

## Short Communication

### \*Corresponding author

Jon P. Nelson, PhD

Professor Emeritus

Department of Economics

The Pennsylvania State University

University Park, PA 16802, USA

Tel. +01-814-237-0157

Fax: +01-814-237-0157

E-mail: [jpn@psu.edu](mailto:jpn@psu.edu)

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# Economic Evidence Regarding Alcohol Price Elasticities and Price Responses by Heavy Drinkers, Binge Drinkers, and Alcohol-Related Harms: Summary of Results for Meta-Analysis, Systematic Reviews, and Natural Experiments in Alcohol Policy

Jon P. Nelson, PhD\*

Department of Economics, The Pennsylvania State University, University Park, PA 16802, USA

### ABSTRACT

Numerous economic studies examine effects of alcohol price and tax changes on drinking, drinking patterns and alcohol-related harms. The consensus view is that prices are an effective instrument for addressing issues of heavy drinking, binge drinking, and adverse outcomes associated with alcohol. In a series of published studies, I present evidence that this view is overly optimistic, and results for alcohol prices are more varied, complex, or nuanced. This paper provides a brief overview of main results in eight studies. Alcohol tax and price interventions have selective, rather than broad, impacts on sub-populations, drinking patterns, and alcohol-related harms.

**KEYWORDS:** Alcohol policy; Alcohol prices; Health effects.

### INTRODUCTION

Economic theory predicts that consumer demand for products and services responds to changes in real prices or real income, holding other key variables constant (e.g., prices of substitutes, prices of complements, product availability, product promotion, etc.). Theory predicts neither the magnitude of price response by individuals nor exact patterns of responses across groups of individuals. It is not sensible to claim that all individuals respond in the same manner or to the same degree for a tax-induced change in alcohol prices. Establishing the magnitude of price response for individuals and groups requires statistical evidence, possibly based on several different methodologies. These simple observations have been lost in on-going discussions and debate over the role of prices and taxes as alcohol policy instruments. Instead, what is usually reported is something along the following line - "economic studies have demonstrated that increased alcohol taxes and prices are related to reductions in alcohol use and related problems"<sup>1,(p108)</sup>; and there is "... strong evidence that increasing alcohol taxes reduces alcohol-related harm"<sup>2,(p1)</sup> Statements such as these are often based on aggregate econometric studies that fail to account for individual or group responses to price changes. Magnitude and patterns of response are neglected as necessary details for alcohol policy. Further, there is a seeming lack of attention to issues of publication biases in reporting of results. Finally, evidence from "natural experiments" in alcohol policy has been neglected as a basis for public policies.

**Meta-analysis and Publication Bias in Price Elasticity Estimates**

In a series of published reviews, I examine evidence related to alcohol prices, taxes, and patterns of change for both drinking outcomes and alcohol-related harms. Three of my papers use meta-analysis. My analysis adjust aggregate econometric results for several statistical problems, including heterogeneity, heteroskedasticity, statistical outliers, lack of independence among multiple estimates, and publication bias.<sup>3-5</sup> Publication bias is the basic problem that researchers are prone to report statistical results that support pre-conceived notions of publishability, including “correct” signs, statistical significance, and larger (more price elastic) values. The existence of publication bias in both medical and economics literatures are widely recognized,<sup>6,7</sup> and several techniques are available for detecting its existence and correcting for bias.<sup>8,9</sup> Publication bias also is associated with selectivity in discussion of statistical results.<sup>10,11</sup> In Nelson,<sup>3</sup> I correct for publication bias in 114 primary studies that estimate the price elasticity of beer. I conclude that in regression models that correct for selection bias and heterogeneity the average beer price elasticity is about -0.20, which is less elastic by 50% compared to values commonly used in alcohol tax policy simulations”.<sup>3,(p180)</sup> A second meta-analysis<sup>4</sup> reports average price and income elasticity estimates for beer, wine, and spirits. My sample of primary studies exceeds substantially those employed in prior work along similar lines, e.g., compared to Wagenaar et al,<sup>12</sup> there are 135 studies that were not included in their analysis. Correcting for publication bias, I conclude that cumulative price elasticity estimates are about 28% smaller in absolute value for beer; 29% smaller for wine; and 28% smaller for spirits.<sup>4,(p7)</sup> The total price elasticity for alcohol, however, is virtually unchanged (-0.48 compared to a consensus value of -0.50). A key component also for simulation studies is recognition that “affordability” depends critically on changes in real incomes and associated income elasticities.<sup>13</sup> Results for income elasticities also are reported.<sup>3-5</sup>

**Heavy-drinking and Binge Drinking by Sub-populations: Systematic Reviews for Prices and Taxes in Individual Survey Studies**

The consumption of alcohol by some individuals creates external costs for others in the form of drink-driving accidents, crime, violence, family strife, and other physical, financial, and psychological costs. Reducing alcohol demand by increasing alcohol prices might therefore alleviate some of these costs, although as suggested above the magnitude of response has been overstated. More generally, given heterogeneous drinking patterns, addressing alcohol problems through price increases requires that heavy drinkers, abusive drinkers, and other critical sub-populations respond to price changes, and arguably their response should be as large or larger than those who responsibly use alcohol. In a series of three published papers using a systematic-review methodology, I examine robustness of price-tax results for heavy-drinking adults and young adults,

gender-related differences, and binge-drinking by adults, young adults, and youth. In Nelson,<sup>14</sup> I examine 19 individual-based survey studies for prices and heavy drinking by adults and nine studies of prices and cirrhosis mortality. Only two of 19 heavy-drinking studies find a statistically significant and substantial negative price response, and only two of nine mortality studies find a negative price response.<sup>15</sup> In Nelson,<sup>16</sup> I focus on gender-related differences in price responses. Fifteen survey studies are reviewed for drinking and heavy-drinking by adults and eight studies are reviewed for young adults, ages 18-26 years. I report that adult men are less responsive to price compared to women, and heavy drinking by young adults, regardless of gender, is not easily dissuaded by higher prices. Finally, in my third paper,<sup>17</sup> I review results for binge drinking contained in 56 econometric studies, five natural experiments, and six field studies. The results are not robust-null or mixed results are found in more than half of the studies. I conclude that “the body of evidence indicates that binge drinkers are not highly responsive to increased prices”.<sup>17,(p1)</sup> I also demonstrate that literature-search techniques used in other systematic reviews and meta-analyses are biased, and fail to detect or locate numerous economic studies.<sup>17,(p4)</sup>

**Natural Experiments in Alcohol Policy: Surveys of Results for Drinking and Alcohol-Related Harms**

Natural experiments are an important alternative to observational and econometric studies. Indeed, Babor et al<sup>1,(p105)</sup> argue that “studies of what happens when there is a change provide the most valuable evidence on the effects of alcohol policy.” Past reviews such as Elder et al<sup>18</sup> and Wagenaar et al<sup>19</sup> include only two or three studies based on natural experiments for alcohol prices and taxes. Two recent papers, published jointly with Amy Mc Nall,<sup>20,21</sup> provide summaries of this methodology for drinking and alcohol-related harms. In Nelson,<sup>20</sup> we examine 29 primary studies for natural experiments in price or tax policy for five countries-Denmark, Finland, Hong Kong, Sweden, and Switzerland. Primary studies cover a variety of drinking outcomes and sub-populations, and in general such a diversity of results and methods is not amenable to meta-analysis. We conclude that there is “a lack of consistent results for consumption with a general finding that alcohol tax interventions had selective, rather than broad, impacts on sub-populations and drinking patterns”.<sup>20,(p1)</sup> In our second study,<sup>21</sup> we examine 69 outcomes for five categories of alcohol-related harms, including mortality and hospitalizations; assaults and other crime; drink-driving; intoxication; and survey-indexes for alcohol dependency. Nine countries are included: Australia, Denmark, Finland, Hong Kong, Iceland, Russia, Sweden, Switzerland, and United States. We find that most policy-induced changes in taxes and prices had highly selective effects on harms, with Finland and Russia as possible outliers for mortality.

**DISCUSSION**

Taken together, analysis and reviews reported here demonstrate

mixed results for alcohol prices and taxes, including policy-driven natural experiments. This contrasts sharply with arguments presented elsewhere that a broad or population-level increase in alcohol taxes or prices is the most cost-effective or consistent alcohol-policy intervention.<sup>1,(p242)</sup> Our critical analysis and reviews indicate that changes in alcohol prices do not have the same effect on all sub-populations or on all alcohol-related harms. Rather, effects and magnitudes are more selective and nuanced, and depend importantly on the sub-population or harm, social norms, and possibly other variables. Economic models for tax-policy require accurate price parameter estimates, especially for heavy and abusive drinkers.<sup>22</sup> If abusive drinking and alcohol harms are not responsive to prices or depend importantly on particular circumstances-as evidence reviewed here suggests-then more targeted approaches to alcohol control are to be preferred.

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