The Effects of Merit-Based Financial Aid on Drinking in College

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Abstract

We study the effect of state-level merit aid programs (such as Georgia's HOPE scholarship) on alcohol consumption among college students. Such programs have the potential to affect drinking by (1) raising students' disposable income and (2) increasing the incentive to maintain a minimum GPA in college (in order to retain the scholarship). Using two independent datasets, we find that the presence of a merit aid program in one's state leads to an overall increase in drinking among men but not among women. This increase is concentrated among individuals who are above the minimum GPA threshold necessary for the scholarship; individuals who are below the threshold GPA experience no increase in their alcohol use. Our identification strategy is supported by the finding that no change in drinking is observed for non-students in states that adopt merit-aid programs.

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1 Introduction

Heavy drinking among U.S. college students remains widespread even after several decades of efforts aimed at curbing young people's alcohol use (Hingson, 2010). Researchers have made significant progress toward understanding how public policies designed to discourage (risky) alcohol use shape youth drinking patterns (see, for example, Carpenter et al., 2007), but other policies that indirectly affect youths' drinking may not be as well understood.[1] Perhaps surprisingly, few studies have examined how student income affects drinking behavior among college students.[2] Though alcohol appears to be a normal good in the general population (Ruhm and Black, 2002) and among young adults (Nelson, 2008), little is known about college students in particular. Moreover, since government and institutional financial aid programs are an important determinant of student disposable income, these programs may affect college drinking in ways that are currently unknown to policymakers.

This paper examines how one type of financial aid policy, state-level "merit aid" programs, affects alcohol use among college students. We believe our contribution to the literature is twofold: first, we are the first to examine the effect of these policies–which began being implemented in the early 1990's and now disburse billions in aid to students every

[1]Those policies that explicitly address drinking include the minimum legal drinking age, policies affecting driving under the influence, and alcohol taxes. In addition, a budding literature on how peers affect substance use (including drinking) has made strides toward understanding that dimension of youth risky behavior (see, for example, Kremer and Levy, 2008).

[2]Recent studies that examine the relationship between income and drinking among teenagers include Adams et al. (2012), who find that higher minimum wages are associated with an increase in alcohol-related traffic fatalities among teens. Markowitz and Tauras (2009) estimate a substantial effect of adolescent allowances from parents on drinking participation–a $1,000 annual increase in allowance is associated with a 2.2-7.1 percentage point increase in the probability of drinking. Grossman and Markowitz (2001) is one of the only studies to estimate an income elasticity (albeit with state-level income per capita rather than individual income measures) of alcohol use (number of drinks) for college students–they find that this elasticity is 0.63. In addition, Delaney et al. (2008) use cross-sectional Irish data to show that college students' disposable income is positively related to alcohol expenditure but not to drinking participation or degree of excessive drinking.

year–on alcohol consumption.[3] Second, we exploit the rollout of these programs by state and over time to isolate plausibly exogenous changes to student income in order to estimate the relationship between income and college drinking in general. Since merit-aid programs do not provide "pure" income transfers, our results do not allow us to estimate a true income elasticity of alcohol use; however, for reasons outlined in Section 5, we believe our results provide a lower bound on the effect of a large-scale increase in student disposable income on college alcohol consumption.

A large literature documents the rise of broad-based merit aid programs in the U.S. and their effects on human-capital accumulation.[4] The most prominent example of these programs is the Georgia HOPE scholarship, initiated in 1993, which provides a full tuition/fee waiver at state institutions to Georgia students who achieve a 3.0 GPA in high school. Since that time, many states have modeled their own programs after the HOPE scholarship to varying degrees.[5] There are several hallmarks of merit-aid programs. First, they only provide aid to students who attend in-state institutions. Second, scholarships are awarded for "merit"–students achieve eligibility based on their high-school GPA and sometimes their SAT/ACT score or class rank. Third, in order to retain a merit-aid scholarship during college, students must maintain a minimum GPA (typically between 2.75 and 3.0; see Sjoquist and Winters, 2013). Lastly, there is generally no means test for eligibility and award amounts do not differ by family income or wealth.[6]

[3]For a comparison of all merit-based and need-based state-level financial aid programs, see Baum et al. (2012).

[4]See Hu et al. (2012) for a review of the literature on how merit-aid programs affect college enrollment and other outcomes.

[5]For a description of these programs, which vary in their generosity, see Dynarski (2004); Sjoquist and Winters (2012, 2013).

[6]The HOPE program contained an income cap on eligibility for its first 2 years of existence, but this feature was eliminated in 1995 (Dynarski, 2004).

So far as we know, we are the first to examine the effects of merit-aid programs on health behaviors or outcomes.[7] We choose to focus on alcohol consumption as our variable of interest for several reasons. First, alcohol abuse is among the largest public health concerns for individuals in the college demographic.[8] Second, as stated earlier, the income elasticity of alcohol use for college students has rarely been estimated in the past. Income effects associated with merit-aid programs are expected to be large for many families since the vast majority of those students who qualify very likely would have gone to college even in the absence of the program (Cornwell et al., 2006).[9]

The last reason we are interested in alcohol use as an outcome is that merit-aid programs have the potential to affect drinking through a channel other than an income effect: since these programs increase the incentive to maintain a GPA above the minimum renewal point in one's state, merit aid could *discourage* drinking (particularly for those individuals who are near or expect to be near the GPA cutoff). Indeed, recent research (for example, Williams et al., 2003; Carrell et al., 2011; Lindo et al., 2012) suggests that alcohol use has a negative causal effect on academic performance. If individuals recognize the link between drinking and grades, they may choose to curb their alcohol use in order to keep their merit scholarship.

[7] In doing so, we extend the literature on how merit aid affects student behavior while in college. Cornwell et al. (2005) find that students decrease course enrollments and increase withdrawals in response to HOPE, perhaps to keep their GPA above the scholarship renewal threshold. Sjoquist and Winters (2013) estimate that merit-aid scholarships reduce the number of college students in STEM majors, likely due to their higher degree of difficulty (Dee and Jackson, 1999). Cornwell and Mustard (2007) find that the advent of HOPE led to an increase in car sales in wealthier Georgia counties, presumably because the scholarship is simply a rent payment to families who were planning to send children to college in the first place.

[8] See http://pubs.niaaa.nih.gov/publications/CollegeFactSheet/CollegeFact.htm (last accessed: December 17, 2013).

[9] An important question related to the size of the income effect generated by these programs is whether merit-aid scholarships crowd out other forms of aid or lead to increases in higher education costs that are not covered by the scholarship (e.g. room and board). Dynarski (2004) argues that total educational spending in Georgia rose substantially following the passage of HOPE, while Doyle (2010) finds that merit-aid programs have not led to a reduction in need-based aid among adopting states. This may partly be due to the fact that large merit-aid programs have often been funded by newly established lotteries (Dynarski, 2004). However, there is some evidence of an acceleration in higher education costs due to merit-aid programs (Long, 2004).

Because the *income* and *grade performance* mechanisms theoretically run in opposite directions, the question of how merit-based financial aid affects alcohol consumption must be settled empirically. We use two data sources–the College Alcohol Study (CAS) and the National Longitudinal Survey of Youth, 1997 cohort (NLSY97)–to examine the question at hand. The gradual rollout of merit-aid scholarship programs across the U.S. allows us to use state by time variation in program adoption to identify our effects. We find that college males living in states with merit-aid programs experience an increase in their frequency of heavy drinking and total drinks consumed. On average, the arrival of a merit-aid program leads to a 17% increase in days a male student had 5 or more drinks in a row (heavy drinking) and an 11% increase in total drinks in the past month. These effects are concentrated among those with high college GPA's: individuals who are most likely to be on merit-based scholarship and relatively unconcerned with losing the scholarship due to poor academic performance.

We find no accompanying effects on female drinking of merit aid. Female and male drinking habits differ markedly, with males typically drinking more often and more heavily in many countries (Wilsnack et al., 2009).[10] Researchers have found gender differences in drinking responses to interventions other than changes in financial aid–for example, Kremer and Levy (2008) find that males are more susceptible than females to being assigned a heavily drinking roommate in college. Our results suggest either a large difference in income elasticities for alcohol between men and women or differences in the relative size of the *income* and *grade performance* effects of merit-aid programs across sex. We discuss implications of these possibilities in Section 4.

[10]In our data, female alcohol consumption is about half of male alcohol consumption by both measures (number of days of 5 or more drinks and total number of drinks in the past month).

2 Empirical Model

As we argue in Section 1, a merit-aid scholarship program in one's state of residence is, on average, expected to change both a student's disposable income (if at least part of the increase in financial aid is shared by parents with their children) and the "full" price of consuming alcohol (because alcohol use may lower academic performance, which in turn raises the risk of losing the scholarship). These relationships are modeled as follows:

$$AC = \alpha P + \beta I + X_1\gamma_1 + \epsilon_1, \tag{1}$$

$$P = \delta MA + X_2\gamma_2 + \epsilon_2, \tag{2}$$

$$I = \lambda MA + X_3\gamma_3 + \epsilon_3. \tag{3}$$

In Equations (1) through (3), AC represents a measure of alcohol consumption, P represents the full price of alcohol consumption, I represents a student's disposable income, MA is an indicator for whether a student lives in a merit-aid state, $X_1 - X_3$ are observable characteristics in each respective equation, and $\epsilon_1 - \epsilon_3$ are the respective regression errors. In our data, we do not observe P because we do not know how alcohol consumption affects each youth's grades (in expectation), how that in turn affects the probability of retaining a merit-aid scholarship, and how those two things in turn affect utility. In addition, we do not have reliable data on student disposable income (I) in either of our data sources. For this reason, rather than attempting to estimate Equation (1), we focus on the reduced-form equation:

$$AC = \zeta MA + X\gamma + \epsilon.^{11} \tag{4}$$

This means that our empirical estimates of ζ will subsume both the individual *income* and *grade performance* effects. In our regression analysis, we specifically model Equation (4) as:

$$AC_{icst} = \zeta MA_{ist} + \alpha_s + \beta_t + X_{it}\gamma + Y_{ct}\delta + Z_{st}\lambda + \epsilon_{icst}, \tag{5}$$

where AC_{icst} is alcohol consumption by individual i at college c in state s in year t. MA_{ist} is an indicator for the presence of a merit-aid program in state s in year t for those who were college freshman in the year of implementation or after (or, alternatively, 18 or younger in the year of implementation).[12] α_s is a state fixed effect, β_t is a year fixed effect, X_{it} are individual characteristics, Y_{ct} are college characteristics, Z_{st} are state characteristics, and ϵ_{icst} is the regression error.

As described in Sjoquist and Winters (2012, 2013), the merit-aid programs adopted by states over the time period in this study are heterogeneous in terms of generosity. Some programs, such as the HOPE scholarship in Georgia, offer relatively large amounts of aid to a majority of high-school graduates. Many other programs are much smaller in scope (either going to only the very most elite students, providing significantly smaller subsidies, or both). These latter programs are obviously not expected to have as large of an impact as the bigger programs. Sjoquist and Winters (2013) classify programs into "strong" and "weak" categories, and we follow their definition in this paper. We include Table 1 from

[11] Estimating Equation (1) would also require at least one instrument (exclusion restriction) in addition to MA.

[12] We do not observe merit aid receipt at the individual level in either of our datasets.

their paper in our Figure 1, which provides details on the 9 strong programs and lists the 18 weak programs adopted since the early 1990's. Like Sjoquist and Winters (2013), we define our treatment according to whether an individual is eligible (young enough) to receive merit aid in a state with a strong merit-aid program. We include individuals from states with weak programs in the control group but also perform specifications in which they are excluded from the analysis.[13]

ζ is identified by comparing the (regression-adjusted) difference in alcohol consumption between the pre-law and post-law periods in states that adopt programs with the same difference in non-adopting states (including states that have yet to adopt a program but do eventually). As described in Section 4, we use a variety of controls and falsification exercises to account for the possibility that drinking trends in merit-aid states may have been different than those in non-adopting states even in the absence of a program.

3 Data

The primary dataset used in our analysis is the College Alcohol Study (CAS). CAS is a nationally representative cross-sectional survey of four-year college students in 1993, 1997, 1999, and 2001. In each year, the sample is comprised of roughly 14,000 students from 120 institutions in 40 states.[14] CAS has a long history in economic and public health research (see Wechsler and Nelson, 2008). CAS is ideal for this study in that it contains detailed information on college students' drinking behavior and it coincides with a period of rapid

[13] Another alternative is to include separate dummies for both strong and weak merit-aid eligibility. We also tried this specification and found it made little difference in the treatment effect of strong merit aid.

[14] See http://archive.sph.harvard.edu/cas/About/index.html (last accessed: December 18, 2013).

expansion of merit-aid programs in the United States.

We measure alcohol consumption (our dependent variable) in two ways. The first is a measure of heavy or "binge" drinking: the number of days in the past 2 weeks in which a student had 5 or more alcoholic drinks in one sitting.[15] This kind of drinking has been found to be especially associated with harmful behaviors and outcomes (see, for example, Wechsler et al., 2002). For our other measure of consumption, we simply take the total number of drinks a student had in the past month (days drank alcohol in the past month multipled by average number of drinks per day in which drinking occurred).

CAS allows us to use a rich set of control variables in our analysis. In particular, we include dummies for age, sex (unless regressions are performed separately for men and women), race, year in school, marital status, Hispanic ethnicity, living off-campus, being a member of a fraternity/sorority, current college GPA (dummies for A, A-, B+, B, B-, C+, C, C-, and D), father's college attendance, mother's college attendance, and religious affiliation. Institutional characteristics are also included: dummies for whether the institution is public, whether it is rural, whether it is a commuter school, whether it has a religious affiliation, school size (4 categories), and school competitiveness (8 categories). Lastly, we control for time-varying state characteristics including the median income, unemployment rate, and tax rate on liquor. To deal with the possibility that strong merit-aid states differ from other states in unobserved ways, we include state and year fixed effects in all specifications and additional state and region trends in most specifications (this is described in the next section). Descriptive statistics on variables used in the CAS regression analysis are shown for

[15]Possible answers to this question in CAS were 0, 1, 2, 3-5, 6-9, and 10 or above. We re-code these as 0, 1, 2, 4, 7.5, and 10, respectively. The corresponding variable in the NLSY97 (see description below) is allowed to take any non-negative whole number value up to 30 (since the question is with respect to the past month rather than past 2 weeks).

all college students as well as males and females separately in Table 1.

We employ the National Longitudinal Survey of Youth, 1997 cohort (NLSY97) as a supplementary dataset in this project. The NLSY97 is an ongoing annual survey of 8,984 youths who were ages 12-16 in 1996. The first wave of data is from 1997, and the last wave of data used in this project is from 2005. Though it does not offer some of the advantages of CAS (for example, it does not provide as much overlap with the rollout of merit-aid programs), the NLSY97 allows us to compare the drinking behavior of students and non-students across states with and without merit-aid programs. Because it provides detailed information on drinking behavior, we can define dependent variables that are very similar to those used in the CAS analysis: total drinks in the last month is essentially identical, and number of days of 5 or more drinks in a row is over the past month (rather than 2 weeks as in CAS).[16]

The set of right-hand side controls available in the NLSY97 is different from the set of CAS controls. Institutional characteristics are not available, but NLSY97 does contain some information that CAS lacks: most importantly, parental income in adolescence and a standardized measure of scholastic aptitude (the Armed Forces Qualifying Test, or AFQT, score). The set of NLSY97 individual control variables includes dummies for birth cohort, sex (unless regressions are performed separately for men and women), race/ethnicity, mother's education, parental income quartile, AFQT quartile, living with both biological parents in adolescence, urban residence in adolescence, and number of siblings. State dummies and other characteristics (median income, unemployment rate, liquor tax), year dummies, and

[16]Total number of drinks in the past month is top-coded in CAS at 360. For this reason, we re-code all values greater than 360 to be 360 in the NLSY97 as well (this amounts to top-coding less than 2% of the observations).

state/region trends are also included in the NLSY97 analysis. Table 2 contains descriptive statistics on the NLSY97 regression sample.[17]

Comparing mean measures of the dependent variables across datasets (Tables 1 and 2) reveals that the total number of drinks across data sources is quite similar, both on the whole and by gender. The number of heavy-drinking days in the NLSY97 (1.73) is higher than it is in CAS (1.16), which is expected given that the NLSY97 question is over the past month instead of 2 weeks. A greater percentage of young people qualify for merit aid in the NLSY97, likely owing to its later time frame.

4 Results

4.1 Baseline results

The baseline results of the paper are shown in Tables 3 and 4 (with number of heavy drinking days and total number of drinks as the dependent variables, respectively). All models are estimated with CAS data via OLS with standard errors clustered at the state level. The first two columns of each table show results from regressions with state and year fixed effects but no additional state trends. Columns 3 and 4 add state by linear time trends and region by year dummies. These additional controls help mitigate concerns that trends in young people's drinking behavior would have been different in strong merit-aid states than in control states even in the absence of the programs (these concerns may arise, for example, because strong merit-aid states are concentrated in the south). Meanwhile, the first and third columns of

[17]The NLSY97 sample is composed of 18-22 year-olds. We make use of repeated observations on individuals and cluster standard errors to account for possible correlation in an individual's error terms across time.

each table display results in which individuals from weak merit-aid states are included in the control group; Columns 2 and 4 exclude observations from these states from the analysis.

In Table 3, we see that strong merit-aid eligibility is associated with a slight increase in heavy drinking activity overall, though this effect is smaller when 1) the additional state/region trends are added as controls and 2) weak merit states are dropped from the regression. However, this masks significant heterogeneity by gender: when the regressions are performed separately for males and females, the effect for males is always positive and significant (at least at the 10% level) and actually somewhat larger when the additional trend variables are included in the analysis. In contrast, merit-aid coefficient for females are always much smaller than male ones, never significantly positive, and actually turn negative with the additional controls. Our preferred specification is shown in Column 3 (because it includes the additional controls and all of the data in the analysis). In this specification, the difference in male and female coefficients is significant at the 5% level (in Table 4, with number of drinks as the dependent variable, the difference is significant at the 10% level). A coefficient of 0.27 for men implies that strong merit-aid eligibility increases heavy drinking days by roughly 17%.

Table 4 displays most of the same patterns as Table 3. Women present small, statistically insignificant responses to merit aid in all specifications. The coefficients for men are larger and positive, similar across specification in magnitude, and achieve 10% statistical significance when the additional state/region trends are included. In our preferred specification (Column 3), we find that the presence of a strong merit aid program increases number of alcoholic drinks in the past month by 3.3 for males, which is an 11% difference at the mean.

4.2 Results by year in school and college GPA

We now examine how the effects of strong merit-aid eligibility vary by year in school (freshmen vs. non-freshmen) and college GPA. Because merit aid is renewed only for those college students who maintain a minimum GPA (see Figure 1), we expect these effects to vary over the GPA distribution.[18] To examine whether this is the case, we divide all students into 3 GPA classifications: 3.4 (B+) or above, 2.7-3.0 (B- to B), and 2.4 (C+) or less. The first group is most likely to be on scholarship (a 3.4 GPA qualifies for renewal in all strong merit states), which would be associated with a large *income* effect. These high-scoring individuals might also be relatively unconcerned with scholarship loss, since (marginal) reductions in grades due to increased alcohol consumption would likely not move them below the GPA threshold for renewal (generally between 2.5 and 3.0 depending on the state and year in school).

The next group is the "marginal" group (2.7-3.0): many of these individuals would be eligible for merit aid in strong states, but poor performance could cause one's GPA to dip below the renewal point, so the *grade performance* effect is expected to be more important than it is for the first group. Lastly, many of those in the third category (2.4 or less) will not be on merit scholarship, either because they never received it initally or have since lost it. Since renewal is determined annually in most states, freshmen in this category are more likely than non-freshmen to be on scholarship at the time of interview. Some states with strong merit programs allow individuals who have lost the scholarship to regain it by raising their GPA above the renewal threshold; for this reason, individuals in this category who live

[18] Unfortunately, CAS does not contain data on high-school grades, which determine initial receipt of merit aid.

in strong merit states have an incentive to reduce their alcohol consumption to improve their grades.

The results from regressions run separately by freshman status and GPA category are contained in Table 5 (number of heavy drinking days) and Table 6 (total number of drinks). Once again, large differences in the coefficients are observed for men and women. In Table 5, men in the highest GPA category experience a large, significant (at the 5% level) increase in drinking. This is in line with there being a relatively large boost to income for this group without much concern for falling below the scholarship renewal point. This is especially pronounced for non-freshmen. For women, the result is exactly the opposite: the merit-aid effect is negative and significant (at the 10% level) overall and for upperclassmen specifically (curiously, freshmen women do see a strong positive effect of merit aid). This result is tempered somewhat in Table 6 for total drinks: in this case, the effect is still large and highly significant for high-GPA men and negative but small and insignificant for high-GPA women.

The results for the lower two GPA categories of men indicate that they do not experience as strong of a positive effect of merit aid on drinking by either measure as the highest category of men (though with respect to heavy drinking days, when all classes in school are combined the magnitude of the coefficients for the top 2 GPA categories is essentially the same). Freshmen men with lower grades actually show negative effects of merit aid, perhaps indicating that many are working to keep the scholarship. Among non-freshmen men in the mid-GPA category, the merit-aid effect is positive but insignificant when the dependent variable is heavy drinking days; it is small and insignificant for the lowest GPA category in the case of heavy drinking days and for the 2 lowest categories in the case of total drinks

consumed. We find no significant merit-aid effects for women in the 2 lowest GPA bins for either drinking variable.

The results of the more detailed analysis described in this section suggest that our hypothesis about the relative size of the *income* and *grade performance* mechanisms across year in school and especially GPA holds in large measure for males. Females, on the other hand, do not generally follow the patterns we would expect. This difference–combined with the overall gender difference in effects on alcohol consumption of merit aid–could be due to one or more of several factors. First, the income elasticity of alcohol consumption may vary by sex. Other researchers have found large gender differences in how underage youths obtain alcohol, with males being much more likely to get it from a commercial outlet and females being more likely to get it from someone age 21 or older (Wagenaar et al., 1996). This could translate into differences in income elasticity, though we do not know of estimates that support or fail to support that possibility. Second, the relative importance of the *grade performance* mechanism may vary across gender–either in terms of how alcohol consumption affects grades or in terms of how poorer grades affect utility (for example, the latter may be more of a concern for women, who tend to have higher GPA's, than it is for men). Other possibilities include gender differences in peer effects (Kremer and Levy, 2008) or parents' willingness to increase their child's disposable income in college when they are eligible for merit aid. A careful examination of these issues is beyond the scope of this paper, so we leave it to future research.

4.3 Results by student status

In this section, we turn our attention to whether the differences in alcohol consumption by merit-aid status are unique to students. To perform this analysis, we use data from the NLSY97, which contains information on both college students as well as those who are not in college. Because it is unlikely that merit-aid programs have any direct effects on the incomes or incentives of those not in college, we expect there should be little effect on the drinking decisions of non-students. If an increase in drinking (for males) were also observed for this group, it would suggest that the correlation between the adoption of a merit-aid program and alcohol use is perhaps spurious–the result of some other factor changing roughly over the same time period and disproportionately in strong merit-aid states.

Our estimated effects of merit aid on heavy drinking days and total drinks consumed by college-student status are contained in Tables 7 and 8, respectively. Parameter estimates are positive for college males and a fair amount larger than they are in the CAS (though they are less precisely estimated). This may be due in part to the difference in dependent variable definitions (in the case of heavy drinking days), the fact that 2-year college enrollees are also included in the NLSY79 college student sample, and the difference in sampling frames between the 2 datasets (the NLSY97 began later, which also means there is less within-state variation in the merit-aid variable than in the CAS analysis). Nevertheless, the results in the NLSY97 tables generally support our interpretation of the CAS data: the effects of merit-aid eligibility are positive for students but close to zero for non-students. Furthermore, the positive effect for students is highly concentrated among males, with college females experiencing smaller (in absolute value), negative effects by both measures of drinking.

Perhaps most importantly for our identification strategy, the differences in coefficients between male and female college students are much larger in magnitude than they are for male and female non-students. Though few of the individual estimates in Tables 7 and 8 achieve statistical significance at conventional levels, the difference between the college male and female coefficients is significant at the 10% level for heavy drinking days and the 5% level for total drinks. Meanwhile, non-college males and females are not significantly different from each other in either case.

5 Conclusion

We study the effects of state-level merit-based scholarship programs on the drinking behavior of college students. We find that on average a strong merit-aid program leads to an increase in male alcohol consumption according to 2 measures: the number of days in the past 2 weeks that an individual had 5 or more drinks on one occasion (by 17%) and the total number of alcoholic drinks over the past month (by 11%). These effects are not uniform across the GPA spectrum: male students with high GPA's (who are thus most likely to have a merit scholarship) experience large increases in drinking while those with lower grades experience smaller (and sometimes negative) effects. Strikingly, these patterns do not hold for females. Most notably, the overall effect of merit aid on female alcohol use is slightly negative in our preferred specification (and not significantly positive in any of our specifications).

We believe our results indicate that increases to college students' disposable incomes as a result of merit-aid adoption in their states are, overall, more empirically important than the extra incentive provided by merit-aid availability to maintain a minimum GPA (which

should cause alcohol consumption to fall, all else equal). Based on the information on strong merit-aid programs provided in Sjoquist and Winters (2013) (reproduced in Figure 1 of this paper), the (population-weighted) average subsidy in strong merit states is roughly $1,000 per student (roughly $3,000 per recipient). However, college students may not receive the entire increase in funds as disposable income: for example, parents might keep some of the subsidy for themselves.

For these reasons, we consider our estimates to be a plausible lower bound on a large-scale increase to the incomes of college students.[19] If the elasticity is with respect to financial aid that is not means-tested (such as tuition subsidies) rather than income, our estimates are likely to be even sharper. Future work that is able to make use of data that includes detailed information on respondents' financial aid and disposable incomes should be able to estimate precisely these elasticities.

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Figure 1: Sjoquist and Winters (2013), Table 1

Table 1: States Adopting Strong Merit Aid Programs

Program Name	First Cohort	Initial Requirement	Renewal GPA	Award Amount	Award per Recipient, 2010	Recipients as a Percent of Undergraduates, 2010
Florida Bright Futures Scholarship	1997	3.0-3.5 HS GPA and 970-1270 SAT/20-28 ACT	2.75-3.00	75-100% of tuition & fees	$2,381	31.9
Georgia HOPE Scholarship	1993	3.0 HS GPA	3.00	tuition & fees	$3,877	43.0
Kentucky Educational Excellence Scholarship	1999	2.5-4.0 HS GPA plus ACT bonus	2.50-3.00	$500-$3000	$1,381	44.7
Louisiana TOPS Scholarship	1998	2.5 HS GPA and 20 ACT	2.30-2.50	tuition & fees	$3,050	22.6
Nevada Millennium Scholarship	2000	3.0 HS GPA	2.60-2.75	$80 per credit	$1,279	23.8
New Mexico Lottery Success Scholarship	1997	2.5 first semester college GPA	2.50	tuition & fees	$2,388	19.6
South Carolina LIFE Scholarship	1998	3.0 HS GPA and 1100 SAT/24 ACT	3.00	$5000-$7500	$4,675	23.2
Tennessee HOPE Scholarship	2003	3.0 HS GPA or 1000 SAT/21 ACT	2.75-3.00	$2500-$4000	$3,423	33.5
West Virginia PROMISE Scholarship	2002	3.0 HS GPA and 1000 SAT/21 ACT	2.75-3.00	tuition & fees	$4,943	12.1

Sources: Dynarski (2004), Heller (2004), the Brookings Institution, and state agency websites.

Note: Eighteen other states adopted "weak" merit aid programs. These include Alaska, Arkansas, California, Idaho, Illinois, Maryland, Massachusetts, Michigan, Mississippi, Missouri, Montana, New Jersey, New York, North Dakota, Oklahoma, South Dakota, Utah, and Washington. For several states the renewal GPA increases after the first renewal point, hence the range given.

Table 1: Selected summary statistics: 1993-2001 CAS

	All college students		Males		Females	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Number of days drank 5+ drinks in past 2 weeks	1.16	1.99	1.62	2.34	0.86	1.66
Total number of drinks in past month	20.84	38.75	29.79	49.12	14.94	28.53
Eligible for merit aid in "strong" merit state	0.04	0.20	0.04	0.19	0.04	0.20
Age	20.94	2.20	21.12	2.20	20.82	2.18
Female	0.60	0.49	---	---	---	---
Race: white	0.79	0.41	0.79	0.41	0.78	0.41
Race: black	0.06	0.24	0.05	0.22	0.07	0.26
Race: asian	0.07	0.26	0.08	0.27	0.07	0.26
Race: other	0.08	0.27	0.08	0.27	0.08	0.26
1st year of college	0.22	0.42	0.21	0.41	0.23	0.42
2nd year of college	0.21	0.41	0.21	0.40	0.21	0.41
3rd year of college	0.24	0.43	0.25	0.43	0.24	0.43
4th year of college	0.23	0.42	0.23	0.42	0.23	0.42
5th year of college or higher	0.09	0.29	0.11	0.31	0.08	0.27
Married	0.10	0.30	0.08	0.27	0.11	0.31
Hispanic ethnicity	0.07	0.25	0.07	0.25	0.07	0.25
Lives off-campus	0.56	0.50	0.58	0.49	0.55	0.50
Greek member	0.14	0.35	0.15	0.36	0.14	0.34
GPA	3.20	0.59	3.13	0.61	3.24	0.58
Father attended college	0.70	0.46	0.73	0.45	0.69	0.46
Mother attended college	0.66	0.47	0.67	0.47	0.66	0.47
Not religious	0.13	0.34	0.14	0.35	0.12	0.33
Catholic	0.36	0.48	0.36	0.48	0.36	0.48
Jewish	0.03	0.17	0.03	0.18	0.03	0.17
Muslim	0.01	0.10	0.01	0.12	0.01	0.08
Protestant	0.38	0.48	0.37	0.48	0.38	0.49
Other religion	0.09	0.29	0.08	0.28	0.10	0.29
Public institution	0.68	0.47	0.71	0.46	0.66	0.47
Rural location	0.31	0.46	0.32	0.47	0.30	0.46
Commuter school	0.14	0.35	0.14	0.35	0.14	0.35
Religious institution	0.15	0.36	0.13	0.34	0.16	0.37
Region: northeast	0.23	0.42	0.22	0.42	0.24	0.43
Region: south	0.29	0.45	0.28	0.45	0.29	0.45
Region: midwest	0.30	0.46	0.30	0.46	0.30	0.46
Region: west	0.18	0.38	0.19	0.39	0.17	0.37
State median income	43,092	8,076	42,595	7,930	43,419	8,155
State unemployment rate	5.10	1.58	5.15	1.60	5.07	1.56
State liquor tax (%)	2.78	2.03	2.70	2.04	2.83	2.02

Notes: N=54,380. Variables not shown but used in regression analysis include school size dummies (4) and school competitiveness dummies (8).

Table 2: Selected summary statistics: 1997-2005 NLSY97

	All 18-22 year-olds		Males		Females	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Number of days drank 5+ drinks in past month	1.73	3.85	2.28	4.48	1.18	2.99
Total number of drinks in past month	22.29	50.49	29.98	60.81	14.55	35.67
Eligible for merit aid in "strong" merit state	0.07	0.26	0.07	0.26	0.07	0.26
Enrolled in college	0.33	0.47	0.29	0.46	0.37	0.48
1997 cohort	0.20	0.40	0.20	0.40	0.21	0.40
1998 cohort	0.21	0.41	0.20	0.40	0.21	0.41
1999 cohort	0.21	0.41	0.21	0.41	0.21	0.41
2000 cohort	0.20	0.40	0.20	0.40	0.20	0.40
2001 cohort	0.18	0.38	0.19	0.39	0.18	0.38
Female	0.50	0.50	---	---	---	---
Black	0.14	0.35	0.13	0.34	0.15	0.36
Hispanic	0.11	0.32	0.12	0.32	0.11	0.31
Mother's education: high-school graduate	0.36	0.48	0.37	0.48	0.35	0.48
Mother's education: some college	0.49	0.50	0.48	0.50	0.50	0.50
Parental income in 1997 ($1000's)	70.57	61.26	71.11	61.34	70.02	61.18
Number of siblings	2.08	1.53	2.05	1.45	2.11	1.62
Did not live with both biological parents as teen	0.47	0.50	0.45	0.50	0.49	0.50
AFQT percentile	52.46	29.06	51.50	29.98	53.43	28.06
Urban residence as teen	0.69	0.46	0.68	0.47	0.70	0.46
Region: northeast	0.17	0.38	0.18	0.38	0.17	0.37
Region: south	0.34	0.47	0.29	0.45	0.28	0.45
Region: midwest	0.29	0.45	0.33	0.47	0.35	0.48
Region: west	0.20	0.40	0.20	0.40	0.20	0.40
State median income	50,372	7,731	50,431	7,676	50,312	7,786
State unemployment rate	4.96	1.15	4.97	1.14	4.95	1.15
State liquor tax (%)	2.49	2.12	2.50	2.13	2.48	2.10

Notes: N=30,041. Estimates are weighted by 1997 sampling weights.

Table 3: The effects of merit aid on number of heavy drinking days, 1993-2001 CAS

	(1)	(2)	(3)	(4)
Both sexes	0.106**	0.068	0.031	0.013
	(0.048)	(0.061)	(0.063)	(0.069)
Males	0.173**	0.163*	0.271*	0.292*
	(0.074)	(0.092)	(0.153)	(0.158)
Females	0.074	0.022	-0.115	-0.172*
	(0.082)	(0.090)	(0.078)	(0.088)
State dummies	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
Other controls	Yes	Yes	Yes	Yes
State * linear time trends	No	No	Yes	Yes
Region * year dummies	No	No	Yes	Yes
Strong merit states	Treatment	Treatment	Treatment	Treatment
Weak merit states	Control	Excluded	Control	Excluded
Non-merit states	Control	Control	Control	Control

Notes: *** p<0.01, ** p<0.05, * p<0.1. Standard errors in parentheses are clustered by state of college attendance. N=54,380 (21,579 males and 32,801 females). Dependent variable is number of times drank 5 or more drinks in one sitting in past 2 weeks. "Other controls" include dummies for year of age, sex, race/ethnicity, marital status, year in school, living arrangement (on or off campus), and fraternity/sorority status, college GPA dummies, mother's and father's education dummies, religion dummies, school characteristics, and state characteristics (see the text for additional details).

Table 4: The effects of merit aid on total number of drinks, 1993-2001 CAS

	(1)	(2)	(3)	(4)
Both sexes	2.411	1.635	0.558	0.374
	(1.821)	(1.716)	(1.348)	(1.303)
Males	3.945	3.482	3.295*	3.159*
	(2.551)	(2.283)	(1.701)	(1.784)
Females	1.758	0.821	-1.186	-1.737
	(1.925)	(1.954)	(1.795)	(1.862)
State dummies	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
Other controls	Yes	Yes	Yes	Yes
State * linear time trends	No	No	Yes	Yes
Region * year dummies	No	No	Yes	Yes
Strong merit states	Treatment	Treatment	Treatment	Treatment
Weak merit states	Control	Excluded	Control	Excluded
Non-merit states	Control	Control	Control	Control

Notes: *** p<0.01, ** p<0.05, * p<0.1. Standard errors in parentheses are clustered by state of college attendance. N=54,120 (21,486 males and 32,634 females). Dependent variable is total number of alcoholic drinks in past month. "Other controls" include dummies for year of age, sex, race/ethnicity, marital status, year in school, living arrangement (on or off campus), and fraternity/sorority status, college GPA dummies, mother's and father's education dummies, religion dummies, school characteristics, and state characteristics (see the text for additional details).

Table 5: The effects of merit aid on number of heavy drinking days by year in school and GPA, 1993-2001 CAS

	All classes			Freshmen			Non-freshmen		
	GPA>=3.4	3.4>GPA>=2.7	2.7>GPA	GPA>=3.4	3.4>GPA>=2.7	2.7>GPA	GPA>=3.4	3.4>GPA>=2.7	2.7>GPA
Both sexes	-0.017	0.207*	-0.034	0.384**	-0.355	-0.586	0.029	0.171	0.093
	(0.081)	(0.110)	(0.252)	(0.154)	(0.856)	(0.416)	(0.127)	(0.152)	(0.229)
	N=29,133	N=17,915	N=7,332	N=5,686	N=4,040	N=2,364	N=23,447	N=13,875	N=4,968
Males	0.422**	0.446	-0.312	0.202	-1.141	-1.514**	0.583***	0.335	-0.015
	(0.169)	(0.285)	(0.373)	(0.633)	(1.691)	(0.604)	(0.199)	(0.319)	(0.373)
	N=10,463	N=7,620	N=3,496	N=1,931	N=1,561	N=1,030	N=8,532	N=6,059	N=2,466
Females	-0.252*	0.049	0.206	0.472**	0.028	0.218	-0.245*	0.010	-0.105
	(0.127)	(0.160)	(0.274)	(0.212)	(0.781)	(0.734)	(0.142)	(0.188)	(0.247)
	N=18,670	N=10,295	N=3,836	N=3,755	N=2,479	N=1,334	N=14,915	N=7,816	N=2,502
State dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State * linear time trends	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region * year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Strong merit states	Treatment	Treatment	Treatment	Treatment	Treatment	Treatment	Treatment	Treatment	Treatment
Weak merit states	Control	Control	Control	Control	Control	Control	Control	Control	Control
Non-merit states	Control	Control	Control	Control	Control	Control	Control	Control	Control

Notes: *** p<0.01, ** p<0.05, * p<0.1. Standard errors in parentheses are clustered by state of college attendance. N=54,380 (21,579 males and 32,801 females). Dependent variable is number of times drank 5 or more drinks in one sitting in past 2 weeks. "Other controls" include dummies for year of age, sex, race/ethnicity, marital status, year in school, living arrangement (on or off campus), and fraternity/sorority status, college GPA dummies, mother's and father's education dummies, religion dummies, school characteristics, and state characteristics (see the text for additional details).

Table 6: The effects of merit aid on total number of drinks by year in school and GPA, 1993-2001 CAS

	All classes			Freshmen			Non-freshmen		
	GPA>=3.4	3.4>GPA>=2.7	2.7>GPA	GPA>=3.4	3.4>GPA>=2.7	2.7>GPA	GPA>=3.4	3.4>GPA>=2.7	2.7>GPA
Both sexes	1.352	3.675**	-8.038***	13.447***	4.194	-20.196	2.152	2.009	3.045
	(1.517)	(1.713)	(2.048)	(3.796)	(8.639)	(15.674)	(3.785)	(2.470)	(5.508)
	N=29,000	N=17,833	N=7,287	N=5,658	N=4,017	N=2,349	N=23,342	N=13,816	N=4,938
Males	8.959***	5.114	-15.263***	17.642	8.364	-43.967	12.173**	2.737	3.290
	(3.171)	(5.858)	(3.693)	(13.023)	(12.221)	(26.768)	(4.721)	(6.991)	(9.610)
	N=10,411	N=7,603	N=3,472	N=1,919	N=1,560	N=1,021	N=8,492	N=6,043	N=2,451
Females	-2.910	2.300	-1.551	10.668**	3.186	-3.254	-2.896	0.566	-3.888
	(1.848)	(3.395)	(3.573)	(4.735)	(9.981)	(9.412)	(3.265)	(3.787)	(6.700)
	N=18,589	N=10,230	N=3,815	N=3,739	N=2,457	N=1,328	N=14,850	N=7,773	N=2,487
State dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State * linear time trends	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region * year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Strong merit states	Treatment	Treatment	Treatment	Treatment	Treatment	Treatment	Treatment	Treatment	Treatment
Weak merit states	Control	Control	Control	Control	Control	Control	Control	Control	Control
Non-merit states	Control	Control	Control	Control	Control	Control	Control	Control	Control

Notes: *** p<0.01, ** p<0.05, * p<0.1. Standard errors in parentheses are clustered by state of college attendance. N=54,120 (21,486 males and 32,634 females). Dependent variable is total number of alcoholic drinks in past month. "Other controls" include dummies for year of age, sex, race/ethnicity, marital status, year in school, living arrangement (on or off campus), and fraternity/sorority status, college GPA dummies, mother's and father's education dummies, religion dummies, school characteristics, and state characteristics (see the text for additional details).

Table 7: The effects of merit aid on number of heavy drinking days by student status, 1997-2005 NLSY97

	All 18-22 year-olds	Students	Non-students
Both sexes	0.058	0.393	-0.007
	(0.191)	(0.315)	(0.252)
	N=30,041	N=9,311	N=20,680
Males	0.315	1.188	0.233
	(0.270)	(0.752)	(0.374)
	N=14,929	N=4,004	N=10,888
Females	-0.129	-0.127	-0.156
	(0.253)	(0.186)	(0.403)
	N=15,112	N=5,307	N=9,792
State dummies	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
Other controls	Yes	Yes	Yes
State * linear time trends	Yes	Yes	Yes
Region * year dummies	Yes	Yes	Yes
Strong merit states	Treatment	Treatment	Treatment
Weak merit states	Control	Control	Control
Non-merit states	Control	Control	Control

Notes: *** p<0.01, ** p<0.05, * p<0.1. Standard errors in parentheses are clustered by state of residence. Dependent variable is number of times drank 5 or more drinks in one sitting in past month. "Other controls" include dummies for dummies for birth cohort, sex, race/ethnicity, mother's education, family income in adolescence, AFQT percentile, and living with both biological parents, number of siblings, urban status, and state characteristics (median income, unemployment rate, and alcohol tax rates). See the text for additional details.

Table 8: The effects of merit aid on total number of drinks by student status, 1997-2005 NLSY97

	All 18-22 year-olds	Students	Non-students
Both sexes	0.114	4.125	-1.598
	(2.495)	(3.990)	(2.699)
	N=29,902	N=9,273	N=20,582
Males	3.001	15.831	-0.305
	(5.052)	(10.547)	(5.599)
	N=14,851	N=3,989	N=10,828
Females	-1.931	-4.642***	-0.628
	(2.229)	(1.172)	(4.165)
	N=15,051	N=5,284	N=9,754
State dummies	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
Other controls	Yes	Yes	Yes
State * linear time trends	Yes	Yes	Yes
Region * year dummies	Yes	Yes	Yes
Strong merit states	Treatment	Treatment	Treatment
Weak merit states	Control	Control	Control
Non-merit states	Control	Control	Control

Notes: *** p<0.01, ** p<0.05, * p<0.1. Standard errors in parentheses are clustered by state of residence. Dependent variable is total number of alcoholic drinks in past month. "Other controls" include dummies for dummies for birth cohort, sex, race/ethnicity, mother's education, family income in adolescence, AFQT percentile, and living with both biological parents, number of siblings, urban status, and state characteristics (median income, unemployment rate, and alcohol tax rates). See the text for additional details.