Television and Magazine Alcohol Advertising: Exposure, Targeting, and Trends*

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Abstract

Using unique marketing data that link the media individuals consume and advertising appearing in those media, we document exposure to alcohol advertising. We measure advertising not with the standard expenditure data but with counts of actual advertisements. We document exposure by sex, age, and the level and type of alcohol consumed. We find that firms target drinkers generally and young male drinkers in particular. Men, especially younger men, see more advertisements for alcohol of all types than women. Sex differences in the propensity to read sports and adult magazines and watch sports and gambling programs explains a large proportion of the sex difference in exposure to beer advertising. Trends in magazine and television advertising over a 14 year period suggest that the sharp increase in television liquor advertising in the 1990s might have been driven by the concomitant decline in magazine reading.

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JEL codes: I10; I120; M37

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1 Introduction

A large empirical literature describes the social, economic, and health consequences of excessive alcohol consumption, including 80,000 premature deaths, lost productivity, sexual assault, and other crimes (Centers for Disease Control and Prevention, 2012a; Bouchery et al., 2011; Greenfield, 1998). Researchers have devoted considerable resources to try to better understand whether alcohol advertising contributrd to these consequences. However, available evidence fails to strongly support the claim that advertising causes people to drink and causes them to drink more. Some literature reviews find a positive association between exposure to advertising and alcohol consumption (Anderson and Hastings, 2009; Hastings et al., 2005; Nunez-Smith et al., 2010). But Nelson (2011), who carefully evaluates the statistical nature of the estimated associations, concludes that there are no consistent or robust results with respect to specific measures of drinking and advertising. He warns that most of the literature estimates not the causal effect but only the correlation between consumption and advertising. In part, this conflicting evidence could occur because researchers do not accurately measure the alcohol advertising individuals actually see. And, although researchers recognize that firms have incentives to target advertising at individuals who are inclined to drink, evidence of that targeting is sparse. Here we partially fill this gap by describing the type and number of advertising messages that different aged men and women saw on television and in magazines from 1996 to 2009.

Our main contribution is to describe levels and trends in exposure using measures of advertising that complement and improve on existing descriptions. Our evidence also suggests why, in 1996, firms selling distilled spirits abandoned a 48-year-old self-imposed ban on television liquor advertising. We complement existing descriptive studies of magazine and television alcohol advertising (see Center on Alcohol Marketing and Youth (2010a,b)) by extending the period over which they are described by five years. Because we measure the number of advertising messages people actually see, we also avoid two problems associated with advertising expenditure data that many researchers use to proxy for exposure (e.g. Mela et al., 1997; Jedidi et al., 1999; Saffer and Dave, 2006). Because expenditure data seldom measure the amount

spent on advertising targeted at particular demographic groups, they do not provide insights about targeting of specific vulnerable populations. Further, absent controls for factors that raise spending but do not increase exposure, expenditure data will imperfectly proxy for actual exposure.[1] We avoid these problems because we track the number of advertisements that people likely saw, by demographic group. Finally, our measures avoid problems of recall bias in measures based on self-reported advertising people recall having seen. These recall measures are potentially biased because people who drink may be more likely to remember having seen advertising. We avoid this problem by constructing exposure measures with diary data that track media consumption. Finally, we contribute evidence that documents the significant change in how firms advertise liquor. We confirm the fact that firms shifted advertising from magazines to television in the early 2000s. As importantly, we present evidence that suggests that firms did so because people stopped reading magazines.

We combine survey data that tracks specific television programs individuals watched and specific magazines they read with data on the advertising that appeared on those programs and in those magazines. Assuming stability in media consumption habits, we estimate the number of advertisements men and women saw over the course of 26 six-month periods. We then average estimated exposure to advertising of beer, liquor, and wine. We define six groups of consumers: males and females separately by ages 18 to 20, 21 to 24, and 25 and over. For each age-sex category, we describe advertising seen by people who drink no, some, or a large quantity of beer, liquor, or wine.

The resulting patterns are consistent with the hypothesis that firms target advertising at groups who drink more and who are more inclined to drink. Our evidence shows that individuals who drink more, see more advertisements for all types of alcohol (regardless of the type of alcohol they most heavily imbibe). Further, men ages 18-24 see significantly more advertisements for beer and liquor than do similarly aged women. We show that a large fraction of the difference is explained by the fact that young men are more likely to read sports and two adult entertainment magazines (*Playboy* and *Penthouse*) and watch more sports and gambling

[1] For example, in election years and in political markets with heavily contested seats, demand for limited advertising space drives up costs.

television programs. Firms heavily advertise beer and liquor in those magazines and on those programs.

Our evidence underscores the statistical challenges researchers face. It highlights the point that, absent strong study designs, one should be cautious about attaching causal interpretations to estimated relationships between advertising and drinking behavior. While we do not identify the causal effect of advertising here, our evidence suggests that firms successfully target advertising.

The rest of the paper is structured as follows: in Section 2 we describe our data and how we combine it. In Section 3, we detail how we estimate exposure to advertising and the controls we use to adjust those estimates. In Section 4, we describe alcohol advertising exposure in several different ways. We show how much advertising the average sample member saw each year for beer, liquor, and wine advertised on television and in popular consumer magazines; the relative exposure of men and women; and trends in average exposure to alcohol advertising in magazines and on television from 1996 to 2009. These data quite clearly reveal the sharp increase in advertising of liquor on television and that, as firms advertised more on television, they reduced magazine advertising. In Section 5, we discuss what these patterns imply for studies of the effects of advertising, some of the challenges they highlight, and possible strategies for empirical studies.

2 Data

Simmons National Consumer Survey

We use individual consumption and media viewing data from the 1996 to 2009 waves of the Simmons National Consumer Survey (NCS).[2] The NCS uses a multi-stage stratified probability sample that is drawn from random digit dial sampling frames that exclude Hawaii and Alaska.[3] The surveys collect a rich set of demographic characteristics about each individual

[2]Simmons administered one survey in 1996 and two surveys in every subsequent year. We do not use data from the fall 1998 survey because it collected only limited alcohol consumption data.

[3]The exclusion of wireless-only area codes from the NCS sampling frame is a potential drawback of the survey and could bias our measures of advertising exposure if the viewing habits of these households are signif-

and his household; data on consumption of a wide range of products and services; and information about consumption of movies, magazines, newspapers, television, radio, and other mass media. The NCS yields cross-sectional data for a sample of all adults (age 18 and older) that, with sample weights, represents the US population living in households in the contiguous US.

For our purpose, the NCS are ideal because they collect detailed data on both alcohol and media consumption. The NCS asks each respondent to report the type and amount of any alcohol consumed in the past 30 days. In addition, the NCS collects data on whether and how frequently respondents read magazines and watch television. Over the surveys we use, the NCS collected reading behavior for 229 popular consumer magazines and viewing behavior for 4,907 unique television programs.[4]

To match advertising that aired in local areas, we use use information the NCS collects that allows us to directly or indirectly identify the Designated Marketing Areas (DMA) in which respondents live.[5] When the NCS does not directly identify the DMA, we use other geographic identifiers, including state of residence and the general size of the DMA, to match respondents to a DMA. Our algorithm matches 66 percent of NCS respondents to a DMA.[6] Dropping observations with missing DMA, magazine reading, and television viewing data, our analysis sample includes 306,451 adults. Of these, 12,235 are ages 18 to 20 and 15,182 are ages 21 to 24.

Kantar Media Magazine and Television Advertising Data[7]

The magazine advertising data include: the alcohol brand and sponsor, the magazine, the issue (date), and the page size of the advertisement. Kantar's television advertising data measure, for each advertisement that aired, the brand, the sponsor, the television program, and when

icantly different. Several studies have shown excluding wireless-only households may bias measures of alcohol consumption(Blumberg and Luke, 2009; Centers for Disease Control and Prevention, 2012b).

[4]We track advertising for 85 magazines titles common across all NCS surveys. In 2004, these 85 magazines accounted for 40 percent of all magazine issues sold in the US. A list of titles is available on request.

[5]A DMA is a group of counties that share the same broadcast televisions stations, typically named for the largest city or cities in the area. Nielsen Media Research defines the boundaries of the 210 U.S. DMAs.

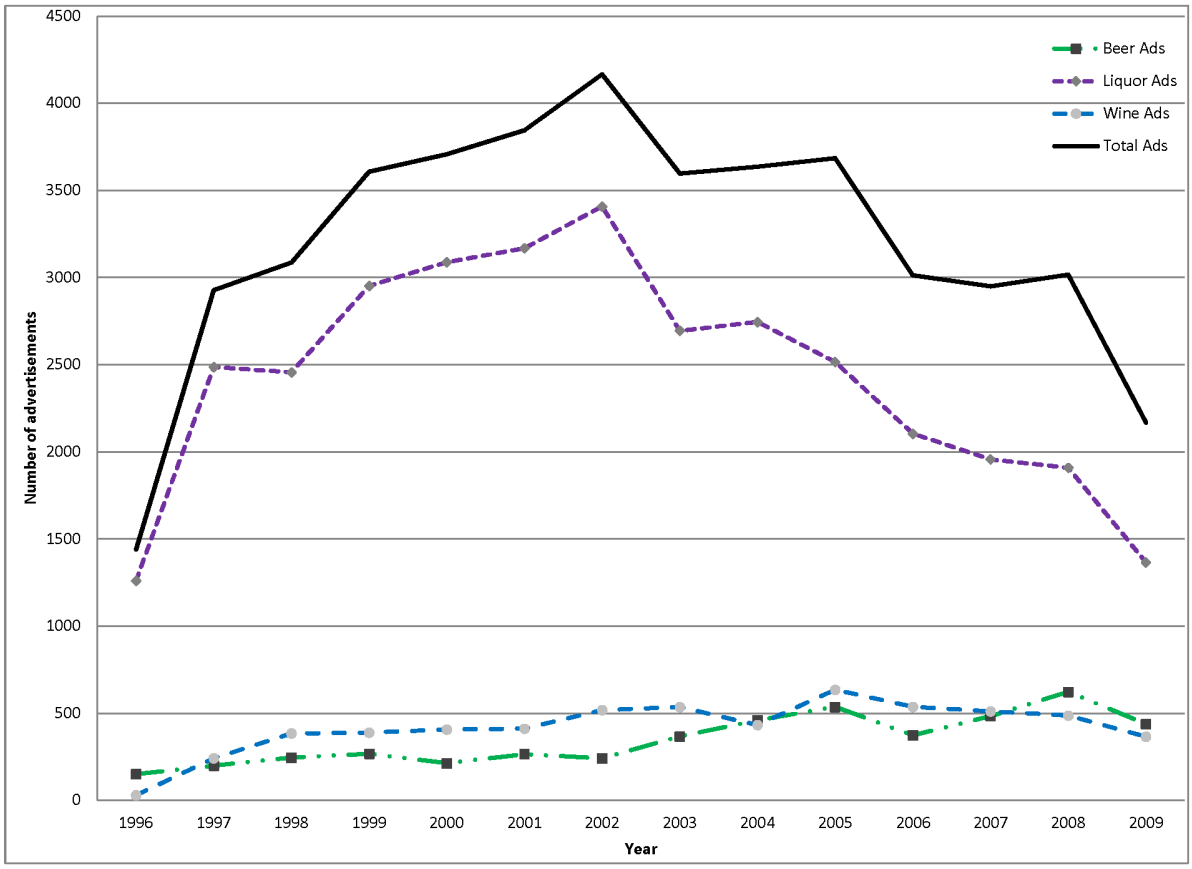
[6]Avery et al. (2007) develop and describe the algorithm.

[7]Kantar Media previously did business under the names TNS Media and Competitive Media Reporting.

and where it aired - either nationally or in one or more of 110 DMAs.[8]

Figure 1 plots the trend from 1996 to 2009 in the number of magazine advertisements (overall and by alcohol type).[9] Starting from just under 1,500 advertisements in 1996, alcohol advertising rose 190 percent - above 4,100 advertisements in 2002. From that peak, overall magazine advertising declined about 50 percent - to 2,200 in 2009. This decline reflects a sharp drop in liquor advertising.

Figure 1: Magazine Alcohol Advertisements 1996-2009, by Alcohol Type (Source: Kantar Media)



[8]Kantar does not measure local cable advertising and only measures cable advertising that aired on 44 popular, national cable networks.

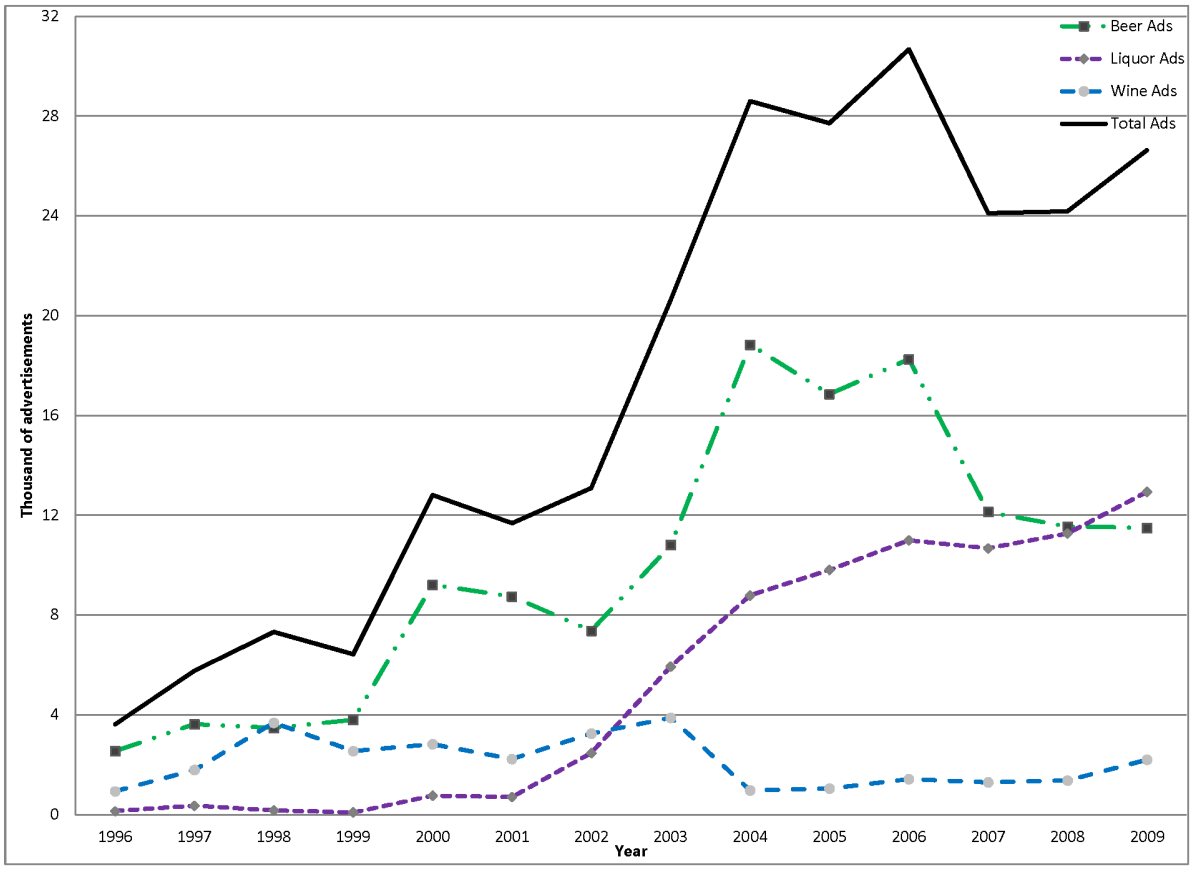
[9]We track advertising in 85 magazine titles that appeared in every survey. We do not adjust for magazine circulation and only count nationally distributed advertisements.

Figure 2 plots a simple count of national airings of alcohol television commercials overall and by alcohol type.[10] Between 1996 and 2009, firms aired 17,300 liquor advertisements in the average year. Starting from around 2,500 airings in 1996, television beer advertising increased about 640 percent to a peak of 18,800 in 2004 then fell 39 percent to 11,500 airings in 2009. Television advertising of liquor increased dramatically. Until 1999 practically no liquor advertising appeared on television. Starting in 2000, advertising rose from close to zero to more than 12,900 airings in 2009.[11]

[10] We plot local broadcast advertising for all 210 US DMAs, not just the 110 DMAs where NCS respondents live.

[11] In 1996, spirits producers ended a ban on broadcast advertising they had voluntarily maintained since 1948. We discuss the ban in more detail below.

Figure 2: Nationally-Aired Television Alcohol Advertisements 1996-2009, by Alcohol Type (Source: Kantar Media)



Measuring Individual Exposure to Alcohol Advertising[12]

To estimate exposure to magazine alcohol advertising, we follow Avery et al. (2007). The NCS asks each respondent whether he read any of the last four issues of each magazine and how many those four issues that he read. We convert these data into a fraction and assume the fraction corresponds to the percentage of issues of each magazine that a respondent read over

[12]We estimate only the potential and not the actual advertising people saw. For expository purposes, in what follows we refer to exposure rather than potential exposure.

the past six months.[13] Formally, we measure respondent i's total exposure to magazine alcohol advertisements in period t as:

$$ad_{it}^{mag} = \sum_{m} read_{imt} \times ad_{mt} \tag{1}$$

where the subscripts denote respondent i, magazine m, and six month period (survey wave) t. The variable $read_{imt}$ denotes the fraction of the past four issues of magazine m that respondent i read and ad_{mt} denotes the number of alcohol advertisements that appeared in magazine m during that period.[14] We proxy for an individual's (potential) exposure to magazine alcohol advertising by the sum of exposure in the 85 magazines.

To estimate exposure to television alcohol advertising we use similar NCS data. Each NCS respondent indicates how many times he watched regularly occurring broadcast, cable, and sports programs.[15] Parallel to (1), we generate the fraction of all shows a respondent watched. We multiply the fraction of those airings a person watched by the number of commercials that aired on the program in the past six months. The NCS also asks respondents if they viewed one-time special programming (e.g., the Academy Awards, the World Series). For each program a person says he watched, we assume he saw all alcohol advertisements that aired during that show. We then sum across exposure to advertising on all shows (parallel to (1)).

From this point forward, when we report average exposure to advertising by calendar year, we average the exposure of all people who responded to an NCS survey in a given calendar year.

Alcohol Consumption

The NCS asks each respondent to report how many drinks of specific alcohol types that he consumed over the past 30 days. To measure drinks consistently, we count only alcohol types

[13] Leone (1995) reviewed evidence in the literature on advertising depreciation and concluded that the effect of advertising persists for six to nine months.

[14] Each NCS is in the field for four months. We measure advertising in the six months prior to the first month an NCS is in the field.

[15] Over our sample period NCS asked about 4,907 specific popular cable and network television programs and the time of day respondents watch network television and specific cable networks on a typical weekday, Saturday, and Sunday.

included in every surveys wave we use.[16] We sum each respondent's consumption of beer, wine, and liquor and classify a person by his past month consumption. For each type of alcohol, we label him as an "abstainer" if he drank nothing, a "light drinker" if he drank between 1 and 32 drinks, and a "heavy drinker" if he drank 33 drinks or more. Molloy (2012) validates the NCS alcohol usage measures against the National Survey on Drug Use and Health, a nationwide survey on alcohol, illicit drug use, and mental health.

Controlling for Media Viewing Habits

Because individuals who read more magazines are more likely to be exposed to magazine alcohol advertising than individuals who read fewer magazines, we create a variable ($dmread_i$) to control for the number of magazines a person read relative to the number of magazines read by the average respondent. It is given by:

$$dmread_i = \sum_{m=0}^{85} M_i - \left(\sum_{j=1}^{N} \sum_{m=0}^{85} M_j \right) \frac{1}{N} \tag{2}$$

where M_i=1 if person read at least one the last four issues of magazine m and 0 if he read none and M_j=1 for each of the other j respondents.

We use data from the television viewing diary that tracks whether a person watched television in each daypart of an average weekday, Saturday, and Sunday to construct a similar variable for television viewing hours ($dmview_i$). It is given by:

$$dmview_i = TVHrs_i - \left(\sum_{j=1}^{N} TVHrs_j \right) \frac{1}{N} \tag{3}$$

where $TVHrs_i$ is the hours of television respondent i watched. The second term measures hours watched by the average NCS respondent. Thus, our reference person is an individual with average media consumption.[17]

[16] We exclude products such as "flavored alcoholic beverages" (sometimes labeled as "alcopops") that only appear on later surveys. We measure consumption of ice beer, imported beer, light beer, malt liquor, micro beer, and regular beer; four types of whiskey (e.g. blended), brandy and armagnac, cognac, cordial and liqueurs, gin, rum, tequila, and vodka; and champagne, domestic dinner wine, imported wine, and port, sherry, and dessert wine.

[17] Below we use the term "unconditional" to refer to estimated exposure that controls for $dmread_i$ and

We also estimate exposure measures that control for differences between men and women in readership of Sporting News, Sports Illustrated, Golf Digest, Golf Magazine, Playboy and Penthouse magazines, and for television viewing of regular sports, special sports, boxing, auto racing, and poker.

3 Empirical strategy

To analyze exposure by sex and age, we group people age 18-20, 21-24, and 25 and older. For each group we then estimate the model given by:

$$ad_{igk}^{mag} = \gamma_0 + \gamma_1 dmread_i + \vartheta_{igk} \tag{4}$$

Our focus is on the intercept term, γ_0, because it measures the number of magazine advertisements that the average person in age group g saw for alcohol type k (i.e. beer, liquor, or wine), holding constant each person's magazine reading habits relative to the average person ($dmread_i$). The model for television advertising exposure is the same but controls for how many hours of television a person watches (relative to the average person) ($dmview_i$).

To investigate the sex differences in exposure, we add a dummy variable for female respondents, the number of sports ($sprtread_i$) and adult entertainment ($gmread_i$) magazines each person reads, and the interaction between the sex dummy and all magazine readership variables. Formally, we estimate:

$$\begin{aligned} ad_{ik}^{mag} &= \alpha_0 + \alpha_1 female_i + \alpha_2 dmread_i + \alpha_3 female_i dmread_i + \\ &\quad \alpha_4 sprtread_i + \alpha_5 female_i sprtread_i + \alpha_6 gmread_i + \alpha_7 female_i gmread_i + \varepsilon_i \end{aligned} \tag{5}$$

For television advertising we specify a similar model. To the basic model, we add a count of how many times per week a person watched regular sports ($rsview_i$), special sports ($ssview_i$),

$dmview_i$ but no other types of individual media consumption.

and other selected sports shows on cable viewed ($otview_i$) with the female dummy and the interactions.

$$\begin{aligned} ad_{ik}^{tv} &= \beta_0 + \beta_1 female_i + \beta_2 dmview_i + \beta_3 female_i dmview_i + \\ &\quad \beta_4 rsview_i + \beta_5 female_i rstview_i + \beta_6 ssview_i + \beta_7 female_i ssview_i + \\ &\quad \beta_8 otview_i + \beta_9 female_i otview_i + \sigma_i \end{aligned} \tag{6}$$

In all cases we use sample weights.

We use the coefficient estimates from (5) and (6) to compute the average advertising exposure of males and females when we do and do not control for systematic sex differences in sports/adult entertainment magazine reading and television viewing of regular sports, special sports, and other sports shows. Specifically we compute the measures given in Table 1.

Table 1: Exposure measures of men and women, without/with controls for sex-specific media consumption

Exposure type	Males	Females
Magazine		
Unconditional	$\hat{\alpha}_0 + \hat{\alpha}_4 \overline{sprtread_{men}} + \hat{\alpha}_6 \overline{gmread_{men}}$	$(\hat{\alpha}_0 + \hat{\alpha}_1) + (\hat{\alpha}_4 + \hat{\alpha}_5)\overline{sprtread_{fem}} +$ $(\hat{\alpha}_6 + \hat{\alpha}_7)\overline{gmread_{fem}}$
Conditional	$\hat{\alpha}_0$	$\hat{\alpha}_0 + \hat{\alpha}_1$
Television		
Unconditional	$\hat{\beta}_0 + \hat{\beta}_4 \overline{rsview_{men}} + \hat{\beta}_6 \overline{ssview_{men}} +$ $\hat{\beta}_8 \overline{otview_{men}}$	$(\hat{\beta}_0 + \hat{\beta}_1) + (\hat{\beta}_4 + \hat{\beta}_5)\overline{rsview_{fem}} +$ $(\hat{\beta}_6 + \hat{\beta}_7)\overline{ssview_{fem}} + (\hat{\beta}_8 + \hat{\beta}_9)\overline{otview_{fem}}$
Conditional	$\hat{\beta}_0$	$\hat{\beta}_0 + \hat{\beta}_1$

The subscripts *men/fem* refer to men and women respectively and the overstrike denotes a sample average.[18]

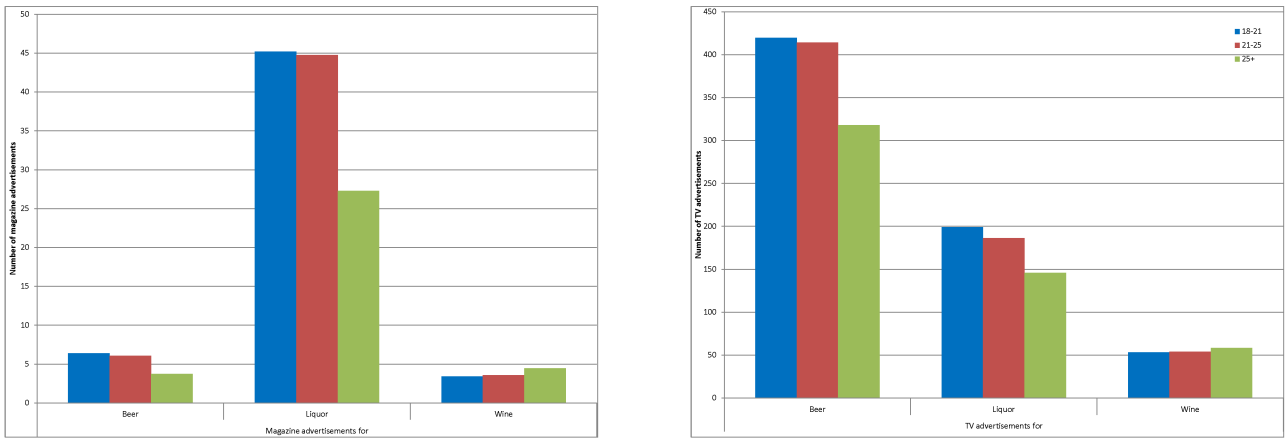
[18] To compute the "unconditional" exposure measures we could also have estimated models that consisted of only the first line of (5) and (6) plus the error terms.

4 Results

4.1 Advertising Exposure, by age and level of consumption

Figure 3 plots the number of magazine and television advertisements for beer, liquor, and wine seen by the average person ages 18-20, 21-24, and 25 and older.

Figure 3: Exposure to Beer, Liquor, and Wine Advertising in Magazines and on Television, by Age



Two common patterns appear for overall exposure to beer and liquor advertisements in magazines and on television. First, exposure hardly varies across groups of young people who can and cannot legally drink. Exposure is about the same for people ages 18-20 and people ages 21-24. Second, there is a pronounced and negative gradient between exposure and age. The average person ages 18-24 sees almost twice as many magazine liquor advertisements and roughly one-third more television liquor advertisements than do people ages 25 and older. Exposure to wine commercials is almost identical across people of all ages.

Figure 4: Relative Advertising Exposure of Drinkers versus Abstainers

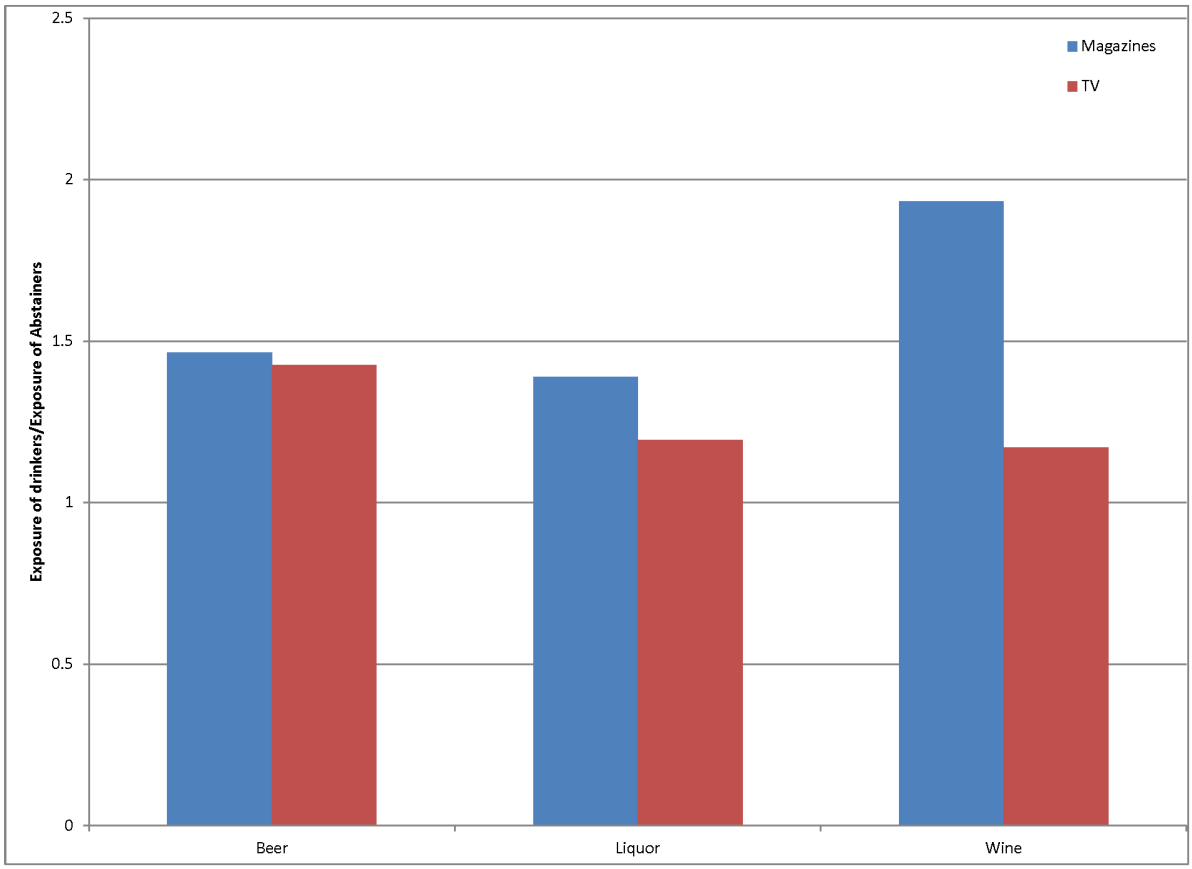


Figure 4 plots the relative exposure of people who drink versus those who do not.[19] We plot exposure to magazine and television advertising side-by-side. Two patterns are notable. First, all ratios exceed one - i.e. drinkers always see more type-specific alcohol advertising than nondrinkers. Second, relative exposure is higher for advertising in magazines than on television. The latter association is consistent with the hypothesis that particular types of magazines attract readers with more narrowly defined characteristics that firms can use to better target advertising. The pattern in relative exposure to wine advertising further supports this

[19]Note: a "non drinker" does not consume the advertised type of alcohol but may drink one of the other two types.

conjecture. Though we do not present it here, magazine advertising of wine appears more frequently in cooking magazines - with readership that firms know to be likely to be interested in wine. Relative to people who do not drink wine, drinkers see 93 percent more advertisements in magazines versus only 17 percent more television commercials.

Table 2 presents exposure of heavy drinkers versus nondrinkers by age. In all cases relative exposure is higher among heavy drinkers than it is among nondrinkers. For television advertising, there is no obvious pattern in relative exposure across age groups. For example, heavy beer drinkers of all ages see between 63 and 65 percent more television commercials than people who drank no beer. By contrast, advertising of liquor seems to most effectively reach people in the 21-24 year old age group - heavy liquor drinkers in that group see 84 percent more television liquor commercials than do similarly aged nondrinkers. It is also notable that underage drinkers (18-20) see substantially more advertising for the type of alcohol they (illegally) drink than do underage nondrinkers.

By contrast, relative exposure to magazine advertisements of all types of alcohol increases with age. Relative exposure of the heavy drinkers ages 18-20 versus those ages 25 and older was 90 versus 201 percent, 15 versus 42 percent, and 50 versus 109 percent for beer, liquor, and wine respectively. So as people age, firms are able to more effectively expose heavy drinkers of particular alcohol types to magazine alcohol advertising (relative to nondrinkers).

Table 2: Advertising Exposure and Percent Difference in Exposure of Heavy Drinkers vs Abstainers, by Age and Type of Advertising

	Age 18-20			Age 21-24			Age 25+		
Advertising of:	Abstainers	Heavy drinkers	% diff.	Abstainers	Heavy drinkers	% diff.	Abstainers	Heavy drinkers	% diff.
Beer									
TV	385.6	628.7	63.0%	339.0	560.1	65.2%	254.7	421.4	65.4%
Magazine	14.3	27.2	90.1%	11.4	25.9	127.7%	6.7	20.2	200.8%
N	8597	653		7549	1233		160326	9723	
Liquor									
TV	182.0	257.4	41.4%	176.5	324.1	83.7%	128.8	182.3	41.5%
Magazine	75.7	87.0	14.9%	65.6	91.2	39.1%	44.8	66.9	49.2%
N	8674	336		8177	519		166069	5113	
Wine									
TV	50.4	110.4	119.0%	50.9	78.1	53.4%	52.9	73.3	38.6%
Magazine	4.9	7.3	49.3%	4.6	7.1	52.9%	5.5	11.4	108.2%
N	10543	69		11290	62		172758	2360	

Notes: Exposure measured for people who drink the advertised alcohol. Difference in exposure as percent of advertising seen by abstainers.

4.2 Relative Exposure of Men and Women

Figures 5 and 6 respectively present the ratio of television and magazine advertising seen by men relative to advertising seen by women. The bars on the left present unadjusted relative exposure (see footnote 17). The bars on the right present relative exposure that is adjusted for readership/viewing of particular magazines/television programs.

Figure 5: Ratio of Male/Female Exposure to TV Advertising, by Alcohol Type

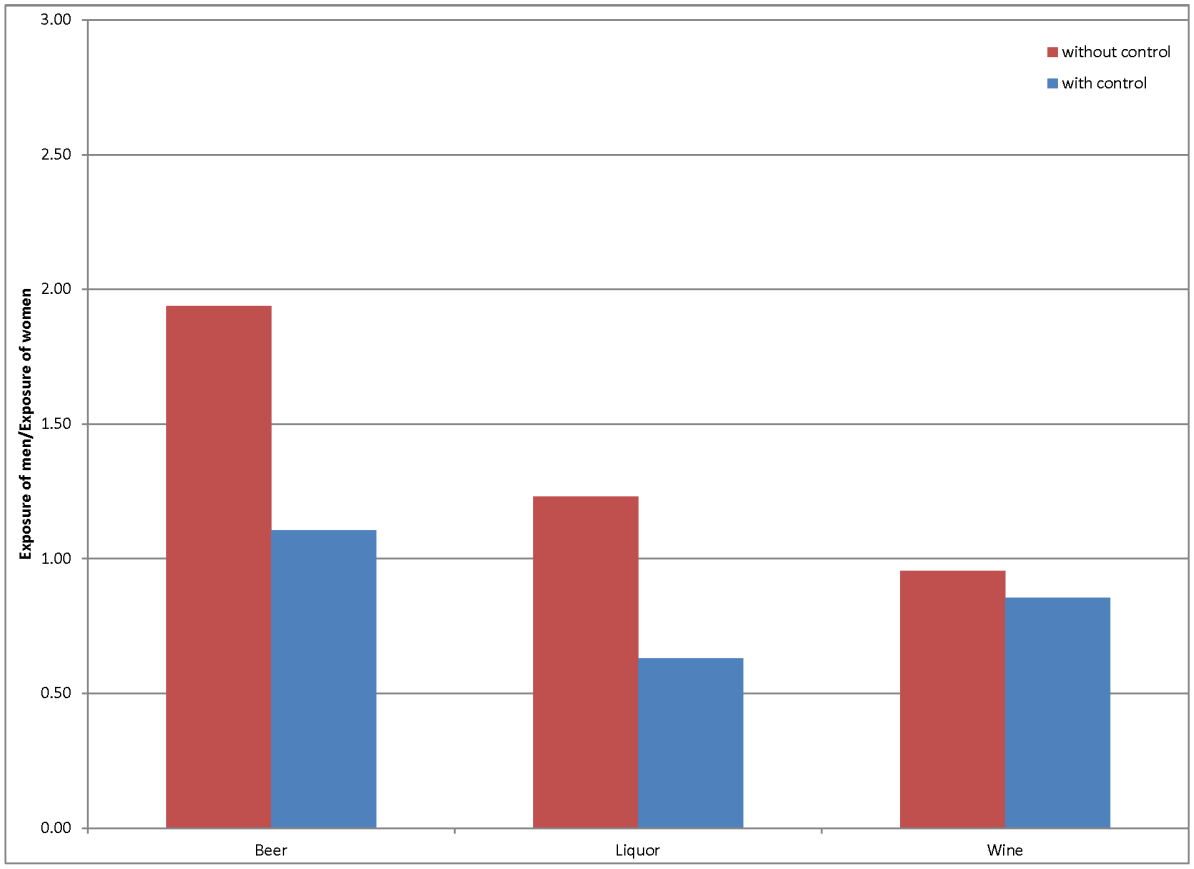


Figure 5 shows that sex differences in media consumption explains much of the sex difference in television advertising exposure. Unadjusted for media consumption differences, men see almost twice as many television beer commercials 1.2 times more television liquor commercials than do women. Accounting for sex difference in viewing of sports, car racing, and gambling reduces male/female ratio of exposure to television beer commercials to close to parity (a ratio of 1.1) and the relative exposure to television liquor commercials to 0.6. Interestingly, wine advertising does not seem targeted by sex. The unadjusted and adjusted relative exposure mea-

sures are 95 and 85 percent respectively.

Figure 6: Ratio of Male/Female Exposure to Magazine Advertising, by Alcohol Type

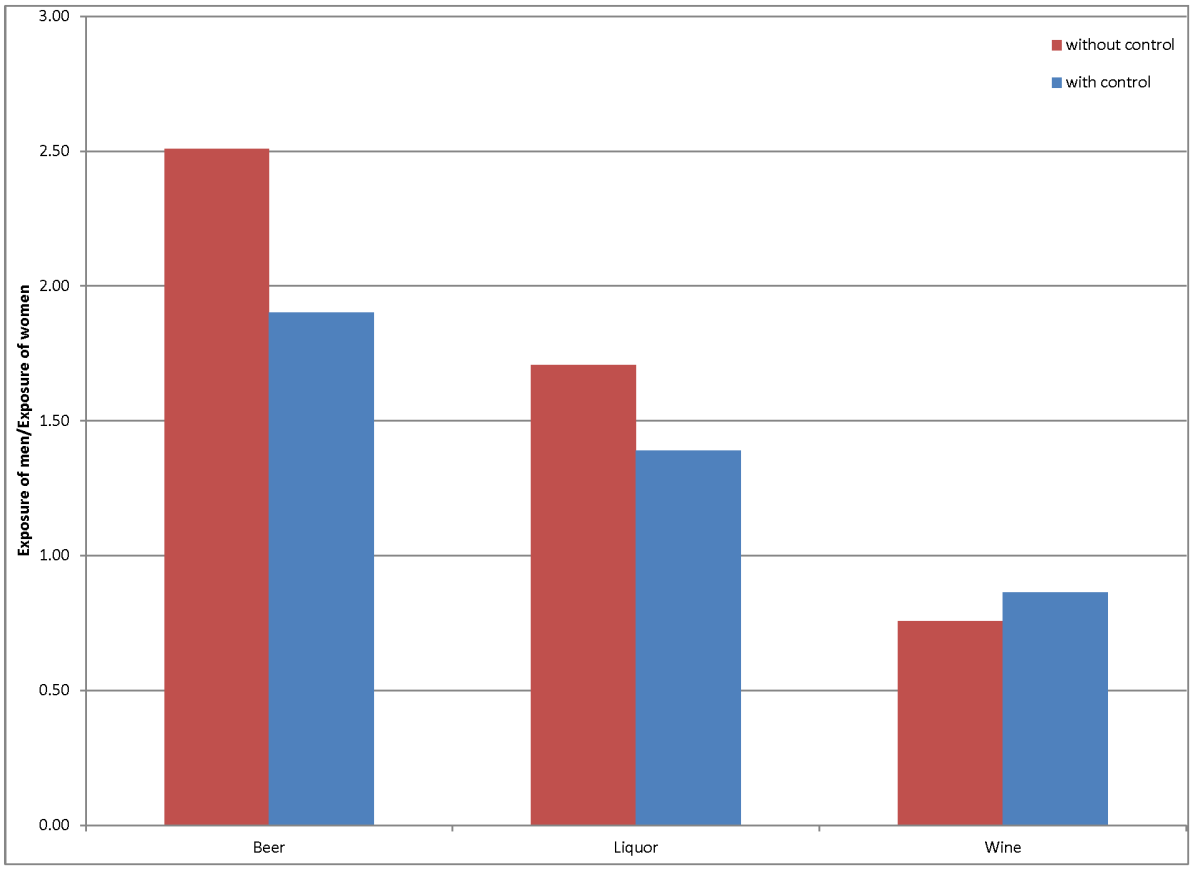


Figure 6 shows that sex differences in magazine alcohol advertising exposure remain even after one adjusts for sex differences in reading of sports and adult entertainment magazines. Unadjusted for sex differences in magazine reading, men see 2.5 and 1.7 times more beer and liquor advertisements respectively than do women. Substantial differences remain even when one adjusts for sex differences in types of magazines read. The adjusted relative exposure to beer and liquor magazine alcohol advertising is 1.9 and 1.4 respectively. As with television,

there is less evidence that wine advertising is targeted by sex. Unadjusted and adjusted measures of relative exposure to magazine advertising of wine are 0.8 and 0.9 respectively.

4.3 Trends in Alcohol Advertising Exposure 1996-2009

Figure 7 plots trends in average exposure to television and magazine advertising of beer, liquor, and wine from 1996 to 2009. The left-hand scale measures average yearly exposure to television advertising. The right-hand scale measures exposure to magazine advertising.

The average consumer in 2009 sees substantially more television commercials for beer and liquor than the average consumer in 1996. In 1996 the average television viewer saw about 200 beer commercials. That exposure more than doubled to 560 beer commercials in 2004. In 2009, the average viewer was still seeing more than 300 commercials per year, 50 percent more than the average viewer saw in 1996. Over the same time period, average annual exposure to magazine advertising of beer fell from an average of 7 advertisements in 1996 to a low of 2 in 1999, then steadily increased to 5 advertisements in 2009.

Figure 7: Exposure to Television and Magazine Alcohol Advertising 1996-2009, by Alcohol Type

Figure 7 also documents the unraveling of the voluntary ban on television advertising of liquor established in 1948.[20] Although the industry abandoned that voluntary agreement in 1996, most firms did not advertise liquor on television until early 1999. In 1999 the average consumer saw almost no television advertisements for liquor. By 2009 the average viewer saw almost 350 commercials per year. It is also clear that, the distilled spirits industry shifted expenditures from print to television advertising. Except for a brief increase in 2002, exposure

[20]The industry voluntarily banned radio advertising of liquor in 1936.

to liquor advertising in magazines steadily fell from 60 advertisements in 1996 to 15 advertisements in 2009.[21]

The timing of the decline in liquor advertising in magazines and increase in advertising on television suggests what might have led firms to advertise liquor on television in 1999. Simply put, people stopped reading magazines. Between 1996 and 1999 the number of magazines read by the average consumer fell from 9 to 5 and has stayed low ever since.[22] And even among those who do read, reading intensity has fallen. Among people who read at least one issue of at least one magazine, the number of issues read by the average magazine reader fell from 32 issues in 1996 to 17 issues in 1999. In 2009, the average magazine reader read only 21 magazine issues. During the period of declining readership from 1996 to 1999, liquor firms were actually spending more total dollars to advertise in magazines.[23] But as Figure 7 shows, the average consumer actually saw fewer magazine advertisements in each year.

These facts suggest that liquor firms began to advertise on television because they could no longer reach consumers through magazine advertisements. The behavioral implications of the dramatic increase in exposure to television advertising of liquor have not yet been established.

5 Discussion and Conclusion

Using unique data, we develop measures of exposure to advertising that vary across individuals, time, and geographic space. We use the measures to describe patterns in exposure to alcohol advertising of various types, by people of particular ages (18-20, 21-24, and 25 and older), sex, and by the amount of alcohol of each type people consumed. We also use the exposure data to describe trends in the advertising individuals potentially saw over a 14 year pe-

[21] We present but do not discuss the trends in wine advertising except to note that, although television advertising of wine did rise up to 2002, its overall trend is flat. Further, overall it is less common. The average consumer sees about one-tenth as many television commercials for wine as he sees television commercials for beer and liquor.

[22] Every year from 1999 to 2009 the average consumer read only 5 magazines.

[23] We note again that this pattern raises concerns about using advertising expenditure data to proxy for exposure.

riod that spanned years when the liquor industry abandoned a long-standing, voluntary ban on television advertising.

Our results demonstrate that people who drink more, see more advertising overall and more advertising for the particular type of alcohol they drink. There are two plausible causes of this strong correlation between drinking and advertising exposure, though these two explanations are not necessarily mutually exclusive or exhaustive. First, firms successfully target advertising at people who drink (a specific type of) alcohol. Alternatively, exposure to advertising affects whether, how much, and what type of alcohol people drink. However, the advertising strategies of alcohol firms argue for the former explanation rather than the latter. Alcohol advertising is strongly concentrated on particular media, an advertising strategy that seems to indicate the targeting of particular audiences. If alcohol advertising could actually induce people to drink (who were otherwise not so inclined), one would expect a profit-maximizing firm to advertise in a wider variety of media. This logic does not imply that advertising does not have an effect on the margin. But it does suggest that advertising largely affects the market shares of brands within an alcohol type and advertising's effect is likely to be muted outside of groups who are not inclined to drink.

Our results suggest that firms target particular demographic groups - showing that many of the sex differences in exposure to beer advertising can be explained by sex differences in the viewing of sports programs and in readership of a very small number of magazines. We also showed evidence in the trend data that suggests a possible factor to explain why liquor firms abandoned their voluntary ban on television advertising. Those data suggest that they began to advertise liquor on television because people are reading fewer magazines.

Overall our results informs research on the effects of exposure to alcohol advertising. The results establish basic patterns in estimated exposure based on reported media consumption as opposed to expenditures. The results provide strong cautionary evidence that researchers need to control for particular types of media that people differentially consume, and confirm the previously noted evidence of regime shifts in long run patterns of advertising of liquor. Using data on temporal patterns in advertising of spirits in magazines and on television and trends

in reading of magazines, we show that firms began to advertise spirits on television at about the same time that people began to read fewer magazines. But whether that relationship is causal has not yet been established and remains for future work.

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