Slippery When Wet:

The Effects of Local Alcohol Access Laws on Highway Safety

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Abstract

Using detailed panel data on local alcohol policy changes in Texas, this paper tests whether the effect of these changes on alcohol-related accidents depends on whether the policy change involves where the alcohol is consumed and the type of alcohol consumed. After controlling for both county and year fixed effects, we find evidence that: (i) the sale of beer and wine may actually decrease expected accidents; and (ii) the sale of higher alcohol-content liquor may present greater risk to highway safety than the sale of just beer and wine.

(**JEL Classification**: **I10, I18, R50**)

Key Words: alcohol, drunk driving, endogenous policy, prohibition

"'Why should I drive 20 miles out of my way to Florence to buy a reasonably priced bottle of wine for dinner guests?' (Dara Florek, resident of Grant County) asked, contending that the nearest liquor stores in Kenton County, a wet oasis to the north, were not only fueling Grant County's rate of drunken driving but price gouging as well…drunk driving rates were higher in Grant County than in three neighboring wet counties."
"Woman Forces Area to Vote on Wet-or-Dry Issue"; July 20, 2000, *The New York Times*

I. Introduction

In the past thirty years, a major goal of public policy in the United States has been to reduce the health and safety risks associated with alcohol abuse. Among these risks, motor vehicle accidents caused by drunk driving are the subject of particularly intense scrutiny. A number of policies exist that are designed to restrict the consumption of alcohol and reduce alcohol related accidents. Some, such as the minimum legal drinking age (MLDA) and drunk driving laws, have become noticeably more stringent.[1] Curiously, at the same time, many city and county governments relaxed their alcohol control policies. Most notably, during the last three decades a number of U.S. counties either legalized or expanded the sale of alcoholic beverages within their borders.[2]

By increasing the availability of alcohol, one might expect these types of policy changes to increase the number of alcohol-related motor vehicle accidents.[3] However, these law changes also reduce the travel distance required to obtain the alcohol, change where the alcohol may be consumed, and/or change the type of alcohol consumed. Thus, the overall effect of local alcohol

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[1] A number of empirical studies conclude that these law changes reduce alcohol-related accident rates. See, for example, Dee (1999), Ruhm (1996), Figlio (1995), Saffer and Grossman (1987) and Chaloupka , Saffer, and Grossman, (1993).

[2] There is a long history of local variation in alcohol access laws beginning prior to prohibition. After prohibition, as many as 34 states allowed local options on liquor control policy. Over 5,000 local access elections took place in the five years following prohibition, and hundreds of elections have occurred annually thereafter (Strumpf and Oberholzen-Gee, forthcoming). For an analysis of alcohol policy decentralization, see Strumpf and Oberholzen-Gee (forthcoming).

[3] Several empirical studies have found evidence that allowing local access increases the accident rate. Brown, Jewell and Richer (1996) and Winn and Giacopassi (1993) find that local access significantly increases highway fatalities and accidents. Ruhm (1996), in contrasts, does not find a significant effect of the percentage of state residents in dry counties on traffic fatalities.

access policies is ambiguous. More liberal local access laws may be entirely consistent with policies aimed at reducing alcohol related accidents.

This paper attempts to resolve this ambiguity using detailed information on alcohol policy changes in the state of Texas between 1975 and 1996.[4] We make two contributions to the existing literature. First, using the panel nature of the data, we explicitly account for nonrandom selection of local alcohol access laws. In particular, we include both county and time fixed effects as well as a county specific linear time trend.

Second, while the existing literature focuses on whether local jurisdictions are wet (that is, allows any sales of alcohol) or dry we provide a more detailed analysis. Changes that occurred in local jurisdictions of Texas vary in terms of where alcohol may be consumed (on and/or off premise) and what type of alcohol (beer and wine or all liquors) may be purchased. We explicitly evaluate the variation in access law. Arguably, the effect of on-premise consumption will differ from off-premise consumption. Likewise, the effects of legalizing the sale of beer and wine may differ from legalizing the sale of hard liquor.

This paper proceeds as follows: Section II describes our unique data set and Section III presents the results. Finally, we conclude in Section IV by noting the type of local regulation influences the magnitude of the effect of local access laws on highway safety. The sale of alcohol, particularly beer and wine, may actually decrease expected accidents. The sale of higher alcohol-content liquor may present greater risk to highway safety than the sale of just beer and wine.

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[4] Brown, Jewell and Richer (1996) also evaluate local access laws in Texas. Their analysis, however, neither exploits panel data nor allows for the effects of local access laws to vary by the type of restriction. Rather, to account for the possibility that local regulations are endogenous, they use local tourism as an instrument for alcohol policy. Without a county fixed effect, local tourism revenue may not be a valid instrument if unobserved determinants of local tourism revenue are also related to the unobserved factors influencing highway safety. Furthermore, as demonstrated below, aggregating the various types of access laws into a single category – wet – may miss important variation in the effects of control polices.

II. Data Description

The data are a panel of observations on the 254 Texas counties over the period 1975 to 1996. For each year, we observe the number accidents in which alcohol was a contributing factor.[5] In addition, we observe county level information on the number of registered vehicles, highway expenditures, police expenditures, religious affiliations, population, per capita income, and vehicle miles driven.[6]

The data also include detailed indicators of local access laws in Texas. Previous studies on the effects of county or state alcohol access policies classify a jurisdiction only by whether or not they allow for the sale of any alcoholic beverage. For some specifications, we follow this convention. In particular, we label a county as "wet" if some alcoholic beverages can be purchased in part of the country. A county is dry if alcoholic beverages cannot legally be purchased within the county.

In addition, we also evaluate the effects of various forms of access policies. Specifically, we observe whether the county allows the sale of beer and/or wine, whether the county allows the sale of all liquors for off-premise consumption and whether the county allows all types of alcohol to be sold for off-premise and on-premise consumption.[7] These access indicators reflect successively less restrictive policies: on-premise access implies off-premise access to all liquors,

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[5] We focus on total accidents, but analysis on fatal accidents is qualitatively similar. Whether alcohol is considered a contributing factor depends both on subjective assessment of the police officer and on more objective tests of intoxication (e.g., police tests of motor skills, breathalyzer test and blood tests). The efficacy and standards used to measure and classify alcohol related accidents might vary over time and across counties. However, these measurement problems are not likely to bias our estimates. In particular, fixed year effects account for time varying changes that are common to the entire state, fixed county effects account for idiosyncratic measurement within a county, and linear county specific time trends will account for variation over time within a county. Thus, only non-linear county specific variation in measurement standards and procedures will bias our results.

[6] The data come from the U.S. Department of Congress (2001), Quinn (1982), Bradley et al. (1992) and unpublished data from the Texas Alcoholic Beverage Commission, the Texas Department of Public Safety, the Texas Transportation and Planning Division, the Texas Vehicle Titles and Registration Division, and the Texas Department of Public Safety. Further details, including descriptive statistics of the variables and detailed information on the data sources, are available from the authors.

[7] In fact, the data distinguish among counties that only allow beer and those that allow beer and wine. Both statuses are primarily for off-premise consumption (no bars), so we aggregate them into one category.

which implies access to beer and wine. Each county is classified as falling into one of these mutually exclusive categories based upon the least restrictive policy allowed for by any level of government within the county. For example, a county is classified as allowing sales of all alcohol for off-premise consumption if any level of government within the county allows liquor stores but prohibits the sale of mixed beverages in bars or restaurants.

Table 1 describes the changes in county liquor law status observed between 1975 and 1996. Over this twenty-two year period, there were 65 changes in county-level alcohol status.[8] In total, 87 of the 254 counties in Texas were dry at the start of the period in 1975, and 33 of these legalized some type of alcohol sales by 1996. There were 32 other changes in which already non-dry counties further relaxed alcohol control policies. The majority of changes were counties that allowed the sales of all liquors for off-premise consumption voting to allow off- *and* on-premise consumption. Panel (B) graphs the yearly number of county status changes between 1975 and 1996. Although access laws were changing over the entire period, the majority of changes took place before 1985.

III. Regression Results

The data clearly show that on average dry counties have fewer accidents per capita than counties allowing the sale of alcohol for on- and off-premise consumption.[9] To evaluate whether this relationship reflects the effects of access laws or instead is spurious, we estimate a series of linear mean regression models that account for observed and unobserved county specific characteristics. We begin by replicating the earlier research that pooled all data and classified

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[8] Liquor law referenda can be voted on at the county, justice precinct, city, or town level. Over the 22 year period in the panel, there were 568 local alcohol-related referenda, 260 of which passed and were upheld by the courts.
[9] Available upon request.

counties only by wet and dry. We then extend the analysis to exploit the panel data and to

account for heterogeneity in local access laws.

To account for unobserved county specific factors, we evaluate a fixed effects model

$$Y_{it} = \alpha_t + C_i + \gamma_i \text{ Year}_t + \beta_1 \text{ Wet}_{it} + \beta_2 X_{it} + \varepsilon_{it}, \qquad (1)$$

where Y_{it} is the observed number of alcohol-related accidents for county i in year t, Year_t

measures the calendar year in period t, Wet_{it} indicates whether county i allows for the sale of

alcoholic beverages at time t, and the vector X_{it} includes other observed county level variables

that are likely to influence the number of alcohol-related accidents.[10] The variable ε_{it} includes

unobserved factors influencing alcohol fatalities, which we assume to be mean independent of

the observed variables. Finally, the coefficients α_t, C_i, γ_i, β_1, and β_2 are unobserved, with α_t

being a year fixed effect, C_i being a county fixed effect and γ_i being a county specific linear time

trend. The fixed year effect captures time specific effects that are constant for all counties. For

example, Texas had several state-level changes in the classification of alcohol-related

accidents.[11] The county fixed effect controls for unobserved county characteristics that might be

fixed over time, such as attitudes toward alcohol. If unobserved county specific characteristics

that vary over time are related to the accident rate (e.g., attitudes towards drinking), then this

fixed effect may not remove the bias in our estimates. Thus, we also include a county specific

linear time trend in one set of regressions.

The first three columns of Table (2) show the estimated effect of allowing alcohol sales in

models without and with county specific effects, respectively.[12] Consistent with previous

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[10] Similar results are found when the outcome variable is the per-capita accident rate rather than the total number of accidents.

[11] These types of changes include blood alcohol limits for DUI and DWI, a "zero tolerance" policy for minors, and the property damage limits for reportable traffic accidents. Any alcohol-related accident where the property damage is below the limit is not included in our accident count.

[12] In all regressions we correct the standard errors for arbitrary heteroskedasticity and clustering within a county over time.

research (for example, Winn and Giacopassi,1993 and Brown, Jewell and Richer, 1996), we find counties with local access have much higher numbers of alcohol-related accidents. Local access to alcohol sales is associated with an additional 6.71 accidents per year per county, a 5 percent increase from the mean number of accidents of 131.[13]

When we account for county specific unobserved factors, however, this observed association appears spurious. With county specific fixed effects, the estimate in Column 2 suggests that local access increases accidents by only 2.12 per year and with county specific time trends, shown in Column 3, we find that local access decreases the expected number of accidents by –5.34, a 4 percent drop from the mean number of accidents. Although these estimated effects are not statistically significant (at the five-percent level), they are qualitatively different than the estimate found using conventional models that do not account for county specific factors. Apparently, local access laws have a negligible and perhaps slightly negative effect on the expected number of accidents.

A richer picture of how access laws affect behavior can be found by exploiting the variation in local alcohol policies. Arguably, the effect of local access laws depends on the nature of the regulation. The effect of access to off- *and* on-premise consumption may differ from the effect of access to off-premise consumption. Likewise, access to certain types of alcohol (i.e., beer versus hard liquor) may have different effects on the number of accidents. The previous models impose the restriction that law changes from dry to any local access have the same affect on highway safety. In addition, moving from one wet status such as access to beer and wine to another such as access to off-premise consumption of all liquors is assumed to have no effect on the expected number of accidents. To relax this restriction, we include indicator

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[13] Other county characteristics generally have the expected effect. For example, an additional 100,000 miles driven is associated with 2.57 more accidents per year and a $1 million increase in police spending is associated with 6.03 fewer accidents per year.

variables for the specific type of alcohol access granted within each county. We continue to account for county specific factors using observed covariates, a county fixed effect, and county specific linear time trends.

The last three columns of Table (2) show the estimated effect allowing different types of access in models without and with county specific effects, respectively. Without county specific effects, all three local access laws are associated with an increase in expected accidents. However, there are substantial differences in the expected number of accidents in counties allowing consumption of all liquors off-premise only versus off- and on-premise. In particular, counties allowing off- and on-premise sales have nearly 16 more accidents per year than similar counties that only allow for off-premise sales of all alcohol or counties that only allow for beer and wine.

As before, we find striking differences in the estimated effects of access laws once we account for unobserved county specific factors. Estimates from the fixed effects models suggest that access has a negligible and possibly negative effect on highway safety. With county fixed effects, the estimated coefficients associated with access to beer/wine and off- and on-premise consumption of all liquors fall to zero. When we include the county specific time trends, the estimates in column (6) suggest that the parameters for all three local access laws are negative. Apparently, the effect on alcohol related accidents of consumers driving a shorter distance more than offsets the effect of any increase in consumption.

Furthermore, the effects appear to be quite heterogeneous, with access to beer and wine alone having a much different effect on accidents than access to all liquors. In particular, access to higher alcohol content liquor seems to present a greater risk to highway safety than beer and wine. In the model with county specific linear time trends, access to beer and wine is estimated to reduce the expected number of annual accidents by 10.19, a substantial and statistically

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significant 8 percent decrease from the mean of 131 per year. Access to all liquors, in contrasts, has a less pronounced effect. The estimated effects of -3.42 for off-premise consumption of all liquors (which includes beer and/or wine) and –4.01 for off- and on-premise consumption of all liquors (which also includes beer and/or wine) are both relatively small and statistically insignificant. Because access to all liquors allows for the sale of beer and wine, the estimated effects associated with these indicators reflect both the effect of allowing sales of hard liquor and beer/wine. The effect of access to hard alcohol relative to beer and wine can be found by differencing the coefficient estimate associated with access to beer and wine from the coefficient on all liquors. Thus, the marginal effect of granting off- and on- premise consumption of hard liquor is to increase the expected number of accidents by at least 6 per year [-4.01 – (-10.19)].

IV. Conclusion

Our empirical analysis differs from the existing empirical literature by classifying alcohol policy in greater detail than simply wet and dry and by explicitly accounting for county specific unobserved factors. Our data allow us to discriminate among policies that change where the alcohol may be consumed and what type of alcohol may be consumed. Three main conclusions follow. First, the sale of alcohol, especially beer and wine, appears to have a negligible if not negative effect on the number of alcohol related accidents. Second, the sale of higher alcohol content liquor may present a greater risk to highway safety than the sale of beer and wine. Finally, county specific unobserved factors play a critical role in evaluating the effects of local access laws. Without these factors, the estimated associations between local access laws and accident rates appear to be both quantitatively and qualitatively misleading.

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Table 1:
Panel (A) : Changes in County Legal Status By Type of Change (65 Total), 1975-96

		To			
		Dry	Beer and Wine Sales	Liquor Sales – Off Premise	Liquor Sales – On and Off Premise
From	Dry	-	10	22	1
	Beer and Wine Sales	0	-	5	5
	Liquor Sales – Off Premise	0	0	-	22
	Liquor Sales – On and Off Premise	0	0	0	-

Panel (B) : Changes in County Legal Status By Year (65 Total), 1975-96
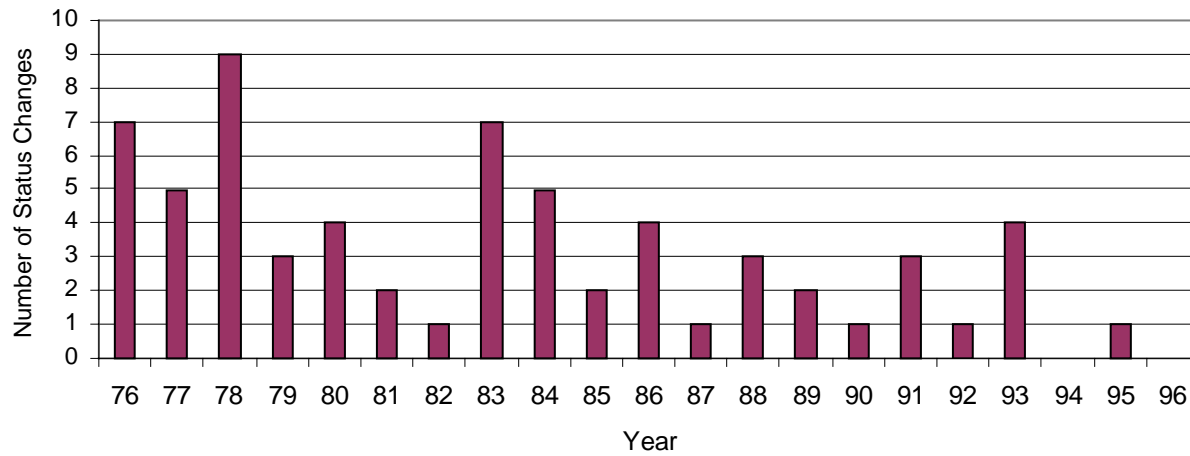
Table 2: Results
Dependent Variable is Alcohol-related Motor Vehicle Accidents
(N = 5888)

	(1)	(2)	(3)	(4)	(5)	(6)
Wet	6.71	2.12	-5.34			
	(5.28)	(3.27)	(2.79)			
Beer and/or Wine				3.46	-0.53	-10.19
				(2.97)	(5.79)	(4.54)
All Liquors Off-Premise				2.10	3.19	-3.42
				(3.57)	(3.33)	(3.13)
All Liquors Off- and On-Premise				19.27	0.37	-4.01
				(13.18)	(5.66)	(5.86)
Registered Vehicles	-0.001	0.00	-0.002	-0.002	0.00	-0.002
	(0.002)	(0.00)	(0.001)	(0.002)	(0.00)	(0.001)
Hwy Expenditures	-0.286	4.16	4.81	-0.24	4.16	4.81
	(1.75)	(1.43)	(0.82)	(1.78)	(1.43)	(0.82)
Police Expenditures	-6.03	-3.30	-23.51	-5.98	-3.30	-23.50
	(1.59)	(1.16)	(6.56)	(1.58)	(1.16)	(6.56)
Percent Population Catholic	26.14	24.06	22.63	22.31	24.02	22.94
	(16.75)	(17.93)	(19.18)	(17.77)	(18.06)	(19.15)
Percent Population Baptist	-21.48	-4.86	6.01	-5.53	-5.11	5.60
	(14.54)	(12.20)	(17.22)	(9.73)	(12.28)	(17.23)
Population	175.49	21.89	10.81	175.00	21.82	10.76
	(31.78)	(59.61)	(84.09)	(31.95)	(59.63)	(84.12)
Per Capita Income	97.89	90.66	-25.83	86.27	91.40	-25.31
	(105.85)	(77.31)	(75.95)	(101.91)	(77.81)	(75.98)
Vehicle Miles – Highway	1.34	1.52	3.92	1.23	1.52	3.91
	(2.25)	(1.84)	(2.73)	(2.31)	(1.84)	(2.73)
Vehicle Miles - Total	2.57	1.04	0.83	2.59	1.04	0.83
	(1.56)	(0.72)	(1.36)	(1.57)	(0.72)	(1.36)
Year Fixed Effects	YES	YES	YES	YES	YES	YES
County Specific Fixed Effects	NO	YES	YES	NO	YES	YES
County Specific Fixed Effects and Time Trends	NO	NO	YES	NO	NO	YES
R^2	0.95	0.98	0.99	0.95	0.98	0.99

Notes: Standard errors in parentheses, corrected for heteroskedasticity and clustering around county. Registered vehicles, population, per capita income and vehicle miles are measured in units of 100,000. Highway and police expenditures are in millions of dollars.

Source: Authors' calculations on data from the Department of Congress (2001), Quinn (1982), Bradley et al. (1992) and unpublished data from the Texas Alcoholic Beverage Commission, the Texas Department of Public Safety, the Texas Transportation and Planning Division, the Texas Vehicle Titles and Registration Division, and the Texas Department of Public Safety.