

# The Price of Liquor is Too Damn High: Taxation and Market Structure

C.Conlon and N. Rao

Columbia University and NYU Wagner

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# Industry Details

Two major ways states regulate the liquor industry in the United States

- ▶ State Controlled (Monopoly) Liquor Stores  
(18 States: NH, PA, NC, ME, VT)
- ▶ Three-Tiered System (31 States: NY, NJ, CT, MA)

Mostly a result of Prohibition Era in the US

# Industry Details

## The Three-Tiered System

- ▶ **Manufacturers:** National or International, Multi-brand large firms  
(Diageo, Bacardi, LVMH, InBev, Heineken, Pernod-Ricard)
- ▶ **Wholesalers:** Buy from multiple manufacturers and sell to multiple retailers  
(Limited to a single state— sometimes a single county).  
Though holding companies may control several in different states.
- ▶ **Retailers:** Liquor Stores (sometimes Supermarkets) (or Bars):  
Required to buy from in-state wholesalers.  
(Cannot deal directly with manufacturers, some exemptions)

# Big Picture

States face a dual mission with “Sin Taxes”

- ▶ Increase Price/Reduce Quantity to limit negative externalities
- ▶ Use taxes to raise revenue

States have a few different levers:

- ▶ Specific Taxes: On quantity of Pure Ethanol
- ▶ *Ad Valorem*/Sales Taxes: Based on Revenues
- ▶ Market Structure (Post and Hold)
- ▶ 12 States (including NY,NJ, CT, and MI) have PH laws.
- ▶ 30 States have proposed raising excise taxes on alcohol since 2007.

# How does Post and Hold Work?

## Step 1: Price Schedule

- ▶ Wholesalers post a linear (no discounts) price schedule that they must sell to all licensed retailers at for all products they stock.
- ▶ 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.
- ▶ There is an adjustment period of 48 hours, during which wholesalers can adjust prices downwards (only), but not below the lowest price on that item from a competing wholesaler in the first period.
- ▶ Prices are fixed for 30 days and books are distributed to retailers.

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

## Recent Court Rulings

### *Granholm v Heald (2005)*

- ▶ States were no longer granted *carte blanche* to regulate alcohol under the 21st amendment.
- ▶ Case involved banning direct shipments from out of state but not in state winemakers.

### 9th Circuit Opinion (Costco v. Hoen 2007)

*We affirm the district court's rejection of Costco's challenge to the retailer-to-retailer sales ban. We also affirm its conclusion that under our precedents, the post-and-hold scheme is a hybrid restraint of trade that is not saved by the state immunity doctrine of the Twenty-first Amendment.*

*- Judge Diarmuid O'Scannlain (9th Circuit)*

# Public Opinion in CT

## Governor Malloy (D-CT)

*For Connecticut's citizens to be as badly punished as they have been as a result of this minimum pricing structure is ghastly, unfair and has driven business from our state, causing us to lose jobs.*

*A bottle of wine selling for \$21.99 in Massachusetts could cost \$29.99 in Connecticut...It is absolutely outrageous that people expect citizens of Connecticut to pay that kind of premium. This has been a 100 percent regulated and protected industry and in so, **in many ways, is quite un-American.***

# Public Opinion in CT

## Retailers

*The governor is basically trying to crucify this industry... With everything that he wants to do there's no way that small stores can compete with the Stop & Shops and Costcos of this world. They would crush us.*

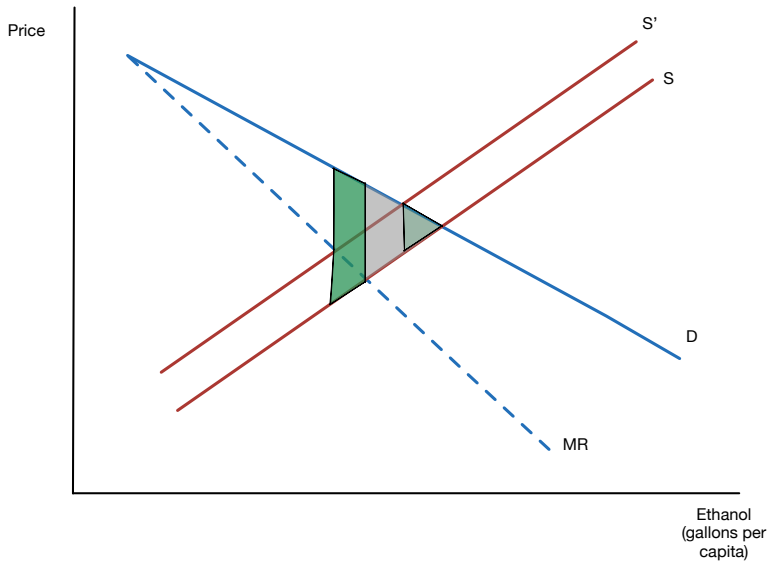
*It's tough now and that's going to make it even more difficult... we're close to what we pay in terms of pricing already. I don't think the consumer is going to gain by eliminating the minimum bottle. We're a dollar above cost on Budweiser, we're a dollar above cost on things like half gallons of Scotch, maybe \$2 a bottle if we buy it right. **I just think the pricing starts before it gets to us.***



# Alcohol Taxes & Alcohol Consumption

- ▶ Huge literature: meta-analyses compare over 1100 tax-elasticity estimates
  - ▶ Uses mostly annual gallonage data, no product level prices and quantities.
  - ▶ Recent exceptions in PA. (Seim and Waldfogel (2013), Miravete Seim and Thurk (2014) for State Monopoly).
  - ▶ Smaller experiments on tax salience: Chetty Looney Croft (2009).
- ▶ What's new here:
  - ▶ Extremely detailed SKU level data from CT
  - ▶ Careful examination of market structure (with game theory)
  - ▶ Market structure does not envelope out – allocations of consumers to differentiated products is major driver of welfare.

# Alcohol Taxes & Alcohol Consumption



# Overview

Our paper focuses on the market for distilled spirits and a particular regulation known as *Post and Hold* which reduces competition among wholesalers

Non Competitive Pricing:

- ▶ PH should lead to higher prices and lower quantity.
- ▶ Also distorts relative prices (higher margins at high-end)
- ▶ Provide some descriptive evidence

Optimal Taxation

- ▶ PH directs profits to wholesalers
- ▶ How much of those profits could state capture with specific taxes? ad valorem taxes?
- ▶ How does the pre-existing distortion affect the ability to raise revenue?
- ▶ Results from simulated model of Supply & Demand

# Single Product Model

- ▶ Assume multiple wholesale firms selling a single brand
- ▶ Firms  $i = 1, \dots, N$
- ▶ Stage 1: Propose Linear schedule
  - ▶ Firms set prices  $p_i^0$
  - ▶ At the end of the stage price vector  $\mathbf{p}^0$  is made public.
- ▶ Stage 2: Update Prices
  - ▶  $\underline{p}^0 \equiv \min_i p_i^0$
  - ▶  $\underline{p}_i \in [\underline{p}^0, p_i^0] \quad \forall i$

Suppose that consumer demand for is described by  $Q(P)$ , then firms face residual demand curve, where they split the market among firms matching the price:

$$D(p_i, p_{-i}) = \begin{cases} 0 & \text{if } p_i > \min_j p_j; \\ \frac{Q(p_i)}{\sum_k \mathbb{I}[p_k = \min_j p_j]} & \text{if } p_i = \min_j p_j. \end{cases}$$

# Single Product Model

If firms have constant marginal costs  $c_i$ , then in the second stage firms' solve:

$$p_i^* = \arg \max_{p_i \in [\underline{p}^0, \overline{p}_i^0]} \pi_i = (p_i - c_i) * D(p_i, p_{-i})$$

which admits the dominant strategy:

$$p_i^* = \max\{c_i, \underline{p}^0\} \quad \forall i$$

Now consider the first stage game, given the dominant strategy in the second stage it turns out that an equilibrium choice for  $p_i^0$  is:

$$p_i^0 \in [\max\{c_i, \min_{j \neq i} c_j\}, p_i^m]$$

An equilibrium is any price between the “limit pricing” price and the price firm  $i$  would charge as the monopolist.

# Multiple Equilibria

## Monopoly Pricing

- ▶ One possible equilibrium is the monopoly pricing equilibrium. That is, all firms set  $p_i^0 = p^m$ . Here there is no incentive to deviate.
- ▶ In the second stage, all firms split the pie. Cutting prices in the first stage merely reduces the size of the pie *without any change to the division*
- ▶ Any upwards deviation in the first stage has no effect because it doesn't change  $\underline{p}_0$ .

## Other Equilibria : Marginal Cost Pricing

- ▶ Another possible equilibrium is symmetric marginal cost pricing. Here there is no incentive to cut one's price and earn negative profits.
- ▶ No single firm can raise their price and increase  $\underline{p}_0$  as long as at least one firm continues to set  $p_i^0 = c$ .

# Refinements

Which equilibrium actually gets played?

- ▶ Monopoly equilibrium is unique Pareto dominant EQ in the set
  - ▶ Pareto dominance need not guarantee stability.
- ▶ It also is the only one to survive Iterated Weak Dominance,  $\epsilon$ -perfection, proper equilibrium, etc.
- ▶ “Meet but not beat” works to clean up the strategies, refine away other equilibria by killing “business stealing” motive.
- ▶ Stage 1 has asymmetry: Firms can set the market price (as a monopolist) for all firms by cutting their price below  $\underline{p_0}$ , but become price takers when raising prices.

# Multi-product Cartel Pricing Equilibrium

Second stage still has a dominant strategy:

$$p_{ij}^* = \max\{c_{ij}, \underline{p}_j^0\} \quad \forall i, j$$

Firms now choose optimal strategies in first-stage prices, understanding what the outcome of the subgame will be.

$$\pi_i = \max_{p_{ij}: j \in J_i} \sum_{j \in J_i} (p_{ij} - c_{ij}) \cdot q_{ij}$$

$$\frac{\partial \pi_i}{\partial p_k} = q_{ik} + \sum_{j \in J_i} (p_{ij} - c_{ij}) \cdot \frac{\partial q_{ij}}{\partial p_k} \quad \forall i = 1, \dots, N$$



# Multi-product Cartel Pricing Equilibrium

- ▶ What is  $\frac{\partial q_{ij}}{\partial p_k}$  for the cartel?
- ▶ Let's assume that  $q_{ij} = \lambda_{ij} Q_j(\mathbf{p})$ .
- ▶ We know the share of each good  $j$  allocated to each cartel member  $i$  and assume that it doesn't vary with price.
- ▶ We will directly observe  $\lambda_{ij}$  in our data
- ▶ (We see shipments to individual wholesalers from manufacturers).
- ▶ We can use this system of FOCs determine marginal costs and counterfactual prices/pass-through of taxation.

# Multi-product Cartel Pricing Equilibrium

$$Q_k \lambda_{ik} + (p_k - c_{ik}) \cdot \frac{\partial Q_k}{\partial p_k} \lambda_{ik} + \sum_{j \in J_i} (p_j - c_{ij}) \cdot \frac{\partial Q_j}{\partial p_k} \lambda_{ij} \geq 0 \quad \forall i = 1, \dots, N$$

$$\underbrace{Q_k + (p_k - c_{ik}) \cdot \frac{\partial Q_k}{\partial p_k}}_{\text{Single Product Monopolist}} + \underbrace{\sum_{j \in J_i} (p_j - c_{ij}) \cdot \frac{\partial Q_j}{\partial p_k} \frac{\lambda_{ij}}{\lambda_{ik}}}_{\text{Cannibalization}} \geq 0 \quad \forall i = 1, \dots, N$$

For each product  $k$ , except in the knife-edge case, the first order condition holds with equality for exactly one firm  $i$ . This establishes a least upper bound:

$$\underbrace{Q_k + p_k \cdot \frac{\partial Q_k}{\partial p_k}}_{\text{Marginal Revenue}} + \min_{i: k \in J_i} \underbrace{\left[ -c_{ik} \frac{\partial Q_k}{\partial p_k} + \sum_{j \in J_i} (p_j - c_{ij}) \cdot \frac{\partial Q_j}{\partial p_k} \frac{\lambda_{ij}}{\lambda_{ik}} \right]}_{\text{Opportunity Cost of Selling}} = 0 \quad (1)$$

If firms have symmetric marginal costs  $c_{ij} = c_j$ , we can find the lowest opportunity cost firm  $i$

$$\min_{i: k \in J_i} \sum_{j \in J_i} (p_j - c_{ij}) \cdot \frac{\partial Q_j}{\partial p_k} \frac{\lambda_{ij}}{\lambda_{ik}}$$

and they become the price-setter for good  $j$ .

## Distortions Across Products

Relative to perfectly competitive markets:

- ▶ Monopolist will obviously set a markup that depends on the price elasticity of consumers
- ▶ If higher-quality products have less price elastic consumers, they will have higher relative markups.
- ▶ PH should encourage substitution to lower quality brands (at a given level of aggregate consumption).

Relative to optimal Pigouvian taxes with perfectly competitive markets:

- ▶ Optimal Pigouvian tax would only target ethanol
- ▶ More elastically demanded products would have the same tax as less elastically demanded products
- ▶ Should lead to (relatively) more premium brand consumption compared to PH

## States with PH Laws (replication of Cooper and Wright)

	<b>Wine</b>	<b>Beer</b>	<b>Spirits</b>
Connecticut	Y	Y	Y
Delaware	End 1999	End 1999	End 1999
Georgia	N	Y	Y
Idaho	Y	Y	N
Maine	Y	Y	N
Maryland	End 2004	End 2004	End 2004
Massachusetts	End 1998	End 1998	End 1998
Michigan	Y	Y	Y
Missouri	Y	N	Y
Nebraska	End 1984	N	End 1984
New Jersey	Y	Y	Y
New York	Y	Y	Y
Oklahoma	End 1990	End 1990	Y
Pennsylvania	N	End 1990	N
South Dakota	Y	N	Y
Tennessee	N	Y	N
Washington	End 2008	End 2008	N
West Virginia	N	N	Y

# Post and Hold Laws and State Alcohol Consumption

	(All)	(All)	(All)	(PH only)	(PH NE)
Wine					
PH	-0.0545*** (0.0183)	-0.0623*** (0.0183)	-0.0229 (0.0192)	-0.0345* (0.0190)	-0.00430 (0.0340)
$R^2$	0.965	0.966	0.984	0.986	0.984
Beer					
PH	-0.0155 (0.0113)	-0.0283*** (0.0107)	-0.0242** (0.0095)	-0.0201** (0.0081)	-0.0276** (0.0129)
$R^2$	0.891	0.905	0.969	0.960	0.991
Spirits					
PH	-0.00702 (0.0175)	-0.0423** (0.0168)	-0.0787*** (0.0180)	-0.0854*** (0.0187)	-0.0979*** (0.0278)
$R^2$	0.950	0.955	0.982	0.976	0.986
Year FE	Y	Y	Y	Y	Y
State FE	Y	Y	Y	Y	Y
Demog. Controls	N	Y	Y	Y	Y
State Trend	N	N	Y	Y	Y
PH States	N	N	N	Y	N
NE States	N	N	N	N	Y
Observations	1,428	1,428	1,428	513	243

Standard errors in parentheses

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

# Post and Hold Laws and State Alcohol Retail Employment

	2010 Only	All	All	Northeast
Share of 1-4 Employee Retailers	0.0705 (0.0436)	0.0334 (0.0209)	0.0454* (0.0262)	0.0466** (0.0227)
R-Squared	0.129	0.868	0.940	0.962
Log(Alcohol Employment/Pop 14+)	0.451 (0.336)	-1.753*** (0.198)	-0.482** (0.240)	-0.431* (0.224)
R-Squared	0.066	0.467	0.739	0.819
Log(Liquor Stores Per Capita)	0.337 (0.201)	-1.336*** (0.0866)	-0.599*** (0.0913)	-0.514*** (0.103)
R-Squared	0.149	0.855	0.954	0.963
Obs	51	1275	1275	300
Demog Controls	Y	Y	Y	Y
State FE	N	Y	Y	Y
Year FE	N	Y	Y	Y
State Specific Trends	N	N	Y	Y

# Product Level Data

We use a number of different data sources

- ▶ Posted Prices scraped from CT DCP
- ▶ Shipments from manufacturers to wholesalers (DISCUS)
- ▶ Nielsen Homescan Scanner Dataset (Kilts-Booth)
- ▶ NIAA data on apparent consumption (by state in proof gallons).

# Price Indices and Excise Taxes by State (License States)

State	Index (CT Q)	Index (MA Q)	Excise Tax	Net of Tax (CT)	Net of Tax (MA)
ME	26.95	29.60	5.80	25.10	27.64
NE	26.31	28.93	3.75	25.11	27.66
NM	26.51	29.45	6.06	24.58	27.40
TX	25.91	28.01	2.40	25.15	27.20
SC	25.12	27.28	5.42	23.39	25.45
AR	25.39	27.90	6.57	23.29	25.69
LA	25.04	27.37	2.50	24.25	26.52
CT	25.03	27.17	5.40	23.31	25.35
WI	25.37	28.12	3.25	24.33	27.02
IL	24.79	26.73	8.55	22.06	23.85
IN	25.23	28.00	2.68	24.38	27.09
MO	25.05	27.50	2.00	24.41	26.82
SD	25.22	27.79	4.68	23.72	26.21
KY	24.79	27.02	6.76	22.63	24.74
NJ	24.42	25.99	5.50	22.66	24.13
NY	24.19	25.66	6.44	22.13	23.49
MD	24.53	26.91	4.41	23.12	25.42
MN	24.27	26.82	8.71	21.49	23.88
NV	23.57	25.28	3.60	22.42	24.07
MA	23.32	24.71	4.05	22.02	23.35
AZ	23.49	25.49	3.00	22.53	24.48
GA	23.50	25.45	3.79	22.29	24.17
DE	22.52	24.48	3.75	21.33	23.21
FL	22.14	23.82	6.50	20.06	21.62
CO	22.10	23.79	2.28	21.37	23.02
CA	21.85	23.60	3.30	20.80	22.48



## Import and Domestic Vodka Share: Northeastern States

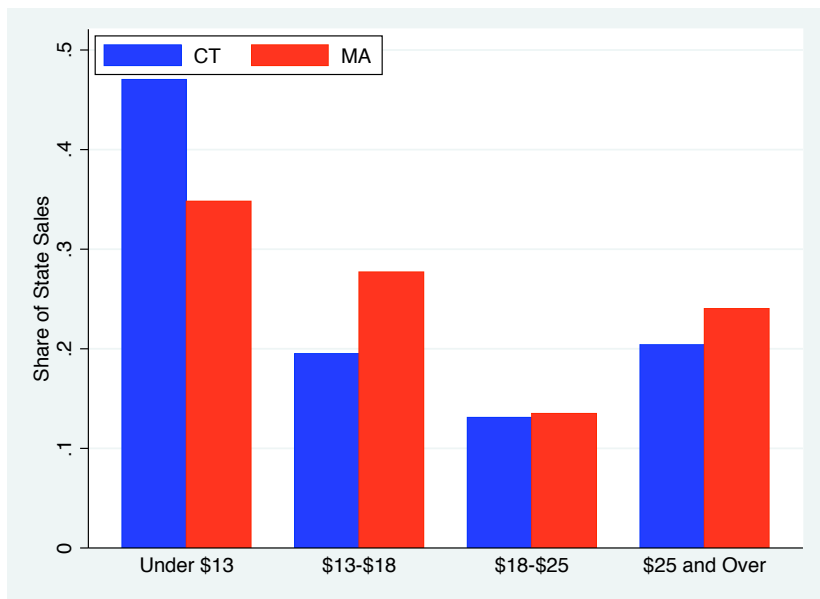
	<b>Domestic</b>	<b>Imported</b>	<b>Total</b>	<b>Import Share</b>
Connecticut	684,520	440,230	1,124,750	39.1%
Massachusetts	1,014,500	1,132,980	2,147,480	52.8%
New Jersey	974,910	1,880,350	2,855,260	65.9%
New York	2,256,280	2,759,480	5,015,760	55.0%
Vermont	90,570	45,330	135,900	33.4%
New Hampshire	365,940	315,700	681,640	46.3%
Pennsylvania	1,459,740	981,660	2,441,400	40.2%
District of Columbia	173,720	186,420	360,140	51.8%

## Product Characteristics:CT

<b>Spirit Category</b>	<b>Price</b>	<b>Proof</b>	<b>Products</b>	<b>Mkt Share</b>	<b>CT Tax</b>
Vodka	\$22.39	78.68	405	40.35%	\$4.13
Rum	\$18.79	73.68	225	18.90%	\$3.88
Gin	\$22.15	88.84	65	7.31%	\$4.65
Tequila	\$28.90	80.00	114	4.63%	\$4.20
Domestic Whiskey	\$24.56	81.93	122	11.33%	\$4.30
Imported Whiskey	\$32.59	81.57	236	17.48%	\$4.28

Reported Price, Proof and Total Tax are category means weighted by number of units sold. Products is the count of distinct brands and sizes. Market Share is the fraction of all of cases sold. Prices are converted to 2013 dollars using CPI-U.

## State Vodka Market Shares By Price (Price Per Liter)



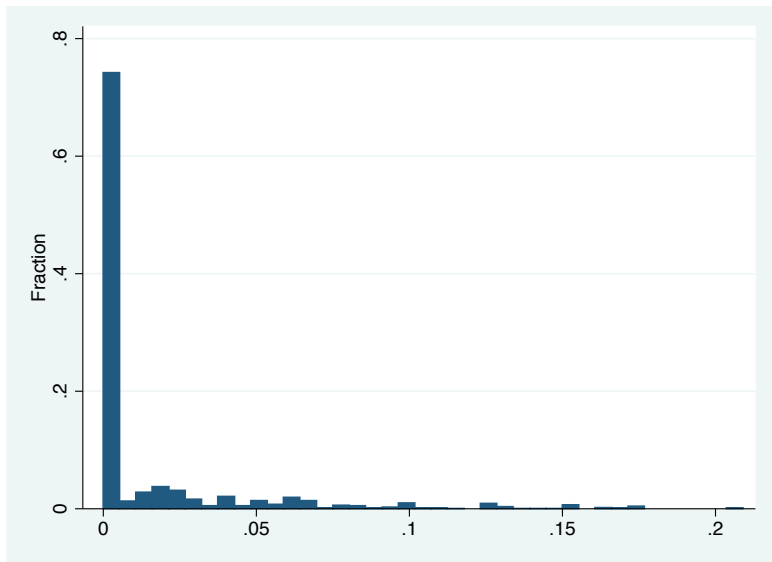
# Conduct

We can't actually say anything firm about conduct (yet)

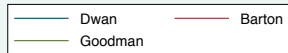
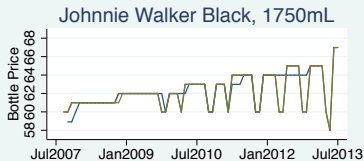
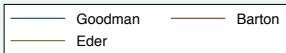
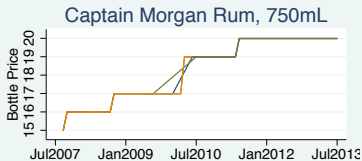
- ▶ We generally need information on the wholesaler's marginal cost to identify collusive pricing.
- ▶ Since we are detecting a potential multi-product monopoly we cannot just look at own price elasticities.

We can show lack of price dispersion (second stage dominant strategy)

## Price Spreads As A Fraction of Mean Bottle Price



# Price Dispersion



## Demand Specification: RCNL (Brenckers Verboven 2006, Grigolon Verboven 2013)

Consumers  $i$  have a utility for a particular product  $j$  in market  $t$  given by:

$$\begin{aligned}u_{ijt} &= \delta_{jt} + x_{jt}\Sigma\nu_i + \overline{\varepsilon}_{ijt} \\ \overline{\varepsilon}_{ijt} &= \zeta_{igt} + (1 - \rho)\varepsilon_{ijt}\end{aligned}$$

Which leads to type specific shares, and aggregate shares:

$$\begin{aligned}I_{igt} &= (1 - \rho) \ln \sum_{j \in J_{gt}} \exp((\delta_{jt} + x_{jt}\Sigma\nu_i)/(1 - \rho)) \\ s_{ijt}(\delta_t, \theta, \nu_i) &= \frac{\exp[(\delta_{jt} + x_{jt}\Sigma\nu_i)/(1 - \rho)]}{\exp[I_{igt}/(1 - \rho)]} \cdot \frac{\exp[I_{igt}]}{\exp[I_i]} \\ s_{jt}(\delta_t^k(\theta), \theta) &= \int s_{ijt}(\delta_t, \theta, \nu_i) f(\nu_i)\end{aligned}$$

# Demand Specification: Identification and Instruments

- ▶ We allow  $\delta_{jt} = d_j + \xi_t + \Delta\xi_{jt}$  (product and month fixed effects).
- ▶ Identification depends on price changes within a product over time.
- ▶ Instruments:
  - ▶ July 2011 excise tax change in CT
  - ▶ Hausman Instruments: contemporaneous prices in other (control and license states), we use FL and TX.
  - ▶ BLP Instruments: Counts of similar products by category-month (How many other Strawberry/Flavored/750mL Vodkas are there?)
  - ▶ Interacted with product category.
- ▶ Right now only from 2007-2011. Will include 2012 when Nielsen data is available.



# With Product Fixed Effects and “Hausman” Instruments

	(1) Logit	(2) LogitIV	(3) NLogit	(4) NLogitIV	(5) RCNL
$\rho$			0.7939*** (0.0353)	0.8771*** (0.0328)	0.8090*** (0.0512)
$\log(\text{price})$	-1.8742*** (0.3745)	-0.4246 (1.2910)	-0.3292*** (0.0797)	-1.5570*** (0.2319)	-4.886*** (0.4621)
$\sigma_{\log p}$					2.157*** (0.312)
$\sigma_{\text{proofgal}}$					0.862*** (0.241)
Observations	24,449	24,449	24,449	24,449	24,449
R-squared	0.1549	0.1351	0.9454	0.9534	n/a
Product FE	640	640	640	640	640
Time FE	52	52	52	52	52

GMM standard errors clustered at product level in parentheses

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

## Price Elasticities by Category

Spirit Category	Mean	P25	Median	P75
Domestic Whiskey	-9.16	-16.3	-11.0	-4.87
Gin	-9.27	-15.5	-8.65	-5.47
Imported Whisky	-8.86	-14.9	-6.33	-0.994
Rum	-11.1	-16.0	-14.2	-6.15
Tequila	-8.93	-11.7	-5.88	-4.02
Vodka	-10.6	-16.7	-13.0	-7.64
Aggregate Elasticity Demand				-1.05
Aggregate Elasticity Consumption				-0.957

Mean elasticity is the sales-weighted average elasticity by spirits category.  
The first, middle and third quartile are reported as P25, Median and P75 respectively

Demand is reported in number of bottles, Consumption is in proof gallons.

## Supply Side

- ▶ Consider a per gallon tax  $T$
- ▶ Consider a sales tax  $\tau$

Counterfactuals use following steps:

- ▶ Recover costs using demand and multi product cartel FOC

$$Q_k + p_k \cdot \frac{\partial Q_k}{\partial p_k} + \min_{i:k \in J_i} \left[ -c_{ik} \frac{\partial Q_k}{\partial p_k} + \sum_{j \in J_i} (p_j - c_{ij}) \cdot \frac{\partial Q_j}{\partial p_k} \frac{\lambda_{ij}}{\lambda_{ik}} \right] =$$

- ▶ Recompute prices without PH and with PC, under alternate tax scheme.

$$\mathbf{p} = (\mathbf{c} + T)(1 + \tau)$$

- ▶ Raise taxes  $(\tau, t)$  to hold consumption of ethanol fixed  $Q_e(\mathbf{p})$ .

# Comparative Statics

**Table:** Marginal Impact of Tax/Price Increases with and without PH

	<b>PH (100% PT)</b>	<b>PH (Endog. PT)</b>	<b>Perfect Competition</b>
Do Nothing (Consumption)			7.9763 4.8651
Double Specific Tax (5.40) (Consumption)	-0.867 -1.275	-0.321 -0.478	-2.305 -2.081
10% Price Increase (Consumption)	-4.060 -3.949	-2.412 -2.326	-1.302 -1.228
\$1 per bottle Price Increase (Consumption)	-0.645 -0.481	-0.341 -0.182	-2.039 -0.822

## Counterfactuals: Fixed Consumption

Suppose we wanted hold aggregate consumption  $Q_e(\mathbf{p})$  fixed

- ▶ This implies the same level of the externality
- ▶ Makes sense of pre-existing specific tax is at Pigouvian level.

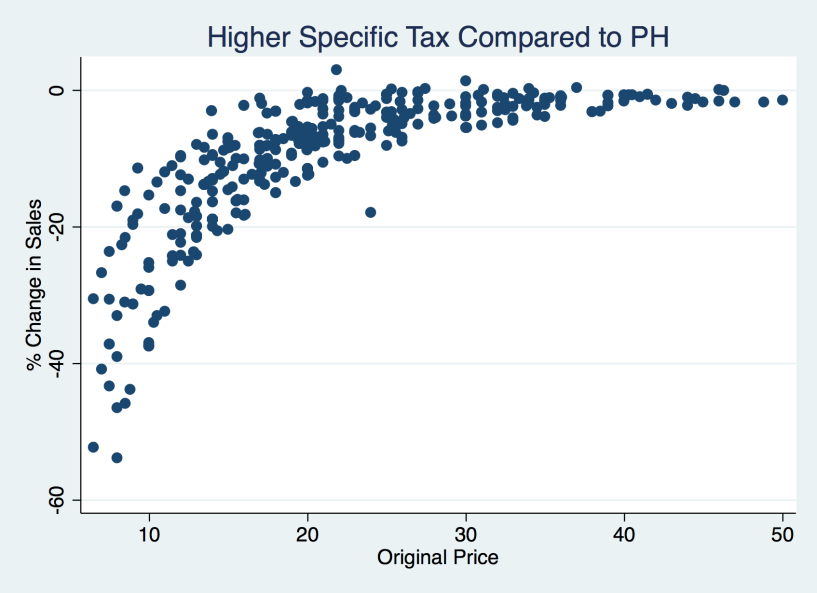
**Table:** Raising Taxes to Hold Alcohol Consumption Fixed

	<b>Specific Tax</b>	<b>Sales Tax</b>
Tax Increase	12.61	35.7%
Per 750mL at 80PF	2.00	
Change in Sales	2.47%	1.50%
Change in Govt Revenue	233.60%	506.67%
Change in Consumer Surplus	2.44%	8.19%
Fraction of Wholesaler Revenue	45.38%	98.40%

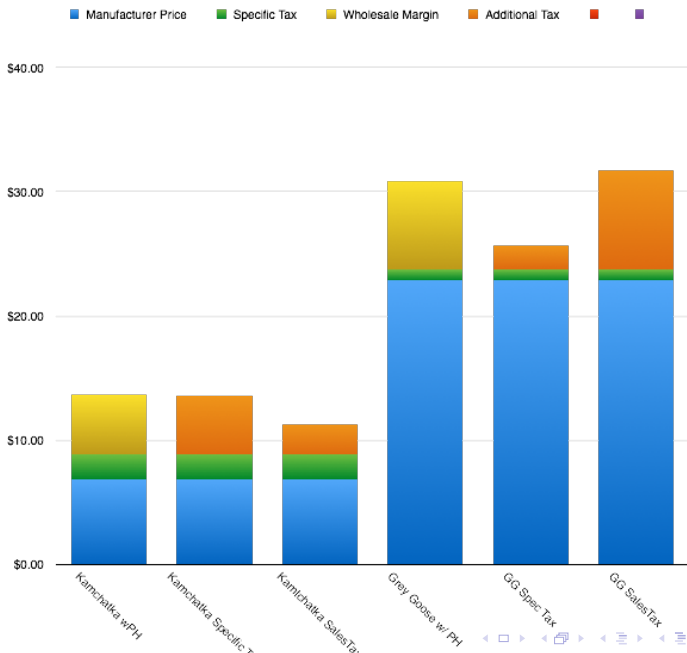
## Can we get a Pareto Improvement?

- ▶ Our scheme of replacing PH with a specific or sales tax and holding quantity fixed is regressive.
- ▶ It shifts rents from consumers of high end products (Grey Goose) to those who consume low end products (Dubra).
- ▶ Pareto improvement is tough to think about in heterogeneous agent models.
  - ▶ If your “type” is just your price sensitivity  $\alpha_i$  which we might think is inversely proportional to your income.
  - ▶ Or your type might also include your full vector of  $\epsilon_{ij}$ 's. (Maybe you wouldn't be happy switching from Dubra to Smirnoff).
  - ▶ In the former case on the \$63 million in new specific taxes we would have to spend about \$2mm to the return the most price sensitive consumers to their pre-rebate utility levels.

# Change in Shares: Specific Taxes (750mL)



# Price Comparison Before and After PH





# Conclusion

- ▶ Holding consumption fixed, the state could increase specific taxes and make \$90.6MM per year, or about 45% of what the wholesalers make.
- ▶ Currently CT makes about \$27MM per year. So this represents a \$63MM increase in potential revenues to the state.
- ▶ New Jersey and Michigan are about 2.5x as large and New York is about 4.5x as large.
- ▶ If everything scaled this is about \$900mm in free money to states.