The Economic Costs of Supply Chain Decoupling

ASSA conference

05/01/2024

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Motivation and key findings

- Increasing role of *geopolitical considerations* in global trade relations

- Growing literature on the impact of a *reversal of GVC integration*

- We quantify a range of *fragmentation scenarios* using Baqae and Farhi (2023)
  - Accounting for rigidities
  - Impact beyond welfare (prices, trade, wages)
Baqee-Farhi 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
Uncertain decoupling

- Increase in **iceberg trade costs** (non-tariffs barriers)

- Shock on trade in **intermediates** but not in final products – reflecting recent friend-shoring policies

- **150 p.p.** increase as a stylised exercise to shut down GVC – in line with literature (Bachmann et al, 2022; Goes and Bekker, 2022)
Heterogenous country 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 ADB IO table and are allocated collectively.
Accounting for rigidities

Flexible

- **Flexible** with exogenous *(constant)* supply of labour

Rigid

- **Sticky**: *constant* with endogenous *(flexible)* supply of labour

Wage flexibility

- 90% **upper** confidence band from Atalay (2017) across inputs
- **Unitary elasticity** *(Cobb-Douglas)* across factors

Substitution elasticities

- **Lower** estimates from Atalay (2017) across inputs
- **Severe** elasticity of Bachmann et al. (2022) across factors
Trade effects

Real imports
(World, percentage deviation from steady state)

Sourcing of intermediate inputs
(World, 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 chart refers to the central scenario (East-West decoupling generalized across sectors) under the flexible setup.
Prices and wages impact

**Consumer prices**
(World, percentage deviation from steady state)

**Wages (central scenario, flexible setup)**
(percentage deviation from steady state, relative to medium-skilled)

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.
Sector and country heterogeneities

**Sectoral prices (central scenario, flexible setup)**
(World, 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.

**Country consumer prices (central scenario)**
(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
(World, percentage deviation from steady state)

Country real GNE (central scenario)
(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.
Conclusion

• Welfare losses in line with literature for the *flexible* setup but magnified when accounting for rigidities

• Lose-lose situation with all countries losing welfare across all scenarios – along with global trade losses

• Fragmentation also having an *upward* effect on price levels
THANK YOU


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Slow-balisation

**GVC related trade**
(share of total trade)

**Trade restrictions and friend-shoring**
(number and index)

Sources: ECB staff, WIOD, OECD TiVA, Trade Data Monitor
Notes: Trade flows are considered related to GVC if they cross at least two borders before reaching the final consumer – as per the definition in Hummels et al. (2001)

Sources: NL Analytics, Global Trade Alert, and ECB staff calculations.
Notes: Frequency of the terms "reshoring", "nearshoring" and "friend-shoring" occurrence in firms' earnings calls. Index 2015 Q1=100. Trade restrictions refer to number of harmful interventions.
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;
Trade by category

Trade by category *(central scenario)*
(World, % change from initial state)

Sources: Baqae 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

CPI decomposition (central, flexible)
(West, p.p., % change from initial state)

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)

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

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

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

General framework

- Multi-country multi-sector model accounting for **global production networks**
- Two types of **trade barriers**: iceberg trade costs (akin to transportation costs) and tariffs
- **EXT extension** of model:
  - Exploration of rigidities to model **transition effects**
  - Estimation of **various variables** (GNE, trade flows, prices, wages)
  - Calibration with up-to-date Input Output data covering 75 countries and 30 sectors

Comparative advantages

- Design of **tailored scenarios**:
  - Different trade barriers, types of goods (intermediate or final), and bilateral country-sector pairs
  - Multiple extensions for rigidities (e.g. sticky wages)
- **Non-linear** production functions – can be viewed as generalization of usual models such as Caliendo and Parro (2015) using Cobb-Douglas functions

Limitations

- **Steady-state** model (no dynamics)
- No endogenous response of **productivity**
- No business cycle or financial **amplification effects**
- Uncertainty around calibration of elasticities of **substitution**
Baqee-Fahri – main structure

**Primary factors**
- Four types: low, medium, and high skilled labour as well as capital
- Not produced (initial endowment) and with inelastic exogenous supply – in baseline version of the model

**Producers**
- Subject to nested CES production function using primary factors (domestic) and intermediate inputs (domestic and foreign)
- 3 layers of substitution:
  1. Across VA and inputs
  2. Across primary factors
  3. Across intermediate inputs (both foreign and domestic)

**Goods**
- Intermediate (for production) or final goods (absorbed by households)
- Initial distribution of goods given by input-output structure

**Households**
- Maximization of homothetic CES aggregator subject to a budget constraint
- Substitution across final goods (domestic and foreign)
- Income earned from factors and revenues generated by wedges
New Input-Output structure

**Source**
- WIOD
- 2008

**Countries**
- 41
- Low coverage of emerging
- Uneven split between East (7) and West (34)

**Factors**
- 4 factors (capital, low-, medium-, high-skilled labour)
- No source of labour split in Baqaee and Fahri (2023)

**Updated**
- **ADB**: “extended” WIOD with similar structure but more extensive coverage
- **2017** – rather than 2021 due to lower country coverage and Covid distortions

**Countries**
- 73 in initial ADB – aggregated into 41 due to computation issues
- Grouping of **smallest** countries
- Grouping within same bloc and with **broadly similar exposure** to other bloc
- Keeping initial ADB **East-West split** (55% West bloc)

**Factors**
- For WIOD countries, **country-sector- specific** split between capital and low- / medium- / high-skilled labour based on Baqaee and Fahri (2023)
- For non-WIOD countries, **averages per sector** split between capital and low- / medium- / high-skilled labour, across WIOD countries
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.
## Summary of literature

### Modelling framework

- **Eaton-Kortum** class of multi-country multi-sector models (Caliendo and Parro, 2015; Antras and Chor, 2018) sometimes with **addons** on labour mobility and knowledge diffusion
- **Large macroeconomic models** (OECD, WB)
- **Other** methods (HEM, gravity model, GTAP)

### Calibration of scenario

<table>
<thead>
<tr>
<th>Variables shocked</th>
<th>Geography</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Iceberg trade costs</strong> and/or tariffs increased by various degrees (10% to infinity)</td>
<td><strong>Global</strong> in most cases</td>
</tr>
<tr>
<td>Iceberg trade costs shocks to <strong>intermediate goods</strong> with some extensions to all trade (incl. final goods) – tariffs in general applied to all imports (intermediate and final)</td>
<td>Breakdown by <strong>geopolitical blocs</strong> for some (West vs. East; high-income vs. rest of the world; US vs. China; EU vs. rest of the world) with the presence of a neutral bloc in some papers</td>
</tr>
<tr>
<td>Some adding national <strong>subsidies</strong> (1% GDP) and lowered import <strong>elasticities</strong> (by 50%)</td>
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### Results

- **Welfare losses** at global level (1-5% in general)
- Losses in all individual economies with **small open economies** more reliant on GVCs more affected (up to 40% in some cases)
- Renationalization of GVCs translating into **lower resilience** to shocks
## Closely related papers

<table>
<thead>
<tr>
<th>Modelling framework</th>
<th>Calibration of scenario</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eppinger et al. (2021)</td>
<td>Iceberg trade costs for global trade in intermediate goods set to infinity (GVC shutdown)</td>
<td>Welfare losses between 2.5% (US) and 38% (LU)</td>
</tr>
<tr>
<td>Felbermayr et al. (2022)</td>
<td>Doubling of non-tariff barriers on imports across all sectors between US allies and BRIC</td>
<td>Almost zero bilateral trade</td>
</tr>
<tr>
<td>Goes and Bekker (2022)</td>
<td>Increase in iceberg trade costs (+160 p.p.) or in tariffs (+32 p.p.) between West and East blocs</td>
<td>Global welfare losses of 5%</td>
</tr>
<tr>
<td>Campos et al. (2022)</td>
<td>Increase in trade restrictions (MATR) between West and East, but with neutral bloc</td>
<td>Trade reduced by 20% to 50%</td>
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</table>

- **Antras and Chor (2018)** with imperfect intersectoral mobility of labour
- **Iceberg trade costs**
- **Doubling of non-tariff barriers on imports**
- **Gravity trade model**
- **Increase in iceberg trade costs**
- **Increase in trade restrictions (MATR)**

- **Caliendo and Parro (2015)**
- **Endogenous knowledge diffusion**
- **Almost zero** bilateral trade
- **Welfare losses** -3.8% in BRIC and -1.2% in West bloc

- **Doubling of non-tariff barriers on imports**
- **Increase in iceberg trade costs**
- **Increase in trade restrictions (MATR)**

- **Welfare losses** largely higher with knowledge diffusion

- **Welfare losses** between 2.5% (US) and 38% (LU)
- **Stronger effect** when shocking intermediate than final goods

- **Almost zero** bilateral trade
- **Welfare losses** -3.8% in BRIC and -1.2% in West bloc

- **Global welfare losses** of 5%
- **Losses** largely higher with knowledge diffusion

- **Trade reduced** by 20% to 50%