The Causal Effects of Global Supply Chain Disruptions on Macroeconomics Outcomes: Evidence and Theory
Bai, Fernandez-Villaverde, Li, and Zanetti

George Alessandria (Rochester)

IMF | November 2024

Summary

- Isolating aggregate effects of supply chain disruptions (SCD) big & un-resolved issue.
  - Berlin Blockade and Airlift
  - Suez closings in 56 & 67-75
  - 1973 Oil shock started with Oil Embargo
  - Port Strikes
  - COVID
  - Sanctions
- Challenge: SCD rarely alone/exogenous.
  - Easy to identify micro effects (Barrot and Sauvignan, 2016 Carvalho, et al., 2021)

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- Convincing. Need more work in this spirit!

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  - But, don't generally think they affect price level by themselves.
- More likely its related to time.
  - Can't get what you want today at any cost.
  - How long do firms have to wait for inputs? And why? Can they speed things up?
  - Shipping or production frictions? Does it matter for downstream firms?
  - Less explored in aggregate

    But time is a common consideration for firms in trade.

International Trade Takes More Time

- Moving goods around the world takes longer than inside of a country (nature of frictions, transportation, policy) and increases delivery uncertainty.
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  - Premium can be quite large 2x as domestic only transactions.

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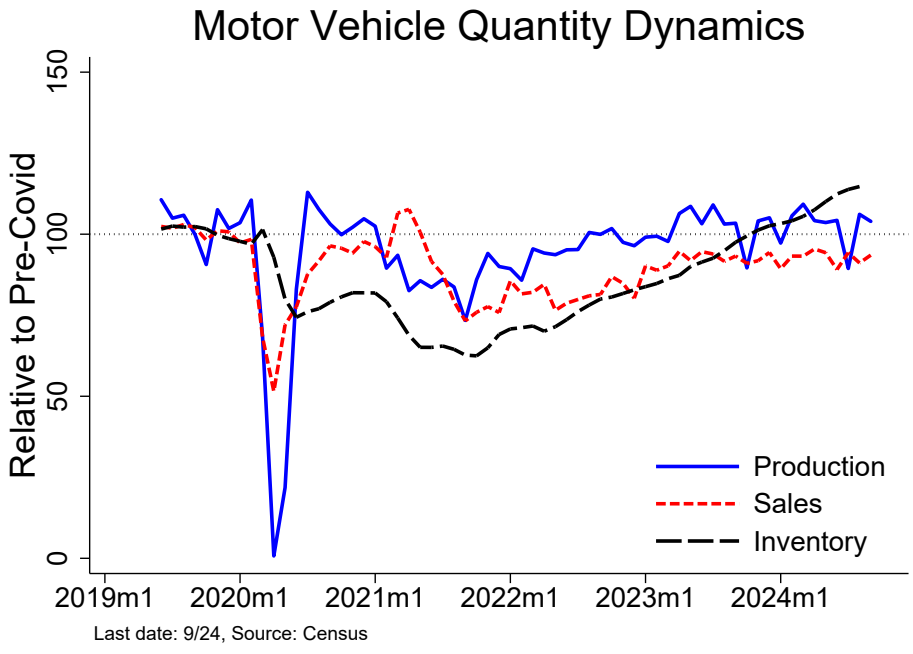
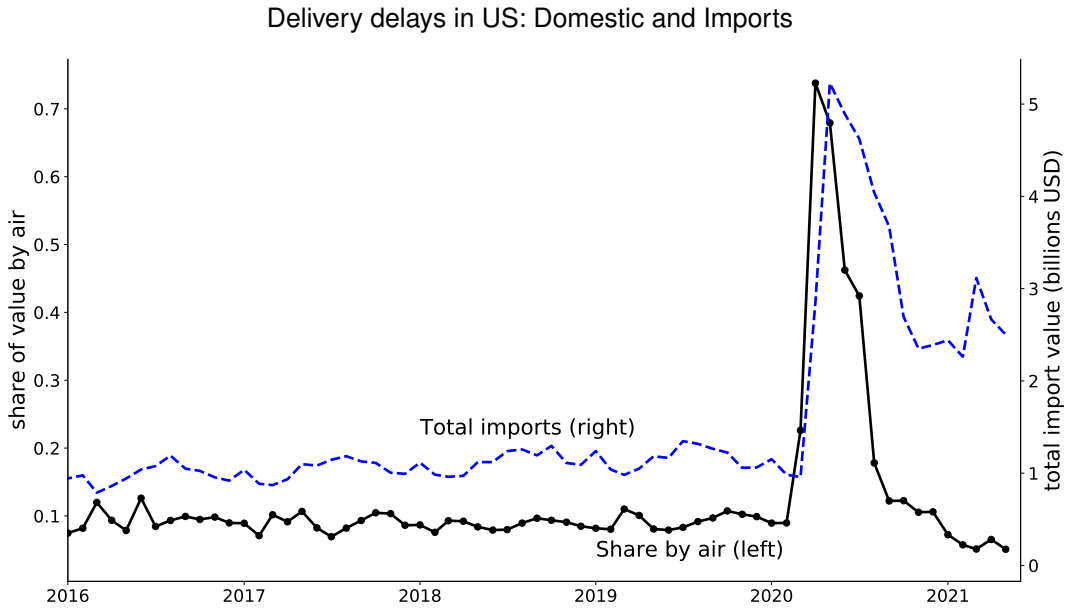
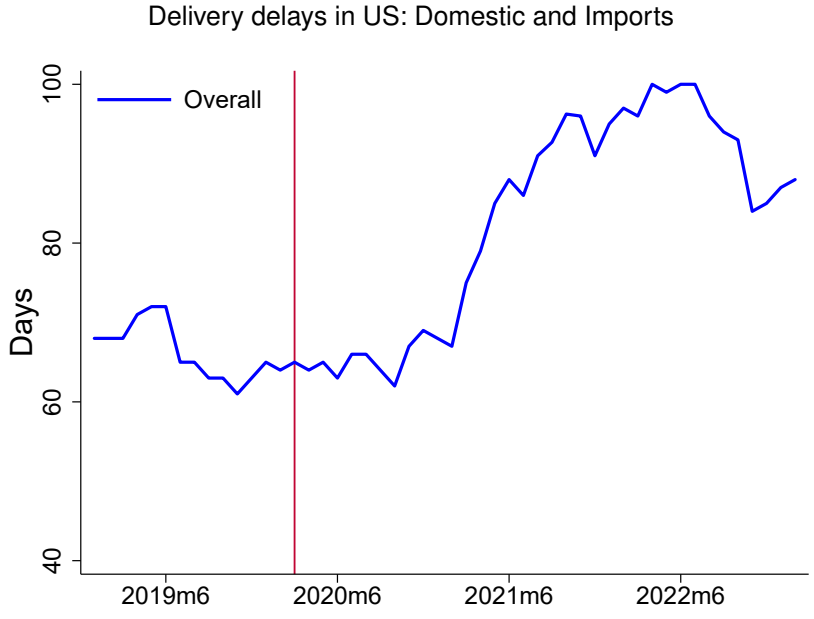
- The time has fallen with new technologies (containerization, air freight).
- There are more transport opportunities internationally - inventories depends on the ability to access fast but expensive modes of transport in response to supply and demand shocks.
- Inventories were key to allowing for shutdowns in COVID
  - Production fell to zero, consumption held up, absorbed by inventory
- Fast transport allowed us to restart the economy by moving the most valuable goods.
  - Example: 5/20-12/20: Almost all Personal Protective Equipment (PPE) shipped by Air.


Motor Vehicle Quantity Dynamics
Relative to Pre-Covid
150
100
50
0
2019m1
2020m1
2021m1
2022m1
2023m1
2024m1
Production
Sales
Inventory
Last date: 9/24, Source: Census

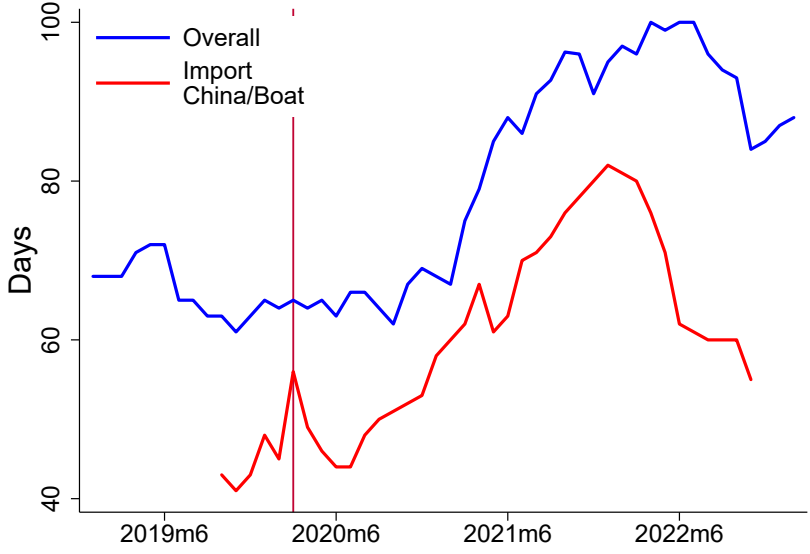

Delivery delays in US: Domestic and Imports
share of value by air
total import value (billions USD)
Total imports (right)
Share by air (left)
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0
1
2
3
4
5
2016
2017
2018
2019
2020
2021

Measuring Delays

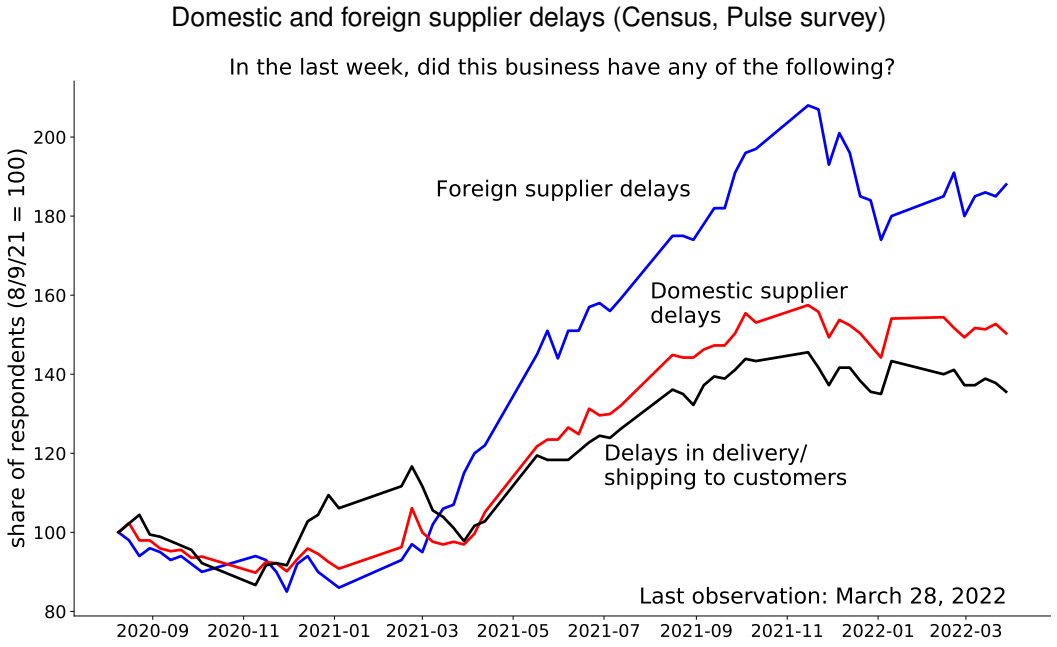
- Lots of measures of delays.
- Most PMI's diffusion index (only direction)
- ISM has a long measure of delays
- Alternatively can use unfilled orders series.
- Logistic industry has measures
- COVID experience.


Delivery delays in US: Domestic and Imports
Overall
Days
100
80
60
40
2019m6
2020m6
2021m6
2022m6
Source: Days (ISM), Shipping from China (Freightos) Last: September 2022.

Delivery delays in US: Domestic and Imports



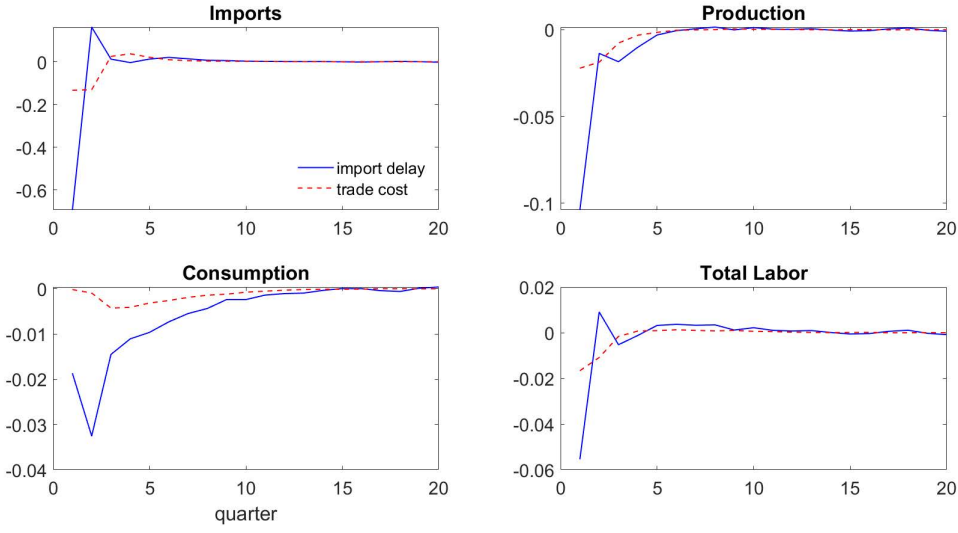
Source: Days (ISM), Shipping from China (Freightos) Last: 12/22.


Domestic and foreign supplier delays (Census, Pulse survey)
In the last week, did this business have any of the following?
share of respondents (8/9/21 = 100)
200
180
160
140
120
100
80
Foreign supplier delays
Domestic supplier delays
Delays in delivery/ shipping to customers
Last observation: March 28, 2022
2020-09
2020-11
2021-01
2021-03
2021-05
2021-07
2021-09
2021-11
2022-01
2022-03

Changes in Time: Delays, Stockouts, and Production

- On impact, delays lead to stockouts.
- Stockouts affect the products with highest demand and lowest inventories (misallocation).
- With roundabout production, these stockouts are a constraint on production.
- Could increase production as firms will order sooner.
- In Alessandria et al., 2023; Alessandria et al., 2022 we explore the effect of delays in a model with logistic frictions (fixed costs, shipping times, and risk) that differ for local and global supply chains.
- Below we compare a shock that delays the arrival of inputs by 30 days with a shock that equal the extra holding costs

Trade Costs vs International delivery delays: Model



Changes in Time: Delays, Stockouts, and Prices

- With delays, sales are constrained by inventory.
- If firms raise prices then prices are allocative.
- But most firms don't raise prices. There is rationing and stockouts
- Statistical agencies don't adjust for this (missing products get the inflation level of continuing products).
- These stockouts preced the recent increase in inflation (Cavallo and Kryvstvov, 2023)
- Is the issue that fiscal/monetary authorities were responding to wrong prices?

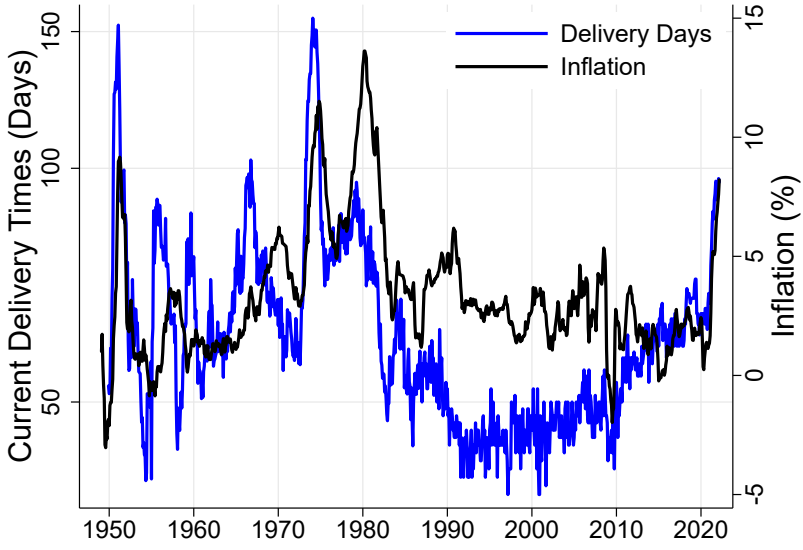
Leading to More Stockouts

Stockouts Lead Price Changes

Conclusions

- Important research agenda studying supply disruptions on global economy
- Need to measure these disruptions and understand how firms prepare/adjust to them.
  - Need a model with time/delays and inventories.
- Disruptions can be surprises or anticipated.
  - Future tariffs or planned shutdowns (holidays).

Delays and Inflation Highly Correlated

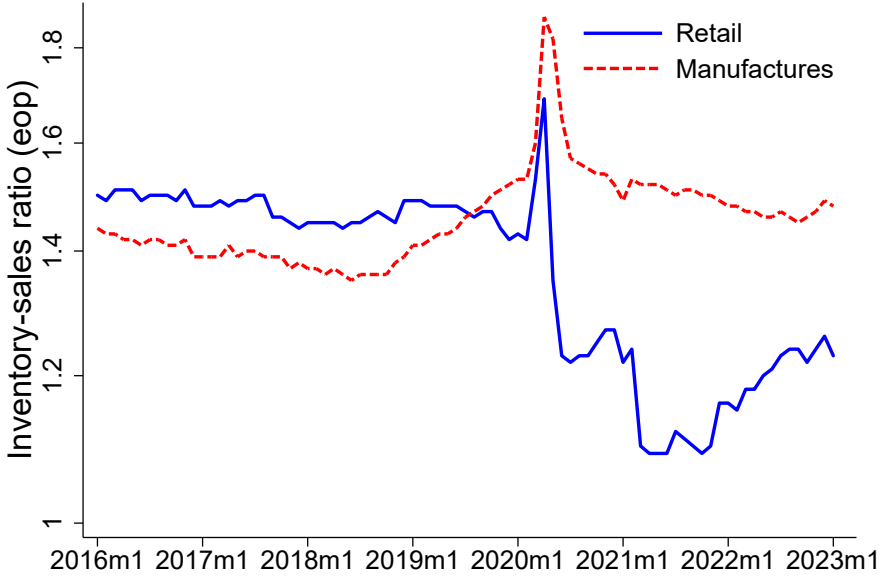


Source: Days (ISM), Inflation (BLS)

Inventories and Pricing I

- Firms hold inventories:
  - To economize on fixed order costs (f) & holding costs (r+δ)
  - As a buffer owing to delivery lags & demand or supply uncertainty
- Inventory levels vary by product & supplier, range between 1 - 6 months supply.
- Inventories held throughout supply chain (manufacturers, wholesalers, retailers)
- Total inventories large: about 1/3 of a years goods production in the US, more in ROW.
  - Crucial to deal with March/April 20 shutdowns

Delays happening when inventory levels are low



Last date: 8/22, Source: Census

bibliography

- Alessandria, George et al. (2022). “Supply chain recessions.” Unpublished manuscript.
- Alessandria, George et al. (2023). “The aggregate effects of global and local supply chain disruptions: 2020–2022.” *Journal of International Economics* 146. NBER International Seminar on Macroeconomics 2022, p. 103788.