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FRATERNITY MEMBERSHIP AND BINGE DRINKING

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ABSTRACT

This paper examines the relationship between membership in social fraternities and sororities and binge drinking among 18–24 year old full-time four-year college students who participated in the 1995 National College Health Risk Behavior Survey. To deal with unobserved heterogeneity in binge drinking incidence and frequency regressions, I enter as explanatory variables various measures of situational and overall alcohol use. When these are added, the fraternity membership coefficient is substantially reduced in size, but remains large and highly significant. This suggests that fraternity membership increases binge drinking. If not, it identifies a very specific mechanism underlying the decision to join a fraternity: members drink more intensely than non-members even while doing so in similar frequencies and situations and for similar lengths of time. Particularly notable is that behavior by underage students appears to drive the relationship.

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1. Introduction

Social fraternities and sororities play a prominent role in the lives of students at many colleges and universities. Over 18 percent of 18–24 year old full-time, four year college students sampled by the 1995 National College Health Risk Behavior Survey (NCHRBS) were fraternity members, while slightly more than 12 percent of 17–25 year old four year college students surveyed by the 2001 Harvard College Alcohol Study reported fraternity membership.[1] Although fraternities serve a variety of functions, the predominant activity with which they are associated is the consumption of alcohol.

Fraternities often connote a culture of heavy drinking, as famously portrayed in the movie Animal House. Anecdotal evidence of problematic drinking at fraternity events abounds. Objective data confirm that fraternity members drink more heavily than do non-members. In the NCHRBS, for instance, the rate of binge drinking, i.e. consuming at least five alcoholic beverages within a few hours, at least once in the past month was 69 percent among fraternity members and 42 percent among non-members. Academic studies using data from the Harvard College Alcohol Study (Chaloupka and Wechsler, 1996) and the Core Alcohol and Drug Survey (Alva, 1998 and Cashin et al., 1998) have documented that fraternity and sorority members drink more frequently and heavily than their non-member peers.

It is tempting to conclude from this descriptive evidence that fraternity membership itself is the reason that fraternity members drink more excessively than do non-members. But does fraternity membership truly cause heavy drinking? More specifically, would the incidence or frequency of drunkenness among students who join fraternities decline in the absence of fraternities? That is the question on which this study seeks to provide information.

[1] Throughout the paper, the term "fraternity" is meant to apply more generally to sororities as well as fraternities.

It is probable that students who join fraternities do so at least in part because they like to drink heavily and perceive that fraternity membership will facilitate such behavior by grouping them with other students who share these preferences. For example, Sacerdote (2001) found that among the Dartmouth College senior classes of 1997 and 1998, students who drank in high school were more likely to join a fraternity than those who did not. Baer et al. (1995), Schall et al. (1992) and Wechsler et al. (1996) obtain similar evidence, and also report that among students who drank in high school, those who joined fraternities were more likely to have been heavy drinkers than moderate drinkers.

In the extreme, imagine that self-selection of heavy drinkers into fraternities is the sole mechanism underlying the correlation between drinking and fraternity membership, and that heavy-drinking students would ultimately socialize together even if fraternities did not exist. Under this scenario, heavier drinking among fraternity members could not be attributed to membership, i.e. eliminating fraternities would not reduce heavy drinking among students who would have otherwise joined fraternities.

Contradicting this hypothesis, Borsari and Carey (1999) outline three ways in which fraternity membership might directly increase heavy drinking. One is by providing social pressure to drink heavily in order to gain acceptance and avoid social ostracism among fellow members who are observed to engage in heavy drinking. Another is by elevating perceptions of peer drinking norms, which already tend to be overestimated by the typical college student. The third is by providing a physical environment that is conducive to heaving drinking because of the ready availability of alcohol and insulation from students who are less tolerant of excessive drinking.

Some evidence suggests that fraternity membership does indeed directly increase heavy drinking. Lo and Globetti (1995) find that students who do not binge drink upon college entry are three times more likely to start binge drinking if they join a fraternity. Also, Sher et al. (2001) estimate that fraternity members drank more heavily than non-members during college, even controlling for previous alcohol use, but that drinking behavior no longer differed across membership status three years after college.

This study addresses the question of whether fraternity membership causes binge drinking using a fairly straightforward and non-technical proxy variable approach. Specifically, it includes a set of potentially endogenous variables as explanatory factors to control for unmeasured determinants of binge drinking that might be correlated with fraternity membership. The unique aspect of the paper is that the main proxy variables are measures of alcohol use, including but not constrained to binge drinking, during the current period. The analysis thus identifies the effect of fraternity membership on binge drinking using differences between members and non-members who consume alcohol, not categorized with respect to intensity, in identical frequencies and situations.

Because it is impossible to determine if proxy variables completely control for the spurious correlation linking two endogenous variables, it would be overly ambitious to state the goal of the study as providing a precise estimate of the causal effect of fraternity membership on binge drinking. In this case, however, the current alcohol use measures specified as proxies explicitly control for the exact type of unobserved heterogeneity that is expected to contaminate the relationship of interest. Moreover, this approach attributes a sizable portion of the observed variation in binge drinking to non-binge alcohol use rather than fraternity membership, even though the latter might directly influence non-binge as well as binge drinking.

Thus, the analysis prospectively provides a conservative estimate of the causal effect of fraternity membership on binge drinking. At the very least, it isolates a component of the correlation between fraternity membership and binge drinking that is arguably non-causal, and outlines the selection mechanisms that would have to prevail to invalidate the interpretation of the remaining correlation as a causal effect. Namely, for the identified effect to not be causal, two conditions must hold: fraternity membership must not directly influence non-binge alcohol consumption, and students who join fraternities must do so because they binge drink more often than other students who otherwise consume alcohol with the same frequency, in the same situations and over the same period of time.

The concern about binge drinking among college students is the many potential harmful effects it can have on others. These include physical and psychological damage from drunken driving, physical violence, vandalism, and forced or risky sexual activity. Even reduced educational attainment or academic performance is a legitimate concern, if we believe that the knowledge obtained from schooling conveys a positive social benefit. The efforts that will most effectively limit external effects of college student binge drinking depend in part on whether fraternities play a causal role in such drinking.

2. Data and Empirical Strategy

This analysis aims to estimate the effect of social fraternity and sorority membership on binge drinking among college students. The main econometric issue that must be surmounted is the expected presence of unobserved factors that simultaneously determine fraternity membership and binge drinking. In particular, fraternity members likely engage in binge drinking with greater likelihood or frequency than non-members at least in part precisely because

their preferences for binge drinking led them to join a fraternity. If so, some of the excess drinking among fraternity members relative to non-members would still be observed even in the absence of fraternities. The goal of the analysis is to address this omitted variable problem, upon which it can be established how much of the initial correlation between fraternity membership and binge drinking remains and whether this remaining correlation is statistically and economically significant.[2]

The empirical strategy is to include proxies for the specific type of unobserved heterogeneity that is expected to bias the estimated relationship between binge drinking and fraternity membership. Ideally, controls for binge drinking preferences could be included to break the spurious correlation between fraternity membership and binge drinking that exists separately from any causal relationship running from membership to drinking. The approach pursued here is to include observable factors that closely approximate the omitted preference measures.

What makes this analysis distinctive is the use of several measures of current alcohol use to reflect unobserved tastes for drinking that might influence both fraternity membership status and current binge drinking. Current drinking, defined without regard to categorization as binging, i.e. that includes both binge and non-binge drinking episodes, is clearly related to the same underlying preferences that determine binge drinking. Simply controlling for current drinking status, however, leaves open the possibility that the remaining correlation between fraternity membership and binge drinking simply represents a scenario in which members gain

[2] I consider the endogeneity problem to be solely due to omitted variables. One could conceivably also admit the possibility of reverse causation, i.e. that binge drinking causes fraternity membership. I dismiss this mechanism because it implies that variations in current binge drinking directly lead to changes in fraternity membership status. The latter rarely changes for a student except for when the student joins a fraternity, and binge drinking clearly depends on unobserved preferences. A complete accounting for unobserved heterogeneity, therefore, would seem to eliminate the potential for reverse causation.

more utility from binge drinking than do non-members who are also drinkers. To address this concern, measures of drinking frequency and duration as well as the incidence of drinking in various circumstances that are particularly risky are included. Any self-selection that persists would have to be quite specific, in that it would involve binge drinking differences between members and non-members who shared the same frequencies and durations of drinking as well as propensities to drink in several extreme situations. Moreover, this strategy could yield conservative estimates of fraternity membership effects on binge drinking, because non-binge alcohol consumption could also be a function of fraternity membership.

These drinking preference proxies are included on top of a baseline model that controls for many standard individual characteristics and are ultimately accompanied by other proxies for omitted factors that are not directly related to alcohol use. The vector of controls can therefore be divided into four groups: an indicator for fraternity membership (F), a set of variables that are plausibly exogenous with respect to unobserved determinants of binge drinking (**X**), a set of alcohol use measures intended to represent omitted factors that influence both fraternity membership and binge drinking (**A**), and a set of additional non-drinking covariates that are included for the same reason as the alcohol use measures (**U**). A regression equation that summarizes this empirical approach is

$$B = \alpha_0 + \alpha_1 F + \mathbf{X}\boldsymbol{\alpha_2} + \mathbf{A}\boldsymbol{\alpha_3} + \mathbf{U}\boldsymbol{\alpha_4} + \varepsilon, \qquad (1)$$

where B represents binge drinking, $\varepsilon \sim N(0, \sigma^2)$ includes unobserved determinants of binge drinking, and the α are the regression parameters.

Variants of equation (1) are estimated using data from the National College Health Risk Behavior Survey (NCHRBS), which was developed by the Centers for Disease Control and Prevention (CDC) and administered during the first half of 1995. As described in CDC (1997),

the purpose of the NCHRBS was to monitor a broad range of health-risk behaviors among college students. A two-stage cluster sample design was used to produce a nationally representative sample of undergraduate students aged 18 and over. In the first stage, 74 four-year institutions and 74 two-year institutions were selected, with probability proportional to undergraduate enrollment size, from 16 strata formed based on the relative percentage of black and Hispanic students. The second stage consisted of a random sample of undergraduates in the 136 participating institutions, with targets of 56 students from four-year schools and 72 students from two-year schools. Of the 8,810 students selected, 7,442 were deemed eligible and 4,838 completed the questionnaire, which was sent by mail to students for self-administration. Responses were voluntary and confidential.

The sample for this analysis is restricted to undergraduate students who were 18–24 years old when their interviews occurred. As of the survey period, 57 percent of the 12 million students enrolled in U.S. colleges and universities were ages 18–24, and one quarter of U.S. residents in this age range were full- or part-time college students. The analysis sample also includes only full-time students from four-year schools. These restrictions are made because the excluded group of students who are older, part-time or at two-year schools contains very few fraternity members. Sensitivity analyses, however, are conducted to verify that these sample exclusion criteria do not drive the estimation results.

The two dependent variables in the regressions are constructed from information on the number of days in the past 30 days on which the respondent engaged in binge drinking, i.e. consumed at least five alcoholic beverages in the span of a few hours. One is an indicator that any binge drinking occurred, regressions of which are estimated using a probit model. Rather

than probit coefficients, the tables report the average marginal effect for sample respondents, as opposed to the marginal effect at the average explanatory variable values.

The other dependent variable is a measure of binge drinking days. The survey reports only categorical information, with choices of 0, 1, 2, 3–5, 6–9, 10–19, and 20 or more. Consequently, this variable is analyzed using an interval regression model. This method handles the lower bound of zero, and top interval upper bound of 30, identically to a Tobit model. The interval model departs from the Tobit, however, by recognizing that while values of 1 and 2 represent exact numbers of days, all that is known about observations with values in the remaining three categories are the lowest and highest possible number of days that the value could represent.

Like the probit and Tobit models, the interval model is estimated using maximum likelihood. Rewriting equation (1) as $B = \mathbf{Z\alpha} + \varepsilon$, the likelihood function is

$$\begin{aligned} L \;=\; & \sum_{B=0} \log \Phi\left(-\frac{\mathbf{Z\alpha}}{\sigma}\right) - \frac{1}{2}\sum_{B=1}\left[\left(\frac{1-\mathbf{Z\alpha}}{\sigma}\right)^2 + \log 2\pi\sigma^2\right] - \frac{1}{2}\sum_{B=2}\left[\left(\frac{2-\mathbf{Z\alpha}}{\sigma}\right)^2 + \log 2\pi\sigma^2\right] \\ & + \sum_{B\in[3,5]} \log\left[\Phi\left(\frac{5-\mathbf{Z\alpha}}{\sigma}\right) - \Phi\left(\frac{3-\mathbf{Z\alpha}}{\sigma}\right)\right] + \sum_{B\in[6,9]} \log\left[\Phi\left(\frac{9-\mathbf{Z\alpha}}{\sigma}\right) - \Phi\left(\frac{6-\mathbf{Z\alpha}}{\sigma}\right)\right] \\ & + \sum_{B\in[10,19]} \log\left[\Phi\left(\frac{19-\mathbf{Z\alpha}}{\sigma}\right) - \Phi\left(\frac{10-\mathbf{Z\alpha}}{\sigma}\right)\right] + \sum_{B\in[20,30]} \log\left[1 - \Phi\left(\frac{20-\mathbf{Z\alpha}}{\sigma}\right)\right] \end{aligned} \quad , \quad (2)$$

where $\Phi()$ is the standard cumulative normal distribution. In lieu of coefficients, which represent marginal effects on the underlying B* which in principle can be negative or larger than 30, the tables report marginal effects on the observed B. These are calculated by multiplying the coefficients by the probability that $0 < B < 20$, i.e. by $\Phi\left(\frac{20-\mathbf{Z\alpha}}{\sigma}\right) - \Phi\left(-\frac{\mathbf{Z\alpha}}{\sigma}\right)$. This adjusts the coefficient downward in magnitude because the lower and upper bounds, i.e. zero and 30 days, are true corner solutions. Again, these marginal effects are averages across sample respondents.

The key explanatory variable in the regressions, F, indicates whether or not the student reports being a member of a social fraternity or sorority. This does not incorporate information on whether the student resides in a fraternity or sorority house. Only 58 of the 260 fraternity members in the analysis sample, i.e. 22 percent, also live in a fraternity house.

The vector **X** of exogenous drinking determinants includes a set of indicators that control for gender, age, grade level, race, marital status, parental education and school. An indicator is included for females, each age from 19–24 (age 18 omitted), the sophomore, junior and senior classes (freshmen omitted), non-Hispanic blacks, Hispanics, Asians and other non-white, non-Hispanics (non-Hispanic whites omitted), married and separated, divorced or widowed (never married omitted), each parent not finishing high school, graduating from high school, having some college and graduating from college ("not sure" omitted), and for each institution represented except one. The school fixed effects are not strictly exogenous, but are potentially important to include as controls for student selection into schools on the basis of drinking prevalence and fraternity presence.

As described above, the vector **A** consists of five alcohol use measures that are intended to proxy for unobserved tastes for alcohol that might simultaneously influence fraternity membership and binge drinking. Three of these correspond to the past 30 day period, including the number of days alcohol was consumed and the number of times alcohol was consumed before driving and in combination with illegal drugs. All three measures are collapsed from categorical responses by assigning midpoints and top-codes. Possible choices were zero, 1–2, 3–5, 6–9, 10–19, 20–29, and 30 for drinking days, zero, 1, 2–3, 4–5, and 6 or more for drunk driving, and 0, 1–2, 3–9, 10–19, 20–39, and 40 or more for use with drugs. Top-codes of 6.4 for drunk driving (three percent of the sample) and 40 (0.1 percent) are specified, assuming that

positive values have an approximate normal distribution (as is done for all top-codes) and rounding to the nearest tenth.

The other two alcohol use proxies are an indicator of whether alcohol or drugs were used before the most recent episode of sexual intercourse, and the number of years since alcohol was first consumed. The latter is formed by subtracting from respondent age the response to a question asking the age at which the respondent first had a drink of alcohol other than a few sips. Choices for the latter question were never, 12 or younger, 13–14, 15–16, 17–18, 19–20, and 21–24. This was converted to a single variable equaling respondent age for those who had never consumed alcohol (forcing the resulting years variable to equal zero), 19 year olds reporting 19–20, and 21 year olds reporting 21–24; 12 for those reporting the youngest category (12 percent of the sample); interval midpoints for all reporting 13–14, 15–16 and 17–18, 20 year olds reporting 19–20 and 24 year olds reporting 21–24; 21.5 for 22 year olds reporting 21–24; and 22 for 23 year olds reporting 21–24. The latter two assignments represent the midpoint between the lower bound age of 21 and the age of the respondent.

Alcohol consumption frequency and duration are intended to directly reflect preferences for drinking. The drinking before sex variable is motivated by the finding in Cashin et al. (1998) that fraternity members are more likely than non-members to view drinking as a vehicle for sexual opportunity. Cashin et al. (1998) also show that fraternity members are more likely than non-members to experience negative consequences from the use of alcohol and other drugs, while Williams et al. (2004) find that alcohol and marijuana are economic complements among college students. Meanwhile, if fraternities are primarily non-residential and serve as a location at which members are likely to consume alcohol, fraternity members might have more opportunities to drink and drive regardless of any effect that membership has on binge drinking.

To reiterate, the central assertion of the study is that these five alcohol use variables control for much of the unobserved heterogeneity that might contaminate the estimated effect of fraternity membership on binge drinking. With these alcohol consumption measures included, the effect of fraternity membership is identified by comparing members and non-members who have consumed alcohol for the same length of time and, in the past 30 days, drank on approximately the same number of days, drove and used an illegal drug while drinking about the same number of times, and had the same drinking status the last time they had sex. If this effect is not entirely causal, self-selection into fraternities must occur on the basis of very specific tastes for binge drinking relative to more moderate drinking. One could alternatively argue that the regressions over-control for drinking that might truly be caused by fraternity membership, so that the estimated effect on binging is conservative.

Finally, the vector **U** includes several other covariates that can potentially control for unobserved heterogeneity in the relationship between fraternity membership and binge drinking. To separate the effect of the fraternity environment from that specifically attributable to membership, a set of indicators reflect whether respondents live in a residence hall, fraternity or sorority house, other institutional housing, off-campus residence, or parent or guardian's home, with "other" as the omitted category. Because working might have both substitution and income effects on fraternity activity and drinking, a variable representing the number of weekly hours the respondent works for pay is constructed from choices of zero, 1–9, 10–19, 20–29, 30–39, 40, and more than 40, using interval midpoints and a top code of 45. The number of sports teams on which the respondent played (intra- or extramural), with a top-code of 3.3 assigned for the "3 or more" category, and height each might proxy for popularity (Persico et al., 2004), which could

influence both membership and drinking. The same is true for bodyweight, which also helps determine the amount of alcohol necessary to cause inebriation.

Two additional controls are included in the **U** vector. The number of cigarettes smoked in the past 30 days, formed by multiplying days smoked and the number smoked per day, proxies for time preference (Fersterer and Winter-Ebmer, 2003). The days variable is analogous to that for alcohol, while midpoints and a top-code of 21 are assigned for cigarettes per day categories of zero, less than one, one, 2–5, 6–10, 11–20, and more than 20. Finally, the number of times marijuana was used in the past 30 days accounts for the potential interrelationship between alcohol and marijuana for college students, as cited above (Williams et al., 2004). This is recoded, using a top-code of 41, from a variable with the same categories as the alcohol and drug combination variable.

The sample size for the analysis is 1,404, from 66 different schools representing between four to 48 respondents. This includes only respondents for whom all variables listed above are observed. Regressions are estimated using NCHRBS sampling weights. To verify robustness, however, models that also include additional respondents for whom the only missing information pertains to a **U** variable and that are unweighted are also estimated. Standard errors are adjusted to be robust to arbitrary forms of heteroskedasticity.[3]

Weighted sample means are provided in table 1. Column 1 shows unconditional means, while columns 2 and 3 show means, respectively, for fraternity members, who comprise 18 percent of the sample, and non-members. Nearly half of respondents binge drank at least once in the past 30 days. Combined with the binge days mean of 2.5, this implies that students who binge drank did so an average of more than five of the past 30 days. As expected, binge drinking

[3] The precise notation for equation (2), therefore, would have each term multiplied by a weight variable, and add a subscript to σ^2 signifying that it can vary across observations.

is much more prevalent and frequent among fraternity members than non-members. Among drinkers, fraternity members binge drank an average of 6.7 days compared to 4.8 days for non-members. Fraternity members are more likely than non-members to be male, in the middle of the age distribution, juniors and seniors, white, and unmarried, and to have mothers who attended college and fathers who graduated from college. Overall and situational alcohol use is also much more common among fraternity members. Fraternity housing appears to crowd out primarily off campus housing rather than dormitories. Compared with non-members, fraternity members work fewer hours in paid jobs, are taller and heavier, play on more sports teams, and use cigarettes and marijuana more often.

3. Results

a. Baseline estimates

Results for baseline models that do not control for alcohol use or other heterogeneity proxies are shown in table 2. Columns 1 and 4 indicate large and highly significant bivariate relationships between fraternity membership and past 30 day binge drinking, with implied semi-elasticities at the dependent variable means of .56 for any binge drinking and .83 for days of binge drinking. Adding exogenous personal characteristics in columns 2 and 5 has only a small mediating effect on the fraternity coefficient sizes, which are reduced by 18 percent for any binge drinking and 22 percent for binge drinking days. Moreover, in contrast to the presumption that school fixed effects would absorb some of the self-selection of heavy drinkers into fraternities, fraternity coefficients increase slightly when school indicators are added in columns 3 and 6. These estimates predict that, in the previous 30 days compared to non-members, fraternity members are more likely to binge drink by 23 percentage points (i.e. 47 percent), and

binge drink on 1.7 additional days (i.e. 67 percent). Out of hand, these seem too large to reflect purely causal effects, thus warranting the insertion in subsequent models of the previously described controls for unobserved confounders.

Columns 2 and 3 also show the coefficients of the included exogenous variables, other than the school indicators. Binge drinking is more common among males, whites and the unmarried, but not significantly related to age, grade level, or parental education.

b. Adding alcohol use covariates

Tables 3 and 4 present results for models that include alcohol use covariates to account for self-selection of students into fraternities based on drinking preferences. The dependent variable is the binge drinking indicator in table 3 and the number of binge drinking days in table 4. For both, the starting point is the specification in columns 3 and 6 of table 2, i.e. with all exogenous factors including school indicators on the right hand side. Columns 1–5 add to this a single alcohol use variable, while column 6 inserts all five of the alcohol use variables at once.

For both forms of the dependent variable, each alcohol use measure enters highly significantly and reduces the size of the fraternity membership coefficient. The covariate that has the largest quantitative impact by far is days of drinking in the past 30 days, which enters in column 1. Adding drinking days as an explanatory factor reduces the fraternity membership coefficient by 60 percent in table 3 and 72 percent in table 4. In terms of the pseudo R-squared, i.e. the ratio of the model and constant-only log likelihoods subtracted from one, the drinking days variable explains an additional 31 percent of the total variation in binge drinking propensity and 25 percent of the variation in frequency. Six more days of consuming alcohol, which is

slightly less than the standard deviation of 6.2, predicts binge drinking increases of 31 percentage points in the probability of occurrence and nearly two days.

Importantly, however, the effect of fraternity membership remains highly significant. This is partly because the additional explanatory power of days drinking reduces the standard errors of the estimates by lowering the regression standard errors (i.e. increasing the pseudo R-squared). This is especially noticeable in table 4, in which the nearly three-quarters reduction in coefficient size is accompanied by a t statistic decline of only 45 percent.

Drinking and driving (column 4) is the next most important alcohol use behavior in terms of both the partial R-squared and the reduction in magnitude of the fraternity coefficient. Drinking before sex (column 5) follows in importance, having a larger impact in table 3 than in table 4 perhaps because, as an indicator, it better explains binge drinking occurrence than frequency. While years since first consuming alcohol (column 2) has the largest t-statistic in table 3, and in partial R-squared terms its contribution is more important than that of using alcohol with drugs (column 3) and comparable to that of drinking before sex, it has the smallest impact on the fraternity coefficient. Years of drinking also has the largest predetermined component of the alcohol covariates. Fraternity involvement can bring about drinking initiation only for students who did not drink until entering college, but 58 percent of respondents first drank by age 16 and another 22 percent did so at age 17 or 18. The relative lack of influence of years since first drinking on the fraternity coefficient could therefore signal that fraternity membership directly affects the other alcohol measures. Net of further omitted factors, this suggests that a model including all of these measures might yield a conservative estimate of the effect of fraternity membership on binge drinking.

Estimates for the model just described are given in column 6. Even when included simultaneously, all five alcohol covariates are highly significant with the exception of using alcohol with drugs in table 4, which is marginally significant. But comparing the fraternity coefficients and partial R-squareds in columns 1 and 6 reveals that the other alcohol use measures have little further impact once drinking days is held constant. In table 3, the fraternity coefficient actually grows when the other four drinking measures are added, while in table 4, over 98 percent of reduction in coefficient size from table 2 is attributable simply to including the drinking days variable.

The column 6 estimates imply that joining a fraternity or sorority will increase the probability of past 30 day binge drinking by just under 10 percentage points and days of binge drinking in the past 30 days by slightly less than one-half. The associated semi-elasticities of around 0.2 are much more plausible causal effect sizes than are those in table 2.

Does this mean that these coefficients indeed represent causal effects of fraternity membership? Their large t statistics, even while holding constant various forms of alcohol use that are highly correlated with binge drinking, suggests that they might be. This is particularly true given that the main fraternity coefficient mediator is days of any drinking over the same period as the binge drinking measures that serve as response variables. It is hard to imagine that alcohol consumption frequency is completely predetermined and not at all influenced by fraternity membership. Even if this were true, for the fraternity coefficient to reflect merely spurious correlation in this context, selection would have to simultaneously occur on binge drinking but be essentially unrelated to the length of time since alcohol initiation and three specific drinking behaviors that are also highly correlated with binge drinking. This scenario seems somewhat convoluted as a full explanation of the fraternity membership effect.

Yet the pseudo R-squareds, though large by cross sectional data standards, are sufficiently small to leave unexplained a substantial portion of the variation in binge drinking. Combined with the reality that it is impossible to know for sure if other types of unobserved heterogeneity are present, the case for causality can never be unquestioningly made. But this concern can be addressed at least partially by weighing evidence regarding the presence of additional unmeasured confounding factors.

c. Adding other unobserved heterogeneity proxies

To further investigate the causality issue, tables 5 (any binge drinking) and 6 (binge drinking days) add other controls for self-selection into fraternity membership. The format is identical to that of tables 3 and 4, i.e. columns 1–6 insert single sets of variables on their own while column 7 includes the entire group of additional variables at once.

The only new heterogeneity proxy that is a meaningful mediator of the fraternity membership effect is the number of sports teams on which the respondent played during the school year, which consistently enters with a t-statistic of slightly above 4. Students with greater sports involvement are heavier drinkers: an additional sports team raises the likelihood of binge drinking by just under 10 percent and binge days by nearly eight percent. Moreover, when appearing without the other new selection controls, the sports variable reduces the fraternity membership coefficient by 13 percent in the propensity equation and 17 percent in the frequency equation, relative to the specifications in column 6 of tables 3 and 4. This would seemingly provide evidence against the argument that binge drinking-related self-selection into fraternities is fully accounted for by holding constant other measures of alcohol use.

Several other aspects of tables 5 and 6, however, support a causal interpretation of the fraternity effect. None of the other additional factors are close to reaching significance except cigarette smoking, which is marginally insignificant in explaining any binge drinking and actually raises the fraternity coefficient in both tables. Since smoking and binge drinking are positively related, the partial correlation of smoking with fraternity membership must be negative. If variation in smoking behavior truly reflects differences in time preference, then contrary to expectations, fraternity members discount the future slightly less than do non-members. Also, once all the variables listed in tables 5 and 6 are included along with sports involvement, the coefficient on fraternity membership falls by only 6–7 percent. Further, playing on sports teams could be a mechanism through which fraternity membership indirectly influences binge drinking, given that fraternities are often represented in intramural leagues and having a fraternity-based team might turn sports competitions into binge drinking occasions.[4]

Still, even in column 7 of each table, the fraternity coefficient falls despite only very small increases in the pseudo R-squared relative to the models in the final columns of tables 3 and 4. In pseudo R-squared terms, the fraction of variation in binge drinking that remains unexplained is close to one-half in the probit model and almost two-thirds in the interval model. This implies that there is scope for other sources of spurious correlation between fraternity membership and binge drinking. To further investigate, tables 9 and 10 below present estimates for samples stratified on the covariates listed in tables 3–6.

[4] Unfortunately, there is no information regarding whether the teams represented by the sports variable are intercollegiate or intramural.

d. Other sample permutations

Before that, table 7 explores the sensitivity of the fraternity membership effect under various permutations to the sample inclusion criteria. These and remaining models employ the specification from column 6 of tables 3 and 4. The additional heterogeneity proxies from tables 5 and 6 are omitted for several reasons. Because the already small sample necessarily shrinks substantially when it is split along various dimensions in tables 8–10, parsimony is desirable. Also, as already argued, the estimated effects might be conservative even without the additional mediators if fraternity membership in reality causes more frequent non-binge drinking, and this leads to more binge drinking. Plus, as mentioned above, fraternity membership might increase binge drinking through its effect on sports participation, the only variable in the additional set which has a tangible impact on the fraternity coefficient when included.

The overall theme of table 7, in which each row represents a different model, is that the previously estimated fraternity membership effects are robust to a wide array of changes to the sample. The coefficients for any binge drinking, in column 2, are particularly stable, as they never deviate by more than five percent from the baseline of 0.96. The estimates for binge drinking days fluctuate somewhat more, yet are never different from the baseline of .448 by more than 15 percent.

The smallest coefficients are in row A., which simply re-estimates the main model without using sample weights. For binge days, removing the roughly one-third of respondents at schools with sample fraternity membership of less than 10 percent (row I.) has a similar impact. Incorporating the 157 respondents who are 25–34 years old (row C.) has a comparable effect in the opposite direction. A similar coefficient is obtained in the days regression when the 74 respondents who have complete information on all variables except those listed in tables 5 and 6

are included. Fraternity effects are smaller when students who have attended school for more years than their class standing would predict are excluded, larger when currently and formerly married students are excluded, and largely unchanged when part-time or two-year college students are included or schools with no sample fraternity members (which does not necessarily imply that the school has no fraternities) are excluded. The latter is unsurprising after observing earlier that selection on schools is unimportant. Significance remains high in all models, with t statistics of nearly 3 or above in all cases.

e. Stratifying on exogenous factors

The final three tables present results for samples that are stratified along a number of different dimensions. In table 8, five separate exercises are conducted in which the main sample is divided into two distinct sub-samples based on values of an exogenous factor that until now has served as an explanatory variable. Panel A. shows that fraternity membership effects are more than twice as large for males as for females. This could be a function of males binge drinking more often or (male) fraternity activities being more focused on drinking than those of sororities. Regardless, coefficients for both measures of binge drinking remain significant for females despite their smaller magnitudes.

Panel B. divides the sample into respondents who are at least 21 years old and thus able to drink legally, and those who are no more than 20 years old and therefore underage. The fraternity coefficients are somewhat larger for the younger group than for the sample as a whole, by around 10 percent for binge days and over one-third for any binge drinking, but are quite small and highly insignificant for the older group. This is one of the more noteworthy results of the analysis. Students who can legally drink presumably face fewer barriers to obtaining alcohol

by means other than fraternities than do underage students. Consequently, the heterogeneity in effects by age suggests that the easier access to alcohol provided by fraternities is an important avenue through which fraternities increase binge drinking.

The results in panel C. support this hypothesis, in the sense that the distinction between the younger and older classes is less stark, particularly for binge days, than that between the underage and legal age. Still, the parallel between the estimates in B. and C. might provide evidence in support of the other two reasons offered by Borsari and Carey (1999) to explain how fraternities increase binge drinking. Social pressure to drink heavily could be more intense for new pledges who want to fit in than for students who have belonged to a fraternity for several years and are more liable to have leadership roles. Similarly, observed drinking activity at fraternity events might inflate peer drinking norms less as students acquire experience in various campus social settings and thereby have opportunities to gain a more representative perspective about drinking behavior at their schools.

Panel D. of table 8 makes apparent that binge drinking is more responsive to fraternity membership for whites than non-whites, particularly in terms of frequency. Taken together, the results from panels A., B. and D. imply that the impact of fraternity membership on binge drinking is particularly problematic for underage white males. In contrast, panel E. indicates that parental education has little to do with fraternity affiliation-related differences in binge drinking.

f. Stratifying on alcohol use

Table 9 again shows several pairs of estimates derived from splitting the sample into two, this time based on values of the alcohol use covariates. This is a further check on whether the fraternity effect is attributable to self-selection of heavy drinkers into fraternities. Consider two

groups consisting of respondents with low and high values of a particular drinking measure. If selection on that variable is important, a substantial component of the relationship between fraternity membership and binge drinking should be explained by changes from below average to above average rates of both membership and binging when moving from one group to the other. The expectation in that case is for coefficients in both corresponding sub-samples to be relatively small compared with those from the full sample.

If this expectation is correct, then from the table 9 results it remains difficult to argue that self-selection is a predominant reason for the significant and large fraternity membership coefficients. To begin with, panel A. divides the sample based on whether alcohol was consumed on at least three occasions in the past 30 days. The fraternity effect on any binging in the infrequent drinking group is about 50 percent larger than in the combined sample, casting serious doubt on an explanation in which unobserved tastes for drinking play a key role. At the same time, the analogous coefficient is smaller, but still sizable and significant, for frequent drinkers, among whom fraternity membership has an effect on binge days that is again roughly 50 percent larger than in the full sample.

Panels B. and C. split the sample into groups of more and less experienced drinkers, based first on age when alcohol was first consumed (B.) and then on years since that event (C.). In both, among less experienced drinkers fraternity coefficients remain highly significant; they are smaller than in the baseline models, but only slightly so for any binge drinking. For more experienced drinkers, the effect of fraternity membership on any binge drinking is akin to the main estimate when the distinction is according to age at first drink, and slightly smaller than that for less experienced drinkers but still significant when categorization is according to years

since first drink. But in each case, the impact on binge days is close to 50 percent larger than originally.

Panel D. reveals that engaging in drunken driving over the past 30 days might be a marker for students among whom fraternity membership has particularly strong effects on heavy drinking. For these students, who make up slightly less than 30 percent of the sample, coefficients are nearly three times as large as in the primary specification, indicating that fraternity affiliates are 28 percentage points (35 percent) more likely to binge and do so on 1.25 (24 percent) more days than non-members. Analogous effects are considerably smaller among students who did not drive while drinking, but are still significant for the prevalence of binging and indicate binge drinking increases of non-trivial size, i.e. 17 percent for incidence and 11 percent for days.

Panels E. and F. separate students who did and did not use illegal drugs with alcohol in the past 30 days and drink before the last time they had sex, respectively. Few students combined drugs or sex with alcohol. Consequently, results for the samples containing students who did not engage in the corresponding activity are similar to those from the whole sample, with coefficients slightly larger in the any binging models and smaller in the binge days models. The dual samples in each case are too small for estimating the probit regressions, which drop observations that are perfect predictors of the outcome. However, for the few students who did use drugs or have sex while drinking, the fraternity coefficients in the binge frequency models are of comparable size to that for students who drove while drinking. Again, particularly for these three groups of students but also to a lesser extent for more frequent and experienced drinkers, if these behaviors drive the link between fraternity membership and binge drinking, the

coefficients for these groups should be much smaller, not much larger, than those prevailing for the full sample.

g. Stratifying on other endogenous variables

Finally, table 10 shows estimates for samples stratified on the unobserved heterogeneity proxies listed in tables 5 and 6, even though these are not included as explanatory factors in the regressions starting with table 7. The results for specifications A.–D. are similar to those for many of the table 9 models. Coefficients are larger than in the full sample regressions for cigarette and marijuana smokers and the tall and heavy, groups that were candidates to have greater likelihood of fraternity membership and binge drinking for spurious reasons. In each of these cases, coefficients are considerably smaller in the residually defined groups, yet are still practically large and statistically significant. In specification E., fraternity effects are smaller, but still important, for those who live on campus even though binge drinking prevalence higher, i.e. 54 percent compared to 43 percent for those living off campus.

Panel F. indicates that the relationship between fraternity membership and binge drinking is substantially different for students who do and do not work. One hypothesis is that non-working students are simply more likely to join fraternities (20.5 percent versus 16.4 percent for working students) and binge drink, particularly with regards to drinking frequency. However, as fraternity membership and its effect on the probability of binge drinking are still sizable among non-workers, and fraternity effects are quite large among workers, it seems unlikely that this sort of selection mechanism drives the relationship.

A much bigger disparity in fraternity membership exists between students who did not play a sport (13.1 percent) and those who did (27.5 percent). Again, though, the pattern of

results makes it difficult to argue that this is a manifestation of an important selection mechanism that is responsible for the association between fraternity affiliation and binging. Even among those not participating in sports, the effect of fraternities on whether binge drinking took place is over three-quarters of that in the baseline model and highly significant. Conversely, though not quite significant at standard levels in the small sample of sports participants, the effect on binge drinking frequency is over three-quarters of that in the baseline model. An alternative explanation, given the prevalence of fraternity-affiliated intramural sports teams, is that sports participation is a mechanism through which fraternity membership leads to binge drinking.

4. Conclusion

Using data on 18–24 year old full-time four-year college students who participated in the 1995 National College Health Risk Behavior Survey, this study examined the relationship between binge drinking and membership in social fraternities and sororities. The primary contribution was to enter various measures of situational and overall alcohol use as explanatory variables in binge drinking regressions. This directly addresses the specific type of unobserved heterogeneity expected to inflate the estimated effect of fraternity membership on binge drinking, i.e. that students who like to drink heavily are precisely the ones who choose to join fraternities. Indeed, including these alcohol use covariates substantially reduces fraternity membership coefficients. But the continued significance of these coefficients in both the statistical and economic sense support the hypothesis that fraternity membership increases binge drinking.

Again, the main caveat is that the alcohol use explanatory variables and other unobserved heterogeneity proxies do not necessarily fully control for endogenous self-selection into

fraternities. Thus it is impossible to argue with absolute certainty that the fraternity membership coefficient represents a causal effect. At a minimum, however, a very idiosyncratic selection mechanism must prevail for these results to be consistent with the absence of a causal effect. In particular, fraternity members must drink more intensely than non-members, yet consume alcohol in similar frequencies and situations and for similar lengths of time. Moreover, an instrumental variables method, which is infeasible with these data, would suffer from analogous uncertainties regarding the correlation between the instruments and unobservable determinants of binge drinking.

Also, the analysis does not attempt to correct for measurement error. This could bias estimates up if binging is over-reported by fraternity members or under-reported by non-members. In contrast, if random, measurement error would impart downward bias in the magnitude of the estimated effect.

From a social perspective, the fraternity membership coefficient is an underestimate of the total effect of fraternities on binge drinking, because it fails to account for effects on drinking by non-members. For instance, holding constant fraternity membership status, Chaloupka and Wechsler (1996) find that the presence of a fraternity on campus increases the likelihood that a student binge drinks, while Glindemann and Geller (2003) estimate that levels of intoxication are higher at fraternity parties than at other parties.

The positive impact of fraternity membership on binge drinking suggests targeting campus alcohol education efforts towards fraternity members. The earlier outlined psychosocial explanations for causal fraternity effects on drinking suggest that fraternity-wide rather than individual sanctions for drinking-related violations, efforts to lower peer drinking norms among fraternity members, and vigilant monitoring of fraternity-house activities might help reduce

binge drinking on campus and its external effects. Particular focus should be placed on underage fraternity members, as they are largely responsible for the observed relationship between membership and binge drinking.

Also, Sacerdote (2001) found that peer effects among roommates and fellow dormitory residents are a major determinant of whether Dartmouth students joined a fraternity. Combined with the conclusion of this study, the implication is that fraternity membership is an indirect way through which peers influence binge drinking. Assigning incoming freshmen who are particularly likely to join fraternities, based on observable characteristics, to the same rooms and dorms might be a way to limit fraternity membership and thus binge drinking.

A problem with this strategy is that increased drinking is only one of many potential effects of fraternity membership, some of which might be positive. Hunt and Rentz (1994) report that fraternity membership provides a sense of security and trust that comes from belonging to a group and identifying with others in the community, which might lead to advantageous outcomes. De Los Reyes and Rich (2003) propose that fraternity members are more involved in campus life and more likely as alumni to maintain connections to their alma mater than are non-members. Indeed, Harrison et al. (1995) found that schools with greater participation in fraternities and sororities had higher rates of alumni giving. Further, Marmaros and Sacerdote (2002) found that among the Dartmouth senior class of 2001, fraternity members and students networking with fraternity members were more likely to obtain a high paying job. More generally, fraternity membership is important for lifelong friendships that could ultimately impact various outcomes (Sacerdote, 2001). Thus, it is important to stress that a large leap would be required to conclude, merely on the basis of a link between fraternity membership and binge drinking, that fraternities should be banned or even limited in any way.

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Table 1: Sample means

Sample	Full sample (1)	Fraternity members (2)	Non-members (3)
Sample size	1,404	260	1,144
Fraternity or sorority member	.179	1	0
Binge drank in past 30 days	.477	.697	.428
Days binge drank in past 30 days	2.54	4.70	2.06
Female	.518	.494	.523
19 years old	.202	.188	.206
20 years old	.203	.190	.206
21 years old	.217	.267	.206
22 years old	.139	.162	.134
23 years old	.081	.080	.081
24 years old	.047	.013	.055
Sophomore	.239	.234	.240
Junior	.243	.278	.235
Senior	.319	.348	.313
Black non-Hispanic	.092	.083	.095
Hispanic	.049	.026	.054
Asian	.078	.047	.085
Other non-white	.035	.033	.035
Married	.045	.017	.051
Separated, divorced or widowed	.008	.016	.006
Mother did not finish high school	.052	.033	.057
Mother graduated from high school	.251	.227	.257
Mother attended college	.283	.330	.273
Mother graduated from college	.401	.406	.400
Father did not finish high school	.063	.040	.068
Father graduated from high school	.194	.197	.194
Father attended college	.234	.218	.238
Father graduated from college	.478	.517	.469
Days drank in past 30 days	5.39	8.34	4.75
Years since first alcoholic drink	4.51	4.72	4.46
Times used alcohol with drugs in past 30 days	.763	1.32	.640
Times drank and drive in past 30 days	.792	1.33	.674
Used alcohol last time had sex	.194	.321	.167
Lives in fraternity or sorority house	.046	.255	0
Lives in college housing other than fraternity or dorm	.021	.009	.024
Lives in off-campus house or apartment	.354	.276	.371
Lives in home of parent or guardian	.217	.120	.238
Lives in other non-dorm residence	.005	.004	.005
Hours per week works for pay	12.0	10.6	12.3
Height in inches	68.1	68.7	68.0
Weight in pounds	154.7	157.2	154.2
Sports teams played for this school year	.573	1.06	.467
Cigarettes smoked in past 30 days	39.6	47.7	37.8
Times used marijuana in past 30 days	1.80	2.31	1.68

Means are calculated using sample weights. Omitted groups for categorical variables are 18 years old, freshman, white, never married, unsure of parental education, and lives in dormitory.

Table 2: Effects on binge drinking with only exogenous covariates

	Any binge drinking in past 30 days			Days of binge drinking in past 30 days		
	(1)	(2)	(3)	(4)	(5)	(6)
Fraternity or sorority member	.268	.220	.225	2.11	1.65	1.71
	(7.33)	(6.85)	(7.10)	(7.51)	(7.12)	(7.15)
	.562	*.461*	*.472*	*.831*	*.650*	*.673*
Female		-.127	-.113		-1.08	-.980
		(4.86)	(4.49)		(5.83)	(5.42)
19 years old		-.001	.029		.213	.297
		(0.02)	(0.58)		(0.59)	(0.84)
20 years old		-.004	.039		.285	.417
		(0.06)	(0.66)		(0.65)	(1.01)
21 years old		-.081	-.017		.357	.549
		(1.16)	(0.25)		(0.63)	(1.03)
22 years old		-.085	.009		.187	.584
		(1.11)	(0.13)		(0.31)	(1.07)
23 years old		-.017	.074		.720	1.12
		(0.20)	(0.88)		(1.16)	(1.91)
24 years old		-.091	.035		-.325	.289
		(0.96)	(0.37)		(0.47)	(0.45)
Sophomore		.028	.012		-.210	-.221
		(0.60)	(0.28)		(0.60)	(0.68)
Junior		.005	-.041		-.325	-.352
		(0.09)	(0.72)		(0.71)	(0.84)
Senior		.034	-.047		-.301	-.521
		(0.53)	(0.74)		(0.57)	(1.11)
Black non-Hispanic		-.362	-.301		-2.73	-2.41
		(7.97)	(5.56)		(6.96)	(5.28)
Hispanic		-.127	-.127		-1.01	-.804
		(2.86)	(2.54)		(3.02)	(2.06)
Asian		-.403	-.379		-2.93	-2.78
		(6.94)	(6.30)		(6.14)	(5.65)
Other non-white		-.010	.042		-.513	-.163
		(0.14)	(0.61)		(1.29)	(0.40)
Married		-.337	-.269		-2.62	-2.16
		(4.37)	(3.59)		(4.27)	(3.74)
Separated, divorced, widowed		.210	.281		1.34	1.56
		(1.33)	(1.45)		(1.28)	(1.36)

Table 2 (continued): Effects on binge drinking with only exogenous covariates

	Any binge drinking in past 30 days			Days of binge drinking in past 30 days		
	(1)	(2)	(3)	(4)	(5)	(6)
Mother did not finish HS		-.051	-.084		-.216	-.305
		(0.32)	(0.58)		(0.17)	(0.24)
Mother graduated from HS		.017	-.002		-.020	-.126
		(0.11)	(0.02)		(0.02)	(0.11)
Mother attended college		.035	.015		.266	.234
		(0.23)	(0.11)		(0.22)	(0.20)
Mother graduated from college		.042	.005		.269	.109
		(0.28)	(0.04)		(0.22)	(0.09)
Father did not finish HS		-.077	-.058		-.631	-.644
		(0.82)	(0.61)		(0.72)	(0.73)
Father graduated from HS		-.069	-.077		-.551	-.721
		(0.85)	(0.94)		(0.70)	(0.90)
Father attended college		.018	.009		-.004	-.183
		(0.22)	(0.11)		(0.01)	(0.23)
Father graduated from college		.021	-.006		-.115	-.342
		(0.26)	(0.07)		(0.15)	(0.44)
Includes school indicators?	No	No	Yes	No	No	Yes
Pseudo R-squared	.031	.151	.212	.018	.069	.093

The sample size is 1,404. Sample weights are used. Probit (interval) regressions are used to estimate the models in columns 1–3 (4–6). The average marginal effect across respondents is shown, along with the absolute value of the heteroskedasticity-adjusted t-statistic in parentheses. The semi-elasticity of the dependent variable with respect to fraternity membership, evaluated at the dependent variable mean, appears in italics.

Table 3: Effects on any past 30 day binge drinking with alcohol use covariates

	(1)	(2)	(3)	(4)	(5)	(6)
Fraternity or sorority member	.089	.214	.199	.177	.177	.096
	(3.45)	(7.20)	(6.50)	(6.07)	(5.55)	(3.85)
	.187	*.449*	*.417*	*.371*	*.371*	*.201*
Days drank in past 30 days	.052					.038
	(9.29)					(7.32)
Years since first alcoholic drink		.055				.017
		(11.3)				(4.40)
Times drank with drugs in past 30 days			.106			.021
			(5.15)			(1.62)
Times drank and drive in past 30 days				.154		.041
				(9.40)		(2.93)
Used alcohol last time had sex					.386	.098
					(10.2)	(3.01)
Pseudo R-squared	.519	.298	.276	.340	.297	.552

The sample size is 1,404. Sample weights are used. Probit regressions are used to estimate all models. The average marginal effect across respondents is shown, along with the absolute value of the heteroskedasticity-adjusted t-statistic in parentheses. The semi-elasticity of binge drinking with respect to fraternity membership, evaluated at the binge drinking mean of .477, appears in italics. Regressions also control for all table 2 variables, including school indicators.

Table 4: Effects on days of past 30 day binge drinking with alcohol use covariates

	(1)	(2)	(3)	(4)	(5)	(6)
Fraternity or sorority member	.472	1.62	1.45	1.10	1.25	.448
	(3.94)	(7.46)	(6.57)	(5.61)	(6.15)	(3.88)
	.186	*.638*	*.571*	*.433*	*.492*	*.176*
Days drank in past 30 days	.309					.256
	(26.2)					(19.1)
Years since first alcoholic drink		.453				.102
		(11.6)				(5.14)
Times drank with drugs in past 30 days			.259			.044
			(4.91)			(2.40)
Times drank and drive in past 30 days				.788		.120
				(13.1)		(2.97)
Used alcohol last time had sex					2.69	.422
					(12.3)	(3.49)
Pseudo R-squared	.343	.141	.124	.161	.145	.362

The sample size is 1,404. Sample weights are used. Interval regressions are used to estimate all models. The average marginal effect across respondents is shown, along with the absolute value of the heteroskedasticity-adjusted t-statistic in parentheses. The semi-elasticity of binge drinking days with respect to fraternity membership, evaluated at the binge drinking days mean of 2.54, appears in italics. Regressions also control for all table 2 variables, including school indicators.

Table 5: Effects on any past 30 day binge drinking with additional covariates

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Fraternity or sorority member	.093	.095	.097	.084	.099	.096	.089
	(3.32)	(3.82)	(3.89)	(3.40)	(3.95)	(3.84)	(3.22)
	.195	*.199*	*.203*	*.176*	*.208*	*.201*	*.187*
Lives in fraternity house	-.002						-.028
	(0.03)						(0.52)
Lives in other non-dorm college housing	.033						.022
	(0.60)						(0.44)
Lives in off-campus housing	-.035						-.029
	(1.26)						(1.04)
Lives with parent or guardian	.001						.018
	(0.05)						(0.61)
Lives in other non-dorm, non-college housing	.063						.073
	(0.70)						(0.88)
Hours per week works for pay		-.001					-.001
		(1.21)					(1.07)
Height in inches			.004				.003
			(0.93)				(0.75)
Weight in pounds			-.0001				-.0001
			(0.20)				(0.34)
Sports teams this school year				.047			.046
				(4.26)			(4.06)
Cigarettes in past 30 days					.0001		.0001
					(1.36)		(1.62)
Times used marijuana in past 30 days						.0001	.0001
						(0.05)	(0.03)
Pseudo R-squared	.553	.552	.552	.561	.552	.552	.565

The sample size is 1,404. Sample weights are used. Probit regressions are used to estimate all models. The average marginal effect across respondents is shown, along with the absolute value of the heteroskedasticity-adjusted t-statistic in parentheses. The semi-elasticity of binge drinking with respect to fraternity membership, evaluated at the binge drinking mean of .477, appears in italics. Regressions also control for all variables listed in tables 2 and 3, including school indicators.

Table 6: Effects on days of past 30 day binge drinking with additional covariates

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Fraternity or sorority member	.442	.445	.445	.374	.453	.454	.422
	(3.64)	(3.84)	(3.86)	(3.23)	(3.92)	(3.92)	(3.52)
	.174	*.175*	*.175*	*.147*	*.178*	*.179*	*.166*
Lives in fraternity house	-.046						-.190
	(0.20)						(0.84)
Lives in other non-dorm college housing	.031						.067
	(0.12)						(0.27)
Lives in off-campus housing	-.086						-.051
	(0.62)						(0.37)
Lives with parent or guardian	-.088						.021
	(0.54)						(0.13)
Lives in other non-dorm, non-college housing	-.488						-.223
	(1.06)						(0.55)
Hours per week works for pay		-.003					-.002
		(0.60)					(0.53)
Height in inches			.026				.024
			(1.31)				(1.24)
Weight in pounds			.002				.002
			(0.96)				(0.85)
Sports teams this school year				.201			.201
				(4.09)			(4.05)
Cigarettes in past 30 days					.0008		.0009
					(1.85)		(2.11)
Times used marijuana in past 30 days						.009	.010
						(0.79)	(0.88)
Pseudo R-squared	.362	.362	.363	.366	.363	.362	.369

The sample size is 1,404. Sample weights are used. Interval regressions are used to estimate all models. The average marginal effect across respondents is shown, along with the absolute value of the heteroskedasticity-adjusted t-statistic in parentheses. The semi-elasticity of binge drinking with respect to fraternity membership, evaluated at the binge drinking days mean of 2.54, appears in italics. Regressions also control for all variables listed in tables 2 and 4, including school indicators.

Table 7: Effects of fraternity membership using other samples and specifications

	Modification to model from tables 3 & 4, column 6	Sample size (1)	Any binge drinking (2)	Days of binge drinking (3)
A.	Does not use sample weights	1,404	.091 (3.72)	.380 (3.55)
B.	Includes students with missing table 5 & 6 variables	1,478	.098 (3.93)	.514 (4.58)
C.	Includes 25–34 year olds	1,561	.100 (4.15)	.517 (4.60)
D.	Includes part-time students	1,493	.099 (4.13)	.446 (3.92)
E.	Includes students at 2-year schools	2,071	.093 (3.91)	.441 (4.32)
F.	Excludes students not on pace to graduate in 4 years	1,159	.091 (3.46)	.409 (3.34)
G.	Excludes ever-married students	1,320	.099 (3.85)	.481 (4.00)
H.	Excludes schools with no sample fraternity members	1,322	.097 (3.86)	.443 (3.88)
I.	Excludes schools with < 10% sample frat. members	964	.094 (3.36)	.382 (2.98)

Sample weights are used in all models except A. Probit (interval) regressions are used to estimate the models in column 2 (3). The average marginal effect across respondents is shown, along with the absolute value of the heteroskedasticity-adjusted t-statistic in parentheses. Regressions also control for all covariates listed in table 2–4, including school indicators.

Table 8: Effects of fraternity membership in exogenously stratified samples

	Modification to model from tables 3 & 4, column 6	Sample size (1)	Any binge drinking (2)	Days of binge drinking (3)
A.	Females	840	.061	.294
			(1.98)	(2.47)
	Males	564	.137	.683
			(3.00)	(2.97)
B.	18–20 year olds	749	.129	.491
			(3.31)	(3.56)
	21–24 year olds	655	.006	.087
			(0.18)	(0.46)
C.	Freshmen & sophomores	623	.110	.467
			(2.68)	(2.93)
	Juniors & seniors	781	.044	.283
			(1.41)	(1.72)
D.	Whites	930	.118	.575
			(3.55)	(3.55)
	Non-whites	474	.071	.07
			(1.90)	(0.53)
E.	Both parents attended or graduated from college	799	.104	.452
			(3.00)	(2.72)
	At least one parent possibly did not attend college	605	.099	.471
			(2.51)	(3.22)

Sample weights are used. Probit (interval) regressions are used to estimate the models in column 2 (3). The average marginal effect across respondents is shown, along with the absolute value of the heteroskedasticity-adjusted t-statistic in parentheses. Regressions also control for all covariates listed in tables 2–4, including school indicators.

Table 9: Effects of fraternity membership stratifying on alcohol use covariates

	Modification to model from tables 3 & 4, column 6	Sample size (1)	Any binge drinking (2)	Days of binge drinking (3)
A.	Drank on 2 or fewer of past 30 days	673	.143	.048
			(1.68)	(1.12)
	Drank on 3 or more of past 30 days	731	.077	.677
			(2.09)	(2.81)
B.	First drank when age 18 or older	591	.089	.226
			(2.77)	(2.11)
	First drank when age 17 or younger	813	.099	.624
			(2.60)	(3.07)
C.	First drank 4 or fewer years ago	661	.084	.253
			(2.60)	(2.45)
	First drank more than 4 years ago	743	.071	.623
			(1.88)	(2.83)
D.	Did not drive while drinking in past 30 days	1,001	.056	.144
			(1.81)	(1.45)
	Drove while drinking in past 30 days	403	.278	1.25
			(3.61)	(4.04)
E.	Did not use illegal drugs with alcohol in past 30 days	1,252	.107	.359
			(3.77)	(3.48)
	Used illegal drugs with alcohol in past 30 days	152		1.00
				(1.54)
F.	Did not drink before last time had sex	1,150	.102	.327
			(3.57)	(3.21)
	Drank before last time had sex	254		1.27
				(2.23)

Sample weights are used. Probit (interval) regressions are used to estimate the models in column 2 (3). The average marginal effect across respondents is shown, along with the absolute value of the heteroskedasticity-adjusted t-statistic in parentheses. Regressions also control for all covariates listed in tables 2–4, including school indicators.

Table 10: Effects of fraternity membership stratifying on additional covariates

	Modification to model from tables 3 & 4, column 6	Sample size (1)	Any binge drinking (2)	Days of binge drinking (3)
A.	Did not smoke cigarettes in past 30 days	1,002	.091	.375
			(3.11)	(3.73)
	Smoked cigarettes in past 30 days	402	.191	.698
			(4.02)	(2.43)
B.	Did not use marijuana in past 30 days	1,167	.096	.277
			(3.31)	(2.75)
	Used marijuana in past 30 days	237		.718
				(1.34)
C.	Below mean height	735	.063	.337
			(1.83)	(2.69)
	At or above mean height	669	.121	.667
			(3.31)	(3.29)
D.	Below mean weight	807	.064	.279
			(1.88)	(2.24)
	At or above mean weight	597	.137	.656
			(3.49)	(3.06)
E.	Lives off campus	781	.085	.433
			(2.27)	(2.39)
	Lives on campus	623	.074	.228
			(2.27)	(1.62)
F.	Works for pay	872	.129	.576
			(4.00)	(4.29)
	Does not work for pay	532	.070	-.020
			(1.46)	(0.10)
G.	Did not play on a sports team this school year	963	.073	.194
			(2.20)	(1.45)
	Played on at least one sports team this school year	441	-.029	.348
			(0.86)	(1.59)

Sample weights are used. Probit (interval) regressions are used to estimate the models in column 2 (3). The average marginal effect across respondents is shown, along with the absolute value of the heteroskedasticity-adjusted t-statistic in parentheses. Regressions also control for all covariates listed in tables 2–4, including school indicators.