

# The corrective and distributional implications of sin taxes

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IIPF Glasgow

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# Sin taxes

Taxes are a tool to improve social welfare when consumption imposes unaccounted for costs on others

- ▶ externalities

- ▶ Pigou, 1920; Diamond, 1973, ....
- ▶ e.g. alcohol taxes
- ▶ alcohol related violent crime, domestic violence, road traffic deaths; costs likely not taken account of at time of consumption
- ▶ raising price can internalise these externalities

# Sin taxes

More recently taxes have been advocated as a tool to reduce consumption that imposes unaccounted for costs on your future self

## ▶ internalities

- ▶ Gruber and Koszegi, 2004; O'Donoghue and Rabin, 2006; Haavio and Kotakorpi, 2011; Allcott, Mullainathan and Taubinsky, 2014, ...
- ▶ e.g. taxes on sugar sweetened drinks
- ▶ excess sugar consumption is bad for health, particularly in children has adverse long-term consequences; costs likely not taken account of at time of consumption
- ▶ raising price can (potentially) improve welfare by getting people to account for these internalities

# This talk

## Taxes on alcohol and sugar sweetened drinks

- ▶ are they well targeted?
  - ▶ a well targeted policy reduces purchases most by those whose marginal consumption creates the largest social costs
    - ▶ **social costs** = internalities + externalities

when we consider (more) realistic market settings

- ▶ **consumers are heterogeneous** in their behaviour and preferences
- ▶ the commodity that generates social costs (ethanol or sugar) is purchased in products that have other characteristics, and sold in **many differentiated products**

What potential is there for welfare gains from **proposed reforms**?

# Consumer heterogeneity is important

If **homogeneous marginal externality** and a **homogeneous good**

- ▶ tax can fully correct for the externality (Pigou, 1920)

If **heterogeneous marginal externalities** and a **homogeneous good**

- ▶ a linear tax can no longer achieve the first best (Diamond, 1973)
- ▶ optimal tax rate equal to weighted average marginal externality

If **heterogeneous marginal externalities** and a **heterogeneous good**

- ▶ optimal tax is a function of correlation between externalities and demand shape (Griffith, O'Connell and Smith, 2019)
  - ▶ allows possibility of targeting products that high social cost consumers prefer (a form of tagging, Akerlof, 1978)

# Alcohol taxes

Most countries have a combination of

- ▶ **Excise taxes**

- ▶ typically on volume of liquid
- ▶ sometimes on alcohol content

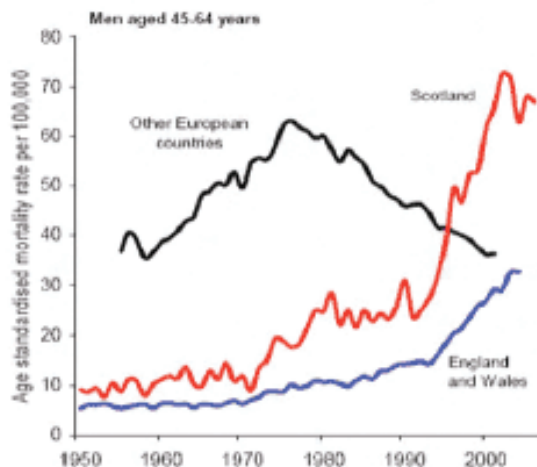
- ▶ **Ad valorem taxes** on price

- ▶ **Price regulations**

- ▶ in the US markup regulations, effect similar to ad valorem tax
- ▶ more recently **minimum unit prices**
  - ▶ set a price floor per unit of alcohol
  - ▶ **introduced in Scotland in May 2018**
  - ▶ passed into law in Ireland, being considered in England and Wales

# SCOTLAND OUT OF STEP

## Liver Cirrhosis Death Rates 1950 - 2006



David A. Lacey, Jim Mc C

Lancet 2006; 367:

on. Published online February 25, 2006. Copyright

# Alcohol taxes

Are alcohol taxes well targeted at reducing social costs?

- ▶ externalities in the form of violence, accidents, anti-social behaviour, etc.
- ▶ internalities in the form of liver cirrhosis and other poor health, social and economic outcomes

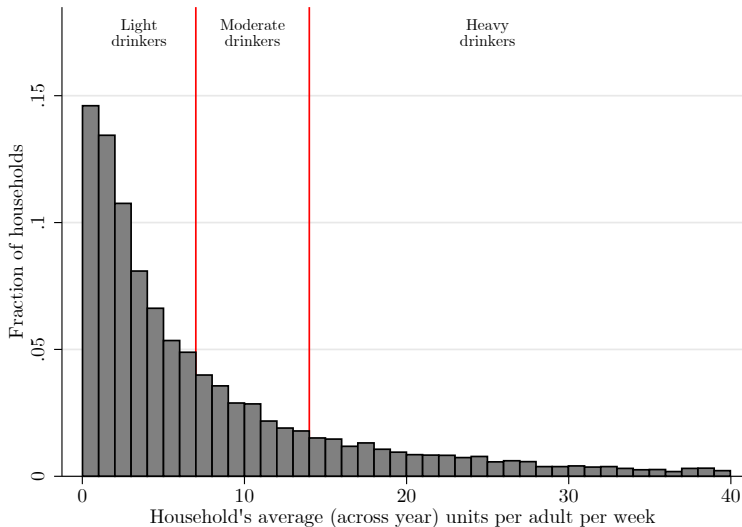
In order to answer that question we need to know:

- ▶ the distribution of social costs across consumers
- ▶ the shape of demand, and how it correlates with social costs
- ▶ (firm responses)



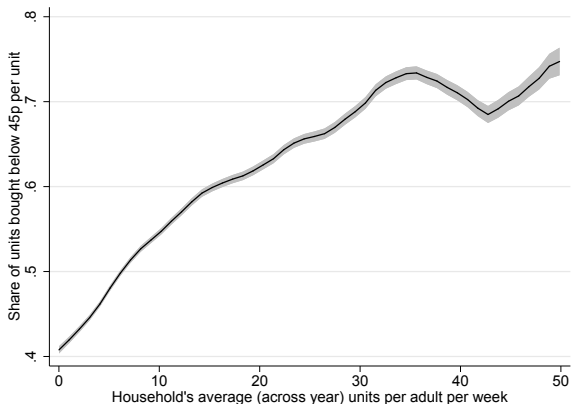
# Distribution of alcohol purchases in the UK

We assume generation of social costs is higher amongst heavy drinkers



# Heavy drinkers buy cheaper alcohol

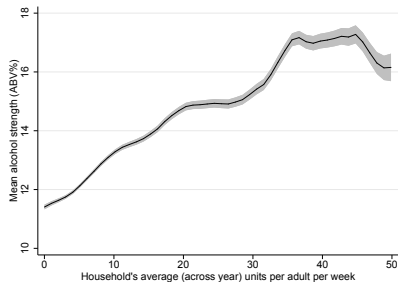
Share of units bought below 45p/unit



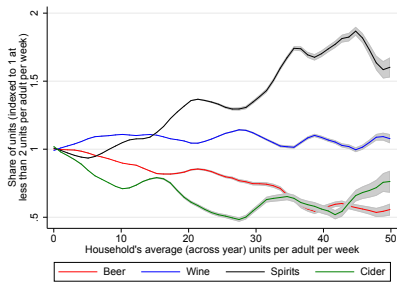
Advocates of the minimum unit price argue it is better targeted at reducing alcohol misuse and problem drinking, while limiting the impact on light and moderate drinkers, than taxes because it raises the price of cheap alcohol, which is disproportionately purchased by the heaviest drinkers.

# Heavy drinkers buy stronger drinks

(a) strength of units purchased



(b) share of units purchased



Heavy drinkers also disproportionately purchase stronger alcohol. Taxes can raise the price of stronger alcohol by more than weaker alcohol.

# Consumer demand

Consumer indirect utility:

$$V_i(y_i, \mathbf{p}, \mathbf{x}) = \alpha_i y_i + v_i(\mathbf{p}, \mathbf{x})$$

- ▶  $i$  consumers,  $j$  differentiated products
- ▶  $y_i$ : income;  $\alpha_i$ : marginal utility of income
- ▶  $\mathbf{p} = (p_1, \dots, p_J)'$  post-tax prices
- ▶  $\mathbf{x}_j$  product characteristics
  - ▶ includes  $z_j$  - characteristic that generates social costs (ethanol)

Yields demand functions:

$$q_{ij} = f_{ij}(\mathbf{p}, \mathbf{x})$$

## Consumption generates social costs

Consumption generates social costs (i.e. not considered by the individual when making consumption decision)

- ▶ Derived demand for  $Z_i$  (ethanol)

$$Z_i = \sum_j z_j q_{ij}$$

- ▶ The social cost associated with consumer  $i$ 's ethanol consumption is  $\phi_i(Z_i)$
- ▶ total social costs are

$$\Phi = \sum_i \phi_i(Z_i)$$

## Policy maker's problem

The policy maker trades off benefits of minimising social costs against reduction in consumer surplus that arises due to the higher prices

- ▶ the policy maker sets rates,  $\tau$
- ▶ the social welfare function is:

$$W(\tau) = \underbrace{\sum_i \left[ y_i + \frac{v_i(\tau)}{\alpha_i} \right]}_{\text{consumer surplus}} + \underbrace{R(\tau)}_{\text{tax revenue}} - \underbrace{\Phi(\tau)}_{\text{external costs}}$$

- ▶ if policy maker can set **consumer specific taxes** equal to consumer's marginal social cost we get first best

$$\tau_i^* = \phi'_i(Z_i(\tau_i^*))$$

## Optimal tax policy

If the policy maker can only set one single tax rate, this is:

$$\tau^* = \bar{\phi}' + \frac{\text{cov}(\phi'_i, |Z'_i|)}{|\bar{Z}'|}$$

$\bar{\phi}'$  : average marginal social cost across consumers

$\bar{Z}'$  : average own tax slope of demand for  $z$  (ethanol, sugar)

$\text{cov}(\phi'_i, Z'_i)$  : covariance in the slope of demand for  $z$  and marginal social costs across consumers

Corresponds to Diamond (1973)

- ▶ the more strongly correlated are marginal social costs and the tax slope of demands for  $z$ , the more effective is the tax at correcting for the social costs of consumption and higher is the optimal rate

# Optimal tax policy

If there is:

- ▶ heterogeneity in externalities:  $\phi_i \neq \phi$
- ▶ heterogeneity in demands (e.g. some like beer, others wine, ...)
- ▶ and these forms of heterogeneity are correlated
  - ▶  $\text{Cov}(\phi'_i, Z'_{ik}) > 0$ ,  $k$  indexes sets of products (e.g. beer, wine, ...)
- ▶ Then if the policy maker can set several rates  $\tau = (\tau_1, \dots, \tau_K)'$ 
  - ▶ the optimal tax rates are pinned down by first order conditions

$$\sum_i \sum_k (\tau_k - \phi'_i) \frac{\partial Z_{ik}}{\partial \tau_l} = 0$$

- ▶ and the optimal taxes will vary across  $k$  (a form of tagging)



## Demand estimates

Key to understand affect of policy is shape of demand and how correlated with consumers' marginal externalities

- ▶ Griffith, O'Connell and Smith (2019) "Tax design in the Alcohol Market" *Journal of Public Economics* and recent extensions
  - ▶ we estimate a discrete choice model of alcohol demand with rich heterogeneity in the preferences and price responsiveness of different types of drinker
  - ▶ estimated preference parameters from the demand model yield a set of own and cross price elasticities that describe how households switch between alcohol products and towards no purchase
  - ▶ heterogeneity by light/medium/heavy drinkers allows us to (roughly) capture correlation between marginal social costs and demand shape

# Data

- ▶ Longitudinal data on a panel of British households off-trade alcohol purchases (from the Kantar Worldpanel):
  - ▶ panel of 11,634 households that purchase alcohol
  - ▶ records transaction level prices, product information (incl. brand, ABV), pack size
  - ▶ we observe households for an average of 40 weeks a year
  - ▶ drawback: we do not observe on-trade alcohol purchases
- ▶ This data allows us to convincingly identify the impact of price on what products people choose:
  - ▶ we use only variation in actual barcode level prices
  - ▶ that is driven by “cost shifters” e.g. producer prices, tax rates

## Switching across disaggregate products

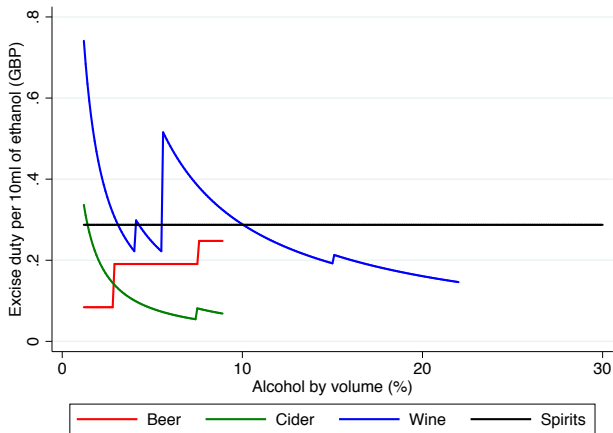
- ▶ It is common in the literature to aggregate products into a relatively small number of categories (e.g. beer, wine etc.)
  - ▶ but this masks the considerable variation in price and alcoholic strength within category
- ▶ Or to estimate disaggregate demand model for just one category (e.g. beer or spirits)
- ▶ We model the choice between 32 different products, available in a range of pack sizes:
  - ▶ aggregate together only similarly priced and strength barcodes
- ▶ These are important if taxes affect products differently within broad categories, if consumers have heterogeneous preferences, and if there is substitution across categories

## Demand estimates

We use these estimates to simulate the effects of potential policy reforms

- ▶ product level own price elasticities
  - ▶ the heaviest drinkers are the most price sensitive
- ▶ cross price elasticities
  - ▶ heavier drinkers having higher cross-price elasticities
  - ▶ this heterogeneity across consumers is important
  - ▶ this mean the overall price elasticity of demand for ethanol (i.e. the % change in demand for alcohol overall that follows a 1% price increase in all alcohol) is lower for heavier drinkers, they are more likely to substitute to other alcohol products, and less likely to substitute to no purchase [▶ Detail](#)

# UK volumetric and specific taxes on alcohol



Note: General VAT rate also applies to alcoholic beverages

## We can improve on existing alcohol taxes

We show that we can move a considerable way towards the optimal Pigouvian tax by setting product level tax rates (e.g. on beer, wine, spirits....)

- ▶ these exploit correlations in preferences (demand curvature) with the marginal externality (i.e. targeting products that high social cost consumers prefer, a form of tagging)

To implement this in practice requires that we know more about the marginal externality function (it's convexity and how it correlates with the shape of demand)

- ▶ allowing heterogeneity along light/medium/high drinkers approximates this but only roughly
- ▶ an important area of future work

# What about Minimum Unit Price?

Consider Minimum Unit Price (MUP) of 45p per unit of alcohol

- ▶ Compare to two tax reforms that achieve the same aggregate reduction in alcohol consumption
  - ▶ increase excise taxes by 4p,
  - ▶ increase ad valorem tax by 12 percentage points

## Policy reforms

The MUP is better targeted at heavy drinkers

- ▶ share of reduction in alcohol consumption accounted for by:

	MUP	Excise	Ad valorem
Light drinker	27%	36%	39%
Moderate drinker	21%	20%	20%
Heavy drinker	52%	44%	41%
	100%	100%	100%

However, the MUP transfers revenue from the government to industry

	MUP	Excise	Ad valorem
Consumer surplus	-654.4	-1030.0	-1126.8
Tax revenue	-552.8	62.0	119.0
Industry revenue	204.6	-464.1	-543.1

(£million per year)

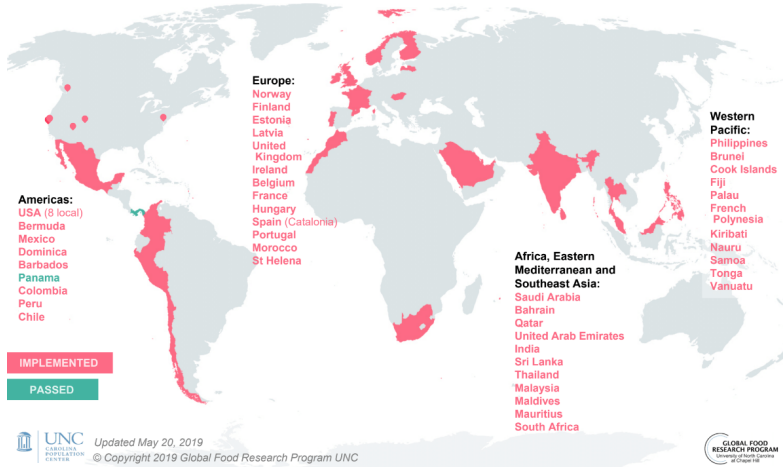


# Sugary drinks taxes

Differ from alcohol taxes in a number of interesting ways:

- ▶ less scope for targeting/tagging, doesn't seem to be the same identifiable correlation between preferences (the shape of demand) and social costs
- ▶ motivated largely by externalities, particularly in children growing up in low socioeconomic households
  - ▶ raises particular equity concerns

# Sugary drink taxes around the world



▶ Europe

▶ USA

▶ Americas

▶ Africa and Asia

# Sugary drinks taxes

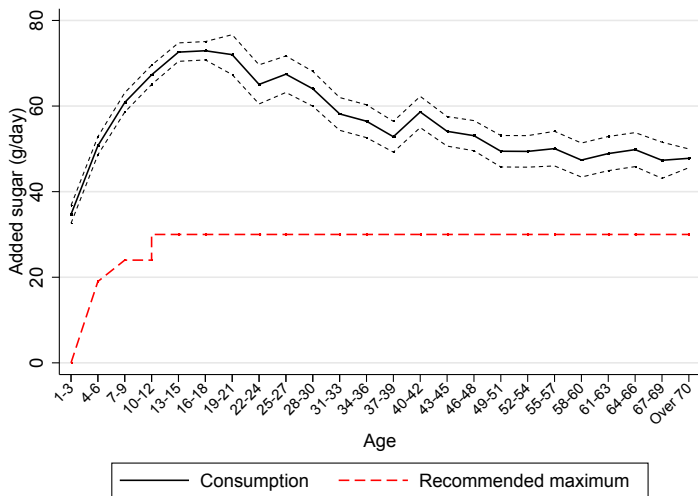
As of August 2019 sugary drinks taxes have been introduced in 50 jurisdictions

- ▶ How effective are they?
  - ▶ what is the extent of externalities and how are they distributed
  - ▶ what is the shape of demand and how does it correlate with externalities
  - ▶ what are the likely distributional consequences
  - ▶ (firm responses)

# Sugar is (massively) over consumed

particularly by children

Average added sugar consumption (g/day) by age



# What is the evidence on internalities?

Consumption above recommendation in itself doesn't imply internalities

- ▶ Excess sugar consumption:
  - ▶ leads to obesity, type 2 diabetes, heart disease, cancers, etc...
  - ▶ is associated with poor mental health and poor school performance
  - ▶ childhood nutrition is a determinant of later life health, social and economic outcomes and of persistent inequality
- ▶ Do consumers make optimisation errors, e.g. because they
  - ▶ suffer from temptation and a lack of self-control
    - ▶ Cherchye et al (2017) "A new year, a new you? Temptation and self-control in food purchases" CEPR WP [▶ Detail](#)
  - ▶ lack the cognitive ability or will to evaluate information effectively
    - ▶ Dubois, Griffith and O'Connell (2018) "The effects of banning advertising in junk food markets" in *REStudies* [▶ Detail](#)

## Equity concerns

Internality taxes are rationalised as a way to help people who will later regret their consumption choices

- ▶ if effective the tax will lead to fewer regrets about poor choices, but they will also have less income
- ▶ if high internality individuals tend to be lower income
  - ▶ poverty, lack of self-control and low cognition are correlated (and possibly causally related)
- ▶ tax might serve a self-control function that benefits lower income groups more
  - ▶ but only when they are more price sensitive, so respond to the tax
  - ▶ if internalities driven by self-control problems or inattention demand responsiveness may be low
  - ▶ they may pay the tax while also subsequently bearing most of the costs of internalities

# Demand estimates

Dubois, Griffith and O'Connell (2019) "How well targeted are soda taxes?" CEPR WP

- ▶ estimate demand for drinks for **immediate consumption** ("on-the-go")
- ▶ exploit longitudinal data to identify **individual specific preference parameters** for price, sugar and soda
  - ▶ allows flexible identification of marginal and joint distributions of preference parameters
  - ▶ we don't measure internalities, we correlate shape of consumer specific demands with age, **total** sugar consumption (in grocery basket over a year), income

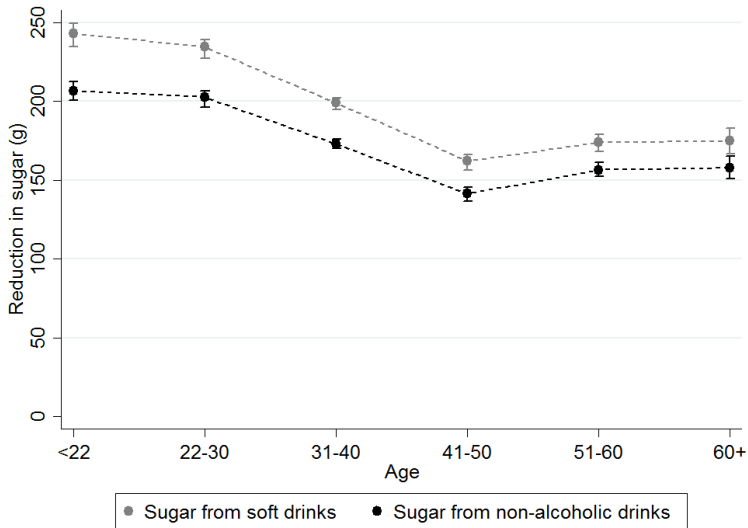
# The shape of soda demand

- ▶ Prices
  - ▶ consumers dislike higher prices, considerable heterogeneity, not normally distributed, poorer households dislike price more
- ▶ Sugar
  - ▶ some consumers have strong preferences for sugary soda, others for diet, not normally distributed, high overall sugar consumers have stronger preferences for sugar in soda
- ▶ Soda
  - ▶ some consumers have strong preferences for soda, others don't
- ▶ Covariance matrix of preferences over price, soda and sugar is unrestricted (assumed stable over time)



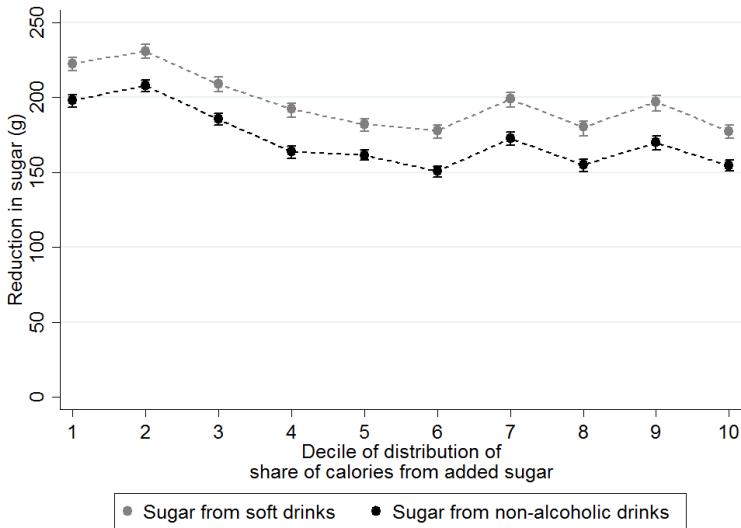
# Impact of sugary drinks tax

reductions in sugar by age



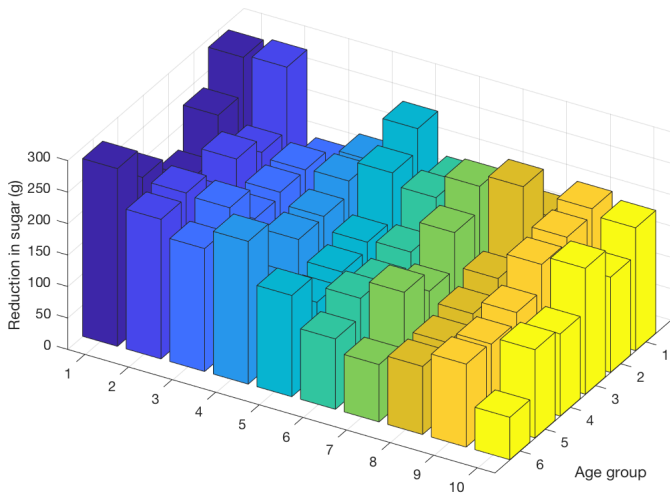
# Impact of sugary drinks tax

reductions in sugar by total dietary sugar



# Impact of sugary drinks tax

reductions in sugar by age and total dietary sugar



Decile of distribution of share  
of calories from added sugar

## Evaluating the impact of sugary drinks tax

Compensating variation is largest among the young, those with high levels of dietary sugar, and those from relatively poor households

- ▶ if no externalities then these groups would be made worse off by the tax
- ▶ if externalities then compensating variation captures only part of the total consumer welfare effect of the tax
- ▶ considering individuals aged 13-21, our estimates imply:
  - ▶ average compensating variation is £6.47
  - ▶ average reduction in sugar is 207g
  - ▶ if the externality associated with drinking a can of Coca Cola is above £1.10, then the soft drinks tax will be welfare improving
  - ▶ if tax revenue is redistributed lump-sum to soda purchasers then this threshold would be £0.50 per can of Coca Cola

# Firm responses

So far I haven't talked about firms, and how they might respond.

- ▶ we need to consider how firms decide prices and the pass-through of taxes
- ▶ recent interest in policies that encourage firms to reformulate products to reduce sugar, salt, calories, etc. [▶ Soft Drinks Example](#)
- ▶ advertising is one way that firms might distort/exploit consumers' decision making biases, regulated in many countries; how do firms advertising choices interact with pricing decisions, etc.
- ▶ other strategic responses

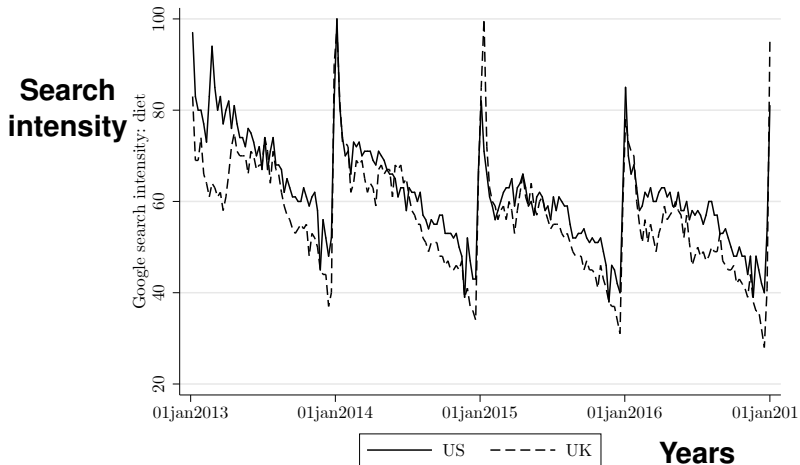
# Final comments

- ▶ Increased public policy interest in using taxes to address paternalistic concerns about consumers who appear to make “mistakes”
  - ▶ standard economics tools (combined with rich data) mean that we have a lot to add to the discussion about the design of these taxes, and other policies
    - ▶ they can have important redistributive effects
    - ▶ we need to know more about the shape of demand and the nature of externalities in order to apply the insights from optimal tax literature
    - ▶ there are very interesting questions about how firms respond to different policies and so what new equilibria will arise
- ▶ These are all promising avenues for future research

Thank you

# Self-control problems?

Google search intensity for “healthy food” [▶ Back](#)



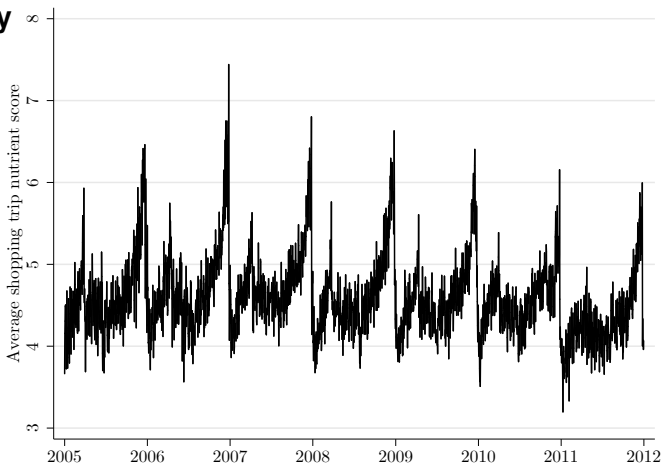
*Cherchye, De Rock, Griffith, O'Connell, Smith and Vermeulen (2017)*



# Self-control problems?

Nutritional quality improves in January and then declines over the year [▶ Back](#)

**Unhealthy**



**Healthy**

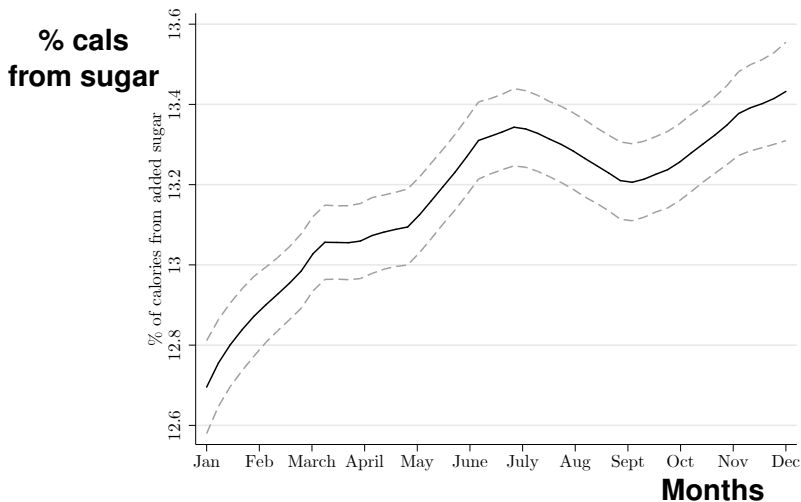
**Years**

*Cherchye, De Rock, Griffith, O'Connell, Smith and Vermeulen (2017)*

# Self-control problems?

Sugar consumption declines in January and then increases over the year

▶ Back



*Cherchye, De Rock, Griffith, O'Connell, Smith and Vermeulen (2017)*

# Inattention and advertising [▶ Back](#)

- ▶ we estimate demand for potato chips, and show that advertising shifts consumers' willingness to pay for the healthier varieties of potato chips

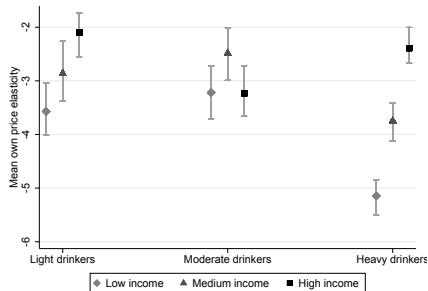
	Advertising level		
	None	Medium	High
willingness to pay for healthier product, % of mean price	1.6 [1.2, 2.0]	-0.2 [-0.4, 0.2]	-1.5 [-1.8, -1.1]

*numbers in [] are confidence intervals*

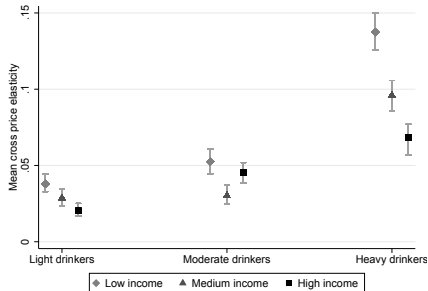
# Elasticities across types of drinkers and income levels

▶ Back

(c) Own price



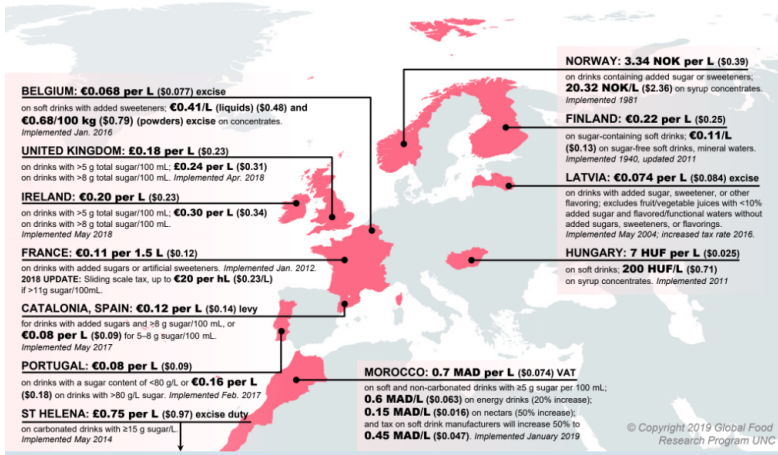
(d) Cross price



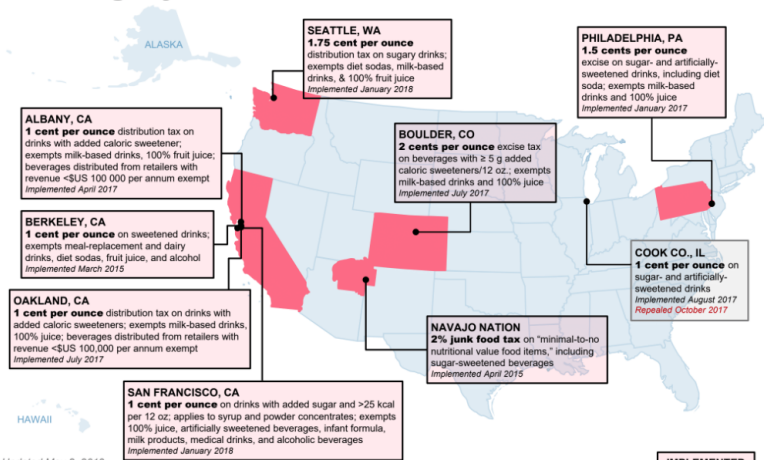
Updated May 2, 2019

IMPLEMENTED

# Sugary drink taxes: Europe & Northern Africa



# Sugary drink taxes in the United States



IMPLEMENTED

Updated May 2, 2019

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PASSED

# Sugary drink taxes: Americas

## SEATTLE, WA: 1.75 cents per ounce

on sugary drinks; exempts diet sodas, milk-based products, & fruit juice. Implemented January 2018

## SAN FRANCISCO, CA: 1 cent per ounce

on drinks with added sugar and >25 kcal per 12 oz; applies to syrup and powder concentrates; exempts 100% juice, artificially sweetened beverages, infant formula, milk products, medical drinks, and alcoholic beverages. Implemented January 2018

## ALBANY, CA: 1 cent per ounce

on drinks with added caloric sweetener; exempts 100% juice, artificially sweetened beverages, infant formula, milk products, medical drinks, and alcoholic beverages. Implemented April 2017

## BERKELEY, CA: 1 cent per ounce

on sweetened drinks; exempts meal-replacement and dairy drinks, diet sodas, 100% fruit juice, and alcohol. Implemented March 2015

## OAKLAND, CA: 1 cent per ounce

on drinks with added sugars; exempts 100% juice, artificially sweetened beverages, infant formula, milk products, medical drinks, and alcoholic beverages. Implemented July 2017

## MEXICO: 1 peso per liter (\$0.05)

on all drinks with added sugar, excluding milks or yogurts. Implemented Jan. 2014

## PANAMA: 8% tax on sweetened beverages;

10% tax on syrups and concentrates. Implementation TBD

## COLOMBIA: VAT on soft drinks

now applied as multi-phase tax at production, distribution, and commercialization phases of supply chain (previously VAT only applied to production phase). Implemented Jan. 1, 2019

## PERU: 25% tax (increase from 17%)

on non-alcoholic beverages with ≥6 g sugar/100 mL; drinks with <6 g sugar/100mL, including bottled waters, remain at 17% tax rate. Implemented May 2018

## BOULDER, CO: 2 cents per ounce

on beverages with added sugars or sweeteners. Implemented Jul. 2017

## PHILADELPHIA, PA: 1.5 cents per ounce

on sugar- and artificially-sweetened drinks, incl. diet soda. Implemented Jan. 2017

## NAVAJO NATION: 2% junk food tax

on "minimal-to-no nutritional value food items," including sugar-sweetened beverages. Implemented Apr. 2015

## BERMUDA: 75% import tax

on sugar, sugary drinks, candies and dilutables; exempts diet sodas, 100% juice, and diet iced teas. Implemented Oct. 2018, increased from 50% import tax implemented Oct. 2018

## DOMINICA: 10% excise tax

on food and drinks with high sugar content, including soft drinks and energy drinks. Implemented Sept. 2015

## BARBADOS: 10% excise tax

on sugary drinks, including carbonated soft drinks, juice drinks, and sports drinks; exempts 100% juice, coconut water, and plain milk. Implemented Aug. 2015

## CHILE: 18% ad valorem tax

on sugary drinks containing >6.25 g sugar/100 mL; includes all non-alcoholic drinks with added sweeteners; exempts 100% fruit juice and dairy-based beverages. 10% ad valorem tax on drinks with <6.25 g sugar/100 mL. Implemented Oct. 2014

Updated May 20, 2019

IMPLEMENTED

## Sugary drink taxes: Sub-Saharan Africa, Asia, & Pacific

### INDIA: 12% goods and services tax on all processed

packaged beverages and foods; **additional 28% GST** on aerated beverages and lemonades.

Implemented Jul. 2017

### UNITED ARAB EMIRATES: 100% excise tax

on energy drinks; **50% tax** on all carbonated drinks except sparkling water. Implemented Oct. 2017

### QATAR: 100% excise tax on energy drinks;

**50% tax** on sweetened aerated drinks and concentrates intended to be made into carbonated drinks. Implemented Jan. 2019

### BAHRAIN: 100% excise tax

on energy drinks, **50% excise tax** on aerated soft drinks. Implemented Dec. 2017

### SAUDI ARABIA: 100% excise

on energy drinks, **50% tax** on sweetened drinks. Implemented Jun. 2017, updated Jan. 2019 to include all drinks with added sugars (prev. only aerated)

### MAURITIUS: MUR 0.03

**per g sugar** (\$0.0088)

on sodas, syrups, and fruity drinks with added sugar. Implemented Jan. 2013, updated Oct. 2016

### SOUTH AFRICA: ZAR 0.021 per g sugar (\$0.0015)

on sugary drinks and concentrates (4g per 100mL exempt). If sugar not labeled, default tax based on 20 g sugar/100mL; exempts dairy drinks and fruit, vegetable juices. Implemented Apr. 2018

### PHILIPPINES: 6 pesos per L (\$0.11)

on drinks using sugar and artificial sweeteners; **P12 per L (\$0.23)** on drinks using HFCS; exempts dairy drinks, sweetened instant coffee, drinks sweetened using coco sugar or stevia, and 100% juices. Implemented January 2018

### THAILAND: 3-tiered ad valorem and excise

on all drinks with >6 g sugar per 100mL. Ad valorem rate will decrease over time as excise increases. Drinks with >6g sugar per 100mL will face higher tax rates, up to **5 baht/L (\$0.16)** for drinks with >10g sugar per 100mL from 2023 onwards. Implemented Sept. 2017

### MALAYSIA: 40 sen per L (\$0.097) tax

on carbonated, flavored, & other non-alcoholic drinks with >5 g sugar per 100 mL or on fruit or vegetable juices with >12 g sugar per 100 mL. Implemented April 1, 2019

### MALDIVES: MVR 33.64 per L (\$2.17)

**import tariff** on all energy drinks; **MVR 4.60/L (\$0.30) tariff** on soft drinks (incl. sweetened and unsweetened carbonated sodas, sports drinks) Implemented Mar. 2017

### SRI LANKA: LKR 0.50 per g sugar

(\$0.003) on sweetened drinks, or **Rs 12 per L (\$0.066)** — whichever is higher. Implemented Nov. 2017

### BRUNEI: BND 4.00 per 10 L (\$ 0.25/L) excise

on all drinks with >6 g sugar per 100mL. Implemented Apr. 2017

### SAMOA: 0.40 WST per L (\$0.15)

on carbonated beverages. Implemented 1984

### FR. POLYNESIA: 40 CFP/L local

(\$0.38); **60 CFP/L import tax** (\$0.57) on sweetened drinks. Implemented 2002

### PALAU: \$0.28175/L import tax

on carbonated soft drinks. Implemented 2003

### FIJI: 0.35 FJD per L local (\$0.16);

**15% import duty** on sweetened drinks. Updated 2016. **10% import duty** on concentrates. Implemented 2007, updated 2017

### NAURU: 30% import duty

on all products with added sugars (+ removal of bottled water levy). Implemented 2007

### COOK ISLANDS: 15% import duty

(with 2% rise per year) on sweetened drinks. Implemented 2013

### TONGA: 1 Pa'anga per L (\$0.44)

on carbonated beverages. Implemented 2013

### KIRIBATI: 40% excise tax

on drinks containing added sugar and fruit concentrates, 100% juices exempt. Implemented 2014

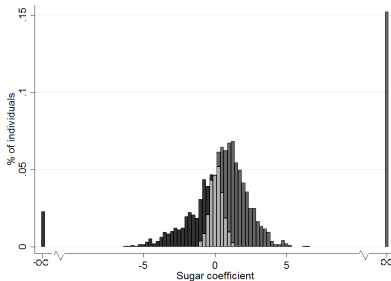
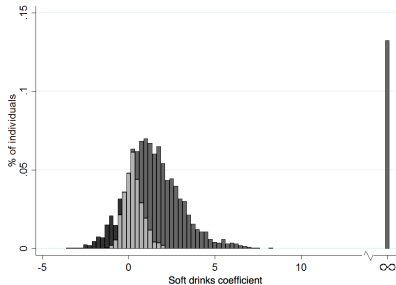
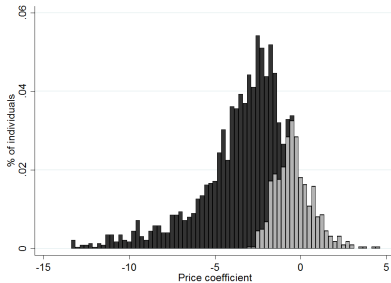
### VANUATU: 50 vatu/L excise

(\$0.44) on carbonated beverages containing added sugar or other sweeteners. Implemented February 2015



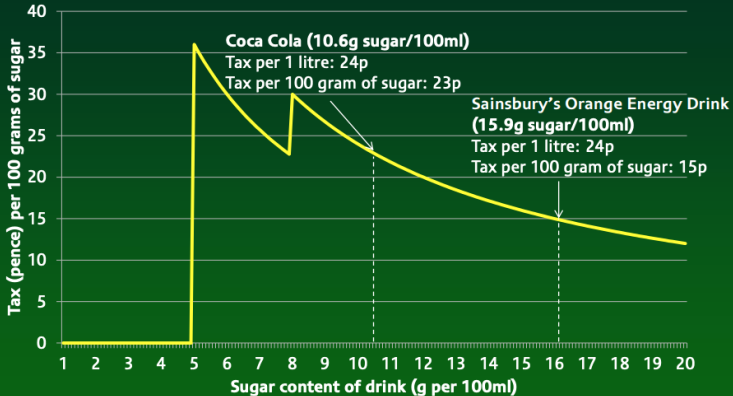
# Univariate distributions of consumer specific preference parameters

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- Negative**
- Indifferent**  
(not statistically different from zero)
- Positive**

## Drinks that contain more sugar per 100ml will attract a lower tax per gram of sugar



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## Irn Bru panic as fans stockpile before recipe change

🕒 4 January 2018 | 📄



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