Covid-19 Supply Chain Disruptions

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CBS

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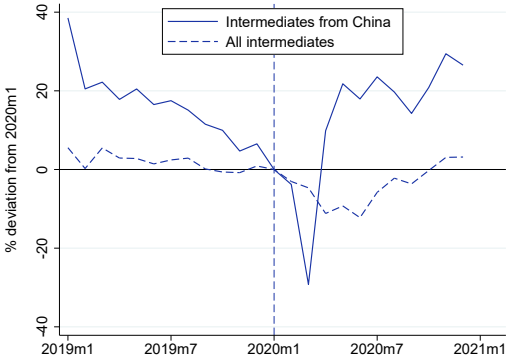
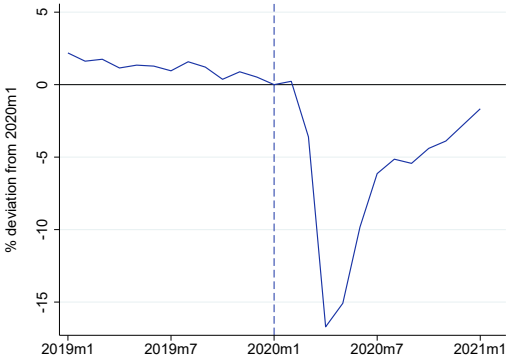
Imports of intermediate goods



Notes: Aggregate seasonally adjusted US imports of intermediate goods from China and globally. Covid-related goods are excluded.

Industrial production



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  Some policy interventions counterproductive after disruptions

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  May–July 2020: reversion to mean

  August 2020–January 2022: decline in prices and trade, else insignificant

Related literature

- Quantitative analysis of Covid-19 through input-output linkages: e.g., Barrot et al. (2022), Baqaee/Farhi (2021), Bonadio et al. (2020), Acharya et al. (2020), Gerschel et al. (2020)
- Empirical analysis of previous disruptions (natural disasters): e.g., Barrot/Sauvagnat (2016), Meier (2020), Carvalho et al. (2021), Boehm et al. (2019)
- Hassan et al. (2021): firms' primary concerns were the collapse of demand, increased uncertainty, and disruption in supply chains

Data

China import exposure

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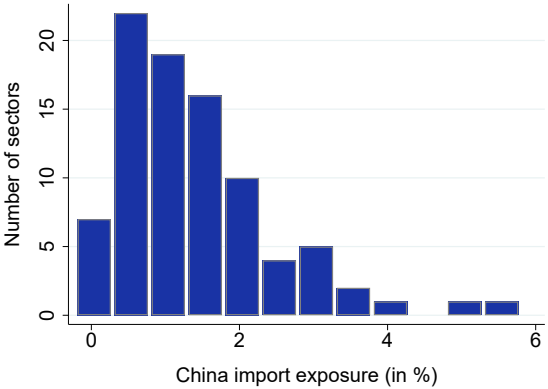
- Sector-specific intermediate goods from China not measured
- Proportionality assumption: (cf. World Input-Output Tables)

$$\underbrace{(\text{commodity-specific China import share})}_{\text{2019 International Trade Data}} * \underbrace{(\text{sector-specific imports of commodity})}_{\text{2012 BEA IO Tables}}$$

- We consider only 6-digit NAICS commodities which are intermediate inputs
- We aggregate to 88 US sectors (3/4-digit) to match exposures to outcomes

Distribution of China import exposure



Mean of e_i^{China}: 1.4%

Standard deviation of e_i^{China}: 1.1%

– Highest exposures –

Apparel, Seafood, Communications

– Lowest exposures –

Power generation, Petroleum and coal products, Gas distribution

A little can go a long way

- Can disruptions in China trade matter given the small e_i^{China}?
- An upper bound estimate
  - Suppose zero substitutability of inputs & zero intermediate goods inventories
  - 29% decline in intermediate goods imports from China will reduce output by 29% (exceeds observed output decline of 17%)

Empirical evidence

Empirical strategy

$$\log(y_{it}) - \log(y_{i,2020m1}) = \alpha_t + \beta_t e_i^{\text{China}} + \Gamma_t Z_{it} + u_{it}$$

- y_{it}: outcome (e.g., production) in month t for sector i
- β_t: relative growth of more exposed sectors

Regression model motivated by a stylized model of supply chain disruptions, see WP

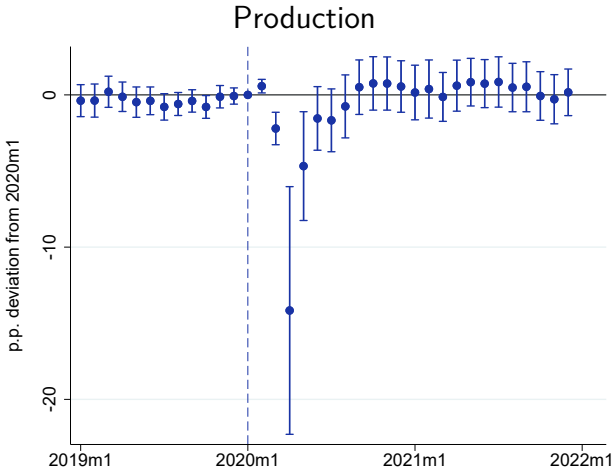
Production

Time line

February 2020: lockdowns in China but (yet) no effect in the US

March/April 2020: significantly larger contraction of exposed US sectors

August 2020 – today: insignificant differences across exposures



Notes: Vertical lines indicate 90% confidence intervals based on HAC se.

Production

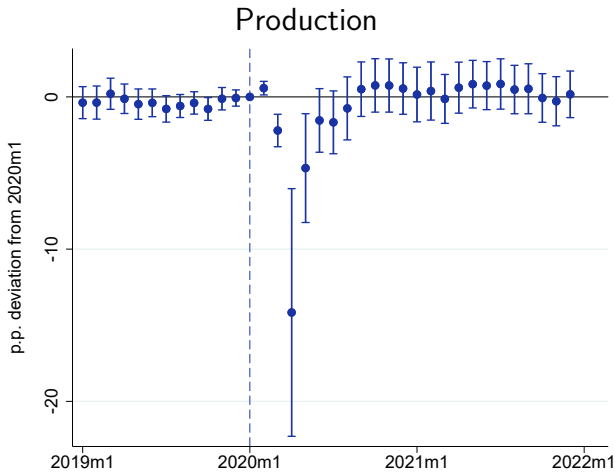
Quantitative magnitudes

Jan–Mar 2020 growth 2.2 p.p. lower in sectors with a 1 sd. higher e_i^{China}

- 12% of variance

Jan–Apr 2020 growth 14.2 p.p. lower in sectors with a 1 sd. higher e_i^{China}

- 8% of variance



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Potential confounders

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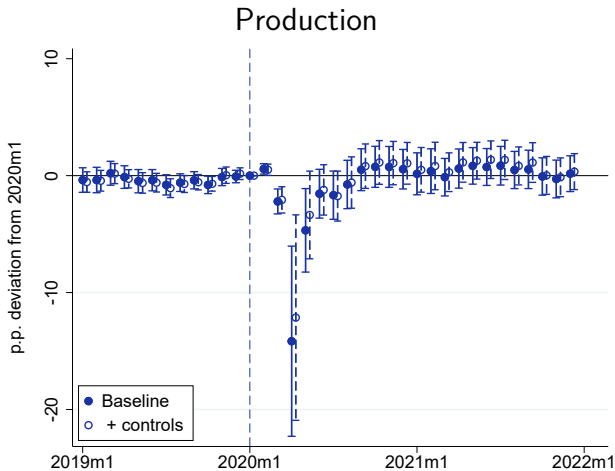

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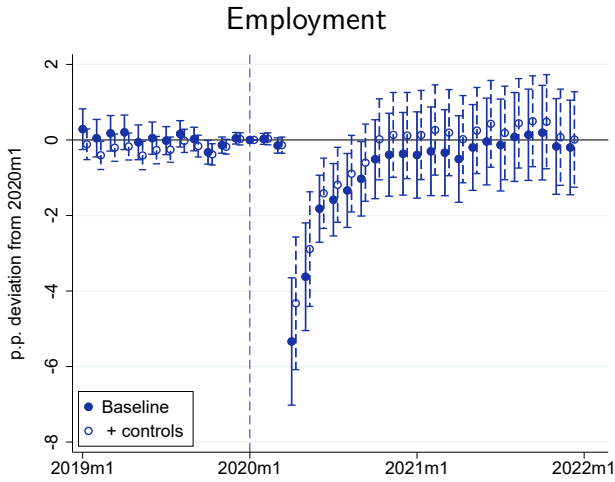
Employment

Response similar to production

Employment contraction much larger for more exposed sectors

- explains 24% of April variance
- robust to controls

Differential contraction starts one month after production, but remains for longer: insignificant by October



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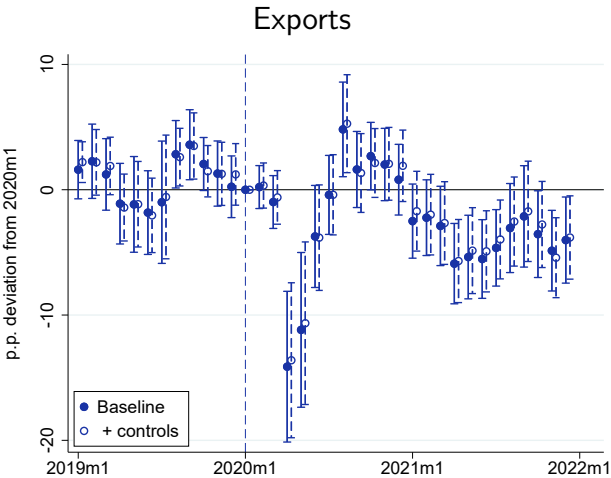
Exports

2020 response similar to production

Export decline larger for more exposed sectors

- explains 16% of April variance
- robust to controls

2021: second wave of lower exports



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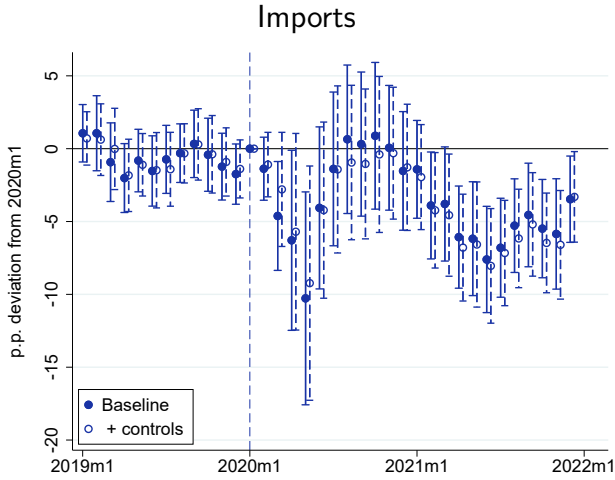
Imports

2020 response similar to production

Import decline larger for more exposed sectors

- consistent with supply chain disruptions from China
- (and low substitutability from elsewhere)

2021: second wave, as for exports



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Import prices

2020: import prices increased by more for exposed sectors

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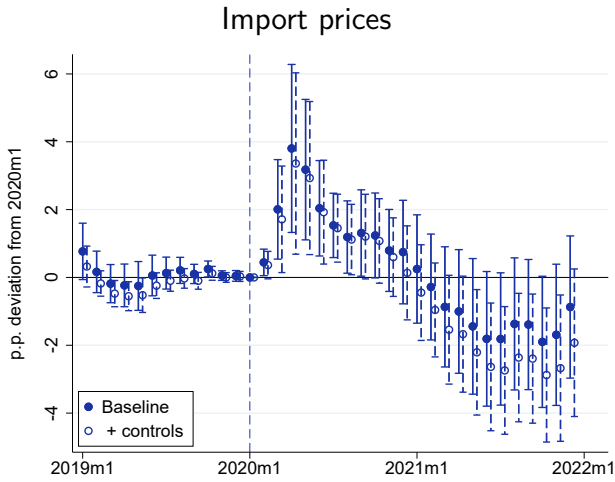
2021: lower prices



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Producer prices

2020: producer prices weakly increased by more for exposed sectors

- consistent with supply chain disruptions from China
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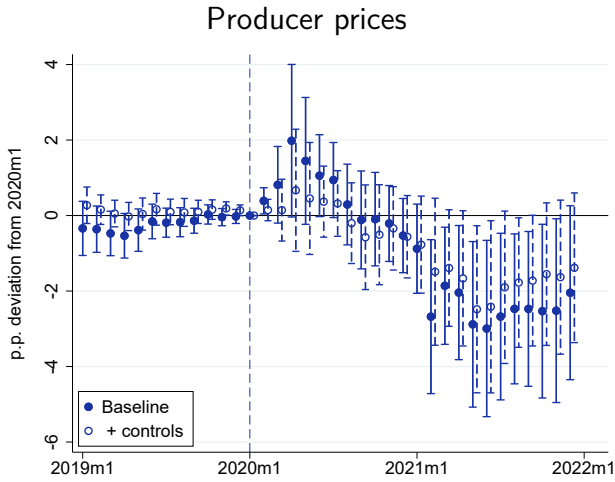
2021: lower prices



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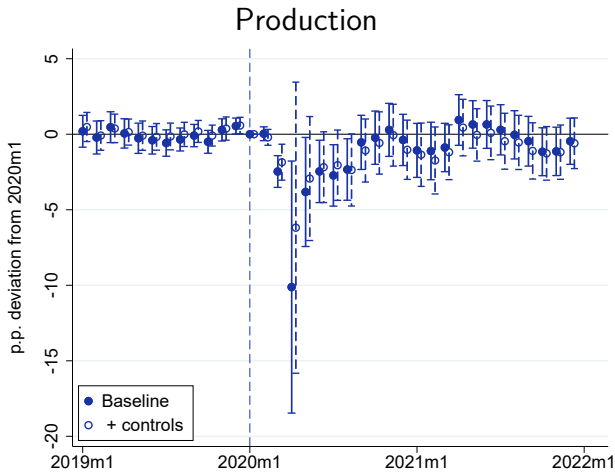

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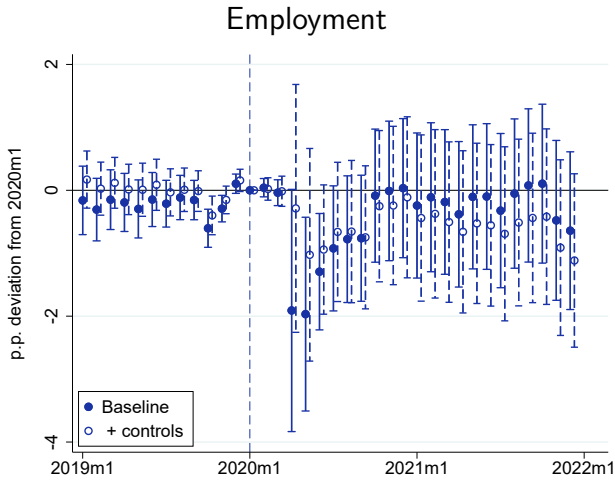

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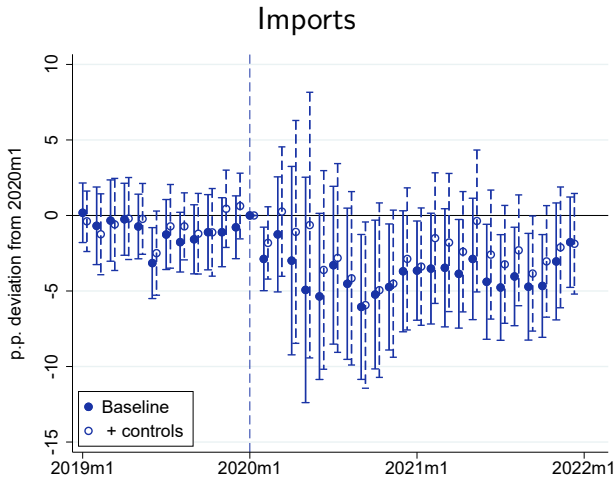

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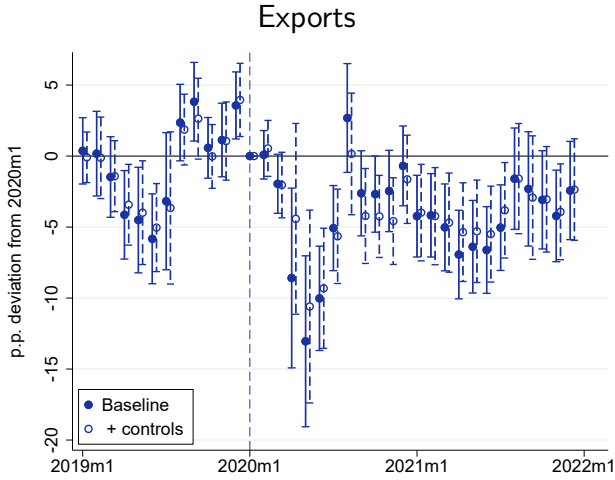

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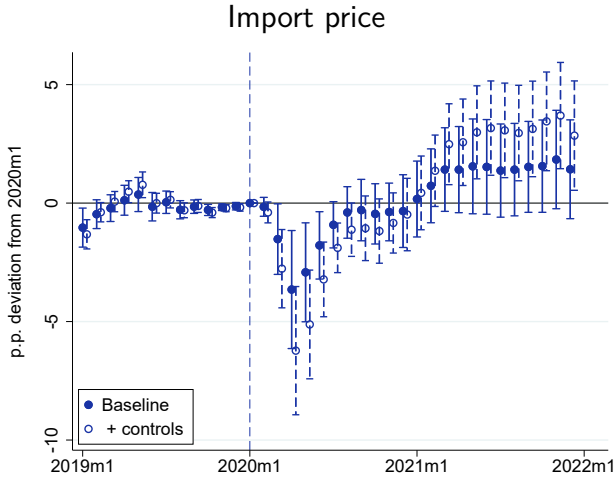

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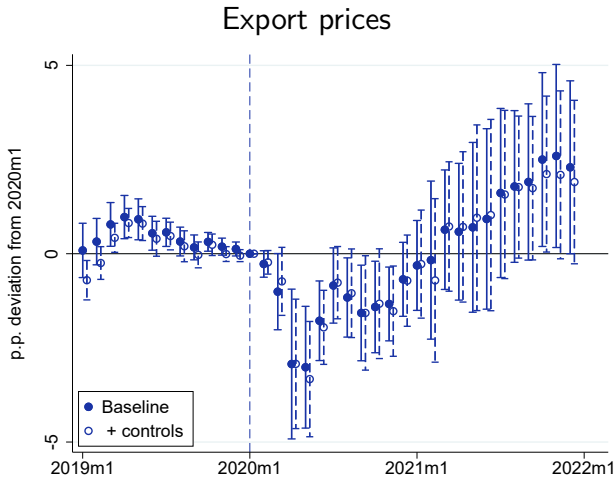

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Price declines suggest higher non-China exposure correlates with larger demand slumps

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Conclusion

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- US sectors with higher exposure to intermediate inputs from China contracted significantly more, while their prices increased more
  - Quantitatively: 8-24% of variance in March/April 2020 production and employment explained by different China exposures
  - Persistence: production and employment differences gone by August 2020

- Relevance for Europe? France and Germany source a larger fraction of intermediate inputs from China than the US