]
Black (n=850)	-0.166*** [0.039]	-0.286*** [0.046]	-0.266*** [0.048]	-0.179** [0.072]
Father Not Reported (n=846)	0.002 [0.079]	-0.336*** [0.089]	-0.444*** [0.085]	-0.327*** [0.113]
State Fixed Effects	X	X	X	X
Year	X	X	X	X
Year^2		X	X	X
(Year + Year^2) x State Fixed Effects			X	X
Controls				X

Notes: Robust standard errors in brackets *** p<0.01, ** p<0.05, * p<0.1. Observations are dropped when the birth rate for a given demographic in a certain state and year is 0. For example, n=848 for the Black 15-19 year old birth rate because there were no births to black 15-19 year olds in Vermont in 1986 and 1988.

Data Appendix I

The data from DISCUS are, to my knowledge, the best data available on beer taxes. However, there are some important limitations. Some states measure their tax in dollars per barrel or dollars per container, while others measure theirs in dollars per gallon. Some states tax beer bought in bulk differently than beer that is not bought in bulk, while other states do not note which they are reporting. Some states also tax beer with an alcohol content of greater than 3.2% differently than beer that contains 3.2% or less alcohol.

Some states differentiated between on and off premise sales taxes in some (but not all) cases, and some states did not note a difference. A few states mentioned on-premise surcharges as a separate tax, and some also have particular counties or big cities listed as having a specific tax. Other taxes listed by a few states include premium tax, gross income tax, gross receipts tax, a state-wide county tax rate added to the sales tax rate, litter tax, wholesale tax, and "Other Taxes." In years with two tax changes or two different sales tax rates, the last tax rate for that year is used. Kansas uses an enforcement tax in place of a sales tax. The value I use for Kentucky's sales tax is the wholesale tax. Maine splits up its sales tax between on and off-premise starting in 1991, so I averaged the on and off-premise taxes from that point on. In Vermont, there is only an on-premise sales tax until 2007, so I use that value up to 2002.
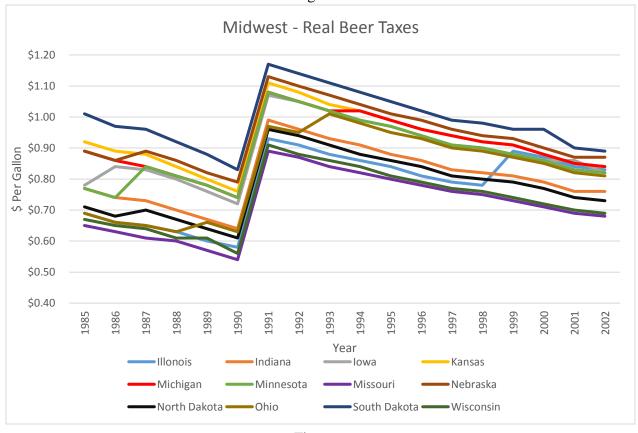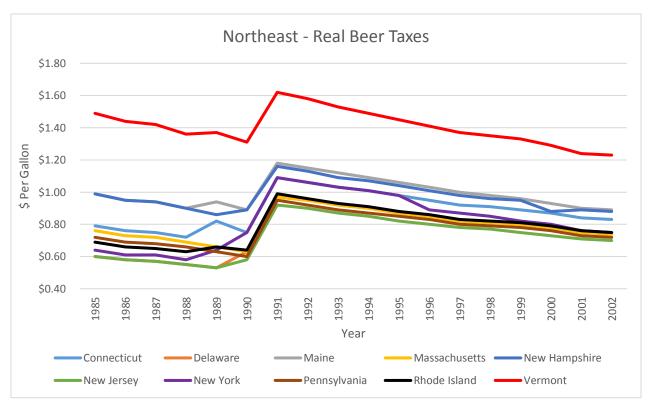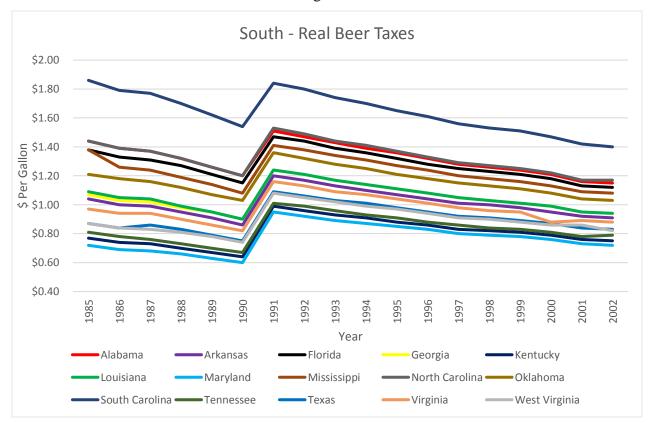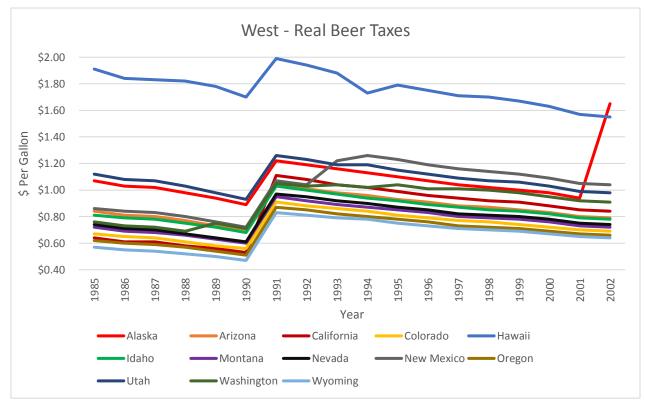
Figure 5

Midwest - Real Beer Taxes

Figure 6

Northeast - Real Beer Taxes

Figure 7

South - Real Beer Taxes

Figure 8

West - Real Beer Taxes

Figure 9

Average Percent of Women (Age 15-44) Living in a County
Without an Abortion Provider