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What matters: Reality or Perception?
The impact of peer binging on college student drinking behaviors

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ABSTRACT

Universities have widely varying rates of heavy drinking, raising the question, "Do peers influence individual decisions to binge drink?" This study examines the impacts of peer perceptions of collegial drinking on binge drinking levels across U.S. college campuses. The analysis employs data stemming from the 1993, 1997, 1999 and 2001 College Alcohol Studies. Descriptive statistics indicate that more students tend to underestimate the rate of binging than overestimate it, violating a key assumption of advocates of social norming policy. Student beliefs about the rate of drinking track loosely with the actual rate of binging at their schools, but the rate of overestimating binge drinking falls as the actual rate of binging increases, implying that social norming policies might have the best chance of success at schools with the least amount of problems. Results stemming from econometric analyses do not provide substantial evidence in favor of these policies. However, results provide evidence that educating students on what actually constitutes binge drinking so that they better understand how much is too much may help to reduce heavy drinking practices among college students. Clearly characterizing the definition of excessive drinking may be a worthwhile lesson for college orientation.

I. Introduction

What we perceive as reality in the so-called outer world is literally a reflection of, and therefore secondary in importance to, the inner workings of our own consciousness.
David Gardener

Everything you see or hear or experience in any way at all is specific to you. You create a universe by perceiving it, so everything in the universe you perceive is specific to you.
Douglas Noel Adams, English humorist & science fiction writer

Perception is real even when it is not reality.
Edward de Bono, US leading authority in the field of human thinking, originated Lateral Thinking

Universities across America are generally characterized by widely varying and persistent rates of heavy drinking, as shown in Figures 1A through 1C, which plot the 1997, 1999, and 2001 rate of binge drinking at the college relative to the 1993 rate. The scatterplot shows a high degree of stability in the rates of binging over time, with very few schools experiencing large declines in the rate since 1993. Given this persistence, one important research question is, "Do peers influence individual decisions to binge drink?" Previous research (Wolaver et al. 2007) has established that the rate of binge drinking among peers on American college campuses has a positive and large effect on the probability that an individual student binge drinks. But, students do not always accurately predict the rates of heavy drinking or other behaviors on their campus (Perkins and Wechsler 1996). The current policy debate surrounding binge drinking by college students encompasses many strategies (Wechsler et al. 2000), including strategies that try to influence student perceptions of their peers' behaviors. Social norming policy is a controversial technique aimed at reducing the rate of heavy episodic drinking by publishing accurate rates of problem drinking on campus. These policies are predicated on the idea that students over-estimate the rate of problem drinking on campus and these over-estimates increase the probability of heavy drinking for the individual.

Direct tests of these policies in practice have not found firm evidence that the policies are effective (Perkins 2002a and 2002b), and the methodology used by many of these studies has been criticized (Wechsler et al. 2003). By examining the impact of perceived and actual rates of peer heavy drinking on individual behavior, we may gain additional insight into the *potential* of these policies to reduce problem drinking among college students, although we will not be able to provide direct evidence on the efficacy of any particular social norming policy. While most of the literature indicates that students respond more strongly to their close friends' behaviors than to school-wide behaviors, we focus on the latter because school administrators will, as a practical matter, have better information on the latter than the former.

Critics point out that many social norming campaigns are financed by alcohol companies, which calls into question the effectiveness of the campaigns. A recent paper (Wechsler et al. 2003) reopened the policy debate by finding no effect of social norming campaigns on rates of binge drinking in a nationally representative sample of colleges and universities. Wechsler and Kuo (2000) also note that even if the policies work in theory, they estimate that only a small fraction of students *overestimate* binge drinking, and overestimation is more common at schools with lower rates of binge drinking. On the other hand, Kypri and Langley (2003) examine data from New Zealand on perceived norms of drinking and on students' perceptions of their own drinking behavior relative to their peers. They found that the average student did overestimate the rate of heavy episodic drinking and vomiting frequency of their peers and that most students perceived themselves as drinking less than the average, even among the heaviest drinkers.

As Wechsler and Kuo (2000) warn, social norming campaigns may be counterproductive in the group of students who *underestimate* the peer rate at their school; since, as Table 1 shows, students who underestimate the rate of binging drinking at their school compose half of the population in a nationally representative sample of college students. Our research questions are

intended to provide further insight into the debate surrounding social norming campaigns. Do students respond differently to the actual rate of peer behavior and their own perceived rate of peer behavior? Are there differences in responsiveness depending on whether the students over- or under-estimate the actual behaviors of their peers? Does the magnitude of the student's measurement error make a difference? Are there other student views about drinking, such as the threshold for "binge" drinking, which may impact their behavior? Although we do not directly examine the impact of these policies, answering these questions will provide evidence on whether perceptions are important and hence on the potential efficacy of a variety of information strategies for campuses to pursue.

II. Literature Review

The Manski (1993, 2000) critique of the literature on peer effects proposes three major identification problems in characterizing the impact of peer behaviors on individuals' behavior. Economists distinguish between what Manski terms as the endogenous interactions, contextual interactions, and correlated effects when examining how group behavior impacts individual behavior. The latter could also be termed a self-selection bias; that is, behaviors are correlated because individuals with similar preferences or characteristics group together. Manski (2000) also characterizes groups of individuals responding to the same institutional constraints as part of the correlated effect. Contextual interactions are sometimes also called "neighborhood effects" where individual behavior is influenced by exogenous group characteristics. The first, endogenous effects, is what we are primarily interested in: how the behavior of an individual responds to the behaviors of peers. The presence of endogenous effects, however, raises the possibility that any measured correlation is also tainted by reverse causality bias (what Manski terms here the "reflection" problem); that is, if the individual is influenced by the group, then the

individual's behavior must also have some influence on the behavior of his/her peers in the group. Each of these effects is likely to be present in any simple correlation of group and individual behavior; disentangling those effects is the central identification challenge of our econometric analysis.

Despite the difficulties, there is a growing literature using a variety of techniques to identify peer effects. Norton et al. (1998) uses instrumental variables to identify the exogenous effect of peer drinking and smoking on adolescents. They employ neighborhood and school characteristics, such as parents' perception of neighborhood safety, racial diversity, and student-teacher ratios, which they argue should affect the probability a family will move into or out of the neighborhood and therefore the peer rates of substance use, but should not directly affect the probability that an individual smokes or drinks. They find that peer smoking and drinking rates do statistically significantly increase the probability that the individual smokes or drinks in specifications that do and do not use the instrumental variable technique to control for the endogeneity of peer and individual substance use. After controlling for the endogeneity of peer use, the point estimates of these effects does not change substantially, particularly for drinking. This implies that selection effects are not large in their data. Their instrumental variable strategy relies on the assumption of no contextual effects; that is the neighborhood characteristics of one's school peers should affect only the peer rate and not the individual.

Another example of instrumental variable techniques is Gaviria and Raphael (2001). In examining several outcomes including smoking and drinking among adolescents, they assume that contextual effects do not exist and, therefore, that average family socioeconomic background characteristics should affect the average group's behavior but not the individual's. Since schools and neighborhoods are highly correlated, these instruments are arguable. They find strong peer

effects for drinking, church attendance, drug use, cigarette smoking, and dropping out of school. Evidence of endogeneity bias is only found for drug and alcohol use.

Powell et al. (2005) incorporates the importance of peer effects and allows cigarette prices (taxes) and tobacco control policies to have a direct effect and an indirect effect (via the peer effect) on smoking behavior. To control for the potential endogeneity of the school-based peer measure they implement a two-stage generalized least squares estimator using instrumental variables. Peer effects are found to have a significant impact on youth smoking behavior: moving a high-school student from a school where no youths smoke to a school where one quarter of the kids smoke would increase the probability that he or she smokes by about 14.5 percentage points. Overall, the results reveal that there is a strong potential for social multiplier effects with respect to any exogenous change in cigarette taxes or tobacco control policies.

Cleveland and Wiebel (2003) examine the issue of peer use similarity among adolescents using fixed and random effects to account for school/institutional effects. They find that peer-individual use was more highly correlated at schools higher overall substance use than in schools with less substance use. The effect was stronger for tobacco use than alcohol use. Their hypothesis is that it is easier for individuals with an existing propensity to use to find peers who also use. This suggests that there is an independent peer effect, in addition to the selection effect.

Lundborg (2006) uses school and grade fixed effects in addition to instrumental variables with data on Swedish adolescents to wash out the sorting effect from the endogenous effect. Students are randomly assigned to classes within a school, so the variation within schools and grades across classes within the grade identifies the model. As in Norton et al. (1998), the instruments rely on the assumption of no contextual effects; they are the average background characteristics of the peers. Estimates of the marginal effects of peer binge drinking, smoking and illicit drug use are positive and statistically significant and are strongest for binge drinking.

When fixed effects are included, the magnitude of the effects decreases for bingeing and smoking, but remains positive and significant. When instrumental variable techniques are used to further identify the potential bias from reverse causality (the individual's behavior affects the group), the estimated marginal effects of the peer rate of use almost double, indicating that estimates that do not account for this bias are subject to considerable downward bias.

Wolaver et al. (2007) use instrumental variable and fixed effects techniques to identify the impact of the overall rate of binge drinking on American college campuses on individual behavior. The peer effects are identified by assuming that the 1993 rate of binge drinking at the college affect current drinking of the individual, but that may affect the peer rate, through a selection/sorting effect. These peer effects are quite strong; a one percentage point increase in the campus rate of binge drinking increases the individual's probability of binge drinking by between 0.74 and 0.96 percentage points. The peer effects are robust to various sample restrictions and different instruments, including using the average family characteristics of the peers to identify the model. Interestingly, peer effects are stronger for subgroups of students on campuses: males, Greek-participating students who live on campus and athletes.

Another strand of literature exploits the randomization provided by roommate assignment to test for peer effects. Sacerdote (2000) measures peer effects on grade point average (GPA) and the propensity to join fraternities and sororities. With random assignment, the selection of individuals into groups can be ignored, although a reflection problem still remains when examining the effect of roommate's GPA on own GPA. To account for this problem, Sacerdote also measures the effect of the roommate's rank in high school and SAT scores on own GPA, peer effects that do not suffer from the reflection problem. He finds small, but statistically significant effects for all of these measures on freshman GPA, but the effects disappear by senior year. Kremer and Levy (2003) examine the impact of freshman roommate's prior alcohol use,

GPA on the subject's GPA. They find that for males, roommate's high school alcohol use lowers GPA; an effect which continues strongly into the sophomore year. In contrast, females are not affected. Roommate's high school academic performance and socio-economic background did not affect GPA. They also present some preliminary evidence that individuals were more likely to drink if their roommates drank in high school, although they note that these results are sensitive to the specification chosen (Kremer and Levy, 2003). Finally, Duncan et al. (2005) use the random assignment of roommates in the freshman year as the means of identifying peer influences. They find that roommate's binge drinking increases the probability of binging for males who also binge drink in high school, but not for non-binging males. They find no effect of roommate drinking behavior for females, regardless of the high school behavior.

The above studies are confined to a very select sample of undergraduates at single colleges, and it is unclear whether they are generalizable to all college students. Further, the randomization of housing is not entirely complete; students in the Kremer and Levy (2003) study who opted into specialized types of housing or for a specific roommate were excluded from the sample; to the extent that these students differ from the randomized sample, the measured peer effects may differ. However, they are arguably cleaner tests than some of the instrumental variable methods used in other studies. The studies employing instrumental variables examine teens, not college students, who are still tied to parents' location. College students, however, are more likely to be removed from their home environment, and thrown into a new group of peers.

The present study examines whether students respond differently to their reported perceptions of the rate of alcohol use and the actual rates of use. Student perceptions will be measured with error; one question is whether the error is random noise or systematic. An additional caution in this literature is provided by Norton et al. (2003). They characterize the measurement error in student perceptions into three types: projection error (drinkers may

overestimate their peers use), scaling errors (all students may consistently over- or under-estimate the behavior regardless of their own behavior), and measurement error (random noise). Unfortunately, the biases produced by these measurement errors are not predictable; researchers may over- or under-estimate peer effects if student perceptions are used instead of the true behavior. One question that arises is whether the theoretical model predicts that students are responsive to the *actual* or the *perceived* rates of drinking. Since our research question is trying to determine whether/how much perceptions matter relative to the actual rates of binge drinking, the effects of perceived campus alcohol use may be interpreted as simply reflecting the measurement error biases, rather than a true difference in effects, and is therefore random noise.

III. Data

The data used in this study are the 1997, 1999 and 2001 waves of the College Alcohol Study (CAS) conducted by the Harvard School of Public Health. In 1993, the CAS survey was administered to a random sample of students attending 140 randomly selected four-year colleges and universities across the United States. Given the variability of measures of interest, this study employs the 1997, 1999 and 2001 data, but we use the 1993 data to construct an instrument to identify the model. For every CAS wave, administrators at each college were given specific instructions as to how to provide a random sample of undergraduates drawn from the total enrollment of full-time students. Depending on the enrollment size of each given campus, every *n*th student was drawn from the school's full-time student registry. In all survey years, questionnaires were mailed directly to students early in the spring semester to help ensure that student responses were based on a two-week period of on campus drinking experiences as opposed to drinking behavior during spring break parties. Over 200 students from each school were sent an anonymous survey to their registered school address. Of the original sample of 140

schools, 130 were retained in the 1997 wave, 128 in 1999, and 120 in 2001. This paper uses the 1997 and 1999 samples because the questions about peer use are specific to binge drinking and the 2001 data to look at perceptions about abstention. A total of 15,685 students responded in 1997, 14,907 in 1999, and 10,924 in 2001. In creating our peer measures and some of the other measures of, we need a sufficiently large campus sample for a more accurate picture of the college averages. Therefore, we drop respondents if there are fewer than 50 responses for the binge drinking, ease of access and other variables at the college. Respondents with missing values for any of the variables used in the regression analyses are also dropped, leaving a total sample size of 19,651. Dropping the colleges with low student responses is also responsible for the higher sample level of binging (44%) in our sample versus the entirety of the CAS data.

In addition to interviewing students, the CAS surveys deans of students and other administrators at each of the participating schools. The school administrator surveys include a series of questions pertaining to campus policies toward student substance abuse and other substance use-related aspects of the campus environment. The following paragraphs describe the measures available in the CAS data. Both dependent variables of interest, peer measures and other control variables for the proposed analysis are discussed.

Binge drinking participation among college students is a gender-specific indicator of binge drinking participation. Binge drinkers include females who reported drinking four or more drinks on a single occasion two weeks prior to completing the survey or males who drank five or more drinks on a single occasion two weeks before taking the survey. A drink could include: a 12-oz (360 mL) can or bottle of beer, a 4-oz (120 mL) glass of wine, a 12 oz (360 mL) bottle or can of wine cooler, or a 1.25 oz. (37 mL) shot of hard liquor straight or in a mixed drink. The binge drinking measure is constructed as a 0-1 dichotomous indicator of binge drinking

participation that equals a value of one if a student reported any binge drinking in the past two weeks and zero otherwise. The frequent binge drinking measure is also a 0-1 dichotomous indicator of heavy binge drinking participation that is set to a value of one if a student reported binge drinking two or more times during the past two weeks and zero otherwise.

In each year of the survey, the questionnaire asked students different questions about alcohol use on campus. Figure 2 details both the perceived measures and the comparable questions in each survey year about individual behavior used to measure both the dependent variable of the individual's behavior and to construct the college-level rate of actual peer use. We focus on the perceptions about binge drinking because they are comparable to our outcome measures from previous work on peer influences and also, because they are less subjective than measures of what students perceive and self-report as "heavy" or "problem" drinking. At this point, we focus on perceptions about actual behaviors, but the surveys also contain information about perceptions of peer approval of drinking behaviors that could be exploited in future work.

There are a variety of perceived measures available in the CAS surveys which presents an opportunity for multiple analyses. The variation in the surveys allow us to study whether students respond differently to perceptions about binging versus abstention. In 2001, students were asked about the fraction of students on campus who abstain, rather than about the rates of binge or heavy/problem drinking. Students are also asked in 1997 and 1999 about both the binge drinking rate at the college and the rate of drinking among their friends. It is possible to compare the responsiveness of individual behaviors to two different measures of the peer group, although it is more difficult to compare perceptions about friends' behaviors to the actual behaviors, since the data do not contain information on specific peer networks; we therefore focus on the college rate. Finally, in the 1997 and 1999 waves students are asked to define the number of drinks that

constitutes "binge" drinking for men and for women. We also estimate the impact of these definitions on the individual's own propensity to binge drink.

Figure 2: Available measures of student perceptions of alcohol use in CAS

Survey Year	Perception Measures (survey variable)
1993	Based on what you have heard or experiences, approximately what proportion of the following do you think drink alcohol at least once a month at this school? All students and friends (B2) Based on what you have heard or experiences, approximately what proportion of the following do you think heavy or problem drinkers at least once a month at this school? All students and friends (B3)
1997	How many drinks in a row must a college man/woman have in order to be called a binge drinker? Based on what you have heard or experiences, approximately what proportion of the following do you think are binge drinkers? All students and friends (D9)
1999	How many drinks in a row must a college man/woman have in order to be called a binge drinker? (D2) Based on what you have heard or experiences, approximately what proportion of the following do you think are binge drinkers? All students and friends (D3)
2001	Based on what you have heard or experiences, approximately what proportion of the following do you think abstainers (students who do not drink at all) / Students who drink more than they should at this school? (D2) What is the maximum number of drinks in a row that it is safe to consume on a single drinking occasion? For a male student/ for a female student (D3) How would you compare your alcohol use to that of students at your school and your friends? (D4)

The CAS surveys collected a variety of demographic and socioeconomic data. Several potential determinants of college student drinking behaviors are constructed from these data. These include: the age and age squared of the respondent, his/her gender, class year, race, religion, marital status, housing, sorority or fraternity membership, student income, parental education, region, and the year of survey.

In addition to the data collected by the CAS surveys, a number of other state and/or local policy variables from a variety of external sources were merged with the CAS survey data according to state, county and city identifiers. These variables include prices, taxes, as well as various alcohol and tobacco control policies. We use the Consumer Price Index (CPI) to denote both our alcohol and cigarette prices in real 1990 dollars.

Drawing upon information from the CAS School Administrator surveys, this research also controls for select restrictions that a given campus has levied on alcohol use and whether or not the campus teaches alcohol use prevention. In particular**,** the administrator survey captures information on the availability and sale of alcohol on campus, as well as the presence of drinking restrictions and the degree of their enforcement. This research focuses on the effects of having 1) a college pub on campus as well as 2) the presence of an alcohol outlet within one mile of campus. With each wave of the CAS, the Harvard School of Public Health also collected information describing the local and state alcohol control laws as they pertain to each college campus. In this analysis, state-level law indicators are set equal to a value of one for those campus states which mandate restrictions on happy hours as well as restrictions of pitcher sales of beer.

Our analysis uses two price measures available in the 1997 and 1999 waves of the CAS surveys to construct the average real college price paid per alcoholic drink and the proportion of students who pay a fixed fee for all they can drink. Students report the amount that they typically pay for a single alcoholic drink. Possible responses include: drink free, under $.50, between $.51 and $1.00, between $1.01 and $2.00, between $2.01 and $3.00, $3.01 or more and pay a set fee. Using this information, we construct the college price as the campus mean of non-zero prices paid for a single alcoholic drink as reported by students from each campus. The

proportion of students who pay a fixed fee for all they can drink is defined as the percentage of drinkers on campus who report typically paying a set fee to drink.

Because the monetary price of the drink is only part of the full cost of drinking, particularly for underage students, we also use sets of specifications which include other measures that reflect the student reports on the availability of alcohol for underage students. These include the percent of students (not including the respondent) who answered that alcohol was easy or very easy to obtain, the percent of students who indicated there was at least one place where alcohol could be obtained without identification, and the percent of students who reported being carded at any campus or Greek event that year.

Descriptive Statistics

Table 1 shows means for the selected peer measures. Thirty-three percent of the sample overestimates the fraction of their peers who binge drink, 15% are accurate (within the same decile) and 52% underestimate the rate of binge drinking. While the means are illustrative, the distributions of responses compared to the actual rates at colleges, shown in table 2, are also interesting. Table 2A uses the 1997 and 1999 wave data and 2B provides similar estimates from the 2001 wave. Because abstainers, bingers and non-bingers are not evenly distributed across colleges, examining the conditional means for each of these types of students must take into account the difference in the mean level of binging at those colleges. As Table 2A shows, non-bingers are more likely to over-estimate the rate at their colleges than bingers are. Part of this discrepancy is due to the difference in definition of binging between the literature (4 drinks for females and 5 for males in one sitting) and what students think of as heavy drinking. Students on average define binge drinking as being 1 additional drink for both men and women (Wechsler & Kuo 2000). In other words, students may be accurately predicting the fraction of their male (female) peers that drink 6 (5) drinks in a sitting, but since binge drinking is defined in the

literature as 5 (4) drinks, this difference in definition causes the gap between perceptions about binging rates. Again, because of our sample restrictions, we have a slightly higher sample means for the definitions of binge drinking for males at 6.97 and 5.77 for females than the overall CAS data show. Bingers have higher threshold definitions for binging than non-bingers do; 7.76 drinks versus 6.33 drinks for males and 6.35 versus 5.31 drinks for females.

The 2001 data ask students to estimate the fraction of their peers who do not drink at all. In this sample, 18% of students do not report drinking alcohol whereas the student perception is that a quarter of their peers do not drink. Students overwhelmingly overestimate abstention; 54% of students gave a point estimate for the fraction of their college population that does not drink above the actual level at their college, while only 19% gave a point estimate below the actual college abstention rate.

In contrast to previous literature, bingers and non-bingers are similar in their assessments of peer behaviors at the college level. Non-bingers predict on average that 38% of their classmates drink and bingers predict an average of 43%, as shown in Table 2A. Contrary to the "projection" hypothesis, where binge drinkers inflate their perceptions of peer behavior to match their own, bingers are less likely to overestimate and more likely to underestimate the rate of binging at their school than non-bingers. On the other hand, bingers indicate that a higher number of drinks for both genders constitutes binge drinking than non-bingers. Analagous patterns appear in the 2001 data on perceptions about abstention, as shown in Table 2B. Binge drinkers are the most likely to overestimate the fraction of students at their school who do not drink at all, while non-drinkers are the least likely to overestimate the rate, although larger fractions of all types of students overestimate abstention at their school than underestimate it. Students seem to be better predictors of abstention than binging, however; 27% of the 2001 sample predicts their college abstention rate within plus or minus 5%, whereas only 15% of the

1997 & 1999 pooled sample accurately predicts their school's binge rate. Again, this discrepancy is likely related to the variation in student-defined binging versus the research literature threshold for binging.

Perhaps the most striking descriptive analysis is presented in Table 3, where the perceptions of peer behavior are presented separately for students at "low," "medium" and "high" binging schools. Low and high binging schools are defined as roughly the bottom and the top quartile; medium binging schools represent the middle two quartiles in the data. The cut-off rate for low binging schools is less than 35.3% binge rate and for high binge schools is a binge rate of more than 55.5%. Student perceptions track the actual rate of binging at the schools- the perceptions increase from 33% to 40% to 48% of all students binging at each school category. This perception represents a slight overestimate at the low binge schools. Students at the "problem" schools increasingly underestimate the actual rate of binging as it increases. On its face, the evidence is contrary to the social norming hypothesis- at the very schools where binging occurs with greatest frequency, on average, students are under-estimating the rate, not over-estimating the rate. Taking a slightly different cut at the data produces similar results. If one simply divides the data into the fraction of students who over- and under-estimate the rate, we find a similar pattern. The fraction of students who overestimate the rate of binging at the school decreases from 47 percent to 22 percent as the actual rate increases. All of these differences are statistically significantly different.

The accuracy of student perceptions may differ depending upon the size of the school. The bottom panel of Table 3 divides the sample by college size. In smaller schools, students will have closer contact with the whole of the college population than in larger schools. Interestingly, the rate of binging increases with the size of the school, but the student perception about the rate of binging is fairly constant. Students at small schools are more accurate in their mean

predictions. The accuracy change is reflected in the fraction of students at each size college who underestimate the rate, which increases as the school size increases. But, the picture is not completely clear-cut, as the percent of students that over-estimate the binge rate decreases with school size. Given the mean predictions, it appears that, whereas fewer students over-estimate the rate at large schools, those who do overestimate the rate perceive much higher rates of binging than students at smaller schools.

The impact of social norming policy cannot be directly taken from this raw information. The impact of the policy will depend on how students respond to their perceptions of their fellow students' behaviors. The following sections outline the methodology used to identify the response of individual behavior to various measures of perceptions of peer use and the results of the analysis.

IV. Methods

The model estimates the probability of individual student binge drinking, S_{is} (a 0-1 dichotomous indicator for binge drinking participation), given by:

$$S_{is}^{*} = \beta_0 + \beta_1 P_{is} + \beta_2 X_{is} + \beta_3 R_s + \beta_4 C_{is} + \varepsilon_{is}$$

$$\begin{aligned} &\textit{where} \quad S_{is} = 1 \quad \textit{if} \quad S_{is}^{*} > 0 \\ &\textit{and} \quad S_{is} = 0 \quad \textit{if} \quad S_{is}^{*} \leq 0 \end{aligned} \qquad (1)$$

where P_{is} defines our peer measure for individual *i* attending college *s* as the proportion of individuals in college *s* excluding individual *i* who binge drink, X_{is} is a vector of personal and family characteristics, R_s is a vector of campus characteristics, and C_{is} is a vector containing

alcohol prices and alcohol control policies, and is estimated using a probit specification to account for the discrete nature of our outcome variable.

We employ several different measures of peer behavior (P_{is}) in our analysis. We use the respondent's perceptions of the school level of binging and two variations on the difference between respondent perceptions and the actual rates. The first is a simple difference: perceived binge all students – actual rate of binging. The second takes this difference and models it as a spline function with a cutoff point of 0- to see if students who underestimate the rate of binge drinking respond differently than students who overestimate the rate of binge drinking at the school. These latter measures are meant to assess the potential of social norming policies to change the propensity of individuals' to binge drink. In additional sets of analyses, we use the respondent's definition of the number of drinks constituting male- and female-specific binge drinking, as well as similar difference estimates. We use the 2001 data to perform similar analyses using abstention as our measure of interest.

The usual model assumes that the error term ε_{is} is uncorrelated with any of the other dependent variables. But, given the potential endogeneity as described in the Manski (1993, 2000) critique and the measurement issues described by Norton et al. (2003), estimation which treats the peer effect as exogenous may produce biased coefficients. In order to control for the potential endogeneity between our perceived peer measures and our dependent variable of student binge drinking, we use college-level fixed effects following Lundborg (2006) to control for endogenous sorting. An alternative strategy would be to use instrumental variables. However, with the available data, it is difficult to obtain a valid instrument for individuals' perceptions of binge drinking or their extent of over- or under-estimation. A potential cost of the college-level fixed effects strategy is the inability to include time-invariant control variables in the fixed effects analysis using the pooled 1997 and 1999 data, and to use any policy or college

characteristics in the analyses of perceived abstention rate using only the 2001 data. Further, we are unable to account for individual-level unobserved heterogeneity.

V. Results

The results are presented in table 4A and 4B; these results are the marginal effects calculated at the mean of the independent variables, not the coefficient value of the probit regressions. Both the uncorrected and college-level fixed effects estimates are shown. Table 5 shows the results for the abstention models. The results of several policy simulations are presented in Table 6.

Perceived rates of binging

Students do tend to respond to the perceived rates of peer use, as evidenced in both the regressions which treat perceived use as exogenous and the fixed effects models in Table 4A. The measured impacts of perceived peer use are smaller when the fixed effects models are used, but are still positive and statistically significant, indicated that students do respond to the perceived rate of binge drinking. However, these marginal effects are smaller than the estimated effect of the actual rate of binge drinking at the college. The marginal effect of perceived peer binging on the individual propensity to consume does not appreciably change when additional controls for the actual college binge rate or an indicator for whether the individual binged in high school are added to the models. Note that in the exogenous model, the actual rate of binge drinking has a much larger impact on the individual propensity to consume.[1]

Difference in perceived and actual rates of binging

[1] The actual rate of binging at the school must be dropped in the fixed effects models, since it is captured in the joint time and school fixed effects.

When looking at the *accuracy* of students' perceptions, however, a more nuanced picture emerges. We model the accuracy of perceptions in two ways; first, by simply taking the perceived rate minus the actual rate of binging among all students. Here, controlling for endogeneity becomes critical; the estimates of the marginal effect increases when college-level fixed effects are used. For students with negative values (those who underestimate the rate of binging), the positive coefficient implies that as they become more accurate in their perception of the binge rate, the more likely they are to also binge. For students with positive values for this variable (those who overestimate the rate), it is also true that as they become more accurate in their predictions, they are less likely to binge. The latter effect is consistent with the social norming hypothesis, the former is not. The overall impact of increasing student accuracy in their binge rate perceptions depends on the relative numbers of students who over- and under-estimate the rate, as well as the magnitude of their errors.

To further explore this result, additional analyses used the difference between the perception and actual rate, but modeled the variable as a spline function, with a cutoff of 0, to see if students who underestimate the rate of binging respond differently than students who overestimate the rate of binging. There is evidence that indeed they do. The results imply a stronger positive reaction among students who underestimate the rate of binge drinking than those students who overestimate the rate. Again, since the difference in estimates is negative for students who perceive that fewer of their peers binge than actually do binge, the under-estimators who are most accurate (have higher perceptions at any given school rate) are more likely to binge than the students who underestimate the rate the most. Conversely, as those who overestimate increase their estimates of the rate of binging, they are more likely to binge, but react less strongly than their counterparts. Thus, also given that a higher percentage of students underestimate the rate of binge drinking, and these students react more strongly than

overestimators (and in the "wrong" direction), correcting the perceptions of students to match the actual rate should increase the rate of binging overall.

Perceptions about definitions of Binge Drinking

As discussed above, students and researchers clearly differ in how they define heavy drinking. On average, students establish a higher threshold number of drinks when defining binge drinking for both males and females. The male-specific threshold is positively correlated with the individual's probability of binge drinking, while the female-specific threshold does not appear to add any explanatory power to the model as the variable estimates are statistically insignificant. Both the level and the difference measures (the student threshold minus the literature definition of 5 drinks for males) are strong predictors of individual propensity to binge. Given the scale of this variable (integers), the marginal effect of this perception is much larger than the perceptions about the fraction of students who binge. At the mean, an increase of 1 drink in the student-defined threshold for male binging will increase the probability the student binges by 7 percentage points.

Perceptions about Abstention

In 2001, the perception questions asked respondents to estimate what percent of their peers did not drink at all. Students overestimate the fraction of their peers who abstain; estimates of these perceptions on whether the respondent abstains as well as whether the respondent binge drinks are presented in table 5. Curiously, the more the respondent thinks their peers abstain, the less likely they are to abstain themselves, both in the exogenous and fixed effects models. Similarly, students are also more likely to binge drink if they perceive higher rates of abstainers among their peers. These general results hold in the fixed effects models, as well as the models which use the difference in the perceived rate from actual college rate of abstention.

Simulations of Social Norming Policy

The regression results are used to predict the probability of binging for each student. Since social norming assumes that if students had accurate information about the rate of binge drinking, they would feel less pressure to binge themselves, and the overall level of heavy drinking at the college will fall. Table 6 simulates the impact of a social norming campaign using the regression estimates for the perceived rate that changes students' perceptions to match the actual rate of binge drinking and abstention at the school and to match the actual school rate. A further simulation is provided by replacing the difference in estimates of the perceived percent binging minus the actual binge rate with zero in both the simple specification and the spline specification. The fixed effects results are shown, but these results are similar to the other models.

Most of the simulations imply that changing student perceptions will result in little change in the percentage of students engaging in heavy episodic drinking. The only simulation to show a large change in the binge rate is one that predicts a large *increase* in the rate of binge drinking from the spline-function model. This result is from correcting the perceptions of students who underestimate the rate upwards, thereby increasing their own probability of binge drinking. Similar effects are predicted based on the student perception of abstention; neither binge rates are predicted to substantially decrease nor abstention rates to substantially increase by correcting student perceptions about the fraction of students at the school who do not drink alcohol at all. By and large, most of the simulations predict less than one percentage point change in the rate of binge drinking as a result in the change in perceptions.

On the other hand, a policy which teaches students moderation in their drinking may be successful. If students could become convinced that the appropriate threshold for heavy drinking was 5 drinks for males and 4 drinks for females, the percent of students who actually binge drink would fall by about 12 percentage points to 33%. Students clearly perceive their own drinking

behavior differently than do administrators and the research community, although the binge drinking threshold has also been subject to controversy in the research community. Nonetheless, binge drinking as defined in the literature is associated with a myriad of negative outcomes for the students and for the college community, and the models predict that student drinking behavior would respond to an alteration in attitudes about what characterizes heavy drinking.

VI. Conclusions

By simply examining the descriptive statistics, one notes that more students underestimate the rate of binging than overestimate it, therefore violating a key assumption of advocates of social norming policy. Furthermore, bingers and non-bingers do not differ substantially in their accuracy of predictions, and they differ in ways that are inconsistent with social norming theory. Student beliefs about the rate of drinking track loosely with the actual rate of binging at their schools, but the rate of overestimating binge drinking falls as the actual rate of binging increases, implying that social norming policies might have the best chance of success at schools with the least amount of problems. The results of the econometric modeling do not provide substantial evidence in favor of these policies; indeed, the one set of estimates which do predict a large change in student behavior predict an increase in the rate of binge drinking.

However, the results provide evidence that educating students on what actually constitutes binge drinking so that they better understand how much is too much may help to reduce heavy drinking practices among college students. Clearly characterizing the definition of excessive drinking may be a worthwhile lesson for college orientation.

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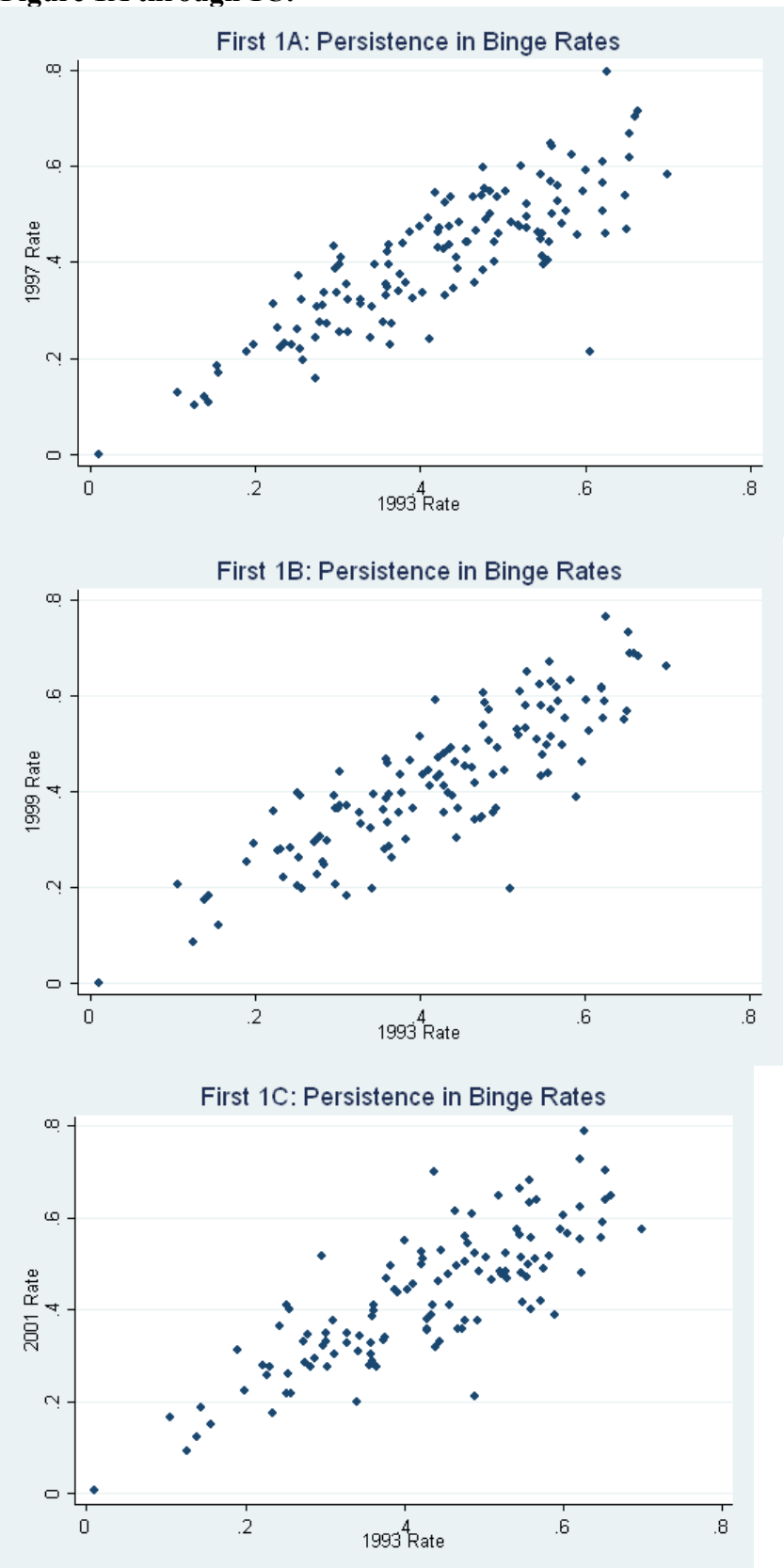
Figure 1A through 1C:



Source: Authors' Calculations from Harvard CAS data.

Table 1: Variable Means, Various Peer Use Measures

	Variable Definition	Mean	Standard Deviation
Binge rate[a]	Fraction of students at school other than respondent who binged in previous 2 weeks	0.45	0.14
Perceived rate of binging[a]	Midpoint fraction for category of perceived rate of binge drinkers at school (ex. =.05 if estimated 0-9% of students were bingers)	0.40	0.22
Difference between Perceived and Actual Rate of binging[a]	Perceived rate of binging among all students – avgbinge	-0.05	0.23
Overestimate Rate[a]	=1 if Perceived rate of binging among all students-avgbinge>0.05	0.33	0.47
Underestimate Rate[a]	=1 if Perceived rate of binging among all students-avgbinge<-0.05	0.52	0.50
Accurate Perception[a]	=1 if estimate is within +/- 5% of avgbinge	0.15	0.36
Number of Drinks for a Binge	Binge drinking for men = X # of drinks	6.97	2.17
	Binge drinking for women = X # of drinks	5.77	1.98
	Malebinge-5	1.97	2.17
	Fembinge-4	1.77	1.98
Overestimate Number of Binging Drinks, males	=1 if Diffest Malebinge>0	0.70	0.46
Overestimate Number of Binging Drinks, females	=1 if Diffest Fembinge>0	0.70	0.46
Accurately Estimate Binge=5 drinks, males	=1 if Diffest Malebinge=0	0.17	0.38
Accurately Estimate Binge=4 drinks, females	=1 if Diffest Fembinge=0	0.13	0.34
2001 Sample Measures			
Abstainers	Fraction of students at school other than respondent who abstain from alcohol	0.18	0.14
Perceived rate of abstention[b]	Midpoint fraction for category of perceived rate of abstention drinkers at school (ex. =.05 if estimated 0-9% of students were abstainers)	0.25	0.19
Difference between Perceived and Actual Rate of abstention[b]	Perceived rate of binging among all students – avgabst	0.07	0.16
Overestimate Abstention[b]	=1 if Perceived rate of binging among all students-avgabst>0.05	0.54	0.50
Underestimate Abstention[b]	=1 if Perceived rate of binging among all students-avgabst<-0.05	0.19	0.39
Accurate Perception of Abstention[b]	=1 if estimate is within +/- 5% of avgabst	0.27	0.44

Source: [a]Authors' calculations from 1997 and 1999 Harvard CAS. N=19,651
b. Authors' calculations from 2001 Harvard CAS. N=7,229

Table 2A: Conditional Expectations based on Drinking Status, 1997 & 1999 Perceptions

Expectations	Binger	Non-Binger
Perceived rate of binging among all students	0.43 (0.22)	0.38* (.22)
Difference between Perceived and Actual Rate	-0.04 (0.23)	-0.07* (0.23)
Overestimate Rate (relative to binge drinking at school)	0.31 (0.46)	0.35* (0.48)
Accurately predict rate	0.15 (0.36)	0.15 (0.36)
Underestimate Rate	0.54 (0.50)	0.50* (0.50)
Number of Drinks for a Binge, Males	7.76 (2.04)	6.33* (2.06)
Number of Drinks for a Binge , Female	6.35 (2.04)	5.31* (1.80)
% Overestimate Number of Drinks=Binge, Males	0.82 (0.38)	0.60* (0.49)
% Overestimate Number of Drinks=Binge, Females	0.80 (0.40)	0.61* (0.49)
% Underestimate Number of Drinks=Binge, Males	0.06 (0.23)	0.19* (0.39)
% Underestimate Number of Drinks= Binge, Females	0.05 (0.21)	0.13* (0.34)
N	9,103	10,548

Source: Authors' calculations from 1997 and 1999 Harvard CAS.
*Non-binger mean statistically significantly different from binger mean at 1% level.

Table 2B: Conditional Expectations based on Drinking Status, 2001 Perceptions

Expectations	Abstainer	Drinker, Non-Binger	Binger
Percent of students at school who abstain	0.28 (0.26)	0.17 (0.09)	0.14 (0.07)
Perceived rate of abstention among all students	0.33 (0.29)	0.23 (0.17)	0.23 (0.15)
Perceived Minus Actual Rate	0.04 (0.19)	0.07 (0.16)	0.08 (0.15)
Overestimate Rate (relative to abstention at school)	0.45 (0.50)	0.53 (0.50)	0.58 (0.49)
Underestimate Rate	0.25 (0.43)	0.21 (0.41)	0.16 (0.36)
N	1,257	2,568	3,404

Source: Authors' calculations from 2001 Harvard CAS.
*Non-binger mean statistically significantly different from binger mean at 1% level.

Table 3: Conditional Expectations based on Type of School

	Low Binge Rate College (First quartile- cut off is less than 35.3% of students binge)	Medium Binge Rate College (Middle two quartiles-between 35 and 55.5% of students binge)	High Binge Rate College (Top quartile- over 55.5% of students binge)
Average Binge Rate	0.26* (0.08)	0.46 (0.05)	0.63* (0.06)
Perceived rate of binging	0.33* (0.22)	0.40 (0.21)	0.48* (0.22)
Perceived Minus Actual Rate	0.07* (0.21)	-0.06 (0.22)	-0.15* (0.22)
% Overestimate binging	0.47* (0.50)	0.32 (0.47)	0.22* (0.41)
% Underestimate binging	0.34* (0.47)	0.56 (0.50)	0.63* (0.48)
N	4861	9712	5078
	Small Schools (less than 4500 students)	**Medium Size Schools (between 4500 & 19496 students)**	**Large Schools (more than 19496 students)**
Average Binge Rate	0.41 (0.16)	0.45 (0.15)	0.48 (0.17)
Perceived rate of binging	0.38 (0.23)	0.41 (0.22)	0.40 (0.22)
Perceived Minus Actual Rate	-0.03 (0.24)	-0.04 (0.25)	-0.09 (0.24)
% Overestimate binging	0.43 (0.50)	0.43 (0.49)	0.37 (0.48)
% Underestimate binging	0.45 (0.50)	0.45 (0.50)	0.50 (0.50)
N	4,779	9,629	4,845

Source: Author's calculations from 1997 and 1999 Harvard CAS.
*College category mean statistically significantly different from medium college category at 1% level.

Table 4A: Comparison of Peer Effects on Binge Drinking Under Different Measures of Peer Effects

	Treating Peer Effects as Exogenous			Fixed Effects Model		
Measure	Marginal Effect	Standard Error		Marginal Effect	Standard Error	
All students in the college						
Perceived Rate of Binging	0.17	0.02	*	0.11	0.02	*
Difference In Perceptions Measures						
Perceived Minus Actual Rate	0.04	0.02	*	0.15	0.02	*
Spline Function: Difference In Perceptions Measures						
Perceived Minus Actual Rate, If ≤0	0.056	0.040		0.19	0.03	*
Perceived Minus Actual Rate, If>0	0.031	0.045		0.09	0.04	*
Adding Actual Rate of Binging to Regression						
Perceived Rate of Binging	0.13	0.02	*	NA		
Actual Rate of Binging	0.63	0.04	*			
Adding High School Binge Indicator to Regression						
Perceived Rate of Binging	0.14	0.02	*	0.09	0.02	*
Binged in High School	0.40	0.007	*	0.40	0.007	*
Split Sample Regressions, by College Size						
Only At Small Colleges (less than 4500 students), N= 4,779						
Perceived Rate of Binging	0.14	0.05	*	0.10	0.05	*
Only At Medium Size Colleges (Between 4500 & 19496 students) N=9,629						
Perceived Rate of Binging	0.20	0.04	*	0.16	0.04	*
Only At Large Colleges (Greater than 19496 students) N=4,845						
Perceived Rate of Binging	0.14	0.03	*	0.11	0.03	*

Source: Author's calculations from 1997 and 1999 Harvard CAS. Regressions also include price of alcohol, fraction of students reporting alcohol easy to obtain/did not use ID/ever carded, gender, age, race, class year, marital status, religion, housing arrangements, greek status, weekly wages, weekly allowance, parent's education/alcohol use, type of college, and sample year. Fixed effects model drops type of college controls.

*Statistically significant at the 5% level; standard errors corrected for clustering by college

Table 4B: Impact of Student Perception About Number of Drinks Constituting a "Binge" on Individual Propensity to Binge Drink

	Treating Peer Effects as Exogenous			Fixed Effects Model		
Measure	**Marginal Effect**	**Standard Error**		**Marginal Effect**	**Standard Error**	
Perceptions about Number of Drinks Constituting Binge Drinking						
# of Drinks for Male Binge	0.07	0.003	*	0.07	0.003	*
# of Drinks for Female Binge	0.004	0.003		0.004	0.003	
Difference in Student Perception and Literature's Definition of Binge Drinking						
# of Drinks for Male Binge - 5	0.07	0.003	*	0.07	0.003	*
# of Drinks for Female Binge - 4	0.004	0.003		0.004	0.003	
Spline Function: Difference in Student Perception and Literature's Definition of Binge Drinking						
# of Drinks for Male Binge – 5, If ≤ 0	0.09	0.01	*	0.09	0.01	*
# of Drinks for Male Binge – 5, if >0	0.07	0.003	*	0.07	0.003	*
Drinks for Female Binge – 4, If ≤0	-0.05	0.02	*	-0.05	0.02	*
Drinks for Female Binge – 4, If >0	0.006	0.003	*	0.006	0.003	

Source: Author's calculations from 1997 and 1999 Harvard CAS. Regressions also include price of alcohol, fraction of students reporting alcohol easy to obtain/did not use ID/ever carded, gender, age, race, class year, marital status, religion, housing arrangements, greek status, weekly wages, weekly allowance, parent's education/alcohol use, type of college, and sample year. Fixed effects model drops type of college controls.
*Statistically significant at the 5% level; standard errors corrected for clustering by college

Table 5: Results Using Peer Perception of Abstainers at College

	Peer Effects Treated As Exogenous			Fixed Effects Model		
	Marginal Effect	**Standard Error**		**Marginal Effect**	**Standard Error**	
Outcome = Abstain						
Perceived Rate of Abstention All Students	0.14	0.08	†	-0.11	0.03	*
Difference in Perceptions						
Perceived Minus Actual Rate	-0.16	0.04	*	-0.05	0.03	†
Spline Function: Difference In Perceptions Measures						
Perceived Minus Actual Rate, If ≤0	-0.40	0.09	*	-0.17	0.11	
Perceived Minus Actual Rate , If>0	-0.06	0.05		-0.02	0.04	
Outcome = Binge						
Perceived Rate of Abstention All Students	-0.09	0.09		0.20	0.05	*
Difference in Perceptions						
Perceived Minus Actual Rate	0.26	0.05	*	0.16	0.05	*
Spline Function: Difference In Perceptions Measures						
Perceived Minus Actual Rate, If ≤0	1.01	0.17	*	0.51	0.20	*
Perceived Minus Actual Rate, If>0	0.05	0.07		0.08	0.06	

Source: Author's calculations from 2001 Harvard CAS. Regressions also include gender, age, race, class year, religion, marital status, housing arrangements, greek status, weekly wages, weekly allowance, parent's education/alcohol use.

*, † Statistically significant at the 5%, 10% level; standard errors adjusted for clustering at the college.

Table 6: Social Norming Policy Simulations

Policy Simulation	Predicted % Binge, base estimate	After Policy Simulation	Difference
Perceived Rate of Binging			
Changing to Match Own College Rate	46.7	46.1	-0.6
Changing Difference in Perception and Actual College Rate to 0, Basic Model		46.0	-0.7
Changing Difference in Perception and Actual College Rate to 0, Spline Model		67.8	+21.1
Perceived Rate of Abstention			
Changing to Match College Rate	47.1	45.1	-2.0
Changing Difference in Perception and Actual College Rate to 0, Basic Model		47.1	0
Changing Difference in Perception and Actual College Rate to 0, Spline Model		46.9	-0.2
Perception of Number of Drinks Defining Binge			
Changing to Match 5/4 Male/Female	45.0	33.3	-11.7
Changing Difference in Perceptions to 5/4 definition to Zero		33.0	-12.0
Changing Difference in Perception to 5/4 definition to Zero, Spline		33.0	-12.0
Perceived Rate of Abstention			
	Predicted % Abstain, base estimate	**After Policy Simulation**	**Difference**
Changing to Match College Rate	17.4	18.1	+0.6
Changing Difference in Perception and Actual College Rate to 0, Basic Model		17.4	0
Changing Difference in Perception and Actual College Rate to 0, Spline Model		17.4	0

Source: Authors' calculations from Harvard CAS, based on fixed effects regression results; holding all individual's demographic characteristics and price and policy variables constant.

Appendix Table A1: Exogenous Peer Effects Probit, All Students

	Exogenous peer effect			With Fixed Effects		
	Marginal Effects	Standard Error		Marginal Effects	Standard Error	
Perceived rate of binging	0.1721	0.0177	*	0.1140	0.0183	*
Price of alcohol	-0.0964	0.0163	*	-0.0936	0.0444	*
Fraction of peers paying fixed fee	0.3032	0.0849	*	-0.1822	0.2222	
% say alcohol easy obtain	0.2868	0.0575	*	0.2270	0.0973	*
% obtain alcohol w/o ID	0.0626	0.0578		-0.1092	0.0804	
% ever carded	0.2892	0.1223	*	-0.0455	0.2169	
Male	0.0923	0.0079	*	0.0959	0.0081	*
Age	34.1648	5.0379	*	35.5351	5.1386	*
Age squared	-78.1821	11.4754	*	-81.4356	11.7067	*
Black	-0.2467	0.0166	*	-0.2535	0.0167	*
Asian	-0.1778	0.0149	*	-0.1771	0.0155	*
Native American	0.0471	0.0477		0.0580	0.0481	
Other Race	-0.0803	0.0187	*	-0.0822	0.0190	*
Hispanic	0.0278	0.0203		0.0388	0.0210	
Sophomore	-0.0529	0.0132	*	-0.0606	0.0134	*
Junior	-0.0442	0.0167	*	-0.0536	0.0170	*
Senior	-0.0645	0.0190	*	-0.0748	0.0194	*
5^{th} year senior or above	-0.0559	0.0225	*	-0.0629	0.0229	*
Catholic	0.0702	0.0123	*	0.0543	0.0127	*
Jewish	-0.0139	0.0232		-0.0250	0.0236	
Moslem	-0.2109	0.0450	*	-0.2196	0.0450	*
Protest	-0.0478	0.0125	*	-0.0454	0.0127	*
Other Religion	-0.0149	0.0155		0.0022	0.0159	
Married	-0.2672	0.0145	*	-0.2593	0.0151	*
Divorced	-0.1587	0.0303	*	-0.1533	0.0310	*
Separate	-0.0846	0.0635		-0.0822	0.0640	
Widowed	0.1232	0.1697		0.1025	0.1785	
Same Sex Dorm	-0.0616	0.0136	*	-0.0772	0.0152	*
Coed Dorm	0.0029	0.0109		-0.0193	0.0114	
Other university housing	-0.0305	0.0222		-0.0335	0.0232	
Fraternity/sorority Housing	0.1253	0.0274	*	0.1260	0.0280	*
Other social Housing	-0.1196	0.0190	*	-0.1222	0.0193	*
Greek	0.1940	0.0121	*	0.2059	0.0125	*
Wage	0.0242	0.0077	*	0.0267	0.0079	*
Allowance	0.0893	0.0090	*	0.0902	0.0092	*
Mother/Father College education	0.0327	0.0101	*	0.0326	0.0103	*
1999 Sample	-0.0090	0.0443		0.1106	0.0595	
College pub	0.0117	0.0095		-0.0102	0.0286	
Bar within mile	0.0189	0.0144		-0.0009	0.0259	
State happy hour restrictions	-0.0289	0.0090	*	-0.0084	0.0275	
State pitcher sales restrictions	-0.0218	0.0179		0.0146	0.0483	
Father former drinker	0.0992	0.0258	*	0.0880	0.0261	*
Father infrequent drinker	0.0480	0.0111	*	0.0362	0.0113	*
Father moderate drinker	0.0837	0.0129	*	0.0742	0.0131	*
Father heavy drinker	0.0737	0.0196	*	0.0612	0.0198	*

	Exogenous peer effect			With Fixed Effects		
Father problem drinker	0.0237	0.0190		0.0081	0.0192	
Mother former drinker	-0.0315	0.0423		-0.0379	0.0425	
Mother infrequent drinker	0.0484	0.0094	*	0.0419	0.0096	*
Mother moderate drinker	0.1188	0.0150	*	0.1101	0.0152	*
Mother heavy drinker	0.0614	0.0359		0.0596	0.0363	
Mother problem drinker	0.0844	0.0353	*	0.0813	0.0360	*

Source: Authors' calculations from 1997 & 1999 Harvard CAS.
* Statistically Significant at 5% level.

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