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

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Summarize

- Are supply disruptions inflationary?

- Evidence on comovement inflation and stockouts in online retailers
  - significant but gradual response of inflation to increase in stockouts

- Model of inventories and stockouts to help interpret evidence
Broader Comments

• Impressive and timely paper
  – careful work with micro data
  – combined with model to alleviate endogeneity concerns

• Inventories, costs and markups closely related in macro models
  – so using data on stockouts informative about drivers of inflation
Comments

- Inflation vs. relative price changes
- Model of inventory adjustment
- Questions and suggestions
Inflation vs. Relative Price Changes

- Paper convincingly documents link stockouts and relative price inflation

- But changes in relative prices per se not inflationary

- With asymmetries sectoral shocks act like cost-push shocks
  - Ball-Mankiw (1995), Guerrieri et al. (2021)

- Nevertheless, aggregate inflation dynamics determined by monetary policy
Model of Inventory Adjustment

- Study inventory choice of retailer. Order inventories to ensure
  
  \[ \text{Prob. stockout (inventories)} = fn (\text{markup, user cost}) \]

  - user cost: \( \Omega_t - \frac{1-\delta}{1+r_t} \Omega_{t+1} \)
  
  - tradeoff: inventory holding cost vs. unable to meet consumer demand

- Transitory increase in replacement cost increases user cost
  
  - so firm buys less inventories, more likely to stockout

- Increase in markups leads to more inventories, fewer stockouts

- So comovement prices, stockouts suggests increase in costs, not markups
Mechanism in Paper

- Paper describes following mechanism
  - ordering larger batch of inventories more costly on the margin
  - so firms that stockout have larger replacement cost, set higher prices
  - perhaps less relevant for smaller individual retailer

- Alternative: linear ordering cost and estimate persistence of costs?

- Model assumes firms know the distribution of $v$ and no delivery lags
  - unexpected increase in mean $v$ will lead to stockouts
  - more so if larger delivery lags
  - larger orders by all firms in the sector increase production costs

- Data on inventories and sales + full info estimation can tell these apart
Alternative Model

• Permanent stockouts suggest model of frequent product replacement
  – decide initial stock at beginning of product life-cycle
  – if demand low, reduce price since lower shadow valuation of goods
  – if demand high, raise price

• Based on dormant work with Golosov-Rodnyansky
  – inventories evolve according to
    \[ k_{t+1} = k_t - \min [v_t q(p_t), k_t] + x_t \]
  – fixed costs of changing prices \( p_t \) and ordering \( x_t \)
  – irreversibility \( x_t \geq 0 \)
  – good discontinued after \( T \) periods
Firm with Low Demand

price

inventory

orders

quantity
Firm with High Demand

- Price
- Inventory: beginning and ending
- Orders
- Quantity sold
- Demand

Week: 0 10 20 30
Price: 1
Inventory: 0 1 2 3 4
Orders: 0 1 2 3
Quantity sold: 0 1 2 3
Demand: 0 1 2 3
Questions and Suggestions

- Do inventory frictions change dynamics of inflation?
  - typically inflation depends on current and expected real marginal costs
  - how do inventories/stockouts change inflation response to sectoral shocks?
- Implication for COL measurement (love-for-variety effects)?
- Why are transitory shortages associated w/ permanent changes in prices?
Conclusions

• Very impressive paper!

• Future work: extend to multi-sector, international setting?
  – use likelihood methods to back out sectoral cost/demand shocks
  – bring in data on inventories, orders, sales
  – understand dynamics of sectoral inflation and implications for aggregate?