What Can Stockouts Tell Us About Inflation? Evidence from Online Micro Data

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What we do

- Create two high-frequency measures of consumer product shortages in 7 countries
  - temporary stockouts, discontinued products
- Are shortages associated with inflation?
- Are the inflation effects stronger for imported goods?
- What do observed prices and shortages imply about the cost to replenish inventories?

Micro data on price and stockouts

- Data scraped from websites of large multi-channel retailers that sell mostly offline
- We focus on 70 retailers in 7 countries that show "out of stock" information

	Products	Retailers	Coverage of All CPI Weights, (%)	Coverage of Goods CPI Weights, (%)
Canada	194,151	11	27	80
China	49,685	3	38	76
France	372,962	11	32	63
Germany	297,320	13	27	52
Japan	95,313	7	30	68
Spain	171,400	8	31	56
USA	777,554	17	21	62
All	1,958,385	70	29	65

- Sectors: Food & Beverages, Furnishings & Household, Health, Electronics, Other goods
- Not included: Alcohol & Tobacco, Apparel, Cars, Gasoline

Measuring shortages in retail (sector *j*, country *c*, date *t*)

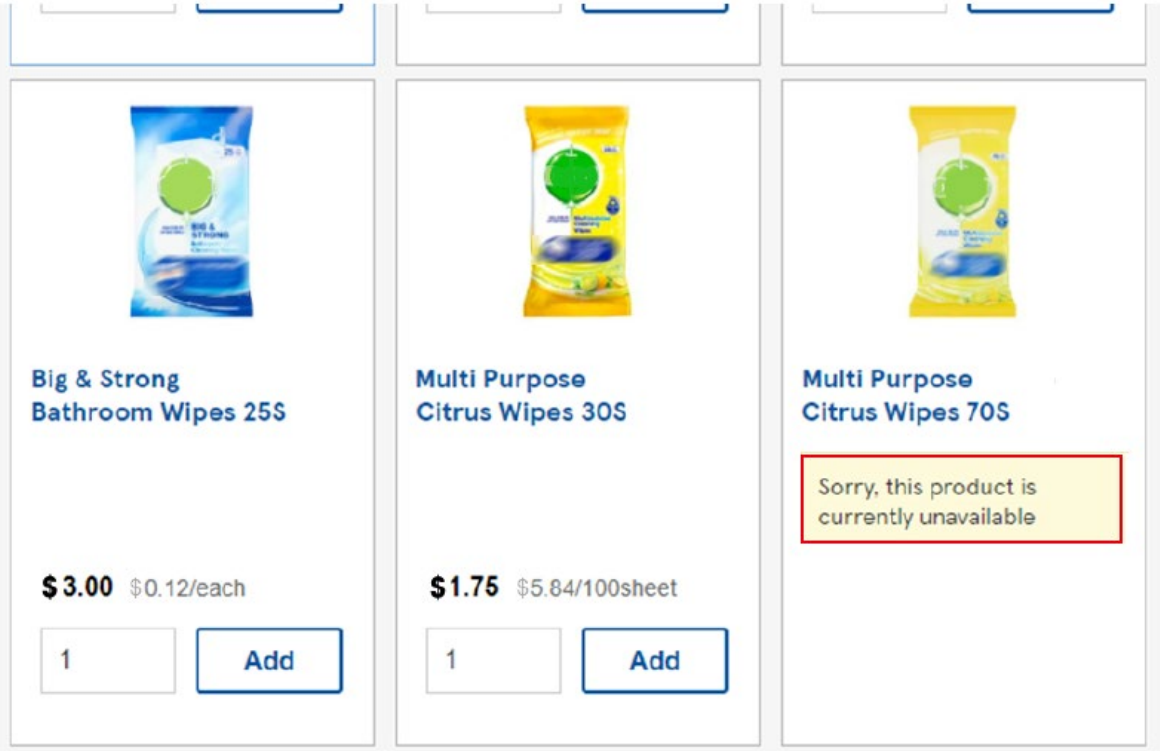


Figure 1: Identifying Stockouts on a Retailer's Website

- Temporary Stockouts $(TOOS_{jc,t}) = \frac{\#\ out\ of\ stock_{jc,t}}{\#\ total\ products_{jc,t}}$

Measuring shortages in retail (sector *j*, country *c*, date *t*)

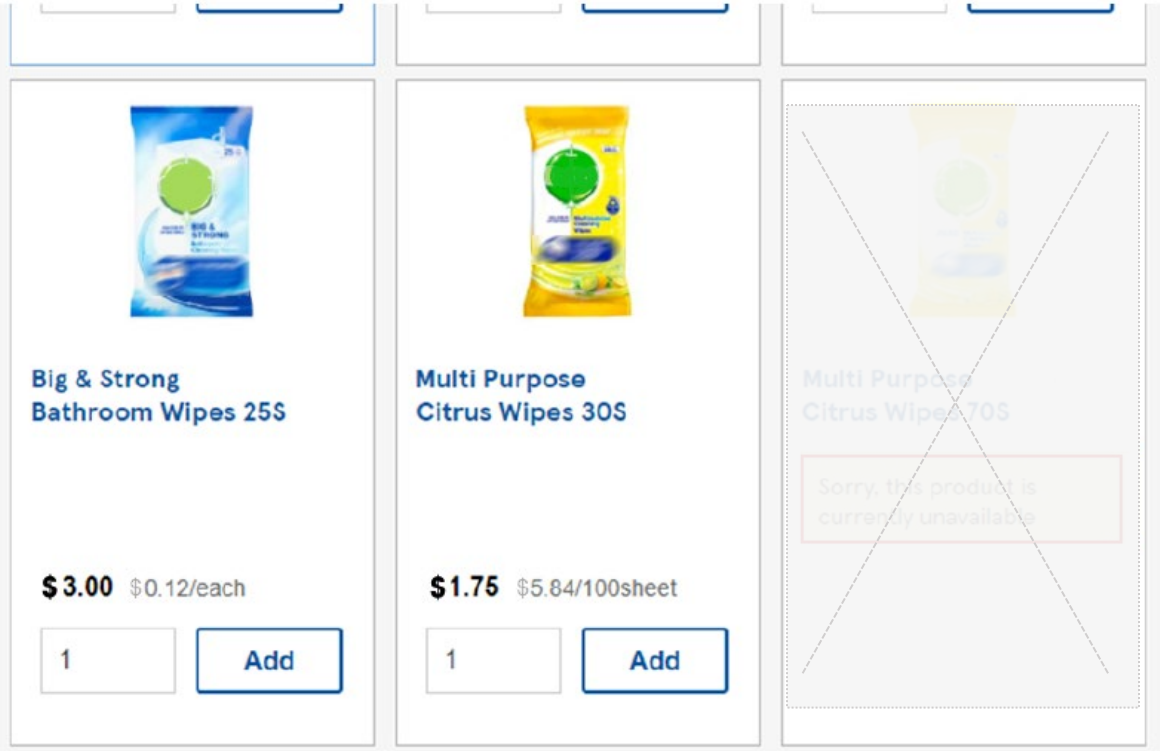
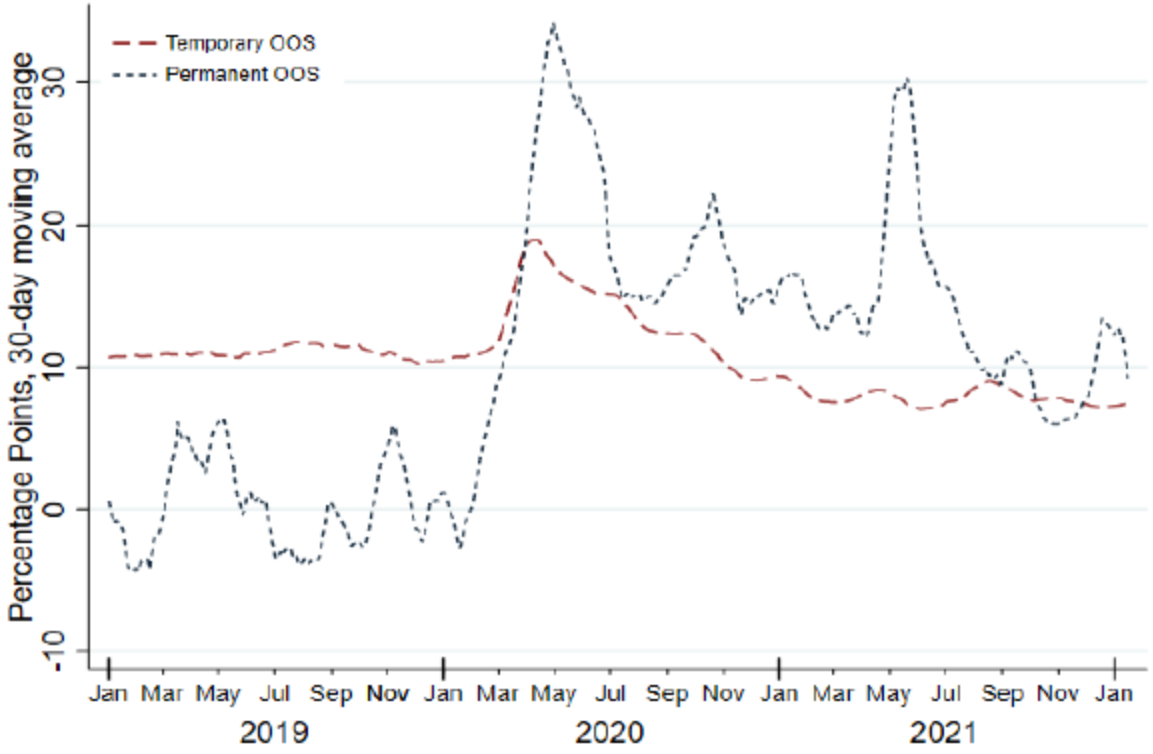


Figure 1: Identifying Stockouts on a Retailer's Website

- Temporary Stockouts $(TOOS_{jc,t}) = \frac{\#\ out\ of\ stock_{jc,t}}{\#\ total\ products_{jc,t}}$
- Permanent Stockouts $(POOS_{jc,t}) = 1 - \frac{\#\ total\ products_{jc,t}}{\#\ total\ products_{jc,Jan-2020}}$

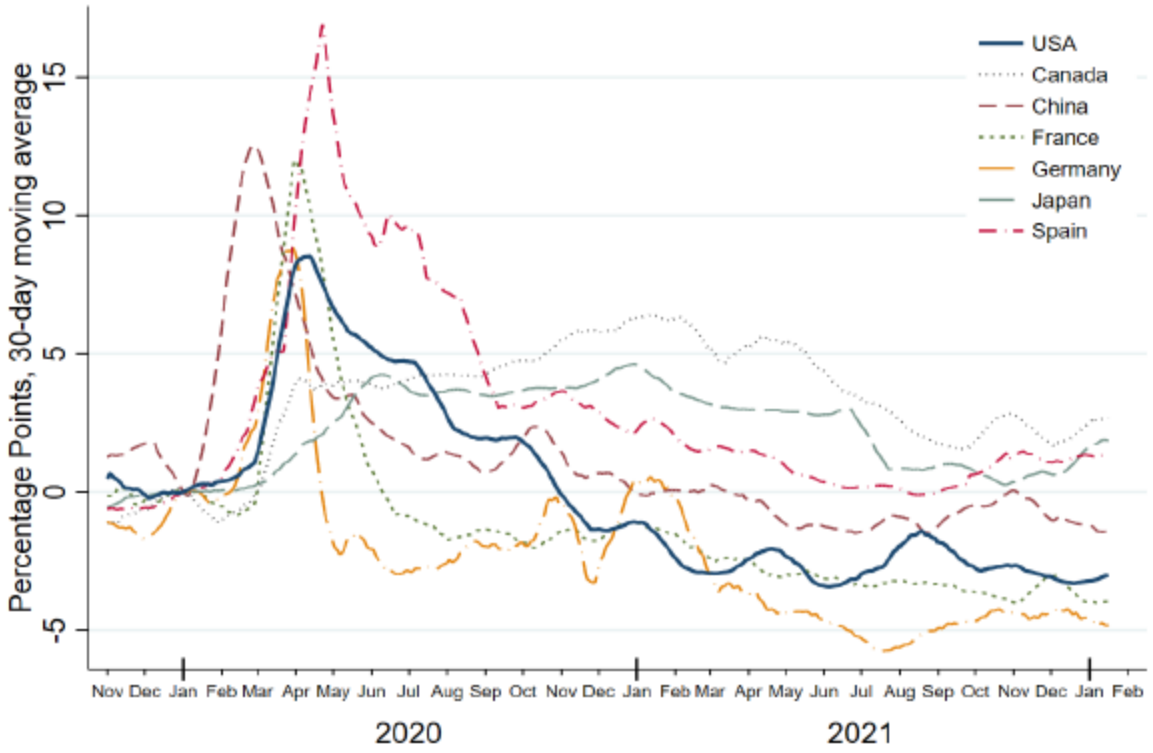
Stockout dynamics in the United States

(a) All Stockouts

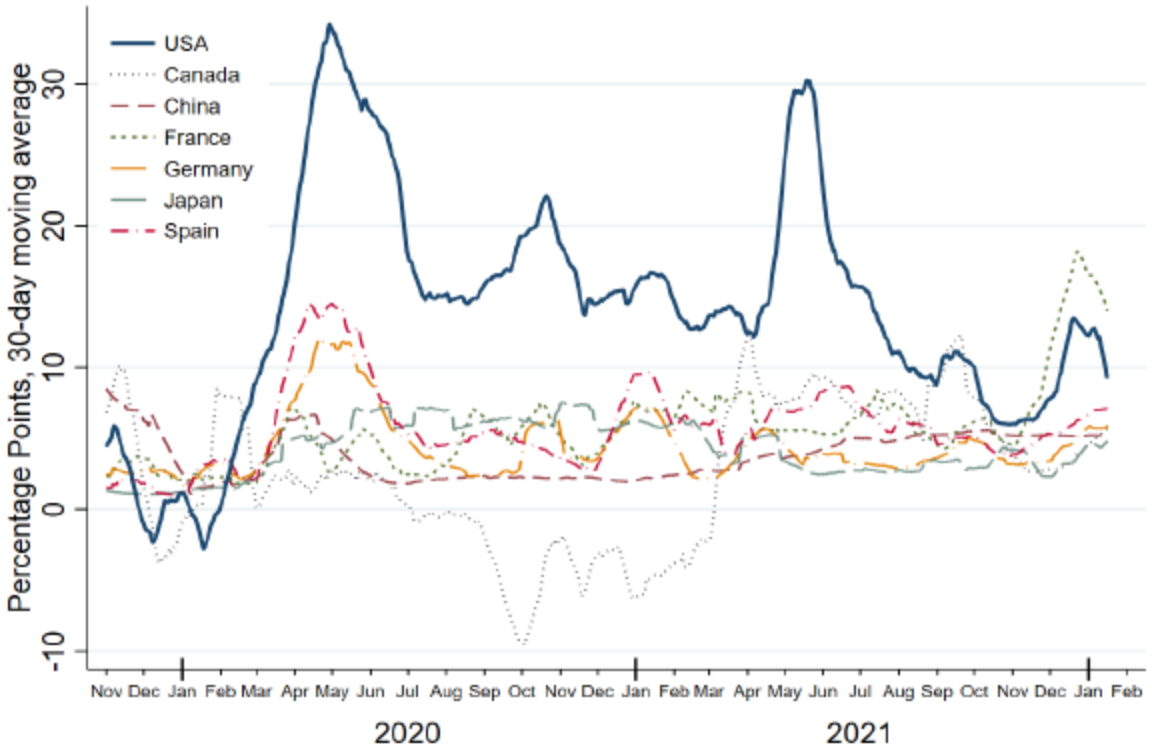


(b) Temporary and Permanent Stockouts

Stockout dynamics in 7 countries

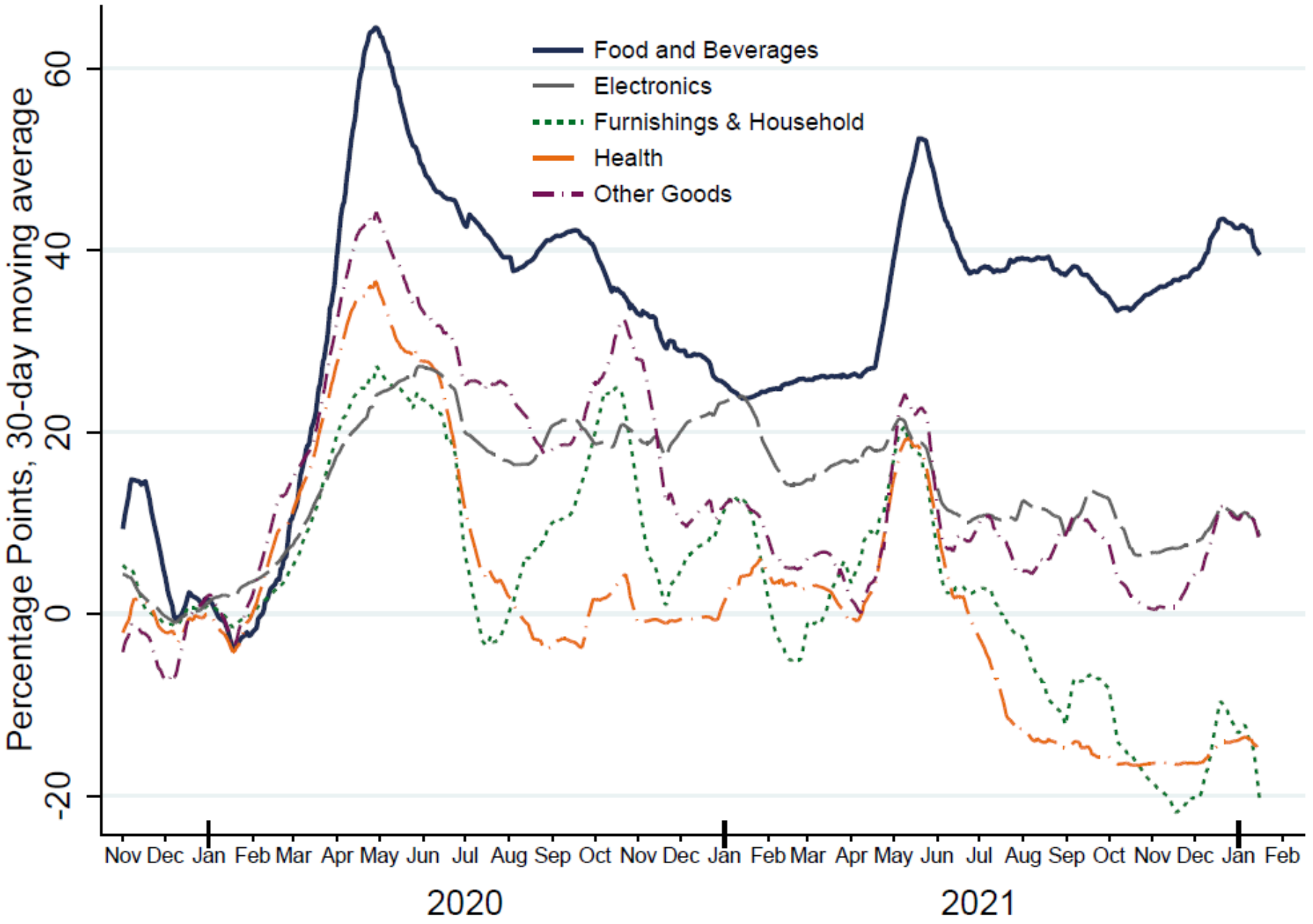


(a) Temporary Stockouts



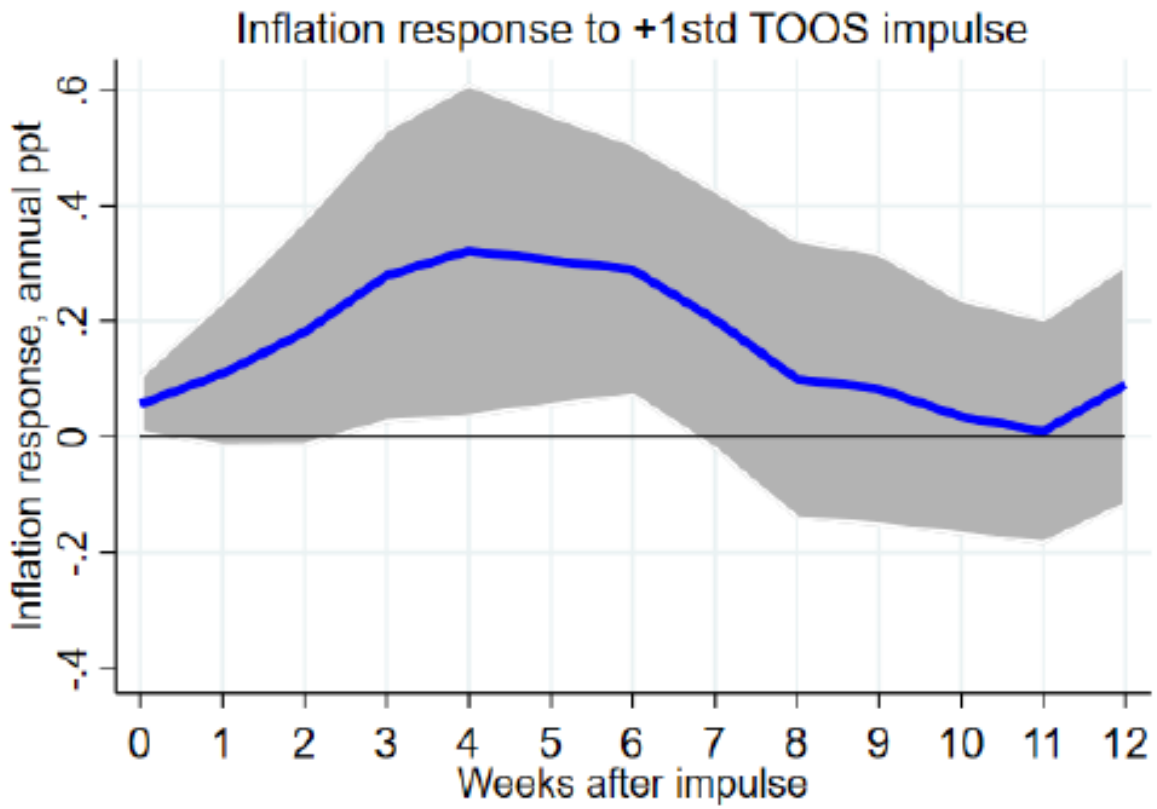
(b) Permanent Stockouts

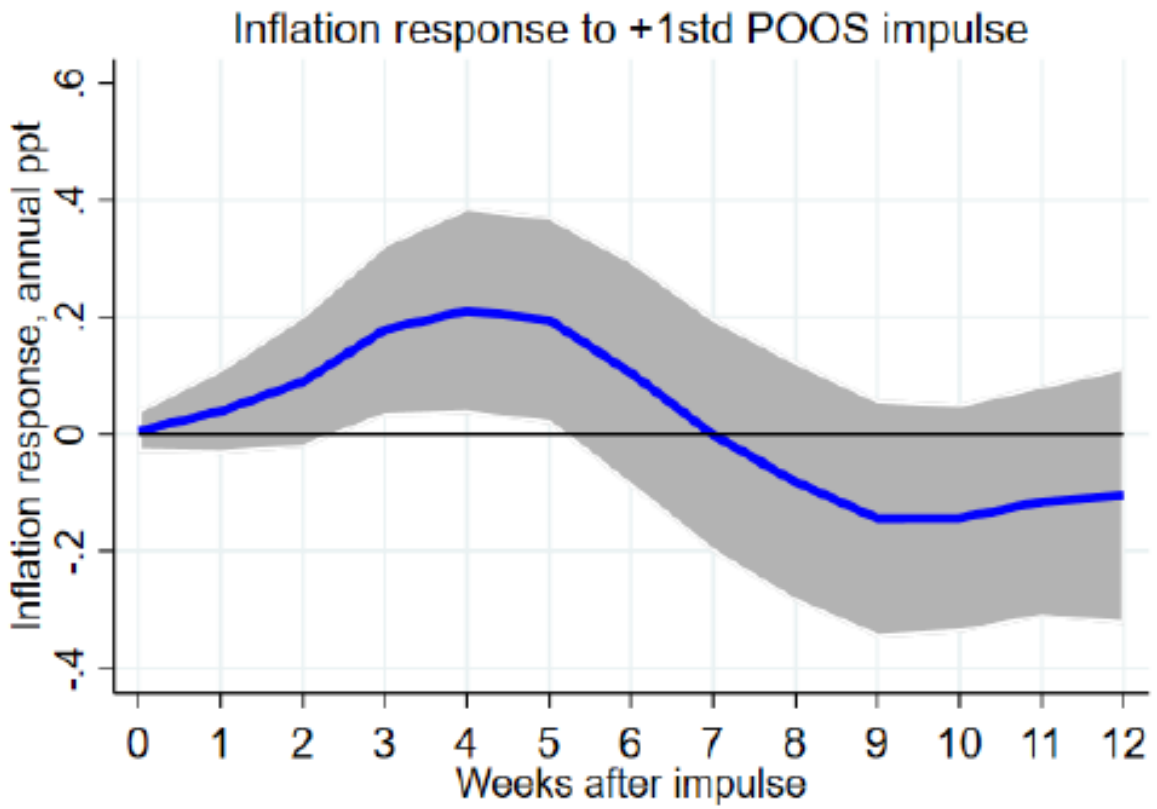
In the United States, stockouts are more persistent in Food & Beverages



Result 1: Shortages are associated with rising sector prices within 1-2 months

- Estimate the response of inflation to an exogenous stockout disturbance at the 3-digit level

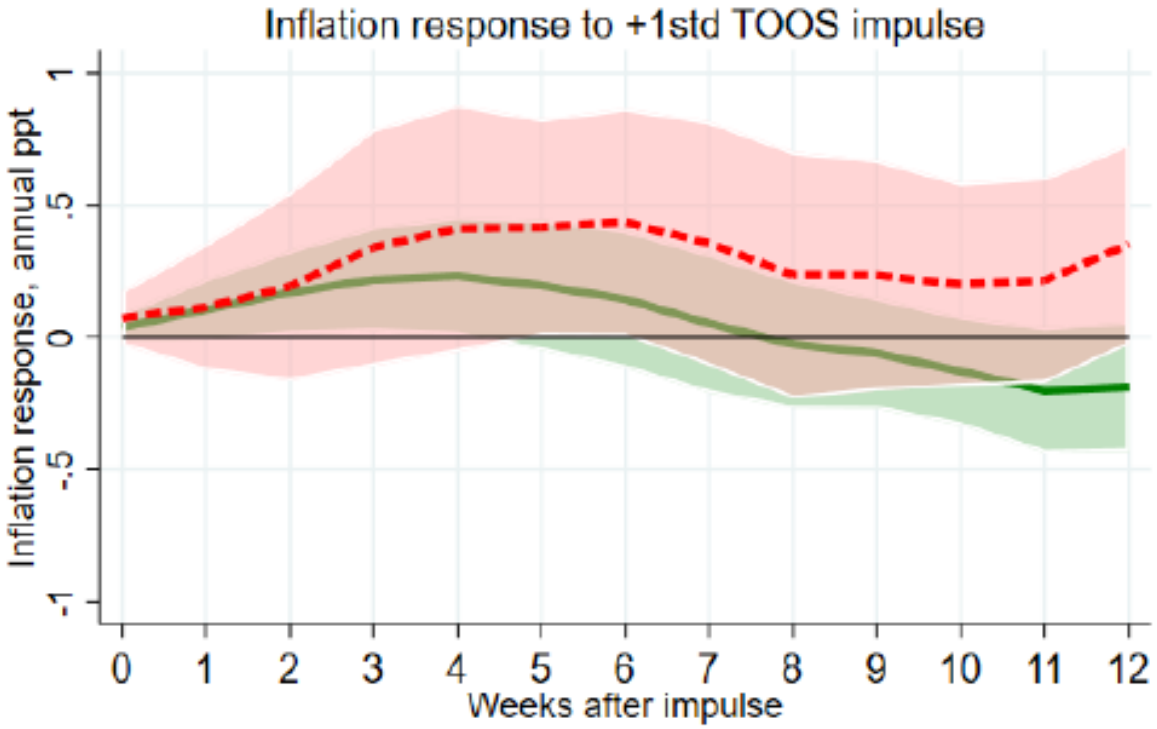


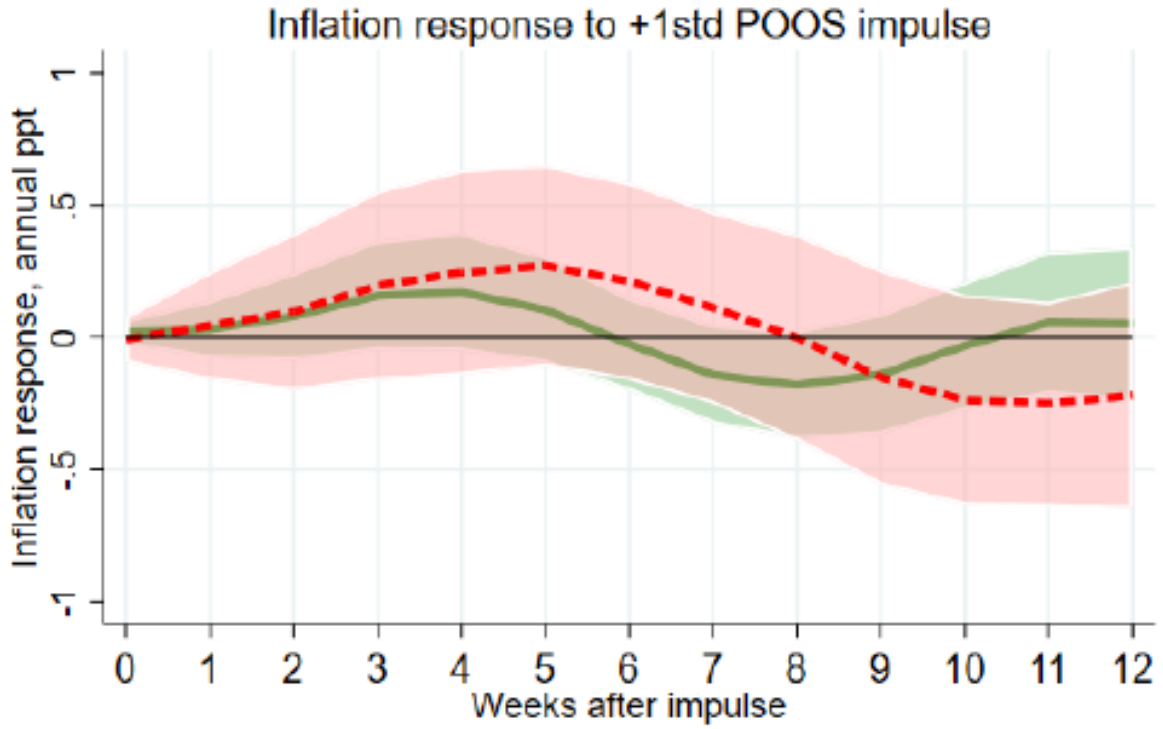


- Doubling stockouts from 10% to 20% increases sector inflation by 1.6 ppt (annualized rate)

Result 2a: Inflation response is larger & longer in import intensive sectors

- Split 235 sectors (7 countries) into groups below/above weighted median import share (0.24)
  - Low shares: China, Japan, USA; unprocessed food, plants, printed material
  - High shares: Canada, Germany; video/audio equipment, furniture, jewelry and watches

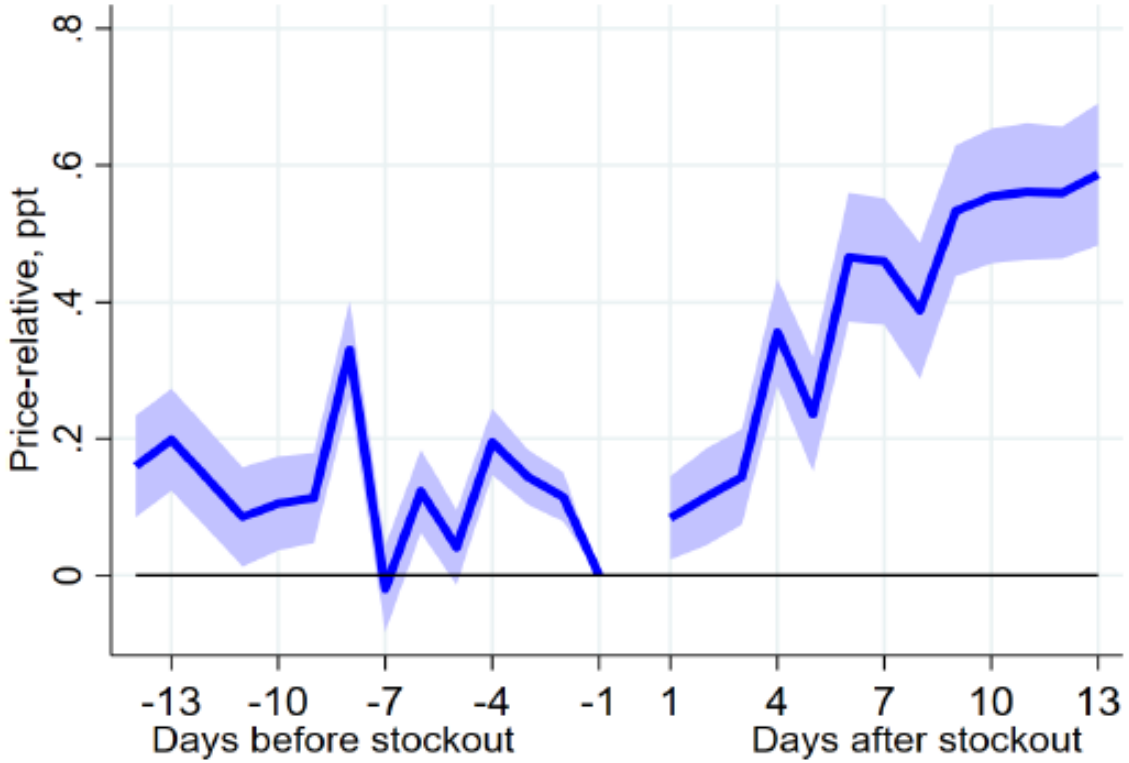




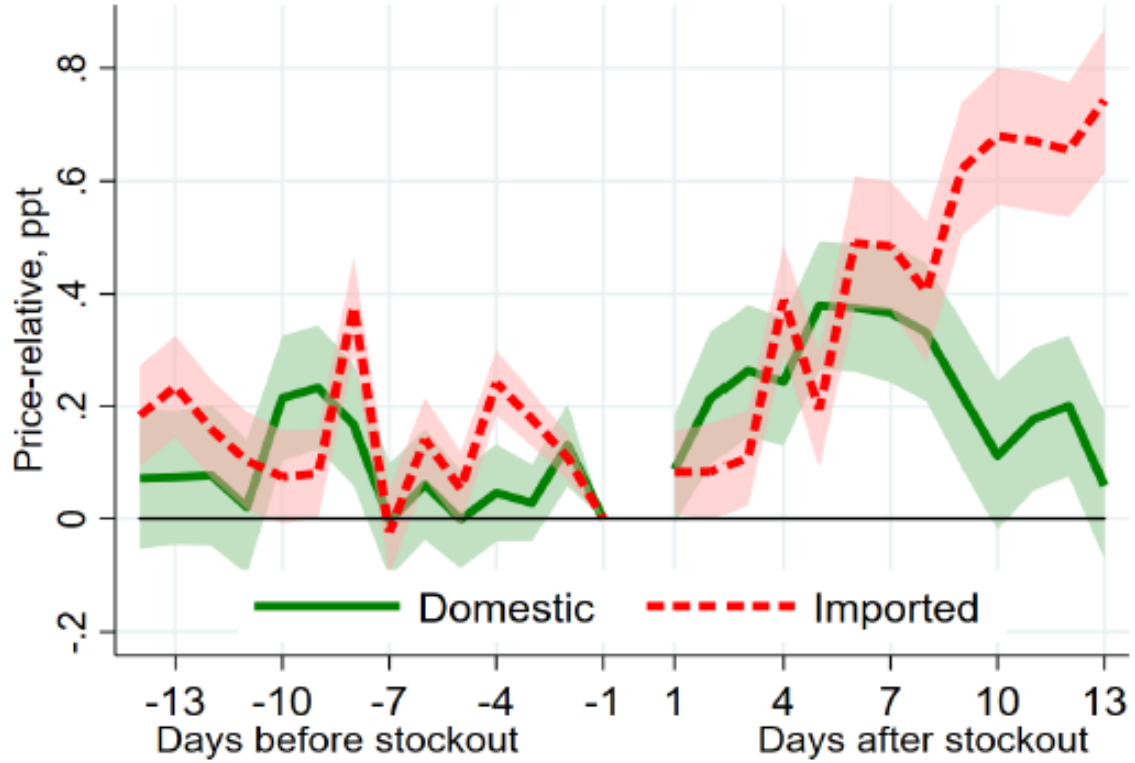
Low import share High import share

Result 2b: After stockouts prices tend to rise, especially for imported goods

- Micro evidence from a large U.S. retailer



(a) All price changes



(b) Domestic versus Imported Goods

Price-relative = cum log p-change *t* days before/after day -1 relative to cum log price change for all goods in sector

What can stockouts tell us about the cost of replenishing inventories?

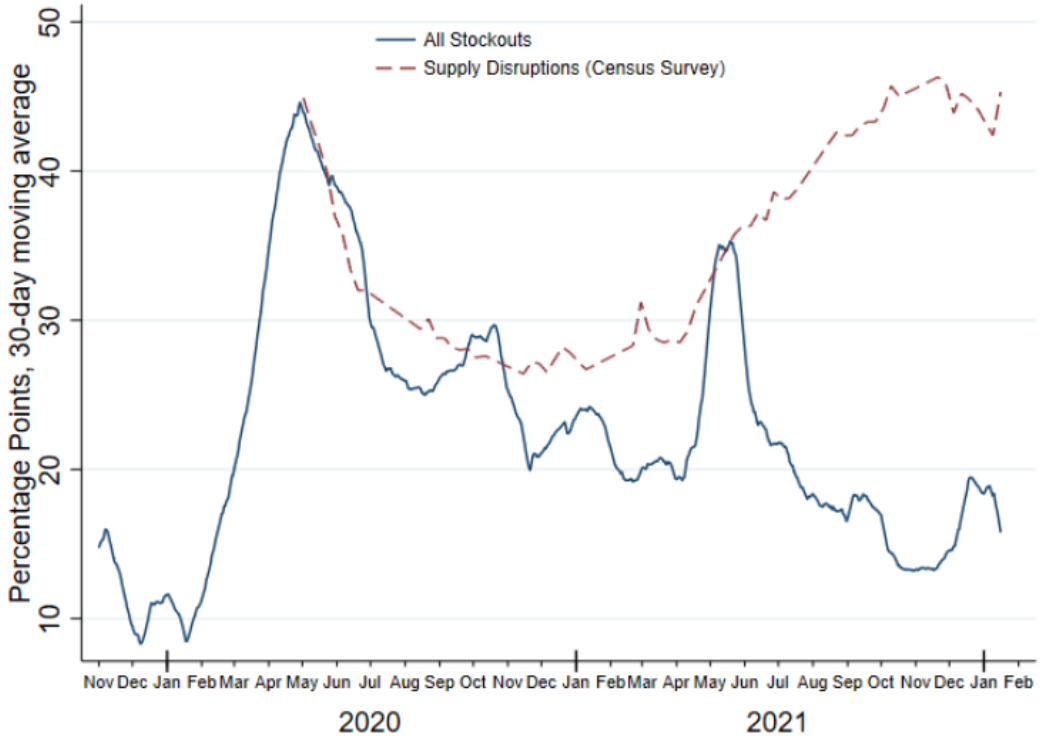
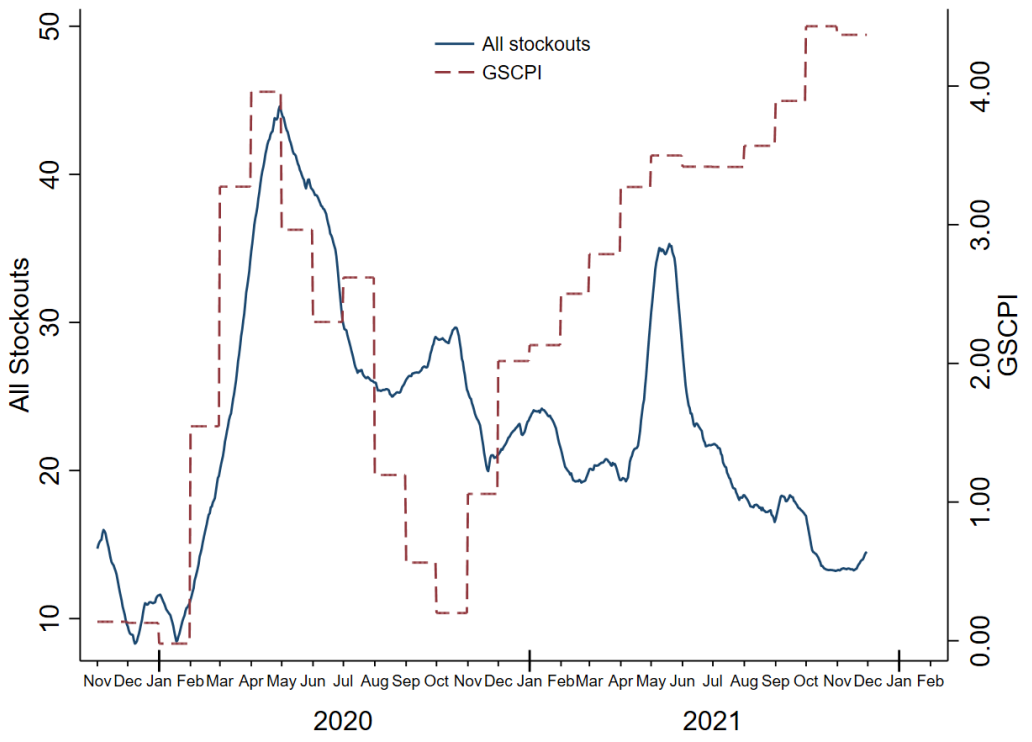


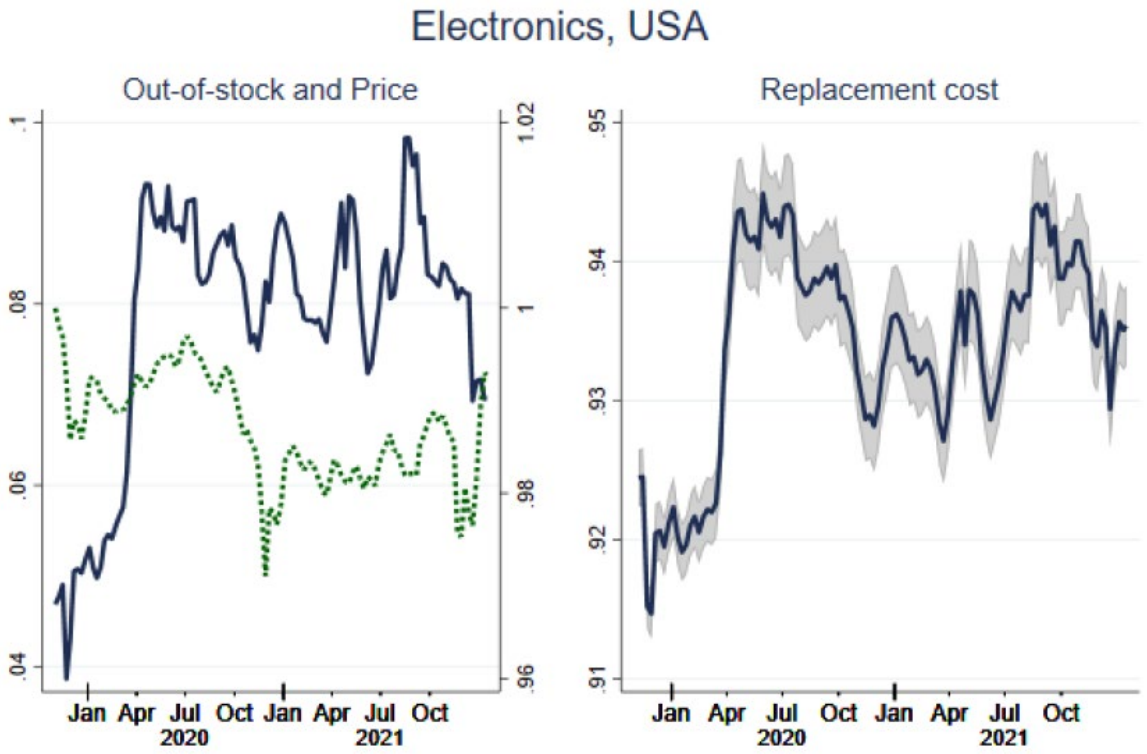
Figure A1: Stockouts (AOOS) vs. U.S. Census Survey of Small Business Disruptions

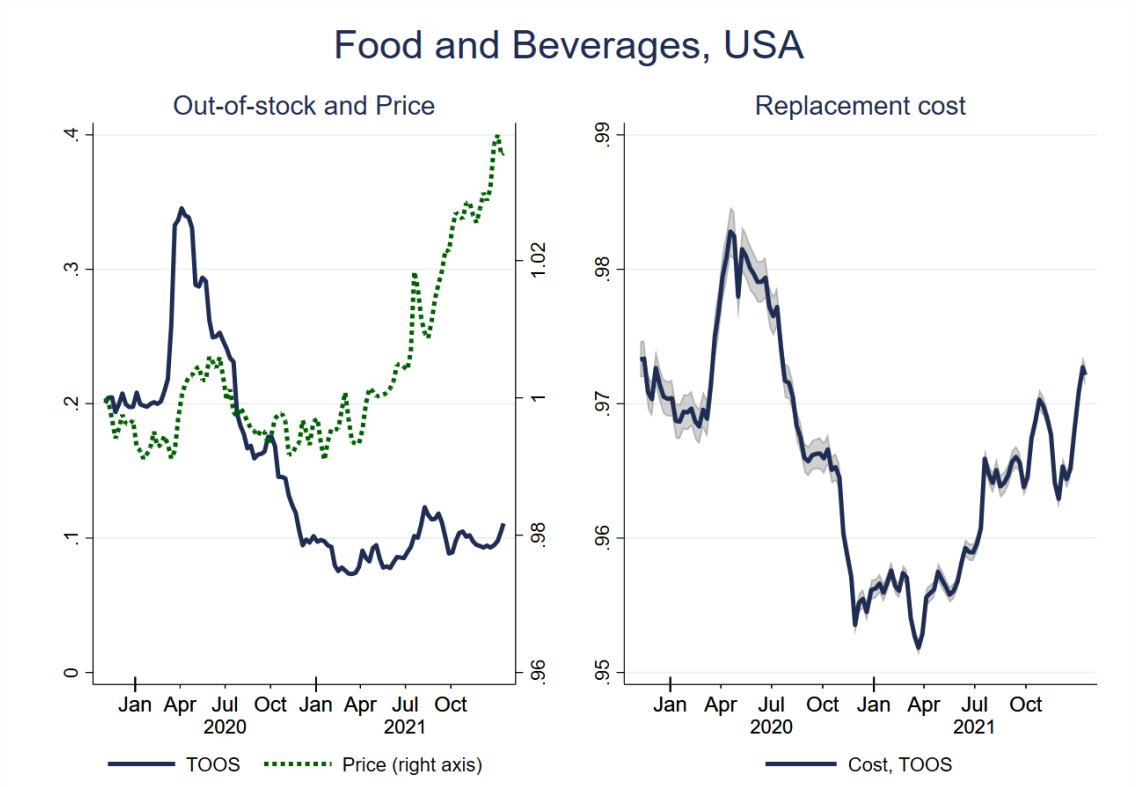


Source: Benigno et al. (2022) , index of global supply chain pressures

- Our stockouts matched surveys of "supply disruptions" closely until May 2021, but have diverged since
- Firms can adjust to changes in the replacement cost via stockouts and prices → we cannot infer the cost only from stockout dynamics
- We use a model to endogenize inventory decisions, and estimate cost based on observable OOS and prices

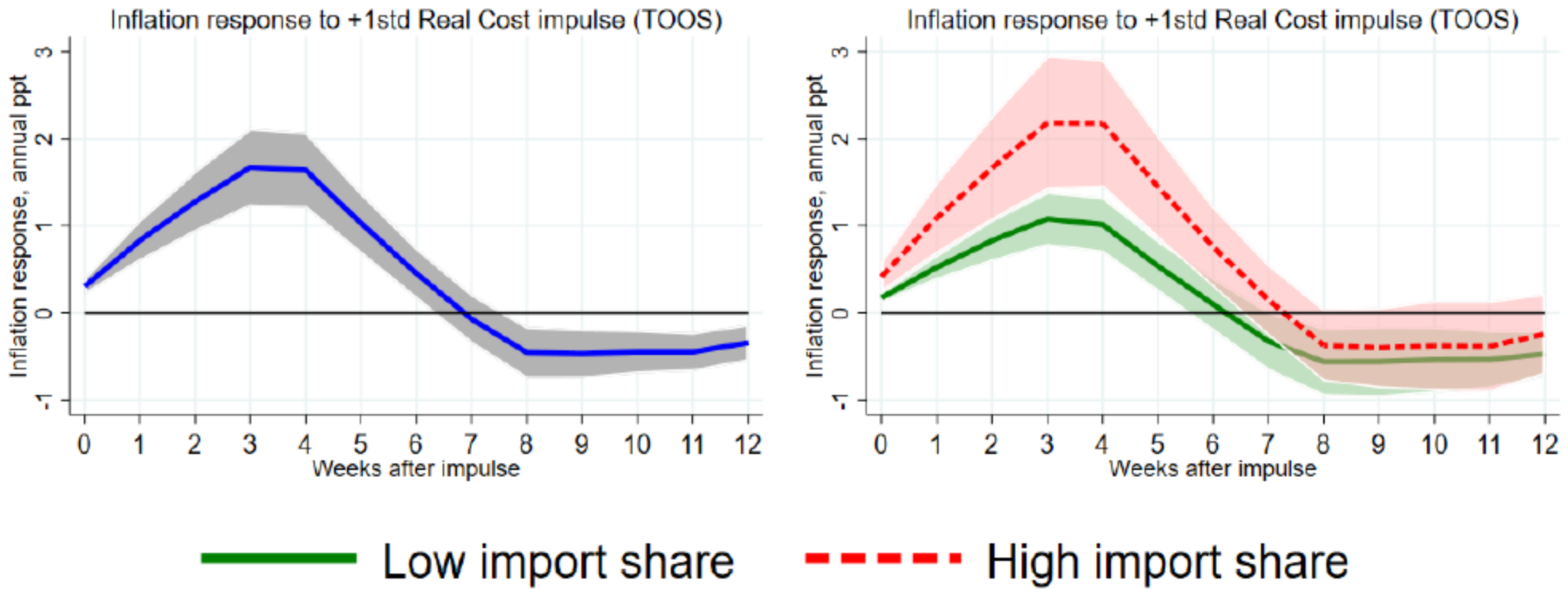
Use observed OOS and prices to estimate the cost of replenishing inventories





- Costs always higher for Electronics and now increasing for Food and Beverages

Result 3: Retailers pass through higher cost to both prices and shortages



- With endogenous stockouts

→ Inflation responses are stronger but less persistent

→ Inflation Inflationary impact twice as high for imported goods

Key results and takeaways

- Widespread increase in shortages during the pandemic
- The composition and visibility of shortages changes over time → from temporary stockouts affecting nearly all categories to permanently discontinued goods concentrated in fewer sectors
- Shortages have economically significant inflationary effects, within 1 to 3 months
- Effects are larger and more persistent for imported goods and import-intensive sectors
- Co-movement of stockouts and prices suggest higher cost of replenishing inventories was an important driver of inflation in this period

THANK

YOU