Corrective taxes and consumer heterogeneity in the alcohol market

Rachel Griffith, Martin O'Connell and Kate Smith

May 2016

Motivation

- In a number of markets consumption can impose negative externalities on other people and on society
  - Typical examples include markets for alcohol, tobacco, motor fuel ...
  - Possibly also some food markets, e.g. sugar
- Provides a rationale for government intervention to reduce excessive consumption
- With homogeneous externalities a tax can fully correct for sub-optimal consumption (Pigou, 1920)

Motivation

- In more realistic settings effectiveness of policy will depend on relationship between demand responses and externalities
- In some markets externalities are likely to be much larger for some people
  - Important to understand how their response differs from other consumers
  - Optimal tax can be expressed as a weighted average of marginal externalities where weights are demand slopes (Diamond, 1973)
- Most markets have many differentiated products
  - Policy interventions often change relative prices within the market, encouraging intra-market switching
  - Optimal policy will depend on correlation between externalities and preferences across products

Aims of paper

1. Estimate demand in the alcohol market capturing:
   - Substitution patterns between disaggregate products and in/out of the market
   - How preferences vary with a proxy for consumers' external costs of consumption

2. Assess demand response to topical policy changes – excise tax reform, minimum prices per unit alcohol

3. Use empirical model to characterise optimal system of alcohol taxes
   - Optimal taxes depend on correlation in externalities, product level price elasticities and demand levels.
   - How close is the full optimum (one tax per product) to a constrained system of one tax for all alcohol or one tax for each segment (spirits, beer, cider, wine)

Market for alcohol

- Consumption externalities are well documented:
  - Higher public expenditure on policing and health care
  - Victims of alcohol fueled violence and road accidents
  - Lower tax revenue and higher welfare payments
- But marginal externalities vary:
  - Nonlinearly with consumption
  - Across people
- Evidence that small set of heavy consumers create substantial majority of externalities
- Our focus will be on the UK off-trade alcohol market
  - Off-trade accounts for 4 in every 5 units of alcohol purchased

Policy background

- Currently in the UK excise duties are levied on alcohol (over and above VAT)
- Scottish Government has legislated for introduction of minimum unit price
- Rationale for policies is to lower "problem drinking"
  - Success of policy depends on whether it targets externalities creating consumption

Alcohol demand model: key features

- We model substitution across differentiated products in market as well as switching in/out the market
  - Use discrete choice demand framework
- Model heterogeneity in preferences (demands) with a proxy of consumers' external costs of consumption

Alcohol demand model: overview

Each period t consumer chooses between options $j = (0, 1, ..., J)$

$$U_{jt} = \bar{U}(\mathbf{x}_{jt}; \theta) + \epsilon_{jt}$$

$\mathbf{x}_{jt}$ are product characteristics
θ is preferences
ϵ_{jt} is i.i.d. type I extreme value shock to demand

Choose j if $U_{jt} > U_{kt} \ \forall \ k \neq j$

Alcohol demand model: overview

Each period t consumer chooses between options $j = (0, 1, ..., J)$

$$U_{jt} = \bar{U}(\mathbf{x}_{jt}; \theta) + \epsilon_{jt}$$

Denote by y_t the chosen period t option, then:

$$P(y_t | \mathbf{x_t}; \theta) = \frac{\exp(\bar{U}(\mathbf{x}_{jt}; \theta))}{\sum_k \exp(\bar{U}(\mathbf{x}_{kt}; \theta))}$$

where $\mathbf{x_t} = (\mathbf{x}_{1t}, ..., \mathbf{x}_{Jt})$

Alcohol demand model: overview

Each period t consumer chooses between options $j = (0, 1, ..., J)$

$$U_{jt} = \bar{U}(\mathbf{x}_{jt}; \theta) + \epsilon_{jt}$$

Denote by y_t the chosen period t option, then:

$$P(y_t|\mathbf{x_t}; \theta) = \frac{\exp(\bar{U}(\mathbf{x}_{jt}; \theta))}{\sum_k \exp(\bar{U}(\mathbf{x}_{kt}; \theta))}$$

where $\mathbf{x_t} = (\mathbf{x}_{1t}, ..., \mathbf{x}_{Jt})$
In the standard random coefficient logit model (with micro panel data) can write:

$$P(y_1, ..., y_T|\mathbf{x_1}, ..., \mathbf{x_T}) = \int \prod_{t=1,...,T} P(y_t|\mathbf{x_t}; \theta) dF(\theta)$$

Proxy for externality

In contrast, we allow systematic preference heterogeneity with a proxy for marginal externality, ψ

As a proxy we use a function of long run pre-sample purchasing: $\psi = \psi(\bar{y}_0)$

In our case:

$$P(y_1, ..., y_T | \mathbf{x_1}, ..., \mathbf{x_T}, \bar{y}_0) = \int \prod_{t=1,...,T} P(y_t | \mathbf{x_t}; \theta) dF(\theta | \bar{y}_0)$$

Utility

i denotes consumer; each product j is available in different sizes s. Utility from option (j, s) is:

$$u_{ijst} = \alpha_i p_{jst} + \beta_i w_j + \gamma_i z_{js} + \xi_{ijt} + \epsilon_{ijst}$$

Observed product characteristics:
p_{jst} price
w_j alcohol strength
z_{js} volume

Unobserved product characteristics: ξ_{ijt}

Utility from outside option $(0, 0)$ is:

$$u_{i00t} = \epsilon_{i00t}$$

Externality measure

We base our externality measure on how many units of alcohol a consumer purchased in the preceding calendar year.

$d = 1, \ldots, D$ denotes the consumer groups and $\mathcal{D}_d$ denotes the set of consumers in group d

We assume that within each group preferences follow a multivariate normal distribution:

$$f(\theta_i | i \in \mathcal{D}_d) = \mathcal{N}(\mu_d, \Omega_d),$$

The unconditional preference distribution is a mixture of normals

$$\theta_i \sim \sum_d \omega_d \cdot f(\theta_i | i \in \mathcal{D}_d)$$

Externality measure

For observed attributes (on price, strength and size):

$$\begin{pmatrix} \alpha_i \\ \beta_i \\ \gamma_i \end{pmatrix} \Big| i \in \mathcal{D}_d \sim \mathcal{N}\left(\begin{pmatrix} \bar{\alpha}_d \\ \bar{\beta}_d \\ \bar{\gamma}_d \end{pmatrix} \begin{pmatrix} \sigma_d^{\alpha} & . & . \\ \rho_d^{\alpha\beta} & \sigma_d^{\beta} & . \\ \rho_d^{\alpha\gamma} & \rho_d^{\beta\gamma} & \sigma_d^{\gamma} \end{pmatrix} \right)$$

Externality measure

For observed attributes (on price, strength and size):

$$\begin{pmatrix} \alpha_i \\ \beta_i \\ \gamma_i \end{pmatrix} \Big| i \in \mathcal{D}_d \sim \mathcal{N}\left(\begin{pmatrix} \bar{\alpha}_d \\ \bar{\beta}_d \\ \bar{\gamma}_d \end{pmatrix} \begin{pmatrix} \sigma_d^{\alpha} & . & . \\ \rho_d^{\alpha\beta} & \sigma_d^{\beta} & . \\ \rho_d^{\alpha\gamma} & \rho_d^{\beta\gamma} & \sigma_d^{\gamma} \end{pmatrix} \right)$$

For the unobserved attribute, we decompose

$$\xi_{ijt} = \eta_{ij} + \zeta_{dk_jt}$$

k_j are (slightly) more aggregate than j

Externality measure

For observed attributes (on price, strength and size):

$$\begin{pmatrix} \alpha_i \\ \beta_i \\ \gamma_i \end{pmatrix} \Big| i \in \mathcal{D}_d \sim \mathcal{N}\left(\begin{pmatrix} \bar{\alpha}_d \\ \bar{\beta}_d \\ \bar{\gamma}_d \end{pmatrix} \begin{pmatrix} \sigma_d^{\alpha} & . & . \\ \rho_d^{\alpha\beta} & \sigma_d^{\beta} & . \\ \rho_d^{\alpha\gamma} & \rho_d^{\beta\gamma} & \sigma_d^{\gamma} \end{pmatrix} \right)$$

For the unobserved attribute, we decompose

$$\xi_{ijt} = \eta_{ij} + \zeta_{dk_jt}$$

where

$$\eta_i | i \in \mathcal{D}_d \sim \mathcal{N}(\bar{\eta}_d, \Sigma_d)$$

where Σ_d is a diagonal matrix with variance components that are constant within the four alcohol segments (spirits, beer, wine, cider).

Identification (I)

- Model allows for a specific form of state dependence: a consumer's decision depends on whether they were a light, moderate or heavy drink in the previous year
- We do not model state dependence arising through the effect of a recent purchase on current behaviour, for example, due to
  - Habits that form over a short time horizon
  - Consumer stockpiling
- Offer reduced form evidence that suggests these forms of short run dynamics are not of first order importance

▸ Details

Identification (II)

- Conditional on controls in the model, we assume the ϵ_{ijst} shocks are i.i.d.
  - And that therefore we exploit exogenous price variation
- In UK grocery markets pricing is broadly national
- To capture aggregate shocks to demand we include alcohol type-time effects
  - Will absorb effect of seasonality in demand, and
  - Effect on demand of advertising
- We exploit price variation arising from nonlinear pricing across different product sizes within each alcohol type

Data

- We use data from the Kantar Worldpanel for 2010 and 2011
- Observe representative sample of 10,289 households making purchases throughout this time
  - Use 2010 data to construct a measure of long run purchasing behaviour
  - Estimate demand on 2011 data
- Data record all off-trade alcohol purchases
  - 78% of alcohol units are purchases off-trade
- Include detailed information on UPCs purchased including price and detailed product information

Purchase occasion

- We model each household's weekly alcohol purchases
- If a household buys groceries but no alcohol we model them as choosing the no purchase outside option
  - Alcohol is purchased on 53.4% of household-weeks
- 18% of household-weeks involve the purchase of more than one option
  - We treat these as multiple separate purchase occasions
  - Random coefficients allow for statistical dependence in choices
  - Conditional on these we assume the epsilon demand shocks are independent across multiple purchases

Products

- Policy interventions typically cause the prices of alcohol products to change differentially
- It is likely households will respond to this by switching between products (as well as out of the market)
- There are over 7000 alcohol UPCs purchased in our data: infeasible to estimate demand with such large choice sets
- We aggregate the 7000 products into 79 product-size pairs:
  - we group UPCs with similar attributes
  - and that have similar movements in price
- An option is a product-size pair: for each of the 40 products we define a set of sizes based on the total quantity bought

Products

- Beer and ale
- Wine
- Spirits
- Cider and alcopops

Households

	Number of		Average	
Household group:	Households	Purchase occasions	Price per unit (p)	ABV
Less than 7 units	6,435	321,827	51.0	10.1
7-14 units	1,838	113,874	46.6	11.4
14-21 units	814	59,084	44.3	11.7
21-35 units	736	61,554	42.8	12.3
More than 35 units	466	47,174	41.0	13.8

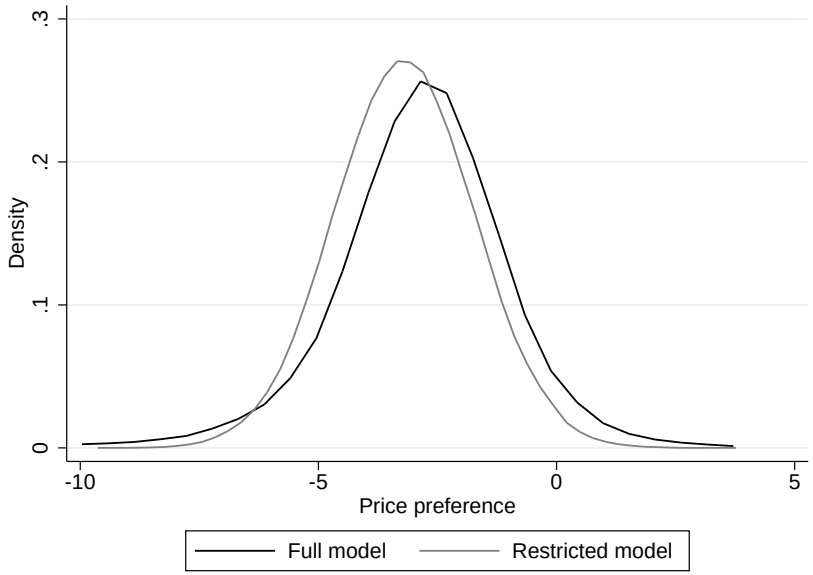
Coefficient estimates:

observable product attributes

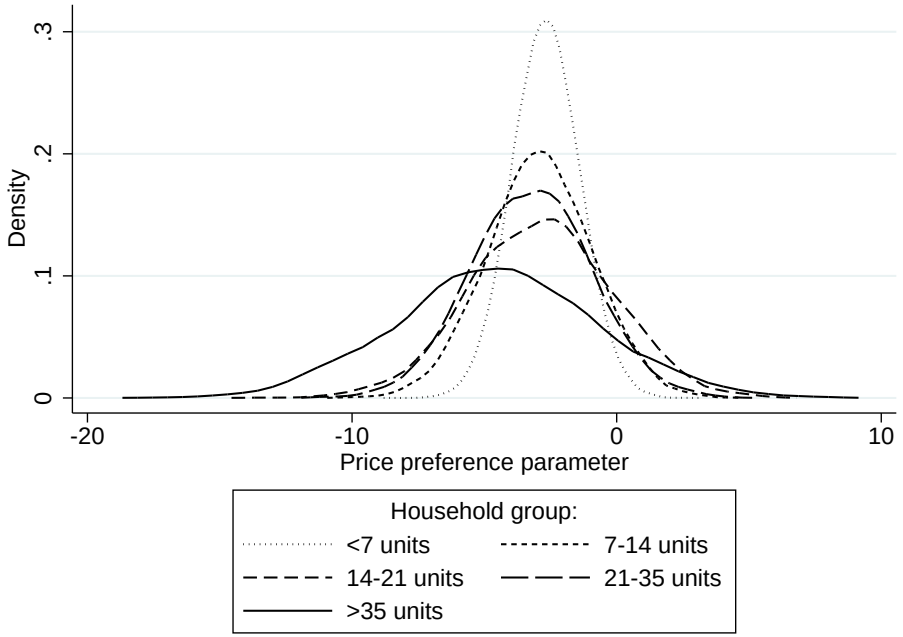
	Full model					*Restricted model*
Household group:	< 7	7-14	14-21	21-35	> 35	.
Means						
Price	-2.661	-2.912	-2.948	-3.272	-4.556	-3.197
	(0.410)	(0.323)	(0.309)	(0.317)	(0.330)	(0.238)
Volume	-0.153	-0.086	0.058	0.071	0.141	-0.112
	(0.021)	(0.016)	(0.011)	(0.012)	(0.012)	(0.012)
Variances						
Price	1.606	4.009	7.575	4.998	13.943	2.131
	(0.297)	(0.388)	(0.576)	(0.585)	(1.047)	(0.214)
Volume	0.035	0.036	0.010	0.020	0.015	0.069
	(0.005)	(0.004)	(0.001)	(0.002)	(0.002)	(0.004)
Strength	0.108	0.204	0.275	0.323	0.323	0.272
	(0.018)	(0.020)	(0.024)	(0.024)	(0.024)	(0.020)
Covariances						
Price*Volume	-0.114	-0.062	-0.128	0.016	-0.043	-0.033
	(0.023)	(0.019)	(0.026)	(0.022)	(0.029)	(0.014)
Price*Strength	-0.102	-0.467	-0.842	-0.782	0.001	-0.039
	(0.048)	(0.068)	(0.082)	(0.086)	(0.069)	(0.031)
Volume*Strength	-0.016	-0.043	-0.008	0.007	0.002	0.065
	(0.006)	(0.005)	(0.004)	(0.005)	(0.002)	(0.005)

Distribution of price coefficients

(a) Unconditional distribution

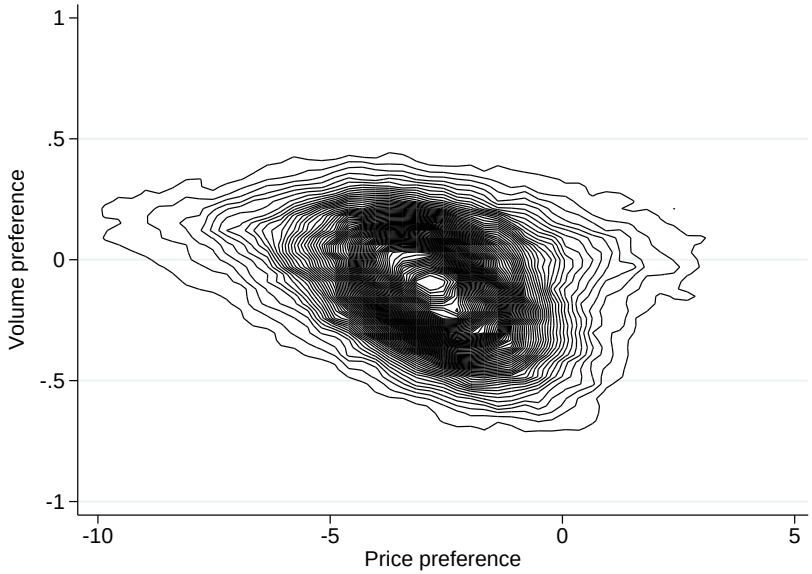


(b) Conditional distributions (full model)

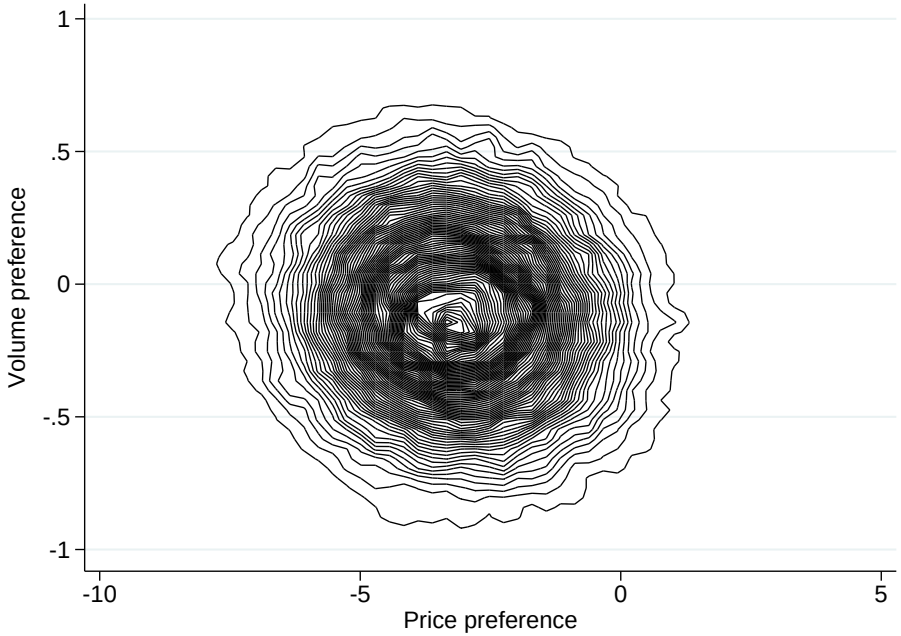


Joint distribution of price and volume coefficients

(c) Full model



(d) Restricted model



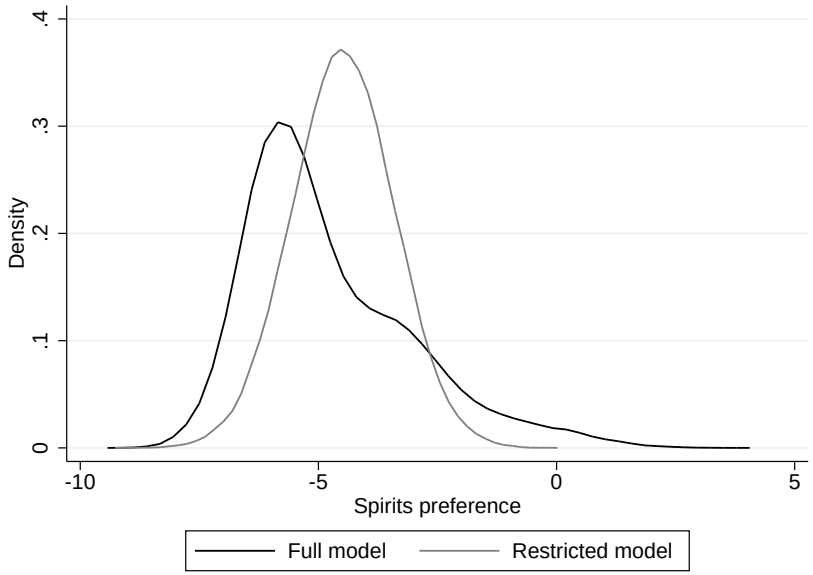
Coefficient estimates:

unobservable product attributes

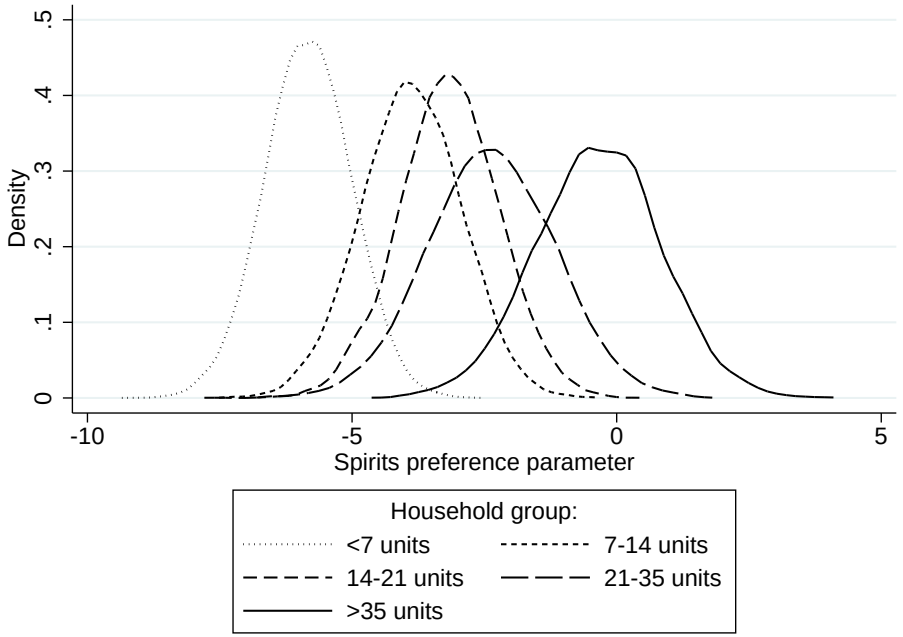
	Full model					*Restricted model*
Household group:	< 7	7-14	14-21	21-35	> 35	.
Mean product effects for each segment						
Beer	-4.637	-3.422	-3.326	-2.651	-1.401	-3.357
	(0.274)	(0.210)	(0.196)	(0.204)	(0.217)	(0.156)
Wine	-4.252	-2.700	-2.306	-1.823	-0.290	-3.046
	(0.259)	(0.199)	(0.191)	(0.194)	(0.209)	(0.150)
Spirits	-5.837	-3.876	-3.182	-2.342	-0.360	-4.478
	(0.238)	(0.172)	(0.171)	(0.163)	(0.173)	(0.137)
Cider and FABs	-5.392	-4.257	-3.863	-3.094	-1.761	-4.046
	(0.310)	(0.243)	(0.222)	(0.224)	(0.237)	(0.175)
Variances						
Beer	2.122	1.706	2.140	2.280	1.136	1.961
	(0.242)	(0.150)	(0.181)	(0.249)	(0.132)	(0.133)
Wine	1.634	1.092	1.349	1.907	1.995	2.019
	(0.158)	(0.097)	(0.116)	(0.162)	(0.170)	(0.133)
Spirits	0.691	0.913	0.898	1.468	1.405	1.162
	(0.143)	(0.137)	(0.094)	(0.146)	(0.153)	(0.141)
Cider and FABs	1.644	3.085	4.259	2.304	2.007	2.325
	(0.219)	(0.306)	(0.314)	(0.274)	(0.195)	(0.205)

Distribution of spirits coefficients

(e) Unconditional distribution

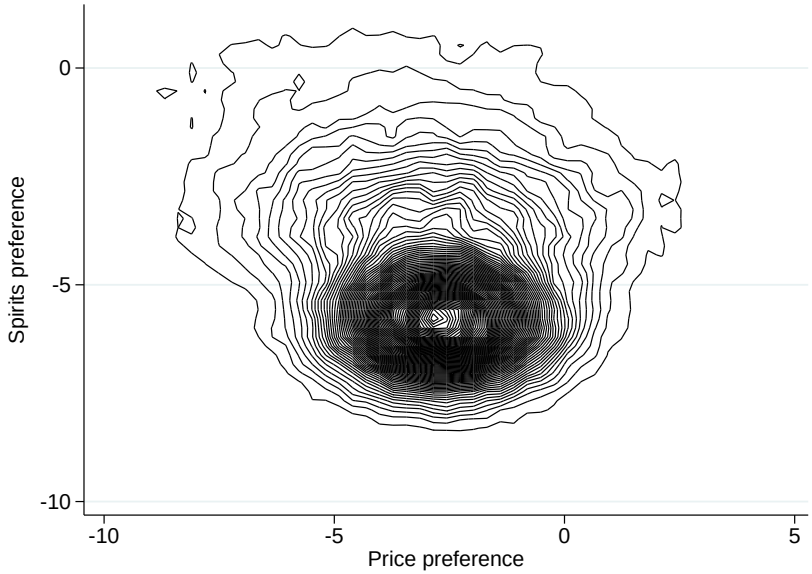


(f) Conditional distributions (full model)

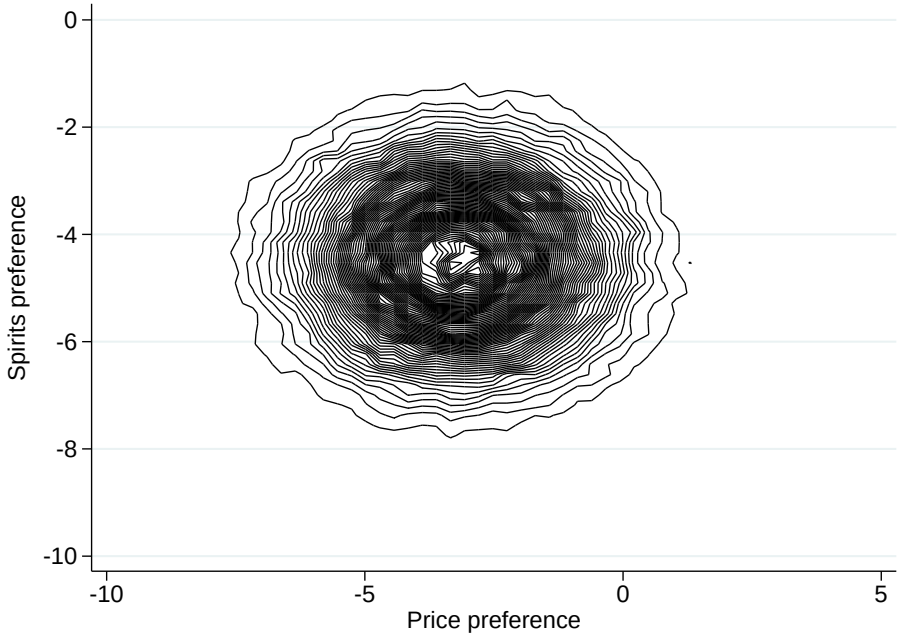


Joint distribution of price and spirits coefficients

(g) Full model



(h) Restricted model



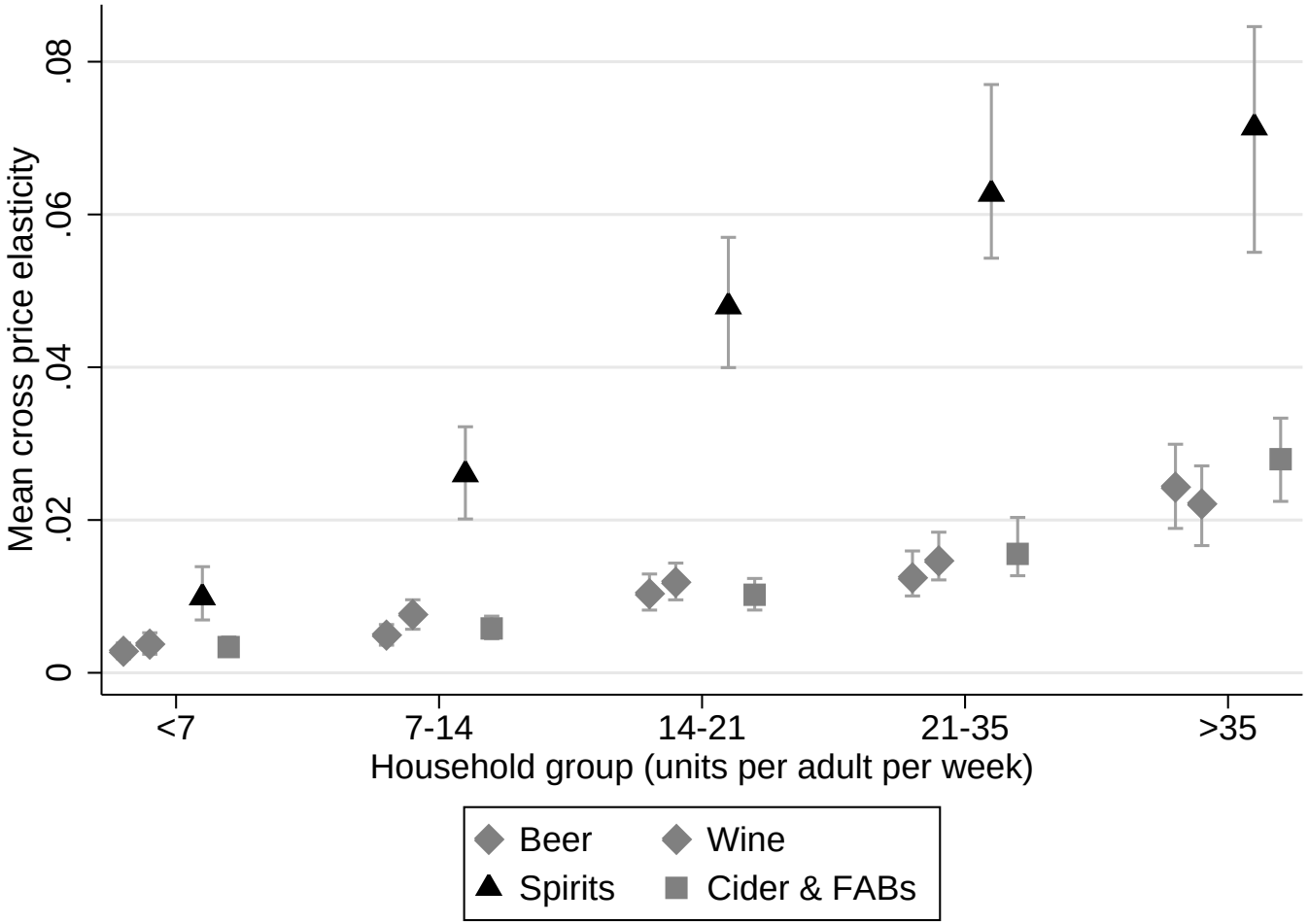
Product level price elasticities

- Heavy drinkers have higher own price elasticities
- But also higher (within market) cross price elasticities

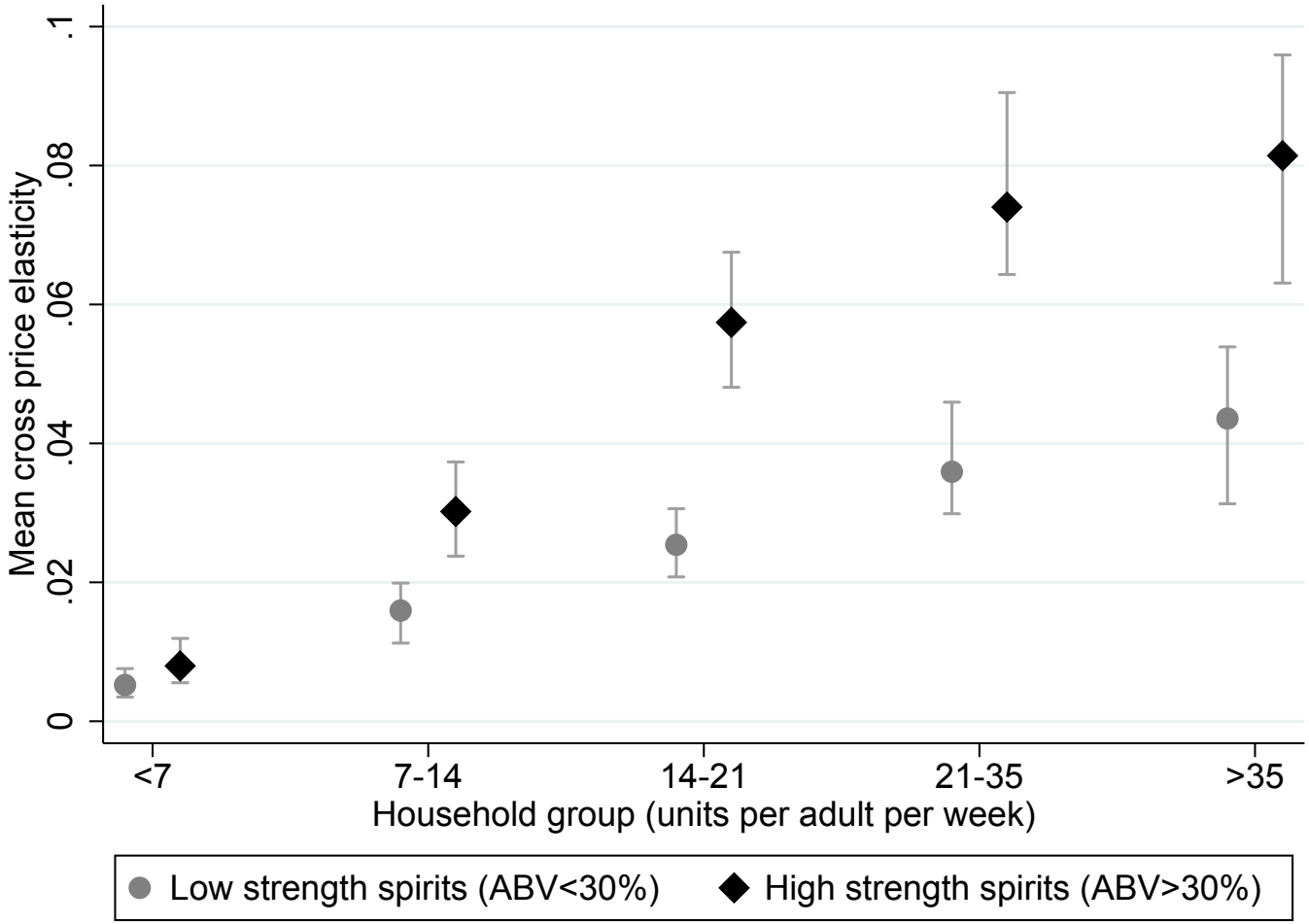
	Household group				
	< 7	7-14	14-21	21-35	> 35
Own price elasticity	-1.16	-1.20	-1.22	-1.35	-1.67
	[-1.43,-0.83]	[-1.45,-0.92]	[-1.43,-1.02]	[-1.65,-1.13]	[-1.97,-1.34]
Cross price elasticity	0.010	0.017	0.023	0.029	0.041
	[0.007,0.013]	[0.012,0.020]	[0.020,0.028]	[0.024,0.036]	[0.033,0.049]

▸ Distributions

Cross price elasticities with respect to price of a spirit option

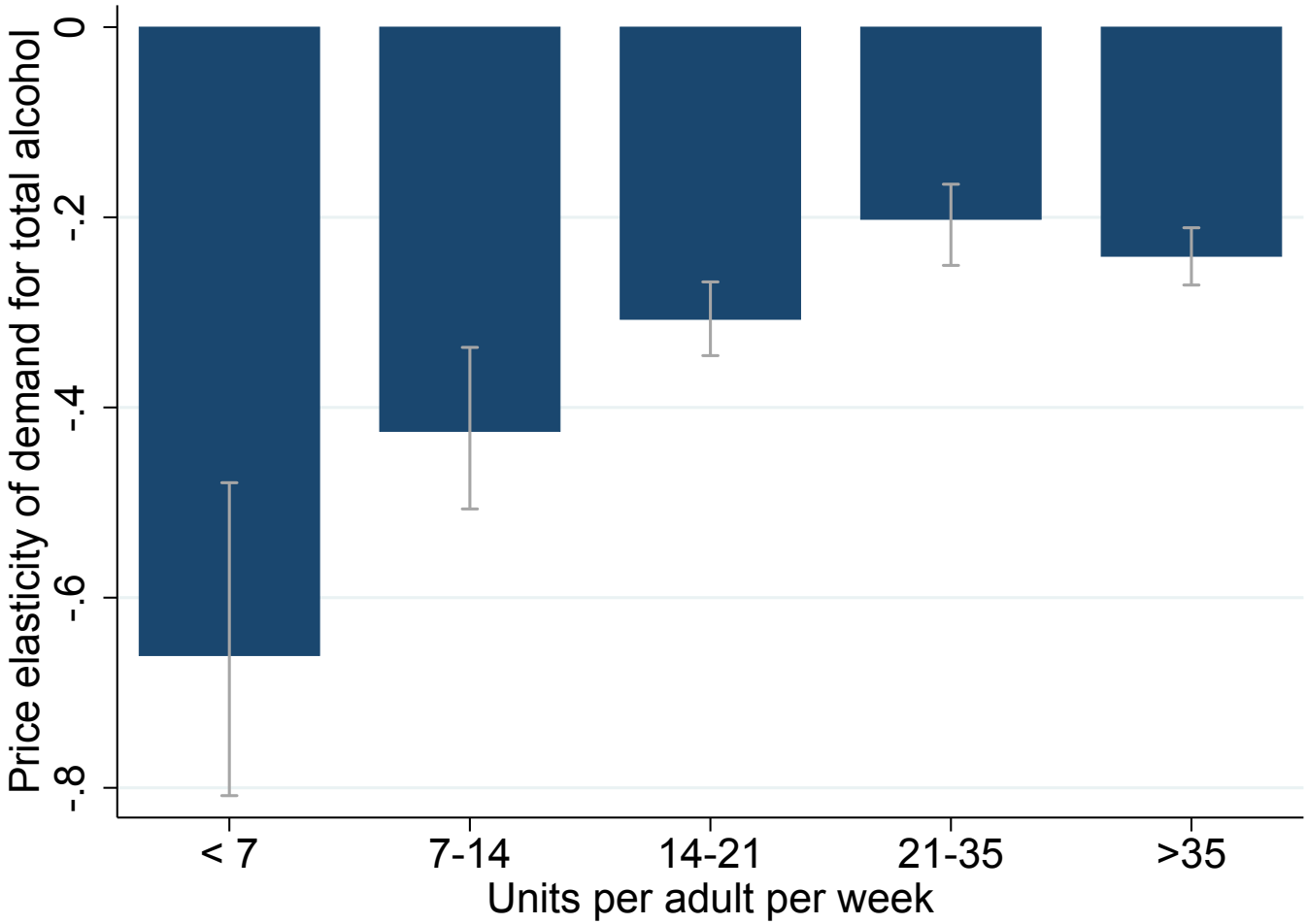


Cross price elasticities with respect to price of a strong spirit option



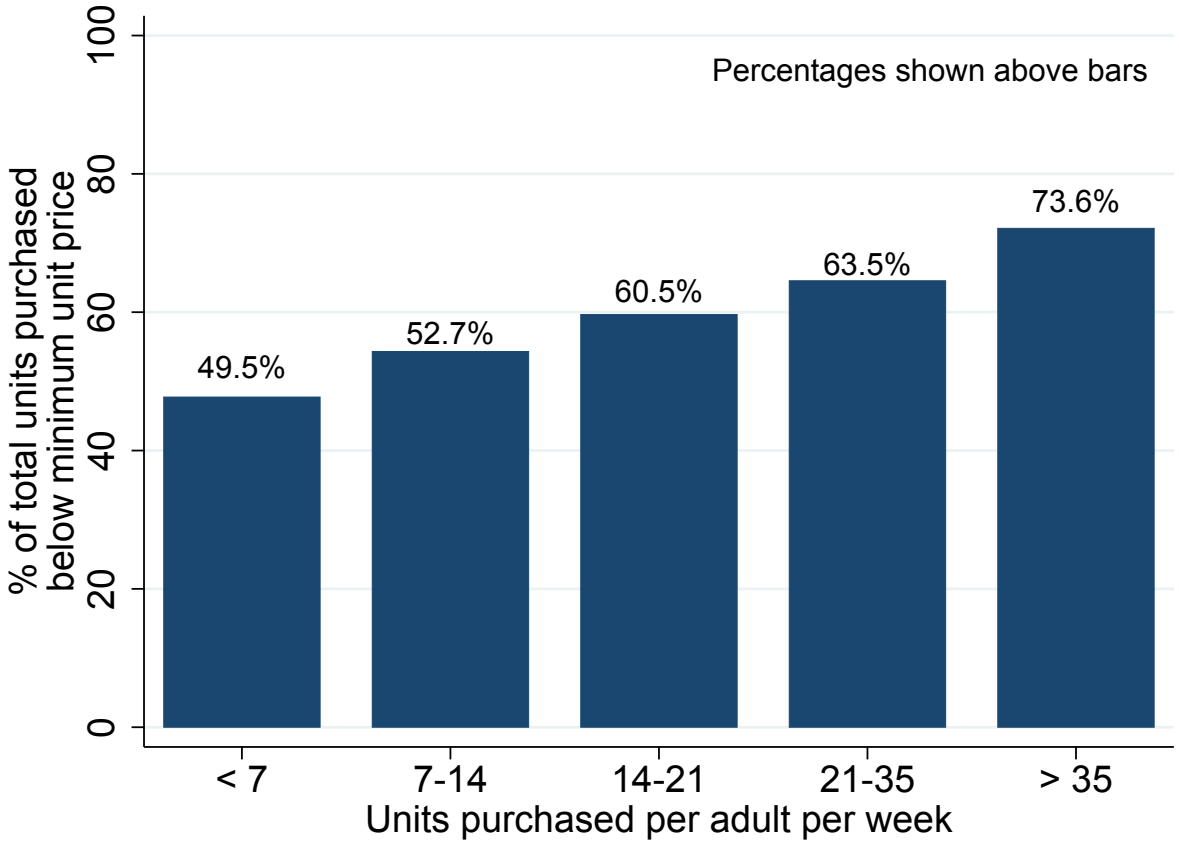
Price elasticity for all alcohol

Can simulate change in alcohol units demanded if all prices rise by 1%

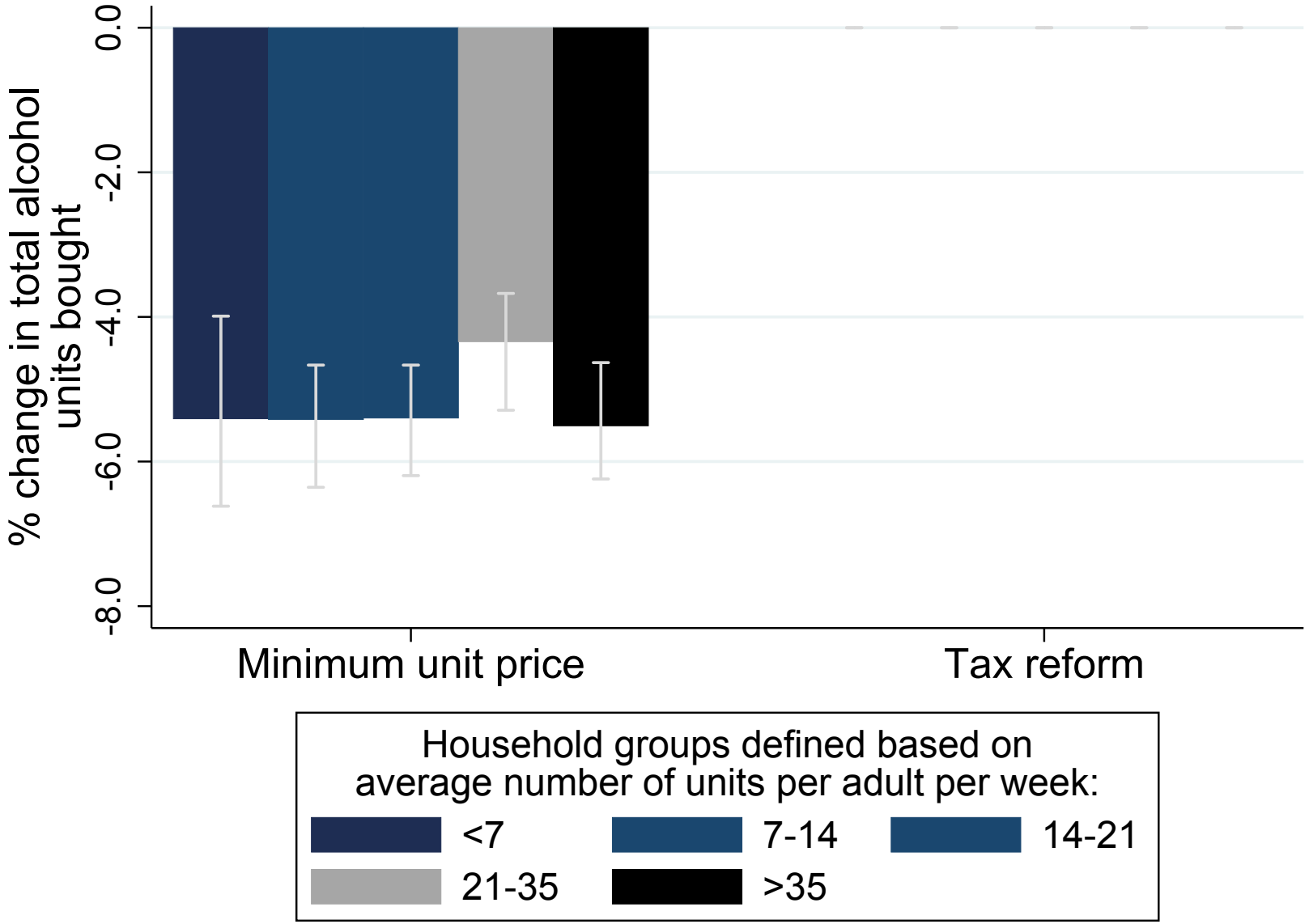


Policy simulations - MUP

- We use the model of alcohol demand to simulate the introduction of a minimum unit price for alcohol - illustrative rate of 45p in 2012
- Policy affects a higher proportion of units purchased by heavy drinkers



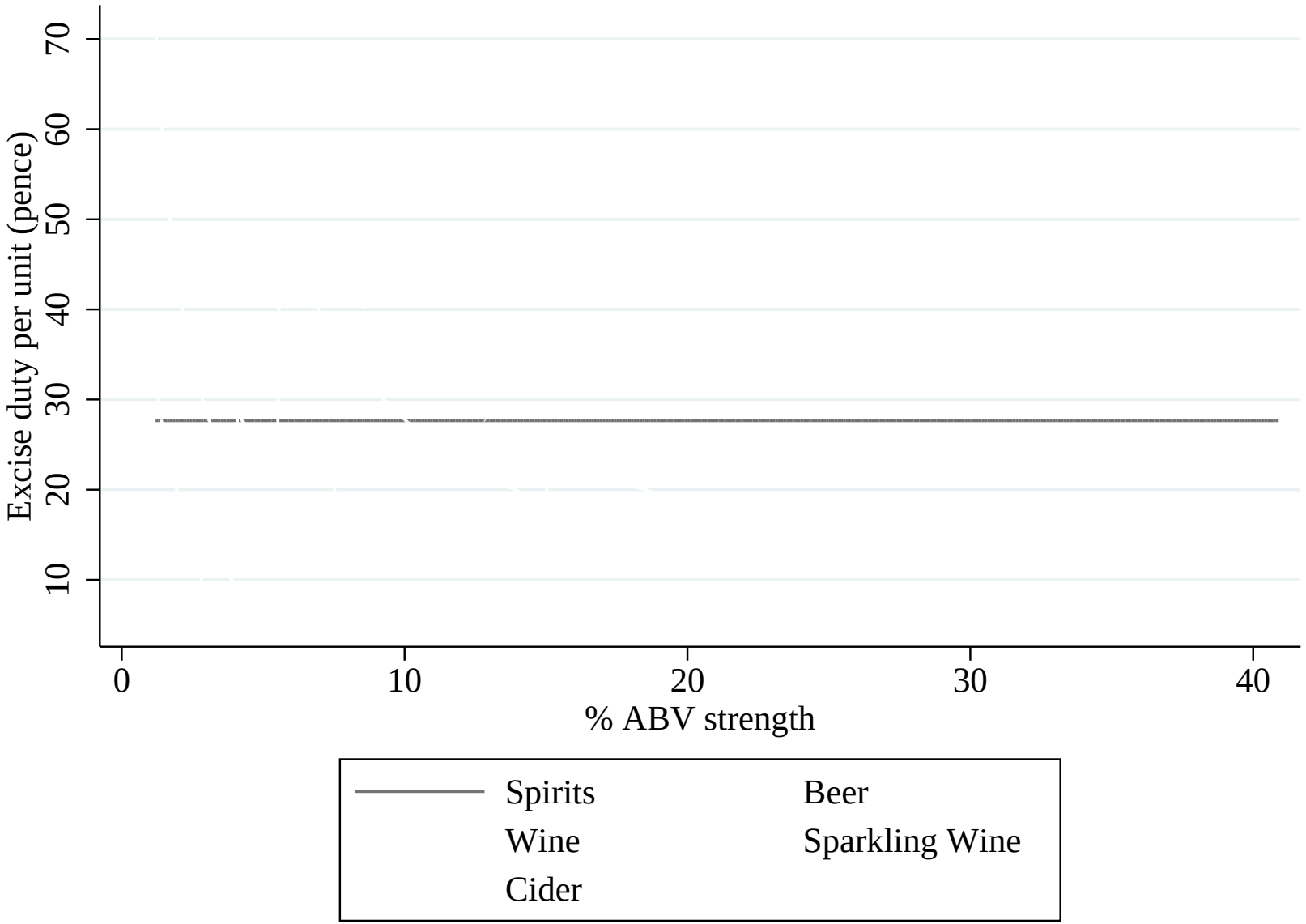
But proportionate demand effect is similar for light and heavy drinkers



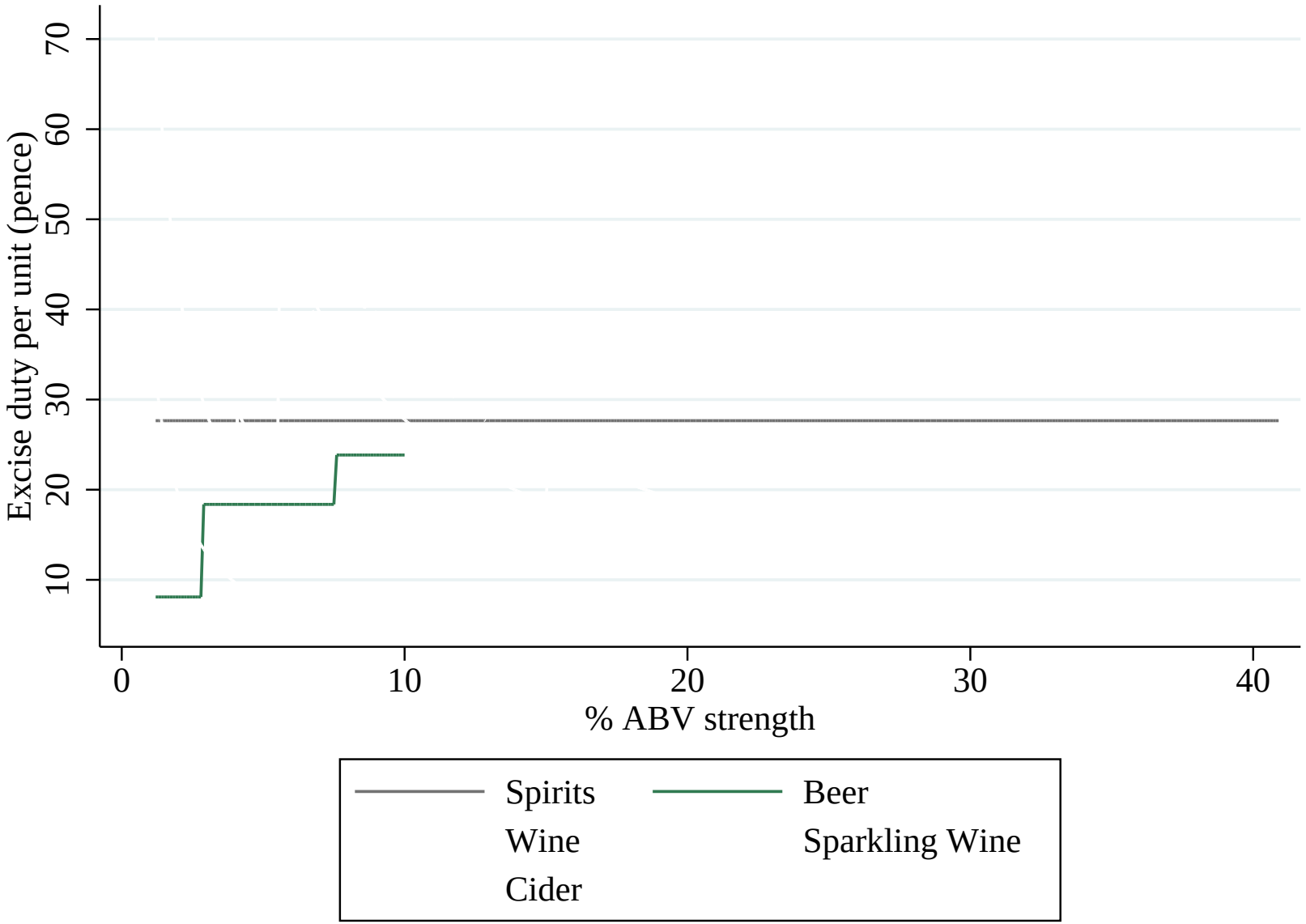
Policy simulations - tax reform

- Alternative to MUP is reform of alcohol duties
- System is ripe for reform ...

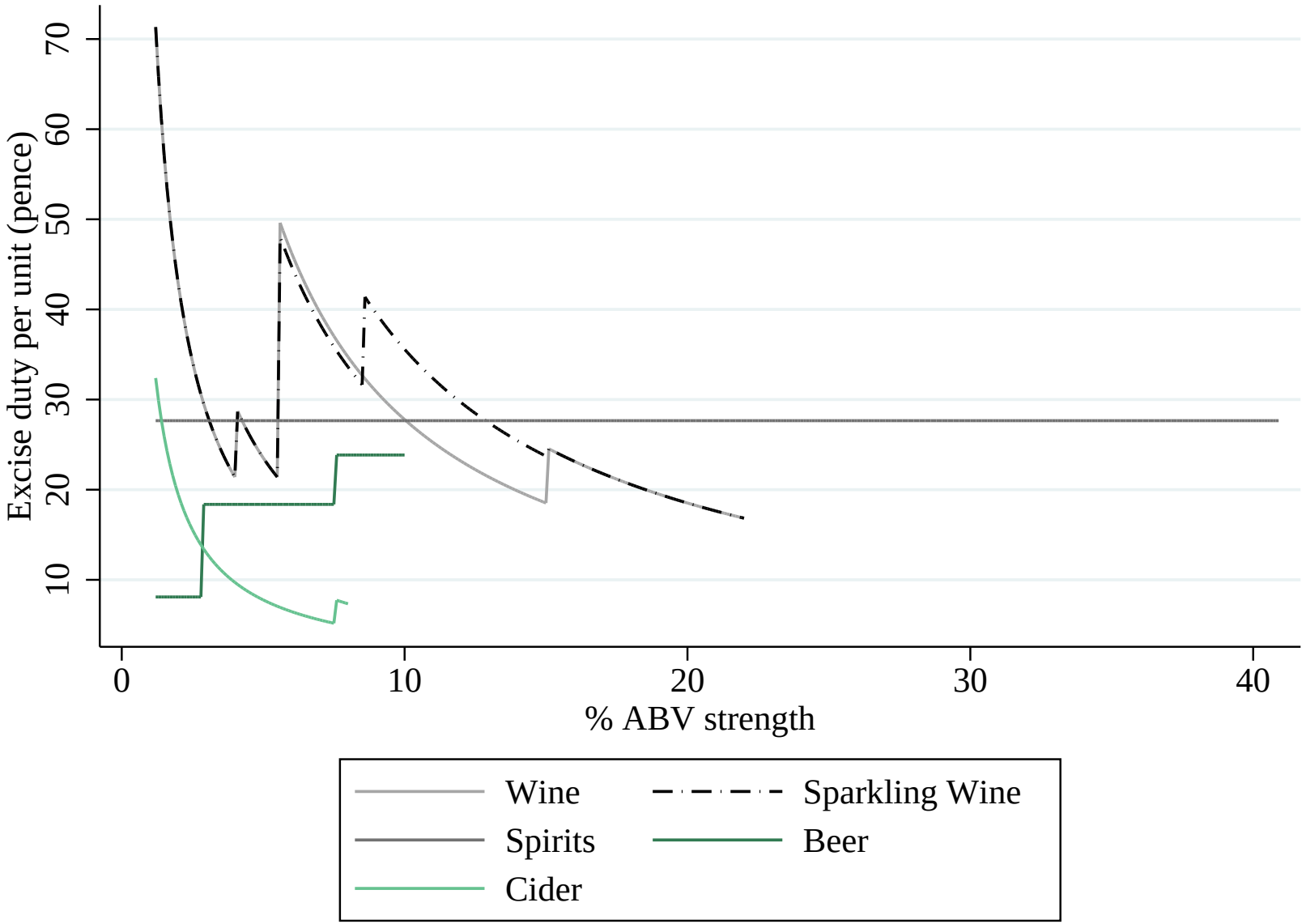
Current alcohol duties



Current alcohol duties



Current alcohol duties

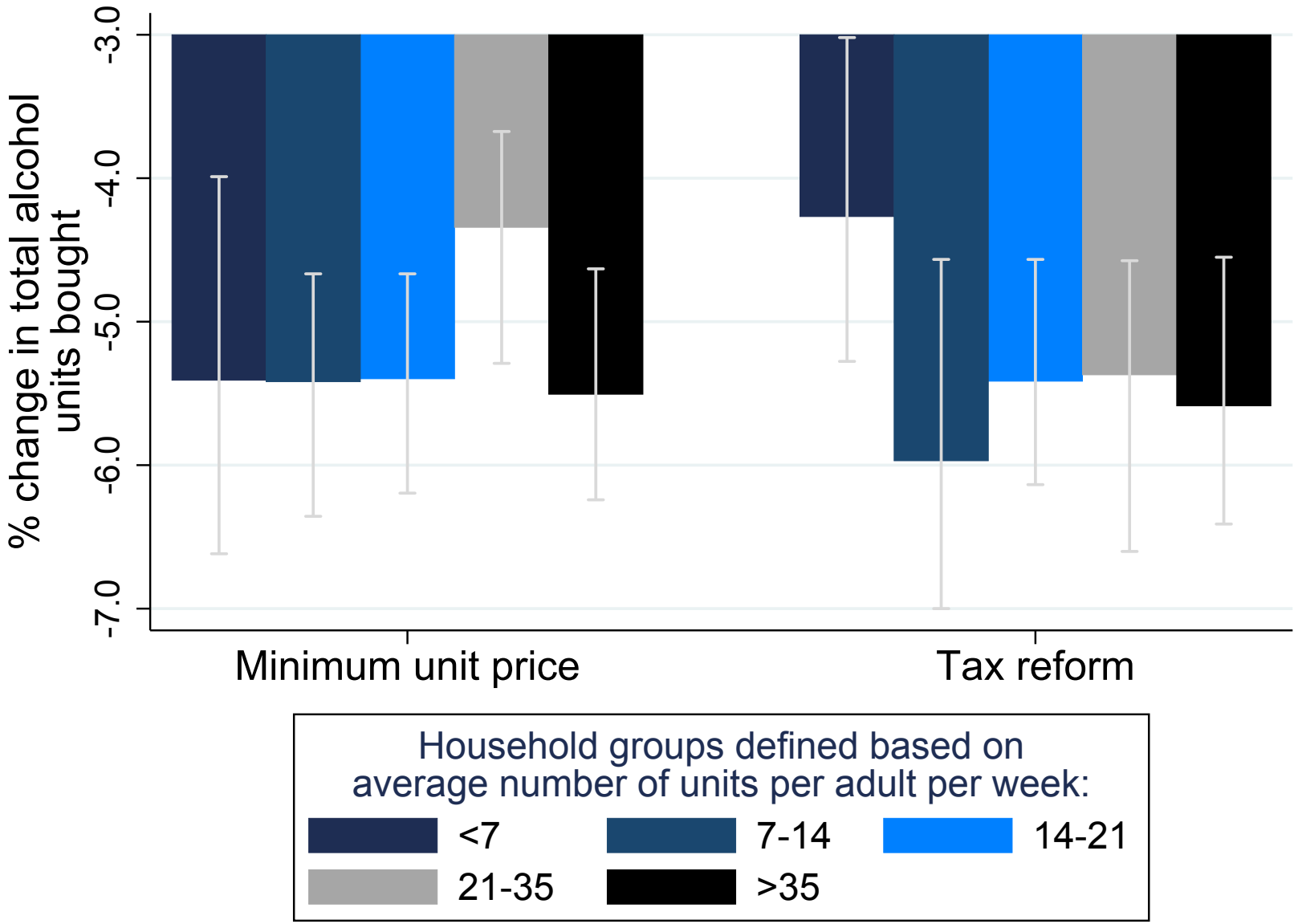


Policy simulations - tax reform

- Alternative to MUP is reform of alcohol duties
- System is ripe for reform ...

- Here I'll consider simple reform, not in conflict with EU law ...
- Increase in spirits duties
  - We choose increase that results in same reduction in total units sold as under MUP
  - Would reverse long run decline in spirits duty (same as real level in early 1980s)

Results in similar reductions across light-heavy drinkers as MUP



MUP vs. simple tax reform

- Both reforms lead to similar reductions in alcohol for heavy drinkers, with tax reform having less effect on lightest drinkers
- However tax reform has the significant advantage of raising more revenue
  - While the MUP *reduces* tax revenue by 2.4% (and also raising industry revenue by 12.5%)
  - The tax reform *raises* tax revenue by 4.5%

Summary

- Demand model captures consumer substitution across products in alcohol market as well as out of market
- It incorporates rich preference heterogeneity, allowing systematic differences in behaviour with a proxy of consumption externality
- Model is well suited for considering demand response to policies that change prices in market
  - Do policies successfully target high externality types?
- What can we say about optimal policy? ...

Where project is heading

- We can also use framework to characterise excise tax system
- Let post tax prices, $\mathbf{p} = \mathbf{q} + \mathbf{t}$, $\mathbf{q}$ are pre-tax prices and $\mathbf{t}$ are excise taxes and denote by s a lump sum transfer
- We can solve:

$$\max_{\mathbf{p},s} W(\mathbf{p}, s) = \sum_i \left[\alpha_i(y_i + s) + V(\mathbf{p}, \mathbf{x}, \psi_i; \theta_i) - \sum_{j=1}^{J} \psi_i f_j(\mathbf{p}, \mathbf{x}, \psi_i; \theta_i) \right]$$

$$s.t. \quad \sum_i \sum_{j=1}^{J} (p_j - q_j) f_j(\mathbf{p}, \mathbf{x}, \psi_i; \theta_i) \geq sN$$

Where project is heading

- Yields set of welfare maximising excises taxes: $t_j^* \ \forall \ j$
- Solution will depend in relationship between demands, elasticities and externalities
- For example, with zero cross price effects and constant marginal utility of income, solution collapses to Diamond (1973):

$$t_j^* = \frac{\bar{\psi}}{\alpha} + \frac{\text{cov}(\psi_i, \epsilon_{ij})}{\alpha \bar{\epsilon}_j}$$

- How does solution compare to optimum when:
  - Tax per unit of alcohol is constant across all goods
  - A different tax is permitted in each segment
  - Current tax system

Additional slides

State dependence

- Our externality proxy does allow purchase patterns to systematically vary with historic/long run purchases
- An issue would arise if the data exhibit state dependence at shorter frequencies
  - If a household's purchase this week is causally related to their recent demand
- We provide reduced form evidence that such patterns in the data reflect spurious state dependence (Heckman, 1981)
  - Once controlling for unobserved preference heterogeneity, evidence of "high frequency" state dependence is weak

State dependence

Habits

- We regress:
  - dummy $= 1$ if household purchased alcohol in week, and
  - total units conditional on purchasing
- on total number of units purchased per adult in each of last 8 weeks, week effects and household fixed effects

State dependence

Habits

	Purchased alcohol?	Purchased alcohol?	Quantity	Quantity
Number of units purchased per adult:				
– 1 week before	0.0016			
	(0.0001)			
– 2 weeks before	0.0024			
	(0.0001)			
– 3 weeks before	0.0022			
	(0.0001)			
– 4 weeks before	0.0023			
	(0.0001)			
– 5 weeks before	0.0021			
	(0.0001)			
– 6 weeks before	0.0019			
	(0.0001)			
– 7 weeks before	0.0019			
	(0.0001)			
– 8 weeks before	0.0021			
	(0.0001)			
Mean of dependent variable	0.3833			
Time effects?	Yes			
Household fixed effects?	No			

State dependence

Habits

	Purchased alcohol?	Purchased alcohol?	Quantity	Quantity
Number of units purchased per adult:				
– 1 week before	0.0016	-0.0005		
	(0.0001)	(0.0001)		
– 2 weeks before	0.0024	0.0002		
	(0.0001)	(0.0001)		
– 3 weeks before	0.0022	0.0001		
	(0.0001)	(0.0001)		
– 4 weeks before	0.0023	0.0001		
	(0.0001)	(0.0001)		
– 5 weeks before	0.0021	-0.0000		
	(0.0001)	(0.0001)		
– 6 weeks before	0.0019	-0.0002		
	(0.0001)	(0.0001)		
– 7 weeks before	0.0019	-0.0002		
	(0.0001)	(0.0001)		
– 8 weeks before	0.0021	-0.0001		
	(0.0001)	(0.0001)		
Mean of dependent variable	0.3833	0.3833		
Time effects?	Yes	Yes		
Household fixed effects?	No	Yes		

State dependence

Habits

	Purchased alcohol?	Purchased alcohol?	Quantity	Quantity
Number of units purchased per adult:				
– 1 week before	0.0016	-0.0005	0.0942	
	(0.0001)	(0.0001)	(0.0028)	
– 2 weeks before	0.0024	0.0002	0.1238	
	(0.0001)	(0.0001)	(0.0028)	
– 3 weeks before	0.0022	0.0001	0.1079	
	(0.0001)	(0.0001)	(0.0028)	
– 4 weeks before	0.0023	0.0001	0.1132	
	(0.0001)	(0.0001)	(0.0029)	
– 5 weeks before	0.0021	-0.0000	0.1017	
	(0.0001)	(0.0001)	(0.0029)	
– 6 weeks before	0.0019	-0.0002	0.0953	
	(0.0001)	(0.0001)	(0.0029)	
– 7 weeks before	0.0019	-0.0002	0.1020	
	(0.0001)	(0.0001)	(0.0029)	
– 8 weeks before	0.0021	-0.0001	0.1074	
	(0.0001)	(0.0001)	(0.0029)	
Mean of dependent variable	0.3833	0.3833	19.7637	
Time effects?	Yes	Yes	Yes	
Household fixed effects?	No	Yes	No	

State dependence

Habits

	Purchased alcohol?	Purchased alcohol?	Quantity	Quantity
Number of units purchased per adult:				
– 1 week before	0.0016	-0.0005	0.0942	-0.0150
	(0.0001)	(0.0001)	(0.0028)	(0.0027)
– 2 weeks before	0.0024	0.0002	0.1238	0.0113
	(0.0001)	(0.0001)	(0.0028)	(0.0027)
– 3 weeks before	0.0022	0.0001	0.1079	0.0013
	(0.0001)	(0.0001)	(0.0028)	(0.0027)
– 4 weeks before	0.0023	0.0001	0.1132	0.0103
	(0.0001)	(0.0001)	(0.0029)	(0.0027)
– 5 weeks before	0.0021	-0.0000	0.1017	0.0008
	(0.0001)	(0.0001)	(0.0029)	(0.0028)
– 6 weeks before	0.0019	-0.0002	0.0953	-0.0039
	(0.0001)	(0.0001)	(0.0029)	(0.0028)
– 7 weeks before	0.0019	-0.0002	0.1020	0.0014
	(0.0001)	(0.0001)	(0.0029)	(0.0028)
– 8 weeks before	0.0021	-0.0001	0.1074	0.0069
	(0.0001)	(0.0001)	(0.0029)	(0.0028)
Mean of dependent variable	0.3833	0.3833	19.7637	19.7637
Time effects?	Yes	Yes	Yes	Yes
Household fixed effects?	No	Yes	No	Yes

State dependence

Stockpiling

- We follow Hendel and Nevo (2006): construct an weekly inventory based on a constant rate of consumption and regress:
  - dummy $= 1$ if household purchased alcohol in week, and
  - total units conditional on purchasing
- on inventory, week effects and household fixed effects

	(1) Purchase alcohol?	(2) Quantity
Inventory	0.0015 (0.0000)	0.0897 (0.0010)
Mean of dependent variable	0.3833	19.7637
Time effects?	Yes	Yes
Household fixed effects?	Yes	Yes

Back

Beer and ale

	Product (j)	Size (s)	Alcohol unit share (%)	Price (pence/ unit)	Alcohol strength (ABV)
(1)	Ale: low strength	c. 500ml	0.03	79.95	3.85
(2)		c. 4x440ml	0.28	57.58	3.63
(3)		c. 12x440ml	1.88	44.37	3.53
(4)	Ale: mid strength, bottles	c. 500ml	0.09	69.78	4.53
(5)		$>$ 1x500ml	1.11	60.73	4.53
(6)	Ale: mid strength, cans	c. 4x500ml	0.33	44.69	4.49
(7)	Ale: high strength	c. 500ml	0.12	61.32	5.66
(8)		$>$ 1x500ml	1.30	52.87	5.59
(9)	Lager: branded, low strength	c. 4x440ml	0.26	53.82	3.84
(10)		c. 12x440ml	1.50	43.68	3.91
(11)		c. 20x440ml	4.12	37.44	3.93
(12)	Lager: branded, mid strength	c. 4x330ml	0.21	58.87	4.65
(13)		c. 12x330ml	0.41	47.48	4.62
(14)	Lager: branded, high strength, bottles	c. 660ml	0.06	59.26	5.27
(15)		c. 4x330ml	0.16	56.50	5.16
(16)		c. 12x275ml	0.56	49.96	5.11
(17)		c. 15x275ml	2.09	41.93	5.02
(18)	Lager: branded, high strength, cans	c. 4x440ml	0.36	44.19	5.53
(19)		c. 10x440ml	2.98	39.17	5.32
(20)	Lager: store brand	c. 4x500ml	1.88	33.46	4.19
(21)	Stout	c. 500ml	0.02	75.48	4.88
(22)		c. 4x440ml	0.14	67.43	4.08
(23)		c. 10x440ml	0.58	54.14	4.10

Wine

	Product (j)	Size (s)	Alcohol unit share (%)	Price (pence/ unit)	Alcohol strength (ABV)
(24)	Red wine: store brand	c. 750ml	1.43	45.69	12.50
(25)		$>$ 1x750ml	4.26	41.14	12.49
(26)	Red wine: branded	c. 750ml	2.20	52.38	12.57
(27)		c. 2x750ml	2.09	50.85	12.50
(28)		$>$ 2x750ml	7.99	46.33	12.57
(29)	White wine: still, store brand	c. 750ml	1.27	47.25	12.06
(30)		$>$ 1x750ml	4.20	42.31	11.80
(31)	White wine: still, branded	c. 750ml	2.05	53.12	12.20
(32)		c. 2x750ml	1.97	51.55	12.23
(33)		$>$ 1x750ml	6.93	46.65	12.30
(34)	White wine: sparkling, store brand	c. 750ml	0.21	69.49	9.73
(35)		$>$ 1x750ml	0.24	58.12	10.46
(36)	White wine: sparkling, branded	c. 750ml	0.36	79.83	9.90
(37)		$>$ 1x750ml	1.35	45.83	8.30
(38)	Rose wine: still, store brand	c. 750ml	0.44	45.59	11.90
(39)		$>$ 1x750ml	0.71	41.14	11.76
(40)	Rose wine: still, branded	c. 750ml	1.04	54.20	11.42
(41)		$>$ 1x750ml	1.78	49.51	11.25
(42)	Rose wine: sparkling, store brand	c. 750ml	0.15	65.09	8.35
(43)	Rose wine: sparkling, branded	c. 750ml	0.19	73.21	10.08
(44)		$>$ 1x750ml	0.17	70.60	9.48

Back

Spirits

	Product (j)	Size (s)	Alcohol unit share (%)	Price (pence/ unit)	Alcohol strength (ABV)
(45)	Brandy	c. 700ml	1.24	45.10	37.29
(46)		c. 1.4l	1.26	42.31	37.03
(47)	Gin; store brand	c. 700ml	0.65	35.47	38.32
(48)		c. 1.4l	1.13	34.92	38.45
(49)	Gin; branded	c. 700ml	0.52	44.07	38.00
(50)		c. 1.4l	1.18	41.24	38.37
(51)	Rum	c. 700ml	0.71	43.52	37.06
(52)		c. 1.4l	1.44	39.91	37.05
(53)	Vodka; store brand	c. 700ml	0.77	36.78	37.58
(54)		c. 1.4l	1.51	35.82	37.50
(55)	Vodka; branded	c. 700ml	0.89	41.28	37.69
(56)		c. 1.4l	2.68	37.77	37.59
(57)	Whisky; store brand	c. 700ml	1.05	41.41	40.00
(58)		c. 1.4l	1.86	39.11	40.00
(59)	Whisky; branded	c. 700ml	2.26	52.48	40.18
(60)		c. 1.4l	5.17	41.10	40.05
(61)	Liqueurs	c. 700ml	1.06	65.51	21.48
(62)		c. 1.4l	1.50	61.51	20.55
(63)	Port	c. 750ml	0.60	49.12	19.78
(64)	Sherry	c. 750ml	1.29	41.91	16.75
(65)	Vermouth	c. 1.4l	0.74	37.28	14.97
(66)	Other fort. wine	c. 1l	1.13	38.48	14.54

Back

Spirits

	Product (j)	Size (s)	Alcohol unit share (%)	Price (pence/ unit)	Alcohol strength (ABV)
(45)	Brandy	c. 700ml	1.24	45.10	37.29
(46)		c. 1.4l	1.26	42.31	37.03
(47)	Gin; store brand	c. 700ml	0.65	35.47	38.32
(48)		c. 1.4l	1.13	34.92	38.45
(49)	Gin; branded	c. 700ml	0.52	44.07	38.00
(50)		c. 1.4l	1.18	41.24	38.37
(51)	Rum	c. 700ml	0.71	43.52	37.06
(52)		c. 1.4l	1.44	39.91	37.05
(53)	Vodka; store brand	c. 700ml	0.77	36.78	37.58
(54)		c. 1.4l	1.51	35.82	37.50
(55)	Vodka; branded	c. 700ml	0.89	41.28	37.69
(56)		c. 1.4l	2.68	37.77	37.59
(57)	Whisky; store brand	c. 700ml	1.05	41.41	40.00
(58)		c. 1.4l	1.86	39.11	40.00
(59)	Whisky; branded	c. 700ml	2.26	52.48	40.18
(60)		c. 1.4l	5.17	41.10	40.05
(61)	Liqueurs	c. 700ml	1.06	65.51	21.48
(62)		c. 1.4l	1.50	61.51	20.55
(63)	Port	c. 750ml	0.60	49.12	19.78
(64)	Sherry	c. 750ml	1.29	41.91	16.75
(65)	Vermouth	c. 1.4l	0.74	37.28	14.97
(66)	Other fort. wine	c. 1l	1.13	38.48	14.54

Back

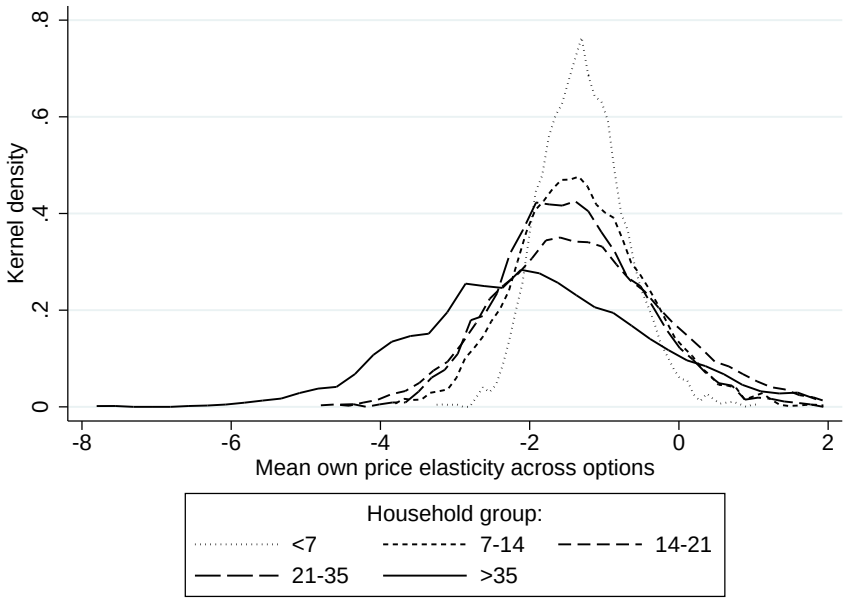
Cider and alcopops

	Product (j)	Size (s)	Alcohol unit share (%)	Price (pence/ unit)	Alcohol strength (ABV)
(67)	Dry cider, low strength	c. 1l	0.18	65.20	4.39
(68)		c. 4l	1.71	39.26	4.38
(69)	Dry cider, high strength, store brand	c. 2l	0.21	29.11	5.81
(70)		c. 5l	1.16	20.62	5.70
(71)	Dry cider, high strength, branded	c. 500ml	0.13	47.13	6.61
(72)		c. 2l	0.43	35.09	6.00
(73)		c. 12x440ml	2.55	29.57	5.60
(74)	Pear cider	c. 568ml	0.13	55.55	4.74
(75)		c. 3l	0.63	40.75	4.85
(76)	Fruit cider	c. 1l	0.25	79.33	4.53
(77)	Pre-mixed spirit	c. 750ml	0.11	91.23	6.13
(78)	Alcopops	c. 700ml	0.08	90.76	4.91
(79)		c. 2x700ml	0.31	85.01	4.59

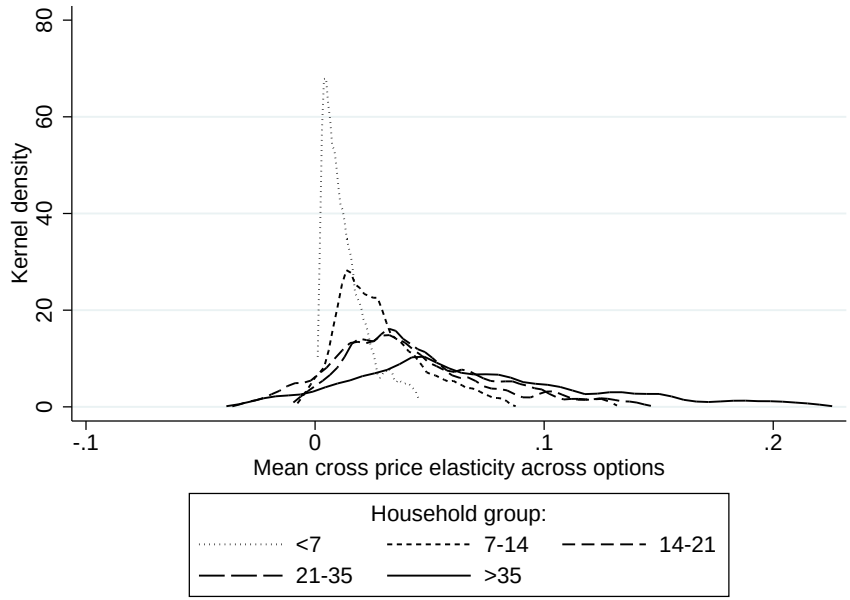
Back

Conditional distributions of price elasticities

(i) Own price elasticities



(j) Cross price elasticities



Back