When the Law Keys on Loading Date, the Pipeline Sets the Lag

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Why can published tariff rates and measured duties move at different speeds? A working-paper explainer on loading-date exceptions, ocean and air transit, and the limits of monthly trade data during the April 2025 tariff changes.

> **About this research**
>
> Working paper; source manuscript not publicly linked. Results below are author-reported, not independently reproduced or peer-reviewed.

Abstract

Published tariff rates and measured duties moved at different speeds after the April 2025 tariff changes. Section 3(a) of Executive Order 14257 kept the earlier treatment for goods that were loaded on a vessel and in final transit before the new rates took effect. A rule keyed to the loading date therefore reaches ocean cargo weeks later than air cargo. This note summarizes a working paper that tests the mechanism by comparing China product cells with different pre-existing shares of vessel shipments. The paper reports that the April-minus-March change in the effective tariff rate falls by 44.1 percentage points per unit of vessel share (standard error 2.3 percentage points; 4,447 product cells): a fitted increase of 54.8 points for all-air cells against 10.7 points for all-vessel cells. It reports a cumulative gap of $14.65 billion between statutory and as-filed duties from April to December 2025, 94 percent of it in April and May, and attributes $7.1 billion to $12.6 billion of that gap to the savings clause. The estimates are the author's. They are not peer-reviewed and have not been independently reproduced, and the manuscript and replication files are not public. They describe product cells in monthly trade statistics. They do not describe any single shipment, forecast future duties, or measure refunds owed.

Keywords: savings clause; reciprocal tariffs; effective tariff rates; duty planning

Different routes. Different timing.

These estimates are carried forward from the author's working-paper summary. Percentage-point changes are differences in rates, not percentage changes in duties paid.

Headline gradient (paper §1, §6.1)	**−44.1pp per unit vessel share (s.e. 2.3pp, t=−18.8, n=4,447 China product cells)**
April rate change: full-air vs full-vessel cells (§6.1)	**+54.8pp vs +10.7pp**
Statutory-minus-as-filed revenue gap, Apr–Dec 2025 (§8)	**$14.65B — 94% of it in April and May**
Savings-clause share of that gap (§8)	**$7.1B–$12.6B (49–86%)**
May 2019 List 3 replication, mode-neutral wording (§6.4)	**−3.8pp gradient (n=4,022), same shape**

Section references refer to the author's manuscript v11. A public manuscript and replication package are not linked on this site.

What a savings clause is

A savings clause can preserve earlier treatment for goods already in transit when a tariff changes. Section 3(a) of Executive Order 14257 included vessel-loading and final-transit conditions for its April 5 and April 9, 2025 changes. Those historical provisions are the starting point for the research question; later amendments and implementation guidance must also be checked for any particular entry.

Ocean and air shipments have different transit times. A rule keyed to loading can therefore produce a lag between an announced rate change and the duties reflected in monthly trade statistics. The paper examines this proposed mechanism by comparing product cells with different pre-existing vessel shares. The comparison is an empirical design, not an eligibility test for an individual shipment.

The author also reports a comparison with the May 2019 Section 301 List 3 episode. That comparison is intended to test whether the pattern persists under a different form of in-transit exception. Its estimates are summarized in the methodology below; the underlying analysis is not available for public replication on this site.

> Historical text: Executive Order 14257, §3(a).

What the author reports

The working-paper summary reports an April-minus-March effective-rate gradient of −44.1 percentage points per unit of January–March vessel share across 4,447 China product cells (standard error 2.3 percentage points). Fitted increases at the full-air and full-vessel endpoints are +54.8 and +10.7 percentage points, respectively. These are regression estimates for product cells, not observations of a representative importer or a forecast for a specific shipment.

The gradient scales with the statutory dose across 38 origins (−0.45 per pp of day-weighted dose), with sharp nulls at the two origins whose dose was zero — Canada (−0.8pp) and Mexico (+0.4pp), both exempted entirely from the April action. Exact randomization inference over dose assignment gives p = 0.000016. A transit-convolved statutory model tracks the month-by-month gradient across all 20 months from May 2024 to December 2025, including the June 2025 unwind (+16.1pp predicted, +19.3pp observed); the 15 quiet months show no spurious gradients. Where the law keyed on entry date instead of loading date — the May 14, 2025 Geneva rate cut and the August country-specific rates — the event study finds no gradient.

On the treated panel (4,492 HTS10 lines × 40 origins, April–December 2025), the cumulative gap between the statutory rate and as-filed collections is $14.65 billion, 94 percent of it ($13.84B) in April and May, converging within about two months. The savings clause accounts for $7.1 billion (49 percent) when the no-clause vessel rate is priced at the rate full-air cells actually paid, and up to $12.6 billion (86 percent) when priced at the frictionless day-weighted statutory dose — with the paper's placement near the lower end, about $7.5 billion (51 percent). The remainder of the April–May spike is an air-side shortfall: full-air cells paid 54.8pp against a 91.6pp day-weighted statutory prediction.

What this means for your entries

Separate a published rate from a measured effective rate. A monthly average can reflect a mix of shipment dates, applicable rules, and filing behavior. The reported lag is a finding about this historical panel; it should not be applied as a universal two-month forecasting rule or used as an adjustment to a tariff calculator.

For an actual entry, identify the applicable order, amendment, entry date, loading or export date, and supporting shipping records. A product-level vessel share cannot establish whether an individual shipment qualified for an exception. Check the governing rule and implementation guidance with your customs broker or counsel.

Read the revenue gap as measurement, not money owed. The $14.65B gap is the difference between the statutory rate and calculated duties as filed on entry summaries. Census monthly statistics record duties as filed — they do not see within-month filing timing or post-summary corrections, reliquidations, protests, or refunds. A large statutory-vs-collected gap does not by itself mean refunds are coming or that duties were overpaid; part of the 2025 gap (roughly the non-clause part of the April–May spike) is filing friction the paper bounds but does not apportion. This note is a planning tool, not legal advice: run specific entries past your customs broker or counsel.

What this note can't tell you

This note summarizes working-paper results attributed to Subodh Khanal. The source manuscript and replication files are not publicly linked here, so readers cannot independently reproduce the reported estimates from this page. The work is not presented as peer-reviewed. The analysis is China-centered and its headline gradient does not directly generalize to every origin.

The panel uses calculated duties in trade statistics. The Census Bureau cautions that calculated duties do not necessarily equal duties paid; its documentation also describes exclusions and processing limitations. They are not a measure of Treasury receipts or refunds. The author's statutory comparison assumes uniform daily entry flow within April and uses average transit distributions rather than shipment-level observations.

Two open puzzles stay open honestly. The air-side shortfall — within-month retiming explains only about 3pp of the 37pp gap between the 91.6pp day-weighted prediction and the 54.8pp observed full-air increase — is unapportioned systems lag, and the same roughly-half compression appears in the 2019 episode. And Hong Kong, assigned the same 125pp dose, does not fit the pattern; the paper reports it as an outlier rather than claiming the mechanism for it.

> Measurement reference: Census Bureau trade statistics definitions.

Methodology

The author's reported specifications and sensitivity checks, retained for readers who want to inspect the design. They have not been rerun for this web publication.

1. Design. The estimand is the savings-clause discount gradient: β = E[Δeff_rate(Apr−Mar) | vessel share = 1] − E[Δeff_rate(Apr−Mar) | vessel share = 0], estimated by unweighted cell-level OLS of the April-minus-March effective-rate change on pre-determined January–March 2025 vessel share, with HS4-clustered standard errors (686 clusters). β = −0.4405 (s.e. 0.0234, t = −18.8); a wild cluster bootstrap (4,999 draws) gives p = 0.0002. Vessel-heavy and air-heavy cells are different goods, but the gradient survives HS4 fixed effects (−39.0pp, t = −23.4, n = 4,274), so no between-product composition story carries it.

2. Dose-response (expansion analysis). The same specification is run per origin on 38 origins; the precision-weighted two-step slope of the origin gradients on day-weighted dose is −0.449 per pp of dose (s.e. 0.061, t = −7.4, intercept −0.6pp, indistinguishable from zero). Formal inference uses a restricted wild cluster bootstrap at the origin level (two-step p = 0.042; the pooled p = 0.059 is reported as a miss) and exact randomization inference over dose assignment (all 442,890 assignments): 7 beat or tie the observed slope, exact p = 0.000016. A restricted version dropping China and Hong Kong (630 assignments of the two zero doses) gives p = 0.017 — significant, but on the dose-10-versus-zero contrast alone the claim is weaker than the full RI suggests.

3. Event study (expansion analysis). For each month May 2024–December 2025, the month-over-month rate change is regressed on rolling vessel share. A transit-convolved statutory model (vessel lognormal mean 25 days, sd 8; air mean 5, sd 2, fixed in the pre-analysis) predicts each month's gradient from the daily statutory schedule and the loading-date rules. The observed-on-predicted slope across the five nonzero months is 0.66 (correlation 0.98; per-month ratios 0.53 to 1.20), the June 2025 unwind is a consistency check (+16.1pp predicted, +19.3pp observed), and the 15 quiet months show no spurious gradients (largest |t| = 2.0, economically zero).

4. 2019 replication (expansion analysis). On China HTS10 cells, March–July 2019: the May-minus-April-2019 List 3 gradient is −3.82pp (s.e. 0.42pp, t = −9.2, n = 4,022, G = 642), the same shape as 2025 from a mode-neutral export-date exception; June-minus-April is −1.91pp, decayed. The non-List-3 placebo is clean (−0.10pp, t = −0.6). Day-weighted on the same footing, the 2019 dose was 10.6pp against which full-air List 3 cells rose 5.2pp — a ratio of 0.49, against 0.60 (2025 full-air level) and 0.52 (2025 cell-level calibration slope).

5. Cell-level calibration (expansion analysis). Convolving the daily April statutory schedule with mode-specific transit distributions predicts each cell's April increment from its pre-determined mode mix; regressing observed on predicted gives slope 0.52 (s.e. 0.03), decisively below 1 (t = −17.2) and above 0, stable across transit assumptions (0.48–0.59). The compression is a level shift, not a shape failure, concentrated on the air side: 37pp shortfall (91.6pp predicted vs 54.8pp observed); the vessel side is approximately right (+10.7pp observed vs +6.7pp predicted). Weekly China/HK air-cargo tonnage (WorldACD, weeks 13–18, 2025) bounds within-April retiming at about 3pp of the 37pp; the May catch-up test rejects the delayed-filing variant (May full-air +49.6pp vs +59.2pp predicted).

6. Revenue arithmetic. On the treated panel, the cumulative statutory-minus-as-filed gap is $14.65B ($10.30B April, $3.54B May, +$0.81B net June–December; 94% April–May). The $14.65B is measured directly; only the clause/friction split is counterfactual. The lower end ($7.1B, 49%) prices the no-clause vessel rate at air's realized 54.8pp April rate ($4.70B China April, $1.56B China May, $0.65B + $0.19B other origins); the

upper end ($12.6B, 86%) prices it at the frictionless 91.6pp dose. Adding the ~3pp timing component back to the vessel counterfactual places the clause near the lower end at about $7.5B (51%).

7. Stated limits. The panel measures calculated duties in formal entries, not Treasury collections; Census monthly data cannot see within-month filing timing or post-summary corrections and refunds; day-weighting assumes uniform daily flow; the convolution uses industry-average transit distributions, not shipment-level data; the dose design has three values so curvature is unidentified; the friction account of the air-side shortfall cannot be tested in public data and needs CBP entry-summary microdata; the 2025 analysis is China-centered by design; Hong Kong is reported as an outlier; nothing was pre-registered (all falsification rules were written before estimation and labeled as such; expansion analyses ran under pre-written expectations archived with the replication files).

References

Primary references for the policy setting and measurement definitions. These references do not independently validate the working paper's estimates.

1. Executive Order 14257, §3(a)

   Federal Register, April 7, 2025. Original loading-date language; later amendments and implementation guidance are outside this source.

   https://www.govinfo.gov/content/pkg/FR-2025-04-07/html/2025-06063.htm

2. Census Bureau — trade statistics definitions

   See “Dutiable Value of Imports and Calculated Duty” and “Estimated Calculated Duty” for measurement limits.

   https://www.census.gov/foreign-trade/guide/sec2.html

3. WorldACD — weekly air cargo trends archive

   Context for the author-reported timing check. This archive does not supply the paper's replication files.

   https://www.worldacd.com/trends/weekly-trends-archive/

4. USITC — Harmonized Tariff Schedule

   Official classification reference. The current schedule is not a substitute for the historical version applicable to an entry.

   https://hts.usitc.gov/

Cite this research note

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