

# The Price of Liquor is Too Damn High: The Costs of Post and Hold Pricing

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# Externalities and Public Policy

Policymakers often worry when consumption generates **negative externalities**:

“sin goods” tobacco, beer, wine, spirits, marijuana

“internalities” sugar-sweetened beverages

pollution gasoline, carbon

traffic parking, congestion charges, etc.

# Externalities and Public Policy

Several tools available to address these externalities:

- corrective taxes** Cigarettes \$5.35/pk in NY;  
Taxes on 1.75L bottle of Smirnoff Vodka are \$7.50 in CT.
- price controls** Scotland instituted a minimum price £1.00 per alcohol serving in 2018.
- market structure** Many states (NC, NH, MI, PA) have state-run liquor monopolies. Maine has a private one.
- other regulations** Who can sell alcohol/cigarettes. When they can sell them (“blue” laws)

# Current Debates

Is allowing firms to expand or exploit market power a good way to correct externalities?

LET THEM EAT SMOKE:  
THE CASE FOR EXEMPTING THE TOBACCO  
INDUSTRY FROM ANTITRUST

Style

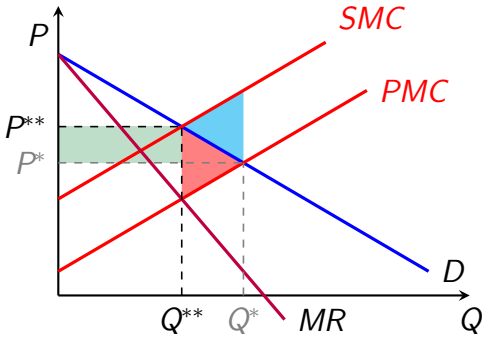
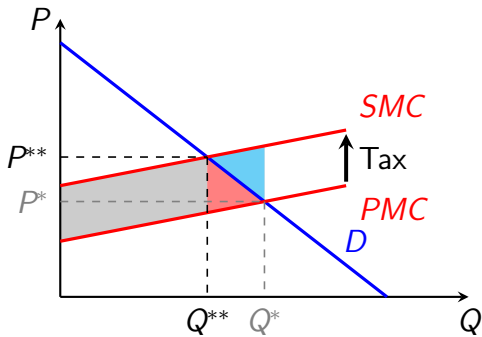
**The Ohio marijuana vote that could make Nick Lachey a weed kingpin. Yes, that Nick Lachey.**

**Ohio's marijuana proposal was lambasted for creating a cartel. But pot cartels could work.**

By German Lopez | @germanlopez | german.lopez@vox.com | Nov 4, 2015, 11:50am EST

- ▶ Should we limit entry among marijuana sellers?
- ▶ Should externalities be a mitigating factor in mergers among polluting firms?
- ▶ Should we promote cartels/co-operatives in industries with negative externalities?

# Restricting Output in Markets with Externalities



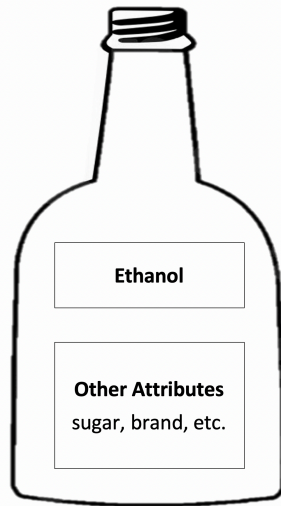
- ▶ Higher  $P$  and lower  $Q$  reduce private benefits to consumers (red).
- ▶ But society (net) benefits from less external damage (cyan).
  - ▶ Taxes transfer surplus to government (gray);
  - ▶ Market Power transfers surplus to firms (green).
- ▶ If both get us to  $(P^{**}, Q^{**})$ , why do we care?

# Sin Goods and Public Policy

- ▶ Our intuition from Econ 101 suggests maybe market power is a second-best method to address the externality.
  - ▶ Government can always tax back excess profits from firms.
  - ▶ This view is likely to be shared by some economists and policymakers.

# Sin Goods and Public Policy

- ▶ Our intuition from Econ 101 suggests maybe market power is a second-best method to address the externality.
  - ▶ Government can always tax back excess profits from firms.
  - ▶ This view is likely to be shared by some economists and policymakers.
- ▶ Our work suggests this intuition is highly misleading.
  - ▶ Extremely sensitive to the assumption of **homogenous products**.
  - ▶ Market power can distort not only **how much you consume** but also **which products you consume**.



# Sin Goods and Public Policy: Simplified Version

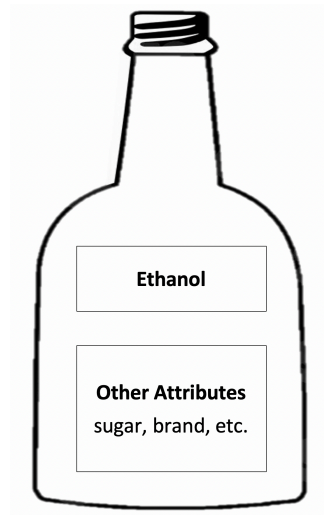
- ▶ Firms with market power will set price in accordance with **inverse elasticity rule**

$$\frac{p_j - mc_j}{p_j} = \frac{\theta}{|\epsilon_{jj}|}$$

- ▶ Social planner sets price (tax) to correct externality:

$$\begin{aligned} p_j &= mc_j + \text{marginal damage}_j \\ &\approx mc_j + \lambda \cdot \text{ethanol}_j \end{aligned}$$

- ▶ Premium products tend to have **less elastic demand** but **no more ethanol** than inexpensive ones.
- ▶ If problem drinkers seek out the cheapest source of ethanol, this gets even worse (firms set high markups on exactly the wrong products!).





# Our project

We study a regulation known as **post-and-hold (PH)** in the market for **distilled spirits**.

- ▶ Why distilled spirits?
  - ▶ Alcoholic Beverage market is \$250B per year.
  - ▶ Spirits are the largest source of ethanol by volume
  - ▶ Spirits are most heavily taxed and regulated (even per unit of ethanol).
- ▶ Why post and hold?
  - ▶ About 13 states use some form of PH for setting prices
  - ▶ NY/NJ/CT for Spirits.
  - ▶ Even without state monopoly PH tends to lead to **higher prices**.
  - ▶ Legality is currently subject to a **circuit split**
    - ▶ Found to violate the Sherman Act in one circuit ruling but not another.
    - ▶ Supreme Court declined to hear case. (We were cited but did not testify)

# How Does Post and Hold Work?

## Step 1: Price Schedule

- ▶ Wholesalers post a uniform (no discounts) price schedule. They must sell all products they stock at these prices to any licensed retailers.
- ▶ These prices are submitted to the regulator and printed in a book.

## Step 2: Price Posting

- ▶ The price book is circulated among wholesalers and retailers.
- ▶ **Lookback:** Adjustment period of 48 hours, during which wholesalers can adjust prices downwards (only), but can't beat the lowest price from a competing wholesaler in the first step.
- ▶ Prices are fixed for 30 days and distributed to retailers.

## Step 3: Sales Happen (30 Days Later)

# The Incentives of PH: A Simple Example

## 2nd Step

Assume retail firms always pick the cheapest wholesaler.

Assume 3 wholesalers with identical costs ( $c$ ) and the following Step 1 prices:

$$P_1 = 19$$

$$P_2 = 18$$

$$P_3 = 20$$

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## 1st Step

If you know you get to match your lowest competitor, what price should you play in the 1st stage?

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## 1st Step

If you know you get to match your lowest competitor, what price should you play in the 1st stage?

Your monopoly price

# Theory Slide

In the paper we do some more sophisticated game theory:

- ▶ Any price between  $[mc, p^m]$  is a **Nash Equilibrium**.
- ▶ Set your  $p^m$  in first stage, and match lowest competitor price if  $\underline{p} \geq mc$  in the second stage is the unique equilibrium that survives many refinements (iterated weak dominance, Pareto dominance, trembling hand, proper eq.).
- ▶ **Iterated Weak Dominance** works for the case with heterogeneous multi-product firms.
  - ▶ We also need to know how much share each wholesaler has of each product.
  - ▶ Can vary with products: 1/3 of Smirnoff Vodka, 1/5 of Captain Morgan.
  - ▶ If we assume this doesn't change, amounts to straightforward extension of  $\mathcal{H}_t(\kappa)$  **ownership matrix**.



# Data

We assemble several data sources:

## Price data (2007-)

- ▶ Wholesale and Manufacturer price data from price postings in CT DCP (Department of Consumer Protection).
  - ▶ Matching and digitizing these was a multi-year project
- ▶ Retail price data from Nielsen

## Quantity data (2007-2013)

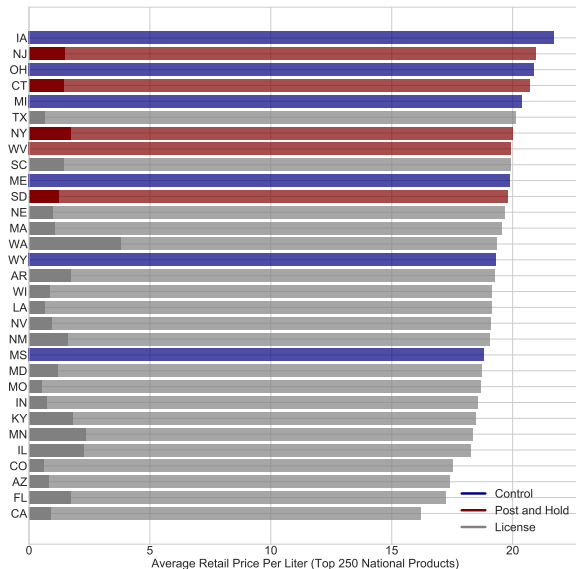
- ▶ Proprietary data from industry group (DISCUS) tracking every shipment from a member (around 70% of volume).
- ▶ Nielsen quantity data to capture sales of non-DISCUS products.
  - ▶ For example, Heaven Hill Distillery and Ketel One Vodka

# Facts

Before we estimate our model, some key facts:

1. PH states have high(er) prices for same set of products.
2. Ending PH is associated with **price decreases**.
  - ▶ Bonus: Ending PH is not associated with change in retailing employment.
3. CT has higher prices than non-PH neighbor MA, especially on **premium products**.
4. CT consumes fewer premium products than neighbor MA  
**consumption basket is distorted downwards**
5. No evidence of wholesale competition in CT.
  - ▶ Changing # of firms has no effect on prices.
  - ▶ Wholesale prices move in “conscious parallelism”.

# Fact #1: PH States Have High Prices



- ▶ State taxes are shaded.
- ▶ Not all states have sufficient Nielsen coverage.

## Fact #2: Consumption Increases After PH

	(All)	(All)	(PH only)	(PH NE)
Wine				
<i>PH</i>	-0.0623*** (0.0183)	-0.0229 (0.0192)	-0.0345* (0.0190)	-0.00430 (0.0340)
$R^2$	0.966	0.984	0.986	0.984
Beer				
<i>PH</i>	-0.0283*** (0.0107)	-0.0242** (0.0095)	-0.0201** (0.0081)	-0.0276** (0.0129)
$R^2$	0.905	0.969	0.960	0.991
Spirits				
<i>PH</i>	-0.0423** (0.0168)	-0.0787*** (0.0180)	-0.0854*** (0.0187)	-0.0979*** (0.0278)
$R^2$	0.955	0.982	0.976	0.986
Year FE	Y	Y	Y	Y
State FE	Y	Y	Y	Y
Demog. Controls	Y	Y	Y	Y
State Trends	N	Y	Y	Y
Observations	1,428	1,428	513	243

Standard errors in parentheses

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

## Aside: Why Have Post and Hold???

Rationalized as a way to protect small retailers.

- ▶ Rules out volume discounts.
- ▶ Precludes temporary sales aimed at particular retailers.

In reality ...

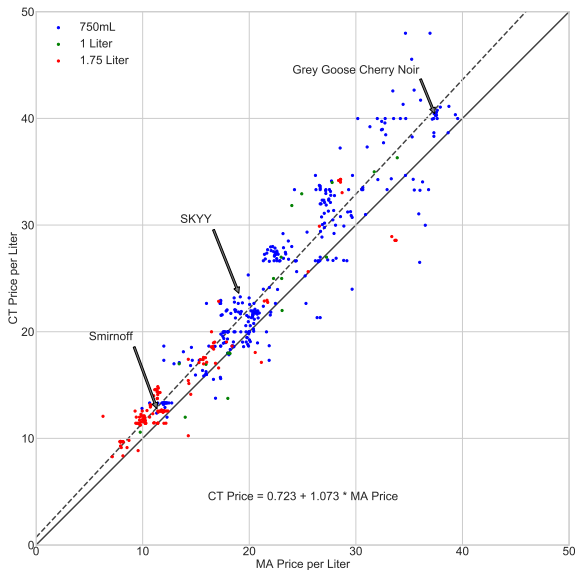
Alcoholic beverage wholesalers (and car dealers) are the biggest contributors to state legislator election campaigns.

On net it looks to be the case that retailers, including small retailers, pay uniform but higher prices under PH.

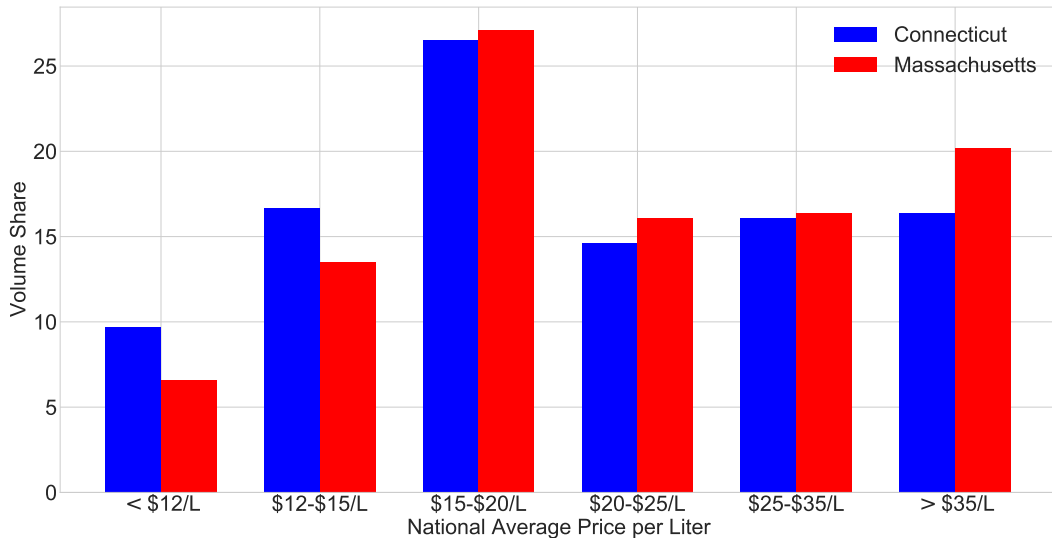
## Fact #2b: PH and State Alcohol Retail Sectors

	All	All	Northeast
Share of 1-4 Employee Retailers	0.0334 (0.029)	0.0454* (0.0262)	0.0466** (0.0227)
R-Squared	0.868	0.940	0.962
Log(Alcohol Employment/Pop 14+)	-1.753*** (0.198)	-0.482** (0.240)	-0.431* (0.224)
R-Squared	0.467	0.739	0.819
Log(Liquor Stores Per Capita)	-1.336*** (0.0866)	-0.599*** (0.0913)	-0.514*** (0.103)
R-Squared	0.855	0.954	0.963
Year FE	Y	Y	Y
State FE	Y	Y	Y
Demog Controls	Y	Y	Y
State Trends	N	Y	Y
Obs	1,275	1,275	300

## Fact #3: CT has higher prices on premium products

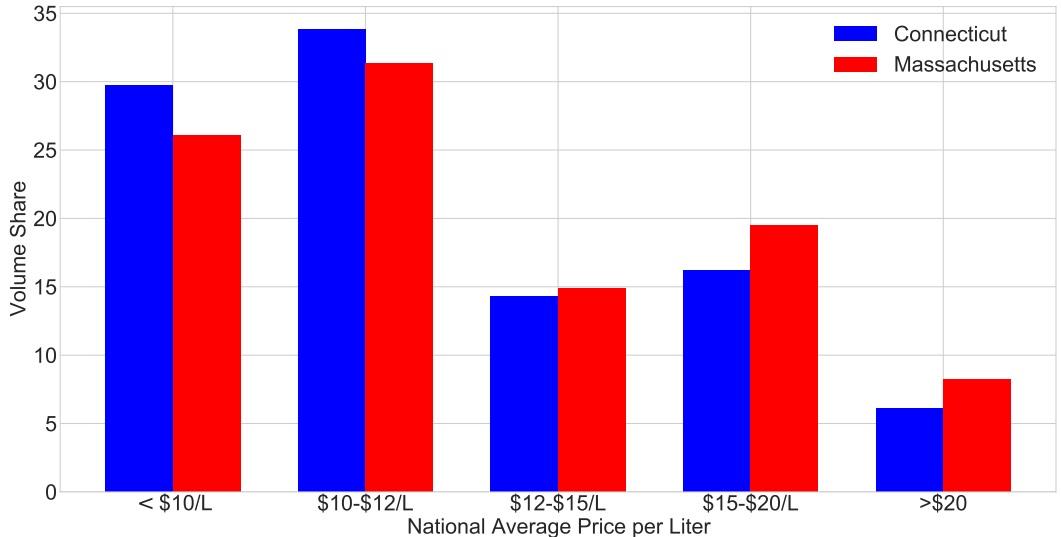


## Fact #4: CT skews to low-end products (750mL)

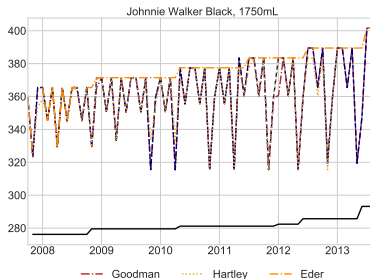
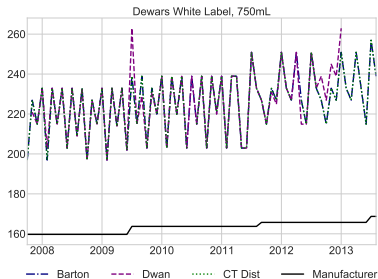
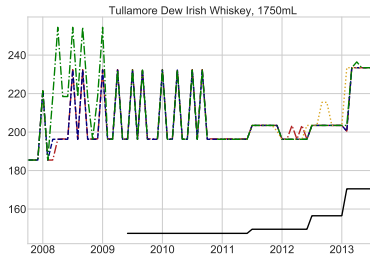
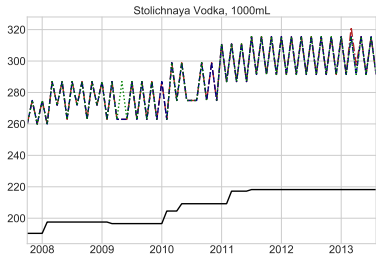




## Fact #4: CT skews to low-end products (1.75L)



# Fact #5: Wholesalers don't compete



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PH should reduce the scope for competition.

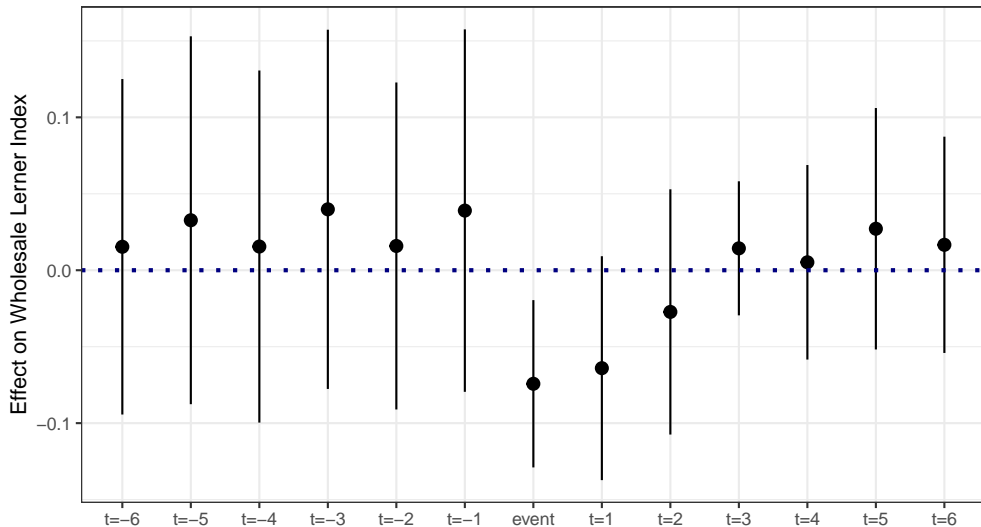
What do we see empirically?

- ▶ We focus on entry by a second or third firm and analyze entry as an event study:

$$L_{it} = \sum_{\tau=-6}^6 d_{\tau} + \eta_i + \delta_t + \epsilon_{it}$$

- ▶  $L_{it}$  is the lowest wholesale Lerner markup,  $\eta_i$  and  $\delta_t$  are product and time FE

## Fact #5: Wholesalers don't compete



# Supply Model

Objective: eliminate wholesale markup  $p_w = p_m$  and replace with taxes.

Two options:

1. Recover wholesaler marginal cost from the PH FOC.
2. Use the observed manufacturer price as the wholesaler's  $MC$ .
  - ▶ Not ideal if we think the wholesaler incurs real costs of distribution.

Two variations:

- a. Assume that manufacturer prices remain fixed.
  - ▶ Prefer this if manufacturers can't price discriminate across MA/CT/NY/NJ.
- b. Allow manufacturer prices to re-adjust

Ignore retailers: paper is about **wholesale** market.

Don't want to exclude sales to bars/restaurants (40% of market).

# Manufacturers, Markups, Margins

	Share	%750mL	%1.75L	$p_m$	$p_w$	$p_r$	$\frac{p_w - p_m}{p_w}$
Diageo	32.4	0.19	0.60	12.38	17.69	20.25	0.22
Pernod	13.1	0.21	0.45	14.35	19.94	22.72	0.22
Bacardi	12.9	0.21	0.46	15.30	21.12	24.59	0.20
Jim Beam	8.0	0.20	0.57	9.79	14.78	17.87	0.23
Black Prince	6.2	0.04	0.71	4.00	5.86	7.07	0.09
Brown Forman	5.0	0.23	0.47	14.94	22.35	26.09	0.26
Skyy	4.6	0.14	0.75	6.41	10.66	12.57	0.26
Star	3.1	0.25	0.66	10.95	15.61	18.33	0.20
Constellation	3.0	0.10	0.48	4.70	7.71	9.67	0.22
MHW	2.0	0.43	0.44	12.08	17.46	21.61	0.23

Wholesaler pays \$1.42/L in taxes after July 2011.

# Demand Model

Usual workhorse differentiated products demand model (BLP95):

$$u_{ijt} = \beta_i x_{jt} - \alpha_i p_{jt} + \delta_j + \delta_t + \Delta \xi_{jt} + \varepsilon_{ijt}$$

- ▶ Demand follows the RCNL model of Brenckers and Verboven (2006). Now popular: Grigolon Verboven (2014), Miller-Weinberg (2017), Miravete Seim Thurk (2018).
- ▶ Estimation done in PyBLP (Conlon Gortmaker RJE 2020).
  - ▶ Consumers have correlated tastes for **categories** (Whiskey, Vodka, etc.)
  - ▶ Consumers also differ by income (drawn from ACS for CT).
  - ▶ Consumers have tastes for: all goods, prices, size, ethanol content.
- ▶ Matching the following:
  - ▶ Aggregate market shares
  - ▶ Aggregate moment conditions  $\mathbb{E}[\Delta \xi'_{jt} Z_{jt}] = 0$ .
    - ▶ IV: tax change, characteristics of other goods, manuf prices(?)
  - ▶ Micro-moments: Nielsen panelist purchases (average price and size by income quintile).
  - ▶ Optional:  $p_{jt}^w - \eta_{jt}(\theta) = p_m + \omega_{jt}$

# Demand Elasticities

	Whiskey	Gin	Rum	Tequila	Vodka
Product FE	196	44	119	53	248
Observations	8944	2097	4721	2247	9018
Elas 75%	-1.93	-2.74	-2.62	-1.22	-3.35
Elas 50%	-2.61	-3.69	-3.00	-1.70	-3.80
Elas 25%	-3.13	-5.04	-4.33	-2.27	-5.75

Overwhelming share of consumers substitute within the nest  $\rho \in [0.8, 0.9]$ .

Aggregate elasticity (of 1% alcohol tax) around  $\epsilon = -0.3$ .

Median markup around 30% without constraint.

Otherwise match at an average of 24%.



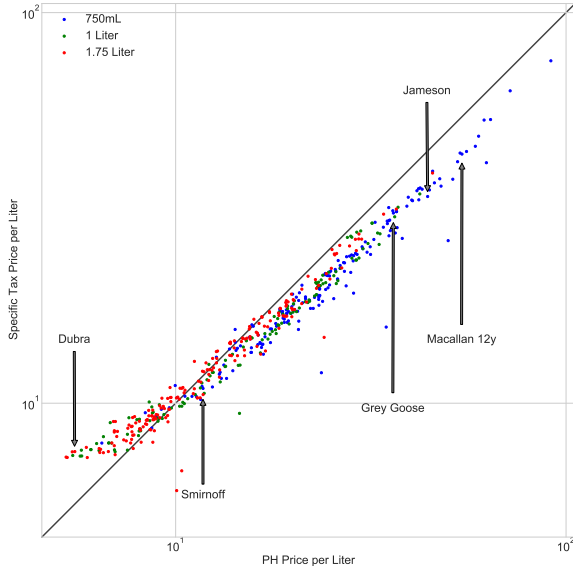
# Lots of Tax Interventions (in paper)

- ▶ Volumetric Taxes
- ▶ Ethanol (Pigouvian) Taxes
- ▶ Ramsey (price elasticity) taxes
- ▶ Minimum unit pricing

## Variants

- ▶ Fixed/Endogenous upstream prices
- ▶ Same ethanol consumption (+10%/-10%).

# PH vs Volumetric Taxes (CS up 3%, Ethanol Fixed)



# Conclusion

Replacing PH with a tax would raise meaningful revenue.

- ▶ In Connecticut, annual spirits tax revenue would increase by \$96M (from about \$36M).
  - ▶ The CT FY2016 deficit was about \$170M.
- ▶ NJ is about 2.5x as large and NY is about 4.5x as large.
- ▶ Would also boost total consumer surplus
  - ▶ Though some consumers will lose.
  - ▶ We could compensate them with  $\approx 15\%$  of tax revenue raised.
- ▶ The price of high-end spirits products in CT is too high.

# Questions

We have matched manufacturer data (after only 7 years).

1. Should we impose the *PH* pricing jointly when estimating demand?
2. Is  $p_m$  a valid IV for  $p_w$ ?
3. Should we back MC out of the PH FOC's for wholesalers? or use  $p_m = mc_w$ ?
4. Should we use  $p_m$  to test predictions of PH theory? (ie: like BCS Cereal).