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**A PANEL DATA ANALYSIS OF ALCOHOL CONSUMPTION: WHAT'S
PARTY GOT TO DO WITH IT?**

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Several studies in psychology find a significant link between personal values and alcohol consumption. Yet, very few studies by economists examine the effect of personal values or attitudes on alcohol consumption. A pertinent recent study by Zhang and Shrum (2008) found that states with more individualistic attitudes have higher levels of alcohol consumption, causing some readers to infer that conservatives drink more than liberals. However, Zhang and Shrum's (2008) cross-sectional estimates are misleading due to significant unobserved heterogeneity bias. In this study, I estimate a panel data model with fixed effects and a time-variant measure of political ideology, which proxies for personal values or attitudes. I find significant differences in the consumption of beer, wine, and spirits between liberal and conservative states even when controlling for economic, demographic, and regulatory factors.

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I. INTRODUCTION

According to a recently conducted study (Bouchery et al., 2011), the total economic cost of excessive alcohol consumption in the United States has averaged at almost two dollars per drink in 2006, or 224 billion dollars in total. When measuring these costs in per-capita terms, the authors conclude that economic costs reach about \$746 per person. These nontrivial costs arise from alcohol-related productivity losses, health care costs, criminal activity, and fatal motor vehicle accidents. Therefore, understanding the determinants of alcohol demand is of paramount importance.

While there are many psychological and sociological studies measuring the effect of personality traits and personal values on alcohol consumption, there is no empirical analysis of such a relationship conducted by economists. To fill this void, this study estimated the effect of political ideology on alcohol consumption using a longitudinal panel of 50 states from 1969 to 2008. Several psychological studies find a link between alcohol consumption decisions and impulsive consumption traits (Grau and Ortet, 1999; Granö et al., 2004; Ramanathan and Menon, 2008), as well as between impulsive consumption and self-construal (Kacen and Lee, 2002; Zhang and Shrum, 2008). Self-construal measures how an individual may feel about their connection to society and their immediate family, which is most commonly reflected in a measure of individualism and collectivism (Zhang and Shrum, 2008). Political ideology, being another possible measure of self-construal, has been shown to capture differences in personal values, norms, and individual attitudes towards themselves and the role of government in society (Caprara et al., 1999; Napier and Jost, 2008; Jost et al., 2009). As a result, political ideology may have a significant effect on alcohol demand as a consumer preference factor.

II. PREVIOUS RESEARCH

While there is much research on the relationship between personality traits and the consumption of alcohol, few studies have specifically explored the relationship between personal values and alcohol consumption (Shim and Maggs, 2005). Personal values are relatively subjective, and it is even more uncommon for them to be utilized as a preference factor in the demand for alcohol. Because the use of personal values as a measure of preferences in demand models is rather unusual in economics research, I will first survey the relevant psychological literature on personal values, followed by economics literature on alcohol consumption.

Impulsive and Hedonic Consumption of Alcohol

Impulsive consumption occurs when one's desire to consume overcomes their ability to self-regulate, and is generally unplanned. While impulsive consumption in general is not this paper's area of focus, alcohol is widely considered a hedonic product (consumed for pure pleasure) and is typically a product that highly related to impulsiveness (Granö et al., 2004; Grau and Ortet, 1999). Impulsiveness has also been considered a trait which decreases the ability of one to self-regulate their hedonic desires (Ramanathan and Menon, 2006).

Personal values have also been shown to directly influence the consumption of alcohol. Shim and Maggs (2005) develop a behavioral-hierarchical decision model to find that personal values are good at predicting college students' intentions to drink, rather than their impulsive consumption.

Measures of Self-Construal

Personal values and cultural norms fall under the category of self-construal, a term that describes how an individual would describe themselves in relation to society. As a foundation for current self-construal research, Hofstede (1984) shows that quality of life is affected by national-level cultural patterns. Through an analysis of employees of multinational companies, Hofstede finds that three factors explain 49 percent of the variation between the questions asked and the nationality of the employees. Through these findings, Hofstede creates four dimensions of a country's quality of life. The first dimension is power distance, which measures the acceptance of the inequality in power between citizens of a country. The second is individualism in a non-political sense, which measures the belongingness of members to a family. Third is masculinity, measuring the roles of gender in a society. Fourth is uncertainty avoidance, which measures the degree in which a culture attempts to avoid uncertainty by enacting rules and regulations.

While there are many measures of self-construal, the most relevant for this research paper is the individualism and collectivism dimension. There is much confusion in attempting to define the characteristics of individualism-collectivism constructs. Using surveys of student participants from both Chung-Ang University in South Korea and the University of Illinois, Triandis and Gelfand (1998) explore the existence of multiple dimensions of traditionally one-dimensional individualism-collectivism constructs. They argue that there are two dimensions to both individualism and collectivism: A horizontal aspect empathizing equality among peers, and a vertical aspect indicating uniqueness. This is different from other methods, in that vertical individualism and collectivism are both characterized by uniqueness, while the horizontal measure is characterized by group adherence for both. This is true for equality as well, while

individualism is unique in that it is characterized by a sense of high freedom and market-based pricing. Triandis and Gelfand not only conclude that consideration of two-dimensional constructs is important, they find that vertical individualists are more competitive, while horizontal individualists are more self-reliant. In addition, they find that vertical collectivists are authoritarian and sociable, while horizontal collectivists seemed to be sociable and interdependent.

To analyze individualism and collectivism patterns across the U.S. states, Vandello and Cohen (1999) create a state-level index that consists of eight variables covering social, political, religious, and economic domains for the 1980-1996 period. Vandello and Cohen find high levels of individualism in “Mountain West” and “Great Plains” states, while Southern states are more associated with collectivism.

Conway et al (2006) analyze how state-level culture and politics balance between the “collective good” and individual freedom. Using the state-level index created by Vandello and Cohen (1999) and the Legal Restriction Index (LRI) from Savageau and Loftus (1997), they find evidence of the LRI being positively correlated with collectivism. Interestingly, the authors also conclude that the degree of collectivism may not only represent a state population’s attitudes, but also the creation of their restrictive laws. This positive correlation between collectivism and restriction reaffirms the speculations of Triandis and Gelfand (1998), who believed that legislators in more collectivist regions tend to use legislation as a way to restrict undesirable behavior. Conway et al. note a difference between the findings of the state-level and cross-national models, and conclude that their state-level analysis may be biased because the Vandello and Cohen index does not fully account for the level of collectivism.

Self-Construal as a Determinant of Impulsive Behavior

Self-Construal has been linked to impulsive hedonic consumption, or the consumption of goods for pure pleasure on an impulse. This connection has been used to explain many problems in the United States, such as high personal debt ratios (Vohs & Faber, 2007) and alcohol consumption (Zhang and Shrum, 2008). The connection between culture and impulsive consumption is shown by Kacen and Lee (2002) through the implementation of surveys in several countries, which were picked based on Hofstede's individualism ranking. In their preliminary study, Kacen and Lee find that the correlation between impulsive consumption and personality is 0.64 for individualist nations and only 0.4 for collectivist nations. When accounting for other variables, there was a lesser correlation between individualism-collectivism and impulsive consumption habits (0.49 and 0.42, respectively).

While some studies show that those in collectivistic societies tend to limit their hedonic consumption due to the presence of others that would disapprove of the behavior, these results might be reversed in a collectivist culture sympathetic to drinking, where the presence of peers may encourage impulsive consumption (Zhang and Shrum, 2008).

Measures of Political Ideology

One of the most prominent and time-variant measures of personal values and attitudes in the United States is political ideology. Berry et al. (1998) offer a thorough analysis of political values by measuring ideology on the basis of a liberal-conservative scale, rather than an individualism-collectivism construct. The study uses a state-level panel-data analysis for the years 1960-1993 for each U.S. district, with an emphasis on state government and citizen ideology measures. They create three indexes to measure both citizen and government ideology,

and find that their overall measure, the “BRFH”, is superior to other measures of state ideology in that it accounts for variability within political parties; the measure is not solely based on which political party is in power but rather sensitive to public opinion of government, which may address the omitted variable bias in the Vandello and Cohen indicator used in Conway et al (2006). Berry et al. (1998) recommend that their political ideology measures be used to assess changes in political power and consequences of policy bipartisanship. Berry et al. (2010) reaffirms the validity of the model presented in Berry et al. (1998) by using the pooled-cross-sectional time-series, which helps eliminate the unobserved variations between states. The study ultimately concludes that previously constructed measurements relying on the unadjusted ADA and COPE ratings are superior to measurements relying on the adjusted ratings. Compared to the aforementioned indexes, the Berry et al. ideology index is the only available time-variant self-construal measure, making it suitable for a fixed effects panel data model.

Personality has been shown to be linked with political orientation, as well as the differences in the set of moral foundations between the left and right-wing (Graham et al., 2009). Specifically, right-wing orientation in both the United States and other democratic countries has been associated with a higher degree of subjective well-being (Napier and Jost, 2008), and a higher degree of conscientiousness in the Italian political system (Caprara et al., 1999).

Self-Construal and Alcohol Consumption

Personal values have been shown to determine the level of alcohol consumption. Using the index developed by Vandello and Cohen (1999), Zhang and Shrum (2009) measure the effects of self-construal on impulsive beer consumption. In part one of their study, Zhang and Shrum employ data from 42 countries for the year 1999 to estimate the effect of individualism on per-

capita beer consumption. Controlling for temperature, income, and “masculinity”, they find that individualism is positively correlated with most teen and adult drinking behaviors. Because their alcohol consumption model is estimated for a cross section of states and is lacking economic theory, there is a high probability that the Zhang and Shrum estimates suffer from the omitted variable bias. In part two of their study, the authors conduct surveys with business students at the University of Texas to find that those with independent traits exhibit more impulsive consumption habits than those with interdependent traits. On the matter of beer consumption, they find that independents increase their consumption in the presence of peers, while interdependents actually decrease their beer consumption behavior. These estimates are also likely to be biased as business school undergraduates were the exclusive participants in the study, which does not accurately portray the entire population.

Moreover, Zhang and Shrum’s findings are highly suspect, since collectivistic societies tend to follow the group. United States may be unique in that it is highly individualistic and is a relatively pro-drinking nation. Those that are relatively interdependent are more likely to conform with group norms, while independents typically seek their own agendas (Ybarra and Tramifow, 1998). Therefore, alcohol consumption may be closely linked to those with an interdependent self-construal in the United States if it is considered a social norm.

Alcohol Demand Models for the United States

Alcohol consumption is a heavily researched topic in economics. Freeman (2000) creates a fixed effects model using state-level panel data for the period 1961-1995. Freeman uses beer in gallons of ethanol per-capita as the dependent variable and fixed effects to control for unobserved religious beliefs and cultural norms. Freeman finds that an increase in state excise

taxes has little effect on consumption. He also finds that alcohol is income-inelastic in both the short and long run, and a lack of evidence indicating that alcohol demand is pro-cyclical. In a newer version of his previous study, Freeman (2011) uses both Pesaran's (2006) common correlation effects (CCE) estimator and a traditional fixed effects model for the period 1970-2007. According to Freeman, Pesaran's CCE estimator is superior to fixed-effects when measuring beer demand because it is more effective in controlling for unobserved heterogeneity. Along with the logarithmic functions of income, taxes, and cyclical variables, Freeman uses dummy variables to represent factors such as religious belief and age. Contrary to the findings of Freeman (2000), Freeman (2011) finds evidence that beer is a normal good, its consumption is very responsive to state age distribution, and that it is pro-cyclical.

Similar to Freeman's studies, Nelson (2001) measures the effect of various alcohol regulations in addition to the substitution effects between alcoholic beverages. Nelson believes that there is redundancy in alcohol advertising regulations because they tend to have unintended consequences, which can be an increased level of consumption for beverages that are not as heavily regulated. For his data, Nelson uses state-level panel data for 45 states for the years 1982-1997, a total of 720 observations. He separates license states and non-license states with dummy variables to account for different regions. Like Freeman (2000) and Freeman (2011), Nelson specifies the model in terms of natural logarithms. Nelson finds that restrictive laws for one beverage can result in substitution towards another alcoholic beverage. He also finds that a monopoly control on spirits (state-controlled) can increase the consumption of wine but reduces the overall amount of alcohol consumption per-capita.

Alcohol Demand Models for Other Countries

I also survey panel-data models of alcohol consumption from other countries. Ogwang and Cho (2009) develop beverage-specific demand models for Canadian alcohol consumption. The study was conducted in light of both the importance of alcohol as a source of government revenue, and the uncertainty of its consumption effects. The study consists of panel data estimation with fixed-effects for Canadian provinces for the years 1981-2004, with per-capita alcohol consumption as the dependent variable, and a focus on price, income, and unemployment effects as the independent variables. On the contrary to Freeman (2011), Ogwang and Cho find that increasing the beer and spirits taxes do not decrease consumption in favor of wine. However, Canada's consumption patterns may in fact be different from the United States. They also find that income is important in wine and beer consumption, but not spirits, while unemployment is an important determinant for beer only.

Ramful and Zhao (2006) examine the socioeconomic and demographic factors of Australian alcohol consumption by using surveys from 1991-2001. Ramful and Zhao conclude that all types of alcohol have negative price elasticities and relate to different groups. Australia is also unique in that the young population consumes more spirits due to the availability of pre-mixed drinks.

Fogarty (2010) studies the previous literature of demand determinants for the three types of alcohol and estimates his own model of alcohol consumption. After reviewing previous literature, Fogarty concludes that elasticity estimates for alcohol vary widely depending on what type of estimation technique is used, as well as the frequency of data collected and the time period analyzed. Fogarty also concludes that alcohol is income-elastic, but the degree of elasticity has been falling since the mid 1960's and consumers tend to respond with inventory

behavior versus substitution behavior. With the exception of wine, Fogarty believes there is little evidence that suggests alcohol demand varies between most countries.

Colen and Swinnen (2011) analyze beer consumption in 104 countries over the period 1970-2005, using average per-capita beer consumption and percentage of beer consumption out of all alcohol consumption as dependent variables. They use dummy variables to account for “beer drinking countries”, religion, temperature, and rainfall. Colen and Swinnen find that beer consumption increases with income, but eventually falls. They also conclude that globalization has caused beer drinking nations to consume less beer and more wines and spirits. However, wine and spirit drinking countries do not seem to drink more beer out of total consumption.

In this study, I rely on Freeman’s model specification and the citizen ideology index created by Berry et al. to estimate the effect of personal values on alcohol consumption. A more direct measure of individualistic versus collective values like in Vandello and Cohen would be ideal, but the lack of a time-variant individualism-collectivism indicators makes Berry et al.’s political index the only variable suitable for panel data estimation with fixed effects. Berry et al.’s variable can be a reasonable proxy for self-construal or personal values because it is collinear with Vandello and Cohen index, which is also collinear with other measures of political ideology.

III. PROPOSED METHODOLOGY

Hypothesis and Assumptions

As discussed in the literature review, Zhang and Shrum (2009) is one of the very few studies that estimate the effect of personal values on alcohol consumption. However, Zhang and Shrum estimates are highly suspect because their cross-sectional regression analysis suffers from

unobserved variable bias and ad-hoc model specification (i.e. lack of economic theory). To correct for this problem, I will estimate the effect of political ideology, a time-variant preference measure, on alcohol consumption using a longitudinal panel of 50 U.S. states over the 1969-2008 period. The Berry et al. index is the only year-by-year time-variant variable of the three, making it uniquely suited for a panel regression analysis with fixed effects as controls for unobserved heterogeneity. The scatter plot shown in Figure 1 reveals a small positive relationship between alcohol consumption and Berry et al.'s (2010) citizen ideology index, which is consistent with a notion that more ideologically conservative states (i.e. states with a lower index value) may exhibit lower levels of alcohol consumption due to personal values or moral reasons.

Data

Similar to Freeman (2011), I use a panel dataset of 50 U.S. states over a time period of 1969-2008. An even longer timespan is preferred, but the lack of variables across all desired years limits the analysis to the aforementioned timeframe. Because shipments are highly correlated ($r=.99$) with consumption and are available over a longer time span, I use beer shipments per capita instead of consumption for my dependent variable, as in Freeman (2011). For wine and spirits, I use consumption per capita as the dependent variable.

There are two noticeable trends in aggregate consumption patterns of beer in the United States. (Figures 2 through 4) The first trend is the rise in shipments per capita (from 16 gallons to 25 gallons per capita) from the late 1960's to the early 1980's. The second trend is the gradual decrease in shipments per capita after this period. When looking at state-level consumption patterns, there is a large difference between the highest and lowest consuming states. The highest state (Nevada), at times, consumes over three times more alcohol per capita than the lowest state

(Utah). I expect that the high consumption rate in Nevada is linked to their tourism (Las Vegas), and the low consumption level in Utah is attributed to the high population of Mormons. The fixed effects regression is designed to control for these and other unobserved differences.

I choose two (citizen and government ideology) out of the three political ideology indicators developed by Berry et al (2010) as a measure of personal values or consumer preferences that could affect the demand for alcohol. Berry et al.'s citizen ideology indicator, which is available for all states, ranges from 0 to 100 (0 being the most conservative and 100 being the most liberal). The citizen ideology indicator is constructed from the voting preferences of the active electorate for federal and state-level representatives:

$$citideology = (incsupp * incideo) + (chalsupp * chalideo) \quad (1.1)$$

where *incsupp* and *chalsupp* represents the proportion of the electorate that supported the incumbent candidate and the challenger, respectively. The variables *incideo* and *chalideo* represent the ideology score of the incumbent candidate and hypothetical challenger, respectively. Many earlier measures of citizen ideology did not account for losing candidates, therefore they were not an accurate portrayal of overall citizen ideology.

An alternative measure of ideology to be considered for robustness reasons is government ideology, which is based on interest group ratings of members of Congress and used to construct the citizen ideology indicator. Berry et al also use election returns for congressional races, and data on the party composition of state legislators and party affiliation of governors.

Figure 5 shows that the average unadjusted state-level citizen ideology indicator varies substantially over time and across states. The citizen ideology indicator shows that on average, the United States has been historically left-leaning by a small degree.

A survey of the literature shows the following variables to be among significant determinants of alcohol consumption: age (Kerr et al, 2004), real alcohol prices/taxes (Freeman, 2000) state alcohol regulations (Pulito and Davies, 2010), income, unemployment rate, gender, and race (Freeman, 2011). To account for economic effects, I include disposable personal income and unemployment rate from the Bureau of Labor Statistics. I incorporate tax data for beer, wine, and spirits from Ponicki (2009). For demographic variables, I use the proportion of the population that is ages 20 to 24, ages 65 and up, in addition to the proportion of males and the proportion of the population that is white. As shown in Pulito and Davies (2009), state alcohol controls have a significant effect on alcohol consumption. To control for state policy effects on alcohol consumption, I construct an ordinal variable numbered 1 through 4, where the highest number represents the states with the strictest alcohol regulations. The source of state alcohol regulation classification is the National Alcohol Beverage Control Board (NABCB).

As an alternative to ordinal alcohol control variable, I will use the Fraser Institute's economic freedom index as an overall measure of restrictions on economic activity in a state. Hofstede (1980) creates a similar index to measure cross-national beliefs. The economic freedom index should theoretically be negatively correlated with the LRI index (although there is a lack of data to test this hypothesis), due to the fact that they both measure restrictive laws. However, it is noted that the LRI index is a measure of both social and economic restrictions (taxes, labor market regulations, government size), while the freedom index is measuring purely economic restrictions.

All of the aforementioned variables are summarized in Table 1 (in Appendix).

Empirical Framework

To test the effect of political ideology on alcohol consumption, I will estimate a two-way fixed effects model, similar to Freeman (2011), for each type of alcohol (beer, wine, and spirits):

$$\ln(\text{beercap})_{it} = \alpha + \sum_{j=1}^{11} \beta_j X_{it}^j + h_i + v_t + \varepsilon_{it} \quad (1.2)$$

$$\ln(\text{winecap})_{it} = \alpha + \sum_{j=1}^{11} \beta_j X_{it}^j + h_i + v_t + \varepsilon_{it} \quad (1.3)$$

$$\ln(\text{spircap})_{it} = \alpha + \sum_{j=1}^{11} \beta_j X_{it}^j + h_i + v_t + \varepsilon_{it} \quad (1.4)$$

where h_i are the state-specific fixed-effects and v_t are year-specific fixed effects. X_{it}^j is a matrix of, at most, 11 economic and demographic variables as well as the political ideology variable.

For each of the model specifications, I estimate six different outcomes: 3 with the citizen ideology indicator and 3 with the government ideology indicator. For both indicators, I first estimate a model with baseline variables and the alcohol control variable to account for regulations. The baseline model does not include beer and wine taxes because they contain many missing values. In the second model specification, I use the economic freedom indicator in place of the ordinal control variable. In the third model specification, I include wine and spirits taxes, which significantly reduce the number of usable observations and force a rather time-invariant alcohol control variable to drop out.

I conduct several tests to arrive at the proper empirical technique for estimating the aforementioned models. The variance inflation test (VIF) indicates that there is no multicollinearity between the regressors in the baseline model. The Ramsey (1969) Regression Equation Specification Error Test (RESET) indicates the presence of statistically significant

omitted variable bias in a pooled OLS regression. In addition, the Breusch and Pagan Lagrange multiplier test shows that the variance of the error term in the OLS model is not equal to zero, ruling out the pooled OLS model in favor of using either the fixed or random effects model. The Hausman test shows that the fixed effects model is consistent but the random effects model is not. For these reasons, I utilize two-way fixed effects in order to control for state and year unobserved heterogeneity as in Freeman (2011). However, the modified Wald test for group-wise heteroskedasticity, Wooldridge test for autocorrelation in panel data, and Pesaran test of cross sectional independence reveal the presence of heteroskedasticity, serial and contemporaneous correlation in the error term. For these reasons, panel data models are often estimated via feasible generalized least squares (FGLS) or OLS with panel-corrected standard errors (PCSE). According to Beck and Katz (1995), OLS with panel-corrected standard errors (PCSE) outperforms FGLS when sample size is finite or when $T < N$, as is the case here. Therefore, I estimate the model using the OLS-PCSE estimator with state and year fixed effects. Test results are shown in Tables 1 through 3.

IV. RESULTS AND ANALYSIS

The regression results in Table 2 indicate that per capita beer consumption is positively and significantly correlated with government and citizen ideology measures, meaning that states with a predominantly left-leaning philosophy consume more beer, on average. Both the citizen and government ideology coefficients are significant when the alcohol control variable is present, indicating that the significance of political ideology is not a result of politically-oriented alcohol control policies. However, the elasticity or responsiveness of beer consumption to changes in political ideology is rather small (the coefficients, which represent elasticity, range from 0.003 to 0.02). In the second model specification where economic freedom replaces the alcohol control

variable, the citizen ideology coefficient is insignificant. However, the government ideology coefficient remains significant in the fifth model, where economic freedom also replaces alcohol control. The coefficient estimates for income and unemployment indicate that beer is a pro-cyclical and normal good, which is consistent with Freeman's (2011) findings. The economic freedom index appears statistically significant only once and has a negative coefficient, implying that states with more *laissez-fair* policies have lower levels of per capita beer consumption, *ceteris paribus*. All of the coefficients are signed as expected with the exception of the proportion of males, which shows a negative effect on alcohol consumption. However, the male coefficient is only significant when wine and spirits taxes are included in the model, causing a significant loss of observations and probably leading to a biased sample of states.

The spirits regressions in Table 3 indicate a statistically significant positive correlation between per capita spirits consumption and citizen ideology only in one model specification: where alcohol taxes, which proxy for prices, are included. In this model specification, citizen ideology has the elasticity estimate of 0.02, similar to some elasticity estimates in the beer models. The remaining model specifications show either positive or negative effects of ideology on spirits consumption, but none of them are significantly different from zero. The male coefficients in the spirits regressions are similar to those in the beer model specifications. The economic freedom index and alcohol control variable are insignificant in all model specifications.

Interestingly, the results for the wine regression in column 1 of Table 4 produce a negative and significant coefficient for the citizen ideology index, implying that states with a right-leaning philosophy consume more wine, on average, than the left-leaning states. The remaining model specifications in Table 4 show no significant effect of either citizen or government ideology on

wine consumption. The economic freedom index and alcohol control variable are also insignificant in all six wine model specifications.

The lack of consistently significant estimates for political ideology in the wine and spirits models is somewhat curious. This result could be driven by the differences in preferences or values for different types of alcohol that political ideology might capture. Or this result might be driven by a sample bias induced by missing observations. When all taxes are included in the regression, the number of observations is severely reduced, forcing several states to drop out. As a result, I would treat the estimates for the effect of political ideology on wine and spirits consumption with caution given the lack of robustness. In contrast, the results for the effect of political ideology on beer consumption are rather robust. These results also overturn the conclusion that conservatives tend to drink more beer, as implied by Zhang and Shrum's (2008) study. Another interesting observation is that political and government ideologies still have a statistically significant effect even when controlling for state alcohol regulations.

V. CONCLUSION

In this study, I show that political ideology has a significant effect on the consumption of alcohol in the United States, even after accounting for demographic, economic, and regulatory control factors. Specifically, I find that states with a more liberal ideology tend to consume, on average, higher levels of beer per capita. The effect of political ideology on wine and spirits consumption is less conclusive. The significance of political ideology can be attributed to the fact that the left and right-leaning ideologies differ in their self-construal, particularly in their beliefs about themselves in relation to society and the role of government.

One of the peculiar results in this study is that left-leaning states tend to drink more beer, while the right-leaning states might drink more wine. Although possibly spurious, this result might reflect the differences in personal values, captured in political ideologies, towards the social context of alcohol consumption. Further research should examine why these orientations may be associated with higher or lower consumption preferences.

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Table 1. Variable Definitions and Summary Statistics

<i>Variable</i>	<i>Description</i>	<i>Mean (Stand. Dev.)</i>	<i>Min (Max)</i>
$beercap_{it}^1$	Shipments (in gallons) of beer to state i in year t	22.28 (4.56)	7.42 (39.56)
$winecap_{it}^2$	Shipments (in gallons) of wine to state i in year t	1.66 (0.93)	0.21 (5.4)
$spiricap_{it}^2$	Shipments (in gallons) of spirits to state i in year t	1.62 (0.73)	0.37 (6.77)
$citideology_{it}^3$	Citizen ideology indicator for state i in year t	47.09 (16.48)	0.96 (95.97)
$govideology_{it}^3$	Government ideology indicator for state i in year t	49.02 (24.44)	0 (99.39)
$dispincome_{it}^4$	Real disposable income per capita for state i in year t	3724.44 (1312.71)	1135 (8212.75)
$unemprate_{it}^4$	Percentage of the workforce that is unemployed for state i in year t	5.73 (1.97)	2 (18)
$beertax_{it}^2$	Excise taxes (in real dollars) per gallon of beer for state i in year t	2.61 (2.76)	0 (19.84)
$winetax_{it}^2$	Excise taxes (in real dollars) per gallon of wine for state i in year t	0.29 (0.87)	0 (12.88)
$spirtax_{it}^2$	Excise taxes (in real dollars) per gallon of spirits for state i in year t	0.68 (0.67)	0.05 (3.39)
$young_{it}^2$	Percentage of population 20 to 24 for state i in year t	0.07 (0.01)	0.05 (0.11)
old_{it}^2	Percentage of population 65 and over for state i in year t	0.12 (0.02)	0.02 (0.19)
$white_{it}^2$	Percentage of population that is white for state i in year t	0.86 (0.09)	0.59 (0.99)
$male_{it}^2$	Percentage of population that is male for state i in year t	0.49 (0.007)	0.48 (0.51)
$control_{it}^5$	Ordinal control variable (ranging 0 through 3) measuring the degree of control for alcohol sales for state i in year t	-	-
$freedom_{it}^6$	Freedom level (0 to 10) for state i in year t	6.58 (0.62)	4.7 (8.5)

Data Sources:

1. Brewer's Almanac
2. (Ponicki, 2009)
3. (Berry et al., 2010)
4. Bureau of Labor Statistics
5. National Alcohol Beverage Control Board (NABCB)
6. Free The World

Table 2. Impact of political ideology on per capita beer consumption in United States

<i>Variable</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>
$\ln(\text{citideology})_{it}$	0.011** (0.005)	0.003 (0.005)	0.020** (0.008)	- 0.003*	- 0.003**	- 0.005**
$\ln(\text{govideology})_{it}$	-	-	-	(0.002)	(0.002)	(0.002)
$\ln(\text{dispincome})_{it}$	0.215*** (0.034)	0.309*** (0.041)	0.173*** (0.046)	0.217*** (0.035)	0.303*** (0.043)	0.184*** (0.048)
unemprate_{it}	-0.004*** (0.001)	-0.008*** (0.001)	-0.005*** (0.001)	-0.004*** (0.001)	-0.008*** (0.001)	-0.005*** (0.002)
$\ln(\text{beertax})_{it}$	-0.044*** (0.006)	-0.036*** (0.006)	-0.045*** (0.009)	-0.041*** (0.006)	-0.036*** (0.006)	-0.046*** (0.009036)
$\ln(\text{winetax})_{it}$	-	-	0.001 (0.008)	-	-	0.004 (0.008)
$\ln(\text{spirtax})_{it}$	-	-	0.006 (0.011)	-	-	0.008 (0.011)
young_{it}	1.289*** (0.398)	1.980*** (0.380)	0.942* (0.531)	1.107*** (0.406)	1.908*** (0.392)	1.033* (0.531)
old_{it}	-0.021 (0.345)	0.675 (0.416)	-0.112 (0.462)	0.123 (0.369)	0.829** (0.416)	0.048 (0.456)
white_{it}	0.596*** (0.099)	0.568*** (0.095)	1.148*** (0.125)	0.547*** (0.092)	0.570*** (0.088)	1.177*** (0.128)
male_{it}	-1.215 (0.799)	0.699 (0.757)	-2.459*** (0.933)	-1.101 (0.794)	0.753 (0.792)	-2.639*** (0.934)
$\ln(\text{control})_{it}$	-0.025* (0.013)	-	-	-0.021 (0.013)	-	-
$\ln(\text{freedom})_{it}$	-	-0.063* (0.038)	-	-	-0.056 (0.038)	-
<i>N</i>	1,983	1,345	1,040	1,979	1,342	1,040
<i>Pseudo-R2</i>	0.869	0.925	0.839	0.865	0.925	0.513

Notes: Panel-corrected standard errors are in parentheses with ***, **, and *, respectively, denoting significance at the 1%, 5%, and 10% levels. Columns 1 through 3 focus on citizen ideology, while columns 4 through 6 focus on government ideology. All six models include state and year fixed effects (coefficients not reported) and have corrections for heteroskedasticity, autocorrelation, and contemporaneous correlation. Sample includes as many as 50 states from 1969 to 2008.

Table 3. Impact of political ideology on per capita spirits consumption in United States

<i>Variable</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>
$\ln(\text{citideology})_{it}$	0.007 (0.006)	0.0006 (0.007)	0.022* (0.011)	-	-	-
$\ln(\text{govideology})_{it}$	-	-	-	-0.0008 (0.003)	-0.0028 (0.002)	0.004 (0.004)
$\ln(\text{dispincome})_{it}$	0.254*** (0.061)	0.361*** (0.065)	0.292*** (0.062)	0.265*** (0.053)	0.352*** (0.065)	0.308*** (0.062)
unemprate_{it}	-0.006*** (0.002)	-0.011*** (0.002)	-0.008*** (0.002)	-0.006*** (0.001)	-0.011*** (0.002)	-0.007*** (0.002)
$\ln(\text{beertax})_{it}$	-0.042*** (0.010)	-0.039*** (0.009)	-0.019 (0.016)	-0.041*** (0.009)	-0.036*** (0.009)	-0.018 (0.016)
$\ln(\text{winetax})_{it}$	-	-	0.019* (0.009)	-	-	0.020** (0.010)
$\ln(\text{spirtax})_{it}$	-	-	-0.055*** (0.018)	-	-	-0.057*** (0.019)
young_{it}	3.986*** (0.755)	3.292*** (0.702)	6.227*** (0.796)	4.034*** (0.652)	3.369*** (0.691)	6.278*** (0.804)
old_{it}	-1.003 (0.684)	-1.841** (0.733)	-1.982*** (0.681)	-1.181* (0.646)	-1.933*** (0.734)	-1.926*** (0.692)
white_{it}	0.480*** (0.170)	0.281** (0.122)	1.117*** (0.241)	0.472*** (0.146)	0.292*** (0.111)	1.122*** (0.246)
male_{it}	-0.388 (1.473)	-2.946** (1.332)	-1.842 (1.737)	-0.410 (1.328)	-3.172** (1.328)	-1.893 (1.763)
$\ln(\text{control})_{it}$	-0.029 (0.026)	-	-	-0.030 (0.026)	-	-
$\ln(\text{freedom})_{it}$	-	-0.029 (0.062)	-	-	-0.016 (0.060)	-
<i>N</i>	1,733	1,145	912	1,729	1,142	912
<i>Pseudo-R2</i>	0.952	0.971	0.949	0.952	0.971	0.949

Notes: Panel-corrected standard errors are in parentheses with ***, **, and *, respectively, denoting significance at the 1%, 5%, and 10% levels. Columns 1 through 3 focus on citizen ideology, while columns 4 through 6 focus on government ideology. All six models include state and year fixed effects (coefficients not reported) and have corrections for heteroskedasticity, autocorrelation, and contemporaneous correlation. Sample includes as many as 50 states from 1969 to 2003.

Table 4. Impact of political ideology on per capita wine consumption in United States

<i>Variable</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>
$\ln(\text{citideology})_{it}$	-0.042*** (0.014)	-0.0196 (0.018)	-0.011 (0.017)	-	-	-
$\ln(\text{govideology})_{it}$	-	-	-	-0.001 (0.006)	-0.002 (0.006)	0.004 (0.007)
$\ln(\text{dispincome})_{it}$	0.291*** (0.079)	0.637*** (0.109)	0.560*** (0.094)	0.289*** (0.096)	0.639*** (0.111)	0.567*** (0.090)
unemprate_{it}	-0.001 (0.002)	0.0003 (0.003)	0.002 (0.003)	-0.002 (0.003)	0.0001 (0.003)	0.002 (0.003)
$\ln(\text{beertax})_{it}$	-0.076*** (0.019)	-0.061*** (0.019)	-0.003 (0.018)	-0.077*** (0.019)	-0.062*** (0.018)	-0.004 (0.018)
$\ln(\text{winetax})_{it}$	-	-	-0.009 (0.013)	-	-	-0.013 (0.013)
$\ln(\text{spirtax})_{it}$	-	-	-0.108*** (0.024)	-	-	-0.108*** (0.024)
young_{it}	-0.761 (1.243)	-2.764*** (1.143)	-0.184 (1.151)	-0.760 (1.183)	-2.882*** (1.071)	-0.007 (1.113)
old_{it}	-2.763*** (1.010)	-1.771 (1.163)	-1.706 (1.339)	-2.892** (1.229)	-1.975* (1.114)	-1.859 (1.295)
white_{it}	0.956*** (0.297)	0.239 (0.266)	1.264*** (0.318)	0.977*** (0.293)	0.256 (0.254)	1.257*** (0.314)
male_{it}	0.111 (1.956)	-1.427 (1.932)	1.174 (2.150)	0.307 (2.081)	-1.580 (1.980)	0.678 (2.060)
$\ln(\text{control})_{it}$	0.048 (0.040)	-	-	0.048 (0.060)	-	-
$\ln(\text{freedom})_{it}$	-	-0.144 (0.131)	-	-	-0.154 (0.125)	-
<i>N</i>	1,782	1,195	943	1,778	1,192	943
<i>Pseudo-R</i> ²	0.924	0.972	0.953	0.927	0.972	0.955

Notes: Panel-corrected standard errors are in parentheses with ***, **, and *, respectively, denoting significance at the 1%, 5%, and 10% levels. Columns 1 through 3 focus on citizen ideology, while columns 4 through 6 focus on government ideology. All six models include state and year fixed effects (coefficients not reported) and have corrections for heteroskedasticity, autocorrelation, and contemporaneous correlation. Sample includes as many as 50 states from 1969 to 2004.

Table 5. Pair-Wise Correlations

	<i>citideology</i>	<i>govideology</i>	<i>dispincome</i>	<i>unemprate</i>	<i>beertax</i>	<i>spirtax</i>	<i>winetax</i>	<i>young</i>	<i>old</i>	<i>white</i>	<i>male</i>	<i>control</i>
<i>citideology</i>	1											
<i>govideology</i>	0.6485*	1										
<i>dispincome</i>	0.3185*	0.1532*	1									
<i>unemprate</i>	0.0478*	0.1944*	-0.2986*	1								
<i>beertax</i>	-0.4650*	-0.2682*	-0.4758*	0	1							
<i>spirtax</i>	-0.1361*	0	-0.7336*	-0.0619*	0.5189*	1						
<i>winetax</i>	0	0	-0.1044*	0	0.0799*	0.5518*	1					
<i>young</i>	-0.2515*	-0.0836*	-0.6252*	0.3185*	0.2232*	0.2449*	0	1				
<i>old</i>	0.3267*	0.1883*	0.4093*	-0.0984*	-0.1892*	-0.3473*	-0.0659*	-0.4594*	1			
<i>white</i>	0.2131*	0	-0.2584*	-0.0491*	-0.3400*	0.2188*	0.0651*	0.1244*	0.0753*	1		
<i>male</i>	-0.2059*	-0.2452*	0.0926*	-0.2067*	-0.1874*	-0.0828*	0.0903*	0	-0.3547*	0.2979*	1	
<i>control</i>	0	-0.0435*	-0.1152*	0.1211*	0.1032*	.	0.2206*	0	-0.0574*	0.2675*	0.0674*	1

Table 6. Variance Inflation Test

Variable	VIF	1/VIF
<i>ln(dispinc)</i>	3.72	0.27
<i>white</i>	2.5	0.40
<i>young</i>	2.26	0.44
<i>ln(beertax)</i>	2.17	0.46
<i>old</i>	2.15	0.47
<i>male</i>	1.87	0.53
<i>ln(citideology)</i>	1.63	0.61
<i>unemprate</i>	1.35	0.74
<i>ln(control)</i>	1.32	0.76
Mean VIF	2.11	

Table 7. Various model tests.

Test:	Ho:	P-value:
Ramsey RESET test using powers of the fitted values of <i>beercap</i>	model has no omitted variables	0.0000
Breusch and Pagan Lagrangian multiplier test for random effects	error variance equals zero	0.0000
Hausman Test for Fixed Effects	difference in coefficients not systematic	0.0000
Modified Wald Test For Groupwise Heteroskedasticity	no heteroskedasticity	0.0000
Wooldridge test for autocorrelation in panel data	no first order autocorrelation	0.0000
Pesaran's test of cross sectional independence	no cross sectional dependence	0.0000

Figure 1. Scatter plot of per-capita beer consumption and citizen ideology scores.

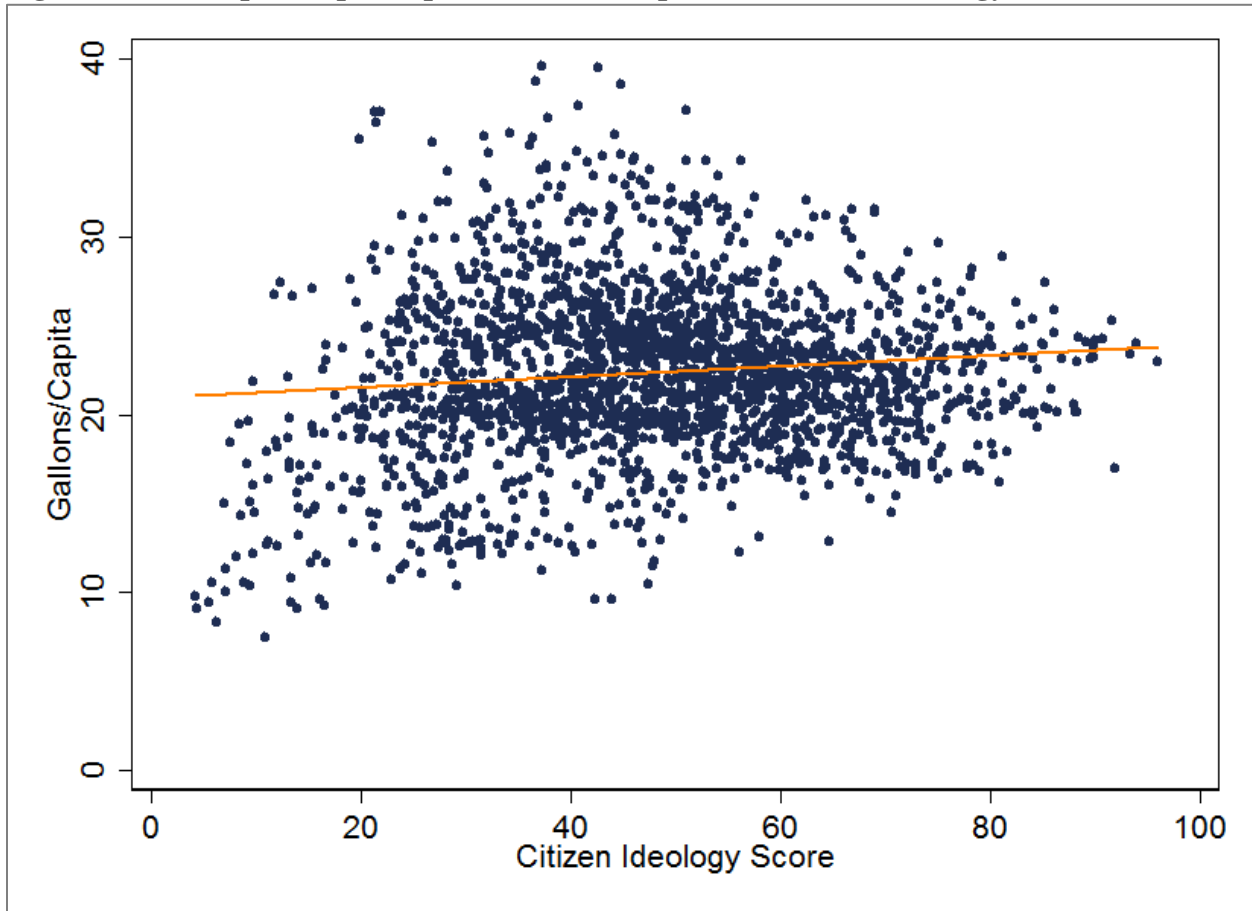


Figure 2. Lowest and highest beer-consuming states, 1967-2010.

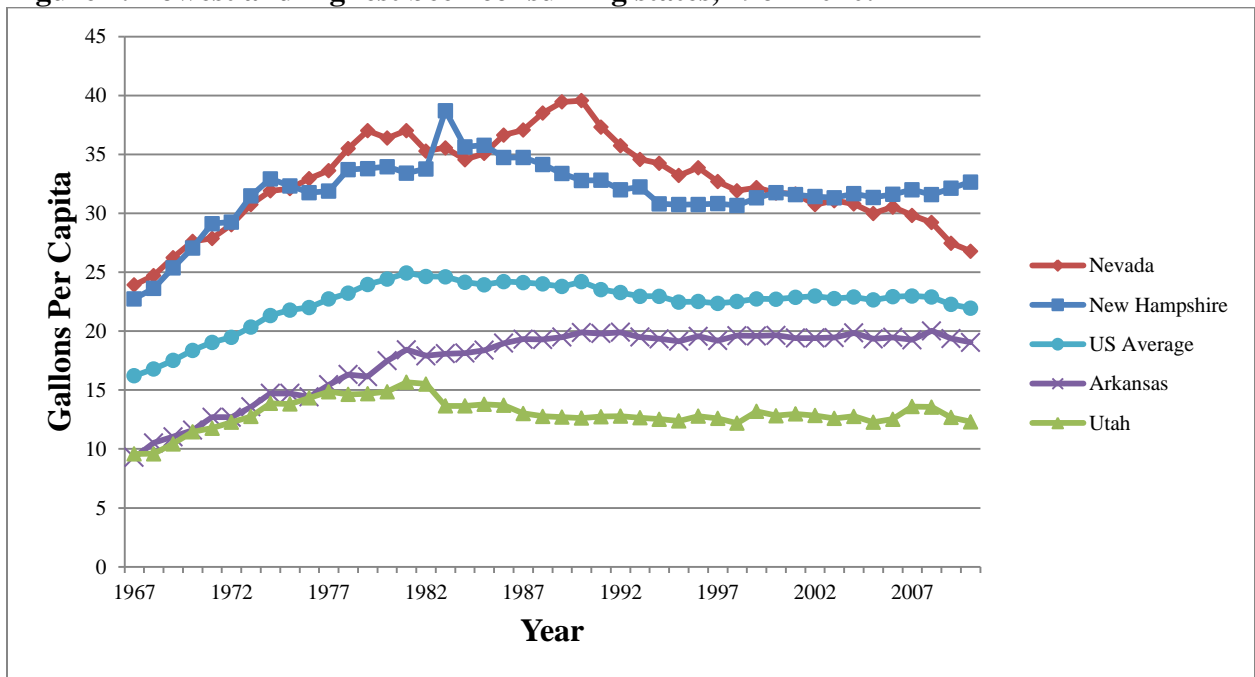


Figure 3. Lowest and highest wine consuming states, 1960-2008.

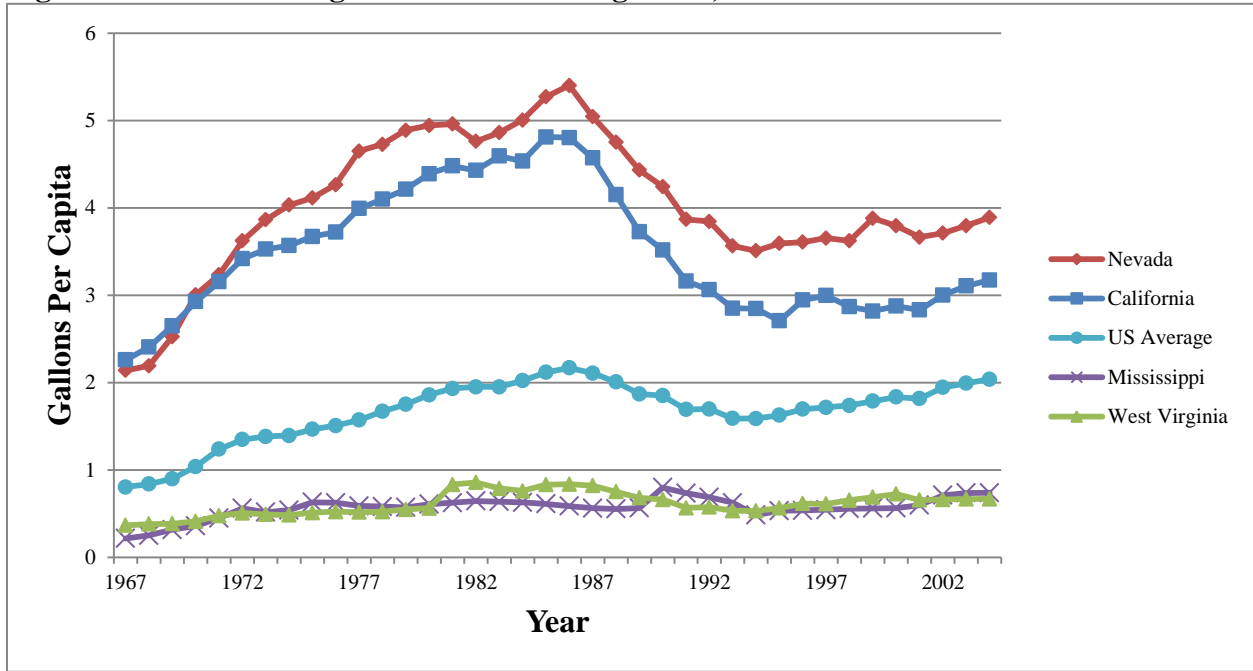


Figure 4. Lowest and highest spirit consuming states, 1952-2003.

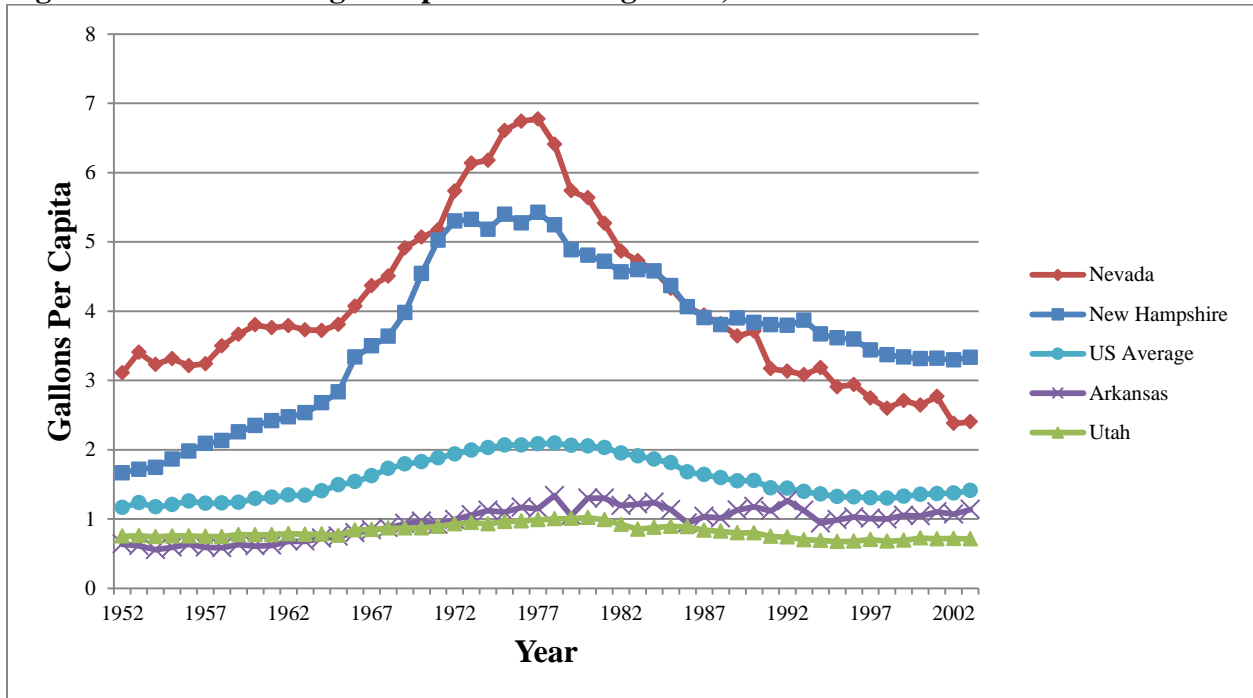


Figure 5. States with most conservative and liberal citizen ideology, 1960-2008.

