BINGE DRINKING IN COLLEGE: THE IMPACT OF PRICE, AVAILABILITY, AND ALCOHOL CONTROL POLICIES

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This paper estimates the effects of beer prices, alcohol availability, and policies related to driving under the influence of alcohol on drinking and binge drinking among youths and young adults. Data are from a nationally representative survey of students in U.S. colleges and universities. Separate estimates are obtained for underage male and female students, as well as for older male and female students. The estimates indicate that the drinking practices of male college students are generally insensitive to the price of beer. However, underage drinking and binge drinking by female students do respond significantly to price, although both are relatively inelastic. The results also show that strong drunk driving policies targeting youths and young adults significantly reduce drinking and binge drinking by male students. Similarly, these policies reduce drinking among female college students but appear to have little impact on their binge drinking. Instead, the results indicate that many elements of campus life (including participation in a fraternity or sorority, living on campus, and the ready availability of alcoholic beverages) are among the most important determinants of drinking and binge drinking among college students.

I. INTRODUCTION

The past two decades have seen significant progress in reducing the use and abuse of alcoholic beverages, particularly among youths and young adults. For example, heavy drinking occasions among high school seniors fell by 14% between 1981 and 1993, while binge drinking among 19 to 22 year olds not in college fell by 9%. Policymakers have targeted youths and young adults because of their relatively high levels of alcohol abuse (Grant et al., 1991). For example, motor vehicle accident fatalities are the leading cause of death among persons under 35 years of age, and alcohol is involved in over half of these deaths. Moreover, the abuse of alcohol by youths and young adults appears to lead to alcohol abuse later in life (Rachal et al., 1980). Thus, targeting policies at youths and young adults is important, since reducing excessive drinking in this population could be the most effective means to achieve long-run reductions in alcohol abuse and its consequences in all segments of the population.

The most widely used policy tool in the campaign against youth and young adult alcohol abuse has been higher minimum legal drinking ages. After a downward trend in legal drinking ages beginning in 1971 when the voting age was lowered to

**ABBREVIATIONS**

ACCRA: American Chamber of Commerce Researchers' Association

MADD: Mothers Against Drunk Driving

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18, alcohol abuse among the young increased significantly. This led states, beginning with Minnesota in 1976, to start raising legal drinking ages. From 1976 to 1984, 27 other states increased their legal drinking ages. The Federal government became involved during the Reagan Administration, which prompted Congress to pass the Federal Uniform Drinking Age Act of 1984. This act forced every state to raise its minimum legal drinking age for all alcoholic beverages to 21 years or face the loss of a substantial portion of its Federal highway funding. After an unsuccessful challenge to the constitutionality of the law, all states had raised their drinking age to 21 by 1987 (although grandfather clauses in some states kept the effective age below 21 until mid-1989).

Other policies in the anti-drinking campaign target all drinkers. For example, Public Law 100-690 mandated that, beginning in November 1989, a label warning of the dangers of drinking and driving and drinking while pregnant appear on all alcoholic beverage containers. Similarly, the Alcohol Traffic Safety Act of 1983 encouraged states to enact hundreds of new and stronger laws related to driving under the influence of alcohol (Ross, 1990). More recently, states have targeted underage drinking drivers by easing the standards required for conviction for driving under the influence and increasing the penalties imposed upon conviction. For example, while most states have a per se illegal blood alcohol concentration of between 0.08 and 0.10% for older drivers, several states have reduced this to 0.04% or lower for drivers under the age of 21. The most restrictive laws targeted at underage drinking drivers consider a young driver under the influence if his or her blood shows any trace of alcohol.

Generally ignored in the anti-drinking campaign is the increased taxation of alcoholic beverages. By raising prices, higher alcohol taxes could significantly reduce alcohol abuse among youths and young adults, as well as in other segments of the population. Federal taxes on beer and wine were constant in nominal terms from 1951 until 1991, when they were raised as part of a deficit reduction package that also increased the tax on distilled spirits for only the second time since 1951. Moreover, with the exception of the wine tax increase, these tax hikes fell far short of the increases necessary to offset the impact of inflation since 1951. Similarly, state and local governments have raised alcohol taxes only modestly and infrequently over time, usually to raise revenues rather than discourage alcohol abuse. Due largely to the stability of these taxes, the real prices of alcoholic beverages have declined significantly over time. The 1991 tax hikes only temporarily reversed this downward trend. Thus, if alcohol use and abuse is sensitive to price, then policies that allow the real price of alcoholic beverages to fall over time exacerbate the problems associated with alcohol abuse.

While alcohol abuse has fallen sharply in many youth and young adult groups, the college students do not display the same reductions. Between 1981 and 1993, binge drinking rates among students in U.S. colleges and universities fell by only 2.6%. In addition to affecting their own health, school performance, and more, binge drinking students impose considerable costs for other students. For example, Wechsler et al. (1994) find that binge drinking among college students is associated with a variety of consequences, including greater probabilities of injury, unsafe sexual activity, health problems, victimization (of assaults or rape), sexual harassment, and impaired sleep and study time.

Why do college students continue to show persistently high rates of binge drinking even as alcohol abuse in most other segments of society has fallen sharply? This paper examines the effects of alcoholic beverage prices and availability, as well as laws related to drinking and
driving by youths and young adults, on drinking by college students. Examining this population is particularly important given its size, the traditionally unique place that alcohol occupies in campus life, and the fact that these students are tomorrow’s leaders and policymakers (Wechsler et al., 1994).

II. REVIEW OF SELECTED PRIOR STUDIES

Numerous econometric studies of alcohol demand and related outcomes among young people have appeared over the past decade (see Chaloupka, 1993; Hilton and Bloss, 1993; and Grossman et al., 1994, for review). The studies employ diverse data and methods to estimate the impact of prices, taxes, and other alcohol control policies on various outcomes. Grossman et al. (1987) use the First National Health and Nutrition Examination Survey to look at the impact of beer prices and minimum legal drinking ages on beer consumption by persons aged 16 through 21 years. Similarly, Coate and Grossman (1988) use the Second National Health and Nutrition Examination Survey to study the effects of beer excise taxes and drinking ages on beer consumption in the same age group. Both studies find that higher drinking ages or higher beer taxes significantly reduce drinking frequency. Moreover, the fraction of young people who were either frequent and fairly frequent drinkers fell more in absolute and percentage terms than the fraction of infrequent drinkers in response to higher drinking ages and prices.

Similarly, Laixuthai and Chaloupka (1993) use data from the 1982 and 1989 surveys of high school seniors conducted by the University of Michigan’s Institute for Social Research as part of its Monitoring the Future project. They also find that higher beer prices substantially reduce the frequency of youth alcohol consumption and binge drinking episodes among youths. Moreover, their policy simulations indicate that a policy indexing the Federal beer tax to the rate of inflation since 1951 would lead to greater reductions in youth drinking and heavy drinking than a policy that raises drinking ages from a uniform 18 years to a uniform 21 years. However, they find that the price sensitivity of youth drinking fell between 1982 and 1989.

Likewise, Kenkel (1993a) uses data from the 1985 National Health Interview Survey to compare the price sensitivity of young people’s heavy drinking to that of adults. He finds that heavy drinking in all age groups was inversely related to the prices of alcoholic beverages. Moreover, that heavy drinking by younger persons was more sensitive to price than was heavy drinking by adults, with heavy drinking by young women much more sensitive to price than heavy drinking by young men. Finally, he concludes that increases in legal drinking ages also reduced drinking by those under 21 years of age.

Finally, Grossman et al. (1995) use the panel data sets from the Monitoring the Future surveys to apply the Becker and Murphy (1988) model of rational addictive behavior to drinking by 17 through 27 year olds. They find that alcohol consumption in this age range is an addictive behavior, in the sense that increases in past drinking lead to higher current drinking. In addition, they find that young drinkers do not behave myopically. Finally, their estimated long-run price elasticities of demand are about twice as large as those obtained when the analysis ignores the addictive aspects of drinking.

In addition to examining drinking, a number of researchers study outcomes related to youth alcohol abuse. For example, Saffer and Grossman (1987) and Chaloupka et al. (1993) look at the effects of alcohol control policies on drinking and driving among young persons as measured by motor vehicle accident fatality rates. Both studies find a negative and significant relationship between beer excise taxes and 18 through 20 year old motor vehicle accident fatality rates. Similarly, both find that higher legal drinking ages
would significantly reduce the probability of a fatal youth motor vehicle accident. Finally, Chaloupka et al. conclude that many of the state policies related to drinking and driving do successfully deter youths from driving under the influence of alcohol.

Similarly, Kenkel (1993a) and Chaloupka and Laixuthai (1994) use self-reported drinking and driving and involvement in non-fatal traffic crashes, respectively, to examine the impact of alcohol control policies on drinking and driving by young people. Both find strong evidence that higher beer prices led to significant reductions in drinking and driving. Kenkel also concludes that higher legal drinking ages and at least some state drunk driving laws deterred youth drinking and driving.

Finally, Cook and Moore (1993) and Kenkel and Ribar (1994) use the National Longitudinal Survey of Youth to examine the impact of alcohol use and abuse by youths and young adults on several other outcomes, as well as the effects of various alcohol control policies on these outcomes. For example, Cook and Moore find that college completion rates were inversely related to alcohol abuse and that raising beer taxes could increase these rates. Similarly, in their sophisticated instrumental variables models, Kenkel and Ribar find that problem drinking had an adverse impact on the probability of being married and on earnings. Coupled with their findings that higher prices significantly reduce both alcohol dependence and alcohol abuse, they conclude that higher alcohol taxes could increase productivity and earnings.

III. DATA AND METHODS

The study here is the first to look at the effects of alcohol control policies on drinking by college students in a nationally representative sample of students in 140 U.S. colleges and universities. In particular, the study focuses on these policies’ effects on the incidence of heavy or binge drinking associated with a number of consequences in this population.

Data are from the 1993 Harvard College Alcohol Study, a nationally representative sample of 17,592 students at 140 U.S. four-year colleges and universities. Wechsler et al. (1994) describe in detail. The Harvard Study used self-administered questionnaires to collect a variety of socio-demographic information along with data on binge drinking behavior. This survey defined binge drinking as drinking five or more drinks on a single occasion for men and drinking four or more drinks on a single occasion for women. While one might question the accuracy of self-reported drinking measures, recent research supports the validity of this approach for understanding drinking behavior (Polich, 1982; Rachal et al., 1980). Finally, the survey collected data on various aspects of the 140 colleges and universities.

All respondents reported on their current/past drinking patterns. A level of drinking variable was created based on self-reported drinking, which could be reported in one of the following four categories: abstention or did not drink in the past year (drinking variable defined as zero); drank in the past year but did not engage in binge drinking in the past two weeks (defined as one); binged once or twice in the past two weeks (defined as two); and binged three or more times in the past two weeks (defined as three). In addition, two dichotomous indicators also were defined based on the self-reported drinking data. The first is an indicator of drinking participation, defined as one for respondents who drank any alcoholic beverages in the past year and zero otherwise. The second is an indicator of binge drinking, defined as one for respondents who indicated any binge drinking in the two weeks prior to the survey and zero otherwise.

Based on the individual level survey data, a variety of independent variables controlled for other factors affecting drink-
ing and binge drinking. These included: age and age squared; indicators of gender, race/ethnicity (Hispanic, Black, and Asian), marital status (married, divorced, separated, and widowed), religiosity (based on the importance of participating in religious activities at college), parental education (at least one parent with a four year college degree), on-campus residence, fraternity/sorority membership, and employment. In addition, to prevent the loss of a large number of students, a set of indicators was created for respondents with missing data for any of these variables.

In addition, several variables reflected the characteristics of the college/university for each respondent. Two of these measured alcohol availability: an indicator for an on-campus bar and a measure of the number of outlets licensed to sell alcoholic beverages within one mile of the respondent’s school. In addition, other college/university specific variables included indicators for co-ed, all-Black, primarily commuter, rural, and private schools and an indicator for schools with at least one fraternity or sorority. Finally, a set of region indicators (West, Northeast, and Midwest) was added.

Beer is the beverage of choice among all drinkers and particularly among young drinkers. In 1993, for example, per capita beer consumption was 22.6 gallons, compared to 1.31 gallons for distilled spirits and 1.74 gallons for wine (Beer Institute, 1994). Adjusting these figures for alcohol content, the per capita alcohol consumption in the form of beer is nearly double that of alcohol consumption in the form of distilled spirits and is more than quadruple that of alcohol consumption in the form of wine. Moreover, Coate and Grossman (1988) and Grossman et al. (1987) find that self-reported drinking by youths and young adults overwhelmingly identifies beer consumption. Therefore, the analysis added site specific beer prices to the survey data. These price data are taken from the American Chamber of Commerce Researchers’ Association’s (ACCRA) quarterly *Inter-City Cost of Living Index* and reflect the retail price (including state and local excise taxes but excluding deposits) of a six-pack of either Budweiser or Miller Lite for over 250 cities in each quarter. In addition, a site specific local cost-of-living index, taken from the ACCRA reports, also was added to the survey in the same manner. All price data then were deflated by this local cost-of-living index. The price from the nearest city (in the same state) in the ACCRA sample was matched to each of the colleges/universities, and a set of indicators was constructed reflecting the quality of the price match—i.e., a perfect match; a high-quality match (ACCRA city less than 25 miles from the college); a good match (ACCRA city 25-75 miles from the college); and a relatively poor match (ACCRA city more than 75 miles from the college). All estimates presented below also were obtained for more limited samples based on the quality of the price match. Given that the source of most of the variation in price results from differences in state excise taxes and that the price measure for each site always comes from a city within the same state, it was not surprising that the results for the restricted samples were similar to those presented below.

Finally, based on the state in which the college/university is located, an index reflecting the restrictiveness of the state’s drunken driving laws targeting youths and young adults was added to the survey data. This variable was constructed based on the “grade” ranging from A+ to F that each state received for its drunken driving laws from the Mothers Against Drunk Driving (MADD). These grades were converted to a simple scale ranging from 0 (F) to 12 (A+). Alternative constructs produced essentially the same results.

Given the limited nature of the dependent variables, ordinary least squares techniques are inappropriate. Instead, two alternative approaches are used. For the ordered, level of drinking variable, ordered
TABLE 1
Prevalence of Drinking and Binge Drinking

<table>
<thead>
<tr>
<th>Level of Drinking</th>
<th>Underage Males</th>
<th>Underage Females</th>
<th>Legal Age Males</th>
<th>Legal Age Females</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abstain</td>
<td>17.8%</td>
<td>19.1%</td>
<td>13.0%</td>
<td>13.4%</td>
</tr>
<tr>
<td>Drank moderately</td>
<td>31.4%</td>
<td>39.1%</td>
<td>37.7%</td>
<td>50.1%</td>
</tr>
<tr>
<td>Infrequent Binging</td>
<td>27.0%</td>
<td>22.0%</td>
<td>27.6%</td>
<td>21.6%</td>
</tr>
<tr>
<td>Frequent Binging</td>
<td>23.8%</td>
<td>19.8%</td>
<td>21.7%</td>
<td>15.0%</td>
</tr>
<tr>
<td>Drinking Participation</td>
<td>82.2%</td>
<td>80.9%</td>
<td>87.0%</td>
<td>86.6%</td>
</tr>
<tr>
<td>Binge Drinking</td>
<td>50.8%</td>
<td>41.8%</td>
<td>49.3%</td>
<td>36.6%</td>
</tr>
<tr>
<td>Sample Size</td>
<td>2,902</td>
<td>4,381</td>
<td>4,070</td>
<td>4,924</td>
</tr>
</tbody>
</table>

*Percentages may not add to one hundred because of rounding.

probit methods are employed. These methods will provide some general sense of the relationships between beer prices, alcohol availability, and drunken driving laws targeted at youths and young adults, and drinking. Finally, dichotomous probit methods are used to estimate the equations using the dichotomous indicators of drinking and binge drinking participation.

In his insightful discussion of the impact of alcohol control policies on underage and legal drinkers, Kenkel (1993b) suggests that responses to changes in money price and other control policies by underage persons may be smaller than those of older persons. This possibility arises from the importance of the legal drinking age in the full price of alcohol for underage drinkers. Moreover, the goal of alcohol control policy differs for underage and legal drinkers. Policies targeting underage youths, from zero tolerance drunk driving laws to legal drinking ages themselves, proscribe drinking, while those aimed at older persons strive for responsible drinking. In order to explore these issues and given Kenkel's (1993a) finding that young men and women respond differently to alcohol prices and control policies, separate estimates are obtained for age and gender specific samples. Table 1 presents the distributions for the three alternative measures of drinking in each sample (descriptive statistics for the independent variables for each sample are contained in an appendix available upon request from the authors). These distributions are consistent with Kenkel's (1993b) hypothesis that the legal drinking age creates a fixed cost for the purchase of the first drink and should thus have a larger effect on moderate drinking than on heavy drinking. The finding that there is a relatively smaller fraction of moderate drinkers among underage drinkers as compared to that among drinkers of legal age supports Kenkel's hypothesis.

IV. RESULTS

Tables 2 and 3 contain coefficient estimates for the policy manipulable variables for the three measures of drinking by male and female college students, respectively.
### TABLE 2
Estimates of Drinking and Binge Drinking Equations—Male Samples

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>Underage Sample</th>
<th>21 and Older Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Level of Drinking</td>
<td>Drinking Participation</td>
</tr>
<tr>
<td>Beer Price</td>
<td>-0.028 (0.62)</td>
<td>-0.063 (1.01)</td>
</tr>
<tr>
<td>Drunk Driving Law Index</td>
<td>-0.017 (-1.77)</td>
<td>-0.036 (-2.61)</td>
</tr>
<tr>
<td>Price Elasticity</td>
<td>-0.072</td>
<td>0.054</td>
</tr>
</tbody>
</table>

**Panel A: Limited Model**

| Beer Price           | -0.021 (-0.45)   | -0.053 (-0.79)        | 0.019 (0.33)               | -0.039 (-0.99)    | -0.063 (-1.01)         | -0.039 (-0.81)            |
| Drunk Driving Law Index | -0.015 (-1.49)  | -0.035 (-2.47)        | -0.027 (-2.24)             | -0.027 (-3.19)    | -0.047 (-3.43)         | -0.015 (-1.42)            |
| Alcohol Outlets Near Campus | 0.224 (4.56)   | 0.164 (2.48)        | 0.260 (4.12)               | 0.335 (7.68)      | 0.405 (7.06)           | 0.213 (3.99)              |
| On Campus Bar Price Elasticity | 0.085 (1.77)  | 0.128 (1.87)        | 0.044+ (0.77)              | -0.009 (-0.22)    | -0.081 (-1.23)         | -0.011 (-0.23)            |
| Price Elasticity     | -0.057          | 0.055                |                            | -0.048           | -0.117                |                              |

**Panel B: Full Model**

*Sample size is 2,902 for the underage sample and 4,070 for the 21 years and older sample. The limited and full models are described in the text. Asymptotic t-ratios are in parentheses. All equations, based on likelihood ratio tests, are significant at better than the 1 percent significance level.*
TABLE 3
Estimates of Drinking and Binge Drinking Equations—Female Samples

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>Underage Sample</th>
<th>21 and Older Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Level of Drinking</td>
<td>Drinking Participation</td>
</tr>
<tr>
<td>Beer Price</td>
<td>-0.077</td>
<td>-0.153</td>
</tr>
<tr>
<td></td>
<td>(-2.21)</td>
<td>(-3.15)</td>
</tr>
<tr>
<td>Drunk Driving</td>
<td>-0.017</td>
<td>-0.045</td>
</tr>
<tr>
<td></td>
<td>(-2.16)</td>
<td>(-4.02)</td>
</tr>
<tr>
<td>Law Index</td>
<td>-0.180</td>
<td>-0.231</td>
</tr>
<tr>
<td></td>
<td>(-2.58)</td>
<td>(-3.53)</td>
</tr>
<tr>
<td>Alcohol Outlets Near Campus</td>
<td>0.346</td>
<td>0.363</td>
</tr>
<tr>
<td>On Campus Bar</td>
<td>0.059</td>
<td>-0.014</td>
</tr>
<tr>
<td></td>
<td>(1.44)</td>
<td>(-0.24)</td>
</tr>
<tr>
<td>Price Elasticity</td>
<td>-0.171</td>
<td>-0.250</td>
</tr>
</tbody>
</table>

Panel A: Limited Model

Panel B: Full Model

*Sample size is 4,381 for the underage sample and 4,924 for the 21 years and older sample. The limited and full models are described in the text. Asymptotic t-ratios are in parentheses. All equations, based on likelihood ratio tests, are significant at better than the 1 percent significance level.
Columns 2, 3, and 4 of each table contain the estimates for the level of drinking, drinking participation, and binge drinking participation, respectively, for the underage samples. Columns 5, 6, and 7 contain the comparable estimates for the older samples. Likelihood ratio tests indicate that estimating the models separately by age and gender is appropriate. Panel A of each table presents the estimates for models that exclude the most likely endogenous independent variables (the measures of alcohol availability, membership in a fraternity/sorority, on-campus living, and attendance at a co-ed college or a college with at least one fraternity/sorority) while the models in Panel B include them. The alternative specifications are estimated in order to explore the sensitivity of the most clearly exogenous policy related variables (price and the drunk driving law index) to the inclusion/exclusion of the potentially endogenous determinants of college student drinking behavior.

In general, the price of beer has a negative impact on the three measures of drinking in each of the samples. However, in the underage male sample, this relationship is never statistically significant at conventional levels, while in the young adult male sample it is only occasionally significant at the 10% level. For underage women, the impact of price on the level of drinking and drinking participation measures is significant at the 5% level or better, while the impact on binge drinking is significant at approximately the 6% level. In contrast, price rarely has a significant impact on the level of drinking or drinking participation by young adult female students. However, the effect of price on binge drinking among older female students is significant at the 10% level in the full model and at approximately the 13% level in the limited model. Otherwise, few differences exist in the impact of price in the models that exclude and include the potentially endogenous determinants of drinking behavior.

Tables 2 and 3 contain estimates of the price elasticities of drinking and binge drinking. The marginal effects of price on drinking and binge drinking participation used in the computation of the price elasticities are based on the estimated coefficients and are evaluated at the sample specific means as described in Greene (1993). To some extent, sizable differences in the marginal effects would arise from differences in the means of key variables. However, a comparison of the means from the different samples suggests that the estimated marginal effects and price elasticities are not sensitive to this issue.

Given the insignificance of price in most of the equations for male college students, these estimates suggest that sharp increases in beer taxes, if passed on in the form of higher prices, would have little impact on drinking and binge drinking among male college students. Similarly, increased beer taxes would not significantly change drinking participation among 21-year-old and older female college students. However, these estimates do suggest that higher beer taxes could reduce binge drinking and underage drinking among college women. For example, a policy that would have equated the tax on the alcohol in beer to that on the alcohol in distilled spirits in 1951 and indexed the tax to the rate of inflation since 1951 (over a tenfold increase in the current tax) would have reduced drinking participation among underage college women by approximately 15%. Similarly, the numbers of underage and 21-year-old and older college women engaging in any binge drinking would fall by roughly 21 and 17%, respectively.

The generally insignificant or small effects of price on drinking among college students may in part result from measurement error in the price variable. That is, local retail prices may not accurately reflect the price of alcoholic beverages for college students if much of their drinking and in particular binge drinking takes
place at parties where alcohol is available for free or at local bars where prices are sharply discounted to attract college students. Unfortunately, detailed data on the prices students pay for alcoholic beverages and on the sources of these beverages and/or the context of their drinking were unavailable. Similarly, the long-run effect of price on drinking among college students may be much larger than described above, given the addictive nature of alcohol consumption for some drinkers. For example, Grossman et al. (1995) apply the Becker and Murphy (1988) rational addiction model to youth and young adult drinking and obtain long-run elasticities about double those that they estimate for models which do not account for addiction. Unfortunately, the survey of college students did not collect the data needed to estimate demand equations accounting for addiction.

Strong state level policies related to drinking and driving by youths and adults significantly reduce all measures of drinking in both specifications for the underage and older male college student samples. The same is generally true for the level of drinking and drinking participation equations for the female college student samples. However, the impact of these policies on binge drinking by college women is not statistically significant at conventional levels, with the exception of the full model for underage women where the rank driving index is significant at better than the 6% level. These results suggest that increasing the probability of arrest, raising the standards for arrest and conviction, and raising the penalties upon conviction for youth and young adult driving under the influence will reduce both drinking and binge drinking among male college students. However, the results indicate that stronger drunk driving laws will have less impact on binge drinking by female college students.

In contrast to the mixed effects of price and drunk driving laws on drinking among college students, alcohol availability has a strong positive and significant impact on all measures of drinking and binge drinking in all four samples. That is, the level of drinking, drinking participation, and participation in binge drinking are all significantly higher among all college students when a greater number of outlets licensed to sell alcoholic beverages exist near campus. The marginal effect of having a bar on campus is generally positive and significant at least the 10% level for the underage samples but is generally not statistically significant in the older samples.

The observed positive relationship between alcohol availability and drinking, particularly binge drinking, among college students may reflect unobserved factors that are difficult to control for in these data. That is, outlets licensed to sell alcoholic beverages may locate near a college campus given college students' relatively high demand for alcoholic beverages. In general, these location decisions are likely to have occurred well before the timing of the survey. Thus, they may be related to past drinking on campus rather than current drinking. However, this past drinking may be one of the elements of the college's reputation that current students consider when making their college choice. Thus, while it is likely that greater availability of alcoholic beverages will lead to more drinking and binge drinking, the estimates presented in the tables may overstate this relationship.

The results for some of the other independent variables include the following: With respect to race and ethnicity, whites generally drink significantly more than do Blacks or Asians. No good income measure was available in the survey data. Instead, a number of proxy variables were used in an attempt to capture the effects of income on drinking by college students. These include: an indicator for working college students, an indicator for students with at least one parent with a four year
college degree, an indicator for private colleges, and others. In general, the results for these variables were mixed. Working college students generally were significantly less likely to engage in binge drinking than were nonworking students but were just as likely to engage in any drinking. This may reflect a negative relationship between income and heavy drinking, if employed students have higher incomes. Alternatively, the responsibilities associated with working and attending college may deter working students from heavy drinking. On the other hand, it could suggest a positive relationship if college students who are not employed have greater resources than those who work while attending college. Students with at least one parent with a four year college degree (expected to reflect higher family income) are much more likely to participate both in any drinking and in binge drinking. In general, the other possible proxy variables for income were not significant.

Students indicating that participation in on campus religious activities is important are significantly less likely to drink or to engage in binge drinking than are students who do not find these activities important. Not surprisingly, members of fraternities or sororities are much more likely to drink and to drink heavily than are students who are not members. Similarly, both drinking participation and participation in binge drinking generally are significantly higher among students attending a college with at least one fraternity or sorority. Likewise, participation in binge drinking among underage female students at co-ed colleges is much higher than among underage students at all-female institutions, although no differences are observed for drinking participation or for older students. Similarly, while the results showed no differences for male and older female students, drinking participation and participation in binge drinking are significantly higher among underage female students living on campus than they are among commuters. Likewise, with the exception of the older female sample, students attending a predominantly commuter college are both less likely to drink and much less likely to participate in binge drinking than are those attending colleges where a greater fraction of the students reside on campus.

V. DISCUSSION

The results indicate that increases in beer prices, which could be achieved by raising excise taxes on beer, would lead to reductions in both binge drinking and underage drinking among female college students. However, these estimates also indicate that male college students are virtually unresponsive to price. While participation in binge drinking is high among female college students (over 40% of underage women and over 36% of older women indicate at least one binge drinking incident in the two weeks prior to the survey), it is particularly problematic among male students (almost 50% participated in binge drinking shortly before the sample). Moreover, although the estimated price effects are statistically significant, the estimates imply that substantial increases in taxes would be necessary to achieve relatively modest reductions in binge drinking by female students. For example, a doubling of the current Federal beer tax to 64 cents per six-pack would lead to less than a 2% reduction in binge drinking participation rates among female students while lowering drinking participation among underage women by about 1.5%.

These results suggest that many aspects of the campus environment contribute to binge drinking. In particular, the ready availability of alcoholic beverages, membership in fraternities and sororities, and living on campus are significantly related to binge drinking. These results suggest that the "Animal House" mentality that is widespread at many colleges and univer-
sities may be very difficult to change. Indeed, college policies may help create an environment more conducive to excessive and abusive drinking than generally prevails in other segments of society. Individuals who are not a part of this culture (those who live off campus, are employed, and/or are not members of fraternities/sororities) generally are less likely to engage in binge drinking. However, given the potential endogeneity of many of these variables, these findings are not definitive evidence that a causal relationship exists between the campus environment and binge drinking among college students. Instead, these results should be viewed as providing a descriptive picture of a typical college environment that is conducive to alcohol abuse.

The results do suggest that some policies may be effective in reducing binge drinking by college students. Strong restrictions on the availability of alcoholic beverages to college students are likely to lead to significant reductions in heavy drinking. Similarly, aggressive policies targeting outcomes related to excessive or abusive drinking by youths and young adults may be very effective in reducing participation in heavy drinking. For example, laws that ease the standards for arrest and conviction associated with drinking and driving by youths and young adults and laws that raise the penalties for drinking and driving do reduce significantly binge drinking by male college students. Nevertheless, unless U.S. colleges and universities implement aggressive efforts to change the campus environment that tolerates, or perhaps promotes, binge drinking, excessive and abusive drinking on campuses will remain a problem.

REFERENCES

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