META-ANALYSIS OF ALCOHOL ADVERTISING BANS: Cumulative Econometric Estimates of Regulatory Effects

by

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Abstract: We apply meta-analysis to empirical studies that examine the effects of advertising bans on aggregate consumption of alcoholic beverages. Two types of econometric studies are analyzed: broadcast advertising bans using a panel of developed countries; and billboard advertising bans using a panel of U.S. states. The cumulative results fail to demonstrate that advertising bans are effective as an alcohol-reduction policy. Given this finding, we discuss several methodological issues associated with empirical studies of advertising bans, including aggregation of brand-level effects of alcohol advertising; alternative industry advertising-sales response functions; and the shortcomings of narrative "vote-counting" literature reviews.

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Introduction

Worldwide alcohol consumption has been declining since the mid-1980s (Smart 1989, 1998; WHO 1999). Although demographic factors and a wide range of alcohol-related public policies may have contributed to this decline, considerable attention has been focused on the regulation of alcohol promotion.[1] At least 29 countries have enacted bans of alcohol advertising for one or more advertising media. All alcohol advertising using domestic broadcast media is currently banned in 19 of these countries, including Belarus, Bulgaria, Croatia, Denmark, Egypt, France, Iceland, India, Malaysia, Norway, Poland, Russia, Slovenia, Sweden, Switzerland, Thailand, Turkey, Ukraine, and Venezuela (WHO 1999, p. 56). The general belief behind these regulations is that advertising increases alcohol consumption, and not just the type of beverage consumed (e.g., distilled spirits v. beer or wine) or brand shares (e.g., Absolut v. Smirnoff vodka).

Our objective in this paper is to conduct a meta-analysis of the econometric literature on advertising bans and aggregate alcohol consumption. Two types of bans are examined: national bans of broadcast advertising in developed nations (cross-national bans); and state bans of billboard advertising in the United States (state-level bans). While several earlier meta-analyses have addressed issues of advertising regulation (Franke 2001), we believe this is the first meta-analysis to examine the effects of advertising bans on the primary demand for a product.[2]

Meta-analysis is a statistical procedure used to summarize or combine a set of empirical studies on a common scientific issue (see Hedges and Olkin 1985; Stanley 2001; Stanley and Jarrell 1989). In order to apply meta-analysis, the investigator first selects a common outcome measure from each

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[1] The influence of demographic factors has been documented by Cook and Moore (2001), Nelson (1997, and others. Other public policies that may have influenced the decline in alcohol consumption include education and health-promotion programs; regulation of alcohol outlets; minimum drinking age laws; government monopolies; licensing of production, wholesaling, and retailing; taxation and other pricing regulations; product labeling laws; restrictive laws on drinking and operation of motor vehicles; and stricter enforcement of restrictions on sale and use, particularly with regard to drinking and driving. Given the multiplicity of policies, the study of advertising bans is appealing because promotional activities are believed to be an especially important factor leading to higher consumption levels, and bans represent a "natural experiment" in terms of public policy.

[2] Meta-analysis has been applied to a diverse set of empirical relationships, including air pollution damages (Smith and Huang 1995); risks to life (Bowland and Beghin 2001); education production functions (Hedges, Laine, and Greenwald 1994); taxes and economic development (Phillips and Goss 1995); minimum wages (Card and Krueger 1995); gender discrimination (Stanley and Jarrell 1998); and the effects of advertising on market-wide sales (Assmus et al. 1984; Andrews and Franke 1991).

empirical study, or what is termed the "effect size" parameter. Depending on the data set, two types of meta-analysis can be conducted. First, some analyses use regressions to examine heterogeneous parameter estimates, which result from different time frames, samples, model specifications, econometric techniques, and investigator characteristics, or what is termed "meta-regression analysis" (Stanley and Jarrell 1989). Second, "fixed-effect" analyses combine a set of estimates based on similar data and techniques to obtain a "cumulative" or weighted-mean effect size and standard error, which can be used to address issues of statistical significance and magnitude of the combined results. Given the limited number of studies of advertising bans and their overlapping data and methods, our use of meta-analysis employs the second method.

One advantage of meta-analysis is that it improves on narrative literature reviews, such as those found in prior surveys of alcohol advertising by Fisher (1993), NIAAA (2000), Saffer (1993, 1995), and Saffer and Dave (2002). In particular, Hedges and Olkin (1985) have shown that traditional "vote-counting" literature reviews have low statistical power. While our analysis has limitations due to sample size, it represents an improvement over existing surveys of advertising bans and alcohol consumption. Indeed, we demonstrate some of the biases present in a recent survey that are avoided due to the discipline imposed by meta-analysis.

Overall, our analysis demonstrates that advertising bans have little or no effect on total alcohol consumption. This result holds at the national level for broadcast bans in developed countries and state bans of billboards in the United States. Our results call into question the efficacy of advertising bans relative to other possible public policies in the alcohol area.

The remainder of the paper is divided into three sections. Section I presents the meta-analysis of cross-national advertising bans. We obtain cumulative estimates for two measures of effect size: total bans of all broadcast advertising and partial bans of broadcast advertising for distilled spirits. Section II performs a similar analysis for state-level billboard bans in the United States. In Section III, we comment critically on the methodology of past studies and discuss the economic model that underlies some studies: the industry advertising-sales response function. We provide beverage and brand evidence that demonstrates some of the shortcomings of the industry-response function as an analytical foundation.

I. Meta-Analysis of Cross-National Advertising Bans

Studies of advertising and aggregate alcohol consumption fall into two categories: time-series studies of the relationship between advertising expenditures and consumption; and (2) cross-sectional and panel studies of advertising bans and consumption. Our use of meta-analysis is focused solely on the second type of study.

Four econometric studies have used cross-national samples to examine the relationship between bans of broadcast advertising and alcohol consumption. In chronological order, the studies are Saffer (1991); Young (1993); Nelson and Young (2001); and Saffer and Dave (2002). Table 1 summarizes salient features of these studies.[3] Features that are common to the studies include: (1) analysis of total alcohol consumption expressed in units of ethanol per capita (logarithmic transformed); (2) a time frame that begins in the 1970s; (2) a sample of 17-20 developed nations that are members of the Organization for Economic Cooperation and Development (OECD); (3) a model specification that includes real per capita income and real alcohol prices; (4) measures of bans based on binary dummy or discrete variables; and (5) econometric methods that address issues of serial correlation and heteroscedasticity. While there are some differences among the studies, such as the model specification for tourism and demographics variables, these differences are minor. A fixed-effect meta-analysis treats these differences as statistical variation around a measure of central tendency, rather than bias in an econometric sense. In general, the common features of the studies reflect their inherent scientific purpose, while the differences among the studies reflect other issues, such as data availability and investigator judgment.

For each of these studies, we obtained estimates of two effect-size parameters and their standard errors: (1) the effect of a broadcast advertising ban of only distilled spirits; and (2) the effect of a broadcast advertising ban of all alcohol advertising (beer, wine, and spirits). Where more than two

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[3] Our analysis is necessarily limited to studies that employ common econometric techniques and which examine advertising bans. As a result, we exclude studies using other statistical techniques (e.g., interrupted Box-Jenkins analysis) or which examine advertising expenditures within a cross-national framework, such as the study Calfee and Scheraga (1994). We note that the empirical results in other studies are consistent with the conclusions drawn below.

estimates of an effect were available, the parameter selection was guided by smaller standard errors or investigator comments on statistical accuracy. Following the procedures for meta-analysis of cumulative effect sizes (see Hedges and Olkin 1985, pp. 109-10; Shadish and Haddock 1994, pp. 265-67), let E_i represent the effect-size estimate in the i-th study and let v_i be its variance (i.e., the square of the estimated standard error of the parameter). The weight assigned to the i-th effect size is the reciprocal of its variance, or $w_i = 1/v_i$. Summing over the set of parameter estimates, the weighted-mean, or cumulative effect-size E, is given by:

(1) $$E = (\Sigma w_i E_i)/(\Sigma w_i)$$

The variance of the weighted-mean is[4]

(2) $$Var_E = 1/(\Sigma w_i)$$

and the confidence interval (CI) is $CI = E \pm (t_{a/2\,[N-1]} * s_E)$, where t is the two-tailed value from the Student t-distribution at the critical level given by α (e.g., the conventional 5% confidence level); N is the sample size; and s_E is the standard deviation of the weighted-mean.

Three of the four cross-national studies provide comparable estimates of the effect of advertising bans on alcohol consumption. Saffer (1991), Young (1993), and Nelson and Young (2001) used identical measures of the dependent variable (natural log of per capita ethanol consumption) and identical binary measures of broadcast advertising bans (either partial or total). The study by Saffer and Dave (2002) used the same measure of alcohol consumption, but scored advertising bans on a six-point scale for partial bans and a three-point scale for total bans. Fortunately, the studies can be compared, because a value of “two” for Saffer and Dave’s ban variables is equivalent to a value of “one” in the other three studies. Thus, in order to make Saffer and Dave’s results comparable to the other three studies, the coefficient estimates are

[4] This expression assumes that Cov (E_i, E_j) = 0. In reality, since the data sets and techniques substantially overlap, the estimates are probably positively correlated. If so, the calculations below will understate the standard error of the estimated cumulative effect size, making it more likely that the null hypothesis of no effect is falsely rejected, and that the width of the confidence interval is underestimated.

multiplied by a factor of two. In order to hold the relative precision of these estimates constant, the standard errors also are multiplied by two.[5]

Table 2 summarizes the empirical estimates in the four studies and also presents the calculation of the weighted-mean effect sizes and standard deviations. Results are shown separately for total bans and partial bans of spirits only. In column (2), the range of estimates for a total ban is -0.3440 to 0.0734, and the weighted mean is -0.0078 with a standard deviation of 0.0155. In column (6), the range of estimates for a partial ban is -0.1810 to 0.1387, and the weighted mean is -0.0092 with a standard deviation of 0.0115. Compared to a no advertising-ban policy, the point estimate for a total ban implies a reduction in aggregate alcohol consumption of 0.8%, while a partial ban yields a comparable reduction of about 0.9%. Neither cumulative effect is statistically different from zero, and the t-statistics are only 0.50 and 0.80, respectively.[6]

Using the cumulative estimates for partial and total bans, we also calculated a grand cumulative mean and tested for a common effect-size between the two classes of estimates (see Hedges and Olkin 1985, p. 154). With a sample size of 16 observations, the grand mean is -0.0087 (.0092), with a t-statistic of 0.95. A test for homogeneity of the mean effect-sizes of the individual bans failed to reject the null hypothesis. In other words, the means for partial bans and total bans share a common population mean-effect size, but neither the grand mean nor individual means are significantly different from zero. This result is important for our discussion of the industry advertising-sales response function in Section III.

In summary, the cumulative evidence from cross-national studies indicates that broadcast advertising bans do not reduce alcohol consumption. The meta-analysis of cross-national bans of broadcast advertising provides point estimates of about -1% for either a partial or a total ban. The effects are small in magnitude, and neither cumulative estimate is significantly different from zero. Consequently, the results contradict the hypothesis that advertising bans are effective as a policy to

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[5] The conclusions of this analysis are unaffected if the standard errors in Saffer and Dave are not changed, and the resulting weight assigned to their study is increased.

[6] If advertising bans reduce consumption, a complete ban would be expected to reduce consumption more than a partial ban. Our point estimates suggest the opposite, but the difference is not statistically significant and neither estimate is significantly different from zero.

reduce the primary demand for alcohol. On the other hand, these results are consistent with the alternative hypothesis that the effect of alcohol advertising is on brand or beverage shares, and not on total alcohol demand. We return to this issue in Section III.

II. Meta-Analysis of State Billboard Advertising Bans

Following the repeal of Prohibition in 1933, all states in the U.S. were granted broad regulatory powers over the importation and sale of alcohol within state borders. For example, eighteen states established public monopolies for the retail distribution of distilled spirits, and some of these states also controlled retail sales of wines. The other thirty-two states established a system of licensing of private retailers. Fourteen states explicitly banned billboard advertising of distilled spirits, including seven of the license states, and a few states also restricted billboard advertising of beer and wine. Fifteen states banned price advertising of alcoholic beverages using billboards, newspapers, or visible store displays.

In 1996, the U.S. Supreme Court ruled that price bans were an unconstitutional restriction of commercial speech; see *44 Liquormart, Inc., v. Rhode Island*, 517 U.S. 484 (1996). Following this decision, existing state laws that banned price advertising of alcoholic beverages were repealed. Nevertheless, considerable pressure still exists at the state and local level for complete bans of alcohol billboards and other publically-visible displays (transit signs, sports stadium signs, visible store displays). Local ordinances restricting alcohol billboards have been enacted in Baltimore, Chicago, Cleveland, Detroit, Oakland, and Los Angeles. The constitutional status of these ordinances is uncertain due to a recent Supreme Court's decision in a tobacco case; see *Lorillard v. Reilly*, 533 U.S. 606 (2001).

Five econometric studies have estimated the relationship between state billboard bans and alcohol consumption. Table 3 summarizes salient features of these studies.[7] Four of the five studies use the log of consumption as a dependent variable. All of the studies use cross-sectional state data and employ dummy variables to represent billboard bans. One study uses a single year, but the other four studies employ panel data covering 5 to 25 years. In general, panel data are more reliable and produces smaller standard errors (see Table 4). This greater precision is captured by the weight assigned to each coefficient estimate, which is an important advantage of meta-analysis procedures.

Some studies examine total alcohol consumption, but two studies estimate only separate demand relationships for beer and spirits: Schweitzer et al. (1983) and Ornstein and Hanssens (1985).

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[7] A common effect measure requires omission of studies that examine the effects of state-level billboard bans on other outcome measures, such as domestic violence (Markowitz and Grossman 1998, 2000). In the interest of space, bans of price advertising are omitted from the analysis. However, we note the consistency of these other results with our conclusions (see Nelson 1990, 2001). State-level advertising expenditure for alcoholic beverages data do not exist. Hence, cross-state expenditure studies are not available.

Given this methodological difference, we analyze two cumulative effects of state-level billboard bans: first, effect estimates were obtained from four studies for the relationship between billboard bans and spirits consumption, which is the beverage targeted specifically by these bans. Second, effect estimates were obtained for total alcohol consumption, either directly if that was possible or by calculating a weighted-mean effect across beverages.[8] Overall, the state-level estimates for *total alcohol* parallel the results for partial bans of broadcast advertising as both estimates cover total alcohol rather than spirits only. Further, four of the five studies in Table 3 used a logged dependent variable. In order to use the results in Hoadley et al. (1984), we calculated the average consumption of spirits in gallons of ethanol per capita for 1955-80 (mean = 0.98 gallons), using data from the NIAAA (1999), and then expressed the coefficient estimates in Hoadley et al. (1984) as a percent of the mean.

Table 4 displays the results of the meta-analysis of billboard advertising bans. The cumulative results for the effect of a billboard ban on total alcohol consumption is a small, but significant, *positive* effect. In column (2), the range of estimates is -0.0632 to 0.0890, and the weighted mean is 0.0382 (.0070). Overall, a state billboard ban increases total alcohol consumption by about 3.8%. Three of four studies also found a significant *positive* effect of billboard bans on spirits consumption, and this result carries over to the cumulative effect. In column (6), the range of estimates is 0.0598 to 0.1750. The weighted mean is 0.1246 (.0108), which implies that a state billboard ban increases spirts consumption by about 12.5%. This result is highly significant and generally contrary to expectations.[9]

In summary, the meta-analysis results for state bans of billboards fail to demonstrate that these bans are an effective way to reduce alcohol consumption. The state-level results are consistent with the cumulative results from cross-national studies of broadcast advertising bans. The significantly positive

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[8] The variance of the estimated effect on total alcohol consumption is calculated as the sum of variances of the estimated effects on the individual beverages. In principle, this could either over or underestimate the variance of the total effect, depending on whether the covariances of the individual effects are negative or positive. In the absence of other information on these covariances, they are treated here as being zero.

[9] Hoadley et al. (1984, p. 396) found that "the most anomalous result comes with restrictions on billboard advertising, where results showed a consistent and fairly large effect in the wrong direction. The presence of such billboard restrictions was apparently associated with *higher* consumption." Ornstein and Hanssens (1985, pp. 208-09) found that "one significant variable (billboard advertising) has a contrary sign . . . general advertising on billboards shows perverse results, since the sign of billboards is counterintuitive." Nelson (2003, p. 13) observes that "the results for billboards indicate that a ban of spirits ads *increase* the demands for spirits and wine, and reduces beer consumption. While this result replicates earlier findings, it is contrary to expectations."

results for billboard bans and the insignificant results for broadcast bans raise several questions regarding the underlying industry or market relationship that is being measured in these studies. In the next section, we discuss three aspects of the methodology of empirical studies of advertising bans.

III. Discussion

Distillers, brewers, and vintners spend millions of dollars each year on advertising, yet the empirical evidence indicates that advertising bans do *not* reduce alcohol consumption. Because this result may seem counterintuitive, this section discusses three aspects of the methodological debate that surrounds empirical studies of advertising bans. First, almost all alcohol advertising takes place at the brand level and thus directly affects brand shares. Such advertising may be rational for individual firms even if it has little or no effect on the total market demand for alcohol. We present an equation describing the effects of advertising at the brand level and demonstrate the difficult steps necessary for aggregation to the industry or market level. We also illustrate this equation with a brand-level example. Second, we discuss alternative shapes for the industry advertising-sales response function in a mature industry, such as alcoholic beverages. Third, we comment on the differences between literature reviews using narrative "vote-counting" methods and the methodology of meta-analysis.

1. Industry vs. Brand Effects

Consider a duopoly with two identical firms. Let q_1 represent the output of Firm 1, A_1 is its advertising expenditures, and $s_1 = (q_1/Q)$ is its market share, where $Q = q_1 + q_2$. Assuming Cournot behavior with regard to advertising expenditures, the advertising-output elasticity for Firm 1 is given by (Schmalensee 1972, p. 34):

(1) $$e_{A1} = \left(\frac{\partial Q}{\partial A_1} \frac{A_1}{Q} \right) + \left(\frac{\partial s_1}{\partial A_1} \frac{A_1}{s_1} \right)$$

where the first term is the effect of Firm 1's advertising on primary demand and the second term is the market-share effect. Since market shares must sum to one, aggregation over brands in an econometric model leaves the market-wide effect of advertising by all firms in the industry. This effect is the object of measurement in econometric studies of advertising bans as well as industry-level studies of advertising expenditures. However, firms are primarily concerned with the second term, since the benefits of increased industry-level demand are largely external to individual firms.

Now suppose that firms fail to behave according to the Cournot assumption; that is, Firm 2 is assumed to increase its advertising in response to increased advertising by Firm 1. Firm 1's advertising elasticity reflects the impact of Firm 2's advertising on industry demand and on Firm 1's market share. Letting $A = A_1 + A_2$, we can write Firm 1's advertising-output elasticity as:

$$\varepsilon_{A1} = \left(\frac{\partial Q}{\partial A}\frac{A}{Q}\right)\left(\frac{A_1}{A}\right) + \left(\frac{\partial s_1}{\partial A_1}\frac{A_1}{s_1}\right) + \left(\frac{\partial s_1}{\partial A_2}\frac{A_2}{s_1}\right)\left(\frac{\partial A_2}{\partial A_1}\frac{A_1}{A_2}\right) \tag{2}$$

where the first term is the industry-output effect due to changes in advertising by both firms and (A_1 /A) is Firm 1's advertising share. The industry-output effect can be zero or positive. If the advertising of Firm 1 and Firm 2 only affects market shares, then the industry effect is zero. The second term is the *direct* effect of Firm 1's advertising on its own market share, which must be zero or positive. The third term is the effect of Firm 2's advertising on Firm 1's market share. This term is assumed to be zero or negative. It is possible for this term to be positive if Firm 2 reduces its advertising in response to Firm 1's increased advertising, i.e., $\partial A_2 /\partial A_1 < 0$. However, it is well known that firms might engage in excessive advertising due to the prisoners' dilemma, and it is more likely that this term is negative. Aggregation over brands again leaves the industry-output effect.

In practice, the "industry" in the theoretical model is not clearly defined in most empirical studies, and this is the main point we wish to make about econometric investigations of alcohol advertising and public policies based on observations of successful alcohol brands. If the industry-effect is to be positive, it should be associated with successful advertising efforts at the brand level; that is, the expectation is that successful brand advertising campaigns will increase the market share of Firm 1 *and* attract consumers who are purchasing products produced by other "industries." For alcohol beverages, studying market-wide effects means aggregation over brands, product-categories (e.g., vodka), and beverages (beer, wine, spirits). It is not clear that the outcome is a well-defined "industry" sales-response function for advertising.

Consider the product category of vodka and the successful brand-level advertising by Absolut vodka, which is produced by the Swedish government's alcohol monopoly. Vodka competes with other distilled spirts, which are broadly categorized into "browns" and "whites." All distilled spirits compete with beer and wine, and perhaps more broadly with other beverages. Absolut vodka has been a tremendous success at the brand level, and is regarded as an icon in the advertising world. Following Absolut's introduction in the U.S. market in 1980, sales rose to 2.25 million cases in 1989 and to 4.05 million in 1999 (Adams 2000). In 1999, Absolut was the second best seller among vodkas and the third leading brand of distilled spirits overall. However, during the period 1980-1999, vodka sales in the U.S. declined from 0.53 gallons to 0.41 gallons per capita and sales of all distilled spirts declined from 2.75 gallons to 1.69 gallons per capita (Nelson 2001, p. 279). While vodka's share of the market for spirits increased from 19 to 24% during this period, relative success at the brand and beverage level was not translated into increased per capita sales for either the product category (vodka) or the beverage (spirits). Thus, expanding sales at the brand level does not imply increased sales at higher levels of aggregation. If advertising by a highly-successful brand (Absolut) has not expanded the product category (vodka), we question whether advertising has expanded the market for the still broader categories of distilled spirits or the market for all alcoholic beverages.[10]

2. Industry-Level Response Functions

The results for vodka lead to our second point, which is the plausible shape of the industry advertising-response function. Although new products are introduced from time-to-time, such as low-calorie beers and wine coolers, most individuals are familiar with the functions of alcoholic beverages at an early age. Promotion of alcoholic beverages takes place within a mature market, where increases in advertising expenditures by major firms are likely to be matched by rivals and the focus of competition is differentiation among well-known brands. Using the terminology introduced by Dekimpe and Hanssens (1995a, 1995b), this is an environment in which brand shares can evolve, but primary

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[10] This point is reinforced by game-theoretic models in which increased product differentiation allow firms to command higher prices for successful brands. Hence, brand advertising can increase the general level of prices for beverages, resulting in a lower level of market-wide demand (Motta 1997). In this case, a positive effect of advertising bans can occur as we found for billboard bans at the state-level. This effect is reinforced by the potentially lower costs of operation under an advertising ban.

demand is stationary.

Given this competitive environment, consider two possible shapes for the industry advertising-response function, which are displayed in Figure 1. Schedule A1 illustrates both increasing and decreasing returns to advertising expenditures (Saffer 1993, 1995). Alternatively, schedule A2 shows that diminishing returns sets in immediately, which is consistent with the empirical evidence for many mature markets. For example, a review of more than 100 studies by Simon and Arndt (1980) concluded that the brand-level evidence was not consistent with a S-shaped response function. This result is reinforced by other recent studies of advertising expenditures and returns to brand-level advertising, including Assmus et al. (1984) and Tellis and Weiss (1995). If the sales-response function is A2, studies of advertising bans should yield insignificant effects of advertising bans on total alcohol consumption, which is consistent with the evidence from the meta-analysis. In particular, we found insignificant results for both the individual means and the grand mean for broadcast advertising bans.

3. Shortcomings of Vote-Counting Literature Reviews

A narrative literature review suffers from four methodological shortcomings (Bushman 1994, p. 194). First, it does not account for sample size of the review (i.e., the total number of studies or estimates subject to review). Rather, the "winner" tends to be the modal category among three qualitative possibilities – no effect, contrary effect, or significant effect. Second, a traditional review fails to reveal whether a consensus outcome "wins by a nose or in a walkaway." Meta-analysis produces both a cumulative effect size and a standard deviation. Third, Hedges and Olkin (1985) have shown that traditional reviews have low power, especially if the sample size is small to medium in number. Fourth, some narrative literature reviews compare studies that do not estimate the same effect-size parameter, making the comparison tenuous at best.

The results of our meta-analysis are inconsistent with finding in some literature reviews, such as several previous surveys by Saffer (1993, 1995) and a more recent summary by Saffer and Dave (2002). To the best of our knowledge, Tables 1 and 3 include all studies of alcohol advertising bans that yield comparable estimates of the cross-national effects of broadcast bans and all studies that yield comparable estimates of the state-level effects of billboard bans.[11] The inclusive nature of the analysis is consistent with the emphasis in meta-analysis, which assigns *quantitative* weights to individual studies according to the precision of the estimates. On the other hand, the recent summary of empirical studies in Saffer and Dave (2002, p. 1328) fails to obtain comparable estimates. Their summary covers several types of empirical studies (time series, cross-sectional, ban studies), which *do not* yield common effect sizes. These studies cannot be compared on a consistent basis. Further, Saffer and Dave's summary of time-series studies includes studies using quarterly and annual data, which are not necessarily comparable (Berndt 1991; Leone 1995). Results also are listed for significant effects at the beverage level, even though total alcohol consumption is the focus of Saffer and Dave's empirical investigation. They summarize two empirical studies that use cross-sectional U.S. data, but this is not accurate for advertising. For example, Goel and Morey (1995) examined state-level data on spirits consumption, but their advertising data is annual national data (which is exactly the data that Saffer and Dave criticize as too aggregate). A cross-sectional study by Saffer (1997) does not examine the effect of advertising on alcohol consumption, but it is listed along with 20 other studies that do examine this relationship. Saffer and Dave also list three multivariate studies of advertising bans, but only the price ban results from Ornstein and Hanssens (1985) are included and their results for billboard bans are completely ignored (see Table 4 and n. 9 above).

In our view, meta-analysis imposes a discipline on investigators that avoids the sort of bias and omissions present in a narrowly-conceived narrative review. As a consequence, the results of a meta-analysis of advertising bans are more reliable as a guide to informed public policy decisions with regard to alcohol advertising.

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[11] As indicated above, we have excluded studies that would not produce common estimates of effect sizes. Thus, we are not concerned here with studies that examine advertising expenditures and the demand for alcoholic beverages; see Nelson (2001) for a methodological examination of these studies as well as a review of studies of price advertising bans.

References

Adams Business Media, *Adams Liquor Handbook* (Arlington Heights, IL: Adams, 2000).

Andrews, R.L., and G.R. Franke, "The determinants of cigarette consumption: A meta-analysis," *Journal of Public Policy & Marketing* **10**, Spring 1991, 81-100.

Assmus, G., J.U. Farley, and D.R. Lehmann, "How advertising affects sales: Meta-analysis of econometric results," *Journal of Marketing Research* **21**, February 1984, 65-74.

Berndt, E.R., *The Practice of Econometrics: Classic and Contemporary* (New York: Addison, 1991).

Bowland, B.J., and J.C. Beghin, "Robust estimates of value of a statistical life for developing countries," *Journal of Policy Modeling* **23**, May 2001, 385-96.

Bushman, B.J., "Vote-counting procedures in meta-analysis," in H. Cooper and L. Hedges (eds.), *The Handbook of Research Synthesis* (New York: Russell Sage Foundation, 1994), pp. 193-213.

Calfee, J.E., and C. Scheraga, "The influence of advertising on alcohol consumption: A literature review and an econometric analysis of four European nations," *International Journal of Advertising* **13**, No. 4, 1994, 287-310.

Card, D., and A.B. Krueger, "Time-series minimum-wage studies: A meta-analysis," *American Economic Review* **85**, May 1995, 238-43.

Cook, P.J., and M.J. Moore, "Environment and persistence in youthful drinking patterns," in J. Gruber (ed.), *Risky Behavior Among Youths: An Economic Analysis* ((Chicago: University of Chicago Press, 2001), pp. 375-437.

Dekimpe, M.G., and D.M. Hanssens, "The persistence of marketing effects on sales," *Marketing Science* **14**, Winter 1995a, 1-21.

Dekimpe, M.G., and D.M. Hanssens, "Empirical generalizations about market evolution and stationarity," *Marketing Science* **14**, Part 2 of No. 2, 1995b, G109-G121.

Fisher, J.C., *Advertising, Alcohol Consumption, and Abuse: A Worldwide Survey* (Westport, CT: Greenwood Press, 1993).

Franke, G.R., "Applications of meta-analysis for marketing and public policy: A review," *Journal of Public Policy & Marketing* **20**, Fall 2001, 186-200.

Goel, R., and M. Morey, "The interdependence of cigarette and liquor demand," *Southern Economic Journal* **62**, October 1995, 451-59.

Hedges, L.V., R.D. Laine, and R. Greenwald, "Does money matter? A meta-analysis of studies of the effects of differential school inputs on student outcomes," *Educational Researcher* **23**, April 1994, 5-14.

Hedges, L.V., and I. Olkin, *Statistical Methods for Meta-Analysis* (New York: Academic Press, 1985).

Hoadley, J.F., et al., "The effect of alcohol beverage restrictions on consumption: A 25-year longitudinal analysis," *American Journal of Drug and Alcohol Abuse* **10**, No. 3, 1984, 375-401.

Leone, R.P., "Generalizing what is known about temporal aggregation and advertising carryover," *Marketing Science* **14**, Part 2 of No. 2, 1995, G141-G150.

Markowitz, S., and M. Grossman, "Alcohol regulation and domestic violence towards children," *Contemporary Economic Policy* **16**, July 1998, 309-20.

Markowitz, S., and M. Grossman, "The effects of beer taxes on physical child abuse," *Journal of Health Economics* **19**, March 2000, 271-82.

Motta, M., "Advertising bans," Unpublished working paper, Universitat Pompeu Fabra, Barcelona, ESP, January 1997.

Nelson, J.P., "State monopolies and alcoholic beverage consumption," *Journal of Regulatory Economics* **2**, March 1990, 83-98.

Nelson, J.P., "Economic and demographic factors in U.S. alcohol demand: A growth-accounting analysis," *Empirical Economics* **22**, March 1997, 83-102.

Nelson, J.P., "Alcohol advertising and advertising bans: A survey of research methods, results, and policy implications," in M.R. Baye and J.P. Nelson (eds.), *Advances in Applied Microeconomics 10: Advertising and Differentiated Products* (Amsterdam: Elsevier Science, 2001), pp. 239-95.

Nelson, J.P., "Advertising bans, monopoly, and alcohol demand: Testing for substitution effects using state panel data.," *Review of Industrial Organization*, February 2003 (In Press).

Nelson, J.P., and D.J. Young, "Do advertising bans work? An international comparison," *International Journal of Advertising* **20**, No. 3, 2001, 273-96.

Ornstein, S.O., and D.M. Hanssens, "Alcohol control laws and the consumption of distilled spirits and beer," *Journal of Consumer Research* **12**, September 1985, 200-13.

Phillips, J.M., and E.P. Goss, "The effect of state and local taxes on economic development: A meta-analysis," *Southern Economic Journal* **62**, October 1995, 320-33.

Saffer, H., "Alcohol advertising bans and alcohol abuse: An international perspective," *Journal of Health Economics* **10**, May 1991, 65-79.

Saffer, H., "Advertising under the influence," in M.E. Hilton and G. Bloss (eds.), *Economics and the Prevention of Alcohol-Related Problems* (Washington, DC: NIAAA, 1993), pp. 125-40.

Saffer, H., "Alcohol advertising and alcohol consumption: Econometric studies," in S.E. Martin (ed.), *The Effects of the Mass Media on the Use and Abuse of Alcohol* (Washington, DC: NIAAA, 1995), pp. 277-95.

Saffer, H., "Alcohol advertising and motor vehicle fatalities," *Review of Economics and Statistics* **79**, August 1997, 431-42.

Saffer, H., and D. Dave, "Alcohol consumption and alcohol advertising bans," *Applied Economics* **34**, July 2002, 1325-34.

Schmalensee, R., *The Economics of Advertising* (Amsterdam: North-Holland, 1972).

Schweitzer, S.O., et al., "Alcoholism: An econometric model of its causes, its effect and its control," in M. Grant, et al., (eds.), *Economics and Alcohol* (New York: Harwood, 1983), pp. 107-27.

Simon, J.L., and J. Arndt, "The shape of the advertising response function," *Journal of Advertising Research* **20**, August 1980, 11-28.

Smart, R.G., "Is the postwar drinking binge ending? Cross-national trends in per capita alcohol consumption," *British Journal of Addiction* **84**, July 1989, 743-48.

Smart, R.G., "Trends in drinking and patterns of drinking," in M. Grant and J. Litvak (eds.), *Drinking Patterns and Their Consequences* (Washington, DC: Taylor & Francis, 1998), pp. 25-41.

Smith, V.K., and J-C. Huang, "Can markets value air quality? A meta-analysis of hedonic property value models," *Journal of Political Economy* **103**, February 1995, 209-27.

Standish, W.R., and C.K. Haddock, "Combining estimates of effect sizes," in H. Cooper and L. Hedges (eds.), *The Handbook of Research Synthesis* (New York: Russell Sage, 1994), pp. 261-81.

Stanley, T.D., "Wheat from chaff: Meta-analysis as quantitative literature review," *Journal of Economic Perspectives* **15**, Summer 2001, 131-50.

Stanley, T.D., and S.B. Jarrell, "Meta-regression analysis: A quantitative method of literature surveys," *Journal of Economic Surveys* **3**, No. 2, 1989, 161-70.

Stanley, T.D., and S.B. Jarrell, "Gender wage discrimination bias? A meta-regression analysis," *Journal of Human Resources* **33**, Fall 1998, 947-73.

Tellis, G.J., and D.L. Weiss, "Does TV advertising really affect sales? The role of measures, models and data aggregation," *Journal of Advertising* **24**, Fall 1995, 1-12.

U.S. National Institute on Alcohol Abuse and Alcoholism, *Apparent Per Capita Alcohol Consumption: National, State, and Regional Trends, 1977-97*, (Washington, DC: NIAAA, 1999).

U.S. National Institute on Alcohol Abuse and Alcoholism, "Alcohol advertising: What are the effects?" in *10th Special Report to the U.S. Congress on Alcohol and Health* (Washington, DC: NIAAA, 2000), pp. 412-26.

Wilkinson, J.T., *Alcohol and Accidents: An Economic Approach to Drunken Driving*, Unpublished Ph.D. dissertation, Department of Economics, Vanderbilt University, 1985.

Wilkinson, J.T., "The effects of regulation on the demand for alcohol," Unpublished paper, Department of Economics, University of Missouri, July 1987.

World Health Organization, *Global Status Report on Alcohol* (Geneva: WHO, 1999).

Young, D.J., "Alcohol advertising bans and alcohol abuse: Comment," *Journal of Health Economics* **12**, July 1993, 213-28.

Table 1 – Summary of Cross-National Studies of Broadcast Advertising Bans

Study	Sample & Dependent Var.	Advertising Variables	Explanatory Variables	Econometric Methods
Saffer (1991)	17 OECD nations, 1970-83; log of ethanol per capita	(1) binary var. broadcast ban of spirits; (2) binary var. broadcast ban all ads	price, income, drinking sentiment, & tourism	weighted least-squares, with & without country dummies
Young (1993)	17 OECD nations, 1970-83; log of ethanol per capita	(2) binary var. broadcast ban of spirits; (2) binary var. broadcast ban all ads	price, income, & drinking sentiment	weighted least-squares, with & without serial correlation adjustment
Nelson & Young (2001)	17 OECD nations, 1977-95; log of ethanol per capita	(1) binary var. broadcast ban of spirits; (2) binary var. broadcast ban all ads	log of price, income, sentiment, unemploy rate, tourism, & demographics	weighted least-squares, with & without serial correlation adjustment
Saffer & Dave (2002)	20 OECD nations, 1970-95; log of ethanol per capita	(1) six-point scale no. of media bans; (2) three-point scale ban of all ads	price, income, & drinking sentiment	two-stage least-squares, with & without country dummies; Huber s.e.

Table 2 – Meta-Analysis of Cross-National Studies of Broadcast Advertising Bans

(1) **Study**	(2) **Total Ban coefficient (s.e)**	(3) **T-stat**	(4) **R^2**	(5) **Variance (inverse)**	(6) **Partial Ban coefficient (s.e.)**	(7) **T-stat**	(8) **R^2**	(9) **Variance (inverse)**
Saffer (1991, p75)	-0.3130 (.0930)	3.35	0.59	0.00865 (115.62)	-0.1690 (.0380)	4.40	0.59	0.00144 (692.52)
Saffer (1991, p75)	-0.3440 (.0980)	3.51	0.54	0.00960 (104.12)	-0.1810 (.0400)	4.49	0.54	0.00160 (625.00)
Young (1993, p223 & p226)	-0.1680 (.0880)	1.90	0.98	0.00774 (129.13)	-0.1310 (.0420)	3.10	0.98	0.00176 (566.89)
Young (1993, p223 & p226)	0.0060 (.0300)	0.20	na	0.00090 (1111.1)	0.0110 (.0370)	0.30	na	0.00137 (730.46)
Nelson & Young (2001, p288)	0.0491 (.0316)	1.55	0.66	0.00100 (1000.4)	0.1387 (.0227)	6.12	0.66	0.00052 (1940.6)
Nelson & Young (2001, p288)	0.0113 (.0257)	0.44	na	0.00066 (1514.0)	-0.0140 (.0203)	0.69	na	0.00041 (2426.6)
Saffer & Dave (2002, p1332)	-0.1796 (.1038)	1.73	0.70	0.01077 (92.812)	-0.0972 (.0549)	1.77	0.69	0.00301 (331.78)
Saffer & Dave (2002, p1332)	0.0734 (.1203)	0.61	0.95	0.01447 (69.099)	0.0734 (.0565)	1.30	0.95	0.00319 (313.26)
Sum of Weights	---	---	---	4137.4	---	---	---	7627.2
Weighted Mean (s.d.)	-0.0078 (.0155)	0.99	---	---	-0.0092 (.0115)	1.00	---	---

Notes: s.e. = coefficient standard error (absolute value). T-statistics and other table values reflect rounding errors. R-sq is the coefficient of determination. Variance is the square of the standard error, with the inverse variance of each estimate in parentheses, and sum of the inverse variances at bottom. The table entries for Saffer and Dave are obtained by multiplying by two, each of the following reported parameter estimates and standard errors: -0.0898 (.0519); 0.0367 (.0602); -0.0486 (.0275); and 0.0367 (.0282).

Table 3 – Summary of State-Level Studies of Billboard Advertising Bans

Study	**Sample & Dependent Var.**	**Advertising Variable**	**Explanatory Variables**	**Econometric Methods**
Schweitzer et al. (1983)	35 states, 1975; log per-capita beer; log per-capita spirits	binary variable if ads banned	log of price, income, tourism, outlets, plus 7 other variables	ordinary and two-stage least-squares
Hoadley, et al. (1984)	48 states, 1955-80 (at 5-yr intervals); per-capita spirits	binary variable if billboard ads *allowed*	price, income, tourism, demographics, monopoly state, plus 10 other variables	ordinary least-squares; panel data
Ornstein & Hanssens (1985)	51 states, 1974-78; log per-capita beer; log per-capita spirits	binary variable if billboard ads *allowed*	log of price, income, tourism, demographics, monopoly state, plus 20 other variables	ordinary least-squares; panel data
Wilkinson (1985, 1987)	51 states, 1976-80; log per-capita total ethanol	binary variable if billboard ads banned	log of price, income, outlets, demographics, plus 4 other variables	two-stage least squares; panel data
Nelson (2003)	45 states, 1982-97; log per-capita beer; log per-capita wine; log per-capita spirits; log per-capita total ethanol	binary variable if billboard ads banned	log of price, income, tourism, demographics, monopoly state, regional dummies, plus 4 other variables	wt. least-squares, Huber s.e.; state-specific exponential trend; panel data

Table 4 – Meta-Analysis of State-Level Studies of Billboard Advertising Bans

(1) Study	(2) Total Alc. parameter (s.e)	(3) T-stat	(4) R^2	(5) Variance (inverse)	(6) Spirits parameter (s.e.)	(7) T-stat	(8) R^2	(9) Variance (inverse)
Schweitzer et al. (1983, p117)	-0.0632 (.0508)	1.24	---	0.00258 (387.50)	0.0598 (.0993)	0.60	0.77	0.00986 (101.42)
Schweitzer et al. (1983, p118)	-0.0423 (.0534)	0.79	---	0.00285 (350.69)	0.1246 (.0995)	1.25	0.79	0.00990 (101.01)
Hoadley et al. (1984, p392)	---	---	---	---	0.1220 (.0610)	2.00	0.82	0.00372 (268.74)
Hoadley et al. (1984, p392)	---	---	---	---	0.1010 (.0505)	2.00	0.89	0.00255 (392.12)
Ornstein &Hanssens (1985, p207)	0.0221 (.0201)	1.10	---	0.00040 (2475.2)	0.1050 (.0410)	2.56	0.79	0.00168 (594.88)
Ornstein &Hanssens (1985, p211)	0.0090 (.0292)	0.31	---	0.00085 (1172.8)	0.1750 (.0500)	3.50	0.89	0.00250 (400.00)
Wilkinson (1985, 1987, p12)	-0.0200 (.1190)	0.17	na	0.01416 (70.621)	---	---	---	---
Wilkinson (1985, 1987, p12)	0.0890 (.0600)	1.48	na	0.00360 (277.78)	---	---	---	---
Nelson (2003, p24)	0.0540 (.0092)	5.90	0.90	0.00008 (11815)	0.1280 (.0133)	9.63	0.89	0.00018 (5653.2)
Nelson (2003, p25)	0.0230 (.0167)	1.38	0.88	0.00028 (3585.6)	0.1150 (.0288)	3.99	0.88	0.00083 (1205.6)
Sum of Weights	---	---	---	20135	---	---	---	8717.0
Weighted Mean (s.d.)	0.0382 (.0070)	5.46	---	---	0.1246 (.0107)	11.6	---	---

Notes: s.e. = coefficient standard error (absolute value). T-statistics and other table values reflect rounding-errors. R-sq. is the coefficient of determination. Variance is the square of the standard error, with the inverse variance of each estimate in parentheses and sum of the inverse variances at bottom. The signs for the coefficients from Ornstein and Hanssens (1984) and Hoadley et al. (1984) have been reversed to correspond to bans of billboard advertising. In column (2), the estimates for Schweitzer et al. are weighted averages of the following reported values: (1) beer, -0.1068 (.0592), and spirits, 0.0598 (.0993); and (2) beer, -0.1097 (.0633), and spirits, 0.1246 (.0995). In column (2), the estimates for Ornstein and Hanssens are weighted averages of the following reported values: (1) beer, -0.004 (.023), and spirits, 0.105 (.041); and (2) beer, -0.077 (.036), and spirits, 0.175 (.050).

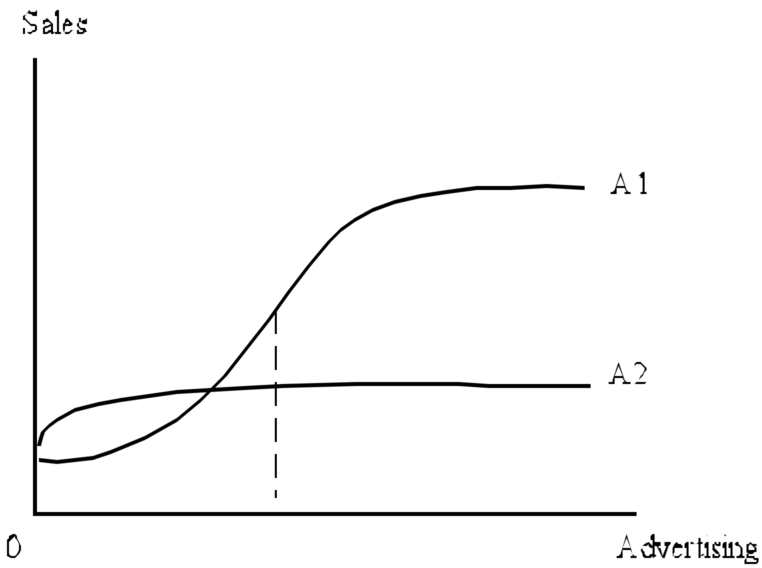

Fig. 1– Industry Advertising Sales-Response Functions