DO ADVERTISING BANS WORK?
AN INTERNATIONAL COMPARISON

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Abstract

Advertising bans can increase or decrease alcohol consumption due to effects on beverage choice, price competition, and substitution by producers toward non-banned media. We study bans on broadcast advertising in seventeen OECD countries for the years 1977-95, in relation to per capita alcohol consumption, liver cirrhosis mortality, and motor vehicle fatalities. The results indicate that advertising bans in OECD countries have not decreased alcohol consumption or alcohol abuse.

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1. INTRODUCTION

A central issue for alcohol control policy is the role and importance of advertising. Although the debate on alcohol advertising has been ongoing for many years, it gained public prominence in the mid-1980s. Several health-related organizations, including the World Health Organization, made advertising control a key part of their anti-alcohol campaigns (WHO 1988). Television advertising of alcohol is especially controversial due to its possible adverse impacts on youth and children, and in most Western nations, television advertising of alcoholic beverages is regulated in some manner. These controls range from voluntary codes and content guidelines to outright bans on broadcast advertising of alcohol. Until quite recently, the trend has been toward stricter rather than more lenient controls.[1]

Two divergent views are held regarding the effects of advertising on alcohol consumption and abuse. Social learning theories contend that advertising creates positive images of alcohol consumption and thus increases the demand for alcohol. Advertising also may increase competition and reduce prices. Thus, advertising bans are predicted to lower alcohol consumption. On the other hand, advertising may primarily affect brand and beverage shares, with little or no effect on total consumption. Indeed, advertising may increase product differentiation and/or signal product quality, resulting in higher equilibrium prices and lower consumption. If this is the case, advertising bans could increase consumption. Finally, existing bans on broadcast advertising may be ineffective simply because it is easy for advertisers to substitute toward other non-banned media such as magazines and newspapers.

Given these conflicting views, the purpose of this study is to investigate empirically the effects of broadcast advertising bans on alcohol consumption and abuse. Our data set is an international panel of seventeen OECD countries for the period 1977 to 1995. We estimate regression models for per capita consumption of alcohol with the following results: Alcohol consumption is positively affected by per capita income, tourism, and a measure of drinking sentiment, and negatively affected by the real price of alcohol and the percent elderly population. The unemployment rate is statistically insignificant. The advertising ban variables are statistically significant in some specifications, but not in others. When the ban variables are

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[1] Following the repeal of Prohibition in 1936, U.S. producers of distilled spirits adopted a voluntary Code of Good Practice that barred radio advertising. Congressional hearings were held as early as 1939 to prohibit radio advertising of alcoholic beverages, including beer and wine. During the period 1947-58, numerous hearings were held to consider bans on television advertising of alcohol (U.S. Congress, Senate 1952). See also Davies and Walsh (1983) and Waterson (1989) for assessments of European and U.K. controls on advertising of alcohol.

significant, the regression coefficient signs are positive, which indicates that advertising bans are associated with increased consumption of alcohol.

We also estimate log-linear and logit models of cirrhosis mortality and motor vehicle fatalities. For cirrhosis mortality, the estimates indicate a positive relationship with income and drinking sentiment, and a negative relationship with alcohol price, elderly population, and the unemployment rate. The advertising ban variables are never statistically significant. Motor vehicle fatalities are positively affected by income and youth population, and negatively affected by elderly population and the unemployment rate. The advertising ban variables, when they have significant coefficients, have positive signs. Overall, the empirical evidence indicates a very weak link between advertising bans and alcohol consumption or abuse. When the effect is statistically significant, advertising bans are associated with increased consumption and abuse.

2. THEORETICAL AND EMPIRICAL BACKGROUND

A number of theoretical models of advertising have been proposed, with sometimes conflicting implications. Social learning theory argues that advertising contributes to the perception of drinking as a legitimate and normal activity in society (Bandura 1986; Grube 1995). This theory stresses the adverse effects of advertising on *drinking patterns*, including the decision to begin drinking alcohol, underage and binge drinking, and other forms of alcohol abuse.[2] In this context, advertising reinforces favorable views of drinking by providing positive role models (athletes), lifestyle images and themes (wealth, social approval, friendship), pleasure (relaxation, humor), and so forth. Given the repetitive nature of advertising, "... the daily flow of images and messages cultivates stable patterns of thinking and action" (Gerbner 1995, p. 22). Further, alcohol advertisements and other media images of alcohol are rarely negative, which may lead to the expectation that excessive drinking has few adverse consequences. Social learning theorists posit that this expectation contributes to alcohol abuse.[3]

Economic models of advertising have conflicting predictions for the effects of

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[2] According to Single and Leino (1998, p. 7), *drinking patterns* include the "temporal variations in drinking, the number and characteristics of heavy drinking occasions, the settings where drinking takes place, the activities associated with drinking, the personal characteristics of the drinkers and their drinking confederates, the types of beverages consumed, and the drinking norms and behaviors often referred to as drinking cultures."

[3] However, the "weak" theory of advertising predicts that advertising primarily reinforces existing behavior patterns, and thus has little effect on total consumption (Hoek 1999).

advertising bans. Advertising may increase competition and result in lower prices, which in turn results in increased consumption. But advertising also may increase product differentiation, reduce price elasticities of demand, and shift consumer purchases toward higher-priced brands and beverages (Ambler 1996). Motta (1997) developed a general theoretical model of an advertising ban under monopoly and oligopoly conditions, where advertising can be either informative or persuasive. His basic point is that an advertising ban could either increase or decrease total consumption because advertising affects both the level of demand for given prices, and the level of prices that sellers find optimal, which in turn affects quantity demanded.[4] Partial advertising bans, such as the broadcast bans examined here, may have little or no effect on total advertising and product demand if producers can easily substitute toward non-banned media or employ other marketing methods.[5] Further, a ban of one media can stimulate innovations within the set of non-banned media. For example, Harrison and Godfrey (1989) discuss the difficulty of alcohol advertising controls in Europe given new media such as broadband cable, videotex, and satellite television.

There is a large empirical literature related to advertising. We focus here primarily on studies involving alcohol. A number of empirical studies have tested alcohol expectancy models for vulnerable groups, especially children and adolescents. Grube (1993, p. 65) concludes that these studies provide evidence that television advertising causes youth to be more favorably disposed toward drinking. However, there is considerable evidence that advertising primarily affects brand and beverage shares, with little or no impact on total alcohol consumption. Empirical evidence consistent with this view has been obtained in studies of advertising expenditures for the U.K. and U.S., including several recent studies using quarterly data by media and modern time-series econometrics (Duffy 1995; Coulson, Moran, and Nelson 1999; Nelson 1999). Calfee and Scheraga (1994) conducted a study of the alcoholic beverage markets for France, Germany, Netherlands, U.K., and Sweden. They focused on advertising expenditures in the first four countries during 1971-94. Sweden bans all print and broadcast advertising, but the

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[4] In a related model, Milgrom and Roberts (1986) show that advertising may signal (high) product quality. Thus, an advertising ban may reduce average quality and prices.

[5] For tobacco advertising bans, Saffer and Chaloupka (2000, pp. 1121-22) argue that "as the number of media banned increases, there are less options for substitution ...[so] additional advertising expenditures in the non-banned media may no longer be able to compensate or may be too costly to justify the gains ...[thus] a limited set of bans may have little or not effect ...[on] advertising expenditures and consumption."

authors concluded that consumption trends in the five countries did not differ appreciably.

A number of studies for the U.S. and Canada examine state-level partial bans of advertising. Hoadley et al. (1984), Ornstein and Hanssens (1985), and Nelson (2000) use state panel data to examine the effects of bans of billboard advertising of distilled spirits. In all cases, consumption of distilled spirits is higher in those states that ban billboard advertising. Nelson (2000) also tests for substitution among beverages, and finds that total consumption of alcohol was increased in states with bans prior to 1989, and unaffected thereafter. Smart and Cutler (1976) studied the effects of a one-year ban of radio, TV, and outdoor advertising of alcoholic beverages in British Columbia. Using annual and monthly Ontario sales as a control, they concluded that the British Columbia ban had no effect on sales of beer, wine, or spirits. Clearly, billboard bans and one-year bans are partial and incomplete. However, Makowsky and Whitehead (1991) examined the termination in Saskatchewan of a 58-year ban on alcohol advertising that was lifted in 1983. The change in legislation allowed advertising of beer and wine on radio and TV, and advertising of beer, wine and spirits in newspapers and magazines. Using Box-Jenkins time-series methods and monthly data for 1981-87, they found that sales of beer increased and sales of spirits decreased following the change in legislation. There was no impact on wine or total alcohol sales from the introduction of alcohol advertising.

An OECD panel covering 1970-1983 was previously studied by Saffer (1991), who concluded that advertising bans reduced consumption and abuse. The data were extended and re-analyzed by Young (1993), who found no evidence that bans reduced consumption. The present study seeks to improve on this work in several ways. First, our data set covers a more recent period for which the quality of the data is substantially improved. Second, the data set includes additional control variables for demographic composition and unemployment, which should yield better estimates of the effects of bans on consumption and abuse. Third, trends in alcohol consumption in the recent period are quite different as per capita consumption has stabilized or declined in most countries since the early 1980s (Smart 1989, 1998). For example, per capita consumption in Canada and the U.S. peaked in 1980 and 1981, respectively, and then fell by 29% and 21% by 1995. Fourth, improved econometric specifications are presented for the probability rates or group proportions for cirrhosis deaths and highway fatalities.

3. EMPIRICAL MODELS AND DATA SOURCES

The data set employed in this study is a time series of cross-sections for seventeen OECD countries for the years 1977 through 1995.[6] Table 1 contains the acronyms, definitions, and summary statistics for all variables used in the current study. The countries covered by Table 1 range from very small countries with populations less than 0.5 million (Luxembourg) to very large countries with populations exceeding 260 million (United States). The average population in 1995 was 32 million, with a standard deviation of 62 million. In this context, Luxembourg and the U.S. might be outliers, and some regression results are reported with these countries excluded from the sample. Deleting these two countries reduces the 1995 population mean to 22 million, with a standard deviation of 21 million.

Dependent Variables. Three dependent variables are examined in this study. The first is per capita consumption of pure alcohol (***ALCOHOL***), expressed in liters per capita.[7] Because the dependent variable is an average, the variance of the disturbance term will be less for larger countries, even if the underlying individual data are homoscedastic. Hence, generalized least-squares is preferred for efficient estimation, which weights the larger countries more. A log-linear model is used for total consumption, and all continuous variables are transformed by taking natural logarithms, which also reduces the importance of extreme values in the data.

In 1995, per capita consumption was highest in Luxembourg (12.57 liters) and France (11.96), and lowest in Norway (3.95) and Sweden (5.39). However, in some countries, official estimates of alcohol consumption are subject to systematic measurement errors due to legal and illegal home production, illegal and duty-free imports, illegal factory production, consumption of non-beverage alcohol, and cross-border purchases. This problem is especially acute for some Scandinavian countries due to high tax rates and other controls on purchase and consumption of

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[6] Some of the important independent variables used in the present study are not available prior to 1977 (e.g., tourism), or were poorly measured. For these reasons, we have not used the available consumption data for 1970-76, or earlier.

[7] The data source is the *International Survey of Alcoholic Beverage Taxation and Control Policies* (9th edn., Ottawa, 1997), published by the Brewers Association of Canada. The latest edition of the *Survey* was used, which updates previous estimates. Using standard conversion methods, the *Survey* estimates, for each country and year, the per capita level of pure alcohol consumed of each beverage (beer, wine, spirits, cider). The aggregate sum, or per capita total alcohol consumption, is the dependent variable. Data on total population of each country were obtained from the OECD, *National Accounts--Main Aggregates*, Volume I, Table 1 (Paris, 1998).

alcoholic beverages. Recent studies estimate that at least 20-25 percent of domestic alcohol consumption in Finland, Norway, and Sweden is systematically unreported (Holder et al. 1998, p. 133; Brewers Association 1997, pp. 126, 344, 422). Because these countries also have strict controls for alcohol advertising and operate state monopolies for production and retailing, interpretation of empirical results for advertising bans requires special care. These issues were largely ignored by Saffer (1991). Underreporting problems also exist in the data for Austria, Belgium, Canada, and Italy. In Denmark and Luxembourg, cross-border purchases cause overreporting of domestic consumption. Alcohol purchased by tourists is a problem in several countries, including Portugal and Spain, and we include a control variable for tourism activity.

The other dependent variables measure alcohol abuse. The data source for cirrhosis mortality (***CIRRHOSIS***) and motor vehicle fatality rates (***HIGHWAY***) is the United Nations, *Demographic Yearbook 1996* (48th edn., New York, 1998). Each variable is a group proportion; that is, each rate consists of a count (n_{it}) of the number of people in the i-th country in year t who die of a specific cause divided by the total resident population of the country. Hence, an observation is [N_{it}, p_{it}, $\mathbf{X}_{it}$], where N is the population of country, p = n/N is the group proportion, and **X** is a vector of explanatory variables (Greene 1997, p. 894). Table 1 reports scaled values for these outcomes.[8] There are several possible econometric specifications for analysis of grouped data on proportions, including the linear probability model, log-linear probability model, and the logit model (Maddala 1983). Each of these models must be estimated by weighted least-squares, where the weights are population based. Previous studies used the logit model exclusively, but estimates are reported here for the logit and log-linear probability models.

Explanatory Variables. From conventional economic models, alcohol demand is expected to be positively related to real income and tourism activity, and negatively related to real price and elderly populations ("age"). The market expansion effects of broadcast advertising bans are uncertain for the reasons discussed above. Because an international data set is employed, a measure of "drinking sentiment" is specified, which captures cultural differences among diverse countries. The expected sign on the sentiment variable is positive. The

[8] In 1994, the cirrhosis mortality rate per 100,000 population was highest in Austria (26.1), Italy (26.2), and Portugal (22.7), and lowest in Ireland (3.0) and the Netherlands (4.7). The highway fatality rate was highest in Portugal (22.3), and lowest in the United Kingdom (6.4) and Sweden (5.7). About 60-85 percent of cirrhosis deaths and 20-50 percent of highway fatalities are alcohol related (Davies and Walsh 1983, p. 26; Edwards 1994, p. 17).

unemployment rate also is included as a regressor. Social learning models suggest that unemployment increases stress, and thereby causes higher alcohol consumption. However, unemployment also affects the distribution of incomes (given the mean), so the expected sign is uncertain. Age and unemployment variables were omitted by Saffer (1991).

Liver cirrhosis and highway accidents reflect underlying health production functions and derived demands for latent health states.[10] The direct effects of age on deaths should be positive for cirrhosis mortality and negative for highway deaths. Deaths due to liver cirrhosis and highway accidents are expected to be positively related to mean alcohol consumption and negatively related to real mean income, since personal health is a normal good. Following past studies, we substitute for alcohol consumption to obtain reduced-form expressions for death rates, which depend on the underlying alcohol demand variables. Hence, the net effect of income is uncertain in the reduced forms, while alcohol price will have a negative effect. The net effect of advertising bans on death rates should be negative following the social learning model; that is, bans reduce alcohol consumption and favorably alter drinking patterns. On economic grounds, a ban might be taken as an incentive to engage in healthy activities, so the direct effect on death rates is negative. However, since that the economic effect of a ban on consumption can be positive or negative (or zero), the net effects on abuse are uncertain. Given that age is negatively related to alcohol demand, the net effect in the reduced forms is uncertain for cirrhosis mortality and negative for highway fatalities. Sentiment should have positive effects in the reduced forms for both direct and indirect reasons. The highway fatality regressions also include a youth demographic variable, which should have a positive sign. Tourism is omitted from the cirrhosis mortality and highway fatality regressions since the death rates pertain to resident citizens. The net effects of unemployment are uncertain.

Variable Specifications. The empirical specification of the explanatory variables follows past studies, except that several new variables have been added. Note that the dependent variables are obtained by dividing by the total population of each country, which ignores the distribution of the population. As a demographic correction, one of the explanatory variables is

[10] The empirical results for liver cirrhosis could be affected by lags between the reduction in alcohol consumption and the resulting effect on mortality. However, using data for 22 European countries and four regions, Corrao et al. (1997) show that the latency period is only 0-2 years for most developed nations.

the percent of the population that is 65 years or older (***AGE65***). For several reasons, this is an improvement over past studies as it corrects for the "graying" populations of developed countries, the lags associated with liver cirrhosis mortality, and the driving habits of the elderly. The data source is Eurostat, *Demographic Statistics* (Luxembourg).

Real income and price estimates were obtained from the OECD's national accounts publications. For ***INCOME***, estimates of each country's national income in current dollars were obtained from Volume I of the *National Accounts*. These data were divided first by total population and then by the implicit price deflator for GDP (1990 = 100) from Volume I, Table 31. The estimates were converted to 1990 U.S. dollars by dividing by the purchasing power parity (PPP) index for 1990 obtained from Volume I, Table 3. Price estimates were obtained using the OECD's diskette version of its *National Accounts--Detailed Tables*, Volume II (Paris, 1998), which contains data for more years than the printed version. However, some of the relevant price data are omitted, and some data were linked to the price estimates used by Young (1993). For ***PRICE***, estimates were obtained from the diskette for expenditures in current dollars on alcoholic beverages in each country. These estimates were divided by each country's estimate of total alcohol consumption (in liters), and then divided by the GDP price deflator (1990 = 100) to obtain the real price of a liter of pure alcohol in each country's currency. Finally, real alcohol prices were divided by the PPP index for 1990 to obtain the price of alcohol in 1990 U.S. dollars. The price-level estimates are subject to measurement error due to changing beverage proportions and inaccuracies in the expenditure amounts (Young 1993, p. 217). ***PRICE2*** was obtained by dividing ***PRICE*** by its 1990 value to obtain an index of relative price changes. This removes some of the systematic errors in the price level estimates. Empirical results are reported for ***PRICE*** and ***PRICE2*** as alternative specifications of the price variable.

The remaining explanatory variables are controls for different economic and social conditions that exist in an international data set.[10] The tendency for countries to have a dominant beverage has been related to per capita consumption, drinking patterns, alcohol abuse, taxation rates, and average prices (Smart 1989, 1998). In particular, the wine-drinking countries exhibit

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[10] Data sources include various issues and editions of Eurostat, *Demographic Statistics* (Luxembourg); Euromonitor, *International Marketing Data and Statistics* (London); OECD, *OECD in Figures* (Paris); OECD, *Labour Force Statistics* (Paris); OECD, *Tourism in OECD Member Countries* (Paris); World Tourism Organization, *Yearbook of Tourism Statistics* (Madrid); OECD, *Health Data 98* (Paris); and Stewart (1993).

higher consumption levels. Important cultural differences are reflected in these outcomes, such as the tendency to view drinking as a part of the daily schedule, which results in continuous, rather than episodic, use of alcohol. In order to control for cultural differences, a measure of drinking sentiment is defined as the percent of total consumption in the form of wine (***PCTWINE***). In 1995, this variable had an average value of 60 percent in France, Italy, Luxembourg, Portugal, and Spain, compared to only 20 percent in the other 12 countries in the sample. Also, because alcohol data reflect purchases by foreign visitors, it is necessary to control for the per capita level of tourism activity in each country (***TOURISM***). Mean per capita levels of tourism are highest in Austria and Luxembourg, and lowest in Australia, Finland, and Sweden. The highway fatality regressions also include a variable for the percent of population between ages 15 and 24 (***AGE1524***). It is well known that youth have higher death rates from motor vehicle accidents due to different risk-taking propensities, and control of youth drinking and driving is an important part of alcohol policy in many countries. The youth variable was insignificant in the demand equation and is omitted. Lastly, the unemployment rate (***UNRATE***) is a regressor for each of the dependent variables. Unemployment rates were obtained from Stewart (1993) and OECD, *Health Data 98* (Paris). Mean unemployment rates during 1977-95 were highest in Ireland and Spain.

4. BROADCAST ADVERTISING BANS

Two binary variables are defined for broadcast advertising bans: ***S-BAN*** has a value of one if the country bans broadcast advertising of distilled spirits; and ***A-BAN*** has a value of one if the ban covers broadcast advertising of all alcoholic beverages, except light beer. Hence, three explicit policy outcomes or categories are defined in the data set: (1) no ban on broadcast advertising of alcoholic beverages (ignoring content codes and time-of-day restrictions); (2) a ban on broadcast advertising of distilled spirits; and (3) a ban on broadcast advertising of all alcoholic beverages, except light beer. In 1995, there were five countries in the first category--Australia, Italy, Luxembourg, Netherlands, and Portugal. In the second category, there were seven countries--Austria, Belgium, Canada, Ireland, Spain, United Kingdom, and United States. In the third category, there were five countries--Denmark, Finland, France, Norway, and Sweden. The long-standing nature of the bans in most countries suggests that the ban variables will not be contemporaneously correlated with the error term, and are therefore exogenous in the estimated relationships. Only three countries changed categories during the study period. In 1981, Spain changed from the no ban category to the spirits ban category (Saffer 1991, p. 72). Prior to 1991, Belgium had no restrictions on broadcast advertising, and the new ban has been interpreted as an attempt to protect the domestic beer industry (Brewers Association 1997, p. 58).[11] In France, there was a longstanding ban on broadcast advertising of non-fruit distilled spirits, which was extended to all beverages in 1993 following passage of the *Loi Évin*. While health concerns played a role in this change (Brewers Association 1997, p. 158), the ban also protects the domestic wine industry from beer advertising (Calfee 1997, p. 78). Given the recent changes, we experimented with leaving Belgium and France in categories one and two, respectively, in order to reduce measurement errors due to mis-categorization.

It is important to recognize that these variables, especially ***A-BAN***, may capture effects of other alcohol control policies, including government ownership of alcohol production and retailing (Finland, Norway, Sweden); significant restrictions on print advertising (Finland, France, Norway, Sweden); different legal drinking ages;[12] limits on blood alcohol content (BAC); and drunk driving penalties.[13] Further, the size or location of some countries means that they are affected by transborder television broadcasts. There also are important differences in tax rates on alcoholic beverages, which should be reflected in price differences. As discussed above, tax rates can have important effects on official figures for alcohol consumption, leading to underreporting in some countries and overreporting in others. For all of these reasons, interpretation of the dummy variables for advertising bans must be done with care.

Table 2 shows the mean values of the dependent variables organized by advertising category for the first and last years in the sample, which can be used to illustrate common trends

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[11] Belgium's broadcast ban applies to all beverages containing more than 10 percent alcohol by volume, so both wines and spirits are affected. However, the ban is enforced on only Francophon television, and not on Flemish television (Brewers Association 1997, pp. 57-58).

[12] In 1995, the legal age for beer consumption was 16 years in five countries (Austria, Belgium, France, Italy, Spain) and 18 years in the other countries, except for Portugal (no age limit) and the United States (21 years). Finland, Norway, and Sweden set higher legal ages for spirits (Brewers Association 1997).

[13] The Nordic countries are of special concern because they ban all forms of alcohol advertising, except for light beer; operate state monopolies for production and retailing; and have high tax rates on alcoholic beverages. European integration is forcing changes in these control policies, including tax harmonization and cessation of production monopolies; see Holder et al. (1998) for discussion.

in the data. In line with the theoretical discussion, the mean growth rates also are reported for prices during two time intervals. In Table 2, Belgium is assigned to (only) category one and France to category two. Mean per capita consumption of pure alcohol declined by 13-16 percent in category one and two, but rose slightly in category three countries, which ban all broadcast advertising. Mean cirrhosis mortality and highway death rates declined by 20-40 percent in the first two categories. For category three, the cirrhosis mortality rate rose slightly, but the highway fatality rate declined by 44 percent. This outcome is subject to interpretation, especially in light of the apparent trend for consumption. It is well known that the Scandinavian countries have strict laws on drunk driving, including lower permitted BAC levels (e.g., 0.02 - 0.05 percent), suspended licenses, and prison sentences for high BAC levels (e.g., BAC > 0.10 - 0.15 percent). These efforts at preventing highway fatalities appear to be successful, but this outcome may have little to do with the use of advertising bans as an alcohol control policy. Lastly, while the samples are small, prices increased less in the category three countries.

5. EMPIRICAL RESULTS: ALCOHOL CONSUMPTION

This section estimates demand functions for per capita consumption of pure alcohol. The dependent variable is the natural logarithm of per capita consumption for each country and year, regressed on explanatory variables for per capita real income, real price of alcohol, per capita tourism, percent elderly, beverage sentiment, unemployment rate, and two advertising ban dummy variables. Dummy variables for each year in the sample are included in all regressions. Some regressions also include fixed-effect dummies for the 17 countries. Hence, the general empirical model for country i in year t can be written as

$$\textbf{ALCOHOL}_{\textbf{it}} = \beta_0 + \boldsymbol{\beta}\textbf{X}_{\textbf{it}} + \sigma_t + \sigma_c + e_{it} \qquad \textbf{(1)}$$

where **X** is a vector that includes all causal variables, $\boldsymbol{\beta}$ is the coefficient vector, and e_{it} is the error term. Time fixed-effects, σ_t, capture the influence of common trends across countries, such as healthier life styles. Country fixed-effects, σ_c, account for omitted unmeasurable factors behind differences in alcohol consumption. However, when both time- and country-fixed effects are included, the estimates are based solely on within-country time-series variation. Because there is very little temporal variation in the advertising bans, we cannot estimate country fixed-effects with the ban variables included. All regressions are estimated by weighted least-squares, where the weights are the square roots of the total population in each country for each year. Some of the regressions also correct for country-specific serial correlation. These regressions provide a final check on the robustness of the advertising results.

Table 3 displays the regression results for alcohol consumption. In regression (1), all non-advertising variables have the expected signs and are statistically significant (t-statistic > 2), except price and the unemployment rate. Dropping ***UNRATE*** from the model did alter the results in any important way. Regression (2) uses the index ***PRICE2*** as the measure of real price. The coefficient for ***PRICE2*** is significantly negative, and it provides a more sensible estimate of the alcohol price elasticity (Nelson 1999).[14] The other empirical results are not affected very much by this change. In regressions (1) and (2), ***A-BAN*** is positive but not statistically significant, while ***S-BAN*** is significantly positive. These results are consistent with the economic model of bans and inconsistent with the social learning model. However, based on the theoretical discussion, it would seem that aggregate demand should be affected more when all advertising is banned, rather than just advertising of distilled spirits. The results for ***A-BAN*** may reflect other restrictive alcohol control policies, which reduce consumption. These other policies should bias ***A-BAN*** toward a significant negative coefficient, which we do not find.

As tests of the robustness of these results, several alternative specifications were tried. Examination of the residuals indicated that Norway was an outlier, and we noted earlier that consumption in this country might be underreported. Regression (3) displays the results deleting Norway, and both ***A-BAN*** and ***S-BAN*** are significantly positive. Further, Luxembourg and the United States were deleted, individually and together, but this did not change the results compared to regression (2). Next, we experimented with leaving Belgium and France in categories one and two, respectively. The results with this constraint are shown in regression (4), where ***A-BAN*** is insignificantly positive. Including Norway in the sample and imposing this

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[14] Hausman's specification test was used to examine possible endogeneity of both price variables in regressions (1) and (2), where the instruments in the first-stage regressions were the real price of tobacco and the openness of the economy (exports plus imports divided by GDP). The test did not reject the null hypothesis of price exogeneity. We also estimated separate demand functions for beer, wine, and spirits. ***S-BAN*** was significantly positive in all cases, and ***A-BAN*** was insignificant for beer and wine and significantly positive for spirits.

constraint yielded an insignificantly negative coefficient for ***A-BAN***. Hence, the results fail to provide a consistent negative relationship between advertising bans and alcohol consumption. The results indicate that bans on spirits advertising do not decrease alcohol consumption relative to countries with no bans. Although the sample group for complete bans is small and somewhat special in nature, complete advertising bans also do not affect alcohol consumption.

Regression (5) shows fixed-effects estimates as a test of the robustness of the non-advertising variables. All causal variables maintain their signs and statistical significance.[15] Lastly, regression (6) shows results that correct for country-specific serial correlation. In regression (6), both advertising variables are statistically insignificant.

6. EMPIRICAL RESULTS: ALCOHOL ABUSE

The per capita measures of alcohol abuse outcomes--liver cirrhosis mortality and highway fatality rates--depend on drinking patterns. As a proxy for these patterns, we use the mean per capita consumption of pure alcohol, and then substitute for its determinates. Tourism is excluded from the reduced forms, and the highway fatality regressions include a demographic variable for youth populations. Both the log-linear probability and logit models were considered, where the empirical weights for the regressions are given by $[N_{it}\, p_{it} / (1 - p_{it})]^{½}$ and $[N_{it}\, p_{it} \cdot (1 - p_{it})]^{½}$, respectively (Maddala 1983, p. 29). However, the probabilities in question are very small, with sample means of 0.000144 and 0.000164 for cirrhosis and highway death rates per capita, respectively. In this case, the log-linear and logit models produce very similar results, i.e., the term $(1 - p_{it})$ is very close to one. The log-linear model is simpler, and the results for this functional form are emphasized. Because liver cirrhosis takes several years to develop, it seems unlikely that recent changes in advertising policies will affect the death rate to any extent. For this reason, Belgium and France were kept in categories one and two, respectively.

Table 4 shows the weighted least-squares estimates for liver cirrhosis mortality rates, where regression (1) is a logit estimate and all other regressions are log-linear probability estimates. There is little to distinguish between regressions (1) and (2), and ***A-BAN*** and ***S-BAN*** are statistically insignificant in either case. The other empirical results are consistent with the economic model. ***INCOME*** is positive, meaning that income growth has worked against

[15] Relative to Australia, the country dummies are positive and significant for only Denmark, and negative and significant for Canada, Italy, Netherlands, Norway, Sweden, and the U.S.

improvements in cirrhosis mortality rates over time and across countries. The results for ***PRICE2*** are consistent with the results in Table 3 for alcohol consumption, i.e., higher prices reduce consumption directly and reduce alcohol abuse indirectly. ***AGE65*** is significantly negative, so the indirect effects of reduced alcohol consumption outweigh any direct effects of aging on mortality. Drinking sentiment, ***PCTWINE***, is strongly positive. The unemployment rate, ***UNRATE***, is significantly negative, but changes sign in the fixed-effects regression (5). Two countries were deleted to test the robustness of these results. The residuals indicated that the Netherlands was a possible outlier and Norway was again deleted for data reasons. These results are reported in regressions (3) and (4), respectively, and are not very different from the full sample results. The results in regression (6) do not alter the outcome for the advertising variables. Hence, the results indicate that liver cirrhosis mortality rates are not consistently related to alcohol advertising bans.

Table 5 displays the results for death rates from motor vehicle accidents, where both specifications of the price variable are again reported. However, due to the presence of measurement errors, the results using ***PRICE2*** are preferred. Regressions (1) and (2) use the full sample, while regressions (3) and (4) omit Belgium as an outlier. The results in Table 5 suggest that ***A-BAN*** is not significantly related to highway fatalities and ***S-BAN*** is significantly positive, which parallels the empirical results for alcohol consumption. These results are robust across the four regressions. ***INCOME*** is significantly positive, suggesting that higher incomes lead to somewhat greater alcohol use--and higher rates of automobile ownership and use--which outweigh direct effects of income on the demand for health. This result parallels the findings for cirrhosis mortality. ***PRICE2*** is negative, but not statistically significant. This replicates Saffer’s (1991, p. 77) earlier results. ***AGE65*** is significantly negative and ***AGE1524*** is significantly positive, and neither variable was included in Saffer’s (1991) empirical model. The coefficient magnitude for ***AGE1524*** emphasizes the importance of alcohol policies toward youth drinking and driving behaviors. ***PCTWINE*** is significantly positive, which is consistent with the results for alcohol consumption and cirrhosis mortality. The wine-drinking countries face significant alcohol problems, which have as much to do with culture as with economic and legal factors. The significantly negative coefficient for ***UNRATE*** is inconsistent with social learning theory, but consistent with an economic model of advertising bans.

Regression (5) shows the fixed-effect estimates for highway fatalities. All variables, except price and sentiment, maintain their signs and statistical significance. ***PCTWINE*** is significantly negative in the fixed-effects regression, a result that is probably due to collinearity problems. Finally, regression (6) reports estimates that correct for country-specific serial correlation. With this adjustment, fatalities are negatively related to ***INCOME, AGE65***, and ***UNRATE***, and positively related to ***AGE1524***. The estimated coefficients for advertising bans are small and statistically insignificant.

7. CONCLUSIONS

The empirical results do not support the notion that bans of broadcast advertising of alcoholic beverages will reduce consumption or alcohol abuse. The evidence indicates that a complete ban of broadcast advertising of all beverages has no effect on consumption relative to countries that do not ban broadcast advertising. Equally important for alcohol policy, the results fail to provide evidence that advertising bans have significant negative effects on alcohol abuse outcomes, including cirrhosis mortality and motor vehicle fatalities. This finding suggests that advertising bans do not have a large impact on drinking patterns, although bans may affect brand and beverage choices. Despite the longstanding use of advertising bans in many of the countries in the sample, other economic and cultural factors are apparently far more important as determinants of drinking patterns and consumption. The empirical results are inconsistent with social learning theory, but consistent with an economic model that emphasizes the persuasive nature of alcohol advertising, and the resulting effects on product differentiation, price competition, and substitution toward non-banned media.

Isolating the effects of advertising is difficult empirically due to the complexity of alcohol control policies in various countries, including public ownership of production and retailing, varying tax rates on alcohol, and laws on drunk driving. Because it is not possible to control directly for these differences, it may be incorrect to regard advertising ban variables, especially those for Scandinavian countries, as measuring restrictive policies on advertising exclusively. However, these other policies should bias the results toward significantly negative coefficients on the ban variables, which we do not find. Also, we include two demographic variables and the unemployment rate as controls, which were omitted from previous studies. The demographic variables are always statistically significant. The unemployment rate and youth variables are especially important for motor vehicle fatalities. Hence, estimates obtained in earlier studies may suffer from omitted variable bias. Alcohol price is consistently negatively related to alcohol consumption and abuse. This finding also provides support for an economic model of advertising bans and alcohol consumption.

Lastly, we note the consistency of our empirical results with a number of existing studies in the advertising literature, including previous cross-country studies of advertising bans (Calfee 1997; Calfee and Scheraga 1994; Young 1993); studies of partial advertising bans of billboard displays; studies of temporary bans and other longstanding bans of most media; and studies of advertising expenditures using annual and quarterly data. It remains to be shown that advertising bans and similar restrictions have an important role to play as part of an alcohol control policy.

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Table 1. Variable Definitions and Descriptive Statistics

Variable Acronym	Definition	Mean (s.d.); Max, Min
ALCOHOL	Annual per capita consumption of pure alcohol in liters	9.08 (2.71); 16.80, 3.67
CIRRHOSIS	Annual deaths from liver cirrhosis per 100,000 (scaled)	14.37 (9.45); 37.5, 2.3
HIGHWAY	Annual deaths from highway accidents per 100,000 (scaled)	16.43 (5.96); 35.7, 5.7
INCOME	Real national income per capita in 1990 U.S. dollars	13002 (3591); 27452, 6042
PRICE	Real price of a liter of alcohol in 1990 U.S. dollars	33.26 (24.66); 136.48, 7.53
PRICE2	Real price index of alcohol (1990 = 100)	96.99 (12.17); 133.14, 56.70
TOURISM	Per capita number of tourist arrivals in country	0.57 (0.57); 2.46, 0.04
AGE65	Percent of total population that is 65 years and older	13.26 (2.06); 18.04, 8.79
AGE1524	Percent of total population that is 15 to 24 years of age	8.04 (0.87); 11.03, 6.10
PCTWINE	Percent of ***ALCOHOL*** that is wine consumption	32.83 (21.92); 83.29, 5.98
UNRATE	Annual unemployment rate as a percent	8.06 (4.48); 24.20, 0.50
A-BAN	Binary variable equal to one if the country bans all broadcast ads	0.24 (0.42); 1.0, 0.0
S-BAN	Binary variable equal to one if the country bans spirits broadcast ads	0.41 (0.49); 1.0, 0.0

Notes: Data for seventeen OECD countries for 1977 to 1995. Data for ***CIRRHOSIS*** and ***HIGHWAY*** cover the period 1977 to 1994, and per capita rates have been scaled to rates per 100,000. The countries are Australia, Austria, Belgium, Canada, Denmark, Finland, France, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, United Kingdom, and United States.

Table 2. Mean Values for Dependent Variables and Price Growth

Ban Category (No. of countries)	**Alcohol Consumption**	**Cirrhosis Mortality Rate**	**Highway Fatality Rate**	**Price Growth**
Means (s.d):	**1977**	**1977**	**1977**	**1977-86:**
1. No Bans (7)	11.20 (1.68)	21.5 (13.1)	23.7 (5.3)	-0.01 (0.83)
2. Spirits Only (6)	9.82 (3.69)	16.2 (12.9)	21.0 (5.4)	1.42 (1.91)
3. All Alcohol (4)	6.50 (1.93)	7.8 (3.8)	14.0 (2.1)	0.36 (1.23)
Means (s.d.):	**1995**	**1995**	**1995**	**1986-95:**
1. No Bans (6)	9.35 (2.11)	14.5 (8.8)	15.0 (5.2)	1.59 (1.02)
2. Spirits Only (7)	8.53 (2.39)	12.4 (8.0)	12.5 (3.4)	1.52 (1.95)
3. All Alcohol (4)	6.62 (2.74)	8.2 (3.0)	7.8 (2.0)	-1.46 (1.50)

Notes: **Alcohol** is measured in liters of pure alcohol per capita for 1977 and 1995; the **liver cirrhosis mortality** and **highway fatalities** are the death rates per 100,000 population for 1977 and 1994; and **price growth** is the mean percent per annum change for 1977-86 and 1986-95. Spain appears in category one in 1977 and category two in 1995. Belgium and France are in only category one and two, respectively (see text). In 1995, category one countries are Australia, Belgium, Italy, Luxembourg, Netherlands, and Portugal. Category two countries are Austria, Canada, France, Ireland, Spain, United Kingdom, and United States. Category three countries are Denmark, Finland, Norway, and Sweden.

Table 3. Weighted Least-Squares Regressions for Alcohol Consumption, 1977-1995

Regressor	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
CONSTANT	1.0847 (2.195)	1.3257 (2.637)	1.4876 (3.196)	1.6341 (3.414)	1.0258 (1.193)	1.0570 (1.434)
INCOME	0.1261 (2.646)	0.1900 (4.330)	0.2109 (5.158)	0.1810 (4.172)	0.3783 (4.212)	0.2315 (3.424)
PRICE	-0.0257 (1.507)	---	---	---	---	---
PRICE2	---	-0.2137 (2.351)	-0.2722 (3.189)	-0.2597 (3.117)	-0.5160 (10.89)	-0.3456 (9.718)
TOURISM	0.0489 (3.296)	0.0570 (3.920)	0.0836 (6.045)	0.0749 (5.143)	0.0939 (3.745)	0.0326 (2.007)
AGE65	-0.4061 (5.764)	-0.4016 (6.082)	-0.3601 (5.866)	-0.3259 (5.312)	-0.2279 (2.479)	0.0091 (0.090)
PCTWINE	0.3194 (15.07)	0.3263 (18.34)	0.2947 (17.45)	0.2946 (17.89)	0.2609 (6.811)	0.1942 (6.620)
UNRATE	0.0153 (0.711)	0.0297 (1.392)	0.0108 (0.536)	0.0022 (0.104)	-0.0062 (0.430)	-0.0032 (0.269)
A-BAN	0.0382 (1.211)	0.0491 (1.553)	0.1059 (3.525)	0.0322 (0.867)	---	0.0113 (0.439)
S-BAN	0.1492 (6.625)	0.1387 (6.115)	0.1109 (5.221)	0.1103 (5.315)	---	-0.0140 (0.689)
R-Sq (unwt)	0.6664	0.6582	0.7165	0.6989	0.9625	---

Notes: Dependent variable is the log of per capita total alcohol consumption, ***ALCOHOL***; all variables are in natural logs, except ***A-BAN*** and ***S-BAN***. Sample size is 323. Estimates obtained using weighted least-squares, with t-statistics in parentheses. All regressions include 18 dummy variables for sample years (1977 omitted). Regressions (3) and (4) omit Norway, and regression (4) constrains Belgium and France to initial ban categories (see text). Regression (5) includes 16 country dummies (Australia omitted). Regression (6) corrects for country-specific serial correlation.

Table 4. Logit and Log-Probability Regressions for Cirrhosis Mortality, 1977-1994

Regressor	(1)	(2)	(3)	(4)	(5)	(6)
CONSTANT	-11.457	-11.457	-11.526	-11.390	-18.407	-6.990
	(11.25)	(11.25)	(11.79)	(10.86)	(11.82)	(6.090)
INCOME	0.5630	0.5628	0.5170	0.5608	0.9860	-0.1488
	(6.345)	(6.344)	(6.055)	(6.128)	(6.328)	(1.300)
PRICE2	-0.6040	-0.6037	-0.4710	-0.6144	-0.4529	-0.0790
	(3.206)	(3.205)	(2.586)	(3.160)	(6.425)	(1.516)
AGE65	-0.7735	-0.7733	-0.7589	-0.7691	0.2254	-0.0862
	(4.120)	(4.119)	(4.212)	(3.981)	(1.669)	(0.615)
PCTWINE	0.7217	0.7216	0.6925	0.7203	0.3993	0.2394
	(20.92)	(20.92)	(20.73)	(20.29)	(5.408)	(5.428)
UNRATE	-0.1386	-0.1386	-0.1319	-0.1421	0.0865	-0.0460
	(3.014)	(3.015)	(2.984)	(2.987)	(3.322)	(2.220)
A-BAN	-0.0682	-0.0683	-0.1433	-0.0251	---	0.2594
	(0.635)	(0.636)	(1.382)	(0.219)		(1.830)
S-BAN	0.0334	0.0333	-0.0197	0.0330	---	-0.0088
	(0.869)	(0.868)	(0.523)	(0.836)		(0.289)
R-Sq (unwt)	0.6586	0.6585	0.7068	0.6549	0.9539	---

Notes: Regression (1) uses the logit of ***CIRRHOSIS*** as the dependent variable and regressions (2)-(6) use the log of ***CIRRHOSIS***. All variables are in natural logs, except ***A-BAN*** and ***S-BAN***. Belgium and France are constrained to their initial ban categories (see text). Sample size is 306. Estimates obtained using weighted least-squares, with t-statistics in parentheses. All regressions include 17 dummy variables for sample years (1977omitted). Regressions (3) and (4) omit Netherlands and Norway, respectively. Regression (5) includes 16 country dummies (Australia omitted). Regression (6) corrects for country-specific serial correlation.

Table 5. Log-Probability Regressions for Motor Vehicle Fatalities, 1977-1994

Regressor	(1)	(2)	(3)	(4)	(5)	(6)
CONSTANT	-8.808	-10.598	-10.457	-10.136	-11.896	-4.155
	(11.55)	(12.13)	(13.50)	(13.03)	(7.773)	(3.521)
INCOME	0.1009	0.3080	0.2869	0.2695	0.4766	-0.4747
	(1.736)	(5.093)	(5.352)	(4.943)	(2.567)	(4.311)
PRICE	-0.2103	---	---	---	---	---
	(7.923)					
PRICE2	---	-0.1215	-0.1325	-0.1660	0.1385	0.0979
		(0.841)	(1.031)	(1.319)	(2.125)	(1.655)
AGE65	-0.7702	-1.0285	-1.3210	-1.2854	-0.2640	-0.3720
	(6.819)	(8.243)	(11.54)	(11.16)	(2.098)	(2.342)
AGE1524	1.0241	0.9102	1.2294	1.2153	0.4147	0.5772
	(6.206)	(4.994)	(7.454)	(7.388)	(3.346)	(3.302)
PCTWINE	0.0625	0.2166	0.2844	0.2715	-0.5329	0.0349
	(2.206)	(9.517)	(13.33)	(12.56)	(8.991)	(0.921)
UNRATE	-0.3144	-0.2461	-0.3489	-0.3569	-0.1631	-0.1653
	(9.102)	(6.638)	(10.11)	(10.28)	(5.315)	(7.208)
A-BAN	-0.0918	-0.0939	0.0418	-0.0160	---	0.0393
	(1.665)	(1.516)	(0.739)	(0.240)		(0.791)
S-BAN	0.0898	0.0986	0.2197	0.2119	---	-0.0088
	(3.152)	(3.129)	(7.138)	(6.960)		(0.231)
R-Sq (unwt)	0.5097	0.5009	0.5851	0.5913	0.9291	---

Notes: Dependent variable is the log of the per capita motor vehicle fatality rate, ***HIGHWAY***, and all variables are in natural logs, except ***A-BAN*** and ***S-BAN***. Sample size is 306. Estimates obtained using weighted least-squares, with t-statistics in parentheses. All regressions include seventeen dummy variables for sample years (1977omitted). Regressions (3) and (4) omit Belgium, and regression (4) constrains France to its initial ban category. Regression (5) includes 16 country dummies (Australia omitted). Regression (6) corrects for country-specific serial correlation.