Global Reallocations in the US-China Trade War

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December 2023
Motivation

- In 2018-19, US-China engaged in a trade war, taxing $450b of annual trade
  - thousands of goods tariffed, avg US tariffs from about 4% to 25%
  - US and China tariffs targeted 3.6% of US GDP and 5.5% of China GDP

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- This paper: How are bystanders' exports affected?

- Trade war is a natural experiment to understand the key forces driving world trade
  - Substitution/complementarities?
  - Scale?
  - Specialization?
This Paper

1. Framework to guide empirical analysis that captures these elements
2. Estimate impacts of tariffs on bystanders’ exports to US, CH, rest of world (RW)
3. Examine possible forces driving the responses
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Method:
- model motivates product-level regressions to estimate impact of trade-war tariffs on countries’ exports
- ...allowing for country-, sector-, and size-specific tariff responses
Findings

1. Bystanders increased exports to US, no change to CH, increased to RW
   - trade war created net trade opportunities, rather than re-shuffling trade across destinations

2. Cross-country het. in export growth in tariffed products (relative to untaxed)
   - avg export growth in taxed products (relative to untaxed) is 6.5%, sd 6.1%
   - sd is just 1.4% under homogenous tariff elasticities

3. Country component of tariff elasticities explains 80.5% of export growth variation
   - size and sector component of tariff elasticities account for rest

4. Model reveals how to infer supply- and demand-forces driving country response
   - countries classified as complements or substitutes of US/China, and
   - MEX, TWN, COL, UKR operate along downward supply
   - MEX, TWN: beneficiaries bc they substitute US and China
   - COL, UKR: not beneficiaries bc they complement US and China
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Related Literature

- **Interdependency across export destinations**
  - Morales et al 19, Alfaro et al 23, Alumnia et al 18, Mau 17, Flaaen et al 20, Albornoz et al 21

- **Cross-country variation in trade elasticities**
  - Anderson VW 03, Eaton Kortum 02, Costinot et al 12, Caliendo Parro 15, Adao et al 17, Lind Ramondo 18

- **Scale economies**
  - Antweiler Trefler 02, Costinot et al 19, Bartelme et al 19, Lashkaripir Lugovskyy 22

- **US-China Trade War**
  - Amiti et al. 19, Fajgelbaum et al. 20, Cavallo et al. 21, Flaaen et al. 20, Flaaen Pierce 19, Waugh 19
Framework

- Ricardian-Armington trade model
- Translog aggregator of varieties (origins) of product $\omega$ from sector $j$ in country $n$:

$$s^n_{i\omega} = a^n_{i\omega} + \sum_{i' \in I} \sigma^j_{i'i} \ln p^n_{i'i\omega}$$

- with prices $p^n_{i'i\omega} = \tau^n_{i'i\omega} T^n_{i\omega} p_{i'i\omega}$
- $\sigma^j_{iCH}, \sigma^j_{iUS}$ capture $i$’s substitution with CH and US
- assume $\sigma^j_{i'i} = \sigma^j_{RW}$ for $i' \neq i$ and $i \neq US, CH$
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  s_{i\omega}^n = a_{i\omega}^n + \sum_{i' \in I} \sigma_{i'i}^j \ln p_{i'\omega}^n
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  - assume $\sigma_{i'i}^j = \sigma_{RW}^j$ for $i' \neq i$ and $i \neq US, CH$

- Supply (sales) curve of exporter $i$ of product $\omega$:
  \[
  X_{i\omega} \equiv A_{ij} p_{i\omega} Z_{i\omega}
  \]
  - $A_{ij}$: endogenous sector ($j$)-level cost shifters (ie, wages, input costs)
  - $Z_{i\omega}$ exogenous cost shifter
  - $b_i = \frac{1}{\epsilon_i} - \gamma_i$, where $\epsilon_i$ reflects factor mobility & $\gamma_i$ reflects scale

- Equilibrium: prices $\{p_{i\omega}\}$ such that goods markets clear
Impact of US-China Tariffs on Third-Country Exports

**Proposition**

Given tariff shocks \{T_{i\omega}^n\}, first-order approximation around an arbitrary initial equilibrium:

\[
\Delta \ln X_{i\omega}^n = \beta_{1i\omega}^n \Delta \ln T_{CH,\omega}^{US} + \beta_{2i\omega}^n \Delta \ln T_{US,\omega}^{CH} + \beta_{3i\omega}^n \Delta \ln T_{i,\omega}^{US} + \beta_{4i\omega}^n \Delta \ln T_{i,\omega}^{CH} \\
+ \beta_{5i\omega}^n \sum_{j \neq \text{CH,US},i} \Delta \ln T_{j,\omega}^{US} + \beta_{6i\omega}^n \sum_{j \neq \text{CH,US},i} \Delta \ln T_{j,\omega}^{CH} + \eta_{i\omega}^n
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\]

- \( \beta_{1i,\omega}^n \): tariff response to US tariff on China:
  \[
  \beta_{1i,\omega}^n \equiv \left( 1_{n=US} + \frac{E_{\omega}^{US}}{E_{\omega}} \frac{1}{\frac{X_{i,\omega}/E_{\omega}}{b_i \sigma_{ii}^j} - 1} \right) \frac{\sigma_{CHi}^j}{s_{i,\omega}^n}
  \]

  - substitutability: \( \sigma_{CHi}^j \)
  - scale: \( b_i \sigma_{ii}^j \)
  - size: \( \frac{E^n_{\omega}}{E_{\omega}}, \frac{X_{i,\omega}}{E_{\omega}}, \frac{X^n_{i,\omega}}{E_{\omega}} \)
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- \( \eta_{i\omega}^n \): other goods prices, factor prices, aggregate demand shifts

\[
\eta_{i\omega}^n = \left( \sum_{n' \in I} \frac{X_{i\omega}^{n'}}{X_{i\omega}} \hat{E}_{n'} - \hat{A}_{ij} \right) b_i^j \sigma_{ii}^j + \sum_{i' = US,CH} \sigma_{CHi}^j \hat{p}_{i'\omega} + \sigma_{RW}^j \sum_{i' \neq i} \hat{p}_{i'\omega} \frac{1}{s_{i\omega}^n} + \hat{E}_{\omega}
\]

- vanishes with
  - Cobb-Douglas product-level shifters
  - \( \rightarrow 0 \) price changes in US and China
  - \( \rightarrow 0 \) cross-substitutions (\( \sigma_{RW}^j = 0 \))

- implementation: exporter-importer-sector FEs, size controls, assess pre-trends
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\]

- \( \Delta \ln X^n_{i \omega} \) vanishes with
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Set \( \beta_5 = \beta_6 = 0 \) because of lack of tariff variation
### Proposition

When the US imposes a tariff on China in product $\omega$, then:

(i) if $\sigma_{CHi} > 0$ ($\sigma_{CHi} < 0$), exports from $i$ to the US generally increase (decrease)

(ii) if $\sigma_{CHi} > 0$ ($\sigma_{CHi} < 0$) and $\sigma_{ii} < 0$, exports increase (decrease) from $i$ to RW iff

\[
\frac{X_{i\omega}/E_\omega}{\sigma_{ii}} < b_i < 0.
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● Same logic applies to Chinese tariffs on US
  ▶ In that case, sign of $\sigma_{USi}$ is revealed
Data

- Global bilateral trade data, 2014:1–2019:12 Comtrade
  - Top 50 countries, 95.9% of world trade
  - US, CH, RW as destinations
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- $\Delta T_{US,\omega}^{CH}$: China tariffs changes on US China MoF
- $\Delta T_{i,\omega}^{CH}$: China MFN tariffs (ex USA) Bown et al. 2019
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  - $\omega$: products (hs6)
  - $j$: 9 sectors
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- Aggregate data to 24-month periods, study long differences
  - Examine 2016/17 to 2018/19 export growth in response to tariffs
  - Scale tariffs in proportion to their duration through the 24-month interval
## Summary Statistics: World Trade in 2017

<table>
<thead>
<tr>
<th>Industry</th>
<th>Examples</th>
<th>USD</th>
<th>Share</th>
<th>HS6</th>
<th>Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Machinery</td>
<td>Engines, computers, cell phones</td>
<td>5,632</td>
<td>0.30</td>
<td>771</td>
<td>0.15</td>
</tr>
<tr>
<td>Materials</td>
<td>Plastics, lumber, stones, glass</td>
<td>2,246</td>
<td>0.12</td>
<td>639</td>
<td>0.12</td>
</tr>
<tr>
<td>Transport</td>
<td>Vehicles, airplanes, parts</td>
<td>2,121</td>
<td>0.11</td>
<td>130</td>
<td>0.02</td>
</tr>
<tr>
<td>Chemicals</td>
<td>Medications, cosmetics, vaccines</td>
<td>1,884</td>
<td>0.10</td>
<td>787</td>
<td>0.15</td>
</tr>
<tr>
<td>Agriculture</td>
<td>Soy beans, wine, coffee, beef</td>
<td>1,617</td>
<td>0.09</td>
<td>899</td>
<td>0.17</td>
</tr>
<tr>
<td>Minerals</td>
<td>Oil, coal, salt, electricity</td>
<td>1,586</td>
<td>0.08</td>
<td>148</td>
<td>0.03</td>
</tr>
<tr>
<td>Metals</td>
<td>Copper, steel, iron, aluminum</td>
<td>1,350</td>
<td>0.07</td>
<td>563</td>
<td>0.11</td>
</tr>
<tr>
<td>Apparel</td>
<td>Footwear, t-shirts, hand bags</td>
<td>1,100</td>
<td>0.06</td>
<td>912</td>
<td>0.18</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>Medical devices, furniture, art</td>
<td>1,255</td>
<td>0.07</td>
<td>354</td>
<td>0.07</td>
</tr>
</tbody>
</table>

- 5203 HS6 products classified into 9 sectors
China Tariff Changes

$\Delta T_{US}^{CH}$ & $\Delta T_{i}^{CH}$

- Agriculture
- Apparel
- Chemicals
- Machinery
- Materials
- Metals
- Minerals
- Miscellaneous
- Transport
China Exports to US on $\Delta T_{CH}^{US}$

China’s exports to US fall with US tariff

$$\Delta X_{CH}^{US} = \alpha + \beta \Delta T_{CH}^{US} + \epsilon_{CH}^{US}$$

**Panel A**
China’s Export Value to US

<table>
<thead>
<tr>
<th>Δln $X_{US,CH}$</th>
<th>Δ ln $T_{US,CH}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>-0.4</td>
<td>0.05</td>
</tr>
<tr>
<td>-0.2</td>
<td>0.1</td>
</tr>
<tr>
<td>0.2</td>
<td>0.15</td>
</tr>
<tr>
<td></td>
<td>0.2</td>
</tr>
</tbody>
</table>

Pre-period: $\beta = -0.12$ (0.29).
China Exports to US on $\Delta T_{US}^{CH}$

China's exports to US fall with US tariff

$$\Delta X_{CH}^{US} = \alpha + \beta \Delta T_{CH}^{US} + \epsilon_{CH}^{US}$$

**Panel A**

**China's Export Value to US**

<table>
<thead>
<tr>
<th>$\Delta \ln X(US,CH)$</th>
<th>Pre-period: $\beta=-0.12$ (0.29). Post-period: $\beta=-1.34$ (0.27).</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.05</td>
<td>2015-17</td>
</tr>
<tr>
<td>0.1</td>
<td>2017-19</td>
</tr>
<tr>
<td>0.15</td>
<td></td>
</tr>
<tr>
<td>0.2</td>
<td></td>
</tr>
</tbody>
</table>

Pre-period: $\beta=-0.12$ (0.29). Post-period: $\beta=-1.34$ (0.27).
US Exports to China on $\Delta T_{US}^{CH}$

US exports to CH fall with CH tariff

\[ \Delta X_{US\omega}^{CH} = \alpha + \beta \Delta T_{US\omega}^{CH} + \epsilon_{US\omega}^{CH} \]

Panel B

US Export Value to China

Pre-period: $\beta = 1.87$ (0.46).
US Exports to China on $\Delta T_{US}^{CH}$

US exports to CH fall with CH tariff

\[ \Delta X_{US\omega}^{CH} = \alpha + \beta \Delta T_{US\omega}^{CH} + \epsilon_{US\omega} \]

Panel B
US Export Value to China

<table>
<thead>
<tr>
<th>Δln X(CH,US)</th>
<th>Δln T(CH,US)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.05</td>
<td>0.05</td>
</tr>
<tr>
<td>0.1</td>
<td>0.05</td>
</tr>
<tr>
<td>0.15</td>
<td>0.1</td>
</tr>
<tr>
<td>0.2</td>
<td>0.15</td>
</tr>
</tbody>
</table>

2015-17: $\beta=1.87$ (0.46). Post-period: $\beta=-2.98$ (0.42).

Pre-period: $\beta=1.87$ (0.46). Post-period: $\beta=-2.98$ (0.42).
Takeaway 1: RW exports to US increase with US tariff

$$\Delta X_{RW,\omega}^{US} = \alpha + \beta T_{CH,\omega}^{US} + \epsilon_{RW,\omega}^{US}$$

Panel A
Bystanders' Export Value to US

Pre-period: $\beta = -0.19$ (0.10).
Takeaway 1: RW exports to US increase with US tariff

\[ \Delta X_{RW \omega}^{US} = \alpha + \beta \Delta T_{CH \omega}^{US} + \epsilon_{RW \omega}^{US} \]

Panel A
Bystanders’ Export Value to US

Pre-period: \( \beta = -0.19 \) (0.10). Post-period: \( \beta = 0.31 \) (0.10).
RW Exports to CH on $\Delta T_{US}^{CH}$

Takeaway 1: RW exports to CH flat with CH tariff

$$\Delta X_{RW,\omega}^{CH} = \alpha + \beta \Delta T_{US,\omega}^{CH} + \epsilon_{RW,\omega}^{CH}$$

Panel B

Bystanders' Export Value to China

Pre-period: $\beta = 0.07$ (0.18).
RW Exports to CH on $\Delta T_{US}^{CH}$

Takeaway 1: RW exports to CH flat with CH tariff

$$\Delta X_{RW,\omega}^{CH} = \alpha + \beta \Delta T_{US,\omega}^{CH} + \epsilon_{RW,\omega}^{CH}$$

Panel B
Bystanders' Export Value to China

Pre-period: $\beta=0.07$ (0.18). Post-period: $\beta=0.01$ (0.19).
Takeaway 1: RW exports to RW increase with US tariff

\[ \Delta X_{RW,\omega} = \alpha + \beta \Delta T_{US,CH,\omega} + \epsilon_{RW,\omega} \]

**Panel C**

Bystanders' Export Value to RW

2015-17

Pre-period: \( \beta = -0.14 \) (0.08).
RW Exports to RW on $\Delta T_{CH}^{US}$

Takeaway 1: RW exports to RW increase with US tariff

$$\Delta X_{RW,\omega} = \alpha + \beta \Delta T_{CH,\omega} + \epsilon_{RW,\omega}$$

Panel C
Bystanders' Export Value to RW

<table>
<thead>
<tr>
<th>Δ ln $X(RW,i)$</th>
<th>Δ ln $T(US,CH)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.05</td>
<td>0.1</td>
</tr>
<tr>
<td>0.15</td>
<td>0.2</td>
</tr>
</tbody>
</table>

Pre-period: $\beta=-0.14$ (0.08). Post-period: $\beta=0.20$ (0.08).
RW Exports to RW on $\Delta T_{US}^{CH}$

Takeaway 1: RW exports to RW increase with CH tariff

\[ \Delta X_{RW,\omega} = \alpha + \beta \Delta T_{US,\omega}^{CH} + \epsilon_{RW,\omega} \]

Panel D
Bystanders’ Export Value to RW

Pre-period: $\beta = 0.11$ (0.08).
Takeaway 1: RW exports to RW increase with CH tariff

\[
\Delta X_{RW}^{\omega} = \alpha + \beta \Delta T_{US}^{CH} + \epsilon_{RW}^{\omega}
\]

**Panel D**

Bystanders' Export Value to RW

Pre-period: $\beta=0.11$ (0.08). Post-period: $\beta=0.29$ (0.08).
Main Specification

Full specification:

\[ \Delta \ln X_{i\omega}^n = \beta_{1i\omega}^n \Delta \ln T_{CH,\omega}^{US} + \beta_{2i\omega}^n \Delta \ln T_{US,\omega}^{CH} + \beta_{3i\omega}^n \Delta \ln T_{i,\omega}^{US} + \beta_{4i\omega}^n \Delta \ln T_{i,\omega}^{CH} + \alpha_{ij}^n + \Omega^n \text{SIZE}_{i\omega} + \pi^n \Delta \ln X_{i\omega,t-1}^n + \epsilon_{i\omega}^n, \]

- \( \beta_{zi\omega}^n = \beta_{zi}^n + \beta_{zi(\omega)}^n + \Gamma_z^n \text{SIZE}_{zi\omega} \quad z = 1, 2, 3, 4 \)
- run separately to destinations \( n = US, CH, RW \)
- country-sector fixed effects, lagged growth controls for pretrends
Main Specification

- Full specification:

\[
\Delta \ln X^n_{i\omega} = \beta^1_{1i\omega} \Delta \ln T^US_{CH,\omega} + \beta^2_{2i\omega} \Delta \ln T^CH_{US,\omega} + \beta^3_{3i\omega} \Delta \ln T^US_{i,\omega} + \beta^4_{4i\omega} \Delta \ln T^CH_{i,\omega} \\
+ \alpha^n_{ij} + \Omega^n SIZE_{i\omega} + \pi^n \Delta \ln X^n_{i\omega,t-1} + \epsilon^n_{i\omega},
\]

- \( \beta^z_{zi\omega} = \beta^z_{zi} + \beta^z_{zj(\omega)} + \Gamma^n z SIZE_{zi\omega} \quad z = 1, 2, 3, 4 \)
- run separately to destinations \( n = US, CH, RW \)
- country-sector fixed effects, lagged growth controls for pretrends
- \( SIZE_{zi\omega} \) contains three proxies:
  - share US (or CH) imports in global imports in \( \omega \)
  - share of exporter \( i \) exports in global imports in \( \omega \)
  - share of variety \( i\omega \) in destination \( n \) imports
Main Specification

- Full specification:

\[ \Delta \ln X_{i\omega}^n = \beta_{1i\omega} \Delta \ln T_{CH,\omega}^{US} + \beta_{2i\omega} \Delta \ln T_{US,\omega}^{CH} + \beta_{3i\omega} \Delta \ln T_{i,\omega}^{US} + \beta_{4i\omega} \Delta \ln T_{i,\omega}^{CH} \\
+ \alpha_{ij}^n + \Omega^n SIZE_{i\omega} + \pi^n \Delta \ln X_{i\omega,t-1}^n + \epsilon_{i\omega}^n, \]

- \( \beta_{zi\omega} = \beta_{zi}^n + \beta_{zj(\omega)} + \Gamma^n SIZE_{zi\omega} \quad z = 1, 2, 3, 4 \)
- run separately to destinations \( n = US, CH, RW \)
- country-sector fixed effects, lagged growth controls for pretrends

- \( SIZE_{zi\omega} \) contains three proxies:
  - share US (or CH) imports in global imports in \( \omega \)
  - share of exporter \( i \) exports in global imports in \( \omega \)
  - share of variety \( i\omega \) in destination \( n \) imports

- Predicted values:

\[ \Delta \ln \hat{X}_{iWD}^n = \sum_{\omega} \sum_n \lambda_{i\omega}^n \left( \beta_{1i\omega}^n \Delta \ln T_{CH,\omega}^{US} + \beta_{2i\omega}^n \Delta \ln T_{US,\omega}^{CH} + \beta_{3i\omega}^n \ln T_{i,\omega}^{US} + \beta_{4i\omega}^n \Delta \ln T_{i,\omega}^{CH} \right) \]

- \( \lambda_{i\omega}^n \) pre-war export shares of variety \( i\omega \) in total exports of \( i \) to \( n \)
Relative Export Growth in Targeted Products

Takeaway 2: Large Heterogeneity in Predicted Exporter Growth
Decomposing Relative Exports, $\beta^n_{zi\omega} = \beta^n_{zi} + \beta^n_{zj(\omega)} + \Gamma^n_z SIZE_{zi\omega}$

Takeaway 3: Importance of Country Component

- $\Delta X(i)$, Alternative Configurations of $\Delta \beta(ziw)$
- $\Delta X(i)$, Full Heterogeneity
- Homogenous Response
- Sector Component Only
- Size Component Only
- Country Component Only
Decomposing Relative Exports, \( \beta_{zi\omega}^n = \beta_{zi}^n + \beta_{zj(\omega)}^n \Gamma_{zi}^n \text{SIZE}_{zi\omega} \)

Takeaway 3: Importance of Country Component

\[
\Delta X(i), \text{Alternative Configurations of } \Delta \beta(zi\omega)
\]

- Homogenous Response
- Sector Component Only
- Size Component Only
- Country Component Only
Decomposing Relative Exports, \( \beta_{zi\omega} = \beta_{zi\omega}^n + \beta_{zi\omega}^n + \Gamma_{zi\omega} \)

Takeaway 3: Importance of Country Component
Decomposing Relative Exports, $\beta_{nzi\omega} = \beta^z_{nzi} + \beta^z_{nzi(\omega)} + \Gamma^z_{n} SIZE_{zi\omega}$

Takeaway 3: Importance of Country Component
Decomposing Relative Exports, $\beta^n_{zi\omega} = \beta^n_{zi} + \beta^n_{zj(\omega)} + \Gamma^n_{z} SIZE_{zi\omega}$

Takeaway 3: Importance of Country Component
Supply and Demand Forces

Takeaway 4: Supply and Demand Forces Driving Response

\[ \beta(RW,1i) \]

\[ \beta(US,1i) \]

- upward supply, CH complement
- downward supply, CH substitute
- upward supply, CH substitute
- downward supply, CH complement

\[ \beta(RW,1i) \]

\[ \beta(US,1i) \]
Supply and Demand Forces

Takeaway 4: Supply and Demand Forces Driving Response

[Graph showing the relationship between \( \beta(RW,1i) \) and \( \beta(US,1i) \) for various countries, with upward supply, CH complement, downward supply, CH substitute, and \( \beta \) values indicated for different countries.]
Supply and Demand Forces

Takeaway 4: Supply and Demand Forces Driving Response

The diagram shows the relationship between two variables, \( \beta(RW,2i) \) and \( \beta(CH,2i) \), with axes labeled accordingly. The graph indicates the following:

- **Upward Supply, US Complement**
- **Downward Supply, US Substitute**
- **Downward Supply, US Complement**
- **Upward Supply, US Substitute**

The graph is a coordinate plane with tick marks at intervals to represent the values of \( \beta(RW,2i) \) and \( \beta(CH,2i) \). The axes range from -5 to 5 for both variables.
Supply and Demand Forces
Takeaway 4: Supply and Demand Forces Driving Response

\[
\beta_{(RW,2i)}
\]

\[
\beta_{(CH,2i)}
\]

upward supply, US complement

downward supply, US substitute

downward supply, US complement

upward supply, US substitute

-1.5 -1 -0.5 0 0.5 1 1.5

-5 -4.5 -4 -3.5 -3 -2.5 -2 -1.5 -1 -0.5 0 0.5 1 1.5 2 2.5 3 3.5 4 4.5 5
Conclusion

- US-China trade war was seen as a major turning point in the globalization era
  - our results do not support this view, at least for the time horizon we analyze
  - several countries increased global exports in products with higher US-China tariffs, relative to non-taxed products

- Future work to uncover the factors driving the country-component of tariff elasticities
Countries’ Pre-War Export Baskets

Agriculture  Apparel  Chemicals  Machinery  Materials  Metals  Minerals  Misc  Transport

ARG  AUS  AUT  BEL  BGD  BGR  BRA  CAN  CHE  CHL  CHN  COL  CZE  DEU  DNK  EGY  ESP  FIN  FRA  GBR  GRD  HKG  HUN  IDN  IND

ARG  AUS  AUT  BEL  BGD  BGR  BRA  CAN  CHE  CHL  CHN  COL  CZE  DEU  DNK  EGY  ESP  FIN  FRA  GBR  GRD  HKG  HUN  IDN  IND

back
Export Response to *US*, *CH*, *RW*, All Coefficients

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
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<tbody>
<tr>
<td></td>
<td>$\Delta \ln X_{i, \omega, t}^{US}$</td>
<td>$\Delta \ln X_{i, \omega, t}^{CH}$</td>
<td>$\Delta \ln X_{i, \omega, t}^{RW}$</td>
</tr>
<tr>
<td>$\Delta T_{CH, \omega}^{US}$ ($\beta_1$)</td>
<td>0.21*</td>
<td>-0.84***</td>
<td>0.12</td>
</tr>
<tr>
<td></td>
<td>(0.11)</td>
<td>(0.18)</td>
<td>(0.09)</td>
</tr>
<tr>
<td>$\Delta T_{US, \omega}^{CH}$ ($\beta_2$)</td>
<td>-0.02</td>
<td>-0.06</td>
<td>0.35***</td>
</tr>
<tr>
<td></td>
<td>(0.11)</td>
<td>(0.20)</td>
<td>(0.08)</td>
</tr>
<tr>
<td>$\Delta T_{i, \omega}^{US}$ ($\beta_3$)</td>
<td>-0.59**</td>
<td>-0.12</td>
<td>0.09</td>
</tr>
<tr>
<td></td>
<td>(0.29)</td>
<td>(0.34)</td>
<td>(0.20)</td>
</tr>
<tr>
<td>$\Delta T_{i, \omega}^{CH}$ ($\beta_4$)</td>
<td>-0.15</td>
<td>-1.46***</td>
<td>-0.19</td>
</tr>
<tr>
<td></td>
<td>(0.21)</td>
<td>(0.40)</td>
<td>(0.20)</td>
</tr>
</tbody>
</table>

Pre-trend control? Yes Yes Yes
Country × Sector FE Yes Yes Yes
R2 0.07 0.08 0.11
N 102,901 90,128 223,556
### Robustness: RW to RW

<table>
<thead>
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<th></th>
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<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
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</thead>
<tbody>
<tr>
<td>$\Delta T_{CH,\omega}^{US} (\beta_1)$</td>
<td>0.12</td>
<td>0.12</td>
<td>0.10</td>
<td>0.29**</td>
<td>0.11</td>
<td>0.08</td>
<td>0.07</td>
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<tr>
<td></td>
<td>(0.09)</td>
<td>(0.08)</td>
<td>(0.09)</td>
<td>(0.11)</td>
<td>(0.09)</td>
<td>(0.08)</td>
<td>(0.08)</td>
</tr>
<tr>
<td>$\Delta T_{US,\omega}^{CH} (\beta_2)$</td>
<td>0.35***</td>
<td>0.32***</td>
<td>0.29***</td>
<td>0.37***</td>
<td>0.34***</td>
<td>0.33***</td>
<td>0.34***</td>
</tr>
<tr>
<td></td>
<td>(0.08)</td>
<td>(0.07)</td>
<td>(0.08)</td>
<td>(0.09)</td>
<td>(0.08)</td>
<td>(0.08)</td>
<td>(0.08)</td>
</tr>
<tr>
<td>$\Delta T_{i,\omega}^{US} (\beta_3)$</td>
<td>0.09</td>
<td>0.09</td>
<td>0.26</td>
<td>-0.19</td>
<td>0.12</td>
<td>0.52***</td>
<td>0.54***</td>
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<td>(0.18)</td>
<td>(0.20)</td>
<td>(0.26)</td>
<td>(0.20)</td>
<td>(0.19)</td>
<td>(0.19)</td>
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<tr>
<td>$\Delta T_{i,\omega}^{CH} (\beta_4)$</td>
<td>-0.19</td>
<td>-0.20</td>
<td>-0.01</td>
<td>0.73***</td>
<td>-0.21</td>
<td>0.30</td>
<td>0.26</td>
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<td>(0.20)</td>
<td>(0.19)</td>
<td>(0.20)</td>
<td>(0.27)</td>
<td>(0.20)</td>
<td>(0.18)</td>
<td>(0.18)</td>
</tr>
</tbody>
</table>

| Pre-trend control        | Yes       | Yes       | No        | Yes       | Yes       | Yes       | Yes       |
| Fixed Effects            | cty-ind9  | cty-ind9  | cty-ind9  | cty-hs2   | ind9      | cty       | none      |
| Winsorized               | No        | Yes       | No        | No        | No        | No        | No        |
| R2                       | .11       | .097      | .009      | .14       | .099      | .1        | .098      |
| N                        | 223,556   | 223,556   | 223,556   | 223,552   | 223,556   | 223,556   | 223,556   |
| Exporters                | 48        | 48        | 48        | 48        | 48        | 48        | 48        |

Outcome is the log change in bystander countries' exports to countries other than the US and China. Column 1 is the baseline specification. Column 2 winsorizes the top and bottom 1% of the outcome. Column 3 excludes the pre-trend control. Columns 4-7 show robustness to alternative fixed effects: respectively, country-hs2, industry only, country only, and none.
Framework Details

- In country \( i \), a bundle \( K_{ij} \) of inputs is used in tradeable sector \( j \)

- Each unit \( k \in K_{ij} \) solves:

\[
\max_{\omega} \max_{x} \left( p_{i\omega} z_{i\omega}^{0} e_{\omega}^{k} \right)^{1-\alpha_{j}} x^{\alpha_{j}} - c_{ij} x,
\]

- \( z_{i\omega}^{0} = Z_{i\omega} K_{i\omega}^{\gamma_{i}} \) captures scale effects
- \( e_{\omega}^{k} \) is distributed Frechet with shape parameter \( \varepsilon_{i} \)
- \( c_{ij} \) is the cost of intermediates

- Yields \( X_{i\omega} \equiv A_{ij} p_{i\omega}^{b_{i}} Z_{i\omega} \) where

\[
A_{ij} \equiv \left( \frac{c_{ij}}{\alpha_{j}} \right)^{\frac{\alpha_{j}}{\alpha_{j} - 1}} K_{ij}^{\frac{1}{b_{i} \varepsilon_{i}}} r_{ij}^{\frac{b_{i} - 1}{b_{i}}}
\]

where

\[
r_{ij}^{\varepsilon_{i}} = \sum_{\omega \in \Omega_{i}} \left( p_{i\omega} \left( \frac{c_{ij}}{\alpha_{j}} \right)^{\frac{\alpha_{j}}{\alpha_{j} - 1}} z_{i\omega}^{0} \right)^{\varepsilon_{i}}
\]
China Exports to US on $\Delta T_{CH}^{US}$

China’s exports to US fall with US tariff

$$\Delta X_{CH\omega}^{US} = \alpha_j + \beta \Delta T_{CH\omega}^{US} + \epsilon_{CH\omega}^{US}$$

Panel A
China’s Export Value to US

Pre-period: $\beta = 0.02$ (0.30). Post-period: $\beta = -1.58$ (0.29).
US Exports to China on $\Delta T_{US}^{CH}$

US exports to CH fall with CH tariff

\[ \Delta X_{US\omega}^{CH} = \alpha + \beta \Delta T_{US\omega}^{CH} + \epsilon_{US\omega}^{CH} \]

Panel B
US Export Value to China

- Pre-period: $\beta = 2.26 (0.48)$.
- Post-period: $\beta = -3.18 (0.44)$.

Pre-period: $\beta = 2.26 (0.48)$. Post-period: $\beta = -3.18 (0.44)$. 

[Diagram showing the relationship between change in ln export value and change in ln trade]
RW Exports to US on $\Delta T_{CH}^{US}$

Takeaway 1: RW exports to US increase with US tariff

$$\Delta X_{RW \omega}^{US} = \alpha_{ij} + \beta \Delta T_{CH \omega}^{US} + \epsilon_{RW \omega}^{US}$$

Panel A
Bystanders' Export Value to US

Pre-period: $\beta = -0.12$ (0.11). Post-period: $\beta = 0.20$ (0.11).
RW Exports to CH on $\Delta T_{US}^{CH}$

Takeaway 1: RW exports to CH flat with CH tariff

\[
\Delta X_{RW\omega}^{CH} = \alpha_{ij} + \beta \Delta T_{US\omega}^{CH} + \epsilon_{RW\omega}^{CH}
\]

Panel B

Bystanders’ Export Value to China

Pre-period: $\beta = -0.01 (0.18)$. Post-period: $\beta = -0.06 (0.20)$. 

Pre-period: $\beta = -0.01 (0.18)$. Post-period: $\beta = -0.06 (0.20)$. 

Panel B

Bystanders’ Export Value to China

Pre-period: $\beta = -0.01 (0.18)$. Post-period: $\beta = -0.06 (0.20)$.
RW Exports to RW on $\Delta T^US_{CH}$

Takeaway 1: RW exports to RW increase with US tariff

$$\Delta X^RW_{\omega} = \alpha_{ij} + \beta \Delta T^US_{Ch\omega} + \epsilon^RW_{\omega}$$

Panel C
Bystanders’ Export Value to RW

$\Delta \ln X(RW,i)$

$\Delta \ln T(US,CH)$

2015-17  2017-19

Pre-period: $\beta=-0.00$ (0.09). Post-period: $\beta=0.15$ (0.09).
**Takeaway 1:** RW exports to RW increase with CH tariff

\[
\Delta X_{RW\omega} = \alpha_{ij} + \beta \Delta T_{US\omega}^{CH} + \epsilon_{RW\omega}
\]

**Panel D**

Bystanders' Export Value to RW

Pre-period: \(\beta=0.12\ (0.08)\). Post-period: \(\beta=0.30\ (0.08)\).
Export Growth Correlates

Distance to US
Distance to CH
GDP
Trade Agreement Trade Share
FDI stock

-0.05 0 0.05 0.1
Supply and Demand Forces

Takeaway 4: Supply and Demand Forces Driving Response

beta(RW,1i), beta(US,1i)

beta(RW,2i), beta(CH,2i)

upward supply, complement

downward supply, substitute

downward supply, complement

upward supply, substitute

beta(RW,1i), beta(US,1i)
Supply and Demand Forces

Takeaway 4: Supply and Demand Forces Driving Response

- \( \beta(RW,1i) \), \( \beta(RW,2i) \)
- \( \beta(US,1i) \), \( \beta(CH,2i) \)

- upward supply, complement
- downward supply, substitute

- \( -2 \) to \( 2 \)
- \( -10 \) to \( 5 \)