On the Design of Effective Sanctions: 
The Case of Bans on Exports to Russia

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Motivation

In response to the Russian invasion of Ukraine, the EU, the US, and their allies have imposed comprehensive sanctions on Russia:
- Financial sanctions
- Sanctions on individuals
- Restrictions on imports from Russia
- Restrictions on exports to Russia
Importance of Coalition for Russian Imports

Country Shares of Russian Imports

- EU: 41.0%
- USA: 2.3%
- Other coalition members: 9.1%
- ROW: 22.0%
- CHN: 25.7%

- Coalition: EU, US, AUS, CAN, GBR, JPN, KOR, TWN,
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**Pre-crisis**
- EU-share in Russian imports: 40%;
  Russian share in EU exports: 2%
- EU share in Russian oil (gas) exports: 50% (75%);
  Russian share in EU oil (gas) imports: 25% (40%)

Source: Own illustration based on www.atlas.cid.harvard.edu/
Importance of Coalition for Russian Imports

Share of Coalition in Russian Imports Across Products

Source: Own illustration based on www.atlas.cid.harvard.edu/
Share of Products Sanctioned

Source: Own illustration based on www.globaltradealert.org/
Share of 6-digit HS Products within 2-digit HS Chapter Sanctioned by EU

Source: Own illustration based on www.globaltradealert.org/
Research Questions

- What is the impact of bans on exports?
- How can they be designed most effectively?
- At the level of 5000 6-digit HS products?
- What are the benefits from improved coordination of sanctions?
Overview

1. Compare sanctioned vs non-sanctioned products
2. Derive theoretically-grounded criterion that can inform bans on exports at a detailed level of disaggregation using readily available data
   - Apply to Russia: identify target products for additional export restrictions
   - Cost to sanctioned country are highly convex in market share of sanctioners
3. Quantitative analysis:
   - Export bans are generally effective: Estimated welfare loss to Russia $\sim 100$ times larger than for coalition countries
   - Re-designing sanctions based on theoretical criterion would increase welfare loss to Russia by $\sim 60\%$ with little to no effect on coalition
4. Conclusion
Literature

Quantitative trade models

- Caliendo and Parro (2015); Costinot and Rodriguez-Clare (2014); Baqae and Farhi (2019, 2021); Cakmakli et al (2021)

Literature on sanctions

- Surveys: Kaempfer and Lowenberg (2007); Peksen (2019); Felbermayr et al. (2021)

Sanctions in Trade Models, e.g.

- Crozet and Hinz (2020); Hinz and Monastyrenko (2022); Bachmann et al. (2022); Evenett and Muendler (2022a,b); Felbermayr et al. (2022); Sturm (2022); Imbs and Pauwels (2022); Chowdry et al (2022)
Broadly speaking, an export ban by a coalition of countries should have a large impact on the Russian economy if it affects products that are important for the Russian economy where Russia relies heavily on imports from Coalition countries these imports are difficult to replace
- local production or imports of the same product from third countries
- substituted by other products
- substituted over time (depending on time horizon of sanctions)
Overview of Existing EU Sanctions

Russian Imports

- **mean(Total imports of Russia by HS6d)**
  - **Sanctioned:** No, Yes

- **Sh Coalition in RUS IM**
  - **w. mean(Coalition share of Russian imports by HS6d)**
  - **Sanctioned:** No, Yes

- **Exp/Imp Ratio RUS**
  - **median(Export-import ratio Russia by HS6d)**
  - **Sanctioned:** No, Yes

- **Elasticity of Subst.**
  - **w. mean(Elasticity of substitution within HS6d (winsorized))**
  - **Sanctioned:** No, Yes

Overview of Existing EU Sanctions

**Russian Imports**
- Mean (Total imports of Russia by HS6d)
  - Sanctioned: No
  - Sanctioned: Yes

**Sh Coalition in RUS IM**
- Weighted mean (Coalition share of Russian imports by HS6d)
  - Sanctioned: No
  - Sanctioned: Yes

Source: Own illustration based on www.globaltradealert.org/, www.atlas.cid.harvard.edu/, Fontagné et al (2022)
Overview of Existing EU Sanctions

- **Russian Imports**
- **Sh Coalition in RUS IM**
- **Exp/Imp Ratio RUS**
- **Elasticity of Subst.**

Source: Own illustration based on www.globaltradealert.org/, www.atlas.cid.harvard.edu/, Fontagné et al (2022)
Overview of Existing EU Sanctions

**Sh. Cons. Goods**

![Bar chart for Sh. Cons. Goods]

**Sh. Intermediates**

![Bar chart for Sh. Intermediates]

**Sh. Capital Goods**

![Bar chart for Sh. Capital Goods]

Source: Own illustration based on www.globaltradealert.org/, www.atlas.cid.harvard.edu/, Broad Economic Categories
Previous discussions suggest room for increasing effectiveness of sanctions
Can we formalize these arguments?
How to prioritize different dimensions?
→ Build on Baqae and Farhi (2019, 2021) to analytically characterize the economic costs to a sanctioned country from a ban on exports of a product to this country
Economic Environment

- ‘Armington’-type model with a production hierarchy
Main Result

Proposition

Consider a ban on exports to Russia of product $g$ by coalition countries. The impact on the Russian economy of this ban is

$$\Delta \ln(Y) \approx \lambda^g \left[ 1 \sigma^g - 1 \ln (1 - \Omega^g_{CO}) + (\theta^g - 1) \left( 1 \sigma^g - 1 \ln (1 - \Omega^g_{CO}) \right)^2 \right]$$  \hspace{1cm} (1)

- $\lambda^g$: Absorption (Domar-weight) of $g$
- $\Omega^g_{CO}$: Coalition market-share for $g$ in Russia
- $\sigma^g$: Elasticity of substitution across varieties of $g$
- $\theta^g$: elasticity of substitution across inputs of the downstream buyers of $g$
  
  (consumer goods vs intermediates)
**Corollary**

There are large gains from coordinating sanctions among a broad coalition of countries and from sanctioning products with a large market share of the coalition in Russia.

\[ \propto \Delta \ln(Y) \]

Parameters: \( \sigma^g = 5, \theta^g = 0.2 \)
Taking Proposition 1 to data

Data

- $\lambda^g$, $\Omega_{CO}^g$: atlas.cid.harvard.edu and ITPD-E
- $\sigma^g$: Fontagné et al (2022)
- $\theta^g$: 1 for consumer goods, .2 for intermediates (based on Broad Economic Categories, rev. 4; Atalay (2017); Boehm et al. (2019); Herrendorf et al. (2013))
EU Sanctions vs Product Ranking Based on (1)
EU Sanctions vs Product Ranking by Cost per Foregone Exports
Quantitative Analysis

- Analytical results: sanctioning one product at a time & ignore cost to coalition

→ Quantitative Analysis based on WIOD data
  - Multi-industry ‘Armington’ with international input-output linkages (at WIOD level) and sector-specific labor
  - Industry-level trade-cost shocks on exports to Russia
    - Same direct effect on Russian industry-level price indices as export bans in baseline economy with ∼ 5000 products

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Description</th>
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<tr>
<td>$\sigma^g$</td>
<td>Fontagné et al (2022)</td>
<td>Elasticity of substitution across HS-6 level varieties</td>
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<td>$\theta^d$</td>
<td>Caliendo and Parro (2015)</td>
<td>Elast. of substitution across HS-6 level products in aggregation to WIOD industries</td>
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<tr>
<td>$\xi^d$</td>
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<td>Elasticity of substitution across intermediate inputs</td>
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<td>$\phi$</td>
<td>0.6</td>
<td>Elasticity of substitution between labor and intermediates</td>
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<tr>
<td>$\epsilon^f$</td>
<td>1</td>
<td>Elasticity of substitution between sectors in consumption</td>
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</tbody>
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Quantitative Results

- Current: 0.01%
- EU Sanctions: 0.5%
- US Sanctions: 0.9%
- EU+US+Optimal: 0.8%
- Optimal Sanctions: 0.7%
- 150% Optimal: 1.7%

Loss (Billion USD)
Discussion and Conclusion

- Theoretically-grounded, readily implementable criterion that helps targeting export bans at a detailed level of dis-aggregation
- Highlights importance of coordinated sanctions among broad coalition
- Quantitative analysis of sanctions against Russia:
  - Export bans very effective policy instrument for sanctions
  - Improved coordination and concentration on products with highest impact on Russia could increase cost to Russia by $\sim 60\%$ with little to no-effect on coalition
Focus on economic costs

Important dimension

Trade sanctions were ‘designed to maximise the negative impact of the sanctions for the Russian economy while limiting the consequences for EU businesses and citizens’ (European Council and Council of the EU, 2022)

Other dimensions are important as well, e.g.

- Disrupting war machinery and energy sector
- Harming elites vis-à-vis general population
- Political economics
- Re-exports
- Retaliation