Tax Design in the Alcohol Market

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How to design corrective taxes in alcohol market?

- Alcohol consumption generates large social costs
  - Alcohol is a causal factor in over 60 medical conditions – *The Lancet*
    - 27.1%/18.9% of cancer deaths in women/men over 50 linked to alcohol
    - Among those aged 15-49, alcohol was the leading risk factor in 2016
  - 1% of deaths in 2016 directly linked to alcohol abuse – *NHS*
  - Alcohol harms are estimated to cost the NHS ∼3.5 billion GBP annually
  - 13% of all deaths in traffic accidents in 2016 involved drink-driving – *NHS*
  - each year over 1.2 million violent incidents linked to alcohol misuse – *NHS*

Griffith, O'Connell and Smith

- Estimate preferences using homescan data & find that
  - heavy drinkers prefer strong spirits than other drinks
  - planner can target heavy drinkers by levying higher tax rate on spirits
  - & encourage them to switch to less strong alcohol products

- Gains from multi-rate system depend on
  - substitution patterns across different types of alcohol
  - externalities' concentration: the more concentrated, the higher the gains
    1. if externalities are linear in alcohol consumption,
       no gains from redistribution $\Rightarrow$ a single tax rate achieves the first best
    2. if externalities are convex in alcohol consumption,
       gains from redistribution $\Rightarrow$ a differential tax rate would increase welfare

Roadmap

- Details about the pillars of these results
    1. elasticities of consumers
    2. curvature/concentration of externalities

- Are there threats to these pillars?

Set up

Social planer maximizes

$$W = \text{consumer surplus} + \text{tax revenue} - \text{social costs}$$

1. consumer surplus + tax revenue
   - consumers' price elasticities

2. social costs
   - sum of consumers' externalities $\Phi = \sum_i \phi(Z_{it})$

The Model

- Consumers choose product-sizes to maximize their utility

$$\max_j \quad -\alpha_i q_{i0} + f_i(x_j) + \varepsilon_{ij}$$
$$s.t. \quad p_0 q_{i0} + p_j = y_i$$

  $\Rightarrow$ i's indirect utilities are $u_{ij} = \alpha_i p_j + f_i(x_j) + \varepsilon_{ij}$

- Model is separately estimated for each quintile of consumption

- $q_{ijt}(\underbrace{\theta_i}) =$ probability that consumer i chooses product-size j

  vector of price effects and preference parameters

- $s_{jt} =$ market share of product-size j

- For each quintile d the implied price elasticities are

$$\eta_{jkt}^d = \begin{cases} -\frac{p_{jt}}{s_{jt}} \int \alpha_i q_{ijt}(\theta_i)(1 - q_{ijt}(\theta_i)) dF^d(\theta) & \text{if } j = k \\ \frac{p_{jt}}{s_{jt}} \int \alpha_i q_{ijt}(\theta_i) q_{ikt}(\theta_i) dF^d(\theta) & \text{otherwise} \end{cases}$$

Estimation of elasticities

- Data: Kantar Worldpanel
  - Households record information of purchases for in-home consumption

- Identification
  - Longitudinal variation in consumption & prices identify price effects
  - Cross-sectional variation provides identifying variation to get at preferences

Potential concerns from data

- Magnitude of variation used to estimate price effects may be small
  - Proposed taxes (assuming heavy drinkers generate 80% of externalities)
    - ∼40% higher than UK taxes for beer
    - ∼27% higher than UK taxes for strong spirits
  - How large is the variation used to estimate price effects?
  - A table detailing degree of price variation in the data would help

Consumers' Externalities

- Evidence that externalities of alcohol are weakly convex
  - social costs of alcohol are at least increasing in alcohol
  - largest costs of alcohol are caused by people who drank heavily

- Assume $\Phi = \sum_i \left(\phi_0 Z_{it} + \phi_1 Z_{it}^2 \right)$

- Paper characterizes optimal taxes under different values of (ϕ_0, ϕ_1)

To Conclude...

- It is possible to decrease heavy drinking by using a multi-rate taxes
  - higher tax rates on spirits can decrease heavy-drinkers' consumption

- In order to implement multi-rate system, need reliable estimates of
  1. price elasticities
  2. concentration of externalities

- Griffith, O'Connell and Smith
  - provide reliable estimates of price elasticities
  - persuade us that there are large gains from estimating (ϕ_0, ϕ_1)
    - What are the costs of alcohol consumption?
      - there are health consequences (internalities) as well as externalities
      - how do we quantify damages from violence due to alcohol abuse?

References

📄 Griffith, O'Connell and Smith (2018)
Tax design in the alcohol market
IFS Working Paper W17/28.

📄 Max G. Griswold, Nancy Fullman, Caitlin Hawley, et al. (2018)
Alcohol use and burden for 195 countries and territories, 1990-2016: a systematic analysis for the Global Burden of Disease Study 2016
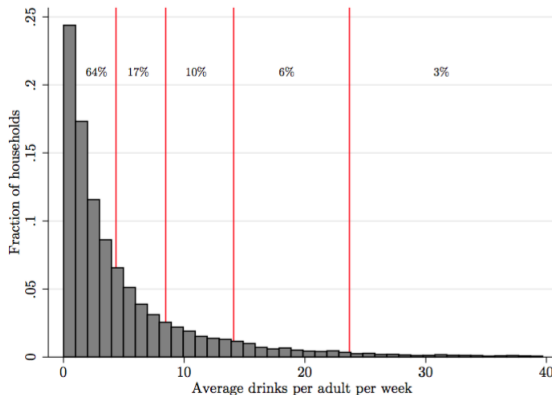The Lancet 388.10053 (2018): 1659-1724.

🌐 Statistics on Alcohol, NHS

🌐 Alcohol's Effects on the Body
National Institute of Alcohol Abuse and Alcoholism, NIH

Figure 3.1: *Distribution of drinkers*

Notes: *Distribution drawn across 11,634 households. The red lines mark the cutoffs between drinking quintiles, which each constitute 20% of total drinks purchased; these are located at: 4.4, 8.5, 14.1, 23.7 drinks per adult per week. The numbers show the percentage of households in each quintile. Numbers are based on the pre-sample period.*
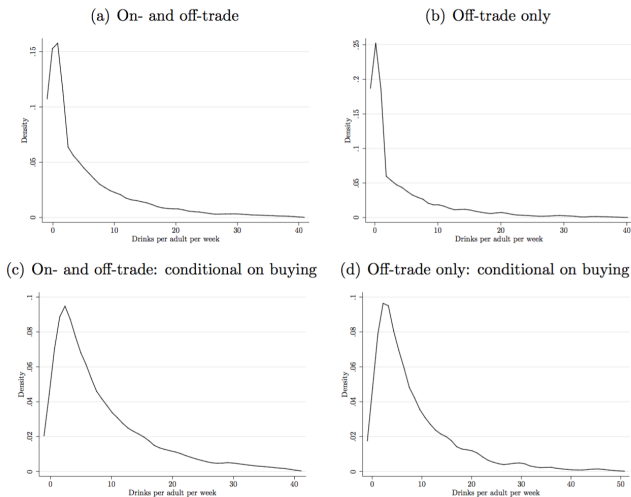
Distribution of ethanol with & without "on-trade" data

Figure A.2: *Distribution of ethanol purchases: on- and off-trade*

(a) On- and off-trade

(b) Off-trade only

(c) On- and off-trade: conditional on buying

(d) Off-trade only: conditional on buying

Heavy drinkers

- Binge drinking is defined as
  - Exceeding 8 units (= 80 ml of ethanol) in a single occasion for men
    $\sim$ 4 pints of normal strength beer or three-quarters of a bottle of wine
  - Exceeding 6 units (= 60 ml of ethanol) in a single occasion for women
    $\sim$ 3 pints of normal strength beer or 2 large glasses of wine

- "binge drinking accounts for $\sim 3/4$ of the cost of excessive alcohol use"
  (Center for Disease Control and Prevention (2016))

- Heavy drinkers: consumers in the top 3 quintiles of alcohol purchases
  per adult per week
  - These are households who consumed at least 8.5 drinks/adult/week

Data: Kantar Worldpanel

- Households record information of purchases for in-home consumption

- Caveats
  - does not contain "on-trade" purchases: 23% of alcohol sold
    - Ethanol purchase heterogeneity similar with & without "on-trade" data

    ▸ figure

  - It does not contain individual consumption: why would households split alcohol in the household equally?

  - High attrition for younger adults (<25 years old) *Leicester et al. (2009)*
    - young adults who over drink may be under-represented

    ▸ figure

Heavy drinkers

Proportion of people aged 16-24 who drink, has decreased but when they drink they are likely to drink more than 6-8 units

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