The Effects of Supply Chain Disruptions: Trade, Output, and Prices

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Based on a research on international supply chains with
Armen Khederlarian, Shafaat Khan, Carter Mix, and Kim Ruhl

Outline

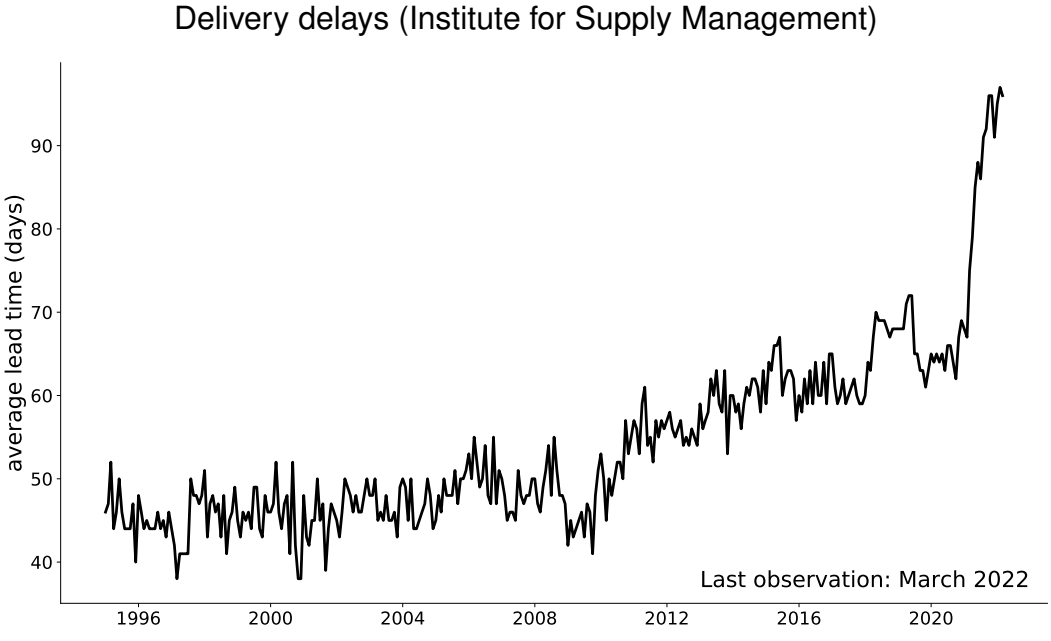
- State of the Economy
- Effects of Supply Disruptions
  - Firms
  - Aggregate
- International Trade
- Going forward

State of the Economy

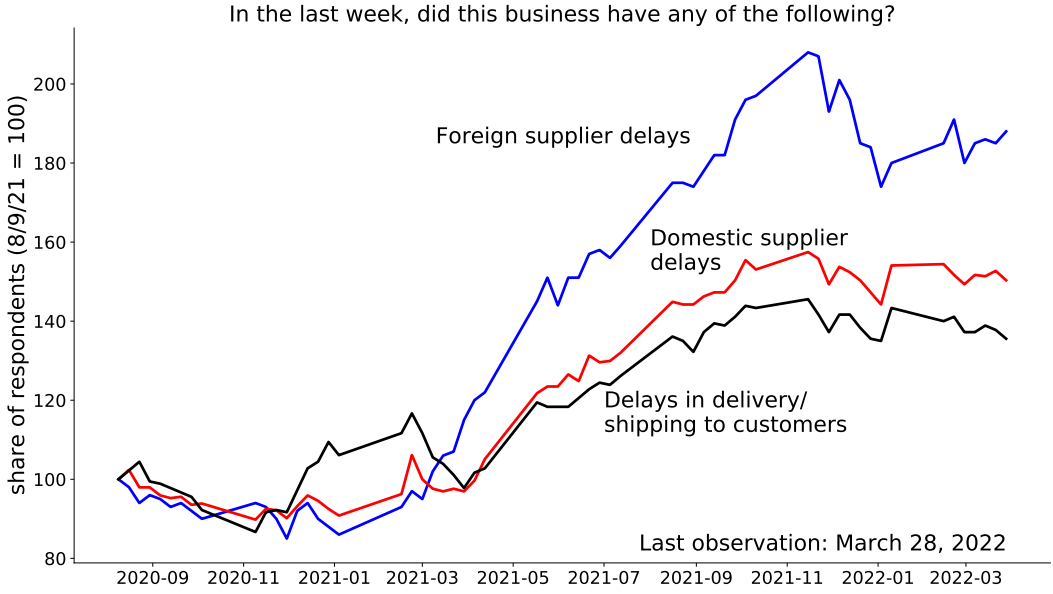
- Challenges in getting inputs or consumption goods
- Substantial inflation: March 8.5% (highest in 40 years!)
- Booming, but slowing consumer expenditures on goods
- Global in nature
- Somewhat unusual, but not entirely new, common pre-1980
- Unlikely to resolve soon (built in inertia, & transitory nature)

Restocking and Supply chain disruptions: Timeliness

- Restocking has become incredibly hard
- Confluence of factors
  - Production disruptions
  - Reduce freight capacity (Air, transportation, border closures)
  - Unexpected pace of recovery
  - Disease outbreaks at ports, production hubs
  - Congestion effects
  - Inherent transitory, unique nature of shock
- Disruptions happening both internationally and domestically
- Lead time on inputs: 60 days $\rightarrow$ 100 days
- Disruption “shock” $\neq$ COVID “shock” (although, they interact)


Delivery delays (Institute for Supply Management)
average lead time (days)
90
80
70
60
50
40
1996
2000
2004
2008
2012
2016
2020
Last observation: March 2022

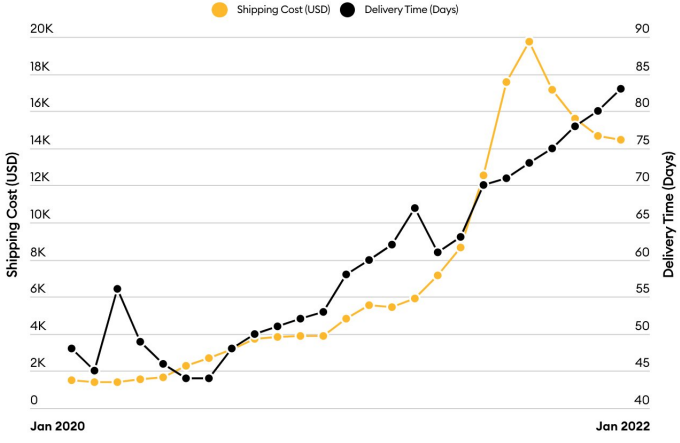
Domestic and foreign supplier delays (Census, Pulse survey)



Shipping Time and Cost (Freightos)

SEA SLUGS

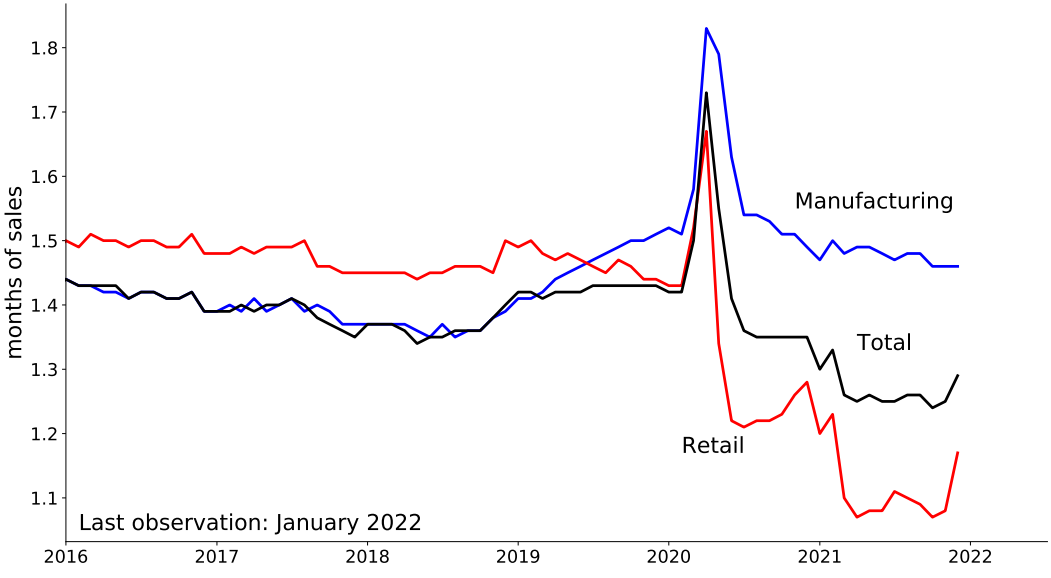
Trans-pacific shipping costs, which reached an eye-popping $20,500 for a 40-foot container in September, are finally in decline. Wait times, however, continue to grow.



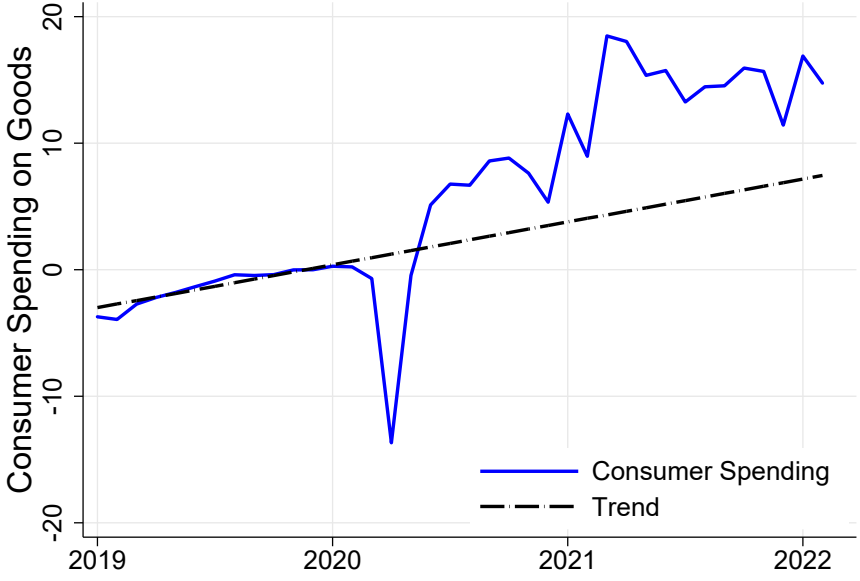
Source: Freightos

Forbes

Delays happening when inventory levels are low



And U.S. Consumer Spending on Goods Booming



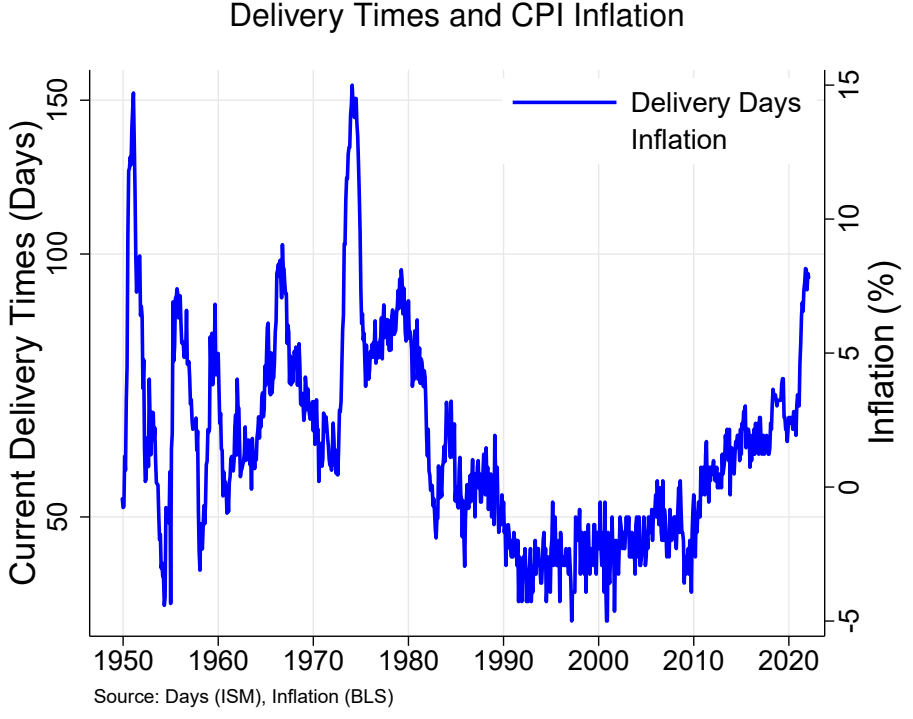
Source: BEA, Last date: February 2022

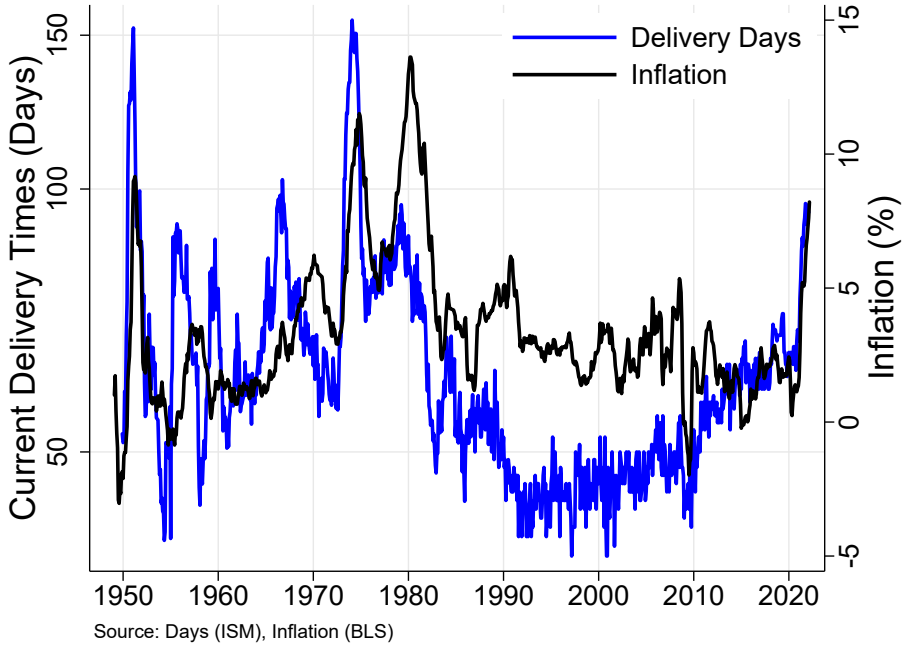
Effects of Supply Disruptions: Firm-level

- A growing literature identifies how firm-level supply disruptions propagate through production networks
  - From suppliers to: customers; to customers-customers; or customers'-suppliers.
- Identification from exogenous shocks: Natural disasters, supplier failures.
- Generally find firms have trouble adjusting to these disruptions in the short-run (1-2 years), more so if the inputs are pretty specific or essential.
  - Eg. Specialized chip for autos
- Disruptions can be partly mitigated in very short-run (6 months) with:
  - Inventories,
  - Diversified supplier bases,
  - Faster transport

Effects of Supply Disruptions: Aggregate (Data)

- Isolating aggregate effects is harder
  - Firm-level shocks lead to substitution across firms (Tokhu Earthquake)
- Requires
  - Unique shocks (Suez Canal disruption in 1967)
  - Strong identification assumptions of relations between aggregate data


Delivery Times and CPI Inflation
Delivery Days
Inflation
Current Delivery Times (Days)
Inflation (%)
150
100
50
15
10
5
0
-5
1950
1960
1970
1980
1990
2000
2010
2020
Source: Days (ISM), Inflation (BLS)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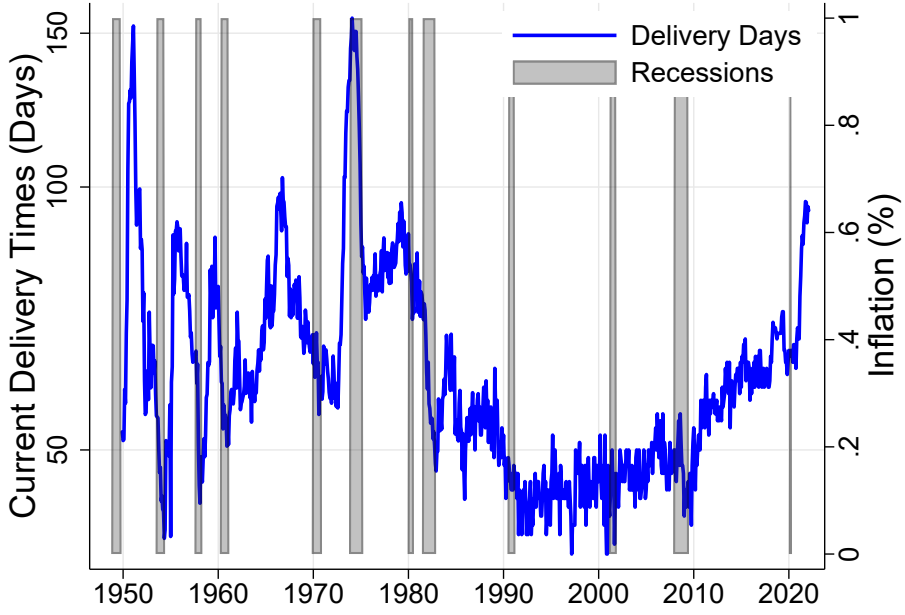
Delays tend to Precede Recessions



Source: Days (ISM), Inflation (BLS)

Effects of Supply Disruptions: Aggregate (Data)

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  - Firm-level shocks lead to substitution across firms (Tokhu Earthquake)
- Requires
  - Unique shocks (Suez Canal disruption in 1967)
  - Strong identification assumptions of relations between aggregate data
- Find that increasing delivery times by 5 days will lead to:
  - Further delays that dissipate in about 1.5 years.
  - Lower industrial production by 1-2 percent gradually.
  - Raise prices of goods, particularly exports & imports by 1-2 percent.
  - Current ”shock” is 5x bigger and there have been additional shocks so if history is a guide, this will be on going for another year.

Effects of Supply Disruptions: Aggregate (Models)

- Early in the model-building as most academic or policy research abstracts from key frictions (delays, inventory management, trade, & risk).
- Focus on key differences between domestic and global supply chains in terms of inventory management (size, frequency of shipments) & mode substitution (air/boat).
- Models allow us to examine policies as well as changing fundamentals
  - Trade policy, infrastructure,
  - Risk/shocks: foreign/domestic, firm-level or aggregate
- Find ”delay shocks” twice as contractionary & inflationary in the SR than in our empirical findings.
  - Worse with lean inventories or tight shipping capacity.
  - Transitory, LR effects depend on Monetary & Fiscal Policy.

Trade: Concerns

- Global supply chains and lack of shipping capacity are key issues.
- Push for re-shoring (bringing production closer to the US).
- Calls for greater infrastructure investment.
- Change in transportation regulations (Jones Act).
- Anti-trust concerns with shipping companies (record profits).

Trade: Efficiency and Stabilization

- Push back against Global supply chains probably misguided.
- Large efficiency gains to producing in most efficient locations.
  - Firms internalize the risks of disruptions.
- Stabilization benefits.
  - Diversification benefits - use trade balance to maintain consumption in face of adverse domestic shocks Link
  - Faster transport modes in crises ”boosts” short-run production
  - Higher inventories in Global supply chains creates an aggregate buffer.
- Tradeoff benefits against costs in extreme events.
- Key challenge: likelihood of future extreme events/policy disruptions.

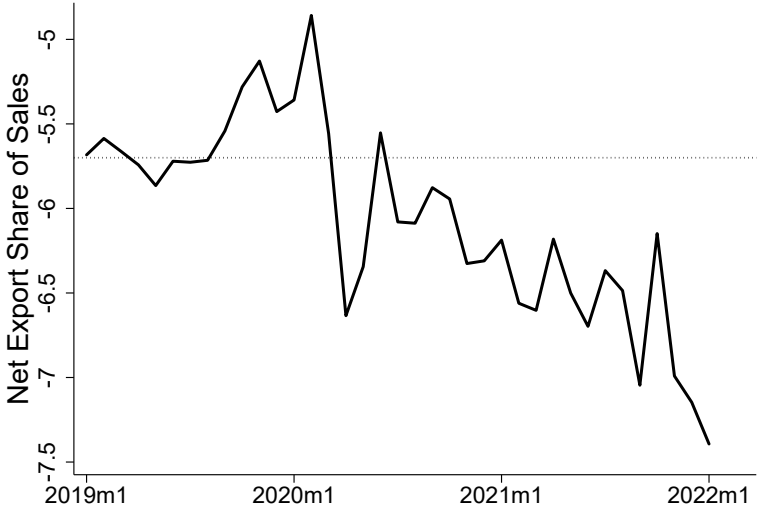
Going Forward

- When will it end? How will it end?
- Rising prices will lead to delays in spending.
- Further re-opening should
  - Shift spending to services and away from goods.
  - Lifting travel restrictions will increase Air-capacity (albeit less to China)
  - Restocking cycle will conclude.
- Suspect the transitory forces should start to dissipate, but it will take time
  - Risk of further shocks.
- Key concern is for policy not to over-react to this shock.

Resources

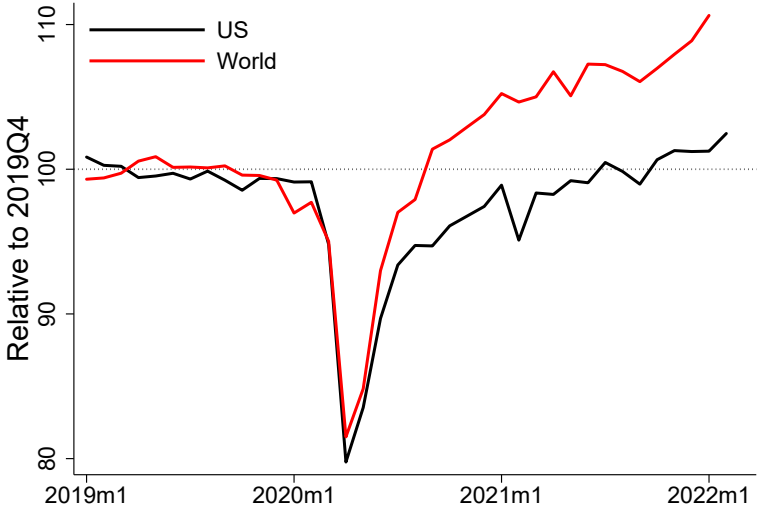
- Non-technical research papers
- Virtual International Trade & Macro Seminar
- Research by Rochester Economics Faculty and Students

US Net Exports, More Borrowing From Rest of the World



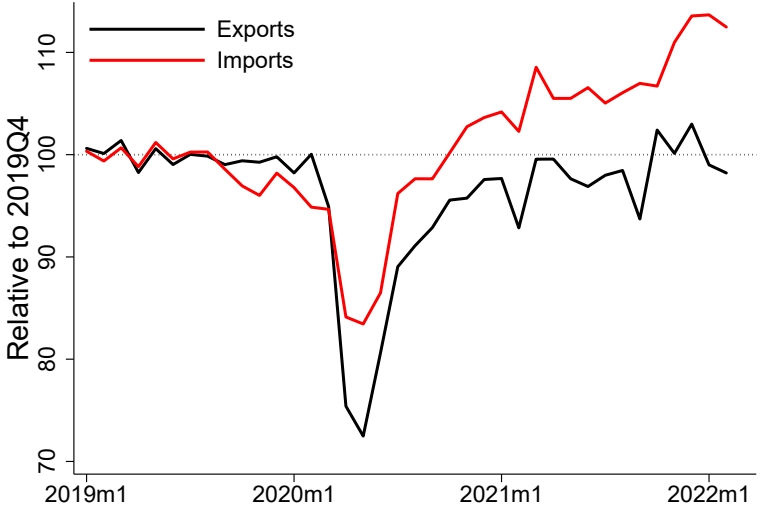
Last date: January, 2022, Source: Census

US Economy Recovery Lagged Rest of the World



Last date: February, 2022, Source: Census, Dallas Fed

US Trade recovered



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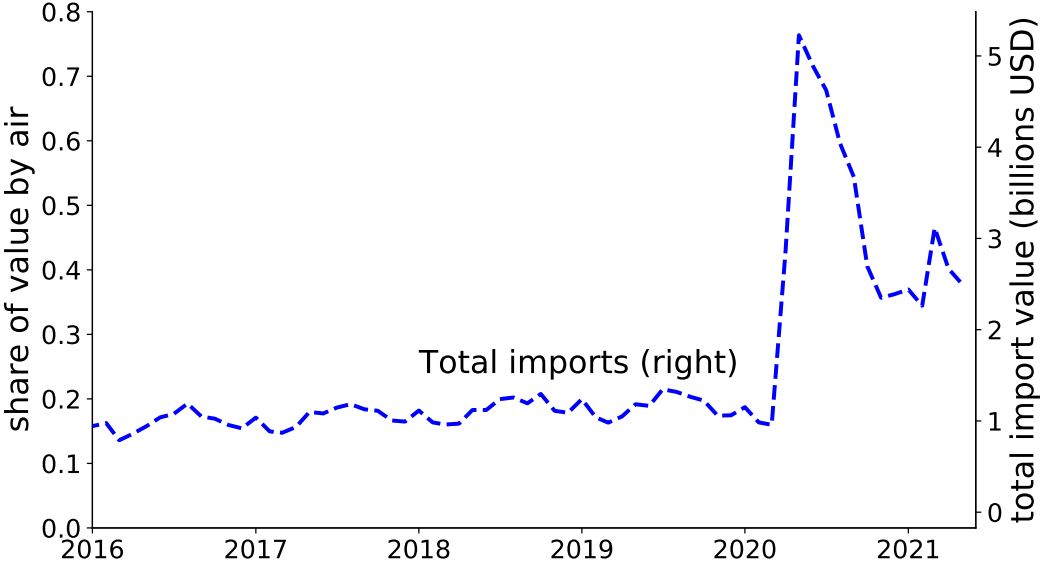
Back

Mode substitution: PPE during the early covid pandemic



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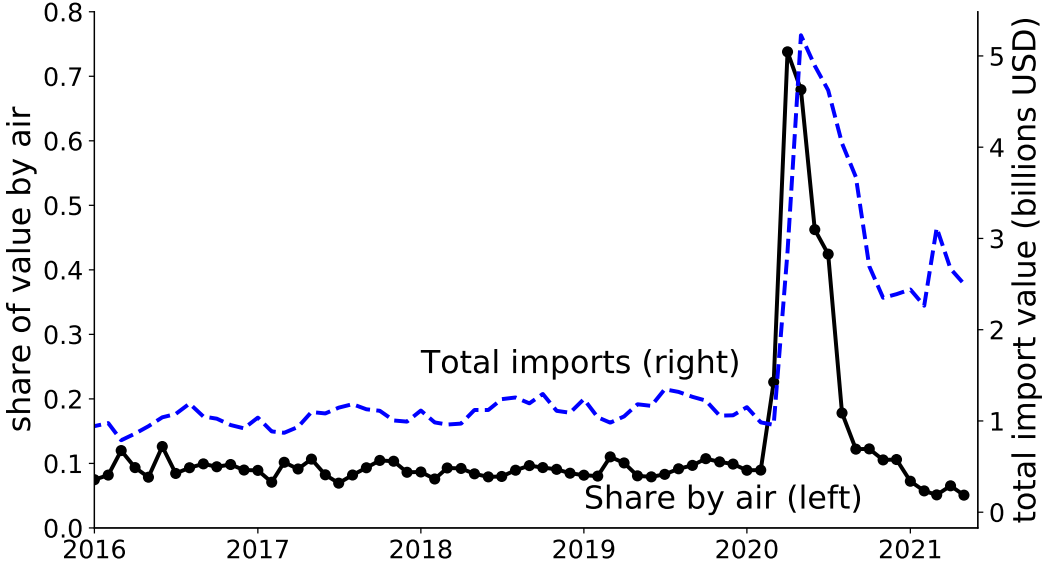

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