

PMB Consulting

Report on smoking rates per state and tax rate effect

Executive Summary

To: The National Alliance of Children's Health

PMB Consulting is appreciative of having been brought on to analyze the effect of raising cigarette tax prices to lower the population of adult smokers in the United States.

Using the Current Population Survey and the Tax Policy Center, we were able to gather characteristics regarding average cigarette consumption per day, the tax associated with a pack of cigarettes per state, the prevalence of children, age, gender, and race. Through analysis of this data, we drew verifiable conclusions that will help the NACH report accurate information to members of Congress regarding raising cigarette tax prices.

We conclude and make a recommendation based on our findings that increasing the excise tax rate on tobacco products does indeed reduce the amount of cigarette consumption by smokers across the United States.

The NACH was especially interested in how cigarette consumption varies for parents with young children. We have found that having young children present in the household once again decreases the number of cigarettes consumed by smokers.

Following is the full, detailed summary of our data analysis process and conclusion.

Data Summary

Data Source

We used data from the Current Population Survey (CPS). The CPS is a monthly U.S. household survey conducted jointly by the U.S. Census Bureau and the Bureau of Labor Statistics. Since September 1992, the National Cancer Institute has been sponsoring the tobacco use supplement survey as a part of the CPS. We have taken responses from the 2019 portion of the survey which includes data from January and May. This data was specific to the general demographic information and smoking/tobacco use habits of survey takers.

We also used data from the Tax Policy Center which is a joint venture by the Urban Institute and Brookings Institute aimed to provide access to analysis of tax issues. We used the Tax Policy Center for the tax rates that each state has on cigarettes/tobacco products.

Variable Summary

Cigarettes Smoked Per Day

This variable states the average number of cigarettes smoked by an everyday smoker per day.

Tax Rate (by state)

This variable includes the excise tax¹ rate that each state puts on tobacco products.

Young Children

The NACH was specifically interested in how having children affected cigarette smoking habits. Because of this, we defined this variable as a household containing any child under the age of five years old.

Age

Our Age variable is simply the age of the survey taker. We limited our data to individuals above the age of 21 because that is when tobacco can be legally purchased and consumed in the United States. We did not add an age limit because tobacco use happens in all age groups, and is hard to stop so it continues throughout life.

¹ An excise tax is a tax levied by a government on specific goods or services, typically those that are considered to be luxury items, harmful to public health or the environment, or subject to high demand.

Sex

This variable is used to differentiate between men and women. We utilized this variable as a control in our regressions.

Race

We utilized race as a control group. We split up white people and minorities to measure the differences in tobacco use in the different races. We did this because white individuals made up the most observations in our dataset.

Marital Status

We took marital status into account because we found that people who are married with their spouse present smoke fewer cigarettes compared to people who don't have their spouse present, or who aren't married.

Smoker Status

Active Smoker was a variable we made to see if the individual was an active smoker. We determined this by separating individuals who smoke within 30 minutes of waking up either consistently or sometimes, as active smokers.

NorthEast

We took regions into account because we found that people in the northeast smoke significantly more than the rest of the United States, but they also have the highest average tax rates on cigarettes and tobacco compared to the rest of the United States.

Weight

We used the included weight from the CPS data source to properly weight our data. This allows for our variables to be accounted for correctly in an accurate representation of the US population.

Analysis

OLS Summary

We used our data from the CPS and the Tax Policy Center to run an analysis on the effect of increasing the tax price of cigarettes on the consumption of cigarettes which also measured how smoking rates were affected by having young children present.

The OLS model specification is below:

$$tcigday = \beta_0 + \beta_1 taxrate + \beta_2 youngKids + \beta_3 age + \beta_4 female + \beta_5 white + \beta_6 married + \mu$$

“tcigday” is the dependent variable explaining the effect on the number of cigarettes smoked on average per day, by a surveyed individual. Each variable from β_1 to β_6 represents a factor impacting this effect.

| VARIABLES | (1) OLS | (2) OLS | (3) OLS |
|---------------------------------------|---------------------------|-------------------------|---------------------------|
| taxrate | -0.00873*** (0.000905) | -0.0120*** (0.00113) | -0.00735*** (0.000853) |
| youngKids | -0.872** (0.365) | -0.877** (0.365) | -0.708** (0.338) |
| age | 0.0463*** (0.00717) | 0.0458*** (0.00716) | 0.0378*** (0.00672) |
| female | -2.287*** (0.194) | -2.316*** (0.194) | -2.291*** (0.182) |
| white | 4.002*** (0.245) | 3.994*** (0.246) | 3.725*** (0.235) |
| married | -0.399** (0.202) | -0.382* (0.201) | -0.324* (0.188) |
| northEast | | 1.603*** (0.349) | |
| activeSmoker | | | 5.310*** (0.180) |
| Constant | 11.26*** (0.453) | 11.63*** (0.461) | 8.490*** (0.440) |
| Observations | 8,078 | 8,078 | 8,005 |
| R-squared | 0.079 | 0.082 | 0.185 |
| Robust | Yes | Yes | Yes |
| Robust standard errors in parentheses | | | |
| *** p<0.01, ** p<0.05, * p<0.1 | | | |

Figure 1: Spreadsheet of regressions throughout the research process

We conducted three different regressions (figure 1) to help describe the impact that different variables had on cigarette consumption. In all three regressions, we included the tax rate and if they had young children as well as our control variables which included age, gender, race, and marital status. In our first regression, our baseline individual smoked 11.26 cigarettes daily, setting all independent variables equal to zero. The tax rate variable shows that for each cent increase in excise tax added on the purchase of tobacco, the number of cigarettes smoked per day decreases by .008 cigarettes. For example, if a state had an excise tax of 0 and they increased that tax to \$1.00 on top of all tobacco products, holding all else constant, the average number of cigarettes smoked per day is estimated to decrease by almost a whole cigarette (approximately .873 fewer cigarettes consumed per day).

Similarly, if an individual has a young child in their household they are also predicted to decrease their daily cigarette consumption by almost a whole cigarette (.872 fewer cigarettes consumed per day). Our other variables give us some more information on these predictions. We found that for each extra year aged after 21, active smokers are expected to increase their cigarette consumption by .04 cigarettes per day. If the surveyed individual is a female or married, their predicted consumption is expected to decrease by 2.287 and .4 cigarettes respectively. Our most alarming prediction was the increase in consumption for a white individual is predicted to be an extra 4 cigarettes a day compared to those who are any other race.

Our second regression contained all the same variables as the first regression as well as taking into account the northeast region. This variable defines the differences in tax rates between the northeastern region and the rest of the regions in the United States. We chose to add this to the regression because the northeast has much higher excise tax rates than any other region in the country (figure 2). The northeast region has more than double the average excise tax than the rest of the regions, and even when looking at each region individually, none compare to the northeast region's tax rates.

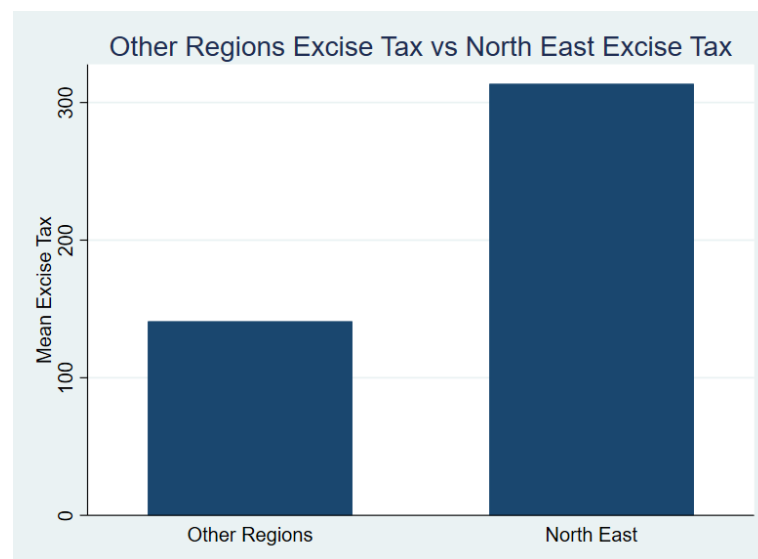


Figure 2: Bar Chart describing regional differences in excise taxes

When the northeast variable was added to the regression, our other variables all shifted. While they kept the same effect on the number of cigarettes smoked per day, (either negative or positive) the magnitude of how each variable impacted cigarette consumption was what changed. This shift was expected because the northeast variable took into account some demographic that was already being explained by our variables. The more interesting observation shown by this regression is the northeast variable, which impacts the regression by showing that if a surveyed individual lives in the northeastern region, they are estimated to smoke 1.603 more cigarettes per day. This is shocking due to how large the excise tax rates are in this area. This shows that while tax rates are an important indicator of cigarette consumption, so is the culture of the area. With the northeast smoking so much more than other areas in the United States, they do so even with extremely high excise tax rates. Two things can be taken away from this: the reason that the taxes are so high in the first place is because of the large amount of smoking due to the culture. Secondly, the impact of tax rates in this regression is still negative, and in comparison to the first regression, the magnitude increased. This means that while culture is important in cigarette consumption, excise tax rates still have an impact even in areas where smoking is much more common.

The final regression we analyzed included all of the variables from our initial regression, as well as accounting for those we defined as active smokers. This variable allows us to discern between individuals who smoke just a few cigarettes a day compared to those who are heavily dependent on smoking. Once again, by adding the active smoker variable, the rest of our variables changed in magnitude. All variables kept their same effect while also decreasing in magnitude except for the female variable which slightly increased in magnitude. There were large changes in magnitude throughout the variables, most notably in the constant term and tax rate variables. These changes can be explained by re-examining what the active smoker variable means and does for the regression.

The large fall in the tax rate variable can be explained by the fact that individuals who are active smokers will be more inelastic to changes in tax rates. These people who must smoke within 30 minutes of waking smoke more cigarettes per day than other active smokers. Due to the addictive nature of tobacco, even if the excise tax was increased, these individuals would still be more than willing to purchase cigarettes. This is shown by the effect of the excise tax on cigarette consumption dropping by almost 20%. The constant term drops by about three cigarettes per day, which can be shown in the active smoker variable. That variable predicts that for active smokers, they are estimated to smoke an astounding 5.3 more cigarettes per day than nonactive smokers. This also gives us a new constant of 8.5 cigarettes per day for smokers who do not smoke within the first 30 minutes of waking up, setting all independent variables equal

to zero. This large change of magnitude and the size of these variables shows how much more dependent an individual can become with regular smoking. This dependency would make it difficult for the excise tax changes to impact their purchasing decisions, and while the tax would still have an effect, the results would see a smaller effect.

This scatterplot (figure 3) shows the effect of the excise tax imposed on tobacco products compared to the number of cigarettes smoked per day. This graphical representation of our data helps support the claims shown in the regression. The majority of excise tax rates lie below \$2.00 (notated by the 200 mark on our graph). Almost all of the states that lie in this high excise tax portion are a part of the northeast region. This reinforces the need for adding regions into our model in order to analyze what the differences in excise tax do between the regions. Another supporting claim that can be seen through the scatterplot is the negative correlation between the cigarettes smoked per day and the excise tax. The line on the graph shows the negative relationship between excise tax and the average amount of cigarettes consumed per day. This same negative relationship was highlighted in each of our regressions.

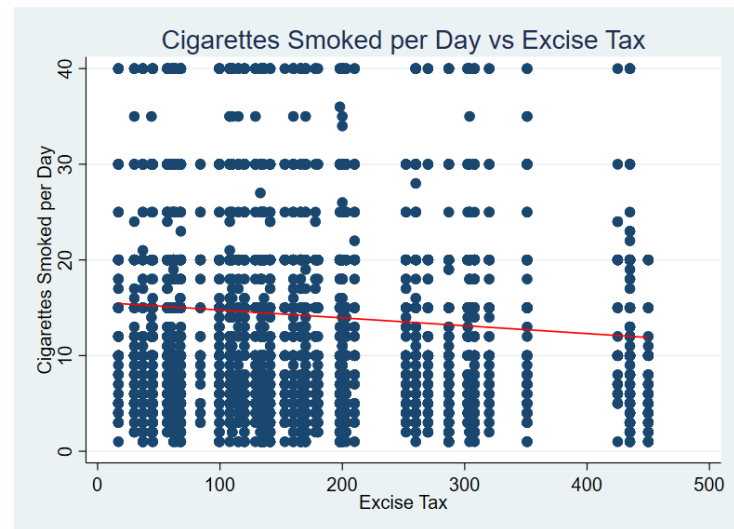


Figure 3: Scatterplot detailing the correlation between excise tax and cigarettes smoked per day

Conclusion

Based on our findings, we are able to determine and report three things to the NACH:

- There is a negative correlation between excise taxes on tobacco products and the consumption of cigarettes.
- This relationship becomes even stronger when there are young children in the household.
- When accounting for individuals who are active smokers, the impact of the excise tax on cigarette consumption decreased due to the inelastic nature of these individuals
- The northeast region of the United States both smokes more than other regions and has the highest excise tax rates. This was an indication that the culture of the area has an impact on the cigarette consumption rate. Excise tax rates still had an impact, but that is not the only thing that must be accounted for.

With these findings, we believe that the NACH should have enough data to support its campaign against parental smoking and the effects that it has on childhood asthma.

We do herewith certify that this project was undertaken in a group manner (shared responsibilities regarding code creation, writing, and creative direction) and that our individual contributions are considered adequate according to all involved.

Signed,

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