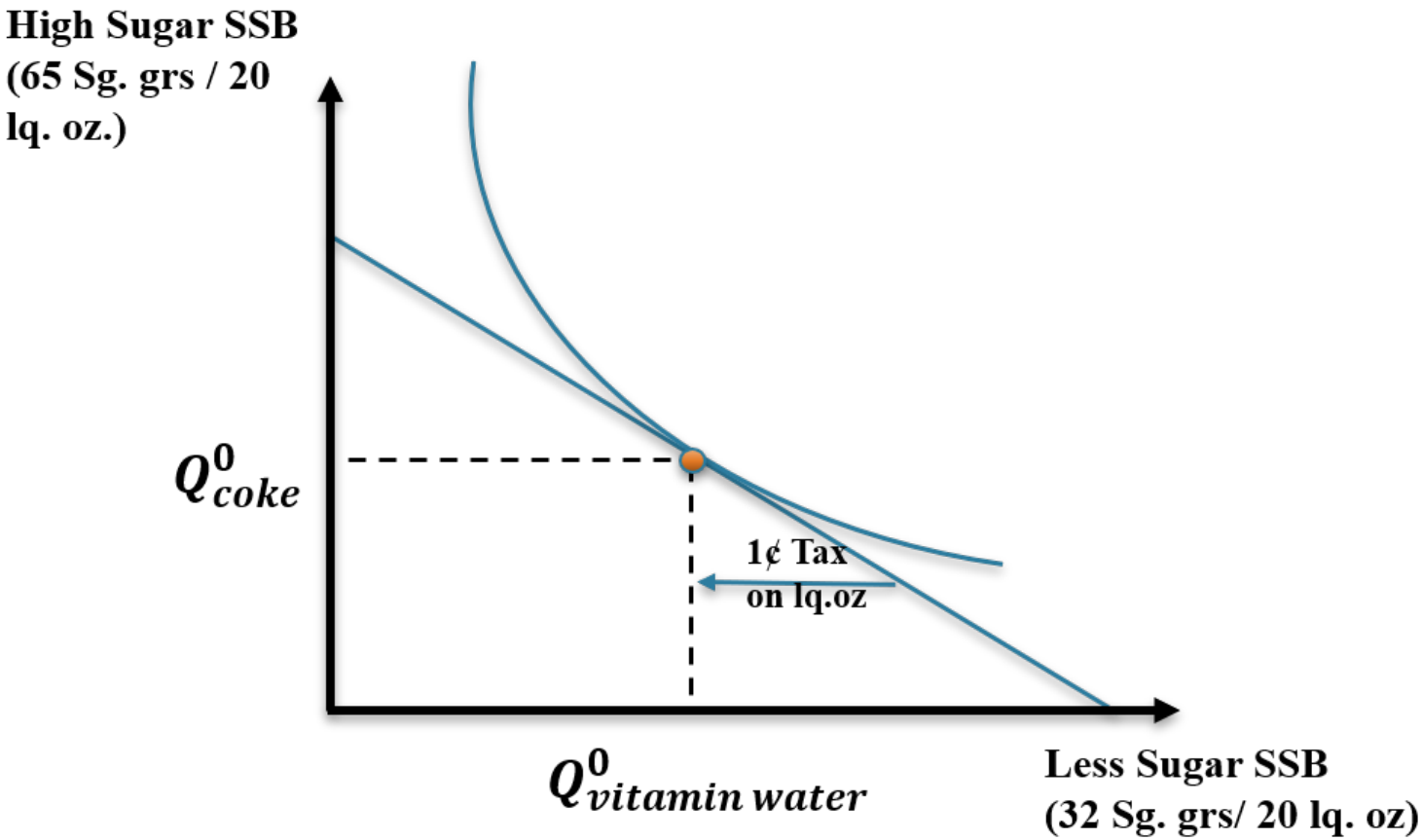
An Inquiry on the Heterogeneous Effects of Soda Taxes

Indiana University - School of Public and Environmental Affairs

September 26, 2018

What we expect from a SSB Tax on Liquid Content



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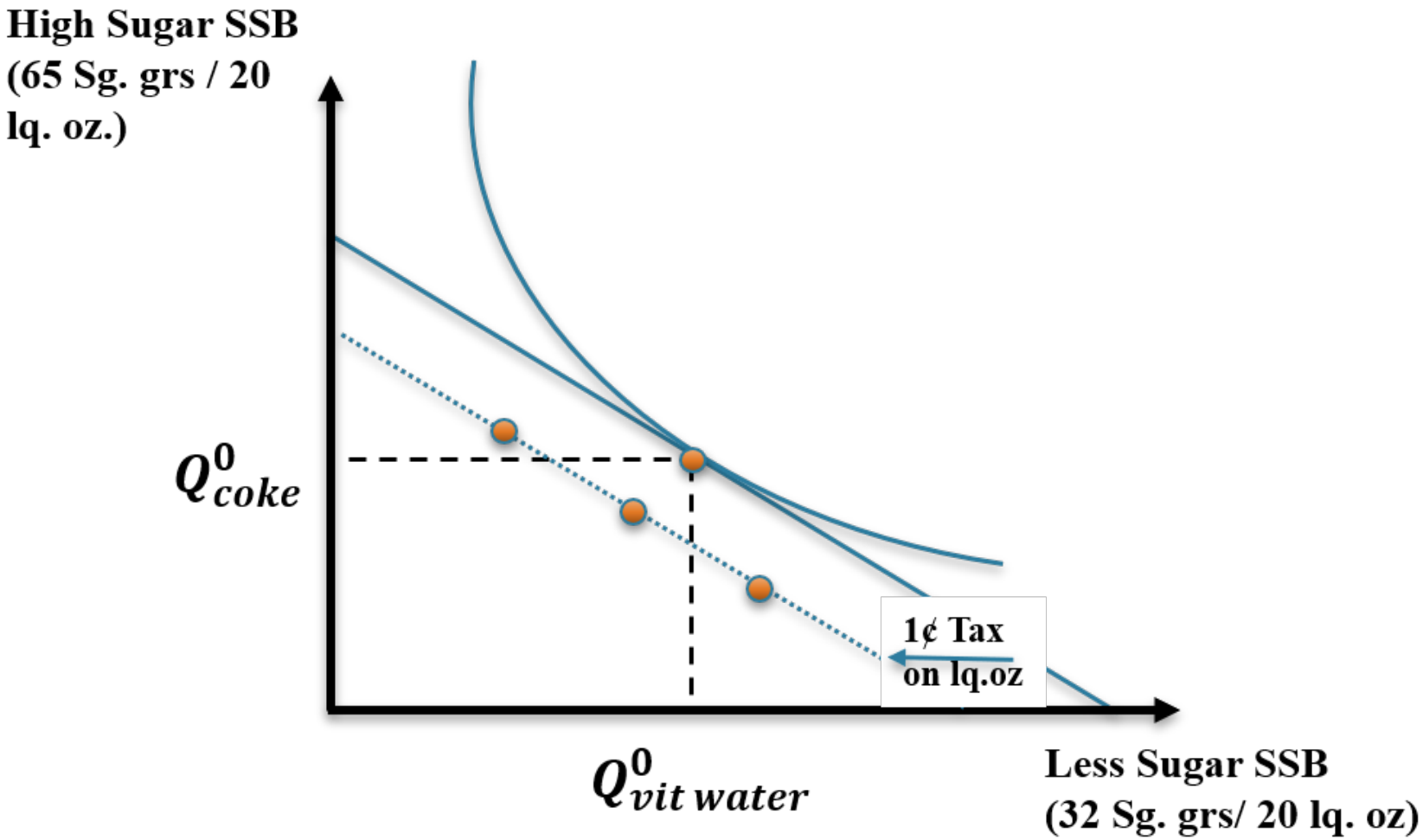

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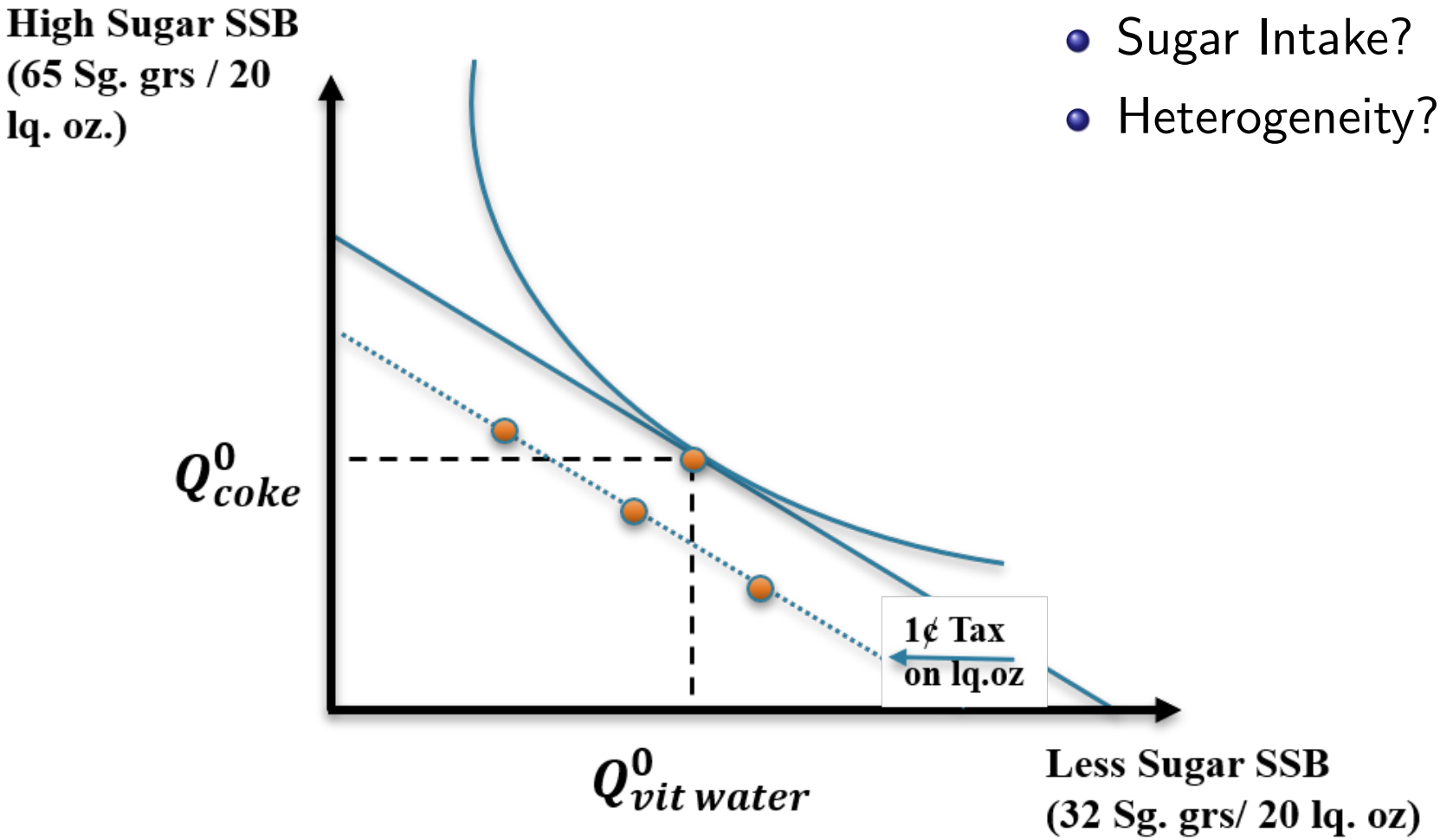

- Sugar Intake?
- Heterogeneity?

Literature Review

- **Silver, et al. (2017) - PLOS Medicine**
  - Survey Data - Barcode data (Jan203-Jan2016)
  - Retailer heterogeneity on prices
  - SSB consumption decreased and prices increased in most retailers (not all).
- **Falbe, et al(2016) - AJPH**
  - Used a repeated cross section - Oakland & San Francisco vs. Berkeley - Survey Data.
  - SSB consumption decreased 21% in Berkeley and increased 4% in neighboring cities.
  - Water consumption increased, 63% in Berkeley and 19% in neighboring cities.
- **Falbe (2015) - AJPH**
  - Follows stores in Berkeley and surrounding cities to analyze price changes
  - In a before and after comparison nds a pass-through of the tax of 67%

Nielsen Data & Additional Sources

- **Retail Scanner Data**
  - POS Information where obtain P,Q transaction observations by store. Barcode data.
- **Household Consumer Panel**
  - Household self-report of consumption in SSBs. We use it to identify basket of SSBs for the di erent consumer groups (income groups).
- **Nutrition Facts Webscrape**
  - Online stores information on Nutrition Facts, attention on sugar content
  - I scrape 1,482 UPCs out of 46,314 identi able UPCs. They account for 62% of identi able transactions.

What is the effect of the Tax on Sugar Intake?

- Standard Difference in Difference approach

$$y_{st} = (D_s \quad Post_t) + \quad _t + \quad _z + \quad _s + \quad _{st} \tag{1}$$

  - y_{st} ! Outcome per month and store
    - **Quantities:** SSBs' **Sugar grams**; SSBs' **uid ounces**.
    - **Prices:** **Price per gram** of SSB sugar; **price per ounce** of SSBs
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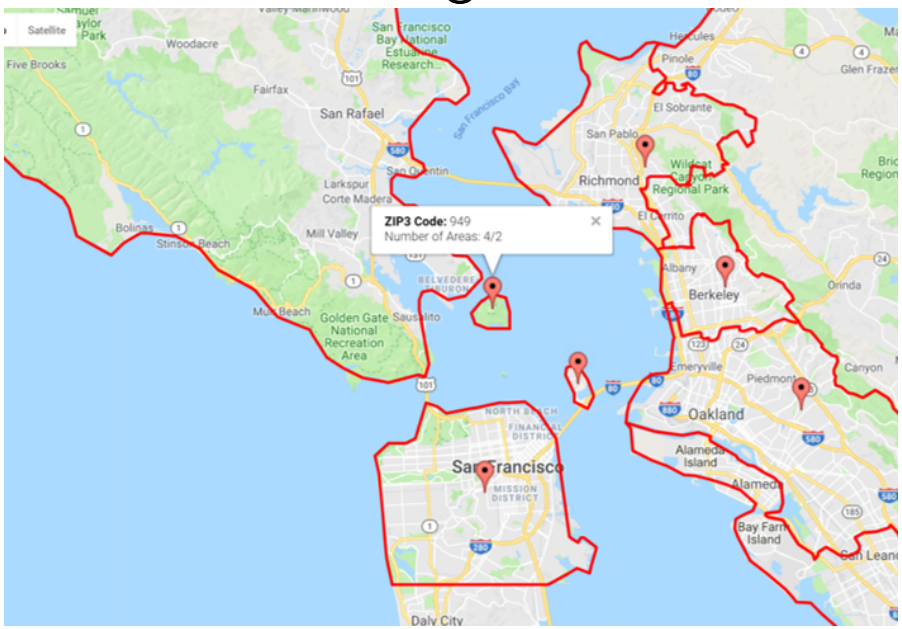
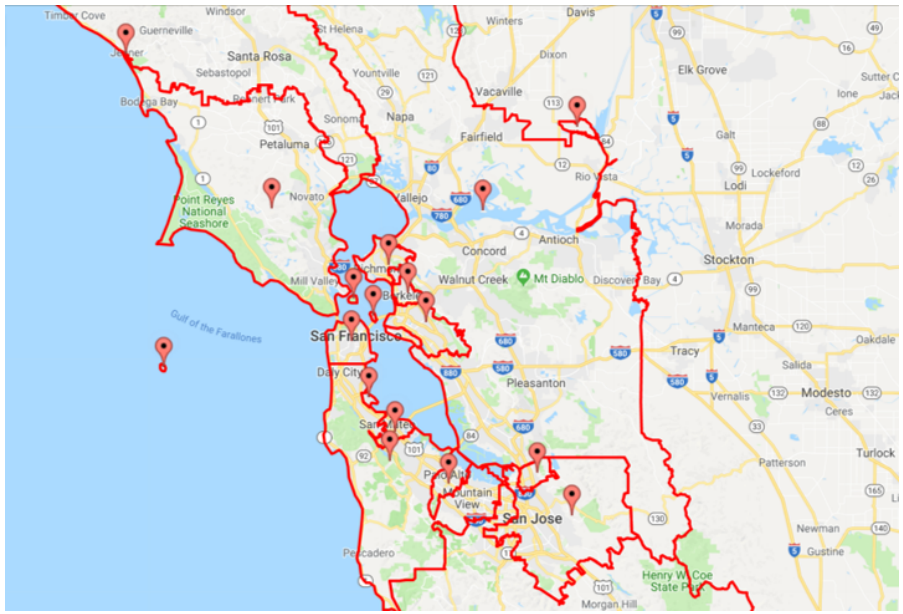
- Full Events model to assess the parallel trend assumption

$$y_{st} = \sum_{t} \quad _t(D_s \quad _t) \quad + \quad _t + \quad _z + \quad _s + \quad _{st} \tag{2}$$

Alternative Counterfactual Groups

1. All CA
2. All CA no neighbors
3. All CA no Bay Area localities
4. Neighboring states





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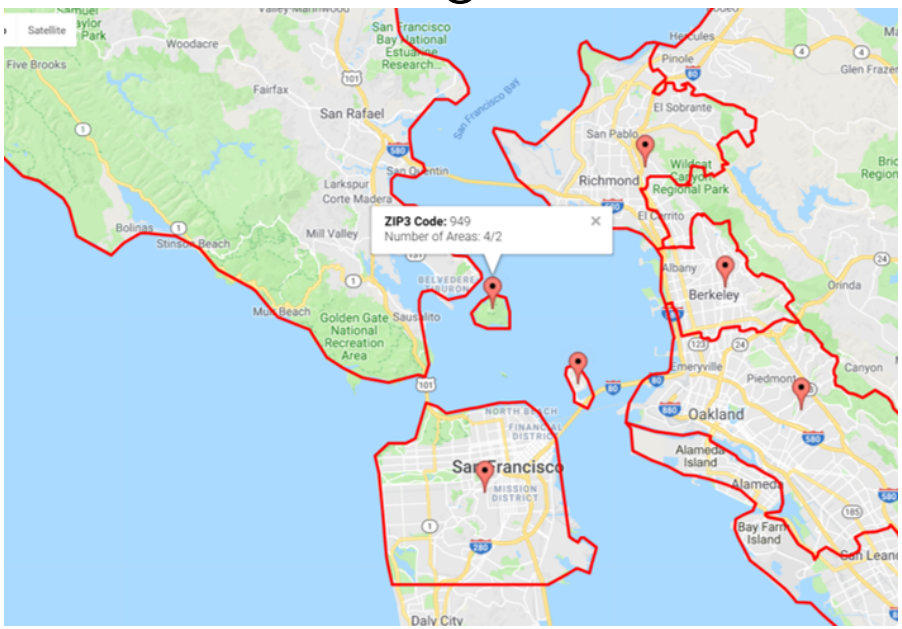
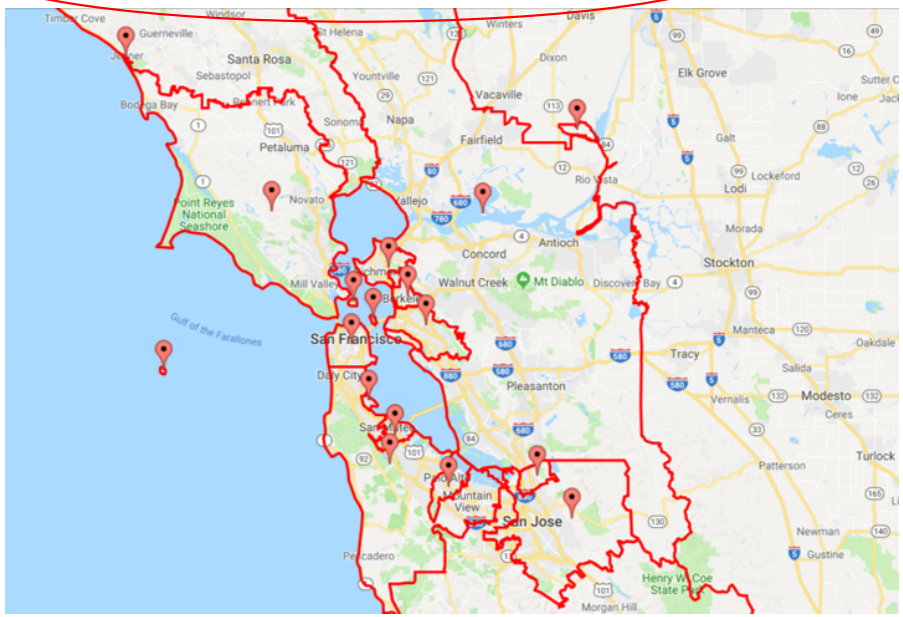
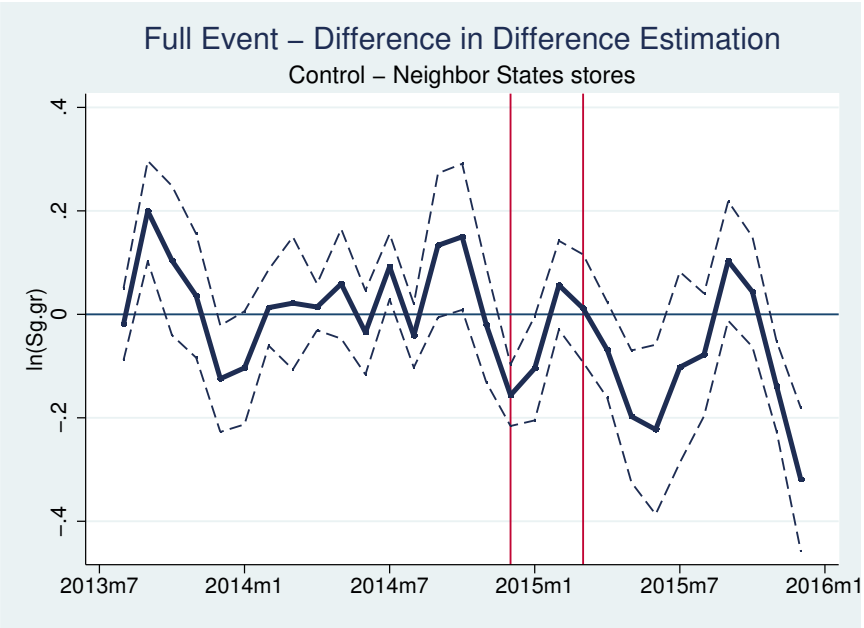




SSB Sugar Intake - Parallel Trends

- The full-event coefficients on the pre-policy period allow us to test the parallel trend
- We test that the distance is constant and equal to zero.



Results { Overall Q&P's

Table: DiD Results - Control: Neighboring States

		Quantities		Prices	
		ln(Sg.gr)	ln(Lq.oz)	cents/sg.gr	cents/lq.oz
D_{st} = 1	P = 1	-0.128***	-0.172***	-0.0126	0.0315**
		(0.035)	(0.0357)	(0.0203)	(0.0118)
	R^2	0.979	0.987	0.887	0.915
	N	58,928	58,928	58,928	58,928
	N Clusters	2,293	2,293	2,293	2,293

Standard errors clustered at the store level in parentheses

+ p < 0:1, * p < 0:05, ** p < 0:01, *** p < 0:001

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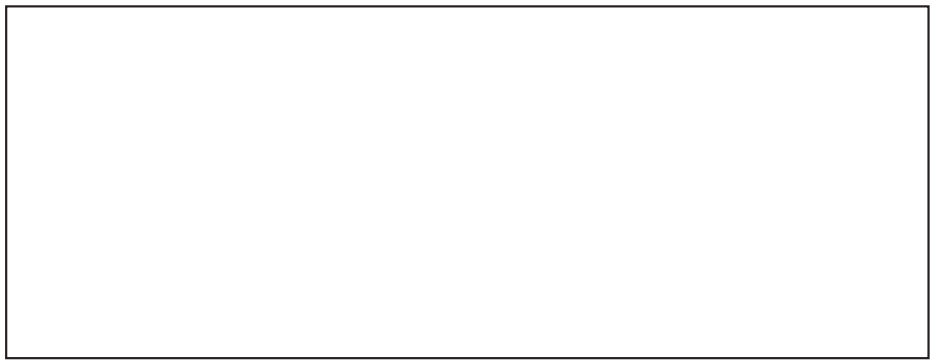

Baskets Characteristics

Heterogeneous e ects across income groups (baskets)?

Triple Di erence approximation

$$y_{sth} = \sum_{h} {}_{DPh}(D_s \; Post_t \; {}_h) + {}_{DP} \; D_s \; Post_t + \sum_{h} {}_{Dh} \; D_s \; {}_h + \sum_{h} {}_{Ph} \; Post_t \; {}_h + {}_t + {}_z + {}_s + {}_h + {}_{sth} \quad (3)$$

y_{tsh} ! Outcome in month (t) in store (s) for basket (h) - Berkeley stores
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The individual income group change will be given by:

$${}_h = y_{sth}(Post = 1) = {}_{DPh} + {}_{Ph} + {}_{DP} \quad (4)$$

I compare this linear combinations across subgroup baskets using a Wald Test.

Heterogeneous E ects - Quantities

$_h$(h =)	Treat. E .	IC 95%		Wald Test - Relative to Low-Income Group (< $20K)			
		Low	Upp	F-Test	df(r)	df(m)	p-value
Sugar Content (grs)							
Low	-0.1325** (0.0449)	-0.045	-0.220				
Mid-Low	-0.1351** (0.0411)	-0.055	-0.216	0.153	1	2295	0.6953
Mid-High	-0.1346** (0.0453)	-0.046	-0.223	0.171	1	2295	0.6794
High	-0.1214* (0.0503)	-0.023	-0.220	1.172	1	2295	0.2792
Liquid Content (lq.oz.)							
Low	-0.1438** (0.042)	-0.062	-0.226				
Mid-Low	-0.1466** (0.0427)	-0.063	-0.230	0.059	1	2295	0.8087
Mid-High	-0.1589** (0.0436)	-0.073	-0.245	2.467	1	2295	0.1164
High	-0.1122* (0.0531)	-0.008	-0.216	1.369	1	2295	0.2421

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Mid-Low	0.0283+ (0.0152)	0.058	-0.002	1.217	1	2295	0.270
Mid-High	0.0304* (0.0137)	0.057	0.004	0.837	1	2295	0.360
High	0.0297 (0.0244)	0.078	-0.018	0.176	1	2295	0.675

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If the aim of the policy was to curb sugar consumption to mitigate the public health concern of obesity and diabetes

- The policy has been successful, not only in reducing overall consumption of SSBs but also its sugar content.
- However, consumers substitute, to some extent, to SSBs with higher sugar concentration.
- This happens to the extent that price per sugar content has not changed.

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The equity concern of shifting the burden towards low-income populations is not materialized.

- Reduction in consumption of SSBs happens across the board, with no statistically significant heterogeneity.

Thanks for your attention!!!

e-mail: ozanor@indiana.edu

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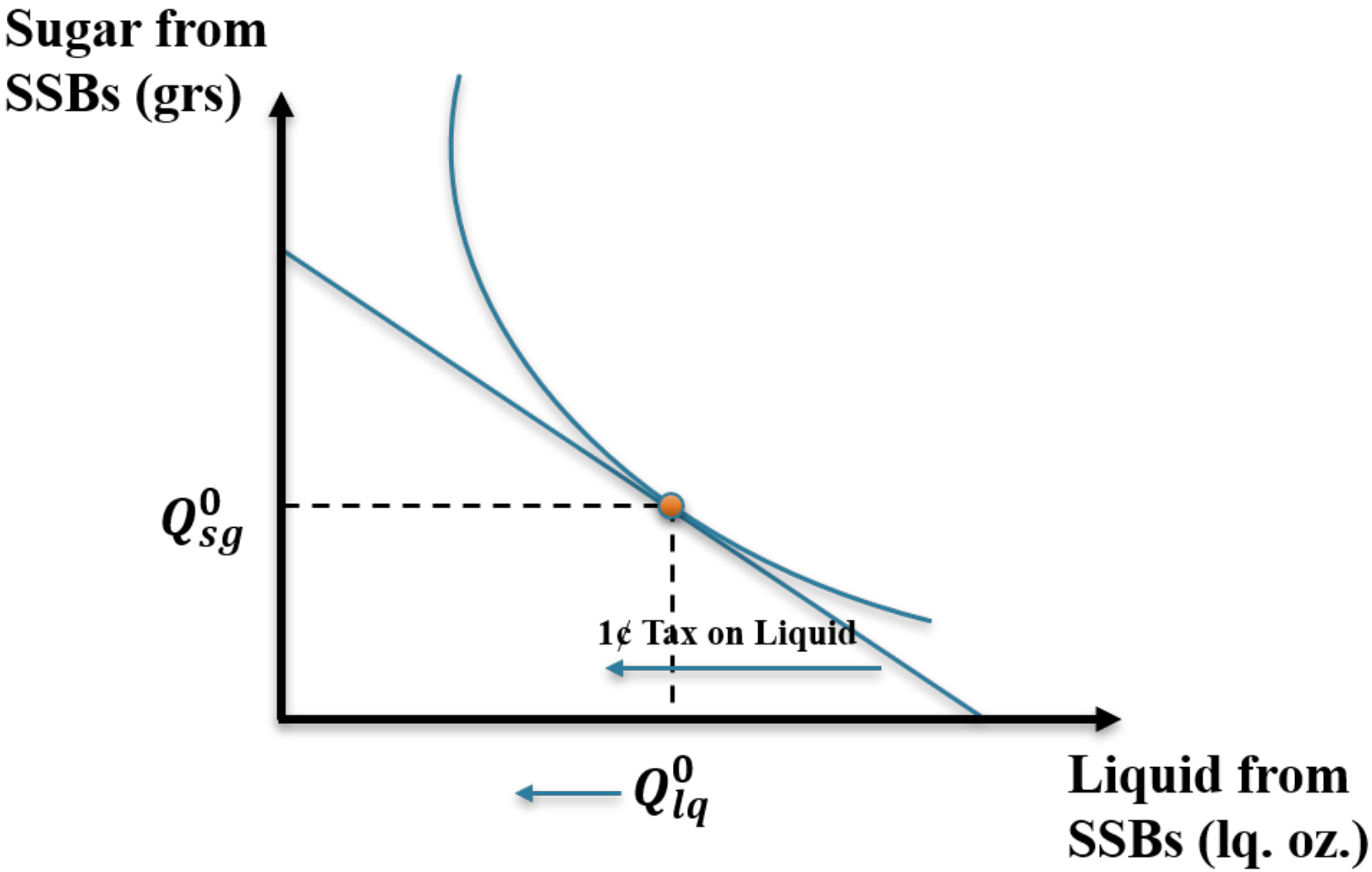

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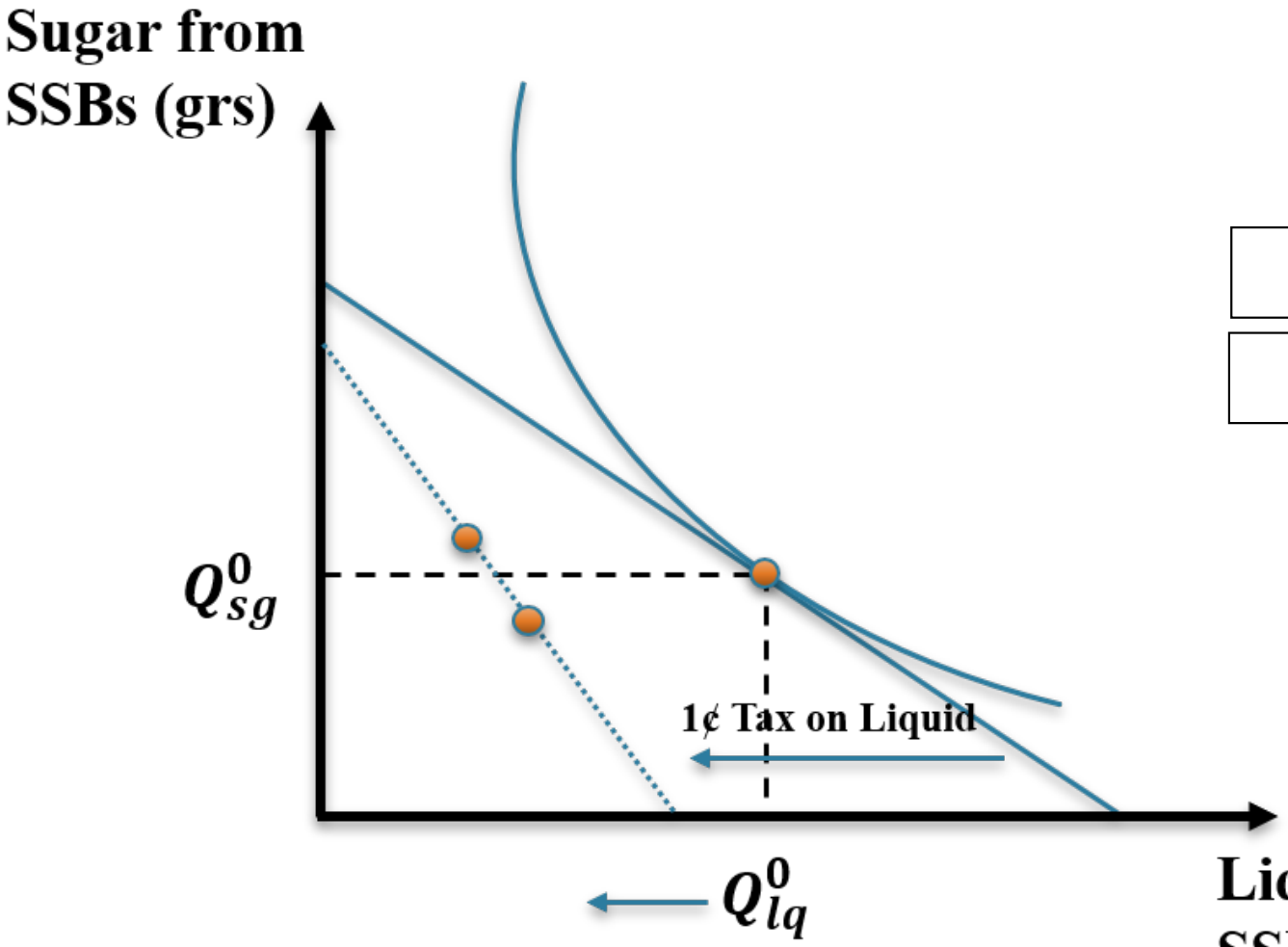

Sugar intake?

Heterogeneity?