Raising ABV Levels, Alcohol Consumption and Alcohol-Related Motor Vehicle Fatalities in the United States

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Abstract

Over the past 10 years, five states have proposed to raise the alcohol by volume (ABV) limit on beer being sold to promote the beer brewery industry in their states. An increase in ABV limits increases the variety of beer being sold and may change people's consumption behavior. Such changes could subsequently influence drinking behaviors as well as driving safety in those states. This paper investigates the relationship between the increase in ABV limits and individual alcohol consumption and alcohol-related fatal crashes. We use difference-in-difference model to analyze the alcohol consumption before and after the rising ABV limit. Our panel data allows us to control for state and time fixed effects, state level economic conditions and beer consumption. We find higher ABV limits lead to a slight increase in alcohol consumption as well as a negative effect on alcohol-related fatality rate.

Key words: alcohol consumption, fatality, alcohol by volume

Introduction

Alcohol by volume (ABV) is a standard measure of how much alcohol is contained in a given volume of alcohol. In the United States, states have different regulations on ABV limits for alcoholic beverages sold in stores.

Laws to allow higher ABV limits on beer have been recently proposed in many states, and some of these proposals have become legislation. Five states, Alabama, North Carolina, Montana, Mississippi and West Virginia have increase the ABV limit substantially from 5% to 8.75% to more than 10% in recent 10 years. Table 1 shows the four types of ABV limit laws and the states involved. Seven states maintain their ABV limits. There are four states that only have ABV limits imposed on beer sold in grocery stores, usually 4%. The other states do not have ABV limits in place.

Rising ABV limits can have a significant economic impact. Since states regulate beer differently, brewers with one facility located in a low ABV limit states are at a disadvantage compared to brewers in neighboring states. Further, brewers with multiple facilities have to alter their production practices if one facility is located in a state with ABV limits. Thus, rising ABV limits is supported by brewers because they will be able to sell a larger variety of beer to attract more consumers. Standardized production methods across states will also help reduce distribution management costs.

There may be unintended side effects of this policy, however, with both drinking behavior and traffic fatalities.

Binge drinking is closely related with alcohol-impaired driving. National Institute on Alcohol Abuse and Alcoholism (NIAAA) defines binge drinking as a pattern of drinking that brings blood alcohol concentration (BAC) levels to 0.08. This typically occurs after 4 drinks for women and 5 drinks for men—in about 2 hours. Different alcohol content by volume in drinks can make it hard to estimate how much drinks one already had. For example, one drink is usually considered as 12 fl oz. of beer, 5 fl oz. of wine and 1.5 fl oz. of liquor because of their different alcohol content. For most of the states, beer has an ABV less than 6%, however, for those states that raise the ABV limit to above 10% on beer recent years, people may not aware of the actual intake of alcohol. If consumers are consuming beer with a higher ABV, they may be more likely to (unknowingly) become intoxicated or impaired. This could lead to a greater number of alcohol related fatalities.

At the same time, higher ABV in beer may improve the quality of drinking or make beer more expensive which can cause people to drink less or reduce their binge drinking behavior. This could also lead to lower alcohol related fatalities.

There are various studies on people's alcohol consumption behaviors and alcohol-impaired driving, however, the link between rising ABV limit, drinking behavior and traffic fatalities has yet to be examined. Those studies focus on two aspects, the economic factors that affect alcohol consumption and traffic laws that reduce alcohol-impaired driving or reduce the fatality of crashes. Although these studies are not directly related to the ABV law, they provide lots of relevant covariates to be considered in our model.

Studies focusing on the economic reasons for binge drinking find employment status is related with drinking behavior. Mulia et al. (2014) find economic recession and job loss are correlated with greater alcohol consumption and alcohol dependence. Another study (Mullahy et al., 1996) finds drinking results in reduced employment and increased unemployment.

Alcohol availability also plays a role in people's consumption behavior and traffic fatality rate. Rickard et al. (2013) find a negative relationship between wine consumption as a share of total alcohol consumption and total traffic fatalities.

The purpose of this study is to evaluate the complicated impact of ABV change on both alcohol consumption behavior and alcohol-related fatalities.

Data

Data concerning people's drinking behavior come from Behavioral Risk Factor Surveillance System (BRFSS) 2004-2013. The BRFSS is a cross-sectional random telephone survey conducted each year on US adults 18 years or older. It collects drinking behavior questions of the individual respondent in the past 30 days. Respondents who report having at least one drink in the past 30 days were asked: "Considering all types of alcoholic beverages, how many times during the past 30 days did you have five or more drinks on an occasion?" Binge drinking was defined as the consumption of five or more drinks for male and four or more drinks for female on at least one occasion in the past month. The respondent were also asked about the average amount they drank each time in the last 30 days: "During the past 30 days, on the days when you drank, about how many drinks did you drink on the average". Respondents that don't have

any drinks during the past 30 days are dropped from our sample because we assume they are mostly non-drinkers and the change in ABV are not supposed to affect them.

The BRFSS also contains individual characteristics, such as age, gender, employment status, marital status and health conditions. Those respondents with chronic or severe disease are also excluded since they may be restricted to drinking alcohol. Our data include 1,219,459 observations over 10 years. The summary statistics are listed in Table 2.

State-level fatality data from FARS between 2004 and 2013 are used to examine the impact of rising ABV limit on traffic fatality rates. Other state-level controls include state income per capita, state unemployment rate and state beer shipment per capita as an indicator of beer consumption. The dependent variable is the fatalities per million of population (fatalities over state population) of state i with Blood Alcohol Content above 0.08 or between 0.01 and 0.08. Blood Alcohol Content (BAC) is the amount of alcohol in a person's blood, expressed as a percentage. All states in U.S. defines BAC at or above 0.08 as violation of DUI law, while BAC greater than 0.01 may be convicted as driving under the influence of alcohol if the driver is pulled over.

Model

For alcohol consumption under the influence of ABV limit change, we use difference-in-difference approach to examine the determinants of alcohol consumption frequency and binge drinking behavior.

The model is

$$y_{ist} = \alpha + \beta T_{st} + \gamma G_s + \delta X_{ist} + \mu_s + \varepsilon_{ist} \ ,$$

where y_{ist} could be the number of drinking days for individual i in the past 30 days, number of binge drinking times, total drinks or maximum drinks in one single occasion. Total drinks can be calculated by multiplying average drinking amount and number of drinking days. S indexes the state and t indexes the year. T_{st} is the policy change indicator variable, which is equal to 1 after state s increase ABV limit in year t. G is a matrix of state group indicators, which distinguish the states with different ABV limit policies as table 1 shows. The baseline group is those states have no ABV limit, and three binary variables indicate states that increased in ABV limit during 2004-2013, states that have no change in ABV limit and states that have grocery store ABV restrictions. X_{ist} is a matrix of individual characteristics that could affect the drinking behavior, including age, gender, race, marital status, employment status, income levels, education. We also adjust for seasonality and year effect.

We estimated a similar model for alcohol-related traffic fatalities:

$$y_{st} = \beta T_{st} + X_{st}\gamma + \mu_s + \lambda_t + \varepsilon_{st}$$

Where y_{st} is the alcohol-related fatality rate of state s at year t. T_{st} is the binary indicator, which is 1 after state s has a change in ABV limit in year t. X contains the characteristics of individual state, including GDP per capita, beer shipment per capita as an approximation of beer consumption per person and unemployment rate. μ and λ control for the unobserved effect within different states and over time. Since the protective traffic laws proved to

effectively reduce the crash fatality, such as BAC law, seatbelt law and minimum legal drinking age law, don't changed since 2000, so there's no need to add them in this fixed effect model.

Result

Alcohol consumption

Table 4 shows the estimation result for the full model of alcohol consumption. We use cluster robust standard errors to adjust for unobserved factors within each state. Our result shows that rising ABV doesn't have significant effect on the number of days people drank in the past 30 days and it also doesn't affect people's binge drinking frequencies. However, total drinks consumed in past 30 days increases by 0.813 after the ABV policy change and maximum drinks on a single occasion also increase 0.134 comparing to before change. So rising ABV limit stimulate the beer consumption to some extent, by improving the taste of beer thus people would like to take more drinks each time.

There's also no significant difference in any one of the four dependent variables among those states that have no ABV limit, states that have ABV limit unchanged, states that have ABV limit. However, in those states that don't have ABV limit but grocery store ABV restrictions, the number of binge drinking episodes can be reduced by -0.09 and the total number of drinks in the past 30 days declines by -1.417, which indicate the availability in grocery stores actually have unexpected effect on alcohol consumption.

To better model the alcohol consumption of people with different drinking habits, we examine the effect of changing ABV on moderate drinker and heavy drinker separately. Moderate drinker refers to male consumes no greater than 2 drinks or female consumes no greater than 1 drinks on average per day (Naimi et al., 2003). People that consume more than this amount of drinks are considered as heavy drinkers. The estimation results are shown in table 5. The rising ABV has a significant positive effect on number of drinking days of the moderate drinker. It causes the number of drinking days increase by 0.381. However, ABV limit change doesn't have any significant impact on binge drinking times of the moderate drinker. For heavy drinkers, ABV change doesn't affect how many days they drank or the binge drinking times in the past month. This is easy to understand that due to addiction, heavy drinker's drinking behavior can hardly be changed by policy. However, whether the state has grocery store restriction on ABV could cause the binge drinking times of heavy drinker to decline. In states with no ABV limit but grocery store ABV restriction, the binge drinking times of heavy drinkers decrease by 0.102 compare to states that have no ABV limit.

Alcohol-related fatality

Table 6 is the estimation result of ABV limit change and alcohol-related fatality rate. We used two sets of dependent variables, one is alcohol-related fatality per million of population and the other is alcohol-related fatality per million of legal drinking age population because of the possible difference in population structure. There are two measurement for alcohol-related crash fatality, the driver involved in the fatal crash has BAC greater than 0.01 and less than 0.08, and BAC greater than 0.08. Rising ABV limit has a significant negative effect on three out of four measurements of alcohol-related crash fatality rates. Fatality rates of BAC>0.08 are more

affected by increase of ABV limit. Change of ABV limit causes fatality rate of BAC>0.08 decrease by 10.47 per million population and 14.12 per million legal drinking age population, which account for about 15% of deaths. Fatality with BAC between 0.01 to 0.08 per million population slightly declines by -0.763 after rising ABV limit. Beer consumption per capita is found to be positively associated with the alcohol-related fatalities. An increase in unemployment rate could cause alcohol-related fatalities to drop, probably through driving less.

Conclusion

Rising ABV limit policy has moderate effect on people's consumption of alcohol. It increases people's consumption each time and also the total amount of drinks. Drinking behavior of moderate drinkers is easier affected by policy change than heavy drinkers. Moderate drinks drank for a little more days after rising ABV limit. Generally, rising ABV slightly increases the consumption of alcohol.

We find imposing restriction on places that sell alcohol could be another way to control alcohol consumption. In states that have grocery store ABV restrictions, there are fewer binge drinking frequencies, maximum drinks per event and total drinks, especially for heavy drinkers.

In the fatality model, rising ABV limit actually reduces about 15% of the alcohol-related fatalities. It seems the increase in ABV limit cause slightly more consumption without doing damage to alcohol-related fatalities. The decrease in alcohol-related fatalities could be caused by other reasons, for example, there may be a change in alcohol consumption place that people

used to drink at bars now drink at home, which reduces the chance of driving after drinking. This assumption needs to be verified further if data are available.

Table 1. States with Different ABV Limit Laws

Increase in ABV limit from 2004 to 2013	No change in ABV limit from 2004 to 2013	No ABV limit but grocery store restriction**	No ABV limit
Alabama (2010)*	Arkansas	Colorado	All other states
Mississippi (2012)	Georgia	Oklahoma	
Montana(2009)	Iowa	Kansas	
North Carolina (2008)	Ohio	Minnesota	
West Virginia (2010)	Oregon		
	Utah		
	Washington		

*inside the bracket is the year in which the increase in ABV takes effect
**no alcohol above certain ABV level can be sold in grocery stores

Table 2. Summary Statistics for Alcohol Consumption

	Drinking days	Binge drinking	Total drinks	Max drinks
Moderate drinker	8.049	0.214	10.817	2.197
	(8.639)	(0.941)	(13.303)	(1.773)
Heavy drinker	8.983	2.029	31.302	4.891
	(8.488)	(4.439)	(37.048)	(3.729)
ABV change state	8.082	1.012	19.519	3.344
	(8.514)	(3.224)	(29.378)	(3.197)
ABV no change state	8.763	0.965	19.579	3.264
	(8.803)	(3.173)	(27.948)	(2.999)
ABV store limit state	8.176	0.907	18.386	3.272
	(8.356)	(2.930)	(26.618)	(2.943)
No ABV state	8.454	0.989	19.580	3.357
	(8.576)	(3.098)	(28.036)	(3.096)

Table 3. Summary Statistics by ABV Limit Policy

	full sample	ABV Change	No ABV Change	grocery store restriction	No ABV limit
GDP per capita (thousand $)	48.59 (2.70)	36.87 (2.13)	44.78 (1.97)	46.42 (2.94)	51.43 (3.86)
Unemployment rate	6.40 (0.19)	6.75 (0.52)	6.56 (0.45)	5.60 (0.25)	6.40 (0.25)
Population (million)	6.19 (0.97)	3.94 (1.47)	5.72 (1.36)	4.17 (0.57)	6.87 (1.39)
Beer consumption Per capita	4.21 (0.64)	2.82 (0.91)	3.81 (0.99)	2.85 (0.43)	4.67 (0.91)
Fatality (0.01<BAC<0.08)	7.49 (0.37)	10.22 (0.82)	6.54 (1.18)	6.57 (1.04)	7.39 (0.41)
Fatality (BAC>0.08)	43.89 (2.81)	70.20 (9.38)	34.00 (4.85)	40.09 (7.23)	42.46 (3.22)
Fatality LDA (0.01<BAC<0.08)	10.63 (0.52)	14.31 (1.17)	9.60 (1.64)	9.39 (1.53)	10.47 (0.61)
Fatality LDA (BAC>0.08)	62.73 (4.07)	99.45 (13.55)	49.09 (6.94)	58.16 (10.63)	60.62 (4.74)
N	490	50	70	40	330

Standard errors in parentheses

Table 4. ABV limit Change and Alcohol Consumption Behavior in Past 30 Days

VARIABLES	number of drinking days	binge drinking times	total drinks	max drinks single occasion
state with rising ABV limit	-0.321	-0.0250	-0.479	-0.103
	(0.261)	(0.0352)	(0.407)	(0.0642)
state w/o ABV limit change	0.265	-0.0216	-0.0487	-0.0801
	(0.362)	(0.0486)	(0.330)	(0.0860)
state w/ grocery store restrictions	-0.424	-0.0887***	-1.417**	-0.112
	(0.428)	(0.0287)	(0.557)	(0.0771)
rising ABV limit	0.276	0.0233	0.813*	0.134*
	(0.166)	(0.0464)	(0.412)	(0.0794)
Season				
2nd quarter	0.140***	0.0249***	0.434***	0.0104
	(0.0316)	(0.00761)	(0.0909)	(0.00854)
3rd quarter	0.324***	0.0833***	1.069***	0.103***
	(0.0264)	(0.00955)	(0.0900)	(0.0107)
4th quarter	0.163***	0.0332***	0.515***	0.0275***
	(0.0215)	(0.00726)	(0.0682)	(0.00729)
Age				
25-34	0.0637	-0.286***	2.516***	-0.815***
	(0.0546)	(0.0287)	(0.258)	(0.0355)
35-44	0.478***	-0.423***	2.890***	-1.420***
	(0.0645)	(0.0344)	(0.303)	(0.0426)
45-54	1.669***	-0.547***	1.937***	-1.890***
	(0.0814)	(0.0402)	(0.352)	(0.0511)
55-64	2.741***	-0.804***	2.192***	-2.399***
	(0.104)	(0.0413)	(0.386)	(0.0589)
above 65	3.641***	-1.071***	2.778***	-2.777***
	(0.137)	(0.0420)	(0.456)	(0.0681)
Race				
black	-1.716***	-0.436***	5.548***	-0.838***
	(0.118)	(0.0148)	(0.203)	(0.0297)
other race	-1.545***	-0.168***	3.389***	-0.229
	(0.126)	(0.0470)	(0.516)	(0.145)
multi-racial	-0.348***	0.0698*	-0.261	-0.108***
	(0.110)	(0.0407)	(0.293)	(0.0337)
Hispanic	-1.960***	-0.320***	4.162***	-0.255***
	(0.132)	(0.0369)	(0.331)	(0.0626)
Gender				
Female	-2.678***	-0.778***	12.46***	-1.624***

	(0.0536)	(0.0199)	(0.226)	(0.0308)
Education				
high school	-0.0934	-0.365***	2.924***	-0.512***
	(0.0670)	(0.0334)	(0.312)	(0.0337)
some college	0.0468	-0.631***	4.809***	-0.852***
	(0.0723)	(0.0355)	(0.323)	(0.0337)
collage graduate	0.938***	-0.970***	6.339***	-1.241***
	(0.102)	(0.0346)	(0.347)	(0.0367)
Income				
$15,000-$25,000	0.0369	-0.112***	-0.482**	-0.0995***
	(0.0418)	(0.0205)	(0.181)	(0.0196)
$25,000-$35,000	0.0875*	-0.146***	0.568***	-0.125***
	(0.0458)	(0.0253)	(0.205)	(0.0298)
$35,000-$50,000	0.239***	-0.159***	0.534***	-0.114***
	(0.0542)	(0.0221)	(0.190)	(0.0265)
>$50,000	1.025***	-0.189***	0.429**	-0.0290
	(0.0689)	(0.0212)	(0.208)	(0.0273)
Employment status				
Self-employed	1.158***	0.0508***	2.035***	0.0239*
	(0.0642)	(0.00928)	(0.164)	(0.0131)
Out of work > 1year	0.294***	0.250***	2.069***	0.124***
	(0.0794)	(0.0253)	(0.259)	(0.0261)
Out of work <=1 year	0.442***	0.217***	2.402***	0.214***
	(0.0454)	(0.0218)	(0.177)	(0.0241)
Homemaker	0.407***	-0.0419***	0.426***	-0.206***
	(0.0382)	(0.0116)	(0.0946)	(0.0173)
student	-0.0721	-0.120***	1.174***	-0.252***
	(0.0518)	(0.0227)	(0.228)	(0.0311)
Retired	1.078***	0.122***	2.531***	0.00530
	(0.0852)	(0.0137)	(0.176)	(0.0110)
Unable to work	-0.931***	-0.00595	1.503***	-0.182***
	(0.0705)	(0.0235)	(0.196)	(0.0227)
Marital status				
Divorced	0.486***	0.441***	4.259***	0.516***
	(0.0717)	(0.0175)	(0.216)	(0.0195)
Willowed	-0.0652	0.261***	2.046***	0.374***
	(0.0715)	(0.0138)	(0.191)	(0.0175)
Separate	0.555***	0.415***	4.107***	0.545***
	(0.0768)	(0.0240)	(0.232)	(0.0291)
Never married	0.477***	0.505***	4.616***	0.664***
	(0.0601)	(0.0141)	(0.153)	(0.0209)
A member of an unmarried couple	1.439***	0.406***	5.272***	0.605***
	(0.0801)	(0.0290)	(0.242)	(0.0310)

year	0.0965***	0.0324***	0.296***	0.0295***
	(0.00824)	(0.00220)	(0.0230)	(0.00319)
Constant	-187.0***	-62.48***	563.3***	-52.56***
	(16.60)	(4.416)	(46.45)	(6.403)
Observations	1,219,459	1,219,459	1,219,459	1,219,459
R-squared	0.072	0.042	0.066	0.156

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5. Comparison between Moderate Drinkers and Heavy Drinkers

VARIABLES	number of drinking days (moderate)	number of drinking days (heavy)	binge drinking times (moderate)	binge drinking times (heavy)
state with rising ABV limit	-0.438	-0.148	-0.0101	-0.0524
	(0.291)	(0.291)	(0.00808)	(0.0421)
state w/o ABV limit change	0.216	0.442	-0.00967	0.0508
	(0.378)	(0.419)	(0.00783)	(0.0442)
state w/ grocery store restrictions	-0.462	-0.261	-0.0166	-0.102**
	(0.448)	(0.463)	(0.0125)	(0.0418)
rising ABV limit	0.381**	0.0869	-0.00944	0.0327
	(0.147)	(0.199)	(0.00688)	(0.0727)
Season				
2nd quarter	0.0633	0.241***	-0.00366	0.0581***
	(0.0394)	(0.0380)	(0.00377)	(0.0164)
3rd quarter	0.183***	0.474***	0.0165***	0.143***
	(0.0305)	(0.0397)	(0.00385)	(0.0197)
4th quarter	0.0893***	0.236***	0.00305	0.0517***
	(0.0281)	(0.0334)	(0.00318)	(0.0166)
Age				
25-34	0.229***	0.0602	-0.0437***	-0.205***
	(0.0698)	(0.0558)	(0.0121)	(0.0333)
35-44	0.440***	0.816***	-0.122***	-0.192***
	(0.0750)	(0.0761)	(0.0135)	(0.0406)
45-54	1.400***	2.576***	-0.170***	-0.134***
	(0.0836)	(0.118)	(0.0154)	(0.0481)
55-64	2.520***	4.276***	-0.230***	-0.235***
	(0.105)	(0.149)	(0.0156)	(0.0565)
Above 65	3.491***	5.858***	-0.280***	-0.502***
	(0.132)	(0.190)	(0.0150)	(0.0653)
Race				
Black	-1.751***	-1.312***	-0.000905	-0.605***
	(0.132)	(0.116)	(0.00934)	(0.0334)
Other races	-1.533***	-1.456***	-0.0434***	-0.208***
	(0.144)	(0.192)	(0.0101)	(0.0451)
Multi-racial	-0.499***	-0.0727	-0.0226**	0.260***
	(0.120)	(0.130)	(0.00997)	(0.0832)
Hispanic	-1.677***	-2.264***	-0.00692	-0.751***
	(0.144)	(0.153)	(0.00790)	(0.0537)

Gender				
Female	-2.874***	-3.130***	-0.220***	-2.198***
	(0.0435)	(0.0670)	(0.00397)	(0.0260)
Education				
high school	-0.0426	0.138*	-0.0823***	-0.323***
	(0.0840)	(0.0767)	(0.0102)	(0.0545)
Some college	0.239***	0.391***	-0.131***	-0.571***
	(0.0832)	(0.100)	(0.0102)	(0.0592)
College graduate	1.406***	1.314***	-0.175***	-0.903***
	(0.106)	(0.127)	(0.0101)	(0.0574)
Income				
$15,000-$25,000	0.172***	0.0200	-0.0163*	-0.177***
	(0.0529)	(0.0612)	(0.00891)	(0.0376)
$25,000-$35,000	0.274***	0.0811	-0.0166*	-0.240***
	(0.0608)	(0.0604)	(0.00886)	(0.0425)
$35,000-$50,000	0.499***	0.165**	-0.0159	-0.273***
	(0.0746)	(0.0642)	(0.00950)	(0.0397)
Above $50,000	1.396***	0.769***	-0.00300	-0.367***
	(0.0781)	(0.0798)	(0.00913)	(0.0354)
Employment status				
Self-employed	1.105***	1.310***	0.00854**	0.176***
	(0.0605)	(0.0830)	(0.00351)	(0.0192)
Out of work >1 year	0.0681	0.414***	0.0123	0.373***
	(0.0909)	(0.0979)	(0.00986)	(0.0480)
Out of work <= 1 year	0.129*	0.620***	-0.00458	0.266***
	(0.0648)	(0.0783)	(0.00830)	(0.0407)
Homemaker	0.430***	0.550***	-0.0234***	0.0419**
	(0.0463)	(0.0584)	(0.00438)	(0.0188)
Student	0.0678	-0.141**	-0.0759***	-0.0973***
	(0.0794)	(0.0669)	(0.0102)	(0.0331)
Retired	0.873***	1.548***	0.000265	0.339***
	(0.0799)	(0.116)	(0.00398)	(0.0418)
Unable to work	-1.057***	-0.659***	-0.0590***	0.138***
	(0.0799)	(0.0879)	(0.00837)	(0.0429)
Marital status				
Divorced	0.0995	0.487***	0.0559***	0.478***
	(0.0753)	(0.0781)	(0.00377)	(0.0261)
Willowed	-0.301***	-0.126	0.0488***	0.227***
	(0.0721)	(0.0977)	(0.00629)	(0.0290)
Separated	0.326***	0.453***	0.0446***	0.467***
	(0.0884)	(0.0989)	(0.0104)	(0.0404)
Never married	-0.0686	0.680***	0.0629***	0.537***
	(0.0740)	(0.0641)	(0.00519)	(0.0207)
A member of an	1.332***	1.295***	0.0728***	0.453***

unmarried couple				
	(0.113)	(0.0765)	(0.00859)	(0.0402)
Year	0.0711***	0.112***	0.00625***	0.0525***
	(0.00944)	(0.00809)	(0.000644)	(0.00343)
Constant	-136.9***	-217.6***	-11.94***	-101.2***
	(18.98)	(16.32)	(1.295)	(6.885)
Observations	705,394	514,065	705,394	514,065
R-squared	0.076	0.103	0.024	0.077

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 6. ABV Limit Change and Alcohol-related Fatality Rate

VARIABLES	Fatality (0.01<BAC<0.08)	Fatality (BAC>0.08)	Fatality LDA(0.01<BAC<0.08)	Fatality LDA (BAC>0.08)
ABV increase	-0.763*	-10.47***	-1.221	-14.12**
	(0.391)	(3.308)	(0.792)	(5.472)
beer consumption per capita = L,	23.67***	98.40***	29.33***	104.5***
	(6.642)	(27.49)	(10.18)	(32.21)
real GDP per capita (thousand $)	0.0238	0.159	-0.00944	0.258
	(0.110)	(0.413)	(0.168)	(0.775)
unemployment rate	-0.403***	-2.120***	-0.616***	-3.186***
	(0.0605)	(0.290)	(0.0835)	(0.460)
Constant	-8.224	-21.64	-6.297	-5.726
	(5.849)	(26.71)	(8.741)	(41.39)
Observations	441	441	392	392
R-squared	0.239	0.431	0.235	0.438
Number of statenum	49	49	49	49

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

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