

# Global Supply Chain Disruptions: *Japan and the World*

Richard Baldwin

RIETI, 19 December 2023  
Tokyo

**IMD** / Real learning  
Real impact



Based on:

***Brookings Papers***  
ON ECONOMIC ACTIVITY

BPEA Conference Draft, September 28-29, 2023

---

**Hidden Exposure: Measuring U.S. Supply Chain  
Reliance**

Richard Baldwin (IMD Business School)

Rebecca Freeman (Bank of England)

Angelos Theodorakopoulos (Aston Business School)

---

# Today's learning journey:

Global framing of supply chain  
disruptions & facts for Japan



Measurement issues & our new  
indicators



Is policy needed?



Goal: New insights  
on global supply  
chain disruptions



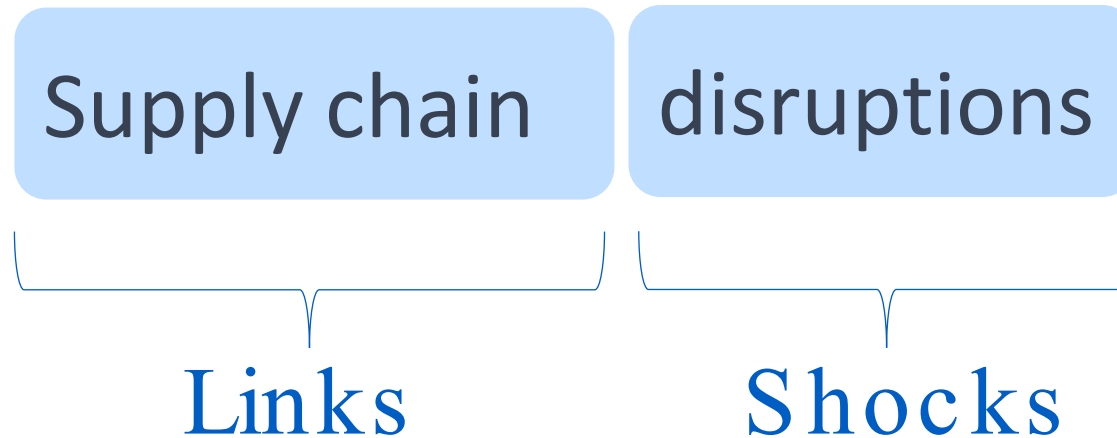


# Global framing of supply chain disruption issues



# What changed?

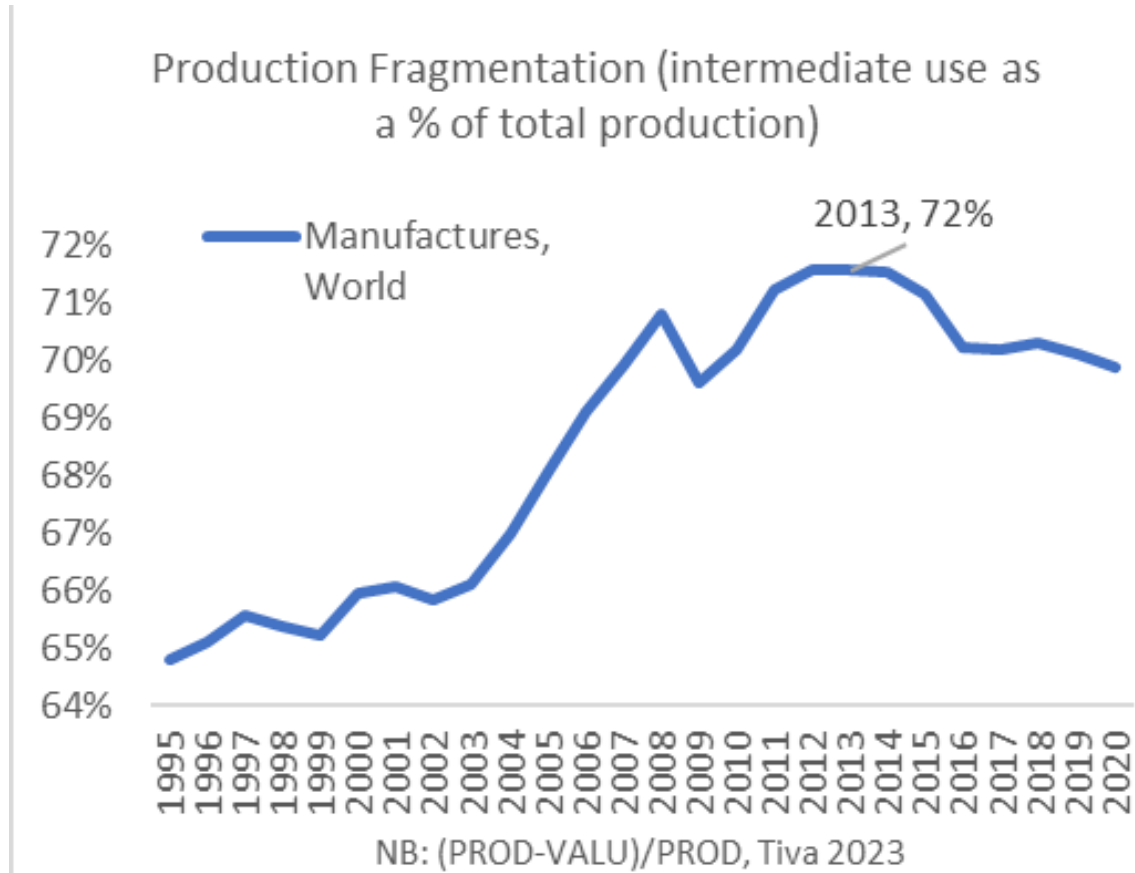
- Before: Global supply chains viewed as a source of productivity & growth.
- Now: They viewed as a source of vulnerability.
- Let's break down the issues:



- *So, did the 'links' or the 'shocks' change?*

# It wasn't the links!

World manufacturing is de-fragmenting.



Use of intermediate inputs from all sources as % of production, Manufacturing sectors, whole world. This is a measure of production fragmentation (it would equal zero if all **firms** made all their own intermediate inputs).

World supply chains are localizing.



Share of all intermediate inputs that are imported. This is a measure of supply chain internationalisation (it would equal zero if all **nations** made all their own intermediate inputs).

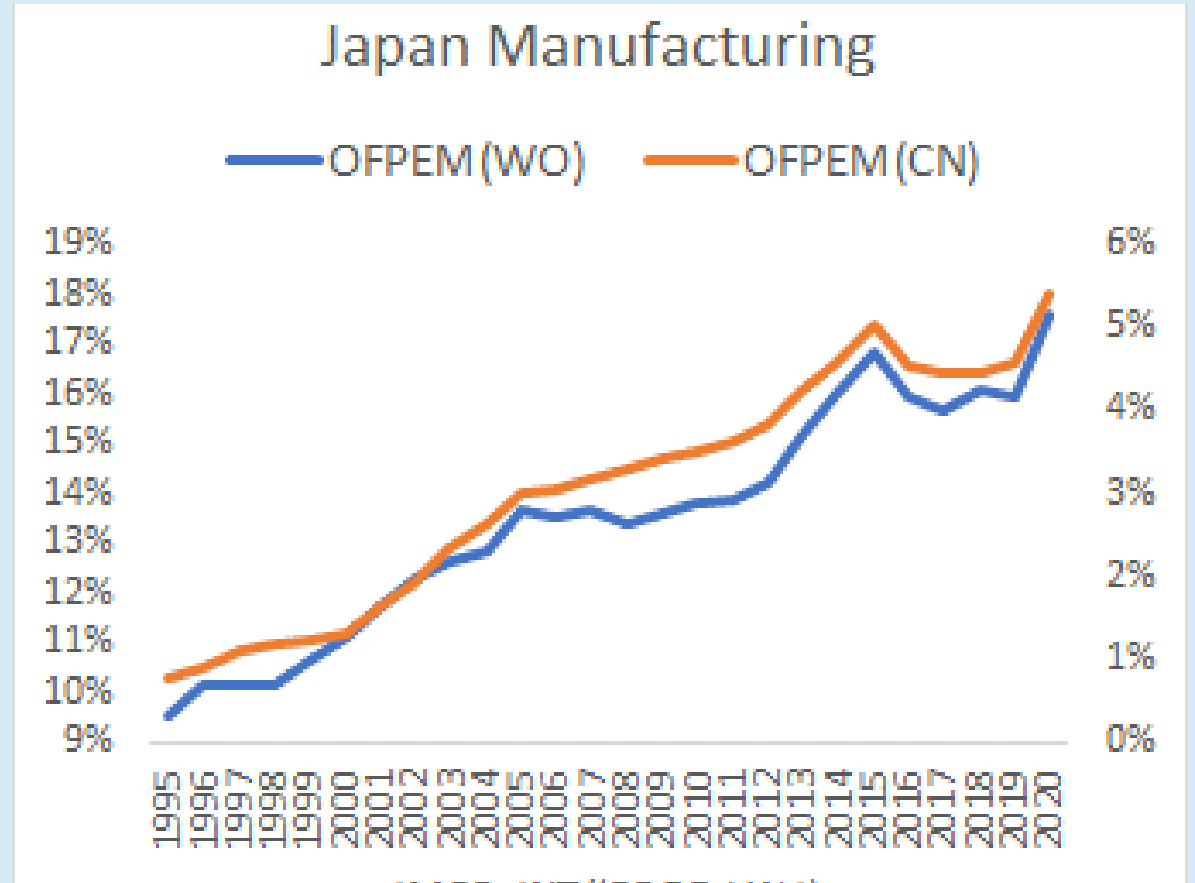
# Japan's exposure to imported industrial

## inputs

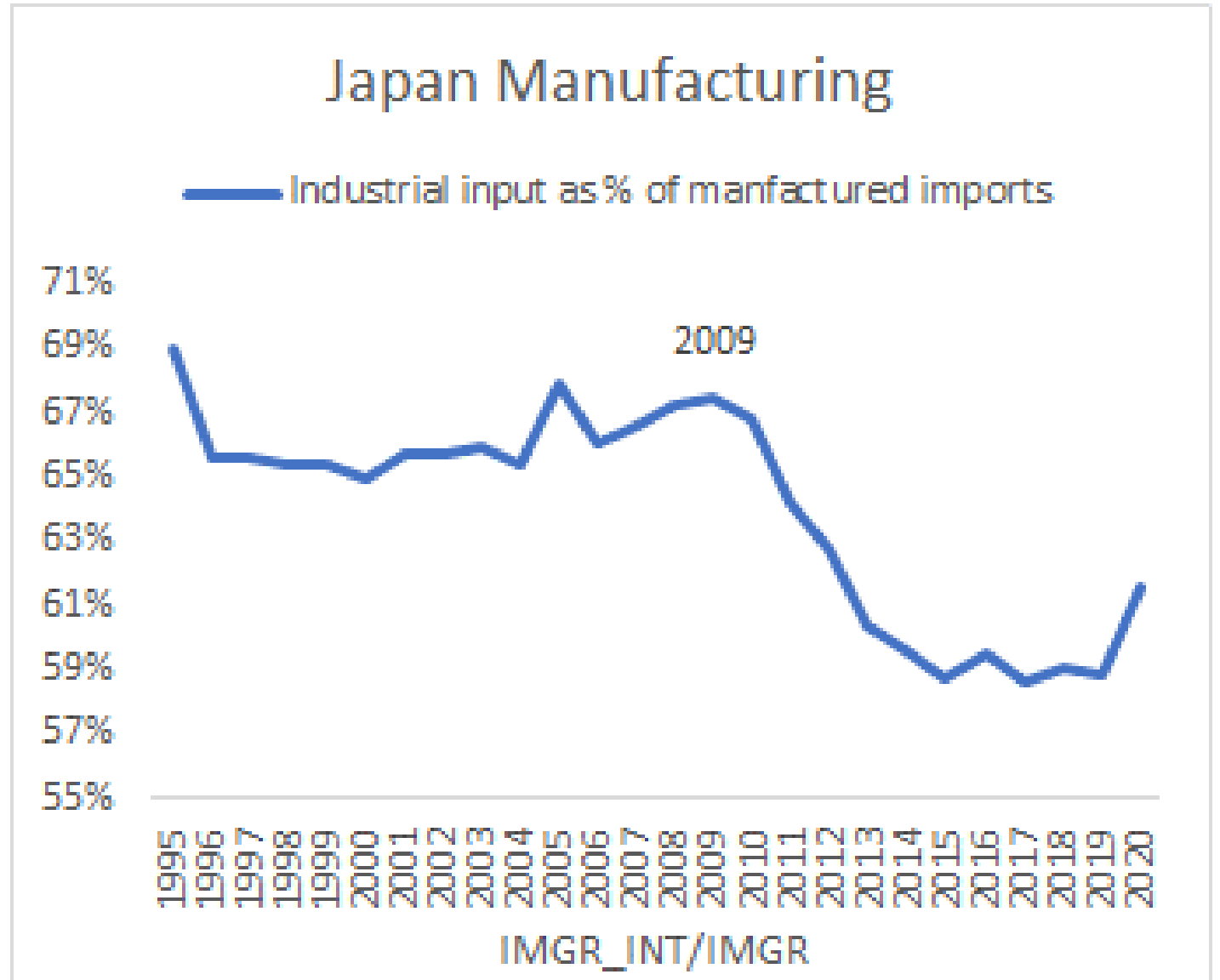
Chart shows % of Japan's industrial inputs that are imported, 1995-2020.

- The share has barely risen since 2015.
- No obvious increase in intensity of reliance on foreign inputs

From world (blue, left) & China (orange, right)



# Japan's imports of industrial inputs (% of *all industrial imports*)





# If it wasn't the links, it was the shocks.

Before

Mostly idiosyncratic  
shocks

One sector, one nation, transient.

*e.g. earthquakes, floods, strikes, etc*

Today

Many systemic  
shocks

Many sectors, nations & long-lasting.

*e.g. C19, US tariffs, Brexit, US-CN  
conflict, Russian invasion of Ukraine, etc*

*Firms can deal with idiosyncratic shocks;  
governments get involved in systemic shocks*

# Our classification of shocks

## 6 combinations of shocks

**Table 3.1: Taxonomy of sources and nature of shocks, with examples.**

	<b>Supply</b>	<b>Demand</b>	<b>Connectivity</b>
<b>Idiosyncratic</b> (isolated, simple)	Factory closure, labor strikes, extreme weather, etc.	Single product demand surge, etc.	Single port closure, single firm cyber-attack, etc.
<b>Systemic</b> (multi-sector, multi-market, complex interactions)	Pandemics, trade wars, large-scale extreme weather, etc.	Sector-wide preference shifts, multi-product, multi-sector boycotts, embargoes, etc.	Massive hurricanes, military conflicts, large-scale hacking, etc.

Source: Baldwin, Freeman, Theodorakopoulos (2023)

*NB: Shocks are not mutually exclusive & one type may lead to another*



The image depicts a complex digital environment. A large magnifying glass is positioned over a glowing globe that is overlaid with a network of red nodes and lines. The background is filled with various data visualization panels, including maps, bar charts, and circular gauges, all rendered in a blue and red color scheme. In the foreground, there are 3D models of shipping containers, a red truck, and various mechanical tools like a wrench and a ruler, suggesting a focus on logistics and engineering. The overall aesthetic is high-tech and data-driven.

# LINKS: Measurement issues



# Business v Economic Approaches

## Business view (chain)

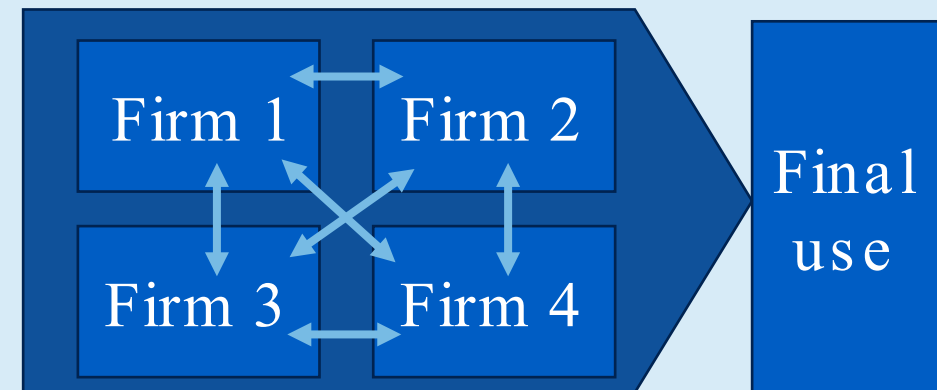
Centred on single firm  
Buying & Selling  
Chain



## Economics view (matrix)

All firms  
Buying & Selling  
Network

Value  
Added

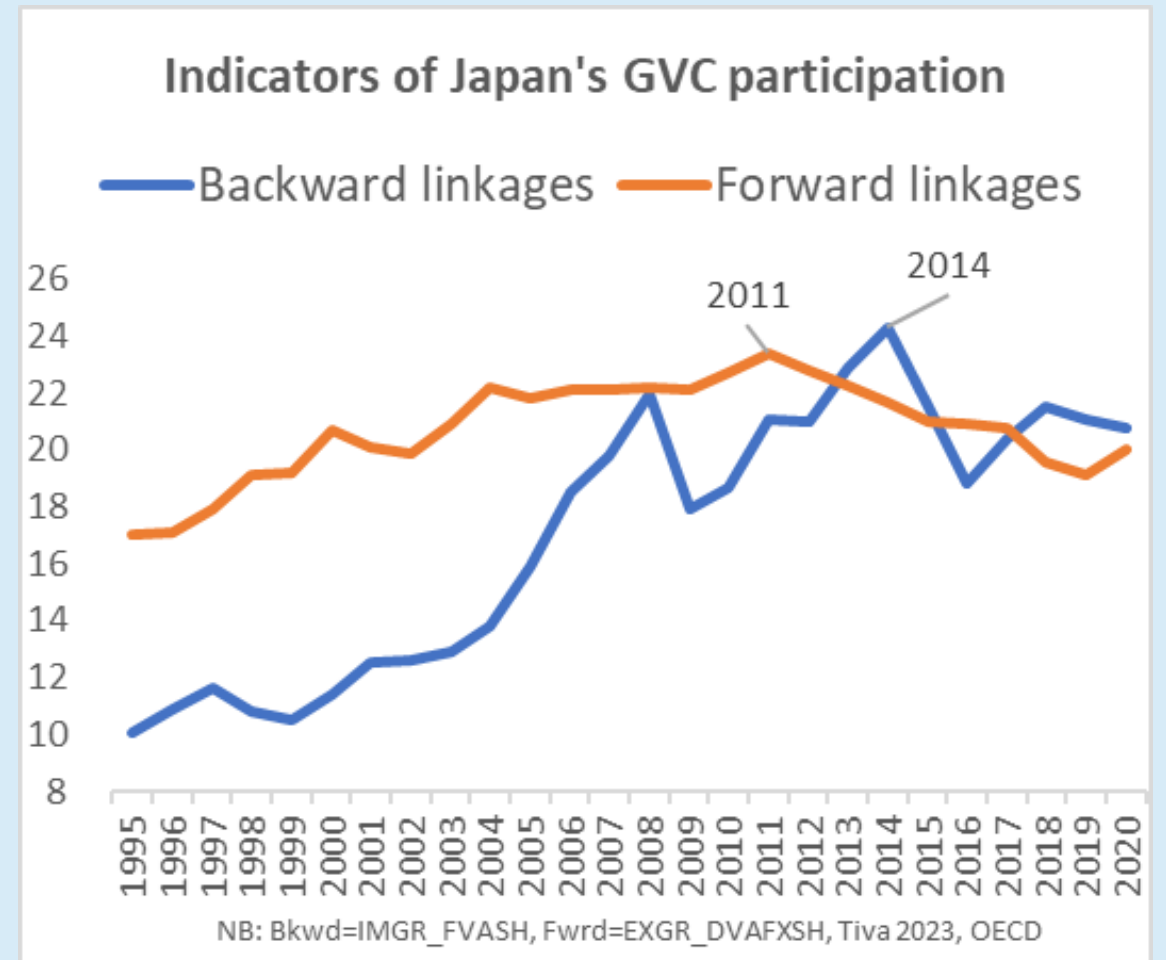


*Family tree analogy*

# Why we developed new indicators

- In 1990s & 2000s, policymaker Q:
  - “Where is the work actually done” (jobs)
- This led to a focus on ‘value added trade’
  - e.g., “Backward Linkages”
  - See chart for Japan
- In 2020s, policymakers Qs:
  - “How vulnerable are my supply chains?”
  - “Where is the production actually done?”
- To answer new questions, we developed new indicators based on **gross trade**\*
  - OECD included our indicators in 2023 TiVA database update
  - NB: Use of value added measures led to miscalculations (Bank of Italy example)

*Traditional GVC indicators*



Our indicators:

Key  
distinction  
No.1

Gross trade  
not value-  
added trade

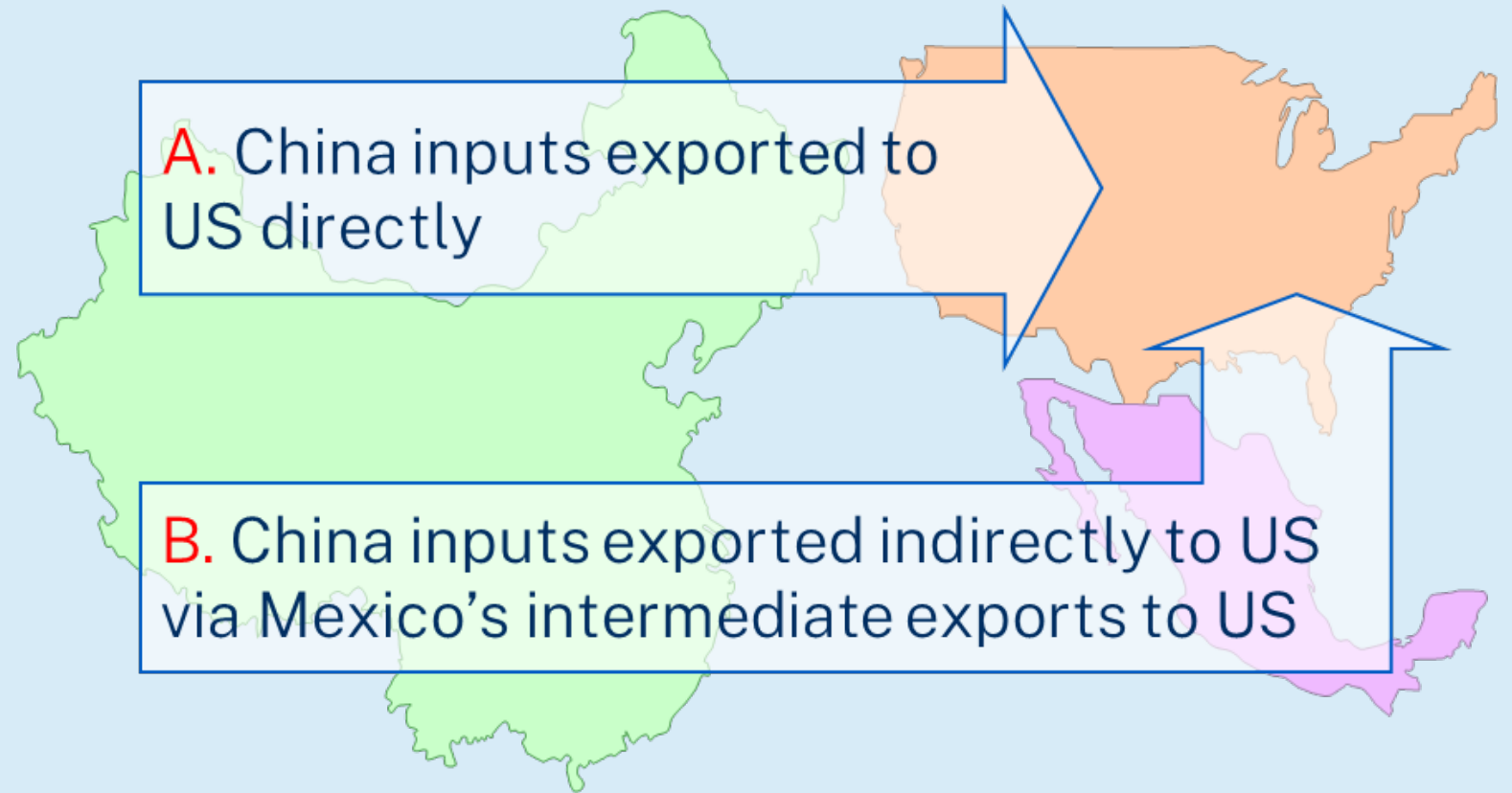
*Ambassador Bridge example, 2022  
6-day blockage*





# Our indicators: Key distinction No.2

- **A** “Face Value” exposure
  - Direct purchases only.
- **A+B** “Look Through” exposure
  - Direct & indirect.



*“Hidden Exposure”, is **B***

# Our indicators: Key distinction No.3

- We count imported intermediates used in production for domestic consumption
  - Not just for exports as in Backward Linkages
- Same on export side







# FACTS: US Global Supply Chain Engagement



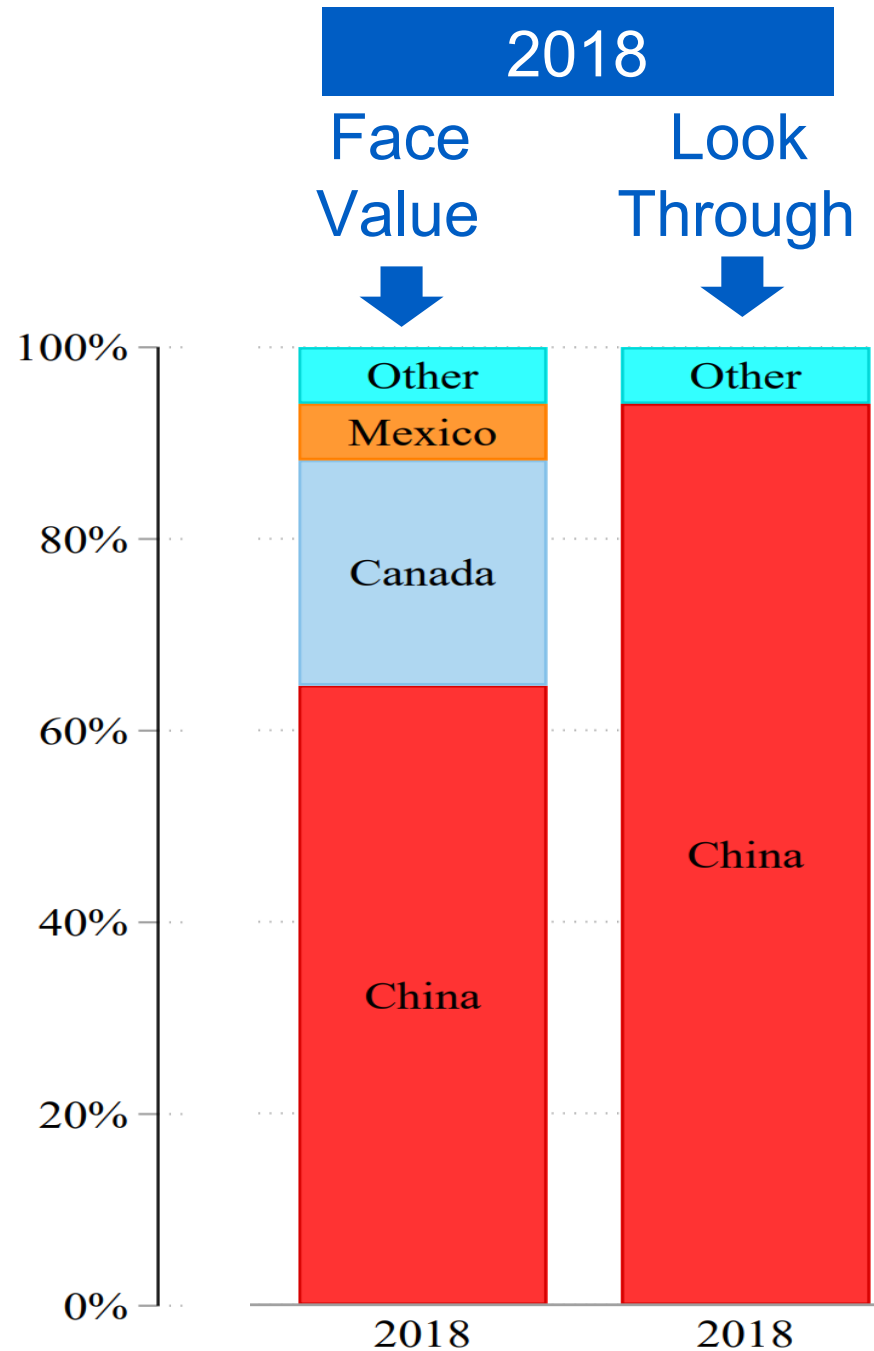
# US Hidden exposure, Take 1

Look-through  
vs face-value  
exposure



# US exposure to China is higher on look-through than Face Value basis

% of the 17 manufacturing sectors





# LINKS:

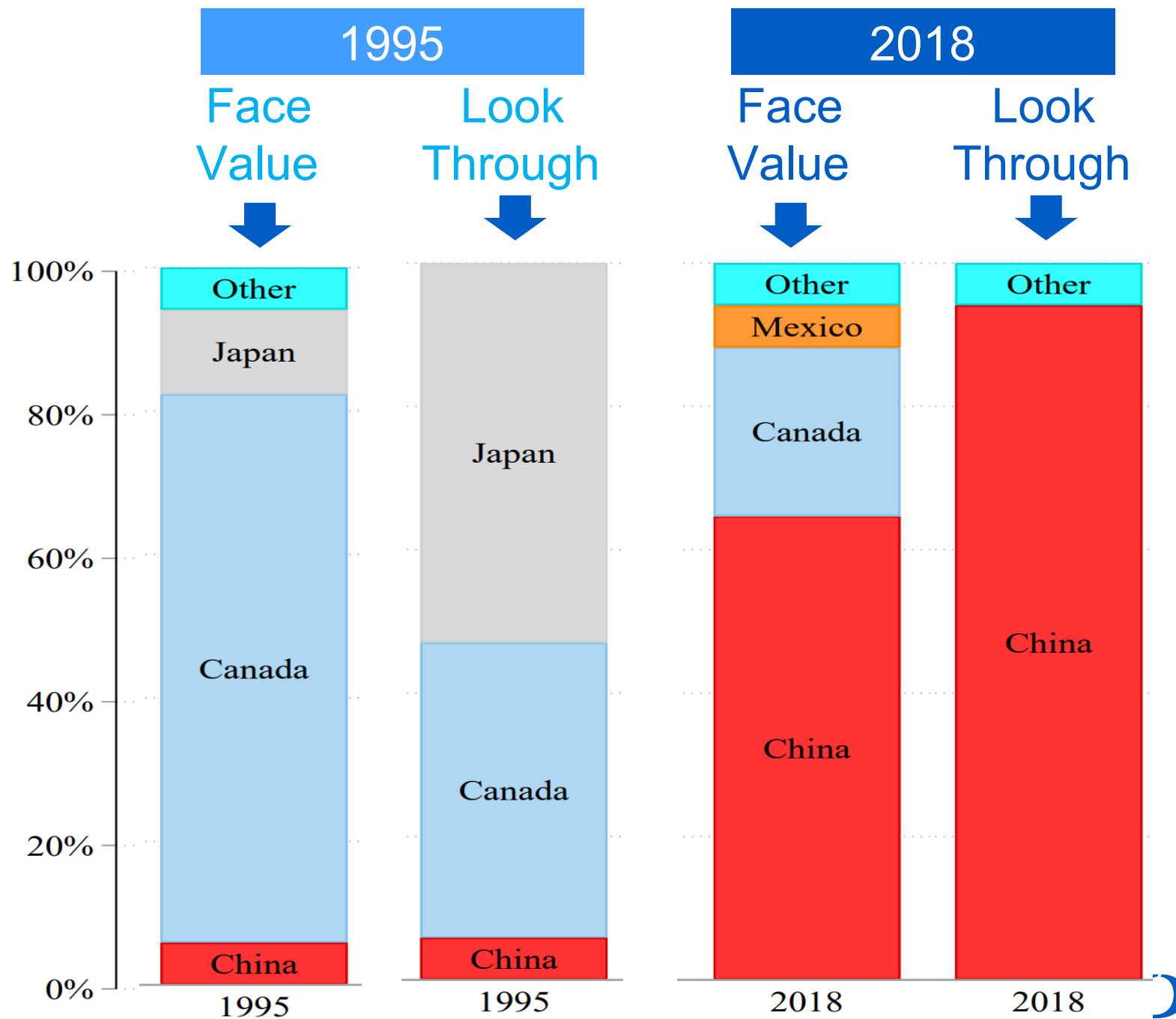
US Hidden  
exposure,  
Take 2

Rapid,  
geographic  
concentration  
of sourcing



# US exposure to China rose rapidly.

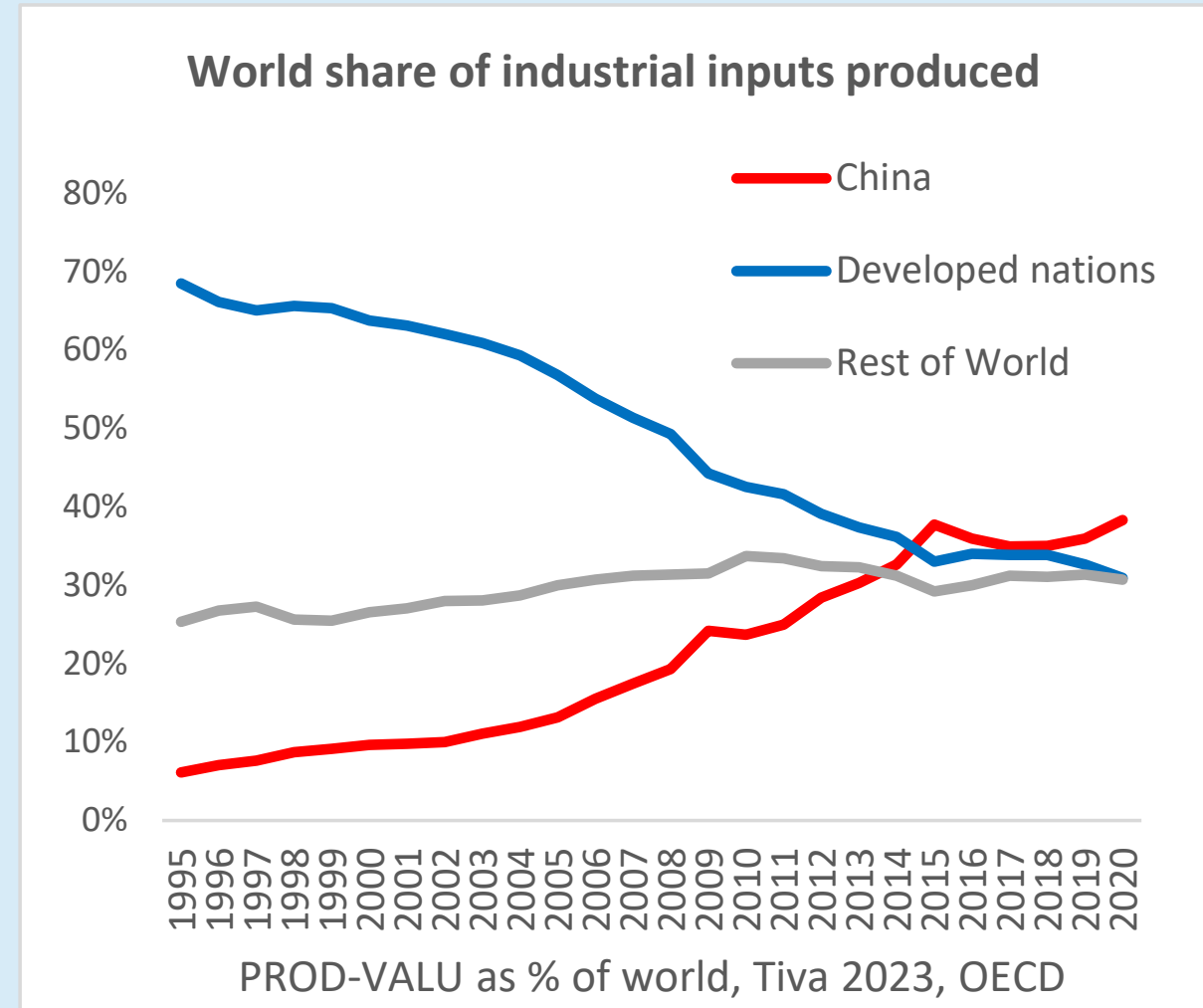
% of the 17 manufacturing sectors





# Manufactured intermediate production (% of world)

China's production of manufactured intermediates rose rapidly & is now dominant.



# POLICY: Organizing framework, not empirical work

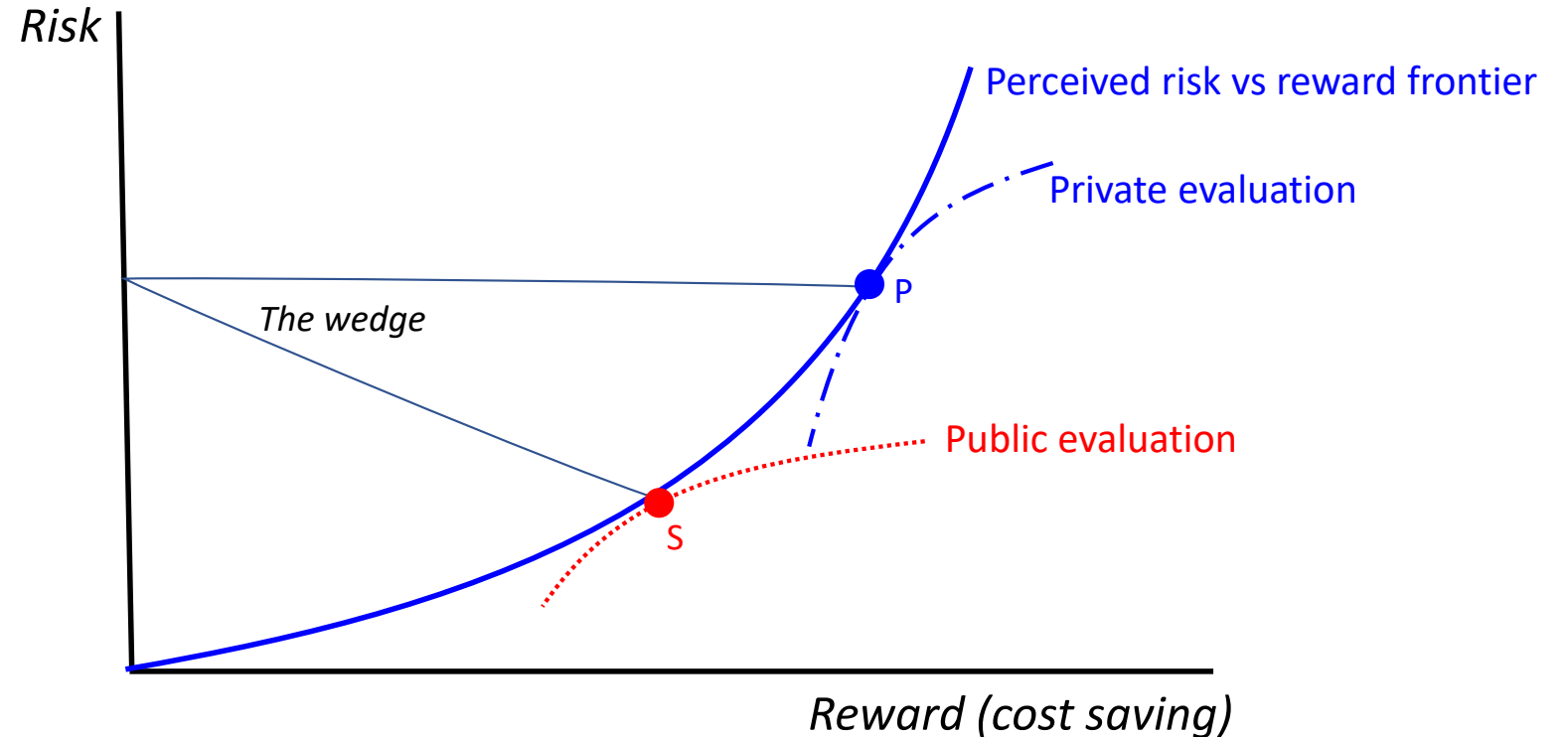




# The risk wedge

*NB: This wedge comes from risk perceptions, not externality*

When is policy justified?  
*(given that firms are optimizing on supply chain risk)*



Source: Baldwin R, Freeman R. 2022. Risks and Global Supply Chains: What We Know and What We Need to Know. Annual Review of Economics. DOI: 10.1146/annurev-economics-051420-113737.

---

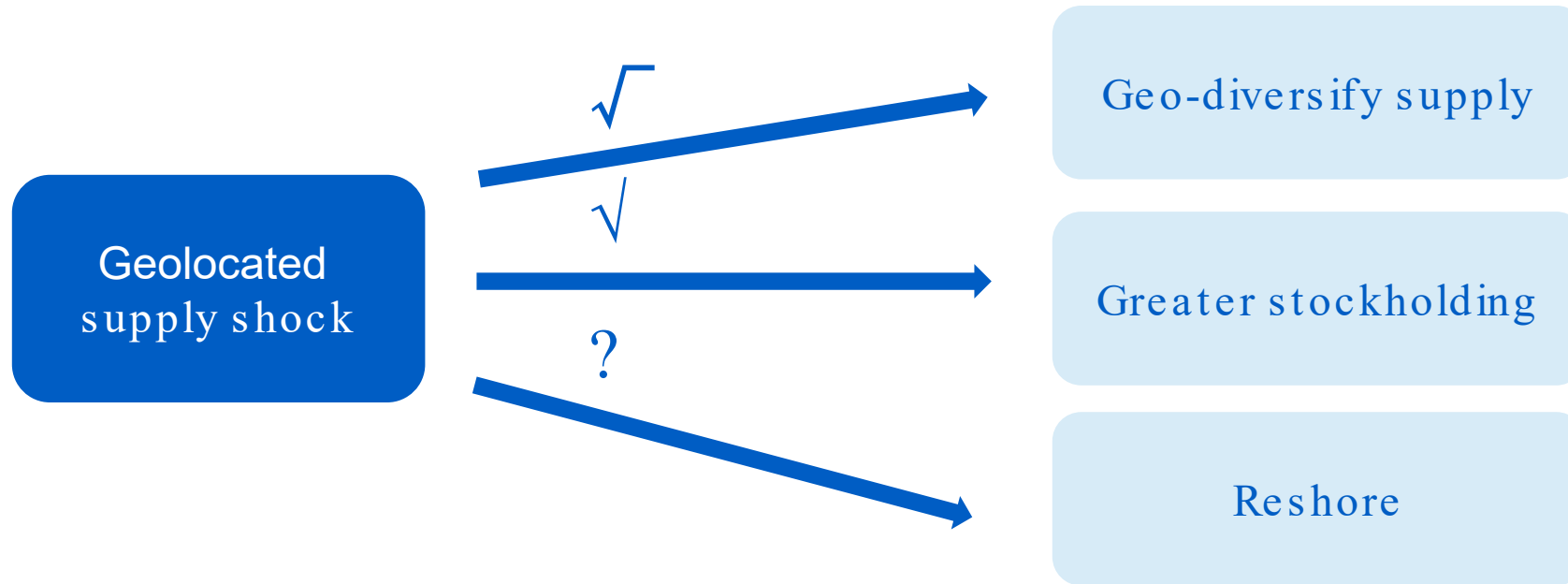
# What creates the risk perception wedge?

Analogies from:

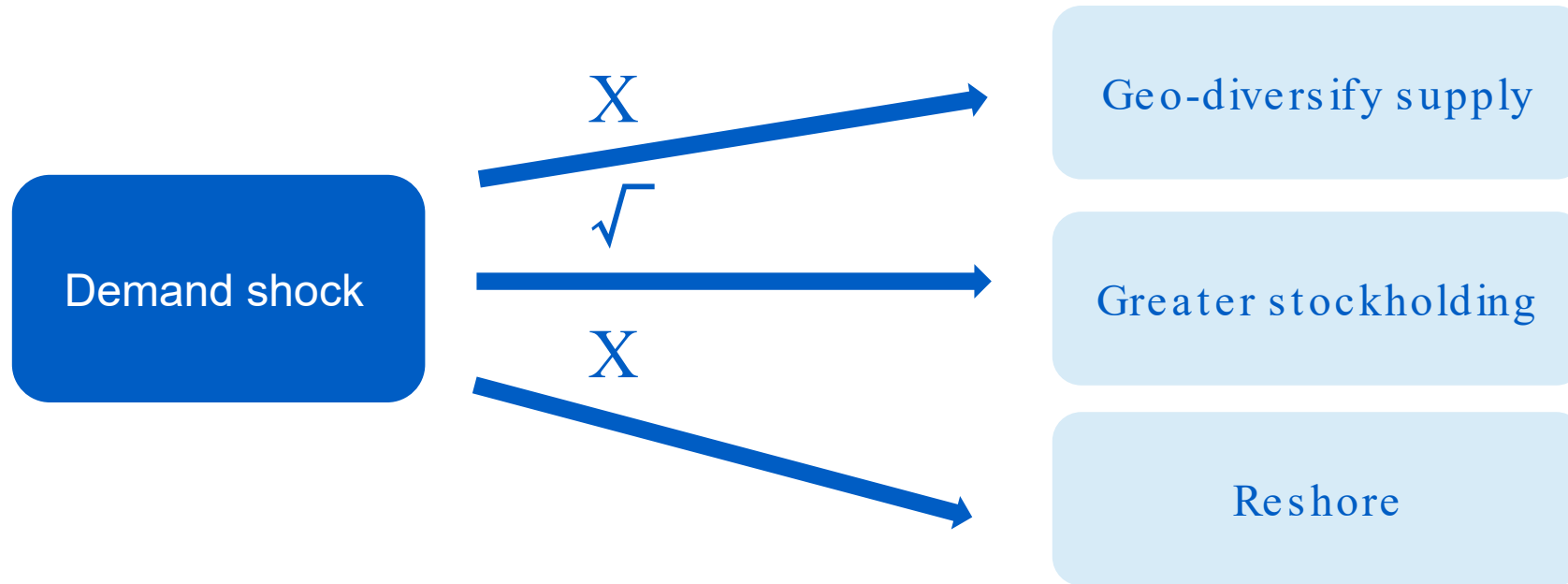
- 'Farms & Arms',
- Financial Sector



# Mapping shocks to remedies: supply shock



# Mapping shocks to remedies: demand shock



## Take away?

- Measuring foreign supply chain exposure requires careful thinking, & selection of measures
- There is not a single best indicator

MUCH more theoretical & empirical research is needed





Thanks for  
listening!

# Horses for Courses: Measuring Foreign Supply Chain Exposure

**Richard Baldwin, Rebecca Freeman & Angelos  
Theodorakopoulos**

WORKING PAPER 30525

DOI 10.3386/w30525

ISSUE DATE September 2022



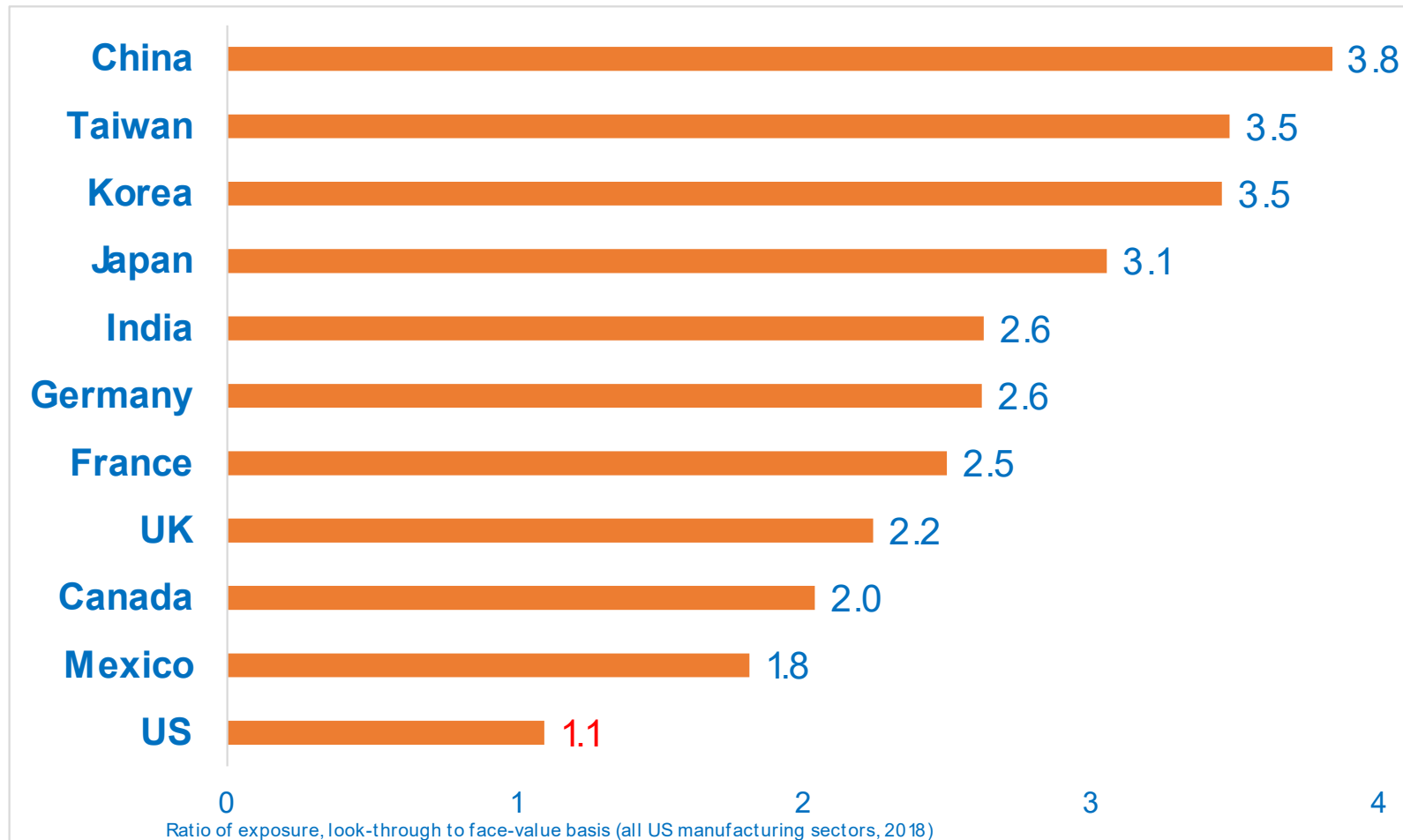
Q&A





US look-through exposure to China is 3.8 times higher than its face-value exposure

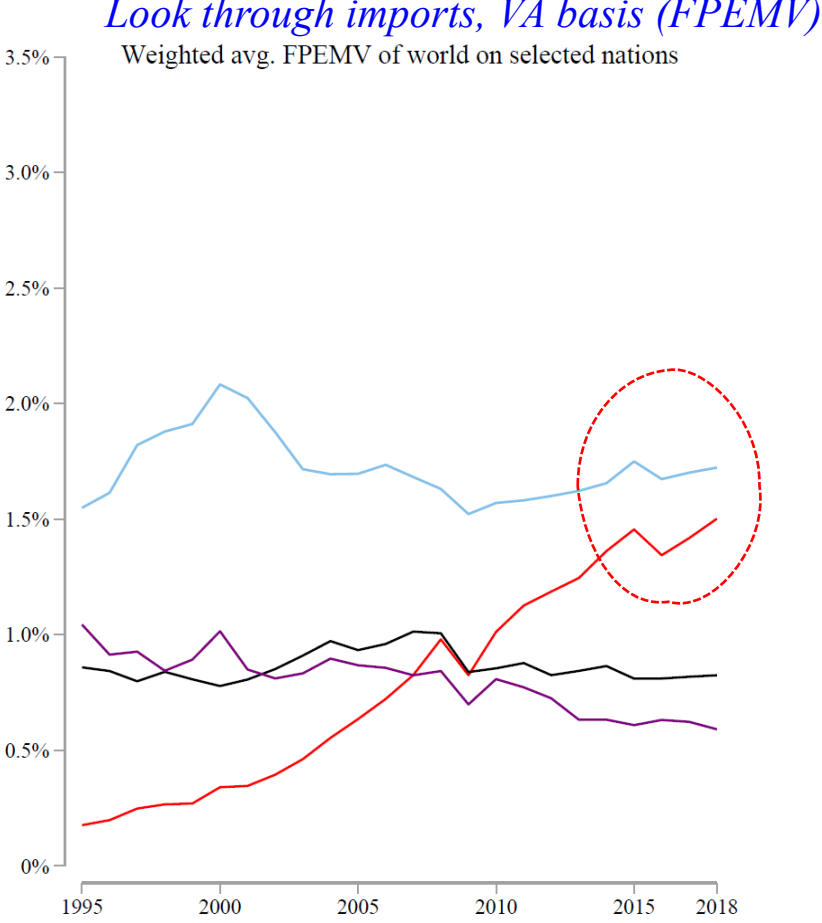
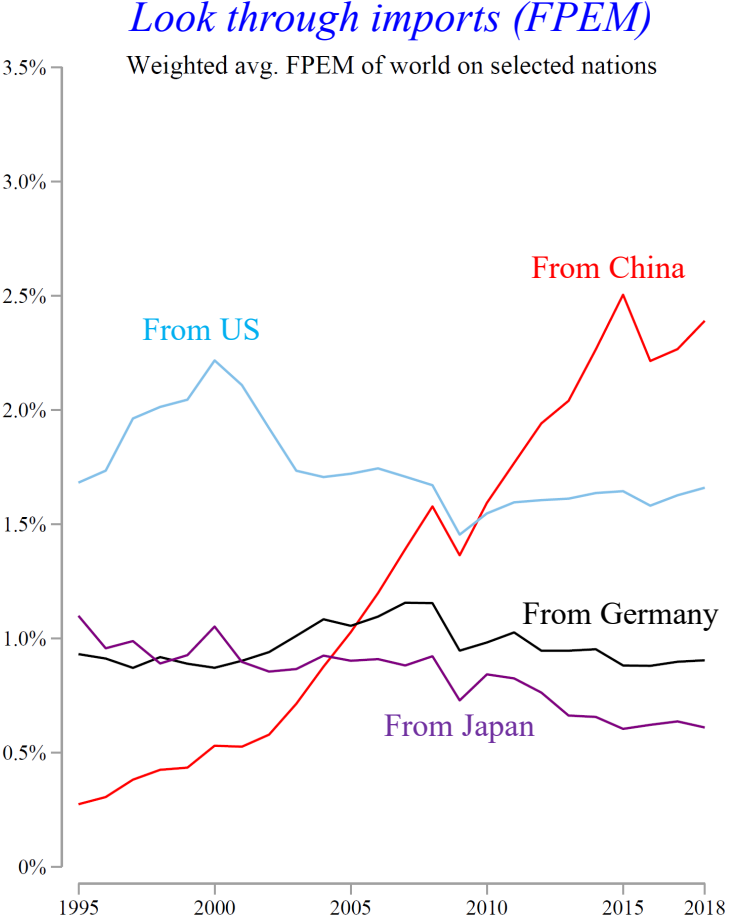
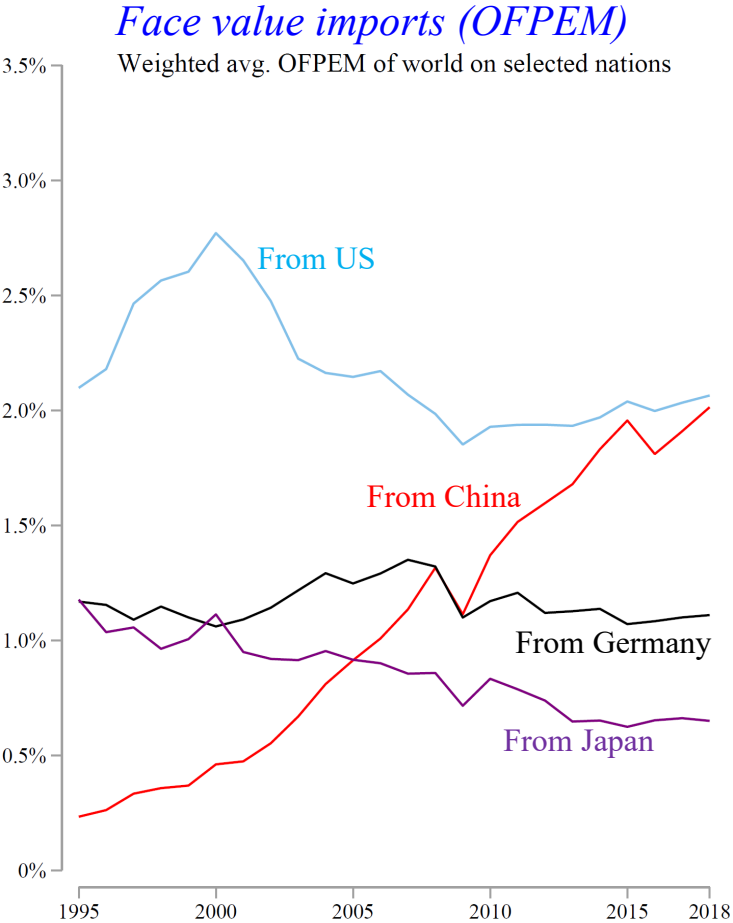
Ratio of look-through to face-value exposure by country (all manufacturing sectors)





# China vs US as industrial input supplier

*NB: Different measures lead to different answers.*



World exposure to intermediates from Giant-4, 1995-2018

