

Online Appendix to “Trump, Trade, and Emissions”

Simon Lepot Marcos Ritel Dora Simon

OA.1 Tariff data: the January 2025 status quo and the 2025 scenarios

This appendix explains how we build the tariffs used in the model. There are three layers.

1. The *2018 baseline* τ^{2018} : applied MFN and preferential tariffs in 2018, from WITS. The ICIO 2018 trade flows are observed under these tariffs.
2. The *January 2025 status quo* τ^{SQ} : the 2018 baseline plus the trade-war measures that were still in force on 1 January 2025, the day before the second Trump administration’s first tariff action. Section 301 duties on China, Section 232 duties on steel and aluminum, the solar safeguard, the column 2 rates on Russia, and the retaliation by China, Russia and Turkey all belong here. None of them is in the WITS data.
3. The *2025 scenarios* τ^s : the full tariff schedule on a specific date in 2025, with and without foreign retaliation. The scenarios s are LibDay, TariffPeak and TariffDeal.

We first solve the status quo as a counterfactual relative to 2018 and take the resulting equilibrium as the new baseline. Every 2025 scenario is then solved relative to the status quo, using the increment $\Delta^s = \tau^s - \tau^{SQ}$. The effects we report for 2025 are therefore effects relative to the trade-war world of January 2025, not relative to 2018. The campaign scenarios of the main text (a uniform 10% tariff, 10% plus 60% on China, and so on) are treated in the same way: they are added on top of τ^{SQ} .

OA.1.1 From products to model sectors

All tariffs are first determined for products, and only then aggregated to the model’s sectors.

- For US tariffs, a product is a 2018 ten-digit HTS line (HTS10) imported from a given partner.
- For retaliation by country p , a product is a 2018 HTS10 line exported by the United States to p .

The trade values come from the replication files of ?, which contain Census data on US imports and exports by country and HTS10 for 2018. US imports of goods in 2018 are \$2,495bn (of which \$554bn from China), and US exports of goods are \$1,599bn.

Each HTS10 line is mapped to an ICIO sector in three steps. HS 2017 codes go to HS 2012 and then to ISIC Rev. 3, using the WITS concordances. The ISIC Rev. 3 code is then mapped to the ICIO sector. Lists published under HS 2022 are first mapped back to HS 2017.

The tariff of partner p in sector j is the trade-weighted average over the products h in that sector:

$$\tau_{pj} = \frac{\sum_{h \in j} m_{ph}^{2018} \tau_{ph}}{\sum_{h \in j} m_{ph}^{2018}}, \quad (\text{OA.1})$$

where m_{ph}^{2018} is the 2018 value of US imports of h from p , or of US exports of h to p for retaliation. The weights are fixed at 2018 for every layer, so differences between the status quo and the scenarios come only from tariff rates, never from changing weights. Rates are *additional* ad valorem duties on top of the 2018 WITS rate. Where a 2025 measure sets a rate that includes the MFN duty (see Section ??), we subtract the 2025 MFN rate of the line.

OA.1.2 The January 2025 status quo

The status quo adds to the 2018 baseline every additional duty that was in force on 1 January 2025. US measures are read from chapter 99 of the 2025 Basic Edition of the Harmonized Tariff Schedule (HTSUS), the edition in force on 1 January 2025. Base and column 2 rates come from the USITC 2025 tariff database. Table ?? reports the result by measure and partner.

Section 301 on China. Four lists of Chinese products have additional duties under Section 301.

- List 1 (July 2018, 856 tariff lines, \$41bn of 2018 imports): 25%.
- List 2 (August 2018, 283 lines, \$10bn): 25%.

- List 3 (September 2018, 5,906 lines, \$207bn): 25%. The rate started at 10% and was raised to 25% in May 2019.
- List 4A (September 2019, 2,981 lines, \$140bn): 7.5%. The rate started at 15% and was halved in February 2020 under the Phase One deal.

Together the lists cover 72% of 2018 imports from China.

The four-year review of 2024 raised the rate on 388 lines to 25%, 50% or 100%. The lines include electric vehicles, batteries, semiconductors, solar cells, steel and aluminum products and medical goods. Where a review rate applies, it replaces the list rate on that line.

We ignore the product exclusions still in force in January 2025. They are few, and they are temporary.

Section 232 on steel and aluminum. Since March 2018 the United States has charged 25% on steel and 10% on aluminum. The product scope is the one in HTSUS notes 16 and 19, including the derivative products added in 2020. By January 2025 most partners had negotiated alternatives to the duty:

- Canada and Mexico (since 2019) and Australia were exempt.
- Argentina, Brazil and Korea had absolute quotas on steel, and Argentina also on aluminum. Imports within an absolute quota pay no duty and imports above it are not allowed, so we set the duty to zero.
- Ukraine’s steel duty was suspended.
- Russian aluminum paid 200% (since 2023).
- The EU, Japan and the United Kingdom had tariff-rate quotas: a given volume each year enters free and the rest pays the full duty.

A tariff-rate quota does not map into a single ad valorem rate. We approximate it by the statutory rate times the share of 2018 tonnage that lies above the quota:

$$\tau_p^{TRQ} = t \cdot \max\left(0, 1 - \frac{Q_p}{M_p^{2018}}\right), \quad (\text{OA.2})$$

where Q_p is the annual in-quota volume and M_p^{2018} is 2018 US imports in tonnes of the products under quota. For EU steel, $Q = 3,300$ thousand tonnes against 4,661 in 2018, so 29% of the statutory rate applies. The shares are 2% for Japanese steel, 0% for UK steel, 0% for EU aluminum and 67% for UK aluminum.

This is the same treatment that tariff-rate quotas receive in the 2018 baseline. In the US schedule, the in-quota and over-quota rates of the agricultural quotas (sugar, dairy, beef, peanuts, cotton, tobacco) are separate tariff lines. The WITS rates are weighted by 2018 imports, so the 2018 baseline charges the average duty that imports actually paid, given how they split between the two lines. For steel and aluminum the quotas only started in 2022, so we cannot observe the split in 2018 data and impute it from 2018 tonnage instead. The approximation is rough: imports adjusted to the quota after 2018, and for over-quota units the duty is a marginal cost rather than an average one. The amounts involved are small, however: the EU, Japan and the UK together face an average additional duty of well under one percent in the status quo.

Section 201 on solar modules. The safeguard on crystalline silicon photovoltaic modules was 14.25% on 1 January 2025. Cells imported within the quota are free. Canada and the developing countries listed in note 18 are exempt. All of this is a small effect at the sector level.

Russia. Since April 2022 Russian goods pay column 2 rates instead of MFN rates, and some lines (note 30) pay 35%. We add the difference between the column 2 rate (or 35%) and the MFN rate. Specific duties (per kilogram or per unit) are converted to ad valorem equivalents with 2018 unit values, capped at 200%. Together with the 200% duty on aluminum, the average additional duty on Russian goods is 16.3%: 5.6 points from column 2, 9.1 from aluminum and 1.7 from steel.

We do not model import bans (oil, gold, diamonds, seafood, alcohol), which the tariff data cannot represent. Belarus is also on column 2, but it is part of the rest of the world in the model and is not adjusted.

Retaliation in force in January 2025. Four partners had retaliated against the 2018 US measures. In January 2025 three of those duties were still in force.

- China: the 2018 rounds and their June 2019 increase are taken line by line from ?. The September 2019 round is added at the halved rates of February 2020. China has 11,790 tariff lines, of which 8,979 carry retaliation. The September 2019 round covers 1,716 eight-digit lines. Chinese lines are averaged within HS6 and matched to US exports at HS6. On 2018 US exports to China (\$119.0bn), the average retaliatory duty is 10.3%.
- Russia (August 2018, 25–40% on machinery and equipment): 1.1% on average.

- Turkey (June 2018, on nuts, rice, cars, cosmetics and other goods, doubled in August 2018 and brought back down in May 2019): 1.7% on average.

For Russia and Turkey we use the product-level retaliation increases in the ? data.

Three other rounds of retaliation had ended by January 2025: the EU’s (suspended in 2021), Canada’s and Mexico’s (removed in May 2019), and India’s (removed in 2023).

Table OA.1: January 2025 status quo: additional US tariffs by measure and partner (%)

Partner	Sec. 301	232 steel	232 alum.	201 solar	Russia col. 2	Total
China	14.05	0.05	0.03	0.00	0.00	14.13
European Union	0.00	0.12	0.00	0.00	0.00	0.12
Mexico	0.00	0.00	0.00	0.01	0.00	0.01
Canada	0.00	0.00	0.00	0.00	0.00	0.00
Japan	0.00	0.01	0.03	0.00	0.00	0.04
Korea	0.00	0.00	0.04	0.00	0.00	0.04
Vietnam	0.00	0.45	0.02	0.04	0.00	0.51
India	0.00	0.20	0.12	0.01	0.00	0.32
United Kingdom	0.00	0.00	0.02	0.00	0.00	0.02
Switzerland	0.00	0.04	0.01	0.00	0.00	0.05
Brazil	0.00	0.00	0.07	0.00	0.00	0.07
Russia	0.00	1.73	9.06	0.00	5.55	16.35
All partners	3.12	0.10	0.11	0.01	0.05	3.38

Notes: Additional duties on top of the 2018 WITS baseline, averaged over 2018 US imports of goods from each partner (equation (??) applied to all goods together). “All partners” is the average weighted by trade over all 2018 US imports of goods, including partners not shown in the table. EU is the EU27.

OA.1.3 The 2025 scenarios

In 2025 the US tariff schedule changed many times. We anchor each scenario to one date and take the US rules from the HTSUS revision in force on that date.

- **LibDay** is the schedule announced on 2 April 2025 and in force for a few hours on 9 April 2025 (HTSUS 2025 Revision 7). It contains the country-specific “reciprocal” rates of Annex I (34% for China, 20% for the EU, 24% for Japan, and so on) and 10% for all other countries. It also includes the fentanyl duties on China, Canada and Mexico, the restored steel and aluminum duties, and the 25% duty on cars (but not yet on car parts). LibDay describes the regime as announced. The country rates were paused on 10 April, before they could change trade.

- **TariffPeak** is 12 May 2025 (HTSUS Revision 11), the highest point of the US–China escalation. China pays a 125% reciprocal rate, all other countries pay 10%, and electronics (smartphones, computers, semiconductors) have been exempt from the reciprocal tariff since 11 April. The 25% duty on car parts has been in force since 3 May. Two days later, at Geneva, the US and China cut their rates.
- **TariffDeal** is 17 November 2025 (HTSUS Revision 29), when most bilateral deals had been implemented.
 - The reciprocal rates are the country rates of 7 August 2025 (Executive Order 14326).
 - The EU, Japan, Korea and Switzerland pay 15% inclusive of MFN. Korea and Switzerland were implemented in revisions after 17 November, with effect from 1 and 14 November.
 - China pays 10% reciprocal plus 10% fentanyl after the Busan agreement of 10 November.
 - Brazil pays an extra 40% and India an extra 25%.
 - Steel and aluminum pay 50% (the UK 25%).
 - There are new Section 232 duties on copper, timber and furniture, and trucks.
 - Agricultural products were exempted on 13 November.

We stop at November 2025 because the Supreme Court struck down the IEEPA tariffs on 20 February 2026. A later date would describe a different legal regime, in which Section 122 and Section 232 replace IEEPA.

Table ?? lists the headline reciprocal rates, and Table ?? the resulting average tariffs by partner.

OA.1.3.1 How the measures combine

A product can be subject to several measures at once. The executive orders set out how they combine (EO 14257 for the reciprocal tariff, EO 14289 and its amendment of 3 June 2025 for stacking). We apply these rules line by line.

1. *Cumulative measures.* Section 301, the fentanyl duty on China, the reciprocal tariff and the extra duties on Brazil and India add up.

Table OA.2: Headline IEEPA “reciprocal” rates by scenario (%)

Partner	LibDay (9 Apr)	TariffPeak (12 May)	TariffDeal (17 Nov)
China	34	125	10
European Union	20	10	15 all-in
Mexico	—	—	—
Canada	—	—	—
Japan	24	10	15 all-in
Korea	25	10	15 all-in
Vietnam	46	10	20
India	26	10	25 + 25
United Kingdom	10	10	10
Switzerland	31	10	15 all-in
Brazil	10	10	10 + 40
Russia	—	—	—

Notes: “15 all-in” means a rate of 15% inclusive of the MFN duty, so the additional duty is $\max(0.15 - \text{MFN}, 0)$. “+40” and “+25” are the additional IEEPA duties on Brazil (from 6 August) and India (from 27 August). Canada and Mexico are not subject to the reciprocal tariff (they face the fentanyl duty instead). Russia is not subject to it either (column 2). The reciprocal rate is not the average tariff: exemptions and Section 232 goods are taken out, see equation (??). LibDay contains 55 country rates and TariffDeal 68. All other countries pay 10%.

2. *Annex II.* Goods in Annex II are exempt from the reciprocal tariff. These include energy, pharmaceuticals, some minerals, and later electronics and the agricultural products of November 2025. We read Annex II from each scenario’s HTSUS revision, so it grows over time from 1,039 to 1,093 codes. At the TariffDeal date, 29% of 2018 imports from China are exempt (29% at TariffPeak).
3. *Section 232 goods.* Goods subject to a Section 232 duty (steel, aluminum, cars and car parts, and in TariffDeal also copper, timber, furniture and trucks) are exempt from the reciprocal tariff.
4. *Metal content.* Many steel, aluminum and copper derivatives (machinery, appliances, furniture) pay the Section 232 duty only on their metal content. The rest of their value pays the reciprocal tariff. The HTSUS identifies these products but not their metal content, which varies from shipment to shipment. We assume a common metal share of $\varphi = 40\%$ of value for derivatives outside HS chapters 72, 73, 74 and 76. Products inside those chapters are 100% metal.

For a product h from partner p , the reciprocal duty is therefore

$$\tau_{ph}^{recip} = r_p (1 - a_h) (1 - \max\{c_h^{232}, \varphi d_h\}), \quad (\text{OA.3})$$

where:

- r_p is the headline rate of partner p ,
- a_h is the share of line h covered by Annex II,
- c_h^{232} is the share covered by a full-value Section 232 duty, and
- d_h is the share covered as a derivative taxed on its metal content.

The shares are between zero and one because a 2018 HTS10 line can contain several 2025 lines. When a list names only some of them, we use the share of the 2025 lines within the HS6 heading.

Canada and Mexico. Goods from Canada and Mexico pay a fentanyl duty instead of the reciprocal tariff, and goods that claim USMCA preference are exempt from it. The rate is 25% for both countries, 10% for Canadian energy and potash, and 35% for other Canadian goods from 1 August 2025. We apply the duty to the non-USMCA share of each line, $\tau_{ph}^{fent} = f_{ph}(1 - u_{p,t})$.

The USMCA share $u_{p,t}$ is the share of imports from p that claimed USMCA preference in the scenario month, from the monthly series of the Dallas Fed (from USITC DataWeb). It rose sharply in 2025 once claiming the preference paid off:

- Canada: 57% in April and 58% in May, against 34% in January.
- Mexico: 47% in April and 48% in May, against 45% in January.
- In November: 89% for Canada and 89% for Mexico.

We use one share per country for all products. In reality compliance varies by product, so the fentanyl duty is overstated on lines that comply more than average and understated on lines that comply less.

Three more rules apply to Canada and Mexico:

- Goods under the automotive Section 232 duty do not pay the fentanyl duty.
- For steel and aluminum, the rule changed on 4 June 2025. Before that date the fentanyl duty displaces the Section 232 duty: the non-USMCA share pays the fentanyl duty and the USMCA share pays the metals duty. From 4 June the metals duty applies to the metal share and the fentanyl duty only to the rest.

- Vehicles from Canada and Mexico that qualify under USMCA pay the automotive duty only on their non-US content. A share q_p of vehicles qualifies ($q = 99.0\%$ for Canada and 92.9% for Mexico in 2025, from USTR’s 2026 report to Congress). We assume US content of $\kappa = 50\%$ for Canadian and 40% for Mexican vehicles. The vehicle duty is then

$$\tau_p^{veh} = t^{auto} [q_p(1 - \kappa_p) + (1 - q_p)]. \quad (\text{OA.4})$$

Car parts that qualify under USMCA remain exempt, so parts pay $t^{auto}(1 - u_{p,t})$.

OA.1.3.2 Scenario-specific details

Section 232 in 2025. On 12 March 2025 all country exemptions, quotas and tariff-rate quotas for steel and aluminum ended. From then on every partner pays 25%, and Russian aluminum pays 200%. The rate doubled to 50% on 4 June (the UK kept 25%), so TariffDeal uses 50%.

The automotive duty is 25% on cars from 3 April and on car parts from 3 May. Under their deals, the EU, Japan and Korea pay 15% inclusive of MFN on cars and parts. UK cars within the quota of 100,000 vehicles pay 7.5% on top of MFN. We treat all UK cars as within the quota.

TariffDeal also includes:

- copper (from 1 August): 50% on copper content,
- softwood timber (from 14 October): 10%,
- upholstered furniture and kitchen cabinets: 25%, 15% for the EU and Japan and 10% for the UK,
- heavy trucks and their parts (from 1 November): 25%, with the same USMCA treatment as cars, and
- buses: 10%.

“All-in” rates. The EU and Japan deals, and later Korea and Switzerland, set the reciprocal rate at 15% inclusive of MFN. The additional duty is then $\max(0.15 - \text{MFN}_h, 0)$. We use the 2025 MFN rate of each line, with specific duties converted to ad valorem equivalents with 2018 unit values. Lines whose MFN rate is already above 15% get no additional duty.

China over time. The China fentanyl duty is 20% in LibDay and TariffPeak and 10% in TariffDeal. The reciprocal rate is 34% in LibDay, 125% in TariffPeak and 10% in TariffDeal (34% with 24 points suspended). The Section 301 duties are unchanged throughout. Table ?? decomposes the average US tariff on China. Most of the fall from TariffPeak to TariffDeal comes from the reciprocal rate.

Table OA.3: Average additional US tariff on imports from China: contribution of each measure (percentage points)

Measure	Jan 2025	LibDay	TariffPeak	TariffDeal
Section 301	14.0	14.0	14.0	14.0
IEEPA fentanyl	0.0	20.0	20.0	10.0
IEEPA reciprocal	0.0	30.5	80.2	5.9
Section 232 metals	0.1	1.3	1.3	3.9
Section 232 autos, wood, trucks	0.0	0.1	0.4	1.2
Total (average additional tariff)	14.1	65.9	115.9	35.0

Notes: Each row is a measure’s contribution to the average additional tariff on China: its rate times the share of 2018 US imports of goods from China that it covers, averaged over all of these imports. The base is the same for every row, so the rows add up to the total. A row is not the rate on the goods the measure covers: for example, steel and aluminum pay 50% in TariffDeal, but they make up only a small share of imports from China. Additional duties on top of the 2018 WITS baseline. The January 2025 metals figure is steel plus aluminum. The Section 201 solar safeguard is negligible for China (below 0.01 points).

OA.1.3.3 Retaliation

The “Retal” variants add foreign retaliation as it stood on the scenario date. LibDay has no retaliation variant, because no partner had retaliated against the country rates within a few hours.

- **TariffPeakRetal** (12 May 2025):

- China: its 2018–19 duties, plus the February 2025 tranche (15% on coal and LNG, 10% on crude oil, agricultural machinery and large cars), plus the March 2025 tranche (10–15% on agricultural goods), plus 125% on all US goods.
- Canada: 25% on the products in its lists of 4 March (C\$30bn) and 13 March (C\$30bn, mostly steel and aluminum). Since 9 April also 25% on the non-USMCA content of US vehicles, which we set to half.

- **TariffDealRetal** (17 November 2025):

Table OA.4: Average additional US tariff by partner and scenario (%)

Partner	Imports 2018 (\$bn)	Jan 2025	LibDay	TariffPeak	TariffDeal
China	554	14.1	65.9	115.9	35.0
European Union	404	0.1	15.3	9.5	12.8
Mexico	340	0.0	14.2	14.0	9.2
Canada	305	0.0	10.0	9.9	8.3
Japan	142	0.0	22.7	15.2	16.5
Korea	75	0.0	21.4	12.0	14.5
Vietnam	51	0.5	42.6	9.2	17.4
India	56	0.3	20.2	8.9	37.4
United Kingdom	53	0.0	10.8	10.9	8.4
Switzerland	35	0.0	14.5	4.8	7.0
Brazil	29	0.1	8.8	9.3	28.2
Russia	21	16.3	16.8	16.8	18.7
All partners	2,495	3.4	26.7	33.8	17.3

Notes: Additional duties on top of the 2018 WITS baseline, averaged over 2018 US imports of goods from each partner. “All partners” is the average weighted by trade over all 2018 US imports of goods (\$2,495bn), including partners not shown in the table. It differs from the averages in Table ??, which include the 2018 base rate and use the model’s sector-level weights. The tariff table in the main paper instead reports the increases over January 2025, weighted by US imports in the January 2025 baseline, where China has a smaller weight. The model receives the difference between each scenario column and the January 2025 column. Averages below the headline rate (for example Vietnam at TariffPeak) reflect goods exempt from the reciprocal tariff, mainly electronics.

- China: its 2018–19 duties plus 10%. The February and March tranches were removed on 10 November, and 24 points of the April duty are suspended.
- Canada: from 1 September 2025 only its duties on steel, aluminum and vehicles remain.
- Turkey: its 2018 retaliation was lifted on 22 September 2025, so the increment over the status quo is negative for Turkey.

The EU never applied its 2025 countermeasures, and Mexico did not retaliate. Russia’s 2018 duties stay as in the status quo. Table ?? reports the average retaliatory duties.

Table OA.5: Average retaliatory tariff on US exports (%)

Partner	US exports 2018 (\$bn)	Jan 2025	TariffPeakRetal	TariffDealRetal
China	119.0	10.3	136.6	20.3
Canada	288.3	0.0	6.3	2.1
Russia	6.6	1.1	1.1	1.1
Turkey	9.9	1.7	1.7	0.0

Notes: Additional duties on top of the 2018 WITS baseline, averaged over 2018 US exports of goods to each partner.

OA.1.4 Validation

Table ?? compares our averages with the trade-weighted averages of ?. Unlike the tables above, this comparison uses total tariffs (the 2018 base rate plus the additional duties), because that is what PIIE reports. It also uses the model’s weights: we aggregate the product rates to sectors with equation (??), then average the sectors with the model’s baseline trade flows.

Table OA.6: Average additional tariffs: this paper versus PIIE (%)

Date	US on China		US on rest of world		China on US	
	Ours	PIIE	Ours	PIIE	Ours	PIIE
January 2025	17.0	20.7	1.4	3.0	18.5	21.2
LibDay	68.5	–	16.1	16.5	–	–
TariffPeak	119.9	126.1	11.3	12.5	145.4	147.6
TariffDeal	37.7	47.4	13.5	18.9	28.5	31.9

Notes: Total tariffs, including the 2018 base rate. Our averages use the model’s sector-level trade weights. PIIE: ?, trade-weighted. PIIE has no China series for the LibDay schedule as announced, because the China rate changed twice within that week.

Our figures are close to PIIE's for the peak and somewhat lower elsewhere. For the rest of the world in January 2025, the whole gap is in the base rate: our additional duty on partners other than China is only 0.32%, so the difference comes from the 2018 WITS applied rates and their weights, not from the status-quo layer. For the other dates there are three reasons.

1. *Weights.* We weight by 2018 bilateral imports from China. By the end of 2018 these had already shifted away from goods on Lists 1 and 2. PIIE uses earlier, broader weights. With all-US-import weights instead of imports from China, our averages for China become 20.9% in January 2025, 117.5% at the peak and 43.7% at the deal, close to PIIE's.
2. *Exempt goods at the peak.* Our share of imports from China that is exempt from the reciprocal tariff is slightly larger than the one implied by PIIE. Part of this comes from applying the 2025 smartphone exemption to the 2018 code that contains smartphones.
3. *USMCA compliance.* In TariffDeal, most of the gap for the rest of the world comes from Canada and Mexico. With the January 2025 USMCA shares instead of the November ones, our rest-of-world average would be 16.3% instead of 13.5%. PIIE assumes less compliance than the Dallas Fed series shows.