## Title
A Taxing Experience: Using Quantity Choice Experiments to Model the Likely Effects of a Henry’s Tax Reform in Australia

## I want to submit an abstract for:
Conference Presentation

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## Keywords
Henry’s Tax Reform, Discrete Choice Experiments, Poisson models, Log-log models, Australia

## Research Question
What is the likely impact the Henry's Tax Reform is going to have on quantities of alcoholic beverages (including wines) demanded by Australia?

## Methods
We estimated a series of zero-inflated Poisson models from the data, initially investigating simple models that included only prices, gradually adding complexity with covariate interactions to capture observable heterogeneity.

## Results
The overall results suggest a general decrease in the demand for all alcoholic beverages as prices increase. However, there are few noticeable exceptions in relation to different socio-demographic variables.

## Abstract
Taxes on alcoholic beverages are generally imposed for two main reasons: to raise government revenue and reduce negative externalities due to consumption of products. Australia historically started to tax alcoholic beverages for the first reason, so much so that in 1860 the New South Wales Government derived one third of its revenue from customs and excises on alcohol. However, this contribution progressively decreased, and today...
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alcohol-generated taxes are less than 3% of total Commonwealth tax revenue (Anderson, 2015). Currently, taxes on “sinful” products like alcohol are considered as one way to reduce social and economic costs associated with abusing such products. Although wine consumers exhibit lower incidences of binge drinking (Srivastava and Zhao, 2010), wine plays some role of overall alcohol misuse (MacAvoy, 2010).

Alcoholic beverages in Australia are not treated equally. Beer, spirits and RTDs are taxed on the basis of alcohol content. The former incurs a lower rate due to lower perceived risks of abuse (FARE, 2015); in contrast, wine is taxed as a percentage of its wholesale price. This state of affairs has made low-quality cask wine the cheapest way to get drunk in Australia. Indeed, in some rural and remote areas some groups tend to abuse cask wines (Skov et al., 2010). A comprehensive review of the Australian tax system (the Henry’s Tax Review) suggested three main courses of action to correct the negative externalities generated by the current taxation system: (i) moving to a volumetric excise tax for all alcoholic beverages; (ii) applying excise tax rates that reflect net spillovers that in the first instance are assumed common across beverages; and (iii) removing tax exemptions for small wine producers and international travellers (Henry, 2009).

Unfortunately, only a few studies investigated the impact such reforms are likely to have on production and consumption of alcoholic beverages. A notable exception is Fogarty and Jakeman (2011), who applied a general equilibrium model to the sales of various alcoholic beverages in Australia following introduction of the reform report. Their results indicated that replacing the Wine Equalization TAX (WET) with a revenue-neutral volumetric excise tax would have a small negative impact on the wine industry. However, removing the WET rebate would have a very negative impact on small wineries. More generally, applying the same tax rate on packaged beer to all alcoholic beverages would have a noticeable negative impact on the wine industry. A fairer approach would recognise that different alcoholic beverages have different external costs, and differences in proportions of moderate and abusive consumption (Anderson, 2015). Fogarty (2012) quantified these differences and suggested the optimal tax rates per litre of pure alcohol should be AUD $11 for wine, AUD $37 for beer, AUD $50 for spirits and AUD $77 for RTDs.

A shortcoming of these prior approaches is the number of assumptions their proposed models need to satisfy for the results to be considered valid. Mueller et al. (2011) proposed an alternative approach to overcome some of these limitations to simulate the likely impacts of the reform. They asked a representative sample of Australian consumers to select the types and quantities of different alcoholic beverages they would buy using two Discrete Choice Experiments (DCEs): the first displayed prices under the current tax regime, and the second displayed prices under the new tax regime. Their results indicated the proposed reform would reduce the consumption of all alcoholic beverages, with high-volume products proportionally more affected than low-volume ones. Like Mueller et al. (2011), we undertook two choice experiments to simulate the effects the Henry’s Tax reform would be likely to have on the alcoholic beverages portfolio of Australian consumers. In contrast to Mueller et al. (2011) we embedded the Before-Tax and After-Tax data in one comprehensive model for analysis purposes.

Consumers can (and do) purchase different quantities (units) of alcoholic beverage products, so we designed the two experiments to focus on quantity (unit) decisions. Our quantity choice experiments are Stated Preference (SP) experiments like DCEs (Louviere & Woodworth, 1983). The objective of the quantity choice experiments is to try to anticipate likely impacts of tax changes on quantities of alcoholic beverages (including wines) demanded by Australia consumers. SP experiments, like DCEs, are widely used to model likely effects of changes in markets and product offerings, with wine choices one of many applications. However, the potential impacts of new taxes on quantities of wines and other alcoholic beverages purchased cannot be adequately studied with traditional DCEs as quantity purchases are not discrete choices. As far as we are aware, this is a novel use of SP experiments to observe and model quantity choices.

Specifically, we designed two quantity choice experiments for 14 alcoholic beverages. These experiments are basically Alternative-Specific Pricing DCEs (Louviere et al., 2000 - Chap 6), where each beverage is assigned a range of price levels to reflect current and future price changes associated with tax changes. Experiment 1 assigned each beverage four discrete price levels to cover the range of current market prices; and we used 16 columns from a 4^21 orthogonal main effects design to make 64 purchasing scenarios. We blocked the 64 scenarios into eight versions using two of the 4-level columns (i.e., we recoded one to two levels and then used them to make a 2 x 4). Experiment 2 used the same design, but we changed the price levels for the wine products (Bottled Premium Wine; 1, 2 & 4 Litre Wine Casks; 1 & 4 Litre Casks of Low-Alcohol Wines; and 1 & 4 Litre Casks of Very Low Alcohol Wine Juice Products) to reflect expected prices and the possible entry of two new
innovative beverages if a tax were to be imposed. We recruited people from the Pureprofile Australia online webpanel, screened by whether they buy wine and were willing to participate. We randomly assigned 704 participants to one of eight Before-Tax versions x eight After-Tax versions (between-subject conditions) subject to equal sample size quotas. Both experiments were embedded in an online survey with other questions about wine and alcohol purchases, attitudes and socio-economic covariates (e.g., gender, age, income, etc.). Each respondent completed both eight Before-Tax and eight After-Tax scenarios in that order. Each scenario offered them 14 products they could choose in any quantities they wished. Thus, the observed responses are quantities, so appropriate statistical analyses include count data models. Unlike traditional discrete choice models applied to DCE data, quantity choice experiments ask participants to select the number of units that they think they are likely to buy under each scenario. This naturally leads to models for count data (e.g., Poisson Regression) that allow estimation of demand systems. The quantities purchased before and after introduction of potential new taxes can be analysed under a comprehensive model, from which demand functions, elasticities, and associations with socio-demographic covariates and different alcoholic beverages can be estimated. More specifically, we estimated a series of zero-inflated Poisson models from the data, initially investigating simple models that included only prices, gradually adding complexity with covariate interactions to capture observable heterogeneity. We tried both general linear and log-log specifications, and found that the best model to describe the effect of the tax reform is a log-log model, which includes the effects of the socio-demographic variables both on the intercepts and on the slopes, but assumes away cross-price effects between alcoholic beverages. The model does a good job of predicting the observed quantities demand for the alcoholic beverages.

The overall results suggest a general decrease in the demand for all alcoholic beverages as prices increase. However, there are few noticeable exceptions in relation to different socio-demographic variables, which we now report. The tax reform generates a more significant decrease in the quantities purchased of spirits and RTDs among younger people, while older people seem to decrease purchases of cask wines, regardless of format in which such products are sold. For all other beverages, declines seem proportional across age groups. However, younger people are more sensitive to price changes, with the exception of light beer; older people seem to be more sensitive price changes for 4litre cask wines. Male purchases of light beer tend to decrease less than other beverages, but they appear to be less sensitive to price changes than females.

Large household seem to continue to purchase light beer and mid-full strength beer. Smaller households exhibit higher elasticities for RTDs, light beer and mid-full strength beer; larger households exhibit larger purchase quantity changes. Unemployed people continue to consume mid-full strength beer, but they exhibit the highest elasticities across almost alcoholic beverages, except for bottled premium wines, light beer, mid-full strength beer, cask wine and low-alcohol cask wines. We found no clear pattern associated with levels of education; different educational attainment groups preferred different types of alcoholic beverages. Finally, we found little association with income, apart from an obvious finding that higher income people tended to be less affected by the price changes.

Our results only partially agree with the existing literature. The new tax system clearly reduces consumption of low quality wines, and more generally, low quality alcohol. This is a positive result, as a decrease in alcohol consumption should help reduce negative externalities generated by use and abuse of alcohol. Turning now to the wine industry, a decrease in consumption of cask wines will require structural changes in the way several grape-growers do business, as their profitability, which has progressively been reduced in the last few decades, will decline even further (Anderson, 2015).

This paper is still a work-in-progress. In the next few months we plan to conduct further analysis of substitution effects between beverages before and after introduction of the tax. We would also plan on estimating joint models of those who buy none or one or more units of any given beverage to see if the proposed tax reform leads to both a change in the way in which alcoholic beverages are chosen and the quantities chosen given that someone buy at least one unit.

References