Did Foreigners Pay America's Tariffs?

Quantity Discounts, Scale Economies and Incomplete Pass-Through

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Did Foreigners Pay America's Tariffs?

The conventional wisdom: US tariffs are paid entirely by US consumers.

- ▷ Import prices rose one-for-one with tariffs (Fajgelbaum et al. 2020, Amiti et al. 2019)
- ▷ Implication: foreign exporters didn't budge. Americans paid the full bill.

But this misses something basic: Buy more, pay less per unit.

- ▷ Quantity discounts are everywhere — from Alibaba screws to Amazon markers
- ▷ Tariffs crushed order sizes. Smaller orders → higher unit costs → prices rise *mechanically*
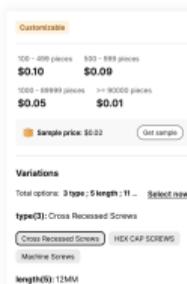
Once you account for this scale loss:

- ▷ Tariff pass-through falls from 100% to **60%**
- ▷ Foreign producers bore $\approx$ 60% of the tariff burden
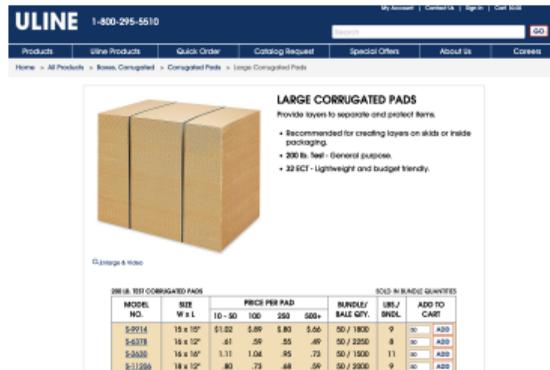- ▷ Consistent with the US exercising market power in trade

Quantity discounts are widespread and prevalent

Screws on Alibaba

Markers on Amazon Business

Corrugated pads on Uline

Buy more → pay less per unit. This is the norm, not the exception.

Context: The 2018-2019 Trade War

The Policy Shock

- ▷ Series of tariff waves starting in 2018, primarily targeting China (Section 301).

- ▷ Average US applied tariff rate rose from **1.6% in 2017** to **2.9% in 2019**.

- ▷ Total duties collected more than doubled: **$29.1 billion $\rightarrow$ $64.8 billion**.

The Standard View (Previous Literature)

- ▷ *Fajgelbaum et al. (2020), Amiti et al. (2019), Cavallo et al. (2021).*

- ▷ **Finding**: Border Import Unit Values rose one-for-one with tariffs ($\rho \approx 1$).

- ▷ **Conclusion**: Complete Pass-Through. US consumers paid the full cost.

- ▷ **Implied Key Parameter**: Foreign export supply is perfectly elastic (Flat MC).

Outline

- **Quantity Discounts in US Import Data**
  - How big? Why? Costs or markups?

- **Who Paid the Tariffs?**
  - Decomposing observed pass-through into strategic pricing and scale loss

- **Welfare & Policy Implications**
  - Incidence, efficiency costs, and lessons for tariff policy

Pass-Through $\neq$ Incidence

Uniform Pricing (standard assumption)

- ▷ Pass-through maps directly to incidence: $\rho \approx 1 \rightarrow$ "Buyers pay everything"
- ▷ This is the logic behind the conventional wisdom   (Fajgelbaum et al. 2020)

Non-Uniform Pricing (our setting)

- ▷ A seller with full pricing power (perfect discrimination):   Consumer Incidence $\approx 0\%$
  - ▷ Seller captures all surplus $\rightarrow$ *seller* bears the tariff, regardless of ρ
- ▷ Somewhere in between (our empirical case):   Consumer Incidence $= 42\%$
  - ▷ Sellers bear majority, but not all — depends on *why* prices vary with quantity

Pass-through alone does not determine who pays.
We need to know whether quantity discounts reflect *costs* or *markups*.
This is what we test.

Quantity Discounts in US Import Data

The Data

US Import Transaction Data (Complete Universe)

- ▷ Every shipment entering the US: buyer, seller, product (10-digit HS), quantity, value
- ▷ Over 60 million transactions analyzed
- ▷ Observe the same buyer purchasing from the same seller across different order sizes

Key Specification

$$\log p_{i \to j,t,v} = \gamma \log q_{i \to j,t,v} + \text{Buyer-Seller-Product FE} + \xi_{i \to j,t,v} \tag{1}$$

- ▷ Within the *same* buyer-seller-product relationship, how do prices vary with order size?

Transaction Quantity Explains Most Price Variation

		Variance Decomposition			
	Controls	Controls	Fixed Effects	Covariance	Residual
1	$\log q$	43.6%			56.4%
2	$\log q \times$ Product	57.4%			42.6%
3	Buyer-Seller-Product FE		73.7%		26.3%
4	Both	16.6%	42.7%	20.6%	20.1%

▷ Transaction quantity alone explains **44%** of import price variation

▷ Aggregate buyer volume (bargaining power) adds almost nothing once order size is controlled

Prices Fall with Order Size
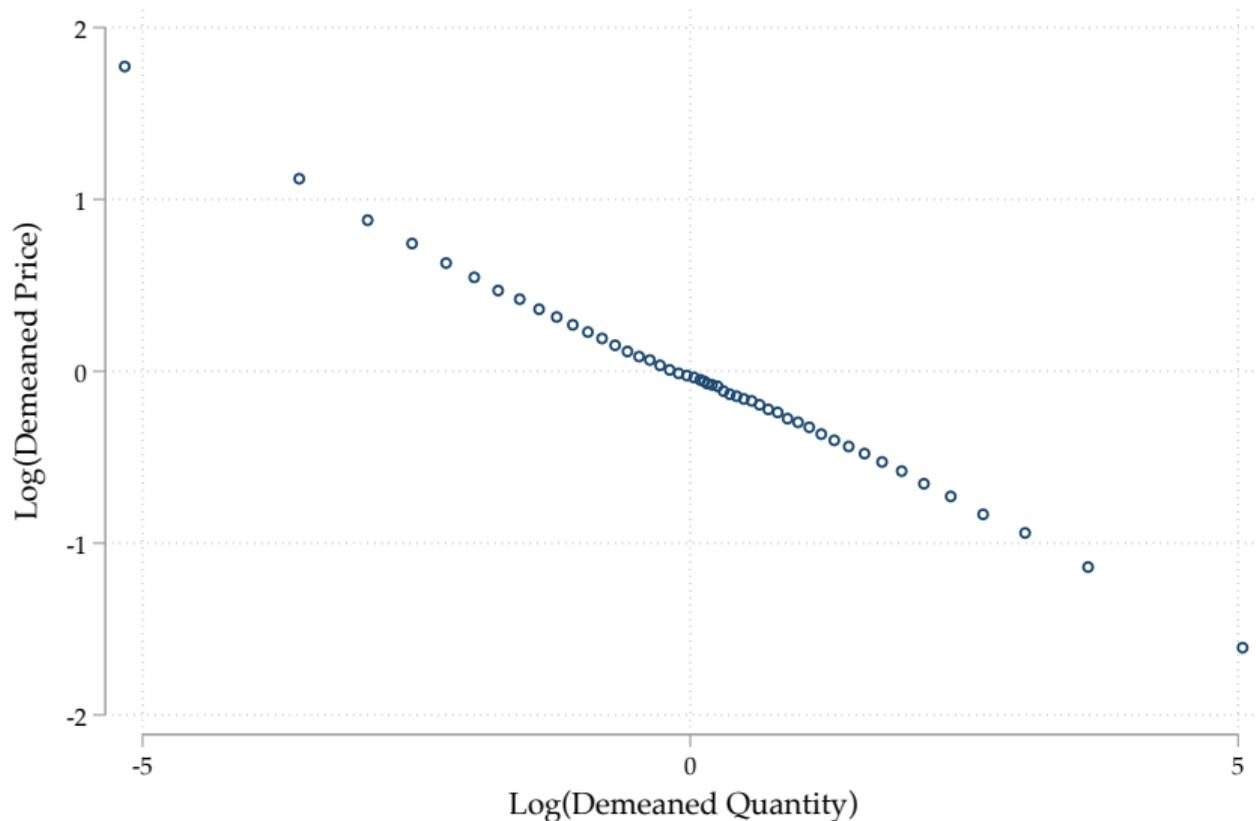
The Quantity Discount: $\gamma \approx -0.28$

	(1)	(2)	(3)
	$\log p$	$\log p$	
$\log q$	-0.268	-0.284	-0.200
	(0.005)	(0.002)	(0.046)
Within R^2	0.226	0.226	0.218
First Stage F-Stat		10,020	115
IV	OLS	Baseline IV	Other Suppliers IV
Fixed Effects			
Buyer-Seller-Variety	$\checkmark$	$\checkmark$	$\checkmark$
Seller-Month-Variety	$\checkmark$	$\checkmark$	

▷ A **10% larger order** → **2.0-2.8% lower unit price**

▷ Robust across IV strategies, domestic data, and product-level heterogeneity

Why This Matters: Decomposing Pass-Through

Prices reflect both **cost structure** and **markups**:

$$\log p(q) = \underbrace{\log c(q)}_{\text{Cost}} + \underbrace{\log \mu(q)}_{\text{Markup}}$$

We distinguish between two types of pass-through:

▷ $\rho \equiv \frac{d \log P}{d \log(1+\tau)}$: **Observed Pass-Through** (what previous studies measure)

▷ $\tilde{\rho} \equiv \frac{d \log \tilde{p}}{d \log(1+\tau)}$: **Scale-Free Pass-Through** (what matters for welfare)

The relationship:

$$\tilde{\rho} = \rho - \underbrace{\frac{d \log p(q)}{d \log q}}_{\gamma < 0} \underbrace{\frac{d \log q}{d \log(1+\tau)}}_{\text{Qty Response}} \tag{2}$$

▷ If $\gamma < 0$ and tariff reduces q: we see $\rho \approx 1$ even when exporters *are* cutting prices ($\tilde{\rho} < 1$)

The Discount is Cost-Driven, Not Market Power

**Question:** Is γ driven by real resource savings or price discrimination?

Evidence Against Price Discrimination:

① **Intra-firm trades** show the *same* quantity discount as arm's-length ($\beta \approx 0$)

  ▷ No bargaining motive within a firm $\rightarrow$ discounts reflect costs

② **Monopoly markets** have *flatter* discounts ($+0.19$), not steeper

  ▷ Opposite of price discrimination prediction

③ **Observable shipping costs** show scale elasticity ≈ -0.38

  ▷ Real physical economies of scale match price elasticity

Interpretation: $\gamma \approx \gamma_c$ (cost parameter). Tariffs reduce order sizes $\rightarrow$ unit costs *mechanically* rise.
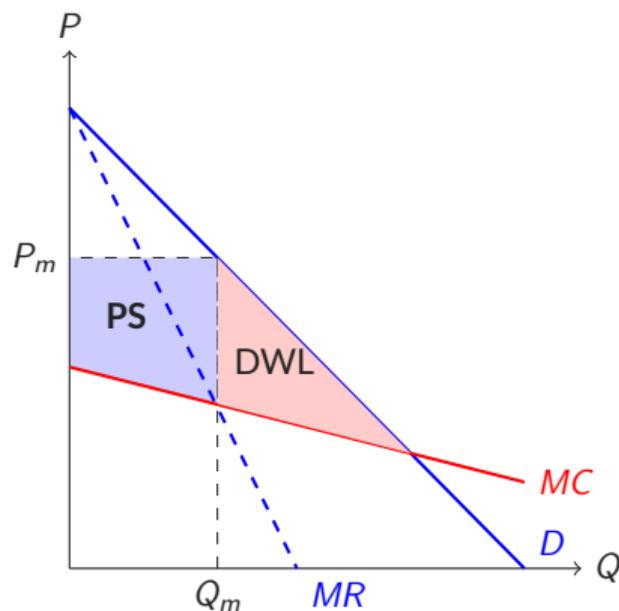
Incidence: Quantity Discounts

Perfect Price Discrimination
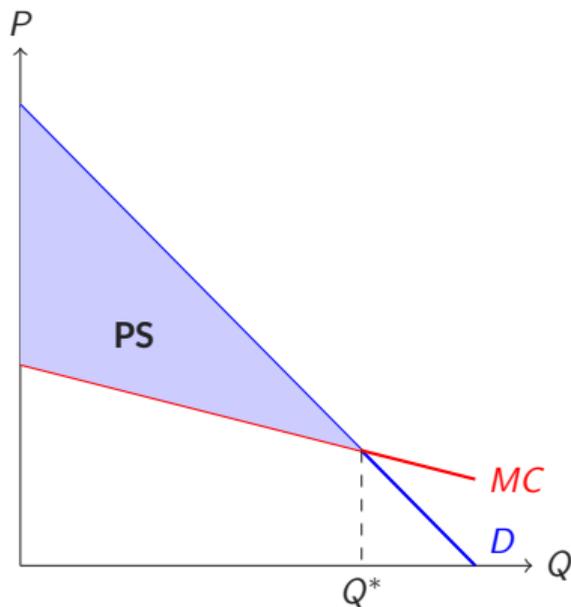
Incidence ≈ 0
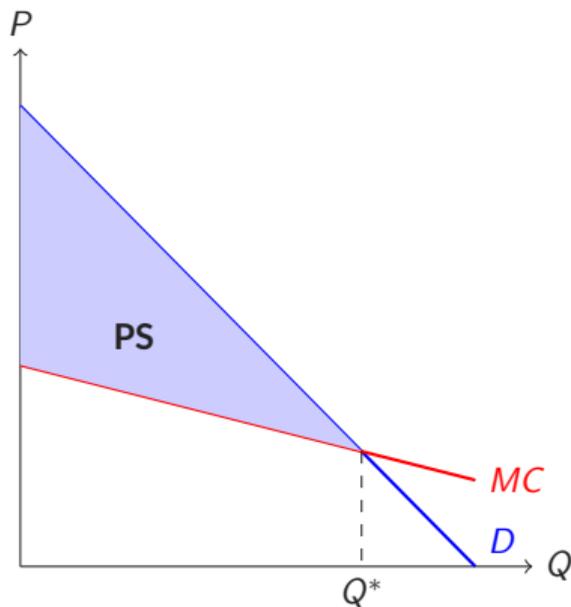Seller captures all surplus.

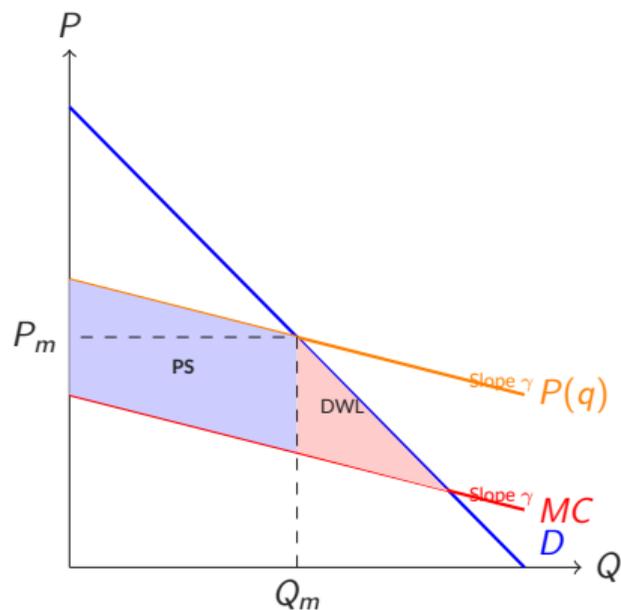**Monopoly Uniform Pricing**

Incidence ≥ 0
Shared burden.

Incidence: Constant Markups with Quantity Discounts

Perfect Price Discrimination

Incidence ≈ 0
Seller captures all surplus.

Constant Markups (Per Customer)

Incidence ≥ 0
Shared burden, depends on marginal customer

Who Paid America's Tariffs?

(We use γ to get $\tilde{\rho}$.)

Tariff Pass-Through Within a Buyer-Seller Pair

	(1) $\log(p)$	(2) $\log(\tilde{p}^{OLS})$	(3) $\log(\tilde{p}^{IV})$	(4) $\log(pq)$	(5) $\log(q)$
log(1+ Tariffs Applied)	0.956 (0.0424)	0.780 (0.0282)	0.800 (0.0360)	0.357 (0.0438)	-0.600 (0.0603)
R^2	0.965	0.967	0.996	0.725	0.912

Fixed Effects   Buyer-Seller-Variety, Variety-Year-Month

▷ **Column (1):** Standard estimate. Looks like consumers pay 95%.

▷ **Column (3):** Controlling for scale loss ($\gamma \Delta q$), exporters cut base prices by 20%.

▷ **The Gap:** $0.96 - 0.80 \approx 0.16$.

▷ This perfectly matches the predicted scale loss: $\underbrace{\hat{\gamma}}_{-0.29} \times \underbrace{\Delta q}_{-0.60} \approx 0.17$.

Aggregate Tariff Pass-Through

	$\log(P)$	$\log(\tilde{p}_{\gamma\text{IV}})$	$\log(\text{Value})$	$\log(Q)$	$\log(Q/T)$	$\log(T)$
Panel 1: Aggregate Monthly Variation 2017-2019 Data						
$\log(1 + \text{Tariffs})$	1.038	0.537	-1.479	-2.517	-1.697	-0.820
	(0.030)	(0.024)	(0.042)	(0.053)	(0.042)	(0.026)
Panel 2: Aggregate Change from 2017 to 2019						
$\log(1 + \text{Tariffs})$	1.093	0.602	-2.189	-3.283	-1.737	-1.546
	(0.065)	(0.059)	(0.094)	(0.118)	(0.089)	(0.063)
Fixed Effects		Variety-Country Origin, Time-Month				

▷ **Observed prices**: pass-through ≈ 1.04–1.09 (previous consensus)

▷ **Scale-adjusted**: pass-through ≈ **0.54**–**0.60**

▷ **Why lower than 0.80?** Composition: larger (discounted) transactions shrank disproportionately

Interpreting the Results

The decomposition adds up:

$$\underbrace{0.60}_{\text{Strategic pricing}} + \underbrace{0.46}_{\text{Scale loss: } \gamma \times \Delta Q \approx -0.3 \times -1.55} \approx \underbrace{1.06}_{\text{Observed } (\approx 1.05)}$$

- ▷ **Strategic Response**: Foreigners *did* cut prices. Scale-free pass-through = 0.60.
- ▷ **Scale Loss**: Tariffs crushed order sizes (-1.55), mechanically raising unit costs.
- ▷ **Together**: Looks like $\rho \approx 1$ — but half of that is mechanical, not strategic.

Reconciling the FX vs. Tariff Pass-Through Puzzle

- ▷ **Tariff lit** uses unit values ($\rho \approx 1.0$) → "Complete pass-through"
- ▷ **Exchange rate lit** uses item-level prices ($\rho \approx 0.5$) → "Incomplete"
- ▷ **Our result**: Strip out $\gamma \times \Delta Q$ and tariff pass-through $\approx$ FX pass-through

Welfare Analysis: Did Foreigners Pay?

Standard pass-through estimates (≈ 1) suggest Domestic Buyers pay everything. Our scale-adjusted results paint a different picture:

	Seller Loss	Buyer Loss	Govt Rev.	Total	Seller Share
Local Incidence	$22.9 bn	$16.6 bn	$30.0 bn	-$9.5 bn	58%
Global Approximation	$35.9 bn	$30.3 bn	$30.0 bn	-$36.2 bn	54%

▷ **Sellers bear the majority**: 54–58% of the market burden falls on foreign exporters — *stable* across specifications.

▷ **Buyers**: Prices rose ($16.6 bn), but partially off-set by tariff revenue ($30.0 bn).

▷ **Sellers**: Double squeeze — lowered markups ($\downarrow \tilde{p}$) AND lost efficiency from smaller orders ($\downarrow$ Scale).

▷ **Extensive Margin**: Accounting for transaction frequency, total welfare loss nearly **quadruples** to $36.2 bn — but incidence shares barely change.

Incidence Benchmarks

What does this tell us about Market Power?

Model	Incidence Ratio (Buyer/Seller)	Prediction
Perfect Competition	∞	Buyers pay 100% + DWL
One-Price Monopoly	≈ 1.0	50-50 Split
Our Result	**0.72**	**Sellers pay majority**
Perfect Discriminatory Monopoly	0.00	Sellers pay 100%

▷ Foreign firms successfully **price-to-market** to defend market share.

▷ **Mechanism**: Markup compression ($\tilde{\rho} \approx 0.6$) offsets the cost increase from lost scale.

Policy Implications

The Scale Loss Channel

▷ Tariffs shrink order sizes → unit costs rise mechanically → **efficiency loss**

▷ This hurts both sides: sellers lose scale economies, buyers face higher costs

▷ Baseline deadweight loss: $9.5 bn. With entry/exit: $36.2 bn.

For Tariff Revenue and Incidence Analysis

▷ Standard estimates assuming 100% pass-through **overstate** domestic consumer burden

▷ Foreign exporters absorb a significant share ($\approx 40\%$) through markup compression

▷ The US does have market power — but exercising it comes with real efficiency costs

Broader Lesson: Beyond the 2018 Tariffs

▷ The same mechanism applies to *any* policy that disrupts transaction volumes

▷ Tariffs, sanctions, trade uncertainty, supply chain reshoring — all trigger scale loss

▷ Non-linear pricing is the norm in intermediate goods trade, not the exception

Conclusion

- ▷ **Quantity discounts** are pervasive in international trade and reflect real **returns to scale** in production and shipping

- ▷ The standard finding of 100% tariff pass-through conflates price changes with **scale losses** from reduced order sizes. Reduced form pass-through $\neq$ incidence

- ▷ Once we account for scale, foreign exporters absorbed $\sim$**60%** of tariff costs — US buyers paid $\sim$**40%**, not 100%. But the deadweight loss is bigger than the standard estimate.

- ▷ This reconciles the tariff and exchange rate pass-through literatures: both imply $\leq 100\%$ pass-through once scale is held constant

Thank You!