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An Analysis of Excise Taxes on Wine in the United States

William A. Saunders
University of New Hampshire - Main Campus

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William Saunders

Thesis Advisor: Dr. John Hasseldine

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Authors Note:

Correspondence concerning this article should be addressed to William Saunders, University of New Hampshire, Durham, NH 03824. Email: was1004@wildcats.unh.edu

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Abstract

Excise taxes are a form of tax that are applied specifically to certain goods, and are charged by the wholesaler to the retailer; they are then usually passed onto the consumer through price increases. Throughout the history of the United States, this form of taxation has transformed and taken on a variety of different roles before arriving at its modern role; a tool to implement certain tax systems, such as the Pigovian system, as well as to influence consumer behavior. The purpose of this research is to evaluate the purpose of excise taxes on wine within the United States by comparing wine taxation to other categories of beverage alcohol, as well as other "sin items" such as cigarettes. This research also intends to identify certain demographic factors on a state-by-state basis that may have an influence on the implementation of wine excise tax policy. Through analyzing the implementation of alcohol excise taxes by comparing state tax revenue to a valuation of perceived negative externalities, it was discovered that alcohol tax policy does not fit the definition of a Pigovian system. Additionally, by analyzing the relationships held between certain beverage category consumption, Per Capita Personal Income, education levels, and excise tax; it was discovered that unlike for cigarettes and spirits, these demographic factors do not have an influence on their excise tax rates, but only on consumption. This leads to the conclusion that differences in state-by-state excise tax policy on wine is based on other state-specific factors.

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Literature Review

Definition and Purpose of Excise Taxation

Excise taxes are broadly defined as intranational taxes levied upon the purchase of specific goods or services such as fuel, tobacco, and alcohol. Excise taxes are typically paid by business, and the consumer may never be aware of the tax as it is usually collected by simply increasing the purchase price of a good or service; the tax payer (i.e. the corporation or business) pays the tax to wholesalers and then passes it on to the end consumer. However, there are certain excise taxes that are paid directly by the consumer; the best examples being property taxes and taxes on specific kinds of retirement savings accounts (Kaglan, Excise Tax, 2020). Businesses who charge excise taxes on their products file a Form 720 Federal Excise Tax Return along with payments on a quarterly basis; however, these payments often allow for deductions or credits on their annual income tax return.

All levels of government; federal, state, and local have the ability to levy excise taxes upon their citizens. As such, excise taxes make up a noticeable but small portion of both federal and state government revenue. However, excise taxes as a percentage of GDP has been steadily decreasing over the past 60 years, and currently sits at about .42% of GDP and about 4.38% of all federal tax receipts; a number which has also been steadily decreasing over the same time period (Key Elements of the U.S. Tax System, 2018). In fiscal year 2017, the largest sources of excise taxation in order from smallest to largest are as follows: highway at 45%, aviation at 18%, tobacco at 16%, and alcohol at 12% (Key Elements of the U.S. Tax System, 2018).

Excise taxes can be charged on either ad valorem or a specific basis. In Latin, the term "ad valorem' translates to "according to rate"; as such, ad valorem taxes are charged on a percentage basis, usually tied to purchase price. Goods typically subject to excise taxes in the ad valorem format include firearms, airline tickets, and heavy trucks (Kaglan, Excise Tax, 2020). Conversely, specific taxes are taxes that have a set dollar amount per unit of product. Common examples of excise taxes in the specific format include cigarettes, pipe tobacco, cruise ship tickets, gasoline, and alcohol (Kaglan, Excise Tax, 2020). Since excise taxes can be levied at both the federal and state level, and both levels have the legislative ability to set their own rates and dollar amounts, there is generally a difference between federal and state rates and amounts. For example, as of 2017 the federal excise tax per 20 pack of cigarettes was $1.01 and the state excise tax per 20 pack ranged from $0.17 in Missouri to as high as $4.35 in New York (STATE EXCISE TAX RATES ON CIGARETTES, 2020).

The term "sin tax" is used to describe excise taxes on products which are assessed to have a high social cost (Kagan, Sin Tax, 2019). Sin taxes are categorized as a "Pigovian tax"; taxes levied upon individuals or businesses which are intended to compensate for negative externalities (scenarios in which producers do not take on all costs of production; often less tangible costs such as environmental harm, or harm to a third party's health) produced by those entities as well as to discourage activities that create negative externalities in the first place (Kagan, Pigovian Tax, 2020). Pigovian taxes are a controversial topic across the entire political spectrum as the right wing often claims that Pigovian taxes equate to government social engineering, whereas the left-wing claims that Pigovian taxes have negatively disproportionate implications for certain less fortunate demographics (Kagan, Pigovian Tax, 2020).

A Brief History of Excise Taxation

Since the first form of excise taxation was introduced in 1791 by then Treasury Secretary Alexander Hamilton during the presidency of George Washington, there has been varying degrees of use and purpose, as well as a wide variety of products and services that excise taxes have applied to. Originally excise taxes were introduced as a means to provide a source of revenue to the government, repay debts from the American Revolution, and to consolidate the debts of the states under one federal system (Federal Excise Taxes: An Introduction and General Analysis, 2013). Over time and varying degrees of use, excise taxation evolved into a means to increase revenues during wartime but were usually pulled back during times of peace. Originally, excise taxes were considered a significant means of government funding; in the period after the Civil War, excise taxes provided anywhere from one third to one half of all federal revenue, however that percentage has decreased significantly over the subsequent centuries despite year over year increases in the nominal receipt of excise taxes (Federal Excise Taxes: An Introduction and General Analysis, 2013). During the latter half of the 20th century, the role of excise taxes transformed into a means to fund certain large-scale projects, to disincentive negative externalities in corporations, and to help address a growing budget deficit issue. During the 21st century thus far, the role that excise taxes had during the subsequent century was expanded upon to be used as a tool to greater influence consumer behavior, disincentivize certain purchases and to align certain actions with legislative reform.

After the formation of the United States Government and up until 1791, the U.S. relied upon tariffs and duties on foreign trade as its largest source of revenue. In 1791 however, under the presidency of George Washington, Alexander Hamilton instituted a tax on the purchase of

whiskey in order to fund the government and consolidate the states under one federal taxation system (Federal Excise Taxes: An Introduction and General Analysis, 2013). This was the first excise tax instituted in the U.S. The tax proved controversial and resulted in the Whiskey Revolution of 1794 in the state of Pennsylvania. After the revolution, additional excises were passed by congress on carriages, sugar, and tobacco then later on land and slave ownership (Federal Excise Taxes: An Introduction and General Analysis, 2013). Upon the 1800 election of Thomas Jefferson all excise taxes were removed by 1802.

Excise taxes remained an important source of revenue for the U.S. throughout the 19th century; providing the government with funding during times of conflict since revenue from foreign import taxes tended to decrease while the U.S. was at war, for example The War of 1812, and the Civil War (Federal Excise Taxes: An Introduction and General Analysis, 2013). The taxes were generally repealed after the wars concluded, with the exception of excises on tobacco and hard alcohol, both of which maintain excise taxes to this day aside from during the prohibition for alcohol in the 1930's.

During the 1900's we saw the introduction of excise taxes on guns and ammunition to help fund World War I. This resulted in federal excise tax revenues increasing by four times between 1914 and 1919 (Federal Excise Taxes: An Introduction and General Analysis, 2013). During prohibition, which lasted from 1920 to 1933, excise tax collection decreased to less than half of pre-prohibition levels. Revenues recovered to 1919 levels upon the repeal of prohibition in 1933 (Federal Excise Taxes: An Introduction and General Analysis, 2013). During World War II, excise tax rates on the vast majority of goods were raised, and excises on luxury goods were introduced in order to help fund the war effort. Concurrently, two attempts to introduce a federal

sales tax in 1932 and 1942 were shot down in favor of the excise tax system (Federal Excise Taxes: An Introduction and General Analysis, 2013). The second half of the 1900's saw a series of increases and subsequent decreases leading up until the 1965 Excise Tax Reduction act; eliminating the majority of federal excises with the ultimate goal of stimulating expansion within the economy.

With the expansion of the U.S. highway system during the 1950's we saw excise taxes beginning to be utilized for purposes other than funding war efforts as the 1956 Highway Revenue Act increased the federal tax rate on the sale of gasoline; the proceeds of which were funneled directly to a fund specifically designated for highway expansion, known as a hypothecated tax. The 1970's and 1980's began to see the introduction of Pigovian style excise taxes on corporations whose production processes created negative externalities; for example, the mining, marine travel, oil, chemical, and airline industries all had excise taxes associated with their production and services introduced. During the 1990's the government utilized increases in the tax rate for "sin" items such as beer and wine, hard alcohol, and tobacco in order to help fund the growing budget deficit.

The 21st century has seen excise taxation decrease in importance as a source of funding for the federal government, and they have taken on a primary responsibility of influencing consumer behavior and aligning it with certain pieces of legislature. The tax rates on sin items saw an increase for tobacco in 2009, and in increase for alcohol in 2018. Additionally, the 2010 Affordable Care Act introduced excise taxes on medical devices and products such as tanning, and brand name prescription drugs (Key Elements of the U.S. Tax System, 2018). The Affordable Care Act also introduced certain taxes on private health insurance providers, high-

cost employer sponsored healthcare plans, companies not offering employee healthcare, and taxes on individuals without any healthcare coverage; all of this sharing the common goal of promoting government subsidized plans (Key Elements of the U.S. Tax System, 2018). The 2017 Tax Cuts and Jobs Act repealed much of the legislation relating to health plans, and delayed the taxation of certain healthcare products into the future.

Economics of Excise Taxation

Under the assumption that modern excise taxation is used as a tool to influence consumer behavior, as well as a tool to facilitate the internalization by producers and service providers of perceived negative externalities; then the setting of excise tax policy across items should depend on the elasticity of demand of those items, as well as the assessed economic value of the negative externalities created by those items.

The elasticity of demand for a product describes the relationship between changes in price for an item and the resulting changes in demand for the item. Mathematically, elasticity is calculated as the percent change in quantity demanded for an item divided by its percent change in price. An elasticity of demand equal to 1 (mathematically -1, but elasticities are described in absolute value as very few items have elasticities with a positive value) implies that the percentage change in price for an item is directly proportional to the percentage change in quantity demanded. In other words, a 10% increase in price for an item would translate to 10% decrease in demand for the item. An elasticity of less than 1 means that the item is relatively inelastic; the change in price has a less than proportional impact on changes in demand. Elasticity of 0 implies that changes in price have no effect on the quantity demanded of the item. Conversely, an elasticity of greater than 1 means that the item is relatively elastic; the change in

price has a more than proportional impact on changes in demand. An elasticity of infinity implies that any change in price for an item eliminates all demand for that item.

Price elasticity of demand for certain products is dynamic, not static. As societal norms evolve, and new research is released the price elasticity of demand is subject to change; therefore, so too are the taxes levied upon those items (Ruhm, Jones, & Kerr, 2011). Cigarettes for example, have had changes in elasticity of demand over the last half century as more research has been conducted on their health effects, as well as an aggressive government sponsored anti-smoking rhetoric. Price elasticity of demand is also subject to change depending on the price level of the cigarettes. In aggregate, based on research conducted by the National Bureau of Economic Research, cigarettes currently have a price elasticity of demand in the range of .77 to .65, making them relatively inelastic (Tauras, Pesko, & Huang, 2016).

For alcohol, determining price elasticity of demand is slightly more difficult than for cigarettes. Alcohol is separated into various different categories such as beer, spirits, and wine; all of which sometimes serve as substitute products for each other. Further, within each of those alcohol categories there is a larger variety of styles and flavors than there are for cigarettes. Alcohol also shares some of the same problems as cigarettes that make determining price elasticity difficult such as varying price points, and state and local policies influencing pricing and sale of alcoholic beverages. It is estimated that beer is relatively inelastic at about .3 whereas spirits are more elastic at about 1.5. It is generally agreed that wine is too difficult to place an assessment of elasticity on due to the higher degree of variety and price points within the category (Ruhm, Jones, & Kerr, 2011).

As Pigovian style taxes, cigarettes and alcohol are perceived to produce negative externalities for society. Cigarette externalities are perceived to include incidences of various types of cancer, second hand smoke inhalation, and strains on the healthcare system. Alcohol shares some of these same externalities with cigarettes, but also includes death caused by alcoholism, drunk driving accidents, and property damage. It is important however, to note that while these products do create negative effects, some of the effects created can be beneficial. For example, early deaths due to their use can have positive implications for the insurance and healthcare industries. It is important for tax policy makers to analyze the aggregate effects imposed upon society by these products so that they can fix the market failure created by their use; instances where rational behavior for an individual does not result in a rational outcome for the group. By imposing these Pigovian style taxes, they have the effect of reducing the quantity demanded of those products as well as generating revenue from the remaining quantity demanded; the end goal being to "internalize" the negative externalities that are created, thus resolving the market failure. In practice however, implementing Pigovian taxes is more difficult. Many of the externalities created by these products such as the death of someone involved in a drunk driving accident or the inhalation of a unit of second hand smoke do not have explicit values whereas property damage caused by a drunk driving accident does. For alcohol, since there are steep financial penalties involved in drunk driving arrests, the effect of disincentivizing alcohol consumption through taxation would have to be weighed against the lost fees from a decrease in drunk driving arrests (Daley, Stahre, & Chaloupka, 2012).

Ultimately, from an economic standpoint when setting tax policy many factors need to be considered. Pigovian tax policy is a balancing act between accurately assessing the externalities produced, and determining the most effective way to levy a tax across categories of items; this

becomes more complicated once one considers that the externalities produced by one category of items is likely not equal to the externalities produced by other categories. For example, the intoxicating effects of spirits likely result in a higher incidence of drunk driving accidents than for wine. Additionally, the effects of price elasticity of demand across different categories further complicates the imposition of taxes on these items (Daley, Stahre, & Chaloupka, 2012).

Tax Policy Across States

Since the United States has a three-tiered tax system; federal, state, and local, governments have the authority to levy taxes upon their citizens. For taxes on cigarettes, wine, spirits, and beer the federal government generally levies the same rate by product for each state. For example, the federal excise tax is $1.01 per pack of 20 cigarettes (STATE EXCISE TAX RATES ON CIGARETTES, 2020), between $1.07 and $3.40 for wine depending on alcohol content (STATE TAX RATES ON WINE , 2020), $3.50 per barrel of beer (STATE TAX RATES ON BEER , 2020), and $2.70 per proof gallon of spirits (STATE TAX RATES ON DISTILLED SPIRITS , 2020); although some variation does exist on a producer to producer basis depending on volume. On the state level, each state has the autonomy to set their own tax policy as they see fit. Economically speaking, each state should set their tax level in efforts to internalize the externalities produced. In practice this is not the case. Many factors, in addition to externalities, influence the setting of tax policy at state level; among them are education, income, consumption level of certain categories as compared to others, and revenue structure. Additionally, any changes in the federal rate often result in a corresponding rate adjustment at the state level in order to maintain a ratio of federal revenue to state revenue by product (Daley, Stahre, & Chaloupka, 2012).

Research Questions

This research is designed to examine the use of Excise Taxation across states; specifically, on the wine industry. Excise taxation is used as a tool to internalize negative externalities among other uses, however their use in theory differs from how they seem to be used in practice. In order to understand the use of excise taxes on wine at the state level the following questions are relevant. What is the value of the alcohol externalities that states are attempting to internalize? Should excise taxation on wine be similar to taxes levied on other alcohol products? What demographic factors influence the imposition of excise taxation on wine and other products?

Method

This research was conducted to compare the imposition of excise taxes on wine to other sin items, as well as excise taxes on wine across states. This research leveraged the analysis and compilation of various secondary data including academic articles, government working papers, and government statistics in order to reach its conclusion. A variety of regression models were utilized in order to identify the relationships held between various factors and excise tax rates across states. The data in the analysis include; Per Capita Personal Income (PCPI), Education Index, general alcohol consumption, wine specific consumption, spirits specific consumption, beer specific consumption, rate of bachelor's level education or higher, cigarette smoking rates, and state excise taxes applied to all of the listed consumption items.

Results

General Assumptions

As excise taxes are no longer utilized for their initial purpose of providing funding for the government during times of war, nor are they considered a substantial portion of government revenue; it is most plausible that in general, the modern role of excise taxes is Pigovian in nature. That being said however, under a Pigovian Tax system one would expect the tax receipts on certain items to compensate for the externalities produced by the consumption of those items. For every state in the U.S. this proves not to be the case. As seen in Figure 1, receipts for excise taxes on alcohol by state only compensate for at most 5.6% of alcohol's cost to society within that state.

Valuation of the Negative Externalities from Alcohol Consumption

The American Journal of Preventative Medicine, breaks down the costs of excessive alcohol consumption to society based on a 26-factor model which consists of 9 healthcare-based factors, 9 productivity-based factors, and 8 other factors mostly related to crime as seen in Table 1 (Sacks, Gonzales, & Bouchery, 2015). To arrive at totals, the model separates costs into four different categories; costs to government, costs associated with binge drinking, costs associated with underage drinking, and costs associated with drinking while pregnant to arrive at a total cost in the U.S. of $249,026,400,000 for the year 2010 (Sacks, Gonzales, & Bouchery, 2015). The model then proceeds to allocate a portion of this cost to each state as seen in Table 2. This model represents an accurate representation of the value of negative externalities produced by the consumption of alcohol.

Wine Externalities vs Other Beverage Categories

Since alcoholic beverages are separated into three primary categories; beer, wine, and spirits, then the externalities produced by consumption should be allocated to those three categories based on the percentage contribution they have to total alcohol consumption. Wine consumption in the U.S. in 2018 was 913,945,000 gallons, which accounted for 11.7% of all alcoholic beverages consumed whereas beer accounted for 81% and spirits accounted for 7.3% (Slater & Alpert, 2020). This would then imply that wine should account for approximately 11.7% of the externalities produced by alcohol consumption and therefore should have taxes levied on its sale to internalize those externalities.

To the extent that it is the intoxicating ingredient, ethanol, within each of these beverages that produces the negative externalities and not necessarily the beverage as a whole, then the allocation of externalities to each of the three categories should be adjusted based on their respective ethanol content. Assuming an average Alcohol by Volume (ABV) of 4.5% for beer, 13% for wine, and 40% for spirits; 117,889,000 gallons of ethanol were consumed from wine, accounting for 18% of all ethanol consumed in the U.S. in 2018 as opposed to 45% for beer and 37% for spirits (Slater & Alpert, 2020). While there is a lack of data on a state-by-state basis, as of 2018 the breakdown of federal excise tax receipts from the three categories was 32% beer, 11% wine, and 57% spirits (Service, 2015).

When evaluating the externalities produced by all three categories of alcoholic beverages, the culture surrounding each of the three different categories must also be considered. While there is a lack of reliable data on the topic, some assumptions can be made by evaluating differences in average prices per ounce of alcohol under the assumptions that higher prices imply

higher quality and binge drinkers prioritize becoming intoxicated over the quality of whatever they are drinking. For example, wine which has an artisanal culture and is most often enjoyed for its taste rather than for its intoxicating effects has an average price per ounce of alcohol of $5.47 (DiLoreto, Siegel, & Hinchey, 2012). Beer on the other hand, has an average price per ounce of alcohol of $1.93 (DiLoreto, Siegel, & Hinchey, 2012). The culture surrounding spirits largely depends on the variety of spirit. Some varieties of spirit do share an artisanal culture similar to that of wine, however other varieties are more susceptible to drinking in excess, and on average spirits in general have the highest ABV thus easily enabling binge drinking. The most popular varieties of spirit; vodka, rum, whiskey, and tequila have average prices per ounce of alcohol of $1.85, $1.66, $1.50, and $5.18 respectively (DiLoreto, Siegel, & Hinchey, 2012). Additionally, some states governments such as New Hampshire take on the role selling spirits themselves through state run liquor stores while beer and wine can be purchased at almost all retailers. While there are a variety of reasons for doing this, one of the reasons is to limit access of spirits to underage populations, thus implying a higher degree of potential externalities for spirits than for beer or wine.

Demographic Factors Influencing Excise Taxes on Wine Across States

To understand the general relationships that certain demographic factors have on the implementation of wine tax policy state-by-state, a variety of regressions were run. The first series of regressions analyze the relationship between Per Capita Personal Income (PCPI) and general alcohol consumption, as well as Education Index and alcohol consumption.

As displayed in Figure 2, PCPI and alcohol consumption share a positive relationship of $4,389.8x with an R^2 of .0734, implying a somewhat weak relationship of the two variables. The

same analysis when run for wine as displayed in Figure 3 showed a comparatively stronger positive relationship of $17,606x with an R^2 of .1659, implying a stronger relationship between the two variables. These regressions show that as the income of a state's citizens increases, so too does their consumption of alcohol and wine. However, wine displays a stronger relationship of the two variables as well as a higher sloping linear equation, meaning that the consumption of wine increases with income at a faster rate than for alcohol in general.

The same regressions were run, but instead of PCPI by state, Education Index by state was used as a demographic variable. When Education Index was compared to general alcohol consumption as seen in Figure 4, a positive relationship of .2171x with an R^2 of .1225 was revealed. When run for wine however, an even stronger and higher sloping relationship was revealed with a slope of .7511x and an R^2 of .206 as displayed in Figure 5. This means that as a state's level of education increases, so does its alcohol consumption; however, this relationship is comparatively stronger for wine, and shows that wine consumption increases faster with education level than it does for alcohol in general.

Similar regressions were run for wine specifically, analyzing the relationships between both PCPI and Wine Tax by State, as well as Education Level and Wine Tax by State. Regressions using the same variables as compared to cigarette taxes were also conducted. As seen in Figures 6 and 7, both of the regressions for Wine Tax reveal negative sloping relationships which would imply that as the income of a state's citizens or the state's level of education decreases, so too do their excise taxes on wine. However, as PCPI vs. Wine Tax and Education Index vs. Wine Tax showed R^2 values of .0186 and .0118 respectively, the degree to which the variables are related is questionable. Conversely, the regressions for PCPI vs.

Cigarette Tax and Education Index vs. Cigarette Tax, as seen in Figures 8 and 9 both showed positive sloping relationships of $5048.6x with an R^2 of .3906 and .1299x with an R^2 of .1765 respectively. This means that cigarette tax and wine tax respond in opposite ways to changes in income and education levels, although the relationships are stronger for cigarettes. Similarly, a regression run between Wine Consumption and Wine Tax as shown in Figure 10 also showed almost no relationship with a slope of -.0008x, and an R^2 of .0000005, whereas a similar regression between Cigarette smoking Rates and Cigarette Tax as shown in Figure 11 revealed a clear negative relationship with a slope of -.016x and an R^2 of .2756. This means that a state's consumption of wine has almost nothing to do with its tax rate on wine; but as the percentage of a state's population who smokes decreases, its excise tax on a pack of cigarettes increases.

Demographic Factors Influencing Excise Taxes on Wine vs. Spirits and Beer

All of the same regressions that were run for wine were also run for spirits and beer. The regressions for spirits analyzing the relationships between state PCPI and Consumption as well as Education Index vs. Consumption as displayed in Figures 12 and 13 both showed positive relationships just as they did for wine; indicating that as income and education level increase, so does consumption of spirits. However, with R^2 values of .1008 and .111 respectively, the relationship proves to be stronger with wine. The same analysis for beer consumption as shown in Figures 14 and 15 on the other hand, displayed a negative relationship for PCPI and a positive relationship for Education Index. This means that as income increases, beer consumption decreases but as education level increases, beer consumption increases; however, with R^2 values of .0144 and .0001 respectively, the presence of any relationship is unclear.

The regressions for spirits analyzing PCPI and Education Index against Spirits Tax as shown in Figures 16 and 17 displayed a negative and positive relationship respectively; whereas for wine, both relationships were negative. However, with R^2 values of .0147 and .0129 respectively, there appears to be an absence of any real relationship. Beer however, displays negative relationships for both PCPI and Education Index as shown in figures 18 and 19 with slightly stronger R^2 values of .0398 and .0354 respectively, but these values still indicate an absence of any clear relationship between the two variables.

The regression analyzing spirits consumption and spirits tax as shown in Figure 20, unlike wine but similar to cigarettes, showed a negative relationship with an R^2 value of .098. this means that as consumption of spirits increases, the excise tax on spirits decreases. Beer however, as displayed in Figure 21, showed a similar relationship between the two variables as wine; virtually no relationship with an R^2 value of .0009.

Discussion

The purpose of this research was to examine the conditions and factors that contribute to the implementation of excise tax policy for wine in the United States. More specifically, the research examined the modern goal of excise tax policy, and the corresponding economics. Demographic factors for excise tax policy on wine was compared on a state-by-state basis, as were demographic factors for other beverage alcohol categories and sin items, such as cigarettes.

Through conducting this research, it was discovered that excise taxes have evolved throughout their history of use in the United States into a modern form, which resembles a Pigovian style system. However, the results revealed that on the state and local level, tax receipts from excises on alcohol for a specific state do not ever cover more than about 6% of that state's

estimated total externalities from alcohol. Therefore, excises on alcohol do not qualify as a pure Pigovian system as the revenues derived from the taxes do not offset the negative externalities produced by consumption, therefore the primary role of excise taxes on alcohol may be to influence consumer behavior rather than to internalize externalities. That being said, if excises on alcohol were set at levels so as to fully internalize the externalities produced by their consumption, then the prices would be far too high thus eliminating any demand or incentive to produce. Such a system would also unfairly punish those in society who drink in moderation. Therefore, it seems as though the most efficient way to address the externalities produced by alcohol consumption is not through taxation, but rather through alternative programs such as education and intervention.

Of the taxes that are collected on alcohol, it can be argued whether the same tax should be applied to all categories, or if one category of beverage warrants higher or lower excise tax rates than the other. If it were based solely on national ethanol consumption, then beer should account for approximately 45% of tax receipts, wine should account 18% and spirits should account for 37%. However, given the different cultures and abuse liabilities of each category it is difficult to arrive at justifiable estimates for each category. While it is widely accepted that beer and spirits likely contribute more to overall alcohol externalities than wine, it is difficult to assess the degree to which the tax rates should differ for those categories.

On a state-by-state basis within the United States, it seems that the higher a state's income or education level, the more alcohol they consume. When the same analyses were conducted on a beverage to beverage basis, wine and spirits held the same trend as alcohol in general, although wine displayed a stronger relationship. This is likely due to the fact that

education and income have a very strong positive relationship, and since wine ethanol costs more on average than spirit ethanol, it is more likely wealthier account for a higher proportion of wine sales than they do for spirit sales. Other factors that could contribute to wine's stronger relationship could be populations of certain nationalities within certain states. For example, if certain states had a higher population of wine-centric cultures, such as Italians, then it is likely that that particular state would drink more wine. A similar relationship is shown in Utah; since they have a high population of Mormon citizens, and it is against the Mormon religion to drink alcohol, Utah's alcohol consumption is noticeably lower than other states. Beer, on the other hand displays almost no relationship between income or education level and consumption. This is likely due to beer being the most widely consumed and widely available variety of alcoholic beverage. It is consumed by all people regardless of education or income.

All beverage categories showed a negative relationship between income or education level and excise tax, with the exception of education level vs spirit tax. This would mean that higher income states generally have lower excise tax rates on alcohol. However, all of these relationships displayed R^2 values of less than .1, indicating that there is likely no relationship present.

It was found that Cigarettes displayed a strong positive relationship between income and excise tax rate, as well as a relatively strong relationship between education index and excise tax rate. Additionally, cigarettes showed a strong negative relationship between smoking rate and tax rate. This indicates that a higher smoking rate leads to lower taxes on cigarettes, and the states with higher smoking rates tend to be less educated and therefore produce less income. For that reason, states with a higher smoking rate are able to charge a lower excise tax on cigarettes to

produce a similar level of excise tax revenue than states with a lower smoking rate. Spirits were the only category of alcoholic beverage to share this relationship with cigarettes, although with a much smaller, but not negligible R^2 of .098. This shared relationship may be due to certain social tax burden factors that are outside of the scope of this research.

Both beer and wine displayed virtually no relationship between consumption and excise tax. This leads to the conclusion that, while demographic factors influence the consumption of cigarettes as well as the implementation of their excise tax policy, the implementation of excise tax policy for beer is not at all influenced by interstate differences in income or education. Rather, the implementation of excise taxes on wine likely has more to do with a wholistic view of a state's revenue structure, as well as with supply side commerce within that state.

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Tables

Table 1

Excessive alcohol consumption costs (in Millions), by category, U.S., 2010 (Sacks, Gonzales, & Bouchery, 2015)

Category of cost	Total costs ($)	Government costs ($)	Binge drinking ($)	Underage drinking ($)	Drinking while pregnant ($)
Total	249,026.4	100,674.8	191,126.9	24,268.3	5,494.1
Health care	28,379.1	16,915.1	16,273.8	3,795.8	2,830.0
Specialty care for abuse/ dependence	12,044.6	9,031.3	8,245.2	2,120.4	—
Hospitalization	5,948.5	2,828.1	2,007.5	198.9	48.6
Ambulatory care	1,524.5	524.0	1,070.8	144.4	7.0
Nursing home	1,166.8	691.6	863.4	2.1	0.5
Drugs/services	1,545.5	471.6	1,085.5	146.4	7.1
Fetal alcohol syndrome	2,750.0	1,248.5	1,160.5	449.5	2,750.0
Prevention and research	1,048.8	1,048.8	496.1	454.4	10.1
Training	34.8	11.5	16.4	6.3	—
Health insurance administration	2,315.6	1,059.7	1,328.5	273.3	6.7
Lost productivity	179,084.9	57,219.0	134,035.4	13,666.6	2,290.0
Impaired productivity at work	76,858.6	25,440.2	52,614.1	1,924.3	—
Impaired productivity at home	6,218.0	—	4,256.6	205.0	—
Absenteeism	4,619.9	1,529.2	4,619.9	201.5	—
Impaired productivity while in specialty care	1,983.4	656.5	1,358.6	349.1	—
Impaired productivity while in hospital	228.4	75.6	64.1	6.4	2.6
Mortality	75,204.5	24,892.7	58,373.4	6,044.2	170.7
Incarceration of perpetrators	9,150.5	3,028.8	9,150.5	3,855.3	—
Crime victims	2,704.8	895.3	2,704.8	734.7	—
Fetal alcohol syndrome	2,116.8	700.6	893.3	346.0	2,116.8
Other	41,562.5	26,540.7	40,817.7	6,806.0	374.1
Crime victim property damage	559.4	—	559.4	216.1	—
Criminal justice: corrections	15,865.9	15,865.9	15,865.9	1,842.0	—
Criminal justice: alcohol-related crimes	2,160.0	2,160.0	1,631.4	478.6	—
Criminal justice: violent and property crimes	5,998.8	5,998.8	5,998.8	2,117.6	—
Criminal justice: private legal	228.1	—	228.1	72.8	—
Motor vehicle crashes	13,461.9	—	13,461.9	1,490.2	—
Fire losses	2,914.3	2,142.0	2,914.3	527.5	—
Fetal alcohol syndrome (special education)	374.1	374.1	157.9	61.1	374.1

Note: Cost to government and costs for binge, underage, and drinking while pregnant are all subsets of total costs. Binge drinking, underage drinking, and drinking while pregnant are not mutually exclusive and may overlap.

Table 2

Estimate total, governmental, and binge drinking costs of excessive alcohol consumption, by state, 2010 (Sacks, Gonzales, & Bouchery, 2015)

	Total cost			Cost to government				Binge drinking	
	2010 cost (millions, $)	Cost per drink, $	Cost per capita, $	2010 cost (millions, $)	Cost per drink, $	Cost per capita, $	% of total cost	2010 cost (millions, $)	% of total cost
U.S.	249,026.4	2.05	807	100,674.8	0.83	326	40.4	191,126.9	76.7
State median	3,520.2	2.05	769	1,386.6	0.79	307	40.3	2,561.2	76.3
Alabama	3,724.3	2.27	779	1,386.6	0.85	290	37.2	3,035.7	81.5
Alaska	827.2	2.25	1,165	347.0	0.95	489	42.0	637.8	77.1
Arizona	5,946.4	2.27	930	2,434.5	0.93	381	40.9	4,539.8	76.3
Arkansas	2,073.3	2.27	711	772.9	0.85	265	37.3	1,692.3	81.6
California	35,010.6	2.44	940	14,468.7	1.01	388	41.3	25,786.9	73.7
Colorado	5,056.5	2.14	1,005	2,193.0	0.93	436	43.4	3,765.7	74.5
Connecticut	3,029.0	2.04	847	1,204.1	0.81	337	39.8	2,297.9	75.9
Delaware	803.8	1.64	895	332.6	0.68	370	41.4	626.4	77.9
District of Columbia	918.4	2.14	1,526	372.3	0.87	619	40.5	715.3	77.9
Florida	15,322.2	1.82	815	6,126.6	0.73	326	40.0	11,854.0	77.4
Georgia	6,930.9	2.12	715	2,805.7	0.86	290	40.5	5,612.4	81.0
Hawaii	937.4	1.58	689	369.2	0.62	271	39.4	702.0	74.9
Idaho	1,137.9	1.62	726	452.6	0.64	289	39.8	865.6	76.1
Illinois	9,715.7	1.86	757	3,795.8	0.73	296	39.1	7,412.1	76.3
Indiana	4,468.2	1.96	689	1,804.4	0.79	278	40.4	3,476.5	77.8
Iowa	1,933.6	1.59	635	766.9	0.63	252	39.7	1,454.4	75.2
Kansas	2,075.8	2.18	728	802.5	0.84	281	38.7	1,636.6	78.8
Kentucky	3,194.5	2.36	736	1,281.2	0.95	295	40.1	2,561.2	80.2
Louisiana	3,801.4	1.91	839	1,521.9	0.77	336	40.0	3,168.4	83.3
Maine	938.7	1.58	707	394.8	0.66	297	42.1	690.3	73.5
Maryland	4,964.7	2.22	860	2,098.6	0.94	363	42.3	3,852.9	77.6
Massachusetts	5,634.6	1.93	861	2,256.4	0.77	345	40.0	4,134.3	73.4

(continued on next page)

Table 2

Estimate total, governmental, and binge drinking costs of excessive alcohol consumption, by state, 2010 (Sacks, Gonzales, & Bouchery, 2015) *(continued)*

	Total cost			Cost to government				Binge drinking	
	2010 cost (millions, $)	Cost per drink, $	Cost per capita, $	2010 cost (millions, $)	Cost per drink, $	Cost per capita, $	% of total cost	2010 cost (millions, $)	% of total cost
Michigan	8,161.7	2.10	826	3,326.8	0.86	337	40.8	6,072.3	74.4
Minnesota	3,886.4	1.74	733	1,533.5	0.69	289	39.5	2,898.3	74.6
Mississippi	2,277.4	2.05	768	827.0	0.74	279	36.3	1,901.3	83.5
Missouri	4,603.6	1.83	769	1,790.4	0.71	299	38.9	3,676.0	79.8
Montana	870.8	1.73	880	335.0	0.67	339	38.5	666.8	76.6
Nebraska	1,166.5	1.61	639	491.3	0.68	269	42.1	879.8	75.4
Nevada	2,296.3	1.49	850	935.9	0.61	347	40.8	1,742.1	75.9
New Hampshire	959.9	0.92	729	376.5	0.36	286	39.2	714.7	74.5
New Jersey	6,175.2	1.70	702	2,540.7	0.70	289	41.1	4,632.8	75.0
New Mexico	2,232.9	2.77	1,084	914.2	1.13	444	40.9	1,680.2	75.2
New York	16,330.2	2.28	843	6,937.8	0.97	358	42.5	12,261.9	75.1
North Carolina	7,034.2	2.11	738	2,801.1	0.84	294	39.8	5,568.4	79.2
North Dakota	487.6	1.40	725	182.7	0.52	272	37.5	372.2	76.3
Ohio	8,519.8	2.10	739	3,404.6	0.84	295	40.0	6,447.2	75.7
Oklahoma	3,081.2	2.49	821	1,205.2	0.97	321	39.1	2,443.6	79.3
Oregon	3,520.2	2.08	919	1,486.7	0.88	388	42.2	2,534.6	72.0
Pennsylvania	9,544.2	1.92	751	3,895.5	0.78	307	40.8	7,487.0	78.4
Rhode Island	886.5	1.82	842	358.2	0.73	340	40.4	657.1	74.1
South Carolina	3,982.9	2.13	861	1,458.7	0.78	315	36.6	3,161.7	79.4
South Dakota	598.2	1.59	735	241.0	0.64	296	40.3	446.2	74.6
Tennessee	4,683.8	2.25	738	1,807.3	0.87	285	38.6	3,760.9	80.3
Texas	18,820.6	1.99	748	7,342.0	0.78	292	39.0	14,968.1	79.5
Utah	1,636.1	2.74	592	711.4	1.19	257	43.5	1,291.5	78.9
Vermont	513.0	1.66	820	212.2	0.69	339	41.4	377.6	73.6

(continued on next page)

Table 2

Estimate total, governmental, and binge drinking costs of excessive alcohol consumption, by state, 2010 (Sacks, Gonzales, & Bouchery, 2015) *(continued)*

	Total cost			Cost to government				Binge drinking	
	2010 cost (millions, $)	Cost per drink, $	Cost per capita, $	2010 cost (millions, $)	Cost per drink, $	Cost per capita, $	% of total cost	2010 cost (millions, $)	% of total cost
Virginia	6,126.0	2.06	766	2,496.6	0.84	312	40.8	4,782.4	78.1
Washington	5,805.1	2.23	863	2,479.6	0.95	369	42.7	4,286.2	73.8
West Virginia	1,334.9	2.20	720	510.0	0.84	275	38.2	1,051.5	78.8
Wisconsin	4,452.9	1.62	783	1,845.4	0.67	324	41.4	3,387.1	76.1
Wyoming	593.1	2.33	1,052	239.2	0.94	424	40.3	459.2	77.4

Figures

Figure 1

Excise tax receipts on alcohol as a percent of total cost of consumption to society, U.S., 2010

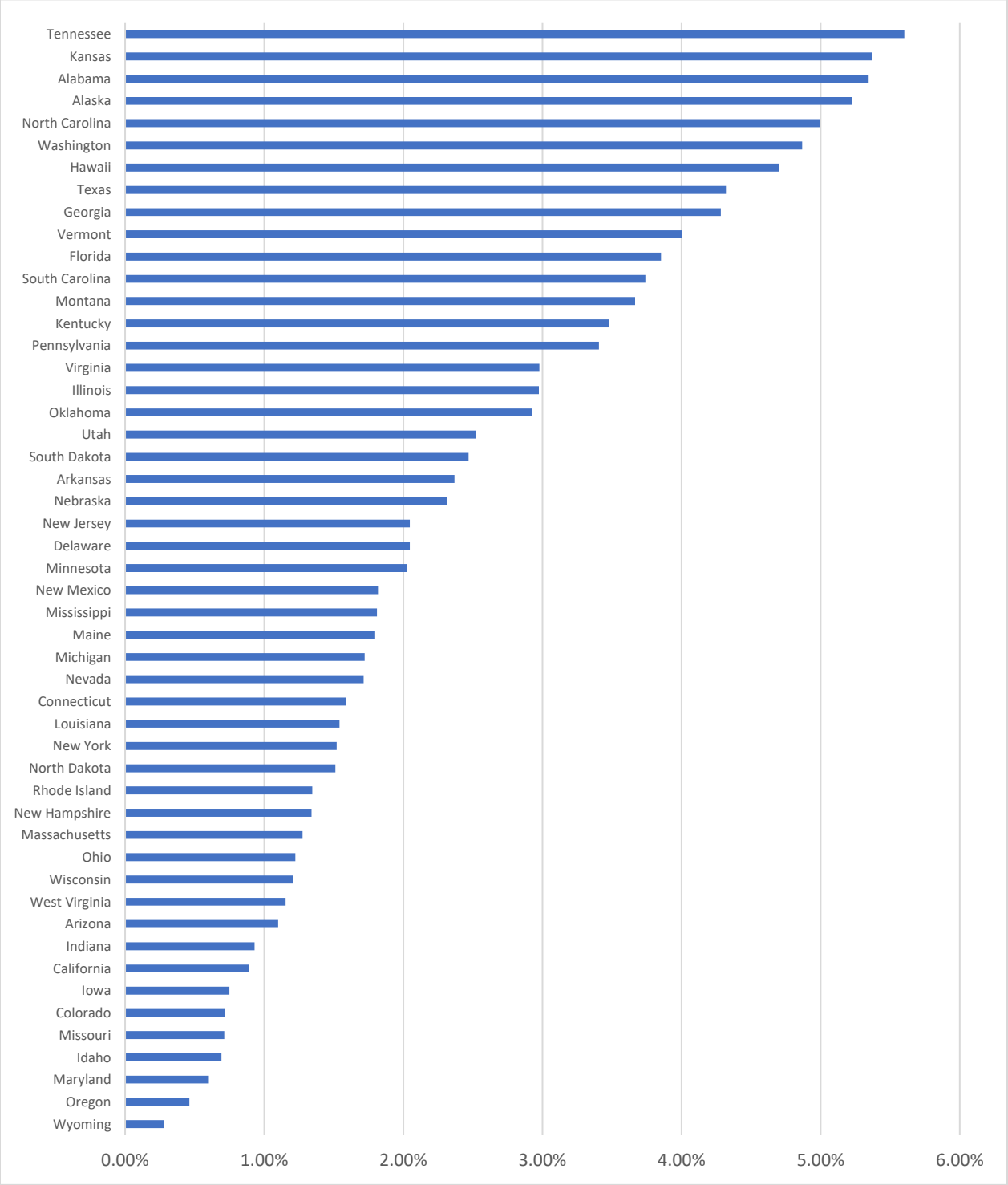

Figure 2

Regression of PCPI by state vs per capita gallons of ethanol consumed by state, U.S., 2018

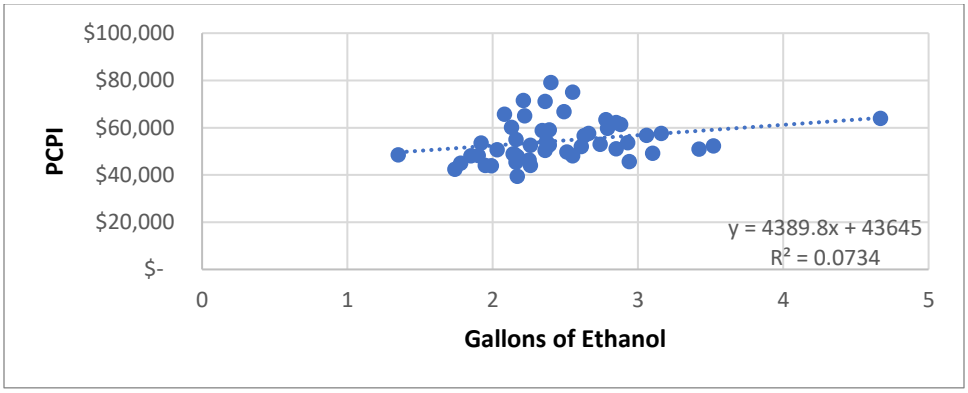

Figure 3

Regression of PCPI by state vs per capital gallons of wine ethanol consumed by state, U.S., 2018

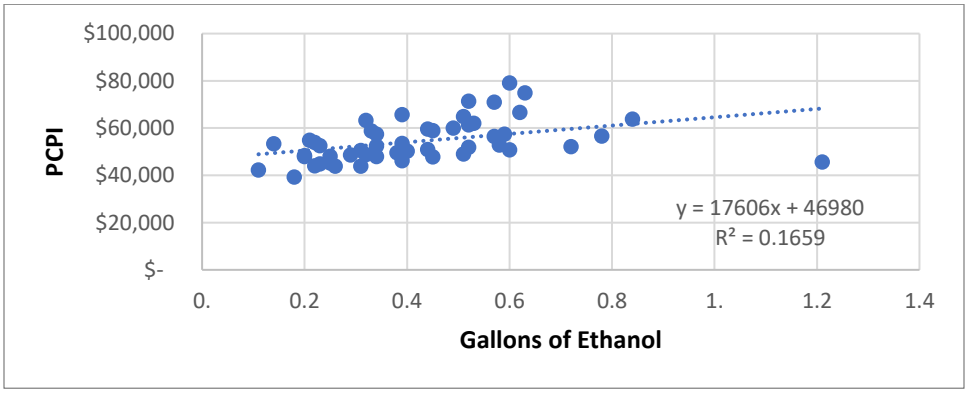

Figure 4

Regression of Education Index by state vs per capita gallons of ethanol consumed by state, U.S., 2018

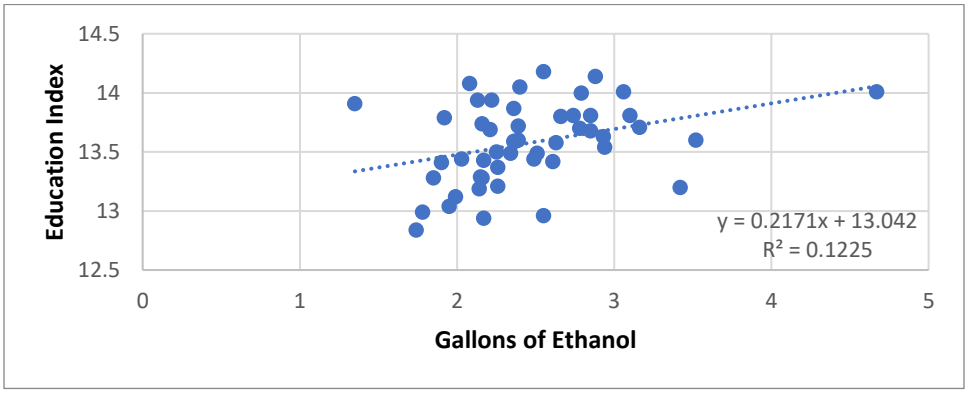

Figure 5

Regression of Education Index by state vs per capita gallons of wine ethanol consumed by state, U.S., 2018

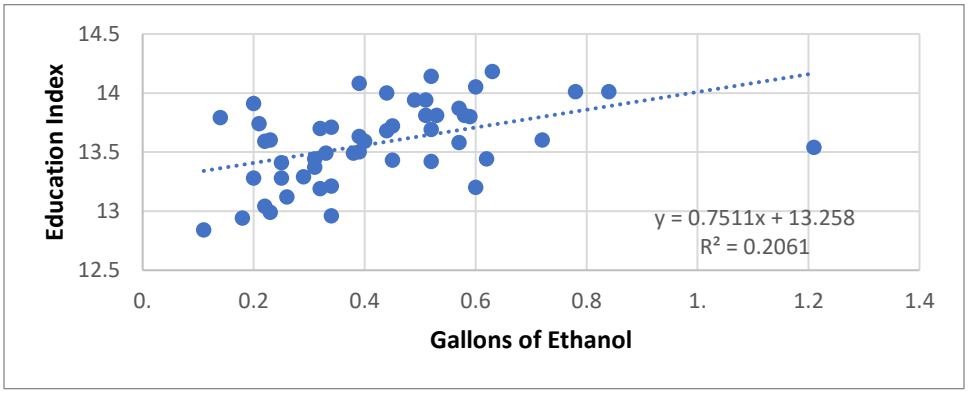

Figure 6

Regression of PCPI by state vs wine excise tax by state, U.S., 2018

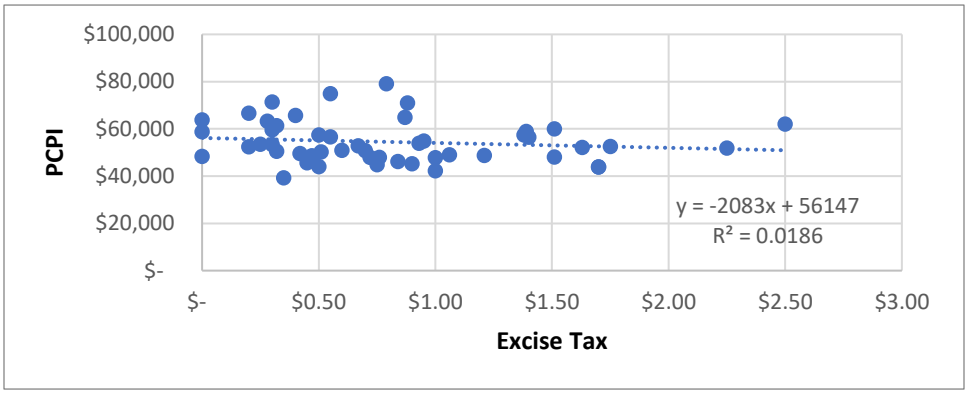

Figure 7

Regression of Education Index by state vs wine excise tax by state, U.S., 2018

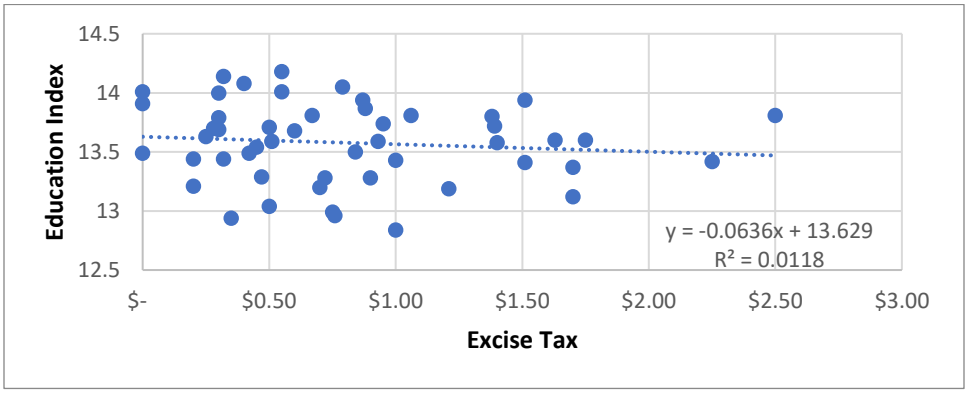

Figure 8

Regression of PCPI by state vs cigarette excise tax by state, U.S., 2018

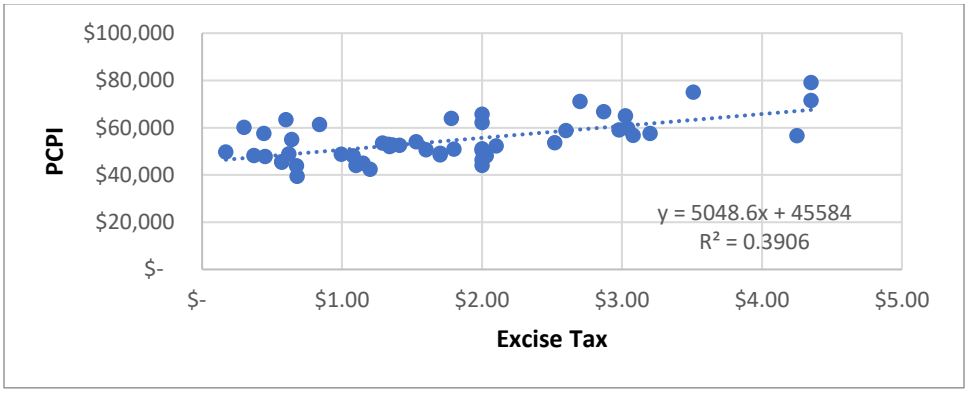

Figure 9

Regression of education index by state vs cigarette excise tax by state, U.S., 2018

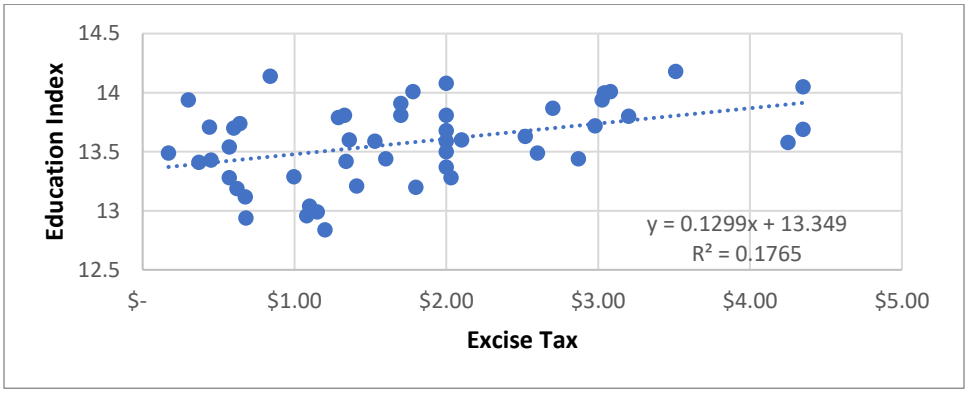

Figure 10

Regression of wine consumption by state vs wine excise tax by state, U.S., 2018

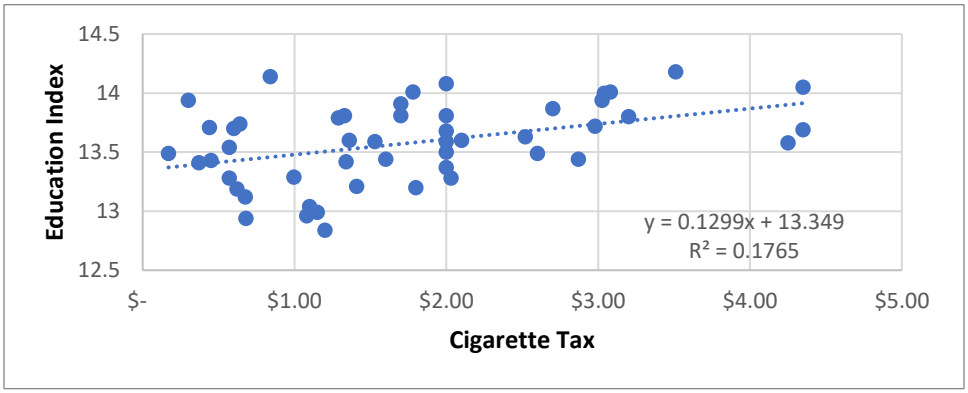

Figure 11

Regression of smoking rate by state vs cigarette excise tax by state, U.S., 2018

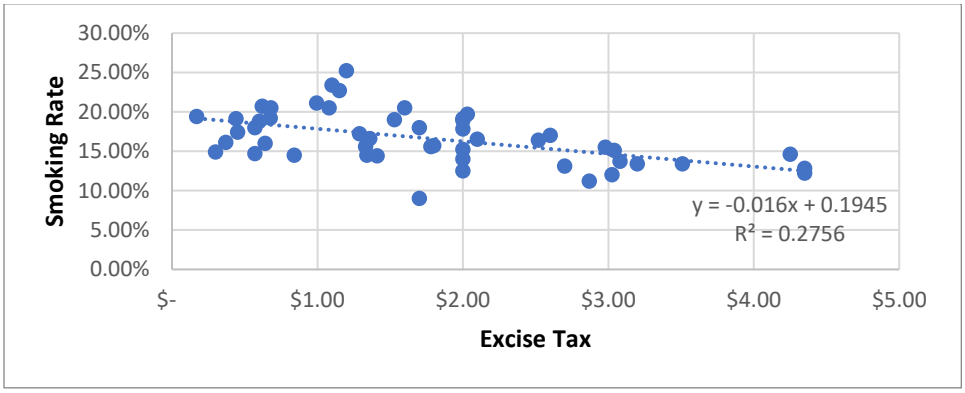

Figure 12

Regression of PCPI by state vs per capita gallons of spirit ethanol consumed by state, U.S., 2018

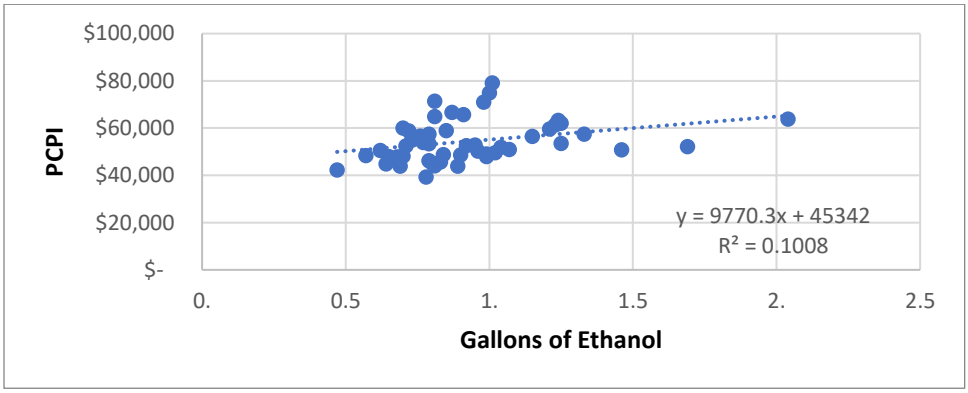

Figure 13

Regression of education index by state vs per capita gallons of spirit ethanol consumed by state, U.S., 2018

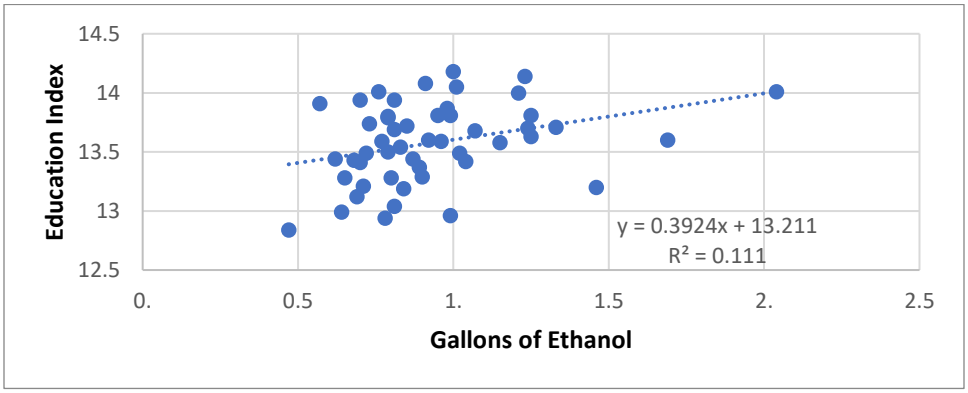

Figure 14

Regression of PCPI by state vs per capita gallons of beer ethanol consumed by state, U.S., 2018

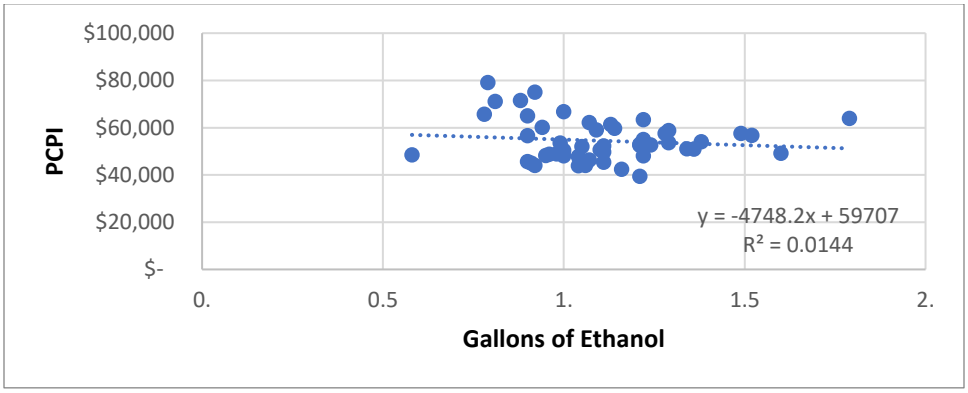

Figure 15

Regression of education index by state vs per capita gallons of beer ethanol consumed by state, U.S., 2018

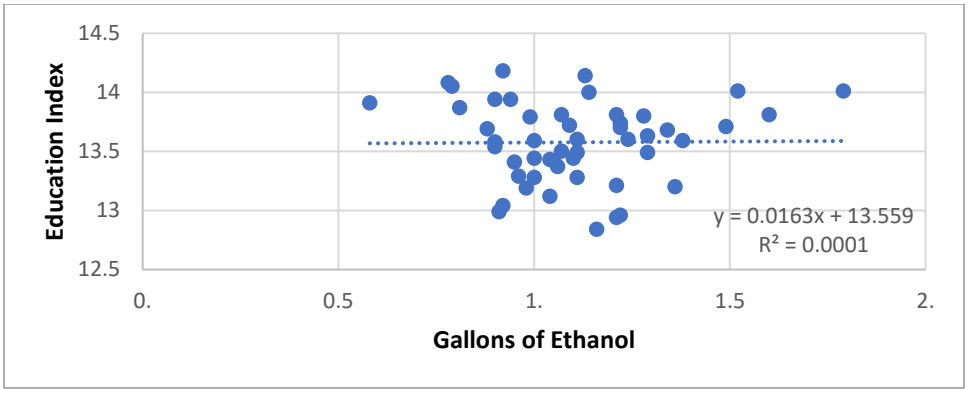

Figure 16

Regression of PCPI by state vs spirit excise tax by state, U.S., 2018

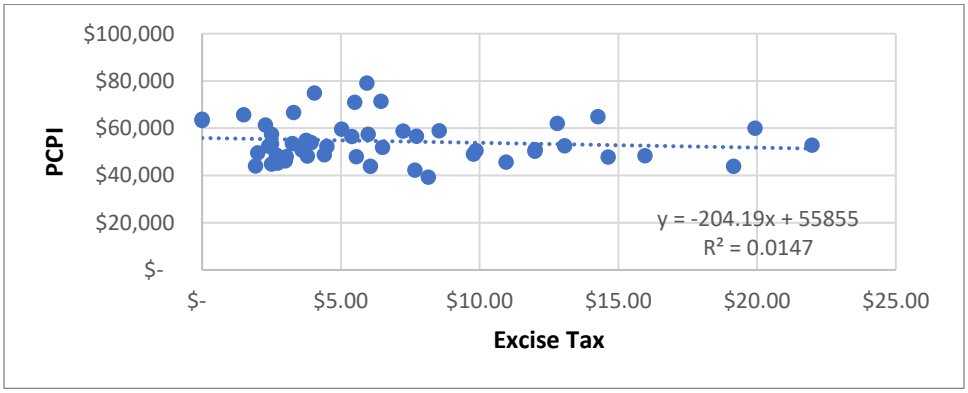

Figure 17

Regression of education index by state vs spirit excise tax by state, U.S., 2018

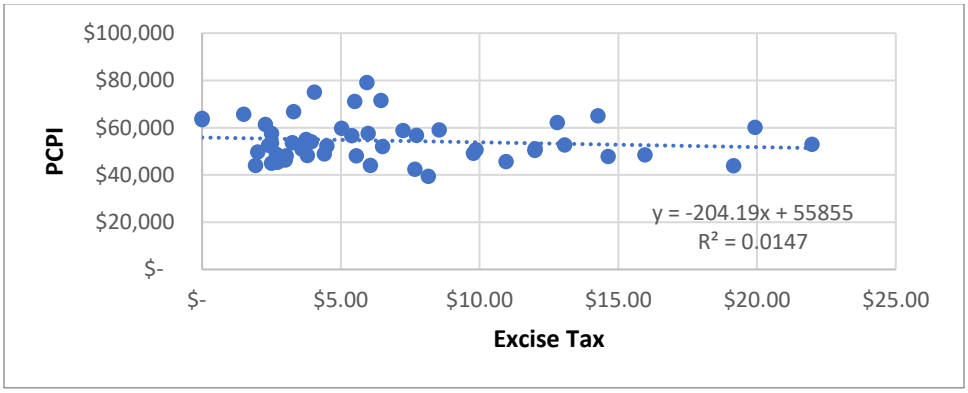

Figure 18

Regression of PCPI by state vs beer excise tax by state, U.S., 2018

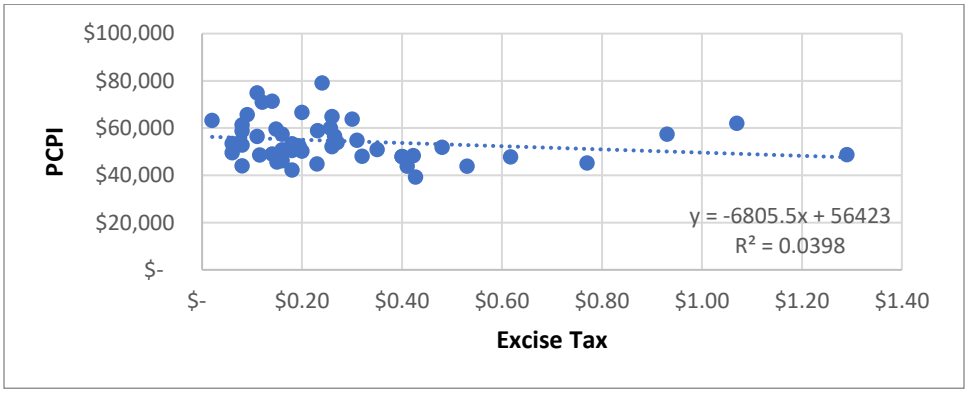

Figure 19

Regression of education index by state vs beer excise tax by state, U.S., 2018

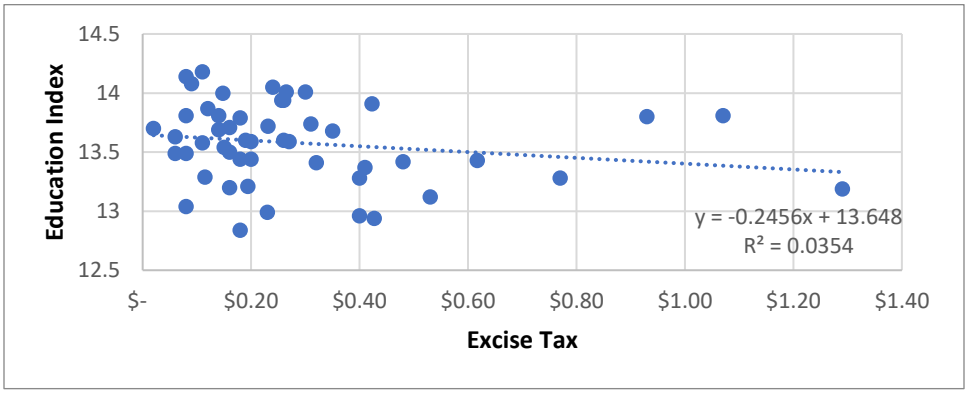

Figure 20

Regression of per capita gallons of spirit ethanol consumed by state vs excise tax by state, U.S., 2018

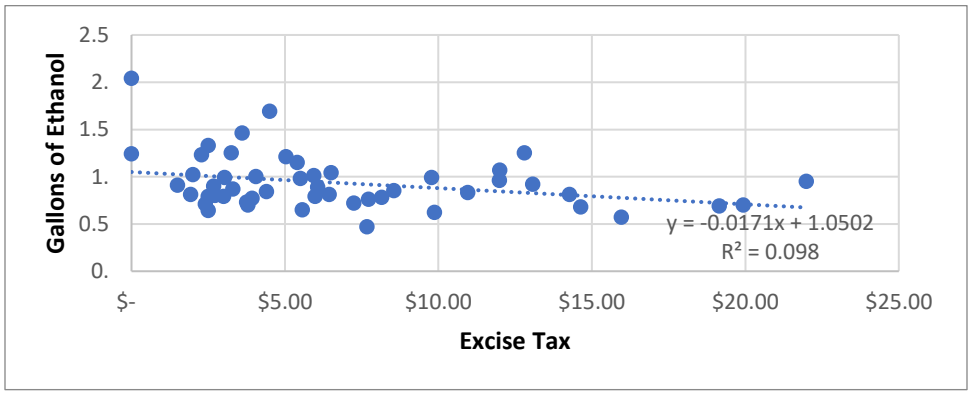

Figure 21

Regression of per capita gallons of beer ethanol consumed by state vs excise tax by state, U.S., 2018