

# Product Variety and Alcohol Purchases

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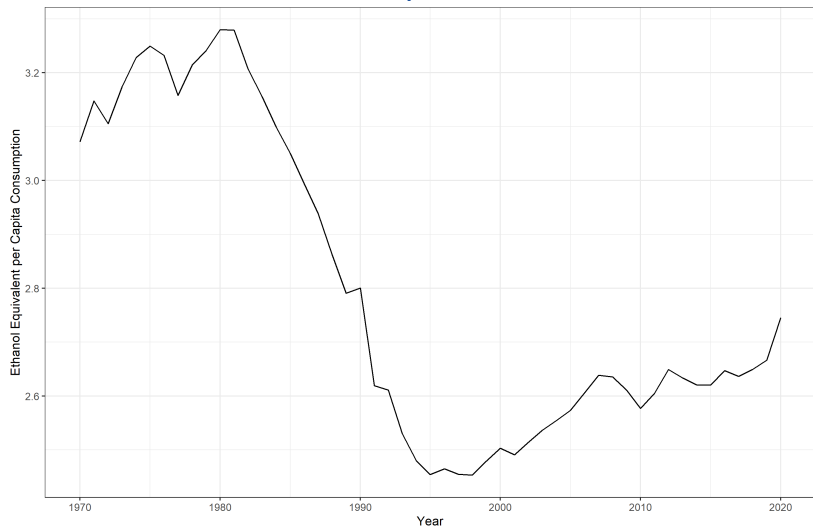
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# Motivation

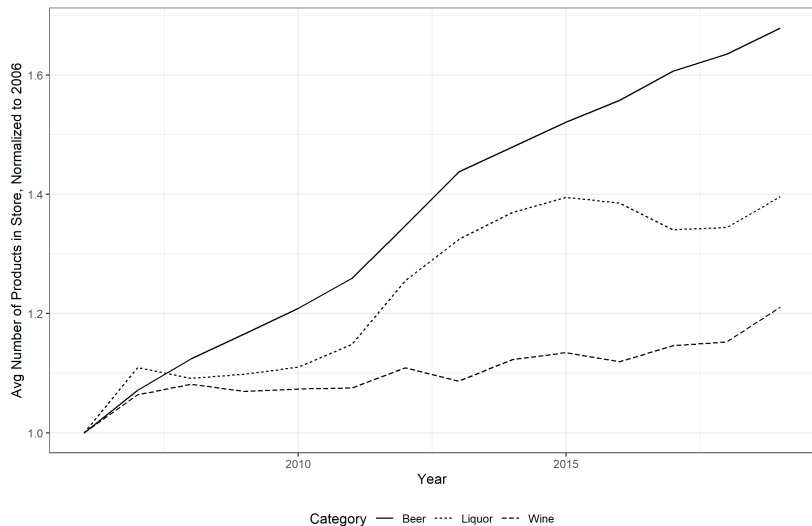
- ▶ Alcohol consumption is a major health concern in the US
  - ▶ A Leading cause of preventable deaths
  - ▶ Over 140,000 deaths annually (CDC, 2022)
  - ▶ Contributes to 40% of violent crimes and traffic fatalities (NCADD, 2015)
  - ▶ Negative impact on the labor market and educational outcomes
- ▶ Various policies in place to reduce consumption and harm
  - ▶ Alcohol taxes
  - ▶ Legal drinking ages
  - ▶ Restrictions on alcohol outlets or general restrictions on sales
  - ▶ Public health campaigns
- ▶ Evidence that public awareness of the health risks associated with alcohol has increased steadily and substantially over the last 40 years

# Motivation: Ethanol Consumption Trends



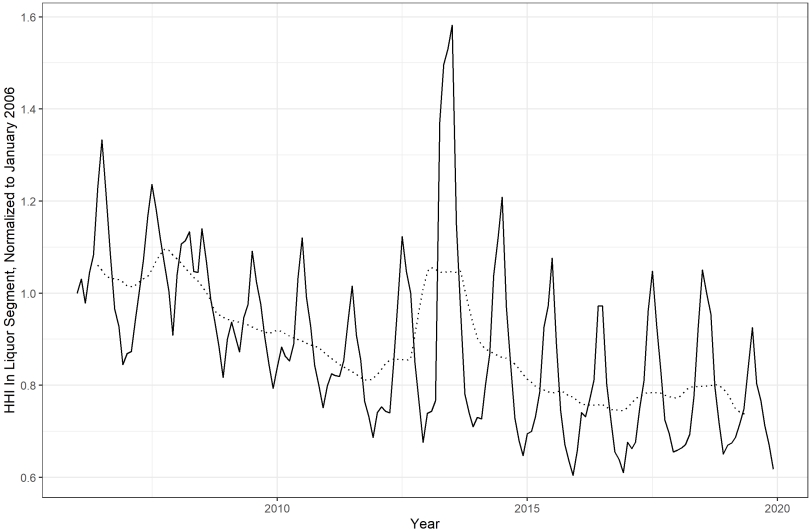
- ▶ **Observation:** Large decrease in consumption followed by gradual increase since the end of the 1990s.

# Motivation: Product Variety Trends



► **Observation:** Increase in product variety over time.

# Motivation: Market Concentration Trends



► **Observation:** Decrease in market concentration over time.

# This Paper

## 1. Does product variety influence consumption?

- ▶ Both store-level and household-level data indicate a correlation between a larger assortment of products and increased consumption
- ▶ These findings are supported by data on households that have relocated

Contribution

# This Paper

## 1. Does product variety influence consumption?

- ▶ Both store-level and household-level data indicate a correlation between a larger assortment of products and increased consumption
- ▶ These findings are supported by data on households that have relocated

## 2. How do policies such as excise tax increases and health awareness campaigns interact with product variety and consumption?

- ▶ Increase in health awareness and taxes reduce consumption but could increase incentive to increase assortment
- ▶ I show that excise tax hikes result in greater product variety
- ▶ The growth in product variety counteracts the intended effects of excise tax increases
- ▶ Is a similar effect observed for health awareness campaigns?

Contribution

# A Stylized Model of Alcohol Purchases



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- ▶ Consumer pays  $p_j$  and has health costs  $h$ , utility:  
 $u_{ij} = (1 - d_{ij} - h - p_j)q_{ij} - bq_{ij}^2$ , with  $d_{ij} = |\rho_i - x_j|$

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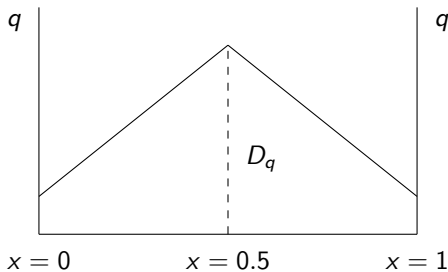
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- ▶ Firm has cost(s)  $C(q_j)$  and decides position(s)  $x_j$

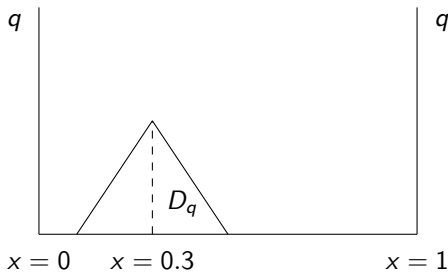
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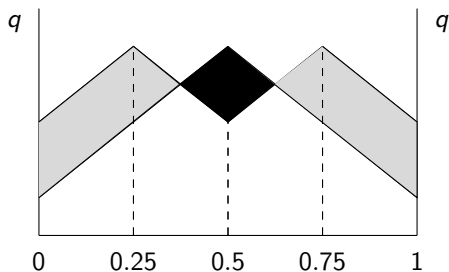
- ▶ In a single product firm equilibrium  $\rightarrow$  locate at  $x_j = 0.5$ , multiple equilibria for sufficiently large  $h$  and  $p$
- ▶ In a two-product firm equilibrium  $\rightarrow$  locate at  $x_1 = 0.25$  and  $x_2 = 0.75$ , multiple equilibria for sufficiently large  $h$  and  $p$



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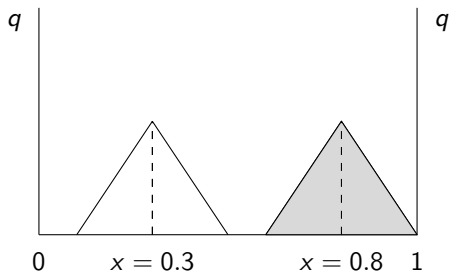
**Lemma 1:** Increasing the number of products increases consumption.



# A Stylized Model of Alcohol Purchases

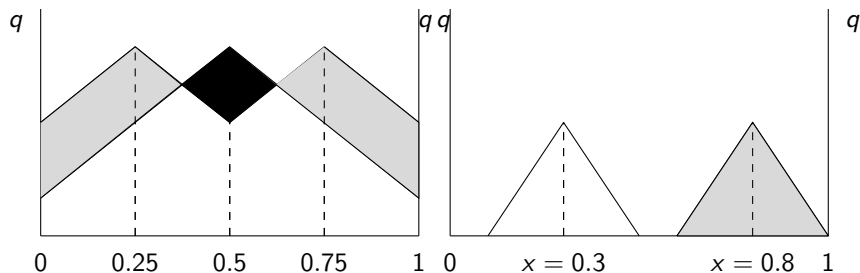
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**Lemma 1:** Increasing the number of products increases consumption. Further, conditional on sufficiently high health costs and prices, consumers who may abstain from consumption may start consuming.



# A Stylized Model of Alcohol Purchases

**Lemma 2:** Increasing health costs or prices (without changing the margin) increases the incentive of product introduction.



Intuition: The firm dislikes cannibalization. Higher health costs or prices reduce cannibalization and increase space for new product introductions.

# The US Alcohol Market

- ▶ State-specific regulations (Twenty-First Amendment, 1933)
- ▶ Examples: Liquor stores, legal drinking age, taxes, distribution, and advertising
- ▶ Still an important retail market: 283.80 billion USD in 2023 and growing
- ▶ Two excise tax changes play a role in the article:
  1. Deregulation of liquor licenses in Washington state in 2012:
    - ▶ Liberalization of liquor, but an increase of the excise tax by 17 percentage points
  2. Excise tax increase in Illinois in 2009
    - ▶ Tax on distilled spirits increased by \$4.50 per gallon for liquor (a 90% increase)
    - ▶ Only small changes in beer and wine

# Data

- ▶ NielsenIQ Retail Scanner & the Nielsen Consumer Panel
- ▶ **Retail Scanner**: Weekly prices and sales of products on more than 90 retail chains accounting for over 35,000 stores
- ▶ **Panel**: Nielsen Consumer Panel includes household data of 40,000-60,000 households since 2004 from across the US record all their purchases intended for in-home use
- ▶ Within this project I use both data sources between 2006 and 2019
- ▶ Identifying product assortment from scanner data
- ▶ Identifying moving households from demographic information of panel

# The Relation of Product Variety and Purchases

## Store-Level Correlation

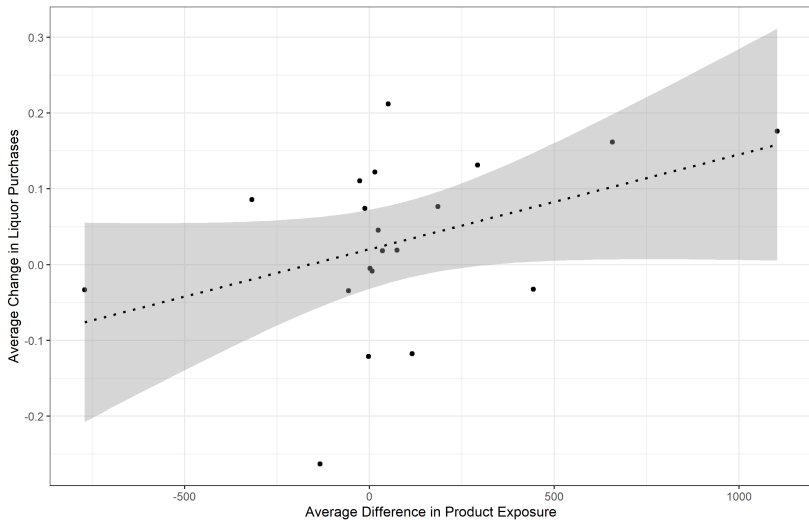
$$\log(\mathbf{y}_{skt} + 0.1) = \alpha + \beta \log(\mathbf{Num}_{st} + 0.1) + \rho_s + \mu_t \cdot \mathit{state}_k + \xi p_{st} + \varepsilon_{st},$$





# Analyzing the Impact of a Move on Consumption

Does a move that changes product exposure affect purchases?



# Movers

$$\log(y_{it}) = \alpha + \beta \log(\text{Exposure}_{it}) + \xi_i + \rho_t + \delta \mathbf{X}_{it} + \mu \bar{y}_{zt} + \varepsilon_{it},$$

# Movers

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	log(Liquor)								I(Liquor>0)	
	Full Sample				Only movers				Full Sample	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
log(Exposure)	0.103*** (0.003)	0.181*** (0.026)	0.050*** (0.002)	0.095*** (0.013)	0.045*** (0.002)	0.078*** (0.013)	0.049*** (0.005)	0.071*** (0.012)	0.005*** (0.000)	0.008*** (0.001)
Constant	-8.752*** (0.011)	-9.088*** (0.110)								
Household FE	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-Month FE	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Origin/Destination Controls	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Household Controls	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
N	6,471,996	6,471,996	6,471,996	6,471,996	6,047,883	6,047,883	597,584	597,584	6,047,883	6,047,883
R <sup>2</sup>	0.005	0.002	0.391	0.390	0.413	0.412	0.396	0.396	0.381	0.381
First Stage F Statistics		72,169		227,147		204,534		204,041		204,534

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

Beer

Wine

→ Households purchase new, previously unavailable products

New Products

→ High but not the highest drinkers are the drivers

Heterogeneity

# Do Excise Taxes Interact with the Product Variety?

# Impact of Tax Increases

- ▶ Lemma 2 suggests that exogenous price increases should lead to an increase in product variety.

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- ▶ Analysis is conducted on a sample of stores with liquor sales prior to deregulation in Washington.

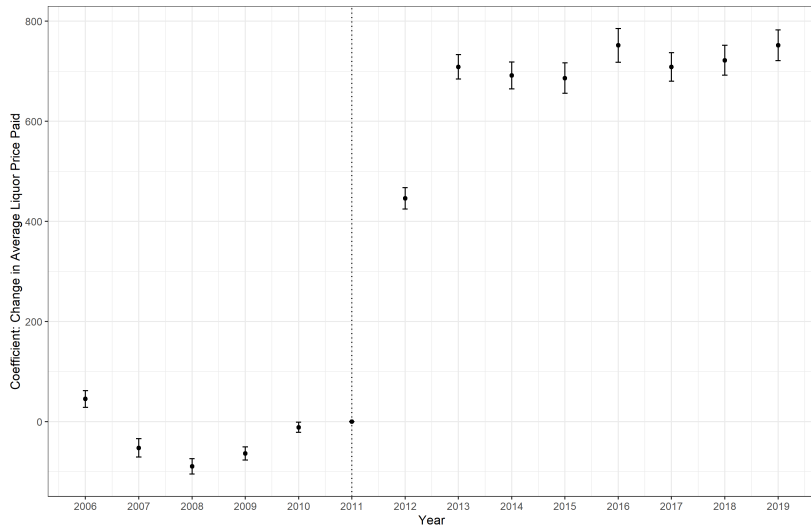


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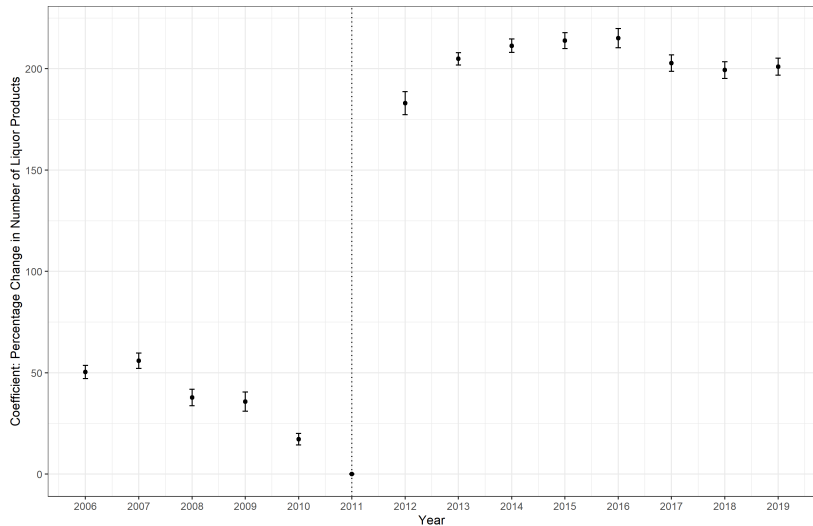
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$$\mathbf{y}_{st} = \alpha + \sum_{k=2019}^{k=2006} \beta \mathbf{l}(t) \cdot \mathit{Treat}_s + \gamma \mathbf{l}(t) + \rho_s + \varepsilon_{st},$$

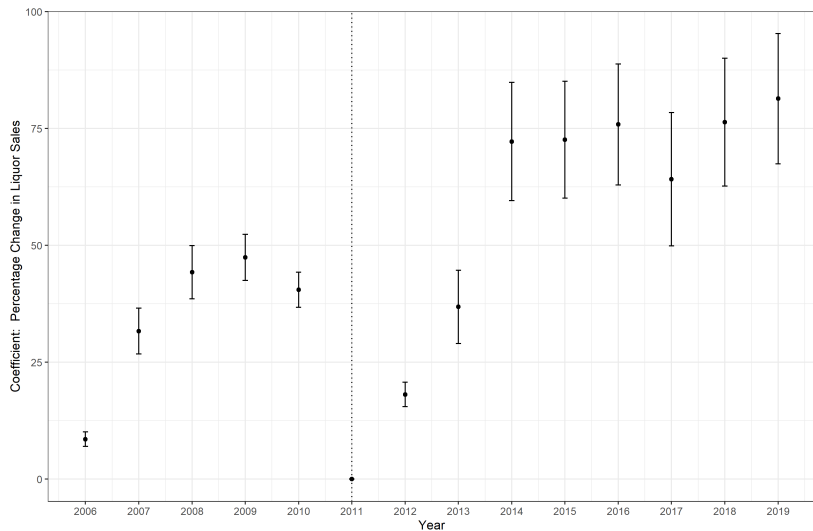
# Washington - The Impact on Prices



# Washington - The Impact on Product Variety



# Washington - The Impact on Quantity



## Store-Level Analysis: Instrumental Variable

$$y_{st} = \alpha + \beta \text{Num}_{st} + \rho_s + \mu_t + \xi p_{st} + \varepsilon_{st},$$

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	Second Stage			
	Outcome Variable: log(Liquor Sales)			
	Deregulation in Washington			
	All	All	Control: Neighbors	Delay
	(1)	(2)	(3)	(4)
$\log(N + 0.5)$	1.200*** (0.150)	0.309*** (0.058)	0.682*** (0.051)	0.332*** (0.067)
Constant	-0.484 (0.922)			
Store FE	No	Yes	Yes	Yes
Month FE	No	Yes	Yes	Yes
Price Controls	No	Yes	Yes	Yes
$N$	789,381	789,381	16,279	789,381
$R^2$	0.530	0.891	0.906	0.893
F-statistics 1st Stage	216	3275.6	3838.5	1768.3

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

# Discussion

Over the last 20 years, we have observed:

- ▶  $\uparrow$  Consumption and  $\uparrow$  Variety
- ▶ Yet,  $\uparrow$  regulation and  $\uparrow$  health awareness

Impact of product variety:

- ▶  $\uparrow$  Variety  $\rightarrow$   $\uparrow$  Consumption
- ▶  $\uparrow$  Variety  $\rightarrow$   $\uparrow$  New Consumers

Product variety may follow from regulation and developments:

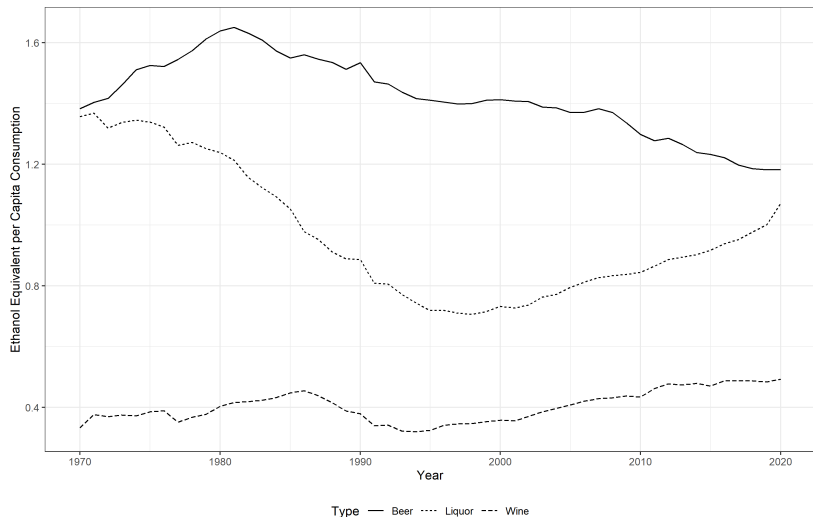
- ▶  $\uparrow$  Taxes  $\rightarrow$   $\uparrow$  Variety  $\rightarrow$   $\uparrow$  Consumption
- ▶  $\uparrow$  Health Awareness  $\rightarrow$   $\uparrow$  Variety  $\rightarrow$   $\uparrow$  Consumption

$\Rightarrow$  Are entry regulation an important policy tool?



# Backup

# Motivation: Detailed View of Ethanol Consumption Per Capita



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# contribution

1. Exploring the relationship between product assortment and consumption
  - ▶ Relevant literature: Borle et al., 2005; Brynjolfsson et al., 2003; Gaur and Honhon, 2006; Sweeney et al., 2023; Wang and Sahin, 2018
  - ▶ Contribution: → Investigate how product variety relates to consumption of products with health risks

Back

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## 2. Assessing the impact of regulation on risky behavior

- ▶ Relevant literature: Gehrsitz et al., 2021; Illanes and Moshary, 2020; Saffer et al., 2022
- ▶ Contribution: → Explore how regulation may influence product assortments

Back

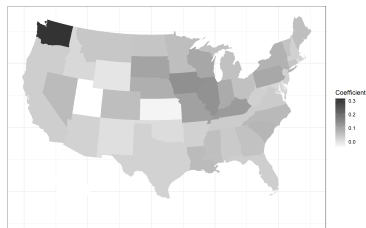
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  - ▶ Contribution: → Explore how regulation may influence product assortments
3. Evaluating geographical heterogeneity in consumption
  - ▶ Relevant literature: Allcott et al., 2019; Bronnenberg et al., 2012; Hinnosaar and Liu, 2022; Hut, 2020
  - ▶ Contribution: → Observe a strong impact on consumption through product variety changes, even after controlling for alcohol consumption at the destination

# The Relation of Product Variety and Volume

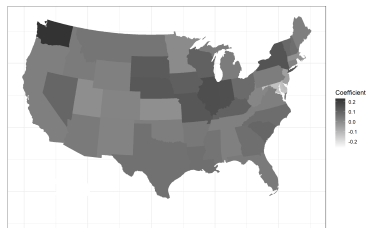
$$\log(\text{Num}_{st}) = \alpha + \beta \cdot t + \rho_s + \varepsilon_{st}$$

$$\log(y_{st}) = \alpha + \beta \cdot t + \rho_s + \varepsilon_{st},$$



Effect on Product Variety

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Effect on Quantity

# Household-Level Correlation

$$\log(y_{it}) = \alpha + \beta \log(\text{Exposure}_{it}) + \xi_i + \rho_{ct} + \phi_{ic} + \delta \mathbf{X}_{it} + \varepsilon_{it},$$

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Panel C: Liquor

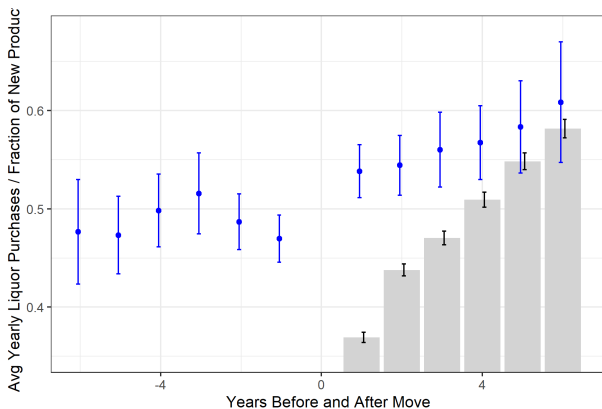
	log(Liquor)				I(Liquor>0)
	(1)	(2)	(3)	(4)	(5)
$\log(\text{Exposure} + 0.5)$	0.103*** (0.003)	0.052*** (0.002)	0.050*** (0.002)	0.048*** (0.002)	0.005*** (0.000)
Constant	-1.987*** (0.008)				
Household FE	No	Yes	Yes	No	No
Year-Month FE	No	Yes	No	Yes	Yes
County $\times$ Year-Month FE	No	No	Yes	No	No
Household $\times$ County FE	No	No	No	Yes	Yes
Household Controls	No	No	No	Yes	Yes
N	6,878,525	6,878,525	6,878,525	6,419,004	6,419,004
R <sup>2</sup>	0.005	0.388	0.392	0.391	0.365



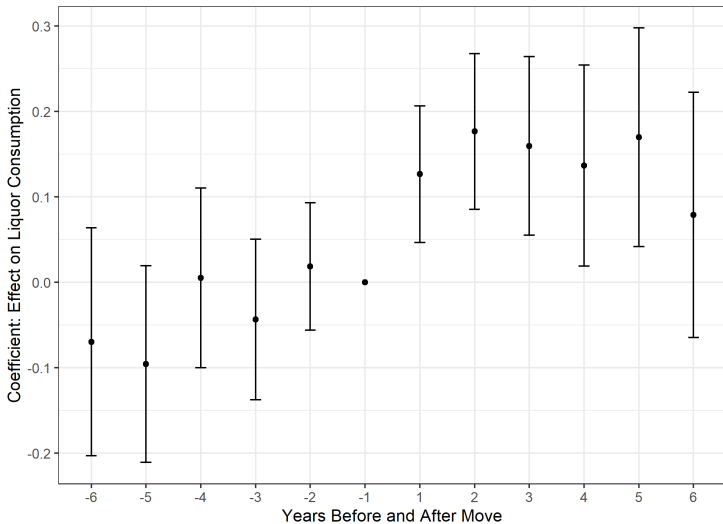
# Movers Purchase New Products

## Key Observation

Moving households consume products that haven't been available prior to the move.



# Event Study of Movers

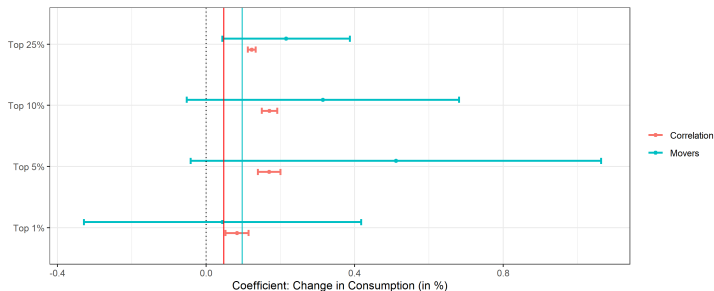


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# Exploring Heterogeneity: Consumption Patterns

## Key Observation

High but not the highest drinkers are the primary drivers of the observed effect.



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Explore Heterogeneity across Types

# Household-Level Analysis: Instrumental Variable

Second Stage					
Outcome Variable: log(Liquor)					
Deregulation in Washington					
	All (1)	All (2)	Control: Neighbors (3)	Delay (4)	I(Liquor>0) (5)
$\log(\text{Exposure} + 0.5)$	0.193*** (0.026)	0.184*** (0.027)	0.202*** (0.062)	0.237*** (0.061)	0.024*** (0.003)
Constant	-9.132*** (0.111)				
Household FE	No	Yes	Yes	Yes	Yes
County $\times$ Year-Month FE	No	Yes	Yes	Yes	Yes
Price Controls	No	Yes	Yes	Yes	Yes
Household Controls	No	Yes	Yes	Yes	Yes
$N$	6,445,788	6,047,883	274,675	6,047,883	6,047,883
$R^2$	0.001	0.018	0.386	0.390	0.364

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

First Stage

Illinois

HH Level

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	(1)	(2)	(3)	(4)	(5)
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First Stage

Illinois

HH Level

# Robustness

1. Alternative specification of product variety on household level:  
Store-level exposure Alternative
2. Alternative moving definition: Cross-state residence changes Alternative

# Movers- Beer

	log(Beer)						l(Beer <sub>t</sub> 0)			
			Full Sample				Only movers		Full Sample	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
log(Exposure)	0.066*** (0.002)	0.030 (0.020)	0.027*** (0.001)	0.050* (0.027)	0.024*** (0.001)	0.030 (0.027)	0.031*** (0.003)	0.009 (0.016)	0.006*** (0.000)	0.008 (0.006)
Constant	-1.988*** (0.008)	-1.797*** (0.101)								
Household FE	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-Month FE	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Origin Controls	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Household Controls	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
N	6,471,996	6,471,996	6,471,996	6,471,996	6,047,883	6,047,883	597,584	597,584	6,047,883	6,047,883
R <sup>2</sup>	0.004	0.003	0.528	0.528	0.556	0.556	0.526	0.526	0.460	0.460
First Stage F Statistics		76,194		24,224		22,120		35,813		22,120

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

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# Movers- Wine

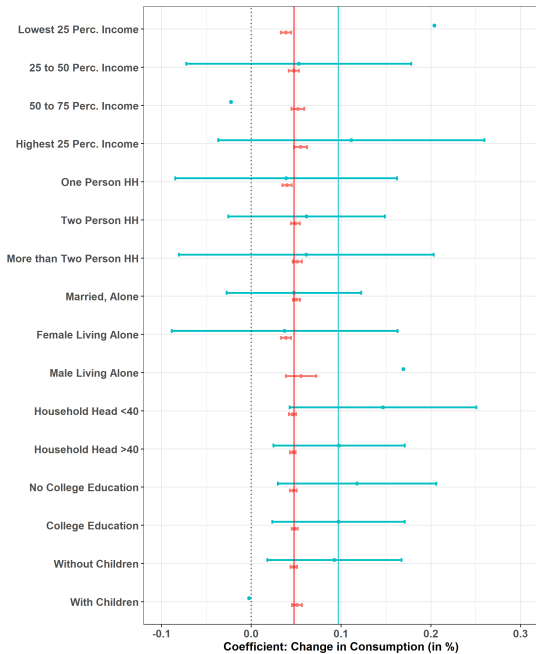
	log(Wine)						l(Wine <sub>0</sub> )			
			Full Sample				Only movers		Full Sample	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
log(Exposure)	0.099*** (0.002)	0.197*** (0.021)	0.047*** (0.002)	0.181*** (0.036)	0.041*** (0.001)	0.144*** (0.038)	0.061*** (0.005)	0.085*** (0.026)	0.006*** (0.000)	0.020*** (0.005)
Constant	-5.901*** (0.011)	-6.412*** (0.108)								
Household FE	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-Month FE	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Origin Controls	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Household Controls	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
N	6,471,996	6,471,996	6,471,996	6,471,996	6,047,883	6,047,883	597,584	597,584	6,047,883	6,047,883
R <sup>2</sup>	0.010	0.000	0.472	0.469	0.499	0.498	0.492	0.492	0.438	0.437
First Stage F Statistics		92,934		24,827		22,752		24,873		22,752

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

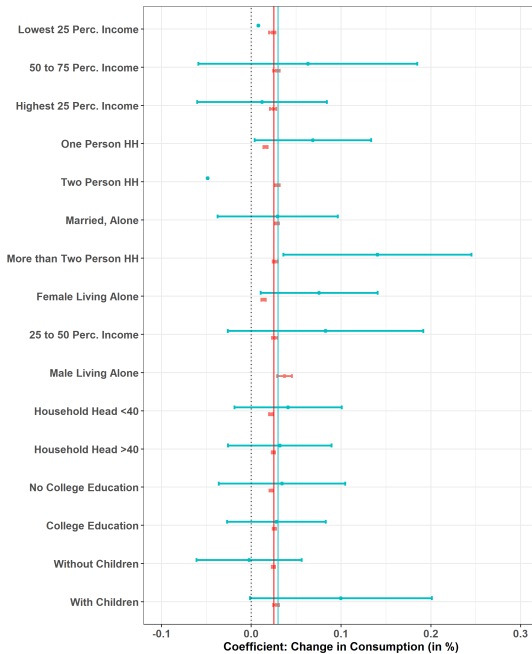
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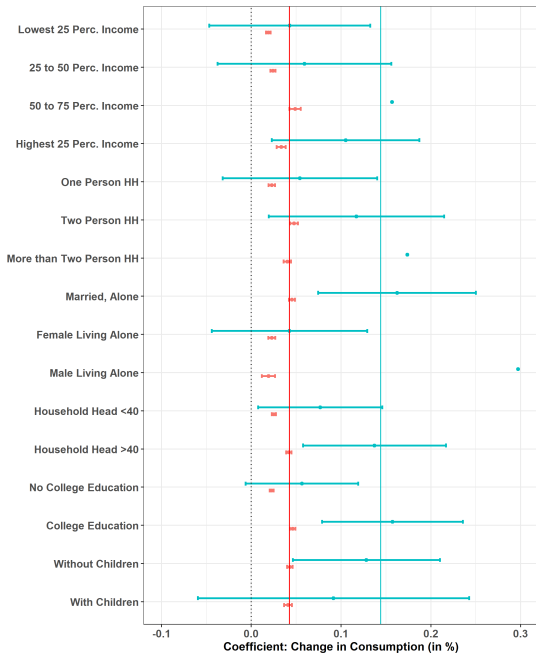
# Heterogeneity Across Household Types, Liquor



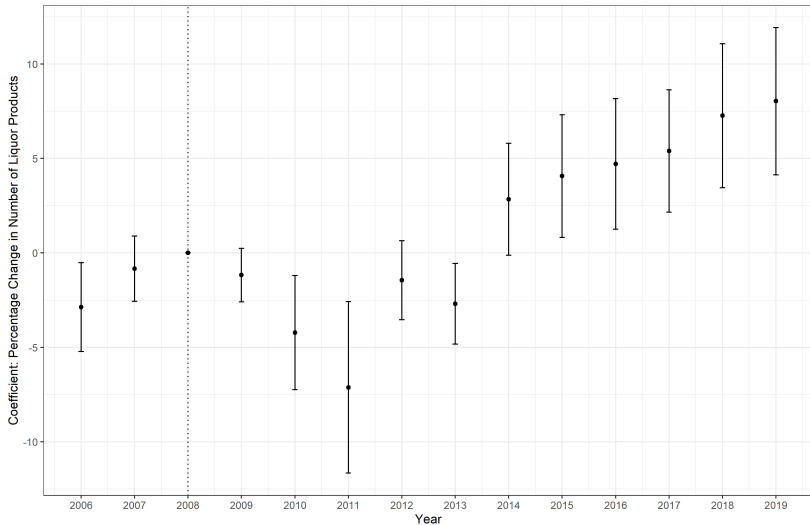
# Heterogeneity Across Household Types, Beer



# Heterogeneity Across Household Types, Wine

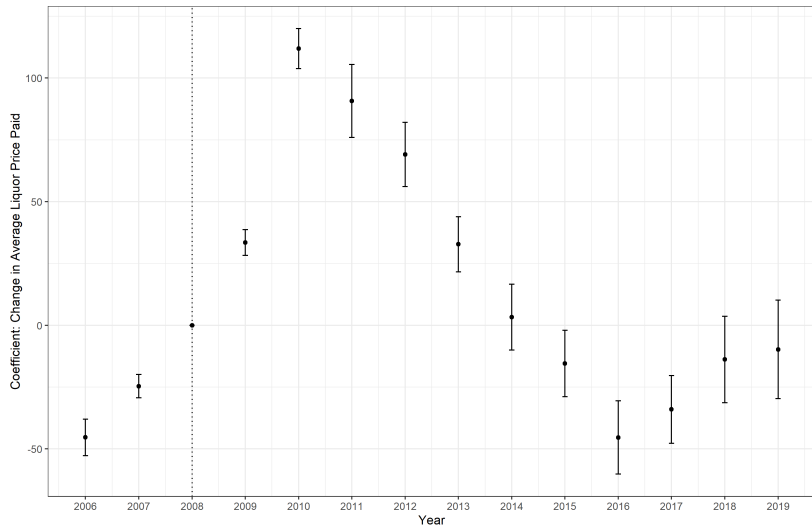


# Illinois - The Impact on Product Variety



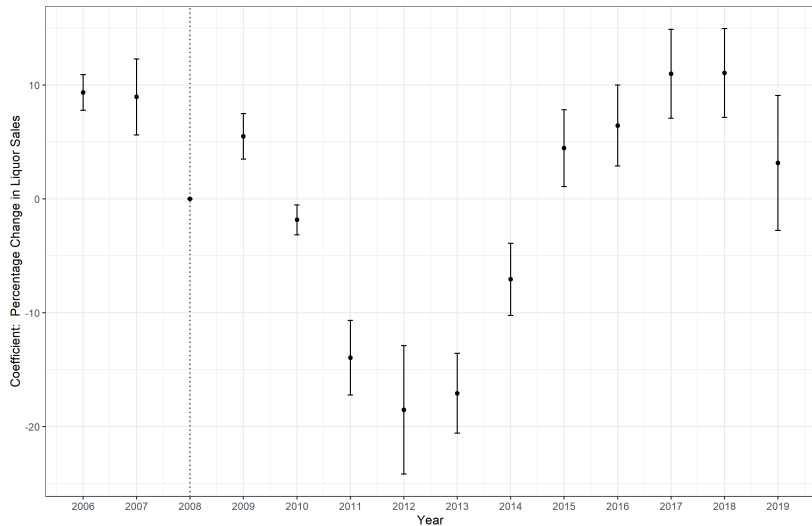
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# Illinois - The Impact on Prices



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# Illinois - The Impact on Quantity



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# Store-Level Analysis: Instrumental Variable, First Stage

	First Stage			
	Outcome Variable: Number of Liquor Products			
	Deregulation in Washington			
	All	All	Control: Neighbors	Delay
	(1)	(2)	(3)	(4)
$Z_{st}$	0.297*** (0.014)	1.010*** (0.037)	1.451*** (0.123)	0.704*** (0.028)
Constant	6.135*** (0.009)			
Store FE	No	Yes	Yes	Yes
Month FE	No	Yes	Yes	Yes
Price Controls	No	Yes	Yes	Yes
F-statistics	216	3275.6	3838.5	1768.3
$N$	789,381	789,381	16,279	789,381
$R^2$	0.001	0.905	0.926	0.902
F-Statistic 1st Stage	97,666	95,996	26,345	12,626

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

# Store-Level Analysis: Instrumental Variable, Illinois, First Stage

First Stage				
Outcome Variable: Number of Liquor Products				
	All	All	Control: Neighbors	Delay
	(1)	(2)	(3)	(4)
$Z_{st}$	0.216*** (0.031)	-0.029** (0.013)	0.459* (0.258)	0.081*** (0.012)
Constant	6.093*** (0.009)			
Store FE	No	Yes	Yes	Yes
Month FE	No	Yes	Yes	Yes
Price Controls	No	Yes	Yes	Yes
F-statistics	24	145	3.1	149
$N$	687,225	687,225	44,794	687,225
$R^2$	0.005	0.884	0.871	0.884

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



# Store-Level Analysis: Instrumental Variable, Illinois, Second Stage

Second Stage				
Outcome Variable: log(Liquor Sales)				
Excise Tax Increase in Illinois				
	All	All	Control: Neighbors	Delay
	(1)	(2)	(3)	(4)
$\log(N + 0.5)$	1.752*** (0.130)	3.263*** (1.106)	0.985*** (0.350)	0.436** (0.177)
Constant	-3.849*** (0.794)			
Store FE	No	Yes	Yes	Yes
Month FE	No	Yes	Yes	Yes
Price Controls	No	Yes	Yes	Yes
$N$	687,225	687,225	44,794	687,225
$R^2$	0.182	0.520	0.917	0.892

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

# Household-Level Analysis: Instrumental Variable, First Stage

First Stage					
Outcome Variable: Number of Liquor Products					
Deregulation in Washington					
	All	All	Control: Neighbors	Delay	$I(\text{Liquor}_{it} > 0)$
	(1)	(2)	(3)	(4)	(5)
$Z_{it}$	2.257*** (0.012)	1.557*** (0.024)	1.672*** (0.043)	0.844*** (0.027)	1.557*** (0.024)
Constant	4.236*** (0.007)				
Household FE	No	Yes	Yes	Yes	Yes
County $\times$ Year-Month FE	No	Yes	Yes	Yes	Yes
Price Controls	No	Yes	Yes	Yes	Yes
Household Controls	No	Yes	Yes	Yes	Yes
F-Statistic	97,666	95,996	26,345	12,626	475,411
$N$	6,445,788	6,047,883	274,675	6,047,883	6,047,883
$R^2$	0.015	0.809	0.804	0.808	0.809

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

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# Household-Level Analysis: Instrumental Variable, Illinois

First Stage					
Outcome Variable: Number of Liquor Products					
Excise Tax Increase in Illinois					
	All	All	Control: Neighbors	Delay	I(Liquor>0)
	(1)	(2)	(3)	(4)	(5)
$Z_{it}$	1.718*** (0.018)	-0.020 (0.028)	-0.189** (0.080)	0.122*** (0.031)	-0.020 (0.028)
Constant	4.207*** (0.007)				
Household FE	No	Yes	Yes	Yes	Yes
County $\times$ Year-Month FE	No	Yes	Yes	Yes	Yes
Price Controls	No	Yes	Yes	Yes	Yes
Household Controls	No	Yes	Yes	Yes	Yes
F-Statistic 133,990	7	59	334	1,105	
$N$	6,445,788	6,047,883	426,353	6,047,883	6,047,883
$R^2$	0.020	0.807	0.591	0.807	0.807

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

First Stage

# Household-Level Analysis: Instrumental Variable, Illinois

Second Stage					
Outcome Variable: Number of Liquor Products					
Excise Tax Increase in Illinois					
	All	All	Control: Neighbors	Delay	I(Liquor>0)
	(1)	(2)	(3)	(4)	(5)
$\log(\text{Exposure} + 0.5)$	0.164*** (0.021)	-0.068 (2.186)	-1.067 (0.723)	0.700* (0.375)	0.006 (0.017)
Constant	-9.009*** (0.091)				
Household FE	No	Yes	Yes	Yes	Yes
County $\times$ Year-Month FE	No	Yes	Yes	Yes	Yes
Price Controls	No	Yes	Yes	Yes	Yes
Household Controls	No	Yes	Yes	Yes	Yes
<i>N</i>	6,445,788	6,047,883	426,353	6,047,883	6,047,883
<i>R</i> <sup>2</sup>	0.004	0.393	0.290	0.351	0.365

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

First Stage

# Alternative Specification of Household Level Regressions

Now: Household  $i$  in month  $t$  purchasing in-store  $s$ .

$$\log(y_{ist}) = \alpha + \beta \text{Exposure}_{ist} + \xi_{is} + \rho_{ct} + \delta \mathbf{X}_{it} + \varepsilon_{ist},$$

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# Alternative Specification of Household Level Regressions

Panel A: Beer							
	log(Beer)						I(Beer>0)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$\log(\text{Exposure} + 0.5)$	0.058*** (0.001)	0.051*** (0.001)	0.012*** (0.001)	0.012*** (0.001)	0.011*** (0.001)	0.011*** (0.001)	0.003*** (0.000)
Constant	-2.344*** (0.002)						
Household FE	No	Yes	Yes	No	No	No	No
Store FE	No	No	Yes	No	No	No	No
Year-Month FE	No	Yes	Yes	Yes	No	No	No
Household $\times$ Store FE	No	No	No	Yes	Yes	Yes	Yes
County $\times$ Year-Month FE	No	No	No	No	Yes	Yes	Yes
Household Controls	No	No	No	No	No	Yes	Yes
<i>N</i>	11,509,995	11,509,995	11,509,995	11,509,995	11,509,995	10,798,561	10,798,561
R <sup>2</sup>	0.013	0.315	0.338	0.461	0.463	0.462	0.404

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

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# Alternative Specification of Household Level Regressions

Panel B: Wine							
	log(Wine)						I(Wine>0)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$\log(\text{Exposure} + 0.5)$	0.074*** (0.001)	0.074*** (0.001)	0.023*** (0.001)	0.024*** (0.001)	0.022*** (0.002)	0.022*** (0.001)	0.003*** (0.000)
Constant	-6.554*** (0.002)						
Household FE	No	Yes	Yes	No	No	No	No
Store FE	No	No	Yes	No	No	No	No
Year-Month FE	No	Yes	Yes	Yes	No	No	No
Household $\times$ Store FE	No	No	No	Yes	Yes	Yes	Yes
County $\times$ Year-Month FE	No	No	No	No	Yes	Yes	Yes
Household Controls	No	No	No	No	No	Yes	Yes
<i>N</i>	11,509,995	11,509,995	11,509,995	11,509,995	11,509,995	10,798,561	10,798,561
R <sup>2</sup>	0.018	0.269	0.289	0.406	0.409	0.412	0.376

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

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# Alternative Specification of Household Level Regressions

Panel C: Liquor							
	log(Liquor)						I(Liquor>0)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$\log(\text{Exposure} + 0.5)$	0.084*** (0.001)	0.073*** (0.001)	0.018*** (0.001)	0.020*** (0.001)	0.017*** (0.001)	0.016*** (0.001)	0.002*** (0.000)
Constant	-9.488*** (0.002)						
Household FE	No	Yes	Yes	No	No	No	No
Store FE	No	No	Yes	No	No	No	No
Year-Month FE	No	Yes	Yes	Yes	No	No	No
Household $\times$ Store FE	No	No	No	Yes	Yes	Yes	Yes
County $\times$ Year-Month FE	No	No	No	No	Yes	Yes	Yes
Household Controls	No	No	No	No	No	Yes	Yes
<i>N</i>	11,509,995	11,509,995	11,509,995	11,509,995	11,509,995	10,798,561	10,798,561
R <sup>2</sup>	0.017	0.212	0.232	0.344	0.346	0.343	0.327

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

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# Alternative Definitions of Moving, Liquor

	log(Liquor)								I(Liquor <sub>t0</sub> )	
			Full Sample				Only movers		Full Sample	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
log(Exposure)	0.103*** (0.003)	0.254*** (0.045)	0.051*** (0.002)	0.242*** (0.053)	0.047*** (0.002)	0.216*** (0.055)	0.061*** (0.008)	0.159*** (0.047)	0.005*** (0.000)	0.021*** (0.005)
Constant	-8.750*** (0.011)	-9.396*** (0.194)								
Household FE	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-Month FE	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Origin/Destination Controls	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Household Controls	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
N	6,768,170	6,768,170	6,768,170	6,768,170	6,316,271	6,316,271	214,974	214,974	6,316,271	6,316,271
R <sup>2</sup>	0.005	-0.006	0.389	0.385	0.388	0.385	0.360	0.359	0.362	0.359
First Stage F Statistics		22,930		19,811		16,845		10,970		16,845

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

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# Alternative Definitions of Moving, Liquor

	log(Liquor)								I(Liquor <sub>t</sub> 0)	
			Full Sample			Only movers			Full Sample	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
log(Exposure)	0.103*** (0.003)	0.254*** (0.045)	0.051*** (0.002)	0.242*** (0.053)	0.047*** (0.002)	0.216*** (0.055)	0.061*** (0.008)	0.159*** (0.047)	0.005*** (0.000)	0.021*** (0.005)
Constant	-8.750*** (0.011)	-9.396*** (0.194)								
Household FE	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-Month FE	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Origin/Destination Controls	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Household Controls	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
N	6,768,170	6,768,170	6,768,170	6,768,170	6,316,271	6,316,271	214,974	214,974	6,316,271	6,316,271
R <sup>2</sup>	0.005	-0.006	0.389	0.385	0.388	0.385	0.360	0.359	0.362	0.359
First Stage F Statistics		22,930		19,811		16,845		10,970		16,845

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

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# Alternative Definitions of Moving, Beer

	log(Beer)						l(Beer <sub>t</sub> 0)			
			Full Sample				Only movers		Full Sample	
	OLS (1)	IV (2)	OLS (3)	IV (4)	OLS (5)	IV (6)	OLS (7)	IV (8)	OLS (9)	IV (10)
log(Exposure)	0.066*** (0.002)	0.099** (0.042)	0.027*** (0.001)	0.208*** (0.054)	0.025*** (0.001)	0.187*** (0.061)	0.034*** (0.006)	0.060 (0.045)	0.006*** (0.000)	0.047*** (0.013)
Constant	-1.988*** (0.008)	-2.157*** (0.218)								
Household FE	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-Month FE	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Origin Controls	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Household Controls	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
N	6,768,170	6,768,170	6,768,170	6,768,170	6,316,271	6,316,271	214,974	214,974	6,316,271	6,316,271
R <sup>2</sup>	0.004	0.003	0.528	0.528	0.556	0.556	0.526	0.526	0.460	0.460
First Stage F Statistics		15,856		7,327		5,464		5,395		5,464

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

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# Alternative Definitions of Moving, Wine

	log(Wine)						l(Wine <sub>0</sub> )			
			Full Sample				Only movers		Full Sample	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
log(Exposure)	0.099*** (0.002)	0.199*** (0.017)	0.050*** (0.002)	0.176*** (0.023)	0.043*** (0.001)	0.132*** (0.024)	0.065*** (0.004)	0.085*** (0.018)	0.006*** (0.000)	0.018*** (0.003)
Constant	-5.896*** (0.010)	-6.421*** (0.088)								
Household FE	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-Month FE	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Origin Controls	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Household Controls	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
<i>N</i>	6,737,280	6,737,280	6,737,280	6,737,280	6,289,946	6,289,946	839,647	839,647	6,289,946	6,289,946
R <sup>2</sup> 0.010	0.000	0.470	0.468	0.497	0.496	0.480	0.479	0.436	0.435	
First Stage F Statistics		139,754		55,735		50,694		48,284		50,694

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

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