China’s Trade Retaliation: Factuals vs. Counterfactuals

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It was the best of times, it was the worst of times, it was the age of wisdom, it was the age of foolishness.  
—Charles Dickens, 1859, A Tale of Two Cities
OVERVIEW

Introduction

Theoretical framework

Retaliatory Motives

Main results
Trade theories show why and how countries should avoid trade wars. They do not say much about trade war practices. For example, if a trade war unfortunately happens, how do countries fight it? And how should they? And how should not they?

Modeling trade wars is challenging:

- The curse of dimensionality: motives, strategies, countries, products
- Few facts to build on: trade wars have been uncommon since Smoot-Hawley

The US-China Trade War is a rare research opportunity.
**Our focus: the China side**

Retaliation in an eye-for-an-eye (EFAE) fashion

<table>
<thead>
<tr>
<th>Date</th>
<th>US</th>
<th>China</th>
</tr>
</thead>
<tbody>
<tr>
<td>6-15-2018</td>
<td>• Tranche 1: effective 7-6-2018, 34bn USD, rate: 25%</td>
<td>• Tranche 1: effective 7-6-2018, 34bn USD, rate: 25%</td>
</tr>
<tr>
<td>5-9-2019</td>
<td>• Tranche 3 continued: rate raised to 25%, effective 5-10-2019</td>
<td>5-13-2019: • Tranche 3 continued: rate raised up to 25%, effective 6-1-2019</td>
</tr>
</tbody>
</table>

October to December 2019: both sides disclosed ongoing negotiation. 1-15-2020: the two sides signed “Phase One Deal”

**Notes:** Only actions that became effective later are included in the figure. US dollar values are taxable values officially announced by the two governments. Actions of the two sides mirroring each other are in red.
WHAT WE DO

The Chinese side chose to mirror the US side in:

► Taxable values
► Tariff rates
► Timing

The product dimension is the only dimension of variation:

1. Forensics of the motive behind the factual retaliatory tariff schedule
2. Construct counterfactual retaliatory tariff schedules
3. Welfare analyses
   ► factual VS counterfactual
   ► counterfactual VS counterfactual
4. Finding the worst (-welfare) retaliatory tariff schedule
BACKGROUND

Figure: China’s Tariffs on US Products, 2018-2019

Notes:
- Unit of tariff rate is percentage point.
- Tariff rates are at the HS8 level.
- Time coverage is May 2018 (2018m5) to December 2019 (2019m12).
- Tariff rates in month t refer to those in effect starting from the 15th day in month t-1 and ending on the 14th day in month t.
- The 2017 imported values were used to compute imports-weighted average rates.
LITERATURE


- Estimated pro-welfare effects of trade agreements serving as trade war prevention: Bagwell and Staiger (2011); Ossa (2014); Caliendo and Parro (2015) among others.

- Welfare evaluation (factual + counterfactual) framework for EFAE retaliations
  - Theory-backed retaliatory motives
  - Politicized protectionism, normative and positive
  - What could have happened (calamity of trade wars)
## Overview

<table>
<thead>
<tr>
<th>Introduction</th>
<th>Theoretical framework</th>
<th>Retaliatory Motives</th>
<th>Main results</th>
</tr>
</thead>
</table>

- Introduction

- Theoretical framework

- Retaliatory Motives

- Main results
FRAMEWORK: setup (FGKK)

Economic interests of importers:

\[ U = \prod_s \left( \frac{C_s}{\gamma_s} \right)^{\gamma_s}, C_s \equiv \left( \sum_{g \in s} m_g \eta^{\frac{\eta-1}{\eta}} \right)^{\frac{\eta}{\eta-1}}, \text{ and } m_g = \left( \sum_i m_g^{\frac{\sigma-1}{\sigma}} \right)^{\frac{\sigma}{\sigma-1}}. \]

Sector: \( s, \gamma^s \in (0, 1), \sum_s \gamma^s = 1 \)
Product: \( g \)
Variety: \( g_i \)

- A “US product”: technically, a variety: \( g_i = gUS \)
FRAMEWORK: WELFARE

The import price index of China is

\[ P = \prod_s (P_s)^{\gamma_s}, \quad P_s = \left( \sum_{g \in s} P_g^{1-\eta} \right)^{\frac{1}{1-\eta}}, \quad \text{and} \quad P_g = \left( \sum_i p_{gi}^{1-\sigma} \right)^{\frac{1}{1-\sigma}}. \quad (2) \]

The inverse of \( P \) is the measure of welfare.

Delivery price: \( p_{gi} = (1 + t_{gi}) p_{gi}^* \)

Producer price: \( p_{gi}^* = z_{gi} m_{gi}^\omega \)
FRAMEWORK: TARIFFS

The post-retaliation tariff levied on an imported product is

$$t_{gi} = \begin{cases} t_{gUS}^0 + T_g, & \text{if } i = US, \\ t_{gi}^0, & \text{if } i \neq US. \end{cases}$$ (3)

- $T_g = 0$ for some $g$’s, since not all US products were selected for retaliation
- $\{T_g\}$: China’s retaliatory schedule against the US
## Parameters

<table>
<thead>
<tr>
<th>Countries</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit of observation</td>
<td>Country-HS8-month</td>
<td>Country-HS8-month</td>
<td>HS8-month</td>
<td>HS8-month</td>
</tr>
<tr>
<td>Structural parameter</td>
<td>-σ</td>
<td>ω</td>
<td>ω</td>
<td>η</td>
</tr>
</tbody>
</table>

**Dependent variable:**

<table>
<thead>
<tr>
<th>Δln(tariff-ridden price, variety level)</th>
<th>-1.453***</th>
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<tbody>
<tr>
<td></td>
<td>(0.547)</td>
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<table>
<thead>
<tr>
<th>Δln(quantity, variety level)</th>
<th>0.521</th>
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<tr>
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<td>(0.430)</td>
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<table>
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<tr>
<th>Δln(price, product level)</th>
<th>1.892</th>
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<td>(0.751)</td>
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<table>
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<th>Yes</th>
<th>Yes</th>
<th>Yes</th>
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<tbody>
<tr>
<td>Country × time fixed effect</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Product × sector fixed effect</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>N</td>
<td>2,109,798</td>
<td>2,109,798</td>
<td>133,931</td>
<td>205,492</td>
</tr>
</tbody>
</table>
**How did China retaliate**

China

6-15-2018:
- Tranche 1: **effective 7-6-2018, 34b USD, rate: 25%**
- Tranche 2: **effective 8-23-2018, 16b USD, rate: 25%**

5-13-2019:
- Tranche 3: **60b USD, continued: rate raised up to 25%, effective 6-1-2019**
- 58bn, 25%
- 16bn, 20%
- 15bn, 10%
- 18bn, 5%
- 108bn ("110bn" in the news)

The rest of imports from US: 12bn, 0%
HOW DID CHINA RETALIATE, THEORETICAL VERSION

Characterized by two equations:

\[
\sum_{g \in \{ T_g^F > 0 \}} p_{gUS}^{2017} m_{gUS}^{2017} = $108b \equiv Q^F \tag{4}
\]

\[
T_g^F = \begin{cases} 
25\%, & \text{if } Q \leq $58bn, \\
20\%, & \text{if } $58b < Q \leq $73bn, \\
10\%, & \text{if } $73b < Q \leq $89bn, \\
5\%, & \text{if } $89b < Q \leq $108bn (= Q^F). 
\end{cases} \tag{5}
\]

Above: Factual (F) stats are used (b: billion USD)
**Ranking function** $\phi(\cdot)$

Consider a hypothetical decision maker who uses function $\phi(\cdot)$ to rank products. WLOG, $\phi'(\cdot) > 0$.

$\Lambda_g$ is an arbitrary product characteristic rankable by $\phi(\cdot)$.

Existing and solvable: $\phi^{25}$, $\phi^{20}$, $\phi^{10}$ and $\phi^5$ such that

\[
\sum_{g \in \{\phi(\Lambda_g) \geq \phi^{25}\}} p_{gUS}^{2017} m_{gUS}^{2017} = 58\text{bn}, \quad \sum_{g \in \{\phi(\Lambda_g) \geq \phi^{20}\}} p_{gUS}^{2017} m_{gUS}^{2017} = 73\text{bn},
\]

\[
\sum_{g \in \{\phi(\Lambda_g) \geq \phi^{10}\}} p_{gUS}^{2017} m_{gUS}^{2017} = 89\text{bn}, \quad \sum_{g \in \{\phi(\Lambda_g) \geq \phi^{5}\}} p_{gUS}^{2017} m_{gUS}^{2017} = 108\text{bn}.
\]

(6)
COUNTERFACTUAL TARIFF STRUCTURE: (RATES AND PRODUCTS)

\[ T_{g}^{CF} = \begin{cases} 
25\%, & \text{if } \phi(\Lambda_g) \geq \phi^{25}, \\
20\%, & \text{if } \phi^{25} > \phi(\Lambda_g) \geq \phi^{20}, \\
10\%, & \text{if } \phi^{20} > \phi(\Lambda_g) \geq \phi^{10}, \\
5\%, & \text{if } \phi^{10} > \phi(\Lambda_g) \geq \phi^{5}, \\
0, & \text{if } \phi(\Lambda_g) < \phi^{5}. 
\end{cases} \] (7)

This algorithm ensures

\[ \sum_{g \in \{ T_{g}^{CF} > 0 \}} p_{gUS}^{2017} m_{gUS}^{2017} = \$108bn = Q^F \] (8)

Intuition: the hypothetical decision maker uses her preferences (represented by \( \phi(\cdot) \)) to compile counterfactual retaliatory tariff schedule \( \{ T_{g}^{CF} \} \), which is observationally equivalent à la margins (7) and (8) to \( \{ T_{g}^{F} \} \).
In short...

Algorithm can generate \( \{ T_{g}^{CF} \} \) based on any (US) product variety characteristic \( \Lambda_{g} \):

\[
T_{g}^{CF} = \Xi \left( \Lambda_{g} \right)
\]

such that and \( \{ T_{g}^{F} \} \) and \( \{ T_{g}^{CF} \} \) are observational equivalent.

Toy example: Higher tariffs are levied on physically heavy products: \( \Lambda_{g} = Weight/unit \). (Of course, this \( \Xi(\Lambda_{g}) \) is funny nonsense...
OVERVIEW

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Main results
Elaboration on $\Xi(\Lambda_g)$

$\Lambda_g$ comes from trade theories that motivate retaliation:

1. **Optimal tariff theory:** $\Lambda_g = \text{inverse export elasticity}$
2. **Sale (SOE) protection:** $\Lambda_g = \text{GH-MG measure}$
3. **Comp. adv. (CA) sanctioning:** $\Lambda_g = \text{Revealed CA}$
4. **Swing state (SS) targeting:** $\Lambda_g = \text{product-level Trump SS index}$
Motive 1: Optimal tariff theory

Optimal tariff theory (Bickerdike, 1907; Johnson, 1953; Broda et al., 2008) is the most obvious theoretical guide for setting trade-war tariffs

\[ T_{g}^{CF,1} = \Xi \left( \Lambda_{g}^{1} \equiv \left[ \frac{dm_{gUS}}{dp_{gUS}^{*}} \cdot \frac{p_{gUS}^{*}}{m_{gUS}} \right]^{-1} \right) \]  

We follow Feenstra (1994) and Broda and Weinstein (2006) to estimate pre-trade war \( \Lambda_{g}^{1} \)
MOTIVE 2: SOE (SALE) PROTECTING

- Unlike the trade policies driven by lobbies in Western democracies, the trade policies in China’s political regime are influenced by state-owned enterprises (SOEs).

- We modified the tariff-setting formula motivated by the “protection for sale” framework (Grossman and Helpman, 1994; Goldberg and Maggi, 1999)

\[
T_g^{CF,2} = \Xi \left( \Lambda_g^2 \equiv \frac{I_g - \alpha}{a + \alpha} \cdot \frac{R_g}{\sigma_g} \right) \quad (11)
\]

where \( R_g \) is inverse import penetration ratio.
Motive 3: CA sanctioning

- The China side may target comparative advantage goods of the US to empower its retaliation.
- Various mechanisms such as coercion, alienation, and signaling (e.g., Mayer, 1977; Kaempfer and Lowenberg, 1988, 2007; Verdier, 2009).
- We follow Balassa (1965), Costinot et al. (2012), and French (2017) to construct a revealed comparative advantage (RCA) measure:

\[ T_g^{CF,3} = \Xi \left( \Lambda^3_g \equiv \frac{Z_{gUS}/Z_{g^0US}}{Z_{gi^0}/Z_{g^0i^0}} \right) \]  

(12)
Motive 4: SS Targeting

- Both recent studies and anecdotes link China’s retaliation to the swing states that would influence Trump’s reelection — Waugh (2019), Fetzer and Schwarz (2021), Kim and Margalit (2021), Bloomberg, The Guardian, MarketWatch, Yahoo! Finance...
- Theories on the importance of swing states/median voters in trade policymaking: e.g. Mayer (1984); Muûls and Petropoulou (2013); Ma and McLaren (2018)
- We construct a Trump’s swing states index for each US product $g$:

$$T_{g}^{CF, 4} = \Xi \left( \Lambda_{g}^{4} \equiv \sum_{h \in \text{Swing}} \frac{L_{gh}}{L_{h}} \cdot \text{TrumpVotes}_{h} \right)$$

$\frac{L_{gh}}{L_{h}}$ is the share of labor related to US product $g$ (Autor et al., 2013; Pierce and Schott, 2012)
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RESULT 1: WELFARE (PILOT)

Counterfactual rates beyond the factual 110bn:
Result 1: welfare (full)
**RESULT 1: CPI AND PPI**

Average monthly ΔCPI: 0.019

Average monthly ΔCPI: 0.019
RESULT 2: MOTIVE FORENSICS

To make sense out of China’s factual retaliatory schedule:

- Define $t_{gUS} = t^0_{gUS} + T^F_g$
- Let data speak:

$$t_{gUS} = \sum_{k=1}^{4} \beta_k \Lambda^k_g + C_g \Gamma + \mu_s + \epsilon_g$$  \hspace{1cm} (14)

- Sample: China’s imports from the US.
- $\Lambda^k_g$: the previous motive measures
- Parameters of interest: $\beta_k$, $k = 1$ to 4
**Result 2: motive forensics**

<table>
<thead>
<tr>
<th></th>
<th>Optimal tariff</th>
<th>SOE protecting</th>
<th>CA sanctioning</th>
<th>SS targeting</th>
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<tbody>
<tr>
<td></td>
<td>0.008</td>
<td>0.960</td>
<td>0.002</td>
<td>0.057**</td>
</tr>
<tr>
<td></td>
<td>(0.113)</td>
<td>(5.241)</td>
<td>(0.006)</td>
<td>(0.006)</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.058**</td>
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<td>(0.025)</td>
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**Control variables:**

<table>
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<th></th>
<th>Pre-war tariff rate</th>
<th>Rauch-differentiation dummy</th>
<th>Made-in-China 2025 dummy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.068***</td>
<td>0.077</td>
<td>-1.423***</td>
</tr>
<tr>
<td></td>
<td>(0.033)</td>
<td>(0.539)</td>
<td>(0.452)</td>
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<tr>
<td></td>
<td>1.068***</td>
<td>0.084</td>
<td>-1.429***</td>
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<tr>
<td></td>
<td>(0.033)</td>
<td>(0.533)</td>
<td>(0.448)</td>
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<td>1.068***</td>
<td>0.081</td>
<td>-1.429***</td>
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<td>(0.033)</td>
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<td>(0.440)</td>
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<td></td>
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<td>0.023</td>
<td>-1.350***</td>
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<td></td>
<td>(0.033)</td>
<td>(0.530)</td>
<td>(0.446)</td>
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<tr>
<td></td>
<td>(0.033)</td>
<td>(0.519)</td>
<td>(0.434)</td>
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</tbody>
</table>

Observations: 4,267
R-squared: 0.530

*Notes:* HS2 fixed effects are included in all regressions. Robust standard errors in parentheses, clustered at the HS2 level. *** p<0.01, ** p<0.05, * p<0.1.
**Result 2: motive forensics, cont’d**

<table>
<thead>
<tr>
<th></th>
<th>Panel D: Pre-war tariffs</th>
<th>Dep. Variable: pre-war tariff rate (unit: percentage point)</th>
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</thead>
<tbody>
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<td>-0.188</td>
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<tr>
<td></td>
<td>(0.183)</td>
<td>(0.182)</td>
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<tr>
<td>SOE protecting</td>
<td>-0.371</td>
<td>-0.354</td>
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<td></td>
<td>(0.475)</td>
<td>(0.421)</td>
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<td>CA sanctioning</td>
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<td>-0.010**</td>
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<td>(0.005)</td>
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<td>SS targeting</td>
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*Control variables:*

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<tr>
<td>R-squared</td>
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<td>0.467</td>
<td>0.466</td>
<td>0.466</td>
<td>0.467</td>
<td>0.468</td>
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</tbody>
</table>

*Notes:* HS2 fixed effects are included in all regressions. Robust standard errors in parentheses, clustered at the HS2.
**Result 3: Counterfactual Factuals**

![Graph showing the comparison of different strategies in the context of counterfactual factuals. The graph compares Original, Optimal tariff, SOE protecting, CA sanctioning, and SS targeting strategies across different magnitudes (Q). The x-axis represents the factual scenario, and the y-axis represents the magnitude Q (zero to factual). The different strategies are color-coded: **Optimal tariff** in green, **SOE protecting** in blue dashed, **CA sanctioning** in orange dashed, and **SS targeting** in red. The graph demonstrates the impact of each strategy on the factual outcome.]
**Result 4: potential TOT effects**

In theory, for a retaliatory tariff rate $T_g$, the burden falling on importers equals

$$
\tilde{T}_g = \frac{1/\omega}{\sigma + 1/\omega} T_g
$$

(15)

► Our earlier short-run estimate: $\hat{\omega}$ approaches zero so $\tilde{T}_g$ approximates $T_g$

► What if we use long-run estimate $\Lambda_g^1$ for $1/\omega$:

$$
\bar{p}_{gUS}(T_g, 1/\omega, p^*_{gUS}, t^0_{gUS}) = 
\left(1 + \frac{1/\omega}{\sigma + 1/\omega}(t^0_{gUS} + T_g)\right) \left(1 - \frac{\sigma}{\sigma + 1/\omega}(t^0_{gUS} + T_g)\right) p^*_{gUS}
$$

observed CIF price

(16)
Dashed lines reproduce the results without PTOT effects
**THIRD-COUNTRY INCIDENCE**

When potential TOT effects are considered, third country incidence should also be considered. Intuitively, numerous third-country supply elasticities are affected by the retaliatory tariffs on US varieties. We derive, following Arkolakis, Costinot, and Rodriguez-Clare (2012),

$$d \ln P_g = \frac{1}{\sigma - 1} d \ln \lambda_{gUS} + \Omega_{gUS}$$  \hspace{1cm} (17)

where $\Omega_{gUS}$ refers to the welfare implications with PTOT effects shown earlier. That is, with $\Omega_{gUS}$ partialled out, the market shares $\{\lambda_{gUS}\}$ serve as a sufficient statistic for all the omitted tax incidence.
\{\lambda_{gUS}\}: \text{PRE-RETAIATION VS POST-RETAIATION}

Post-retaliation:
- Factual (left)
- Counterfactual (right-four)
**RESULT 5: THE WORST SCENARIO**

In theory, how bad the retaliation’s welfare consequence could have been?

\[
\text{maximize } \ln P \\
\{T_{gUS}\}
\]

subject to
\[
\sum_{s} \sum_{g \in s} (1 + t^{0}_{gUS} + T_{gUS})p^{0}_{gUS}m_{gUS} = V 
\]

where \(V\) is tariff-ridden import value. \(V\) is unequal, but linkable, to \(Q\). For instance, the cumulative \(Q\) by Tranche 3 (i.e., \(Q_{F} \equiv \$108bn\)), when tariff-ridden, equals

\[
\sum_{g \in \{T^{F}_{g} > 0\}} (1 + t^{0}_{gUS} + T^{F}_{g})p^{2017}_{gUS}m^{2017}_{gUS} = \$131b 
\]
**NUMERICALLY SOLVED** $\{T^+_gUS\}$

- Customized for each US product variety (flexible rates)
- Interior solutions only (positive)
- Depending on $V$:
COULD HAVE BEEN MUCH WORSE...
Result 6: Reduced-form welfare analyses

Reduced-form measure (RFM) of welfare

\[ RFM = -m^0 \cdot p^* \cdot T \]  \hspace{1cm} (20)

Here, \( m^0 \) is the vector of pre-retaliation import quantities, namely \( \{m_{git^0}\} \) (in our case, the 2017 quantities of imports by China from the US). \( p^* \) is the vector of post-retaliation observed CIF prices, namely \( \{p^*_{gi}\} \). \( T \) is the vector of retaliatory tariffs, namely \( \{T_{gi}\} \).

▶ RFM is counterfactual-friendly.
## Likewise...

<table>
<thead>
<tr>
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<th>Factual</th>
<th>Counterfactual</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Value, billion USD</td>
<td>Optimal tariff</td>
</tr>
<tr>
<td>(s.e.)</td>
<td>-62.8 (27.2)</td>
<td>-30.4 (5.9)</td>
</tr>
<tr>
<td>[95% c.i.]</td>
<td>[-116.1, -9.5]</td>
<td>[-42.0, -18.9]</td>
</tr>
<tr>
<td>% points of GDP*</td>
<td>-0.51</td>
<td>-0.25</td>
</tr>
<tr>
<td>[95% c.i.]</td>
<td>[-0.94, -0.08]</td>
<td>[-0.34, -0.15]</td>
</tr>
</tbody>
</table>

**Notes**: The four columns under "Counterfactual" correspond to the four counterfactual retaliatory schedules (optimal-tariff, SOE-protecting, CA-sanctioning, and SS-targeting) respectively. Standard errors (s.e.) and confidence intervals [95% c.i.] are based on boostrapped product lists (1,000 times). * Points and interval estimates are based on the values above divided by China's 2017 GDP (12.31 trillion US dollars).
Take away

- Welfare consequence of factual retaliation: $-0.37\text{pp}$
- Inferred motive from factual retaliation: Trump SS
- Welfare ranking order of motives:
  SOE protecting $< \text{Factual} \approx \text{SS targeting} < \text{Optimal tariff} < \text{CA sanctioning}$
- With possible TOT effects: net loss
- Worst welfare scenario: $-3.5\text{pp}$
- Reduced form estimation: similar