EUROPEAN CENTRAL BANK

EUROSYSTEM

The Economic Costs of Trade Fragmentation

ASSA conference

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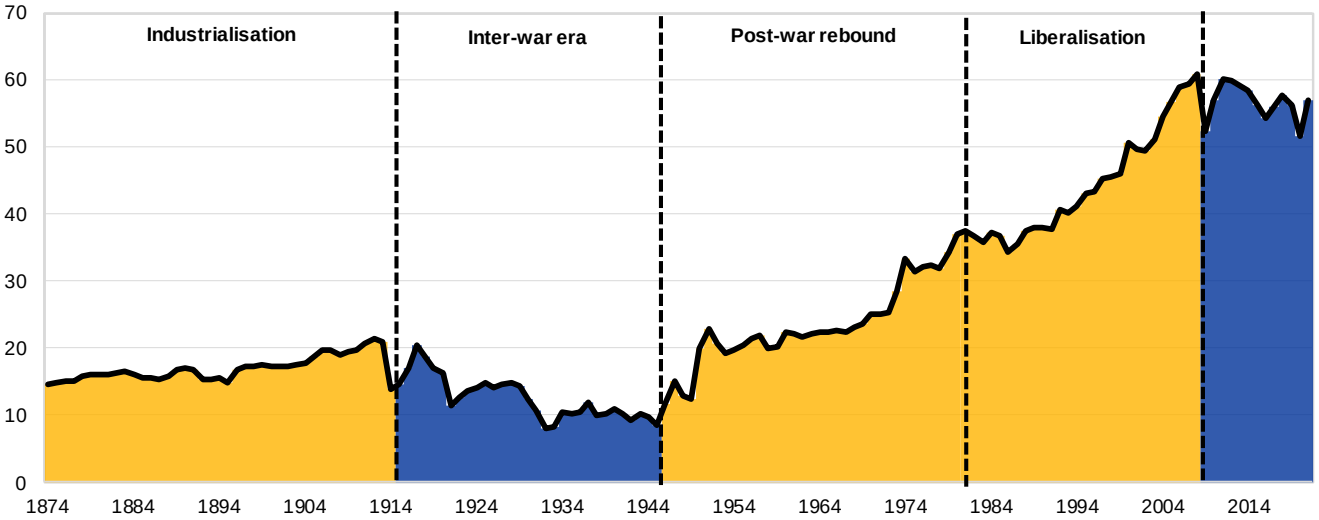
Post-GFC stagnation

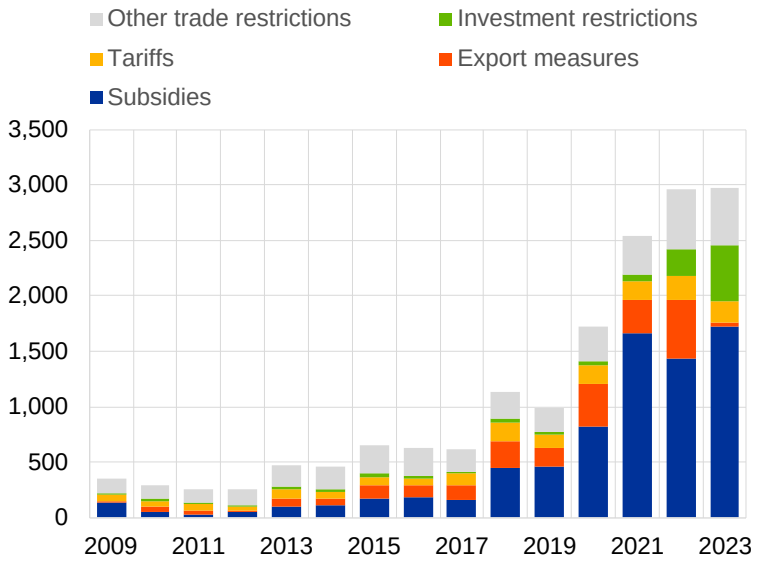
Developments in world trade since the 1870s
(world, exports and imports as percentage of GDP)



Source: ECB staff calculations based on Klasing, M. and Milionis, P. (2014), "Quantifying the evolution of world trade, 1870–1949", *Journal of International Economics*, 92(1), 185-197.
Note: Trade data from Barbieri, K., Keshk, O. and Pollins, B. (2009), "Trading Data: Evaluating our Assumptions and Coding Rules", *Conflict Management and Peace Science*, 26(5), pp. 471-491.

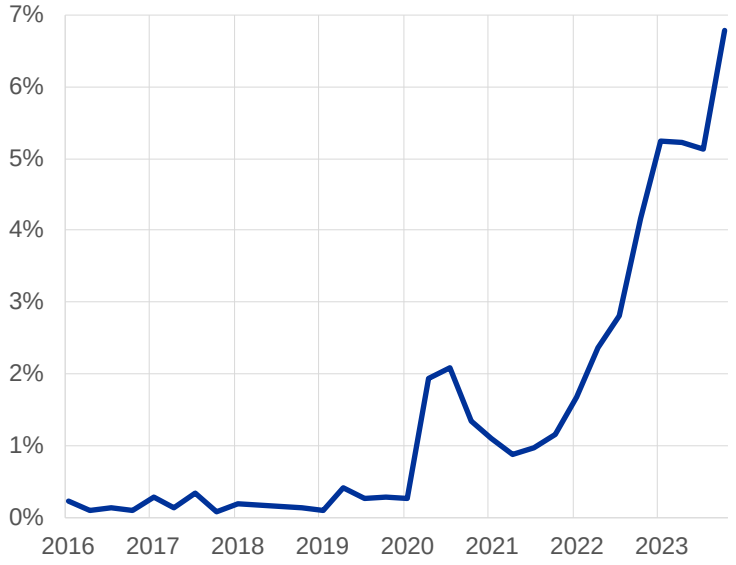
Inward-looking trade measures

Trade restrictions
(world, number)



Sources: Global Trade Alert (GTA) database and ECB staff calculations.
Notes: GTA documents unilateral changes in the relative treatment of foreign *versus* domestic commercial interests across various policy instruments. See Evenett, S.J., and Fritz, J. (2020). *The Global Trade Alert database handbook*.

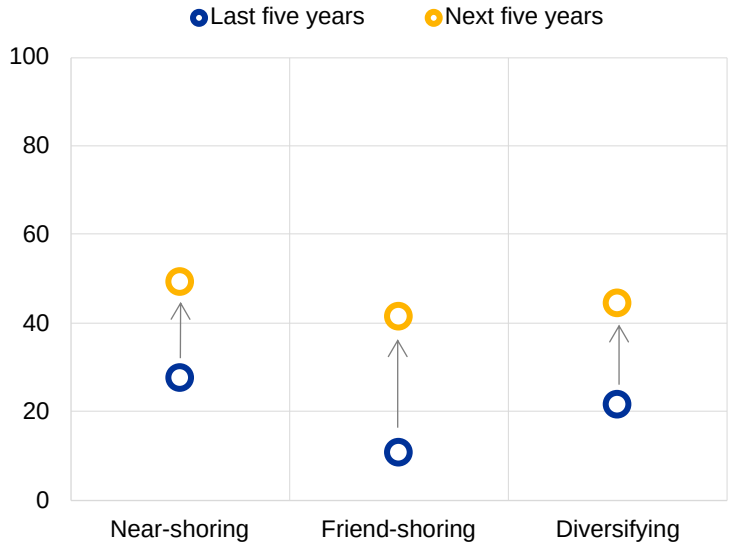
Occurrence of "shoring" in earning calls
(average share of sentences containing "shoring" terms)



Sources: NL Analytics and ECB staff calculations.
Note: Quarterly average of mentions of "friend-shoring", "near-shoring", "on-shoring", and "re-shoring" in firms' earning calls.

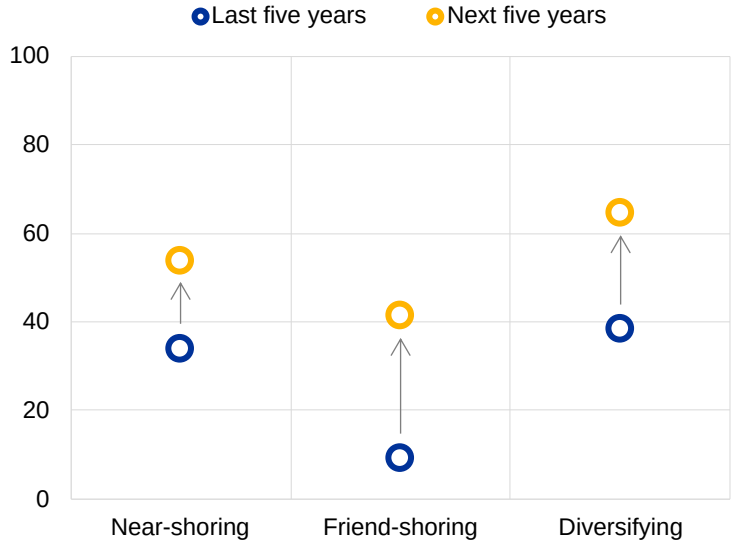
Decoupling in soft data

Location of production
(share of respondents)



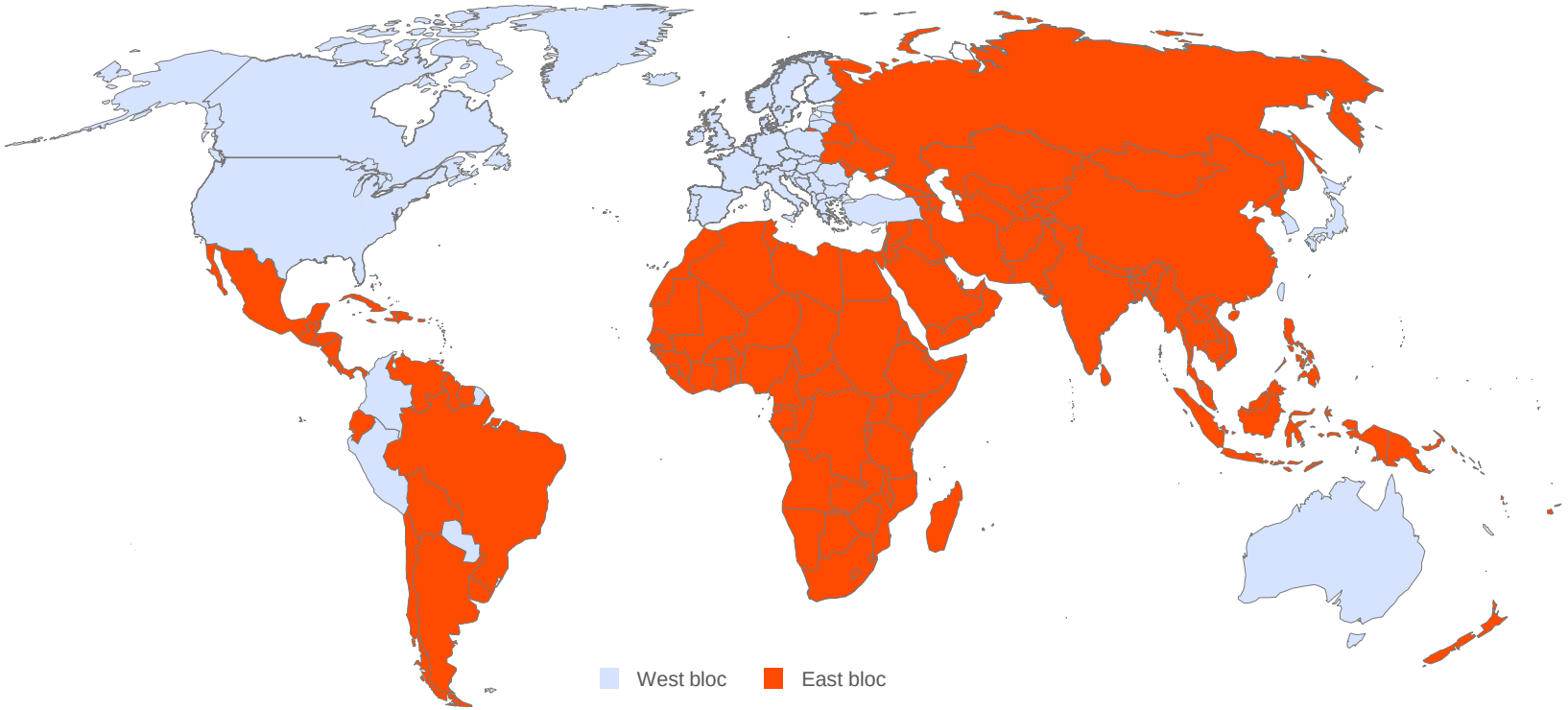
Source: ECB staff calculations based on ECB Corporate Telephone Survey.
Notes: Responses to "How has the location of your company's production/operations changed in the last five years and how do you expect it to evolve in the next five years?" Respondents could choose several replies.

Sourcing of inputs
(share of respondents)



Source: ECB staff calculations based on ECB Corporate Telephone Survey.
Notes: Responses to "How has the geographical distribution of your company's cross-border sourcing of inputs changed in the last five years and how do you expect it to evolve in the next five years?" Respondents could choose several replies.

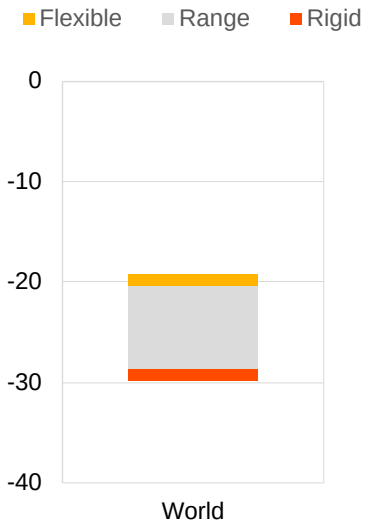
Geopolitical blocs



Notes: Mechanical allocation based on UN voting. Africa, Middle East, Ukraine, New Zealand, Israel, and Moldova belong to the “Rest of the World” aggregate in IO table and are allocated collectively

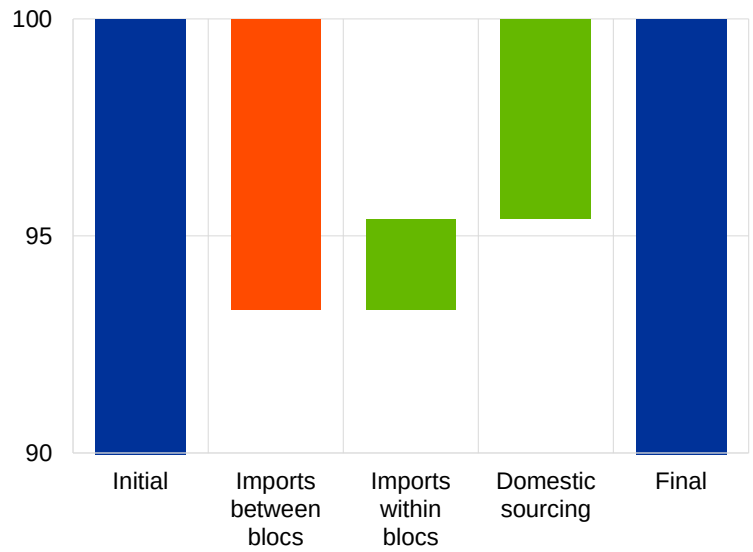
Trade effects

Real imports
(percentage deviation from steady state)



Sources: Baqaee and Farhi (2023), FPS, ADB MRIO, and ECB staff calculations.
Note: Non-linear impact simulated through 25 iterations of the log-linearized model.

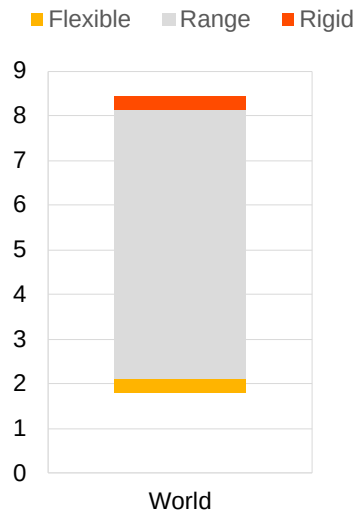
Sourcing of intermediate inputs
(percentage points, market share)



Sources: Baqaee and Farhi (2023), FPS, ADB MRIO, and ECB staff calculations.
Note: Non-linear impact simulated through 25 iterations of the log-linearized model. The red (green) bar indicates losses (gains) in market share.

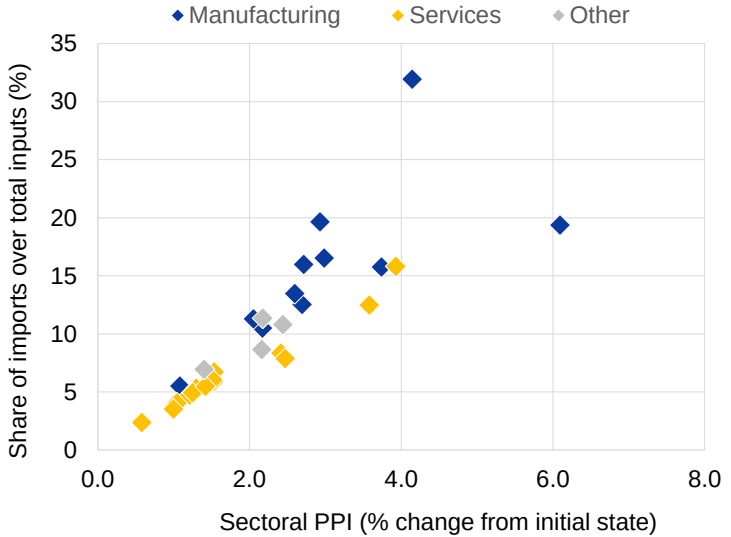
Price impact

Consumer prices
(percentage deviation from steady state)



Sources: Baqaee and Farhi (2023), FPS, ADB MRIO, and ECB staff calculations.
Note: Non-linear impact simulated through 25 iterations of the log-linearized model.

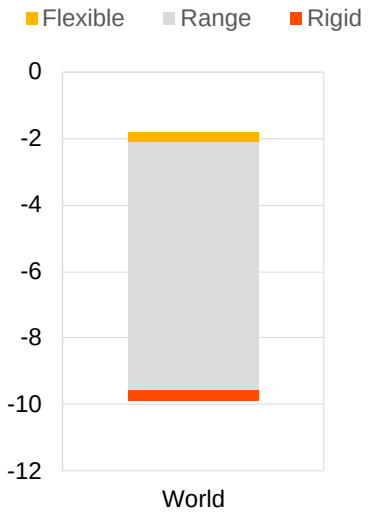
Sectoral producer prices
(x-axis = percentage deviation from steady state)



Sources: Baqaee and Farhi (2023), FPS, ADB MRIO, and ECB staff calculations.
Note: Non-linear impact simulated through 25 iterations of the log-linearized model.

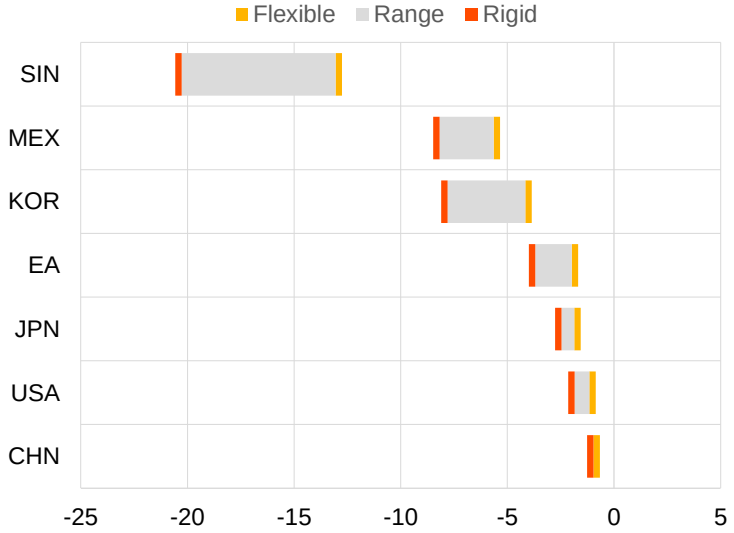
Welfare effects

Real GNE
(percentage deviation from steady state)



Sources: Baqaee and Farhi (2023), FPS, ADB MRIO, and ECB staff calculations.
Notes: Non-linear impact simulated through 25 iterations of the log-linearized model.
"GNE" = Gross National Expenditures.

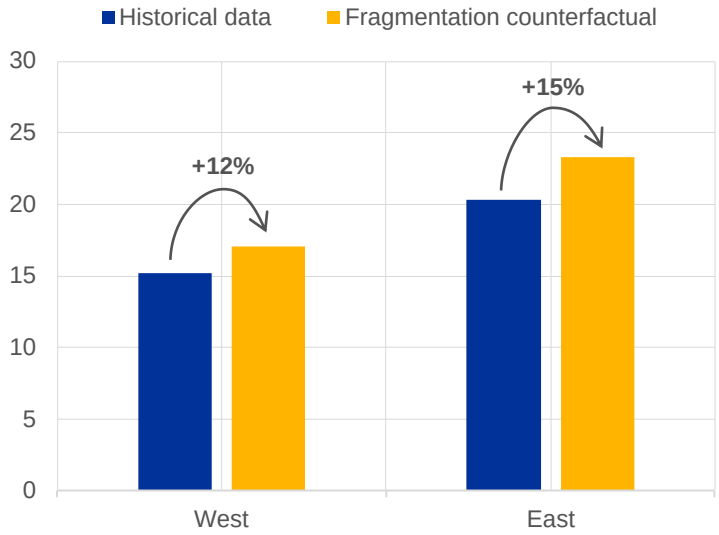
Country real GNE
(percentage deviation from steady state)



Sources: Baqaee and Farhi (2023), FPS, ADB MRIO, and ECB staff calculations.
Notes: Non-linear impact simulated through 25 iterations of the log-linearized model.
"GNE" = Gross National Expenditures.

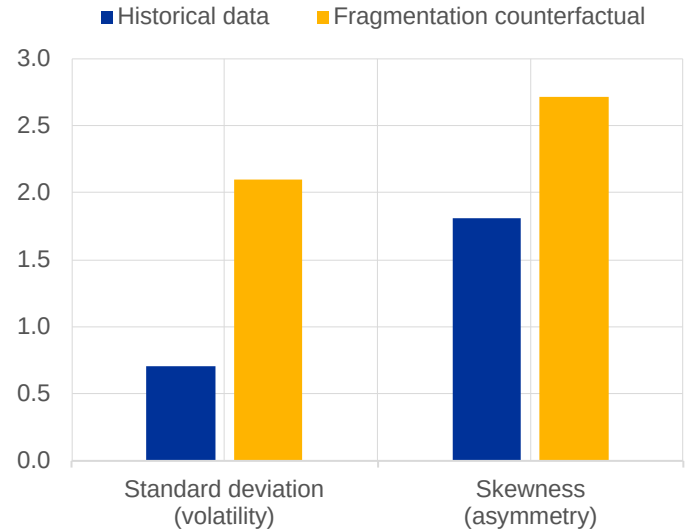
Shock propagation

Industrial production volatility
(standard deviation)



Sources: OECD ICIO, UNIDO, and ECB staff calculations.
Notes: Based on Boeckelmann, L., Imbs, J., and Pauwels, L. (2024). "(Most) Global and Country shocks are in fact Sector Shocks", *ECB working papers*, forthcoming. "Fragmentation counterfactual" is obtained by passing historical structural shocks (identified over 2006-2022) into a multi-country multi-sector model with fragmented trade flows.

Producer prices inflation
(cross-sectional moments)

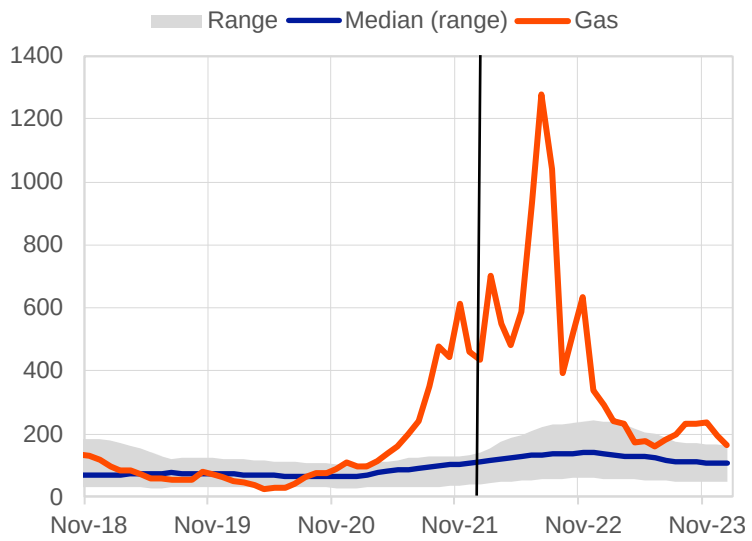


Sources: OECD ICIO, UNIDO, and ECB staff calculations.
Notes: Model-implied cross sectional price moments, average over time (2006-2022). Based on Boeckelmann, L., Imbs, J., and Pauwels, L. (2024). "(Most) Global and Country shocks are in fact Sector Shocks", *ECB working papers*, forthcoming. "Fragmentation counterfactual" is obtained by passing historical structural shocks (identified over 2006-2022) into a multi-country multi-sector model with fragmented trade flows.

Weaponizing supply chains

Gas

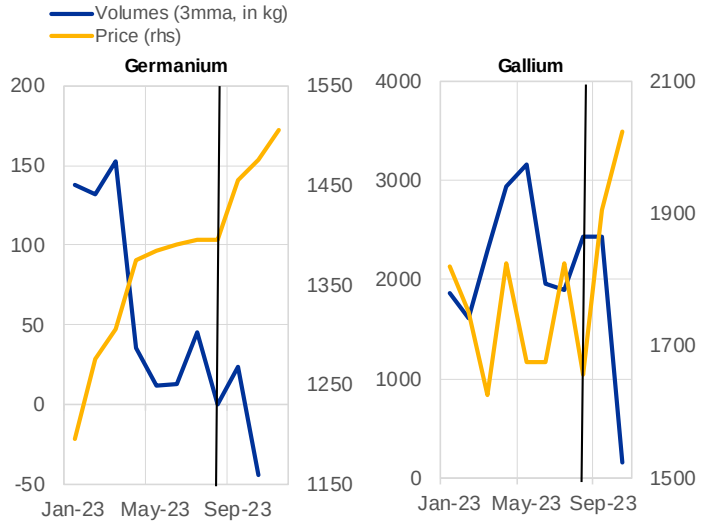
(price indices, 2010 = 100, 12-month moving average)



Sources: Refinitiv and ECB staff calculations.
Note: Price range across 14 critical raw materials: aluminium, cobalt, platinum, titanium, erbium, gadolinium, tantalum, bauxite, silicon metal, silver, gallium, neodymium, praseodymium, and terbium.

Germanium and gallium

(prices and exports from China)



Sources: Trade Data Monitor, Bloomberg, and ECB staff calculations.
Notes: Price for germanium in USD/kg. Price for gallium in CNY/kg. The vertical line corresponds to Chinese imposing export restrictions (August 2023).

Key take-aways

- **Geopolitical considerations** increasingly shaping trade relations towards friend-shoring

- **Static losses**: trade fragmentation as a **lose-lose situation** with welfare lower across all countries

- **Dynamic losses**
  - → Output and prices **more volatile** in a fragmented world than in the current state – even for same shocks
  - → Trade fragmentation likely to be characterized by **more frequent and acute shocks** to global supply chains

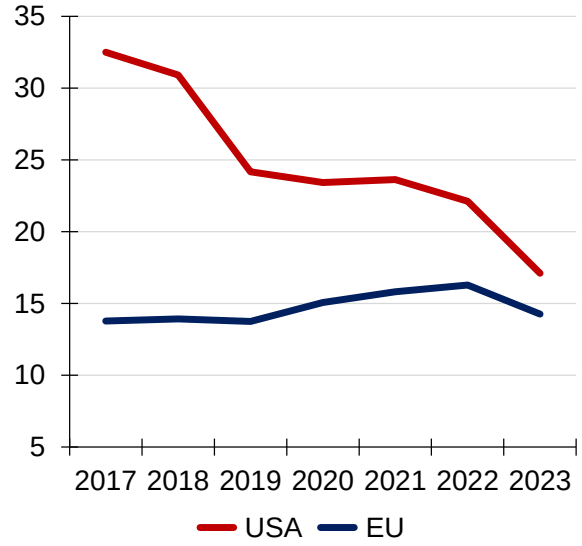
THANK YOU

- ECB firms' survey: https://www.ecb.europa.eu/pub/economic-bulletin/focus/2023/html/ecb.ebbox202307_01~2a0bcf0b48.en.html
- Trade fragmentation (ECB Bulletin): https://www.ecb.europa.eu/pub/economic-bulletin/focus/2023/html/ecb.ebbox202302_03~d4063f8791.en.html
- Trade fragmentation (working paper): https://www.ecb.europa.eu/pub/pdf/scpwps/ecb.wp2839~aaf35001a3.en.pdf
- Quantification of IRA: https://cepr.org/voxeu/columns/unfriendly-friends-trade-and-relocation-effects-us-inflation-reduction-act

Decoupling in hard data

Technological imports from China

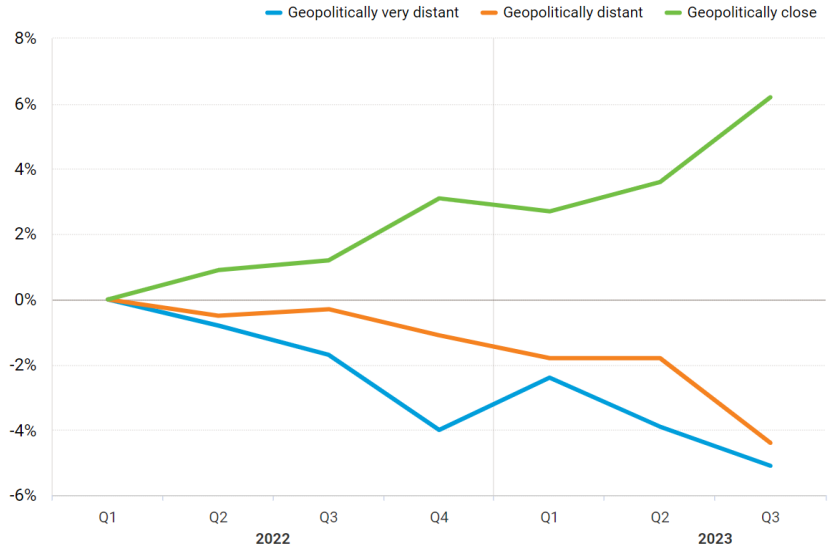
(share in total technological imports)



Sources: Trade Data Monitor and ECB staff calculations.

Trade share by geopolitical distance

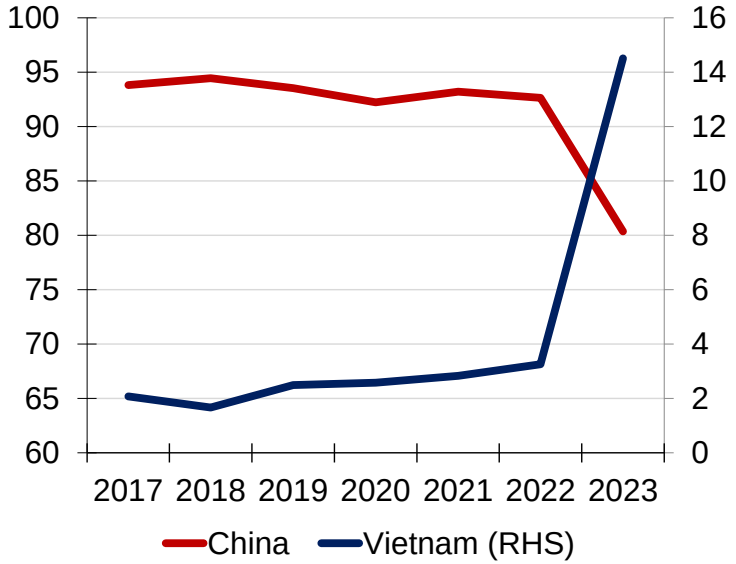
(percentage change since Q1 2022)



Source: UNCTAD.
Notes: Bilateral trade is categorized in 3 groups according to closeness of UN voting. Values are the change in trade share of each group relative to Q1 2022 as a basis. Excludes intra-EA trade.

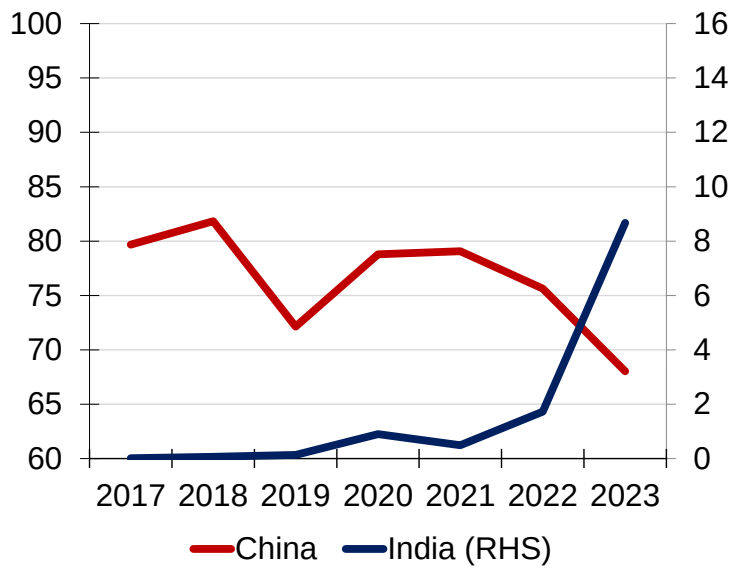
MNEs' strategies are reshaping global trade

US imports of Laptops, by origin
(imports, % share of total)



Sources: own elaboration based on TDM(2019)

US imports of Mobile phones, by origin
(imports, % share of total)

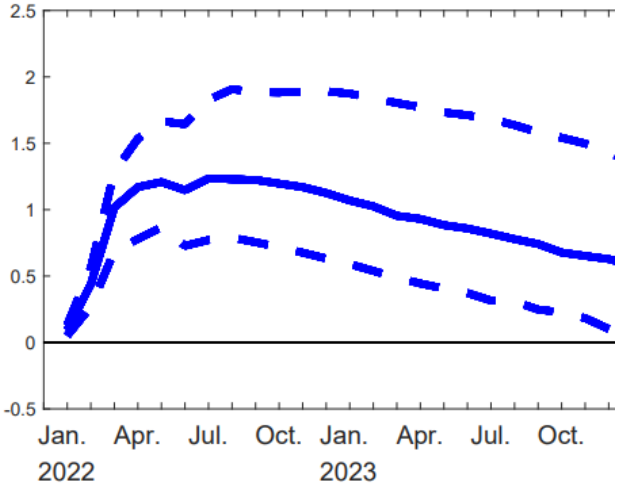


Sources: own elaboration based on TDM.

Impact of geopolitical risks (GPR)

Impact of GPR (Jan. to Apr. 2022)

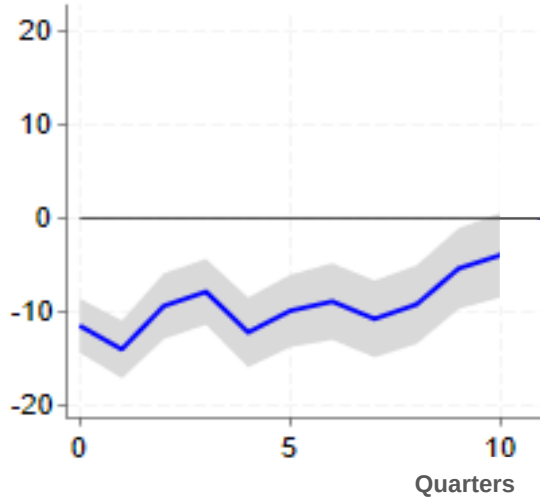
(world inflation, percentage points)



Source: Caldara et al. (2023)
Note: Impulse response to a rise in geopolitical risks sized to mimic the increase occurred between Jan. and Apr. 2022, estimated using a SVAR model. Sample is Jan. 1974 to Apr. 2022. The solid blue line plots central estimates; the dashed blue lines denote the 70 percent confidence interval. Variables are in deviation from a no-war baseline.

Response of trade volume to GPR

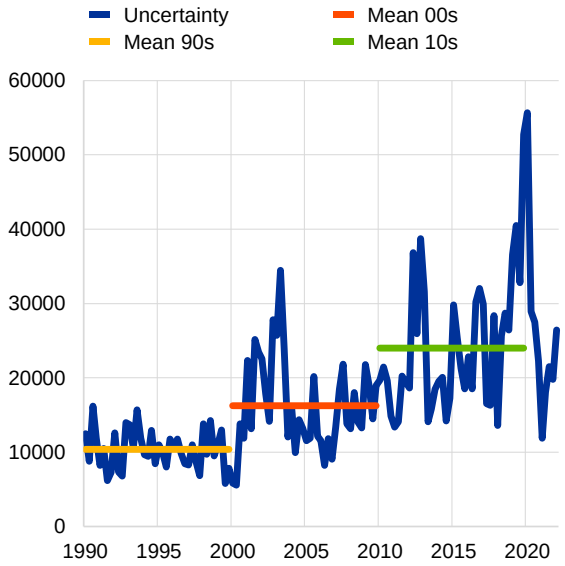
(panel of geopolitically-adverse countries, percentage points)



Source: Deutsche Bundesbank.
Notes: Impulse response to a 50% GPR shock when US sanctions are in place, obtained from local projections on a panel of imported products from 7 US trading partners voting no or abstaining in the vote on the March 2022 UN resolution on Ukraine. Grey bar denotes 95% confidence interval. Variables are in log-deviation from trend. Sample is 2000-2017.

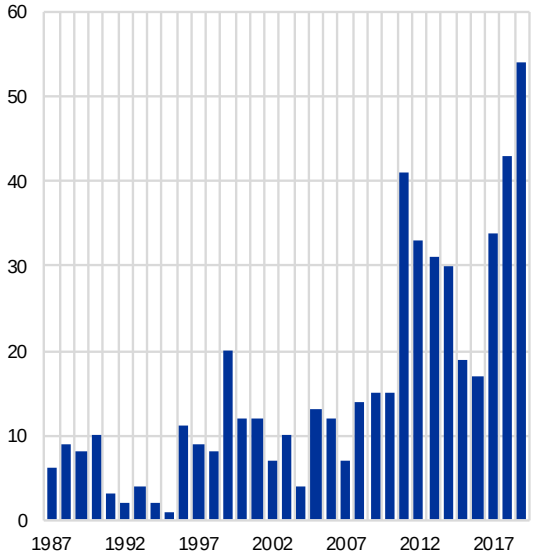
Dimensions of geopolitical risks

World uncertainty index
(GDP weighted average)



Source: Economic Policy Uncertainty Index.
Notes: The world uncertainty index is computed by counting the percentage of the word "uncertain" or its variants in the Economist Intelligence Unit country reports, according to Ahir et al. (2022).

Social unrest (IMF index, global)
(number of unrest events)

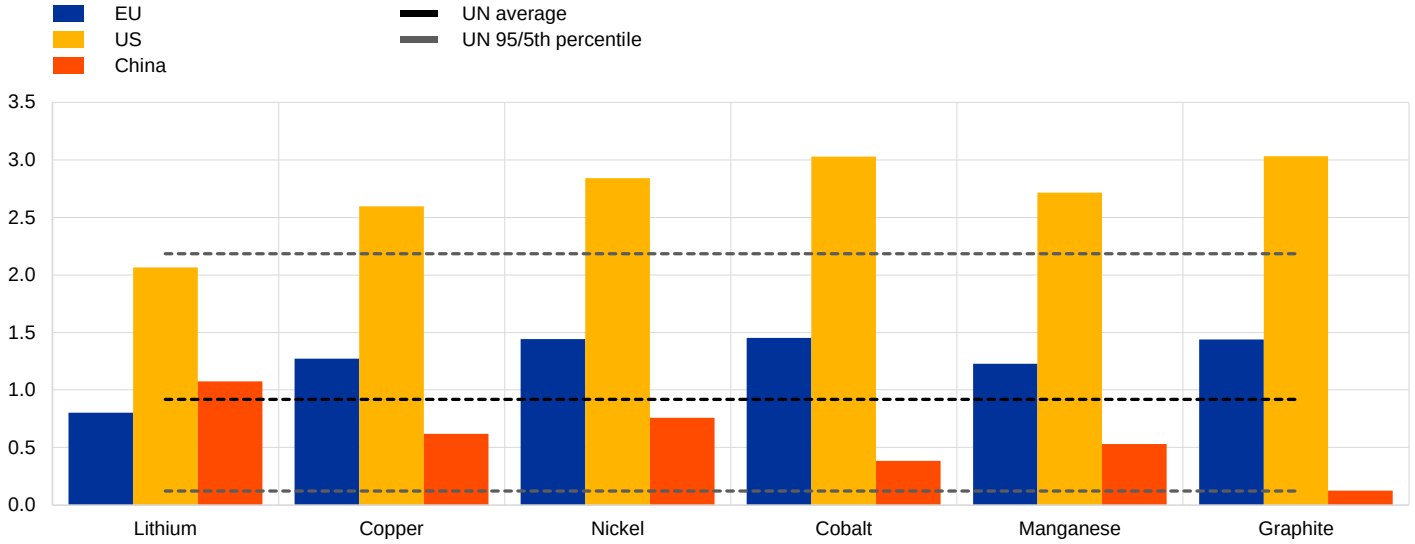


Source: International Monetary Fund .
Note: The frequency of unrest events is the number of countries that report unrest events, according to Barrett et al. (2020).

Resilience of supply for critical minerals

Distance from the EU, the US and China to mineral-mining countries

(index – higher value indicates higher disagreement)

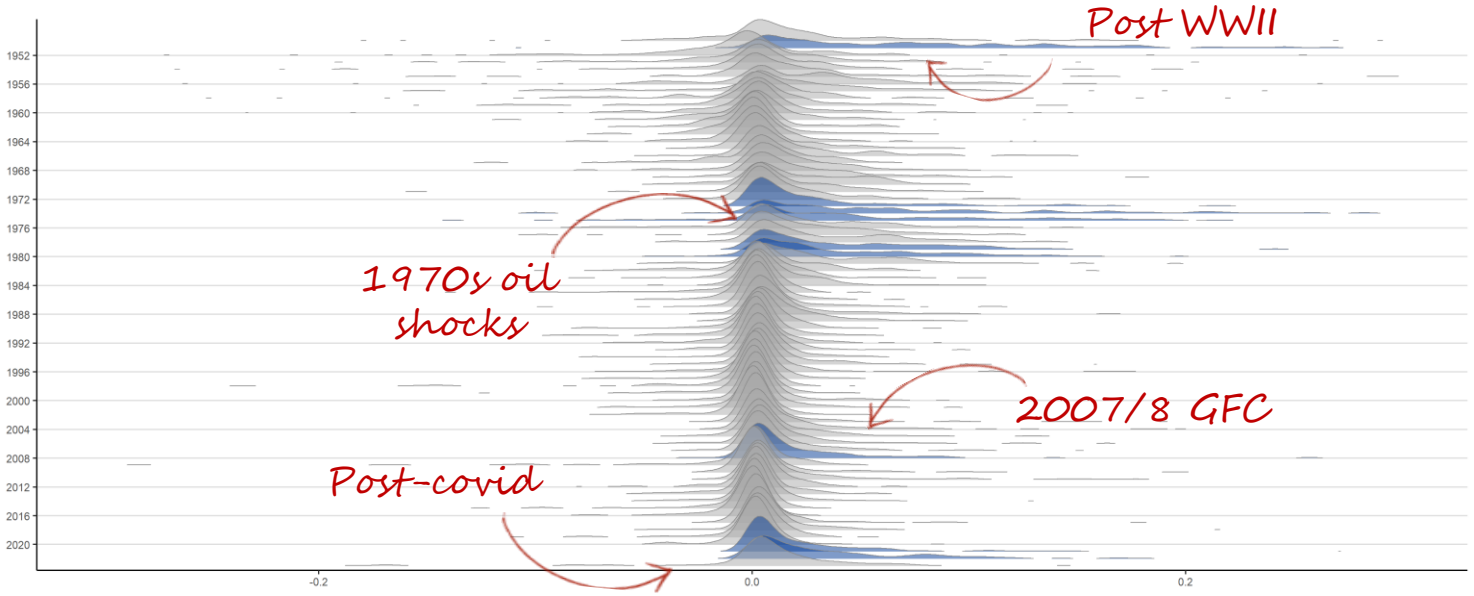


Sources: United States Geological Survey 2022, United Nations General Assembly Voting Data (Bailey, Strezhnev and Voeten, 2017) and ECB staff calculations.
Notes: Political disagreement between two countries is calculated as the distance between preference scores based on records of UN voting over the last 10 years. Each region's disagreement score with metals and minerals suppliers is calculated as the average of the region's disagreement with every supplier weighted by the market share of that supplier for every metal.

Variation in the distribution of price changes

Distribution of Producer Price Index sub-components

(year-on-year log changes, density)



Sources: Bureau of Labour Statistics and ECB staff calculations.

Notes: All four-digit sub-component series of All Commodity Producer Price Index aggregate. Monthly year-on-year log changes are averaged into yearly frequency for each sub-component (weighted by their relative importance, 2022). The weights have been rescaled to reflect an adjustment for the top one percent of sub-components. The period considered is 1950-2023. Distributions colored in blue denote the years where annual (average) PPI inflation was recorded to be one standard deviation above historical 1950-2030 PPI inflation (1951, 1973, 1974, 1975, 1979, 1980, 2008, 2021 and 2022).

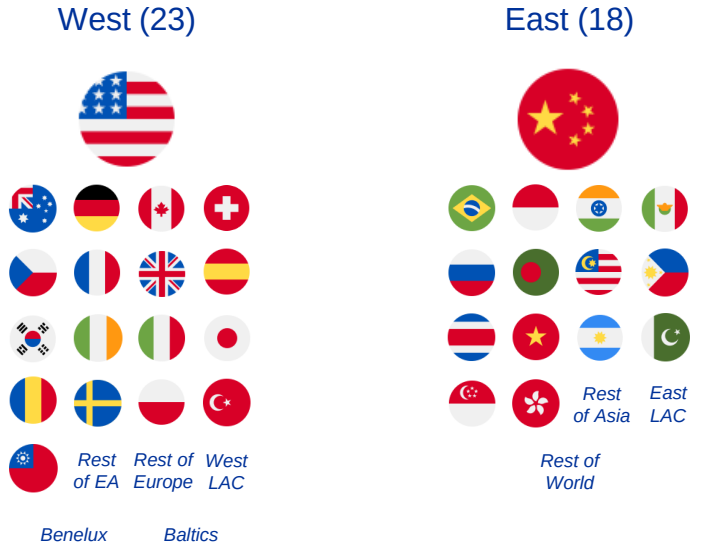
Latest observation: 2023 (average during Jan-Jul).

Accounting for rigidities

	Flexible	Rigid
Wage flexibility	• **Flexible** with exogenous (**constant**) supply of labour	• Sticky: **constant** with endogenous (**flexible**) supply of labour
Substitution elasticities	• 90% **upper** confidence band from Atalay (2017) across inputs • **Unitary elasticity** (Cobb-Douglas) across factors	• **Lower** estimates from Atalay (2017) across inputs • **Severe** elasticity of Bachmann et al. (2022) across factors

Geopolitical lines

- Based on the **Foreign Policy Similarity** database (Hage, 2017) measuring similarity of voting at the UN between country pairs
- Countries **mechanically allocated** to blocs depending on pairwise similarity with US and China
- Approach closely related to the **literature** (Goes and Bekker, 2022; Campos et al., 2023)

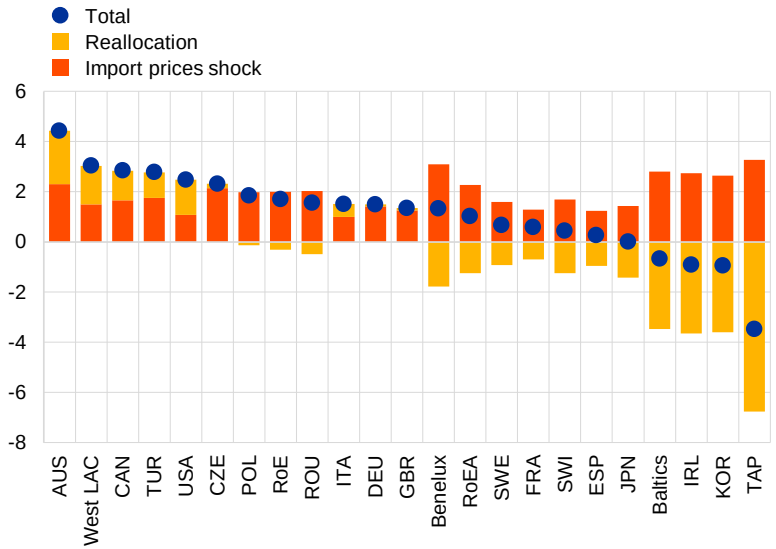


Notes: Benelux = Belgium, Netherlands, Luxembourg;
Rest of Europe = Bulgaria, Denmark, Hungary, Norway;
Rest of EA = Austria, Cyprus, Croatia, Finland, Greece, Malta, Portugal, Slovakia, Slovenia;
Baltics = Estonia, Latvia, Lithuania;
Rest of Asia = Kazakhstan, Mongolia, Fiji, Laos, Brunei, Bhutan, Kyrgyz Republic, Cambodia, Maldives, Nepal, Sri Lanka;
West LAC (Latin America) = Colombia, Paraguay, Peru
East LAC (Latin America) = Bolivia, Chile, Ecuador, Uruguay, Venezuela

CPI decomposition

CPI decomposition (central, flexible)

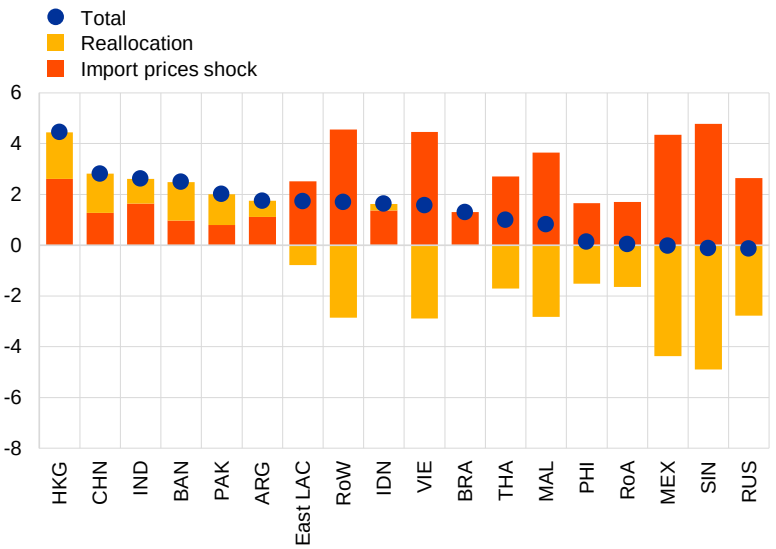
(West, p.p., % change from initial state)



Sources: Baqaee and Fahri (2023), Foreign Policy Similarity database, ECB staff calculations
Notes: Non-linear impact simulated through 25 iterations of the log-linearized model

CPI decomposition (central, flexible)

(East, p.p., % change from initial state)

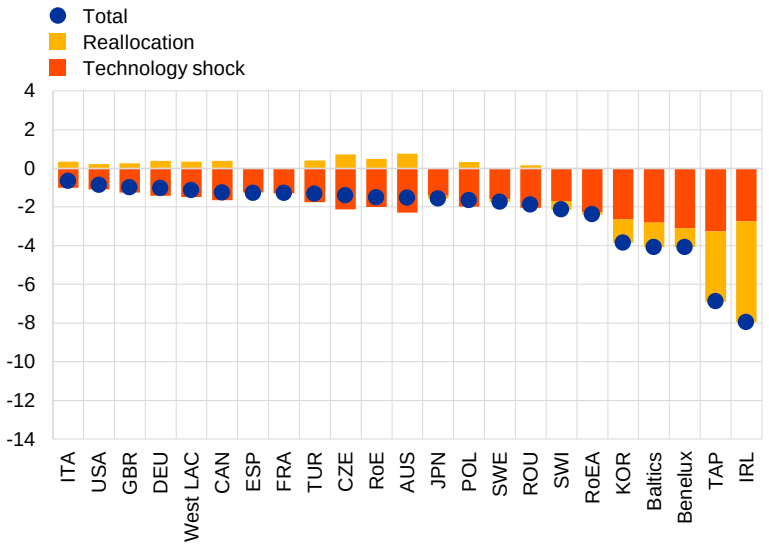


Sources: Baqaee and Fahri (2023), Foreign Policy Similarity database, ECB staff calculations
Notes: Non-linear impact simulated through 25 iterations of the log-linearized model

GNE decomposition

GNE decomposition (central, flexible)

(West, p.p., % change from initial state)



Sources: Baqaee and Fahri (2023), Foreign Policy Similarity database, ECB staff calculations
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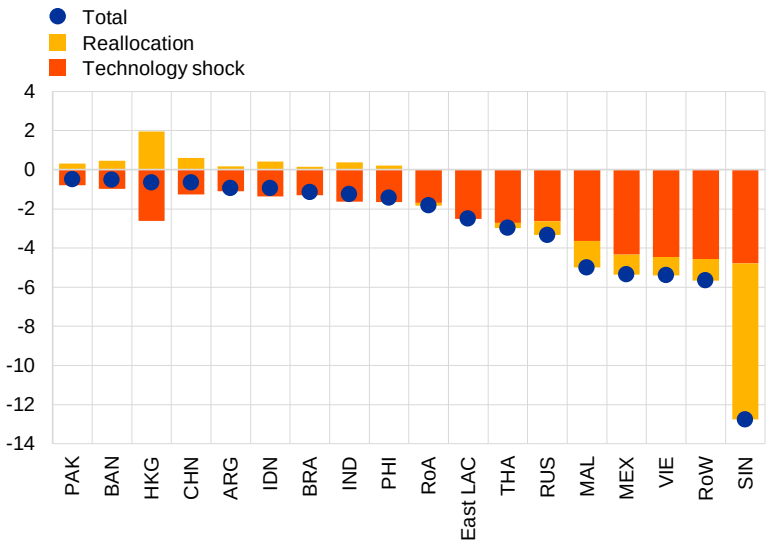
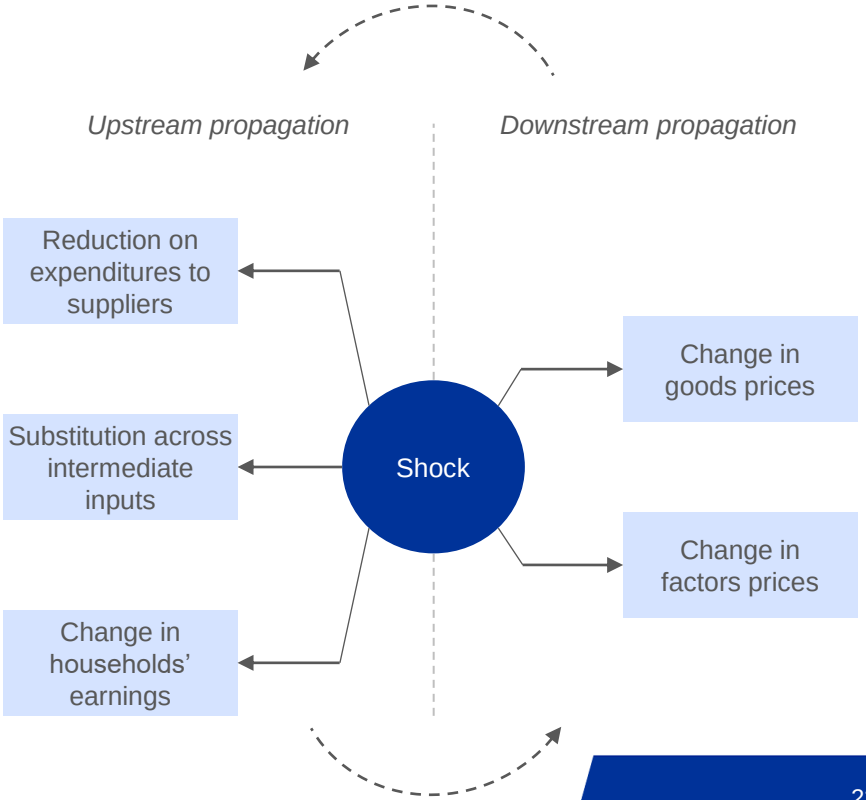
GNE decomposition (central, flexible)

(East, p.p., % change from initial state)



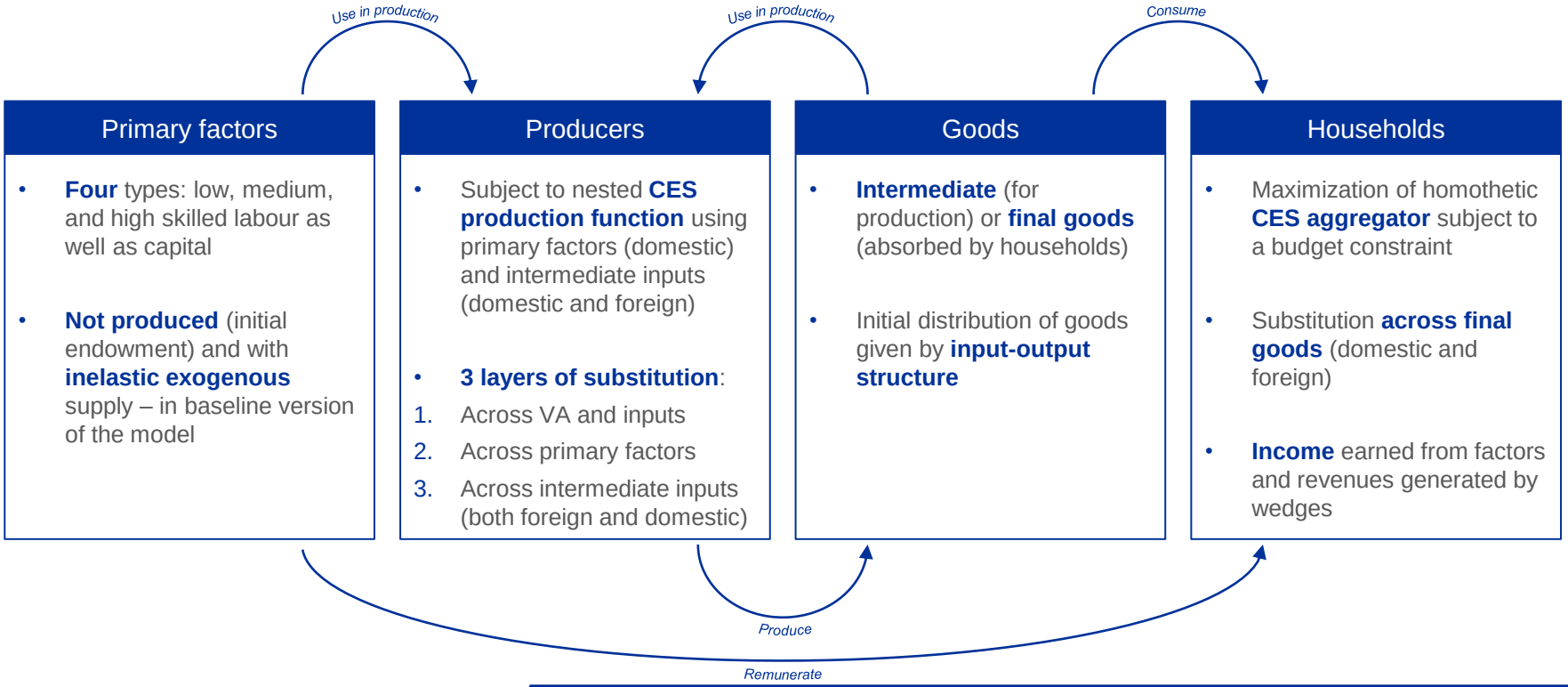
Sources: Baqaee and Fahri (2023), Foreign Policy Similarity database, ECB staff calculations
Notes: Non-linear impact simulated through 25 iterations of the log-linearized model

Baqaee-Fahri model



- **41 countries / 30 sectors** model accounting for global sectoral interlinkages
- Accounts for **non-linearities** while other workhorse trade models rely on linear production functions
- Propagation both to **downstream consumers** (prices) and to **upstream suppliers** (revenues)
- Impact dependent on the **direct and indirect linkages** given by the input-output structure

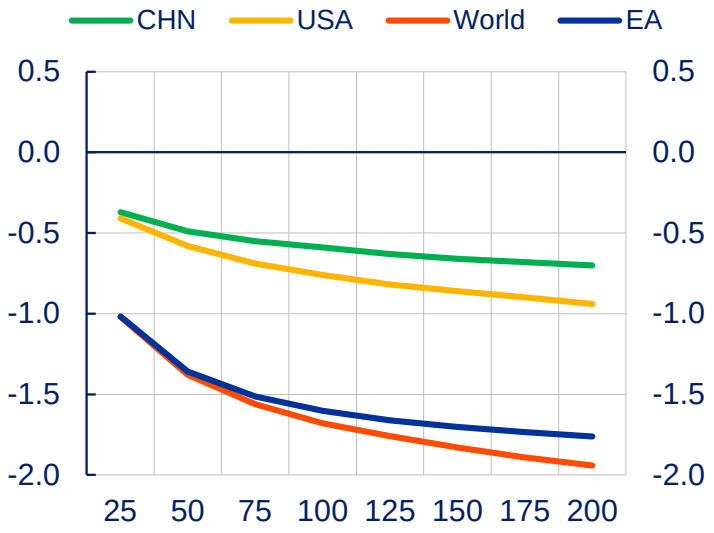
Baqaee-Fahri – main structure



Robustness

Real GNE impact

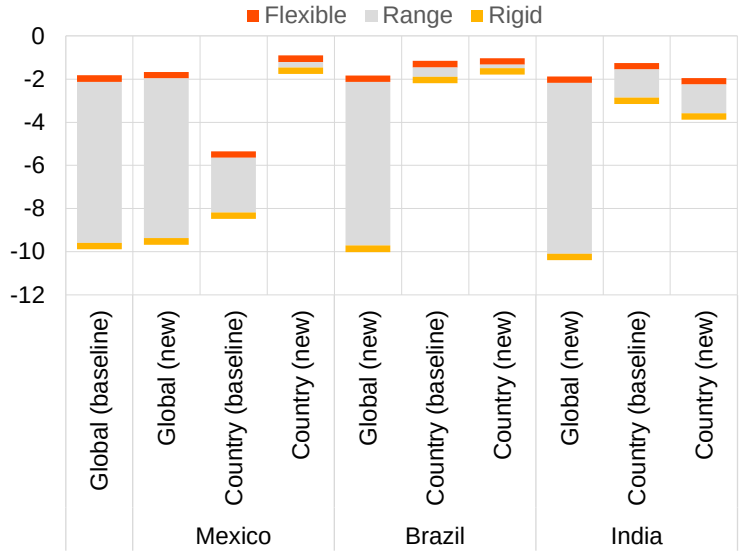
(% change from initial state, by magnitude of iceberg trade costs)



Sources: Baqaee and Fahri (2023), Foreign Policy Similarity database, ECB staff calculations
Notes: Non-linear impact simulated through 25 iterations of the log-linearized model

Real GNE losses under alternative blocs

(% change from initial state)



Sources: Baqaee and Fahri (2023), Foreign Policy Similarity database, ECB staff calculations
Notes: Non-linear impact simulated through 25 iterations of the log-linearized model