Price Gouging During the Pandemic: Evidence from Scanner Data

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All conclusions remain of the authors and do not reflect the official position of the USDA.

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Setting the stage

Food retailers play a central role in price transmission to consumers.

COVID-19 pandemic as a natural experiment

- Significant supply chain disruptions
- Unprecedented demand shocks

Points of inquiry

- How do retailers adjust pricing during crises?
- What are the implications for consumer welfare?

Our focus

$\Rightarrow$ Examine retailer responses to supply and demand shocks, and the implications for consumer welfare during the early stages of the COVID-19 pandemic.

COVID-19 and Retailer Pricing Behavior

Combination of supply chain disruptions and demand surges placed significant pressure on retailers to adjust prices.

Conflicting circumstances:

- Legal constraints from anti-price gouging laws
- Economic incentives to raise prices due to scarcity and increased demand
- Concerns about public perception and long-term customer relationships

$\Rightarrow$ This tension leads to competing expectations about retailer pricing behavior during crises

Two competing expectations:

- Expectation 1: Price gouging behavior
- Expectation 2: Price rigidity

Primer on Price-Gouging Law

Early in the pandemic, retailers were accused of "price gouging."

- Retailers taking advantage of a crisis or an imbalance in supply and demand to exploit consumers by charging **unconscionable** prices for essential goods
- Unconscionable defined as "a price that exceeds. . . equal to or in excess of 10 percent the average price. . . during 30 days before the emergency declaration" and the increase in price does not coincide with an increase in costs (Unconscionable Pricing Act (H.R.732))

Evolution of anti-price gouging regulations:

- First modern law enacted in New York in 1979
- Motivated by heating oil price spikes during energy crisis
- Spread to other states following natural disasters in 1990s
- By 2022, over 30 states had some form of price-gouging regulations

*Ongoing debates argue pros/cons of APG regulations (economic efficiency vs. consumer protection, short-term relief vs. long-term market distortions)

Expectation 1: Price Gouging Behavior

Factors encouraging price gouging:

- Economic theory of supply and demand (Mankiw 2020)
- The price mechanism is meant to clear markets (Hayek 1945, Stigler 1946)
- Short-term profit maximization (Zwolinski 2008, Giberson 2011)
- Historical precedents (Rotemberg 2005, Cavallo et al. 2014, Larsen 2021)

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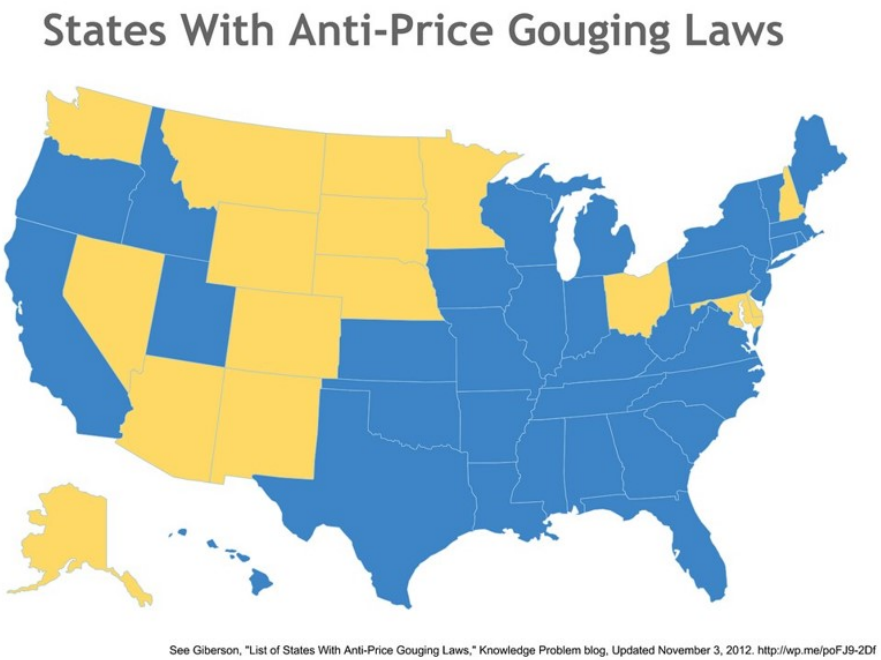
Anti-price gouging regulations:

- Implemented at the state level to moderate price gouging behavior
- Aim to protect consumers during emergencies
- Can influence retailer pricing decisions



Source: Knowledge Problem

Expectation 2: Price Rigidity

Factors encouraging price rigidity:

- **Legal restrictions** (anti-price gouging laws) (Neilson 2009)
- **Reputational concerns** and long-term customer relationships (Anderson & Simester 2010, Rotemberg 2011)
- **Competitive pressures**, e.g., risk of losing customers to competitors who don't raise prices (Blinder et al. 1998, Gopinath & Itshoki 2010)
- **Menu costs** of changing prices (Levy et al. 1997, Nakamura & Steinsson 2008)

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Potential consequences:

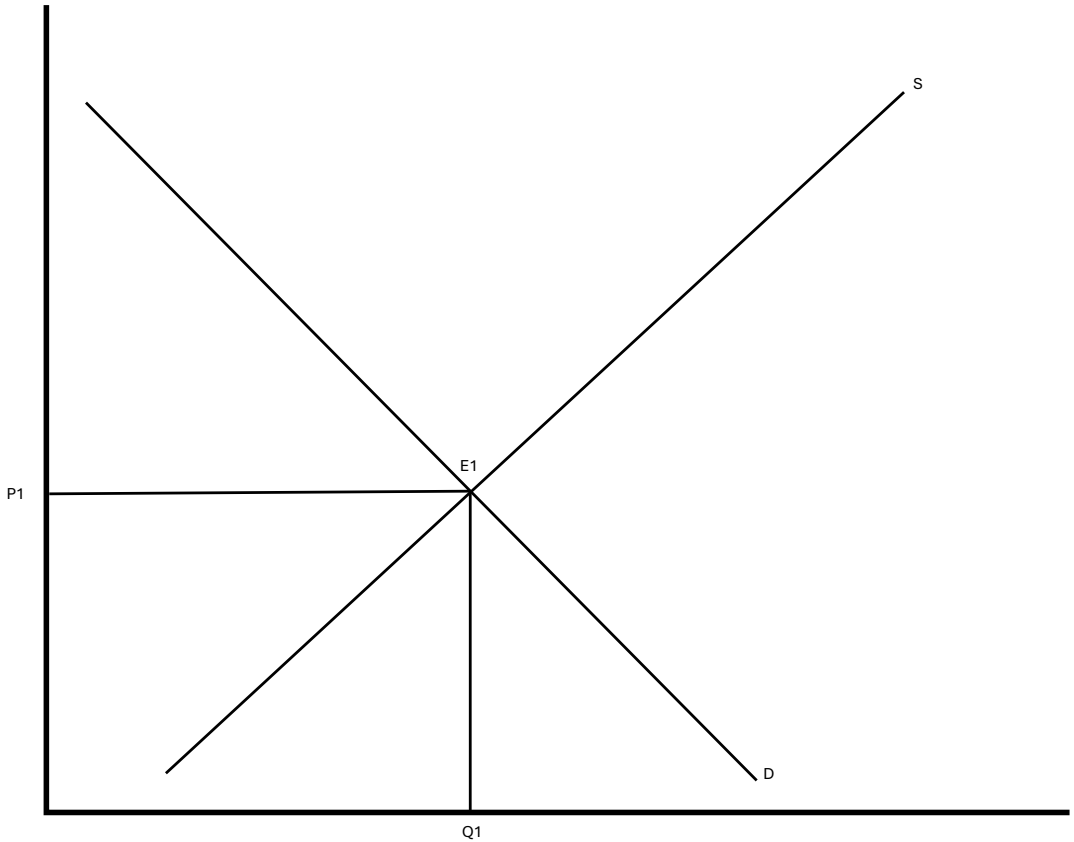
- Shortages and rationing (Weitzman 1991)
- Consumer stockpiling or "hoarding" (Baker et al. 2020)
- Emergence of black markets (Coyne & Coyne 2015)

Long-term impacts:

- Distorted market signals (Hayek 1945)
- Reduced incentives for increased production (Zwolinski 2008)
- Potential for prolonged shortages (Culpepper & Peace 2006)

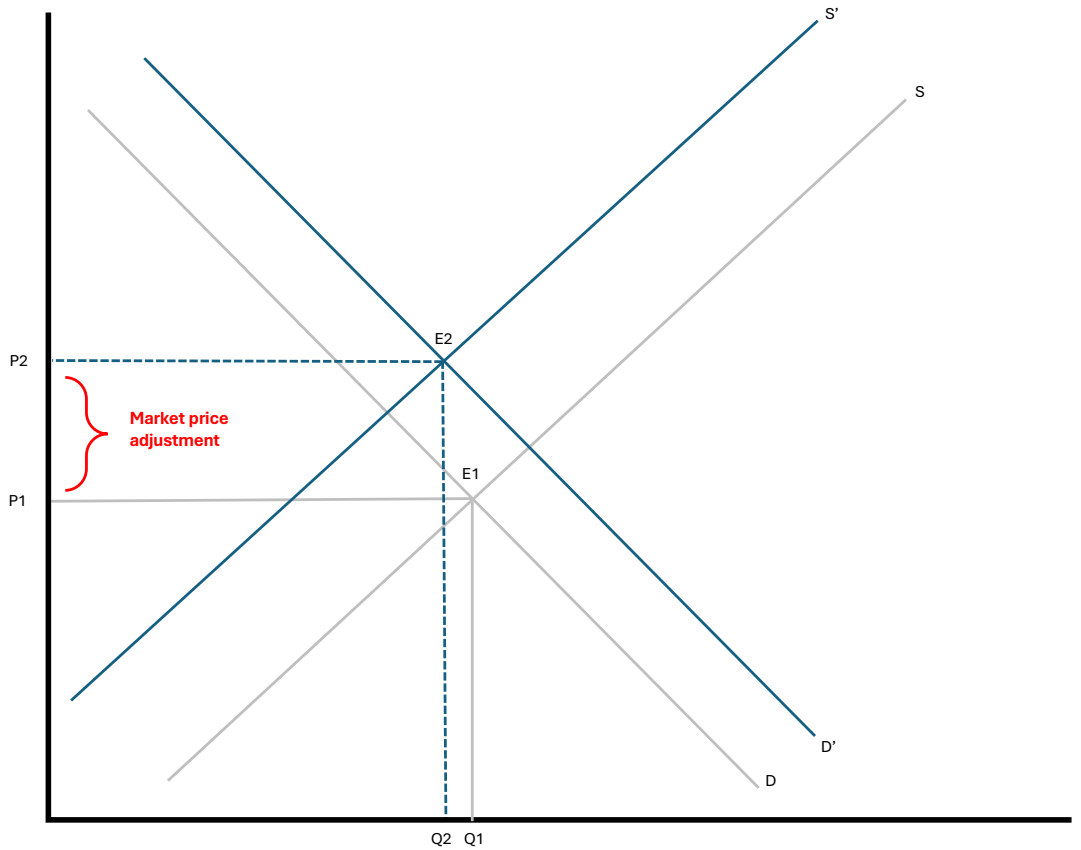
While economic models predict significant price increases in response to supply and demand shocks, various factors may prevent these theoretical adjustments in practice.

Initial Market Equilibrium



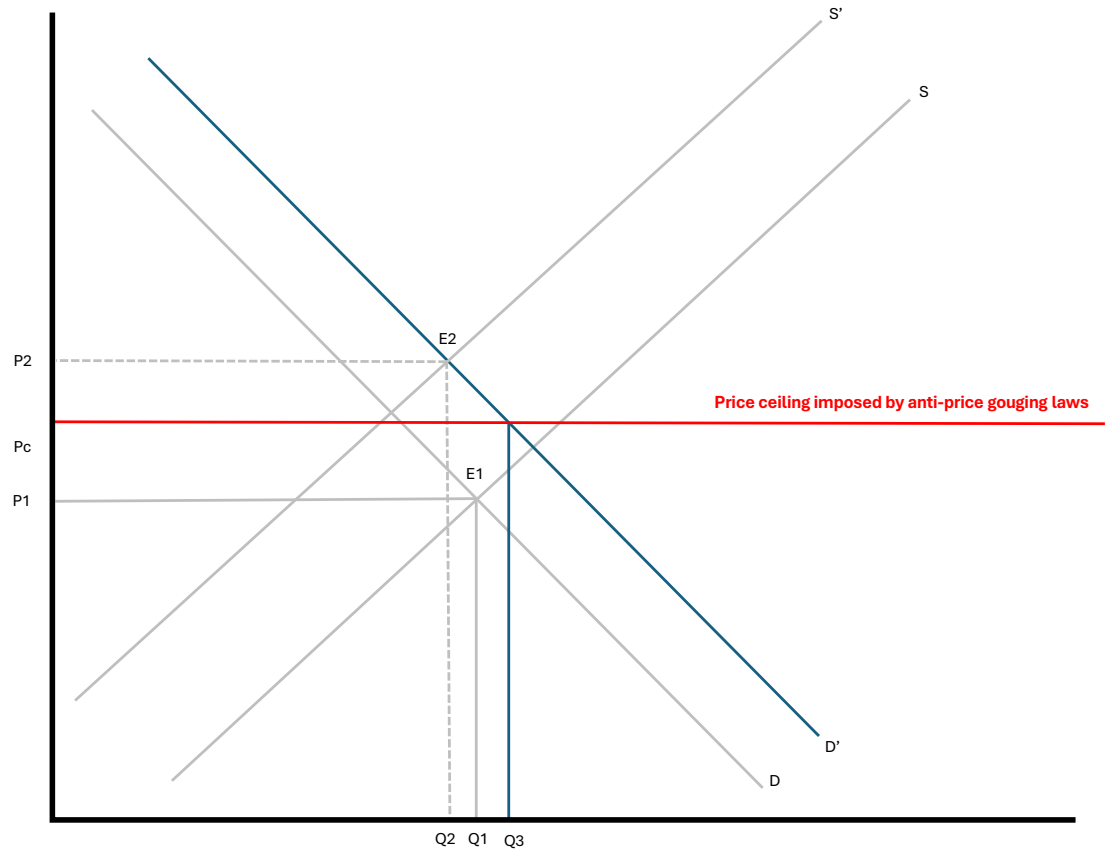
This graph shows the initial market equilibrium (E1) where supply (S) and demand (D) intersect, determining the initial price (P1) and quantity (Q1).

Market Adjustment to Supply and Demand Shocks



In response to supply and demand shocks, the supply curve shifts left (S to S') due to disruptions, while the demand curve shifts right (D to D') due to panic buying. The new equilibrium (E2) results in a higher price (P2) and potentially a different quantity (Q2).

Impact of Price Ceiling from Anti-Price Gouging Laws



Anti-price gouging laws impose a price ceiling (Pc). This prevents the market from reaching the new equilibrium (E2), potentially leading to shortages as quantity demanded (Q3) exceeds quantity supplied at the price ceiling.

Retailer Pricing Behavior: Normal Times vs. Times of Crisis

Price rigidity in normal times:

- Richards & Patterson (2004): **Retailers maintain fixed prices** despite wholesale price fluctuations due to menu costs and customer relationships
- Nakamura & Steinsson (2008): **Price changes are infrequent**, with median duration of 7-11 months depending on the sector

Pricing during crises:

- Cavallo & Rigobon (2016): **Prices remain relatively stable** during natural disasters, with only small, short-lived increases
- Gagnon & López-Salido (2020): After hurricanes, **prices rise by 1.8% on average**, primarily driven by higher wholesale costs

COVID-19 specific studies:

- Chakraborty & Roberts (2020): Despite supply chain disruptions, **retail prices remained largely stable** in the early pandemic stages
- O'Connell et al. (2022): Evidence of **increased price coordination** among retailers during the pandemic, potentially due to fear of negative publicity

Our Contribution

Empirical investigation of retailer behavior during COVID-19:

- Focus on price rigidity vs. price gouging in produce sector
- Detailed point-of-sale and inventory data
- Analysis of markup adjustments and cost pass-through

Implications for theory and policy:

- Test predictions of price rigidity models in crisis context
- Evaluate effectiveness of anti-price gouging regulations
- Assess potential unintended consequences of price controls

Data Requirements

- Retail prices before and during the pandemic
- Wholesale prices (prices paid by retailers)
- Inventory levels (to measure product scarcity)
- Product-level data for multiple retailers
- High-frequency data (daily or weekly)
- Timing of state of emergency declarations

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$\Rightarrow$ Ideally: All of these data points for both APG and non-APG states

Data Description

Source: DecaData

Coverage: 618 stores across 7 Southeastern states (# stores)

- AL (39), FL (393), GA (55)
- LA (29), MS (7), NC (11), SC (84)

  Note: All of these are APG states. This is a study limitation.

Time period: Nov 2019 to Dec 2021

Key variables:

- Product categories (74, UPC'd and random-weight)
- Retail prices (consumer paid)
- Wholesale prices (retailer paid)

Record ID: Unique store ID, transaction number, UPC

Advantages:

- Detailed point-of-sale and inventory data
- Both retail and wholesale prices
- Covers pre-pandemic and pandemic periods
- Multiple states and stores for comparison

Limitations:

- Limited to Southeast region
- Doesn't cover all major retailers
- May not represent national trends

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Today's presentation:

- Potatoes
- Lettuce
- Strawberries

$\Rightarrow$ 3 of top-4 most sold produce items

Empirical Strategy: Event Study

$$PR_{irt} = \alpha_r + \alpha_c + \alpha_s + \sum_{k=-K}^{K} \delta_k D_{rt}^k + \beta Q_{irt} + \gamma \mathbf{X}_{rt} + \varepsilon_{irt}$$

where

- PR_{irt}: Retail price for product i in store r during week t
- D_{rt}^k: Indicator for k periods from price-gouging regulation implementation
- Q_{irt}: Measure of relative scarcity (inventory stockouts)
- $\mathbf{X}_{rt}$: Controls (weekly COVID-19 deaths, demographics) sourced from the [1] CDC and [2] ACS 2018–2022
- α: Fixed effects for store r, category c, state s

Coefficients of interest.

- δ_k: effect of price-gouging regulations (or price rigidity)
- β: effect of scarcity

Interpreting Coefficients

Dependent Variable, ΔPR_{irt}

We measure ΔPR_{irt} as the percent change from the average price, for every item in each store, over the 30-days prior to the state of emergency:

$$\Delta PR_{irt} = \frac{PR_{irt} - \overline{PR}_{ir,base}}{\overline{PR}_{ir,base}} \times 100$$

where $\overline{PR}_{ir,base}$ is the average price for item i in store r during the 30-day base period.

Example:

- Average 30-day base price ($\overline{PR}ir, base$): \$3.49
- Unit price in the week after the pandemic ($PRirt$): \$3.84
- $\Delta PR_{irt} = \frac{3.84-3.49}{3.49} \times 100 \approx 10.03\%$

In this case, we would observe a value of approximately 10.03 for ΔPR_{irt}.

Note: Definitions of price gouging may vary by state, but generally consider a 10% increase from a base period as a significant. Prices are in nominal prices.

Alternative DV Measures

Phases of the pandemic, by state

Federal State of Emergency declared on **March 13, 2020**.

Key dates and duration of stay-at-home orders during the COVID-19 pandemic:

State (FIPS)	30-Day Pre-State of Emergency	State of Emergency Effective Date	Stay at Home Order	Number of Days in Effect
AL (1)	2/9/2020	3/13/2020	4/4/2020	26
FL (12)	2/13/2020	3/9/2020	4/1/2020	33
GA (13)	2/12/2020	3/14/2020	4/3/2020	21
LA (22)	2/12/2020	3/11/2020	4/23/2020	22
MS (28)	2/8/2020	3/14/2020	4/3/2020	24
NC (37)	2/13/2020	3/10/2020	3/30/2020	39
SC (45)	2/10/2020	3/13/2020	4/7/2020	13

For simplicity, the state of emergency was activated during week 11 of 2020.

Evidence of **price gouging** $\Rightarrow$ Expect positive and significant deltas after the event.

Evidence of **price rigidity** $\Rightarrow$ Expect statistically insigniificant deltas after the event.

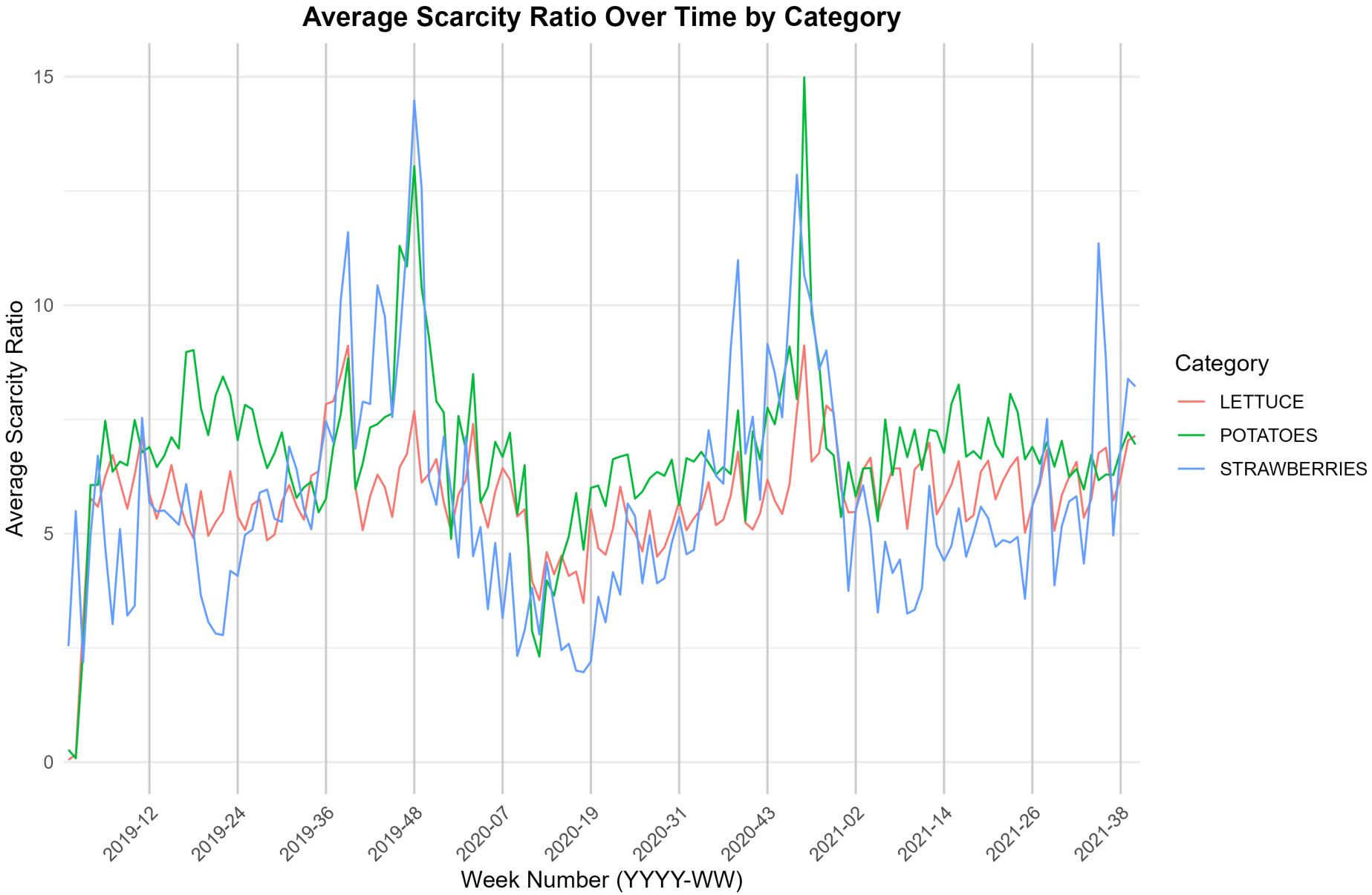
Scarcity Measure, Q_{irt}

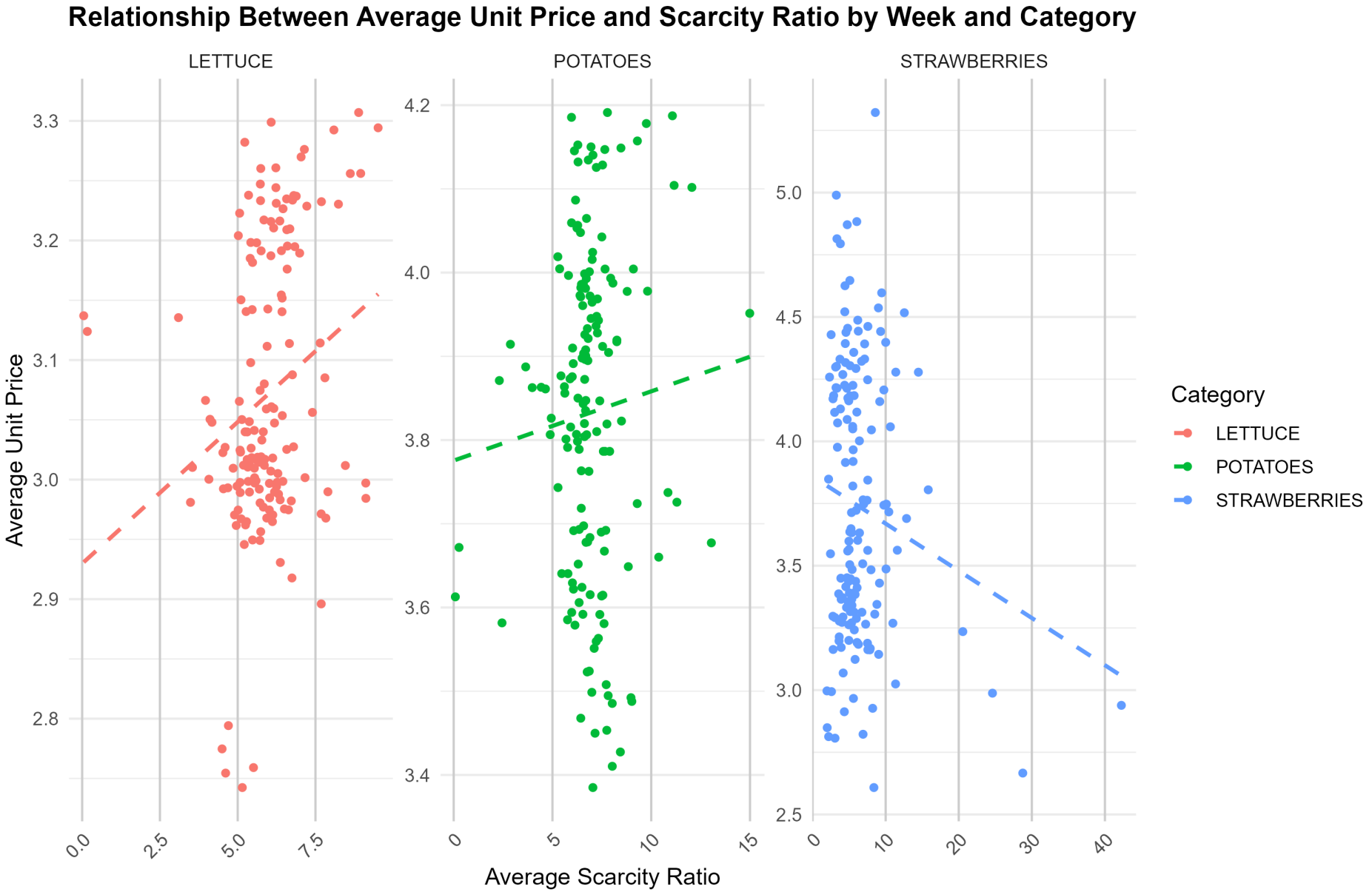
Represents how product availability compares to sales demand on a given day at specific store locations for each category.

Product scarcity is measured as the ratio between units in stock and the quantity of units sold at the category level.

- A **higher ratio** implies **less scarcity**.
- When the ratio is above 1, there's more inventory than sales, suggesting overstocking or less demand.
- Ratios below 1 indicate higher demand than supply, reflecting potential stockouts or high-demand scenarios.

As the scarcity ratio increases (supply exceeds demand), we would expect β to be negative, indicating a decrease in prices due to reduced scarcity.


Average Scarcity Ratio Over Time by Category
Average Scarcity Ratio
15
10
5
0
2019-12
2019-24
2019-36
2019-48
2020-07
2020-19
2020-31
2020-43
2021-02
2021-14
2021-26
2021-38
Week Number (YYYY-WW)
Category
LETTUCE
POTATOES
STRAWBERRIES


Relationship Between Average Unit Price and Scarcity Ratio by Week and Category
LETTUCE
POTATOES
STRAWBERRIES
Average Unit Price
Average Scarcity Ratio
Category
LETTUCE
POTATOES
STRAWBERRIES

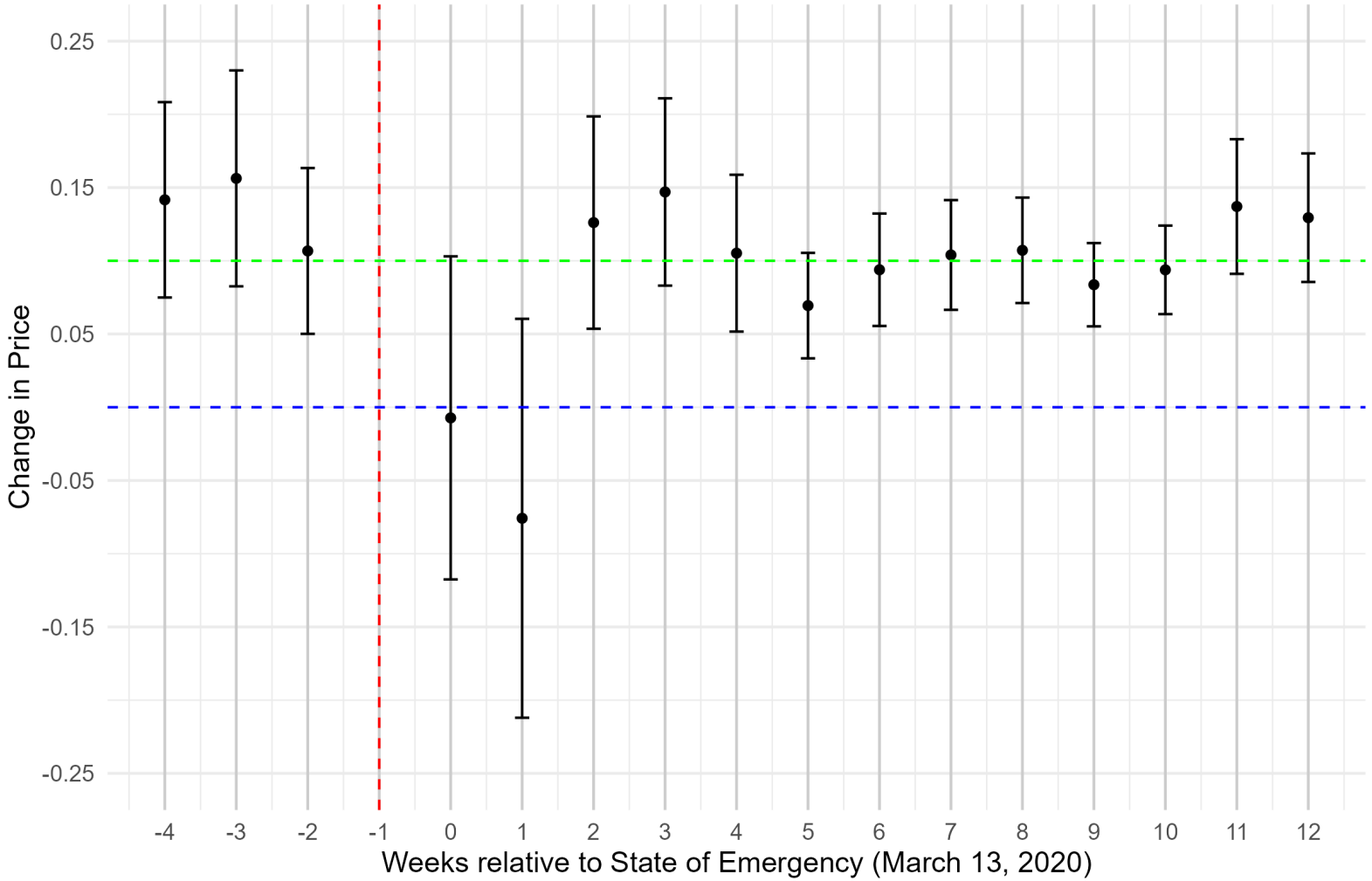
Summary Statistics by Category

Variable (Mean Values)	Lettuce	Potatoes	Strawberries
Price Change (ΔPR_{irt})	2.2046	-0.8045	1.1650
	(9.2868)	(6.4287)	(7.9074)
Price Spread (Nominal \$)	1.3686	1.1256	0.3288
	(1.4003)	(2.0499)	(2.7207)
Unit Price	3.0561	3.8328	3.9617
	(0.9531)	(1.7942)	(1.7348)
Unit Price (Real \$)	3.0415	3.8097	3.9482
	(0.9429)	(1.7800)	(1.7281)
Unit Cost	1.6874	2.7072	3.6329
	(1.1920)	(1.5675)	(3.1694)
Unit Cost (Real \$)	2.0829	2.2396	5.6526
	(1.7050)	(1.3236)	(4.8186)
Scarcity Ratio	5.9129	6.9724	5.7574
	(4.3308)	(5.3699)	(10.3653)
Covid-Related Deaths	253.4273	268.1216	219.7237
	(456.6846)	(466.3844)	(383.0973)
Population Density	773.0475	730.9747	706.2859
	(769.7542)	(758.1780)	(720.2421)
Median HH Income	65,489.4738	65,268.6635	64,702.9380
	(10259.9502)	(10389.7523)	(10339.4023)
N. Obs. (Year-Week)	4,781,538	7,717,936	558,034

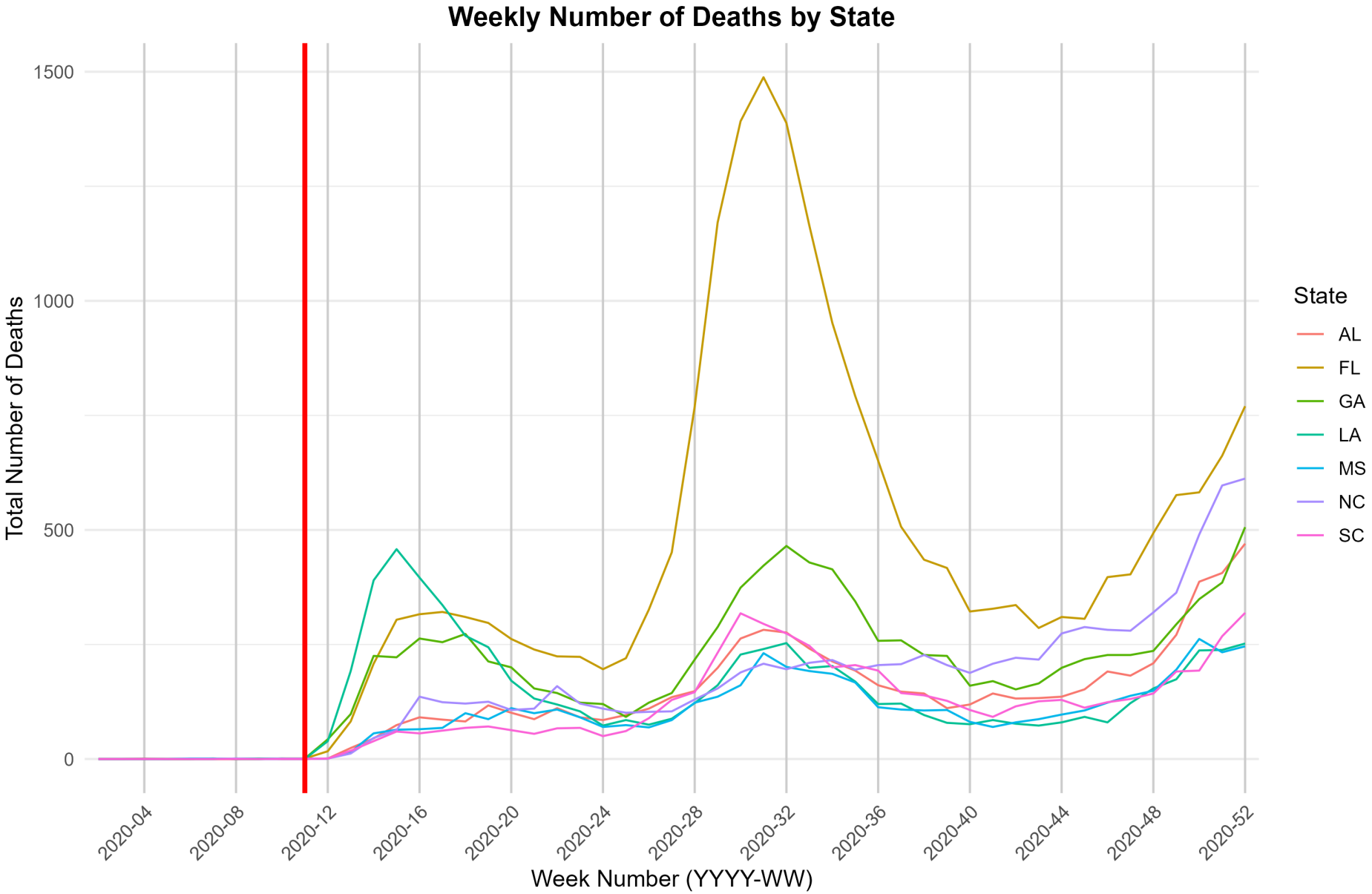
Select results for:
Change in price relative to 30-days prior to State of Emergency

Event Study: Price Changes Around State of Emergency

Pooled Categories: Potatoes, Strawberries, Lettuce

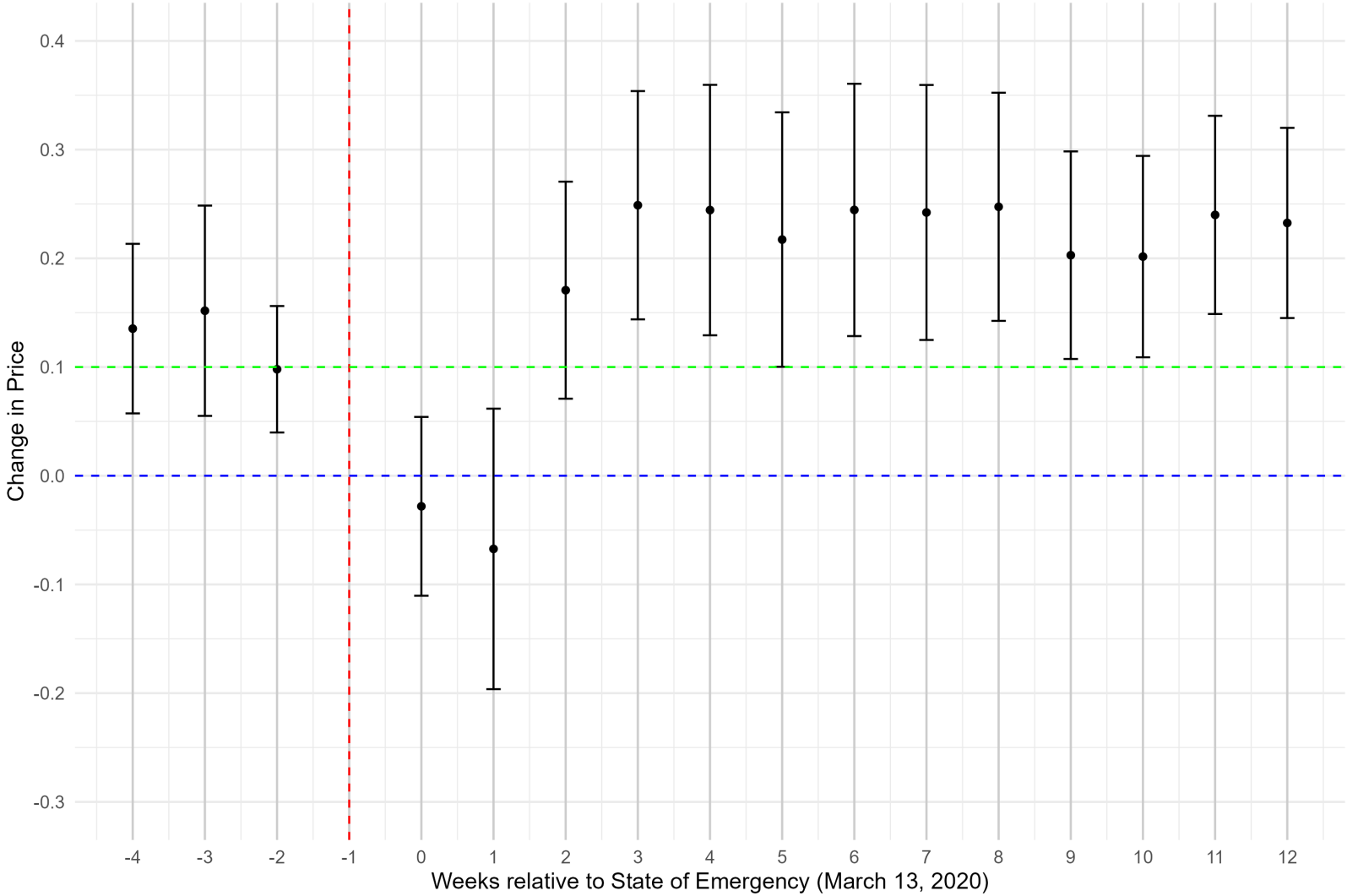


Standard errors clustered by Store ID and week. Dependent variable is measured as the percent change in price relative to the 30-days prior to the SoE. Results from a regression of price changes on indicators for weeks relative to March 13, 2020 (week 0), with week -1 as the reference period, along with fixed effects for Store ID, state, and category. The mean of the price change in the reference period (week -1) is Potatoes: -0.009338 , Strawberries: 0 , Lettuce: -0.396246. The green dashed line represents a 10% price increase, often used as a threshold for identifying potential price gouging. Sample size is 13,037,506. Estimated using the fixest package in R version 4.4.0.


Weekly Number of Deaths by State
Total Number of Deaths
1500
1000
500
0
2020-04
2020-08
2020-12
2020-16
2020-20
2020-24
2020-28
2020-32
2020-36
2020-40
2020-44
2020-48
2020-52
Week Number (YYYY-WW)
State
AL
FL
GA
LA
MS
NC
SC

Event Study: Price Changes Around State of Emergency

Pooled Categories: Potatoes, Strawberries, Lettuce



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Potatoes | Strawberries | Lettuce

Interpreting Results

If $\delta_2 = 0.171$, this means prices in week 2 after the event were 17.1 percentage points higher than the reference week.

Back of the envelope example:*

- Baseline average price (30 days pre-emergency): \$3.49
- Coefficient estimate (δ_2): 0.171
- Price in week 2 post-emergency:
  - Relative increase due to δ_2: $\$3.49 \times 0.171 = \$0.60$
  - New price in week 2: $\$3.49 + \$0.60 = \$4.09$
- Absolute increase: \$0.60
- Percentage increase: $\frac{0.60}{3.49} \times 100 \approx 17.2\%$
- Comparison to price gouging threshold: The 17.1% increase exceeds the common 10% threshold for price gouging.

Interpretation: Given that the prices in week 2 post-emergency are 17.1 percentage points higher than the reference week, this significant increase suggests potential price gouging behavior.

*On average, and can vary based on other factors.

Event Study Coefficient Estimates

Estimate	Pooled (1)	Pooled (2)	Potatoes	Strawberries	Lettuce
δ_{-4}	0.142***	0.135***	0.006	0.045	0.463***
	(0.033)	(0.039)	(0.009)	(0.031)	(0.098)
δ_{-3}	0.156***	0.152***	0.009	0.045	0.460***
	(0.037)	(0.048)	(0.008)	(0.033)	(0.098)
δ_{-2}	0.107***	0.098***	0.036	0.032	0.284**
	(0.028)	(0.029)	(0.044)	(0.021)	(0.133)
δ_0	-0.007	-0.028	-0.001	-0.229	0.113***
	(0.055)	(0.041)	(–)	(0.259)	(0.031)
δ_1	-0.076	-0.067	-0.089***	-0.871***	0.233
	(0.068)	(0.064)	(0.023)	(0.170)	(0.203)
δ_2	0.126***	0.171***	-0.070***	-0.714***	0.811***
	(0.036)	(0.050)	(0.026)	(0.139)	(0.138)
δ_3	0.147***	0.249***	-0.027	-0.957***	0.954***
	(0.032)	(0.052)	(0.019)	(0.174)	(0.141)
δ_4	0.105***	0.244***	-0.001	-1.173***	0.978***
	(0.027)	(0.057)	(–)	(0.212)	(0.147)
δ_5	0.069***	0.217***	-0.066***	-0.511***	0.868***
	(0.018)	(0.058)	(0.024)	(0.184)	(0.137)
δ_6	0.094***	0.245***	-0.063***	-0.243**	0.884***
	(0.019)	(0.058)	(0.023)	(0.118)	(0.138)
δ_7	0.104***	0.242***	-0.064***	-0.249**	0.863***
	(0.019)	(0.058)	(0.023)	(0.127)	(0.139)
δ_8	0.107***	0.247***	-0.070***	-0.245**	0.721***
	(0.018)	(0.052)	(0.026)	(0.111)	(0.122)
δ_9	0.084***	0.203***	-0.104***	-0.260**	0.690***
	(0.014)	(0.048)	(0.025)	(0.126)	(0.114)
δ_{10}	0.094***	0.202***	-0.080***	-0.264**	0.650***
	(0.015)	(0.046)	(0.030)	(0.130)	(0.105)
δ_{11}	0.137***	0.240***	-0.037**	-0.032	0.681***
	(0.023)	(0.045)	(0.016)	(–)	(0.107)
δ_{12}	0.129***	0.233***	-0.023	-0.204	0.606***
	(0.022)	(0.044)	(0.021)	(0.128)	(0.100)
β (Scarcity)	–	-0.008**	-0.004	-0.002	0.027**
		(0.003)	(0.004)	(0.005)	(0.012)

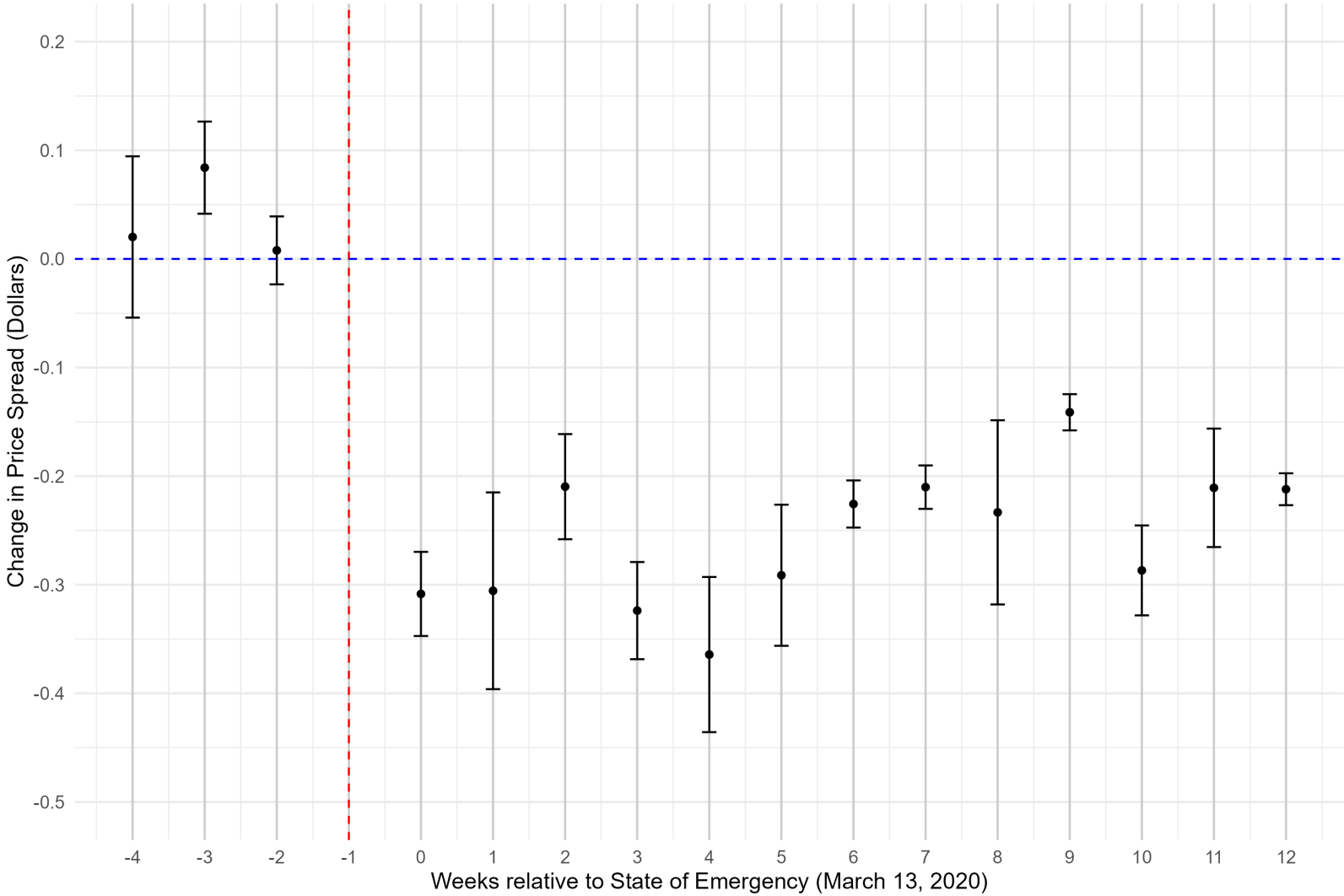
Note: Standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01

Select results for:
Difference in unit price and item cost (i.e., price spreads)

Note: Results presented use nominal prices.

Event Study: Changes in Price Spreads Around State of Emergency

Pooled Categories: Potatoes, Strawberries, Lettuce



Standard errors clustered by Store ID and week. Dependent variable is measured as the difference between the unit price and the item cost, i.e., the price spread. Results from a regression of price spread on indicators for weeks relative to March 13, 2020 (week 0), with week -1 as the reference period, along with controls for product scarcity, Covid-related deaths, and demographics (population density and median household income), and fixed effects for Store ID, state, and category. The mean of the price spread in the reference period (week -1) is 1.307111. Sample size is 13,037,506. Estimated using the fixest package in R version 4.4.0.

Conclusion

Takeaways

1. Overall trend shows price increases following the State of Emergency, but with varying magnitudes.
2. Significant heterogeneity in pricing responses across product categories.

3. The definition and measurement of "price gouging" may need refinement:

→ Should we consider all products, market baskets, or specific categories?

→ Uniform thresholds (e.g., 10%) may not capture nuanced market dynamics.

4. Price spreads generally decreased, indicating retailers absorbed some costs.

Implications

- Anti-price gouging laws may have limited or uneven effectiveness across product types.
- Retailers appear to balance price increases with maintaining price spreads.
- Consumer impact likely varied significantly by product category.

Next Steps

- Examine more nuanced metrics (by state) for identifying price gouging that account for product-specific factors.
- Investigate price changes at different aggregations of products.
- Examine potential unintended consequences such as stockpiling

Questions? Comments?

Lauren Chenarides
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Thank You!

"This was all stolen locally."

Source

Interpreting Coefficients of Interest

δ_k: Effect of price-gouging regulations

- Set of coefficients capturing impact of regulation implementation on price changes
- Measures price changes relative to timing of regulation enactment
- Reveals immediate, delayed, or anticipatory effects of regulations
- Positive values of δ_k would imply an increasing rate of price increases relative to the 30-day base period
- Answers: How do retailers adjust pricing in response to anti-price gouging laws?

β: Effect of scarcity

- Single coefficient measuring impact of product scarcity on price changes
- Captures price response to changes in product availability (inventory stockouts)
- Higher values indicate more supply relative to demand, so we expect β to be negative
- Answers: Do retailers adjust prices when products are more scarce?

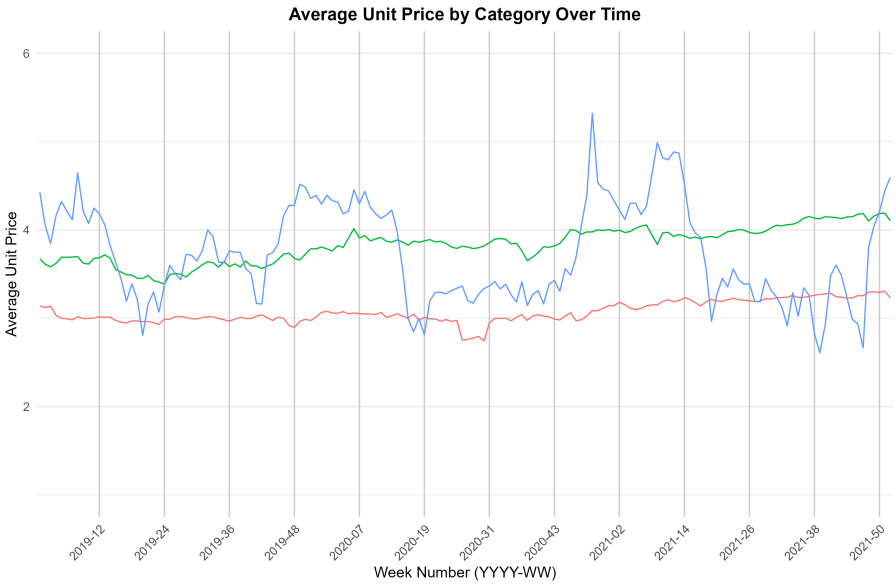
Model

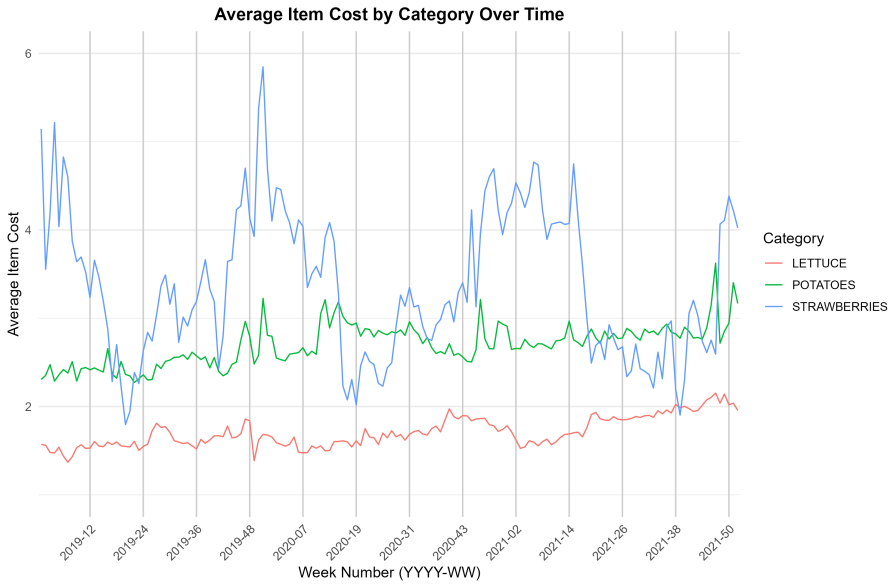
Alternative Dependent Variables Considered

- Long run average: $\overline{PR}_{rc,base}$ = average item (or category) level price during 2019
- January average: $\overline{PR}_{rc,base}$ = average item (or category) price during January 2020
- Price spread: $PS_{irt} = (PR_{irt} - WP_{irt})$, where WP_{irt} is the wholesale price
- Price spread change: $\Delta PS_{irt} = \Delta(PR_{irt} - WP_{irt})$, where WP_{irt} is the wholesale price

Main

Average Unit Price vs. Average Item Cost





Main

Price Adjustments

Retail prices are adjusted using the Consumer Price Index (CPI):

$$PR_{irt}^{real} = \frac{PR_{irt}^{nominal}}{CPI_c t} \times CPI_{base}$$

Wholesale prices are adjusted using the Producer Price Index (PPI):

$$WP_{irt}^{real} = \frac{WP_{irt}^{nominal}}{PPI_c t} \times PPI_{base}$$

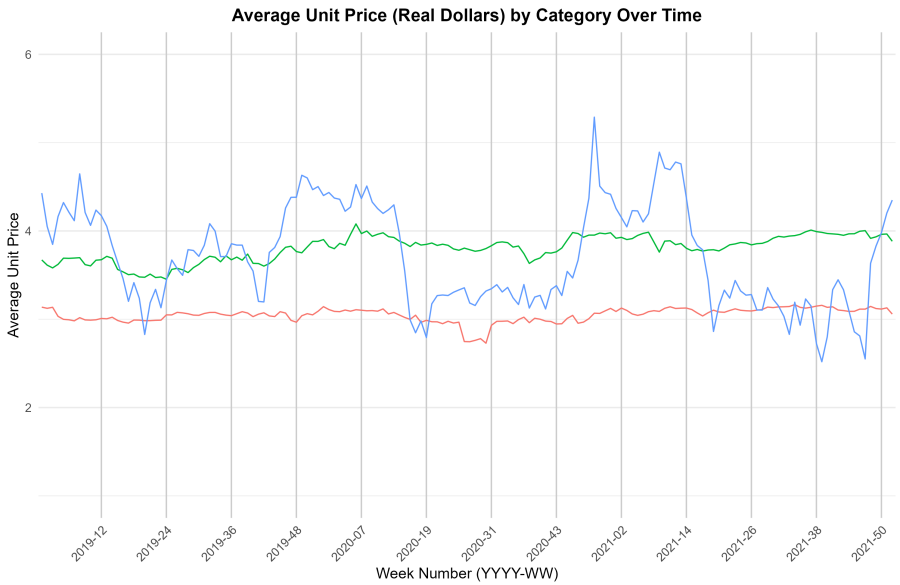
where:

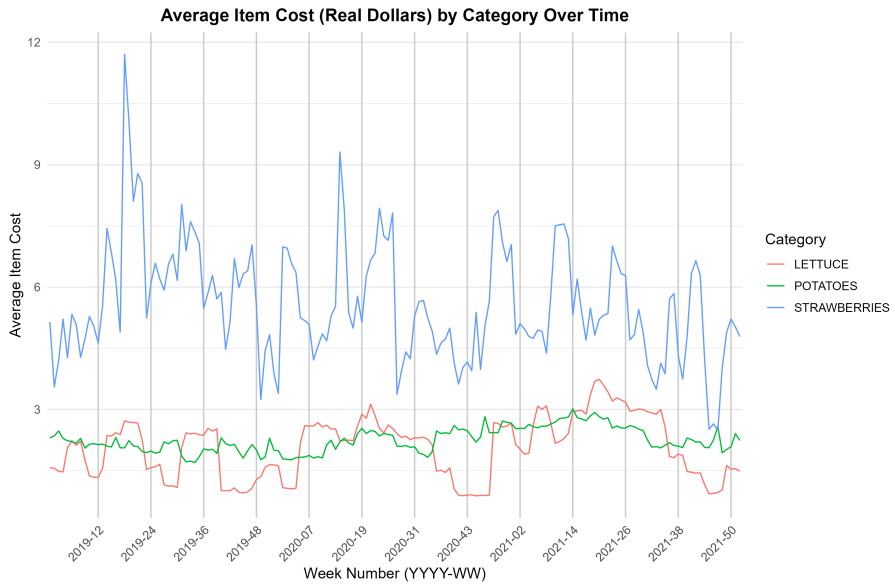
- PR_{irt}^{real}, WP_{irt}^{real}: Real retail and wholesale prices (adjusted for inflation)
- $PR_{irt}^{nominal}$, $WP_{irt}^{nominal}$: Nominal retail and wholesale prices
- $CPI_c t$, $PPI_c t$: Consumer/Producer Price Index at time t for category c
- CPI_{base}, PPI_{base}: Consumer/Producer Price Index at the base period (Jan-2019)

Sources: FRED CPI Fruit and Vegetable Series, BLS Producer Price Index Commodity Data

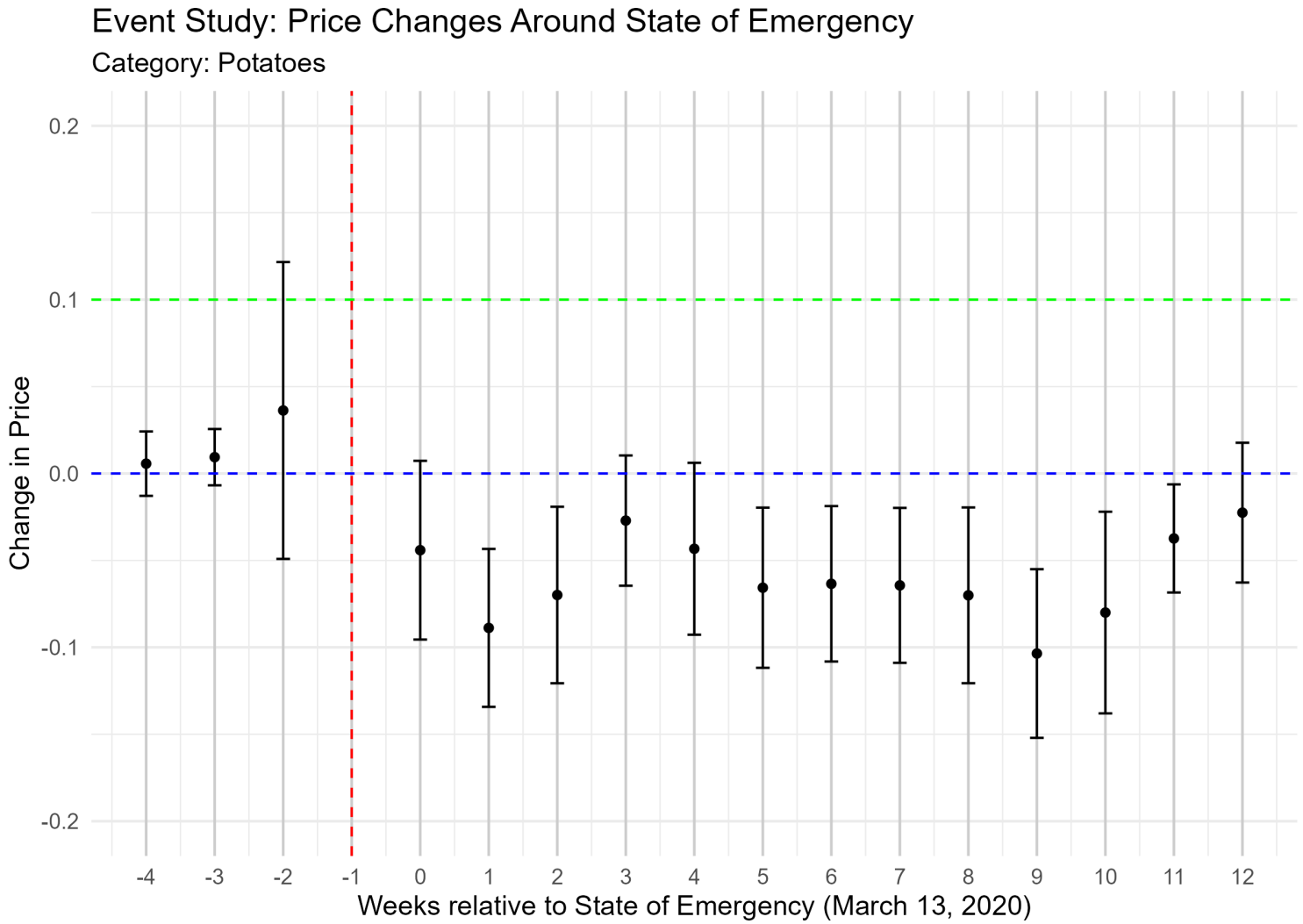
Main

Average Unit Price vs. Average Item Cost (Real Dollars)





Main

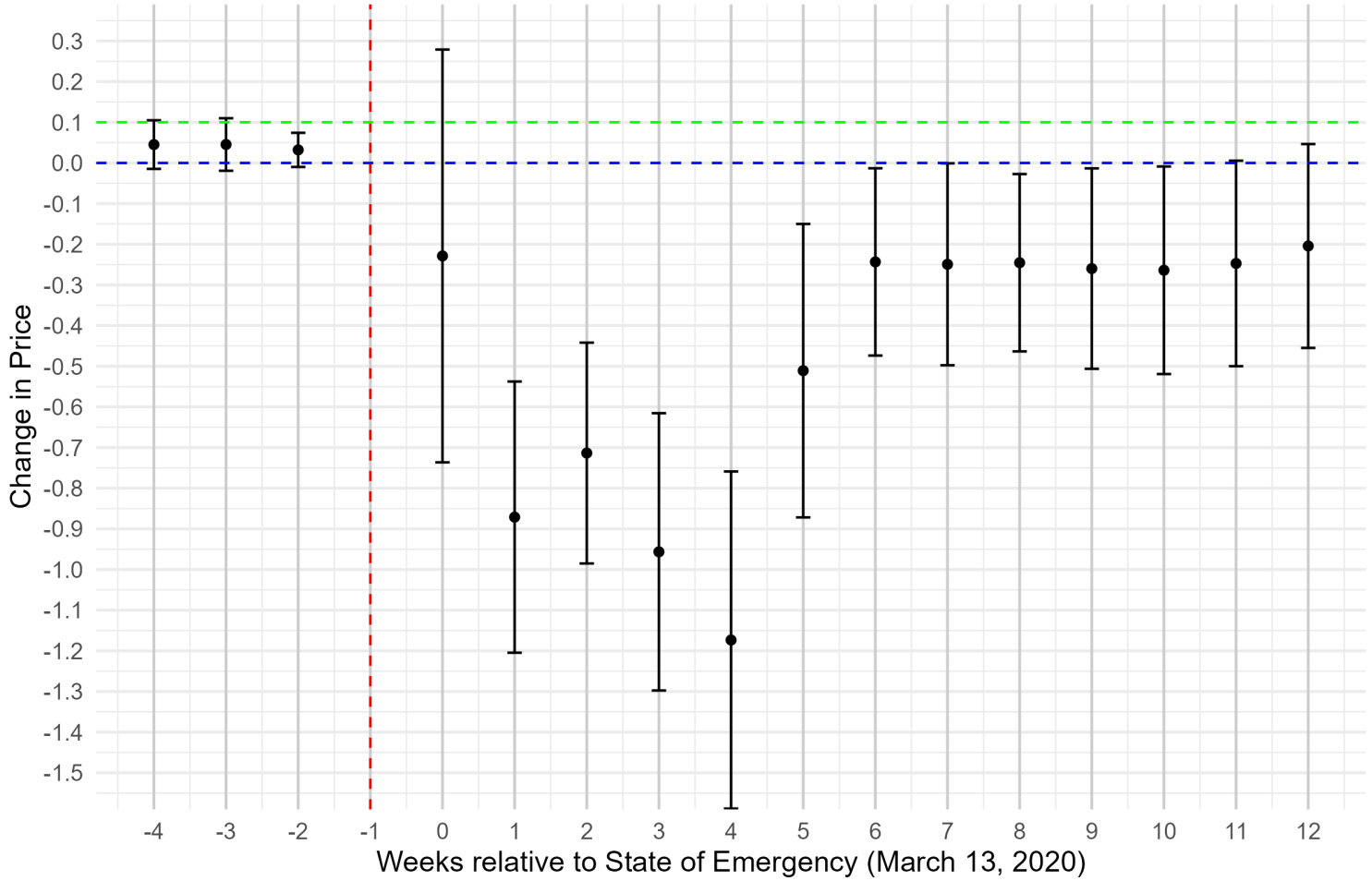


Standard errors clustered by Store ID and week. Dependent variable is measured as the percent change in price relative to the 30-days prior to the SoE. Results from a regression of price changes on indicators for weeks relative to March 13, 2020 (week 0), along with controls for product scarcity, Covid-related deaths, and demographics (population density and median household income), and fixed effects for Store ID and state. The mean of the price change in the reference period (week -1) is -0.141524. The green dashed line represents a 10% price increase, often used as a threshold for identifying potential price gouging. Sample size is 7,717,936. Estimated using the fixest package in R version 4.4.0.

Main

Event Study: Price Changes Around State of Emergency

Category: Strawberries

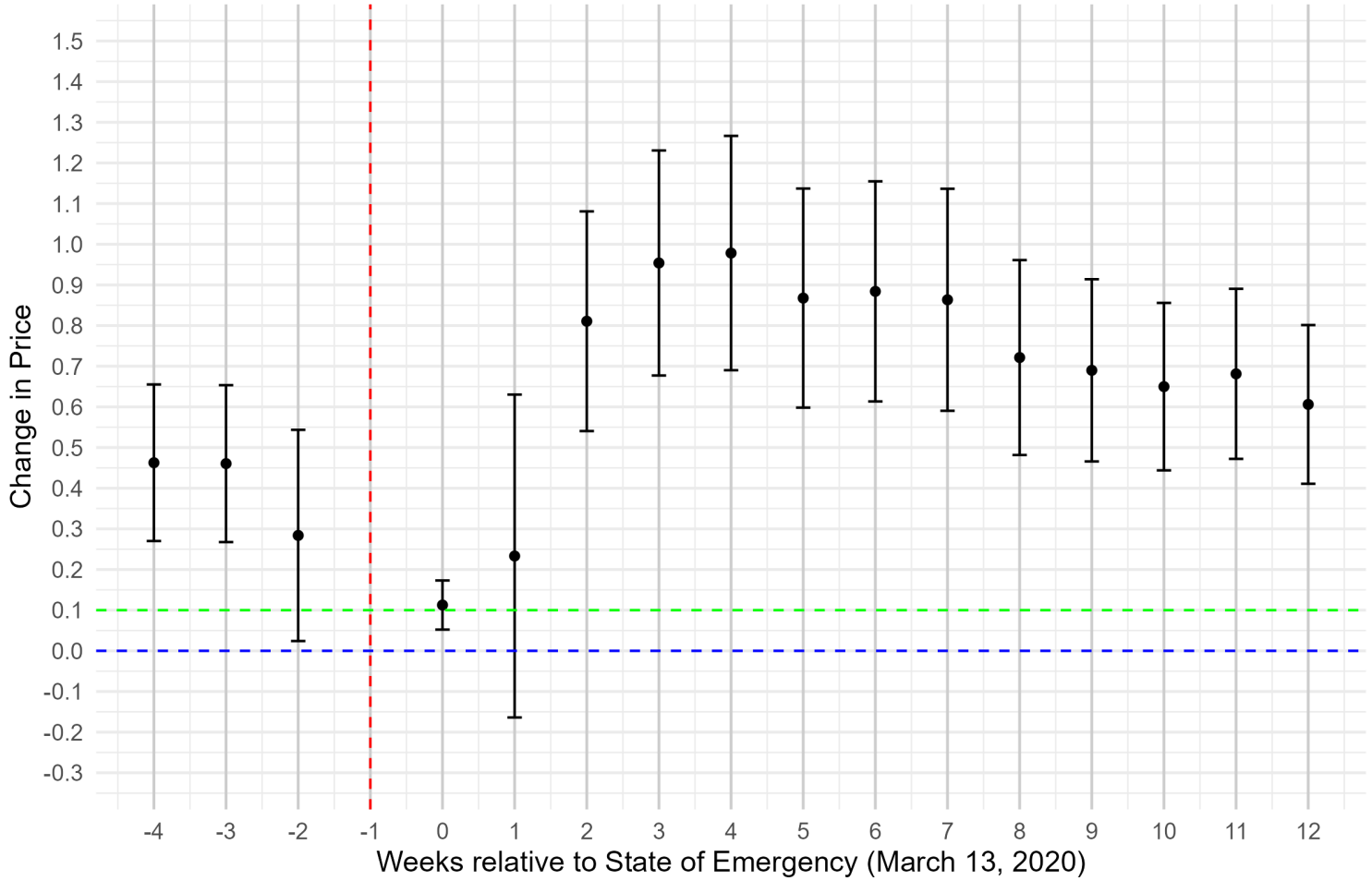


Standard errors clustered by Store ID and week. Dependent variable is measured as the percent change in price relative to the 30-days prior to the SoE. Results from a regression of price changes on indicators for weeks relative to March 13, 2020 (week 0), along with controls for product scarcity, Covid-related deaths, and demographics (population density and median household income), and fixed effects for Store ID and state. The mean of the price change in the reference period (week -1) is -0.141524. The green dashed line represents a 10% price increase, often used as a threshold for identifying potential price gouging. Sample size is 558,034. Estimated using the fixest package in R version 4.4.0.

Main

Event Study: Price Changes Around State of Emergency

Category: Lettuce



Standard errors clustered by Store ID and week. Dependent variable is measured as the percent change in price relative to the 30-days prior to the SoE. Results from a regression of price changes on indicators for weeks relative to March 13, 2020 (week 0), along with controls for product scarcity, Covid-related deaths, and demographics (population density and median household income), and fixed effects for Store ID and state. The mean of the price change in the reference period (week -1) is -0.141524. The green dashed line represents a 10% price increase, often used as a threshold for identifying potential price gouging. Sample size is 4,761,536. Estimated using the fixest package in R version 4.4.0.

Main