U.S.–China Trade: From the Cold War to the Trade War

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A mix of two papers. . .

Trade Policy Dynamics: Evidence from 60 years of U.S.-China trade

Alessandria, Khan, Khederlarian, Ruhl, Steinberg

Trade War and Peace: U.S.-China Trade and Tariff Risk from 2015–2050

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How do trade-policy dynamics affect trade?

- Trade depends on past, present, and future policy
  - Gradual adjustment to past policy changes
  - Expectations about future policy changes affect trade today

- Effects of past and future policy often intertwined
  - Size and speed of adjustment to past depends on expectations about future
  - Changes in expectations may be correlated with previous policy changes

- Today
  1. Develop a methodology to disentangle past and future
  2. Use U.S.-China trade as case study
     + New narrative on timing and size of trade policy uncertainty, 1950–2008
     + Estimate probabilities of trade war ending, 2018–2023

Brief history of U.S.-China trade

1950–1970: Complete embargo

1971–1979: Non-normal trade relations (NNTR); large, exogenous, cross-industry tariff variation (tariffs set by 1930 Smoot-Hawley Act)

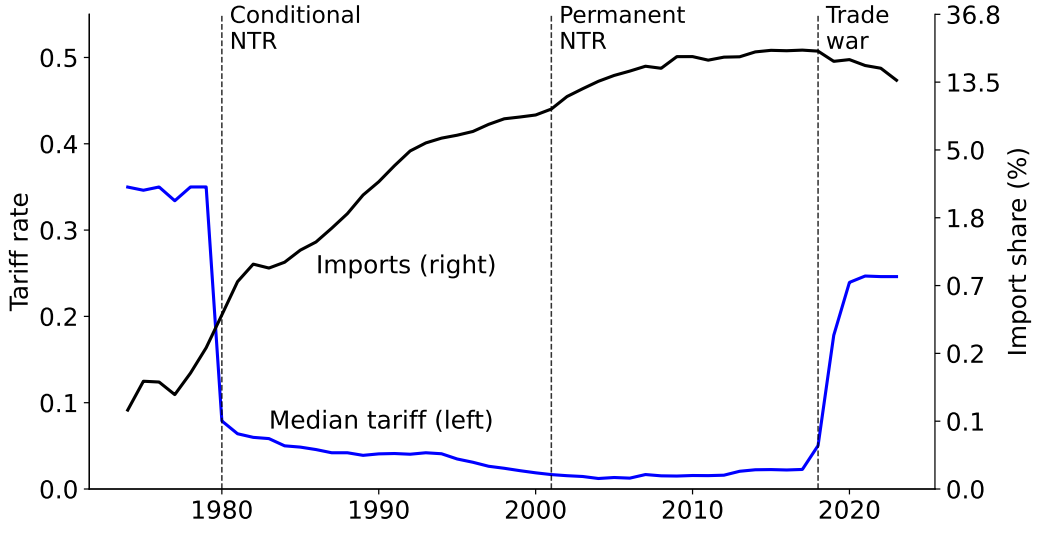
1980–2000: **Conditional** normal trade relations (NTR/MFN); Access to NTR tariffs granted on unilateral basis

- Required annual President renewal
- Starting in 1990, Congress also voted on renewal

2001–2018: China joins WTO, gains permanent normal trade relations (PNTR) status

2018–????: Trump-Biden trade war

U.S.-China trade & policy dynamics



Roadmap

Looking backward, 1971–2008

1. Empirical features
- Slow adjustment to 1980 NTR grant: $\sigma^{LR} \approx 8$, $\sigma^{SR} \approx 2.3$
- Effects of policy uncertainty: 1970/80s $>>$ 1990s

2. Quantitative model: Policy uncertainty $+$ slow adjustment
- Estimate model to match empirical evidence
- Recover agent beliefs over trade regime uncertainty
- Disentangle effects of uncertainty from slow transitions

Looking forward, 2014–2023

1. Empirical features
- Effect of trade-war tariffs small on impact, gradually increasing as trade war persists

2. Quantitative model: Same methodology
- Probability of moving back to trade peace initially high, but falling
- Permanent change in "policy uncertainty paradigm:" probability of going all the way back to NNTR fell

Empirics: Introduction

- Two main goals:
  1. Show that trade responds gradually to trade policy
  2. Revisit results from TPU literature
- Data sources:
  - Import values from U.S. Customs
  - Statutory tariffs (NNTR, NTR rates) from Feenstra et al. (2002)
- Unit of observation: source country (j) - good (g) - year (t)
  - 1974–2008, SITC 5-digit level (1,700 goods)
  - Exclude textile goods (non-tariff trade barriers)
  - Exclude all non-NTR countries other than China (other reforms)
- Results are summarized as a set of elasticities
  - Reduced-form conditional moments, not structural elasticities!

#1: Slow adjustment to tariff changes

- Error correction model (Johnson et al., 1992; Gallaway et al., 2003):

$$\begin{aligned}\Delta v_{jgt} = &\left[\sigma^{SR}_{China}\Delta\tau_{jgt} + \gamma_{China}\left(v_{jg,t-1} - \sigma^{LR}_{China}\tau_{jg,t-1}\right)\right]\mathbb{1}_{\{j=China\}} \\ &+ \left[\sigma^{SR}_{Others}\Delta\tau_{jgt} + \gamma_{Others}\left(v_{jg,t-1} - \sigma^{LR}_{Others}\tau_{jg,t-1}\right)\right]\mathbb{1}_{\{j=Others\}} \\ &+ \delta_{jt} + \delta_{jg} + \delta_{gt} + u_{jgt}\end{aligned}$$

- v_{jgt}: U.S. imports from source j of good g
- τ_{jgt}: U.S. applied tariff on source j of good g
- Control for the following using fixed effects
  - jt: source-country aggregate shocks (exchange rates, structural changes, etc.)
  - gt: good-level U.S. demand shocks, NTR trade policy
  - jg: imports of each good-country relative to a base period
- Note: σ_{LR} is **not** an elasticity to unanticipated, once-and-for-all reforms. Biased downward by policy uncertainty.

#1: Slow adjustment to tariff changes

	Cross-section	ECM
	v_{jgt}	Δv_{jgt}
$\mathbb{1}\{j = China\}\tau_{jgt}$	-6.64 ***	
$\mathbb{1}\{j = China\}\Delta\tau_{jgt}$		-2.29 ***
$\mathbb{1}\{j = China\}v_{jg,t-1}$		-0.37 ***
$\mathbb{1}\{j = China\}\tau_{jg,t-1}$		-2.92 ***
Long-Run China		-7.96 ***
Long-/Short-Run China		3.48
FE	gt, jt, gj	gt, jt, gj
Observations	934,554	934,554
Adjusted R^2	0.79	0.27

Countries: China + all countries with NTR for 1974–2008 that did not have FTA with United States (excludes: Canada, Mexico, and several communist countries)

#2: The effect of future tariff risk

- Pierce and Schott (2016) measure exposure to risk of losing NTR status as

$$\text{NTR gap}_g = \text{NNTR tariff}_g - \text{NTR tariff}_{g,2019}$$

  - Varies across goods; some have large gaps and others have no gap at all
  - Exogenous to U.S.-China relationship
  - Conventional wisdom: risk of losing NTR disappeared (or at least fell) when China moved from conditional NTR to PNTR in 2001

- Estimate effect of NTR gap on trade:

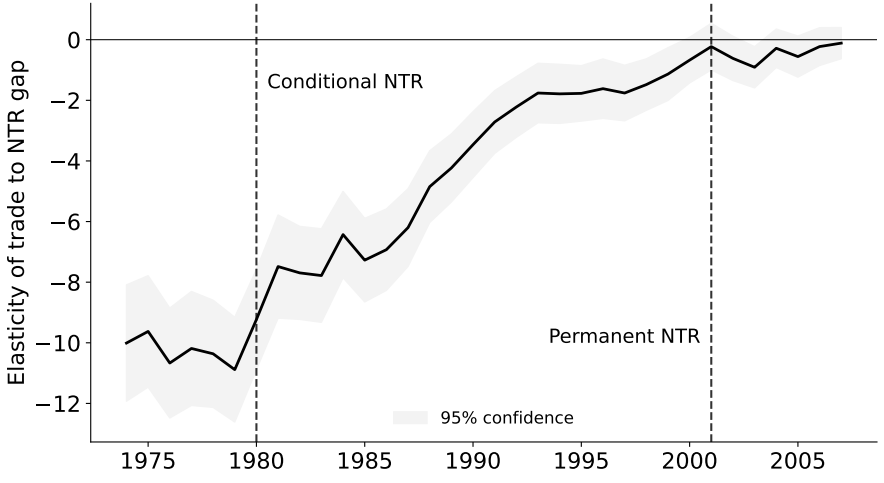
$$v_{jgt} = \beta \mathbb{1}\{t > 2000\} \mathbb{1}\{j = \textit{China}\} \text{NTR gap}_g + \sigma \tau_{jgt} + \delta_{jt} + \delta_{jg} + \delta_{gt} + u_{jgt}$$

- $\beta > 0$: high-gap imports grew more relative to low-gap imports after PNTR, relative to other NTR countries

- We extend to estimate year-by-year elasticity of trade to NTR gap:

$$v_{jgt} = \sum_{t'=1974}^{2007} \beta_t \mathbb{1}_{\{t=t' \wedge j=\textit{China}\}} \text{NTR gap}_g + \delta_{jt} + \delta_{jg} + \delta_{gt} + u_{jgt}$$

Time-varying NTR-gap elasticities



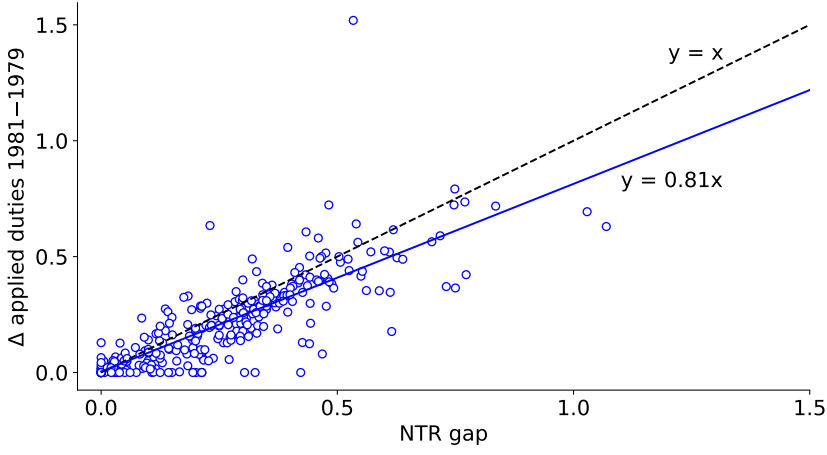
- Coefficients capture both initial reform and expectations (1970s vs. 1980s)
- Flat before 1980; Jumps in 1980 with NTR; stalls in early 1980s
- 1990s growth small share of overall growth
- Calibrate to these elasticities

Interpreting β_t

- Conventional interpretation: Effect of TPU reduction due to 2001 WTO accession
  - Compared to other NTR countries, China more sensitive to NTR gap
- Alternative interpretations:
  1. Delayed effect of 1980 liberalization

$$\text{NTR gap}_g = \text{NNTR tariff}_g - \text{NTR tariff}_{g,2019}$$

The NTR gap and the 1980 liberalization



- NTR gap highly correlated with change in tariffs from 1980 liberalization
- High-gap goods: greater exposure to TPU, but also larger initial liberalizations (and likely, slower adjustments to those liberalizations)

Interpreting β_t

- Conventional interpretation: Effect of TPU reduction due to 2001 WTO accession
  - Compared to other NTR countries, China more sensitive to NTR gap
- Alternative interpretations:
  1. Delayed effect of 1980 liberalization
  2. Delayed effect of prior changes in credibility
- β_t reflect both future uncertainty and lagged adjustment
  - An identification problem that the structural model will help solve...

NTR Gap elasticity results robust to:

- China supply effects (δ_{jgt})
- Level of aggregation (TSUSA8/HS8)
- Sample of countries (NTR countries/all countries)
- Alternative gap measures (NNTR statutory, NNTR applied)
- Sample of goods (balanced/unbalanced)
- Inclusion of other trade costs (applied tariffs, shipping costs)
- Life cycle controls (entry/exit dummies, age, age^2)

The model

- Two key ingredients
  1. Slow adjustment (exporter life cycle, as in ACR 2021)
  2. Time-varying uncertainty over policy
- G goods, matched one-to-one to SITC 5-digit aggregation
- In each good g...
  - Standard monopolistic-competition setup
  - Fixed cost to enter export market and continue (f_0, f_1)
  - Idiosyncratic shocks to productivity (z) and variable trade cost (ξ)
  - New exporter ξ_H, with prob ρ_ξ transition to ξ_L
- Two policy regimes: NNTR ($s = 2$) and NTR ($s = 1$)
  - At each t, regime-specific tariff schedule $\tau_{gt}(s)$
  - Probability of switching regimes $\omega_t(s', s)$

Chinese producers: Static optimization

- Production ($z =$ productivity; $\ell =$ labor)

$$y = z\ell \qquad z \sim \text{AR(1)}$$

- Firm-level demand ($\tau =$ tariff; $D =$ aggregate shifter)

$$d_g(p, s) = \left(\tau_g(s)\, p\right)^{-\theta} D$$

- Given z, ξ, s, choose p, ℓ to max flow profits

$$\pi_g(z, \xi, s) = \max_{p,\ell} p\, d_g(p, s) - w\ell$$
$$\text{s.t.} \quad z\ell \geq d_g(p, s)\, \xi$$

Chinese producers: Exporter life cycle, dynamic optimization

- Variable trade cost (ξ) captures current export status
  - ∞: non-exporter
  - ξ_H: high-cost exporter
  - ξ_L: low-cost exporter
- All firms start as non-exporters ($\xi = \infty$); leave exporting exogenously $\delta(z)$
- Costs of exporting in $t+1$ depend on current export status in t
  - New exporters: pay f_0, start with high-cost (ξ_H)
  - Continuing exporters: pay f_1, switch to higher/lower cost with prob. $1 - \rho_\xi$
- Given z, ξ, s, choose whether to export at $t+1$ to max PV of profits:

$$V_{gt}(z,\xi,s) = \pi_{gt}(z,\xi,s) + \max\left\{ \underbrace{-f(\xi) + \frac{\delta(z)}{1+r}\mathbb{E}_{z',\xi',s'} V_{gt+1}(z',\xi',s')}_{\text{export}}, \underbrace{\frac{\delta(z)}{1+r}\mathbb{E}_{z',\xi',s'} V_{gt+1}(z',\infty,s')}_{\text{don't export}} \right\}$$

Calibration: Timing and beliefs

- Model begins in 1971; all firms are nonexporters
- Benchmark model ("with TPU")
  - 1971: Learn that autarky is over, in NNTR regime ($s = 2$)
  - 1971: Observe tariff paths $\{\tau_{gt}(2), \tau_{gt}(1)\}_{t=0}^{\infty}$
  - 1971: Observe regime-switching probs $\{\omega_t(2,1), \omega_t(1,2)\}_{t=0}^{\infty}$

Calibration: overview

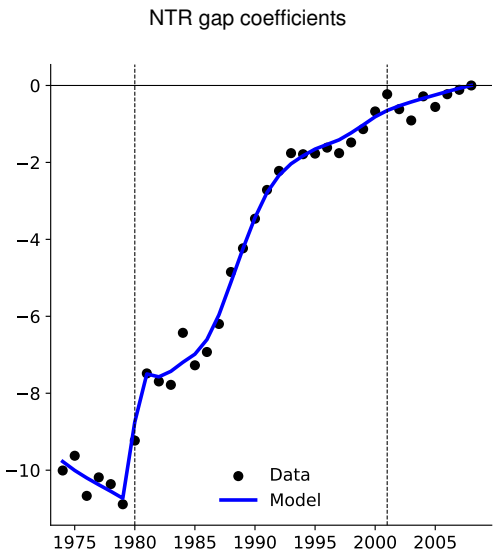
1. Set common parameters to standard values from literature
2. Set tariff schedules directly to data
3. Calibrate exporter life-cycle parameters to match moments from Chinese firm-level data during 2004–2007
4. Calibrate idiosyncratic trade cost persistence + regime-switching probs to match estimates of aggregate trade dynamics

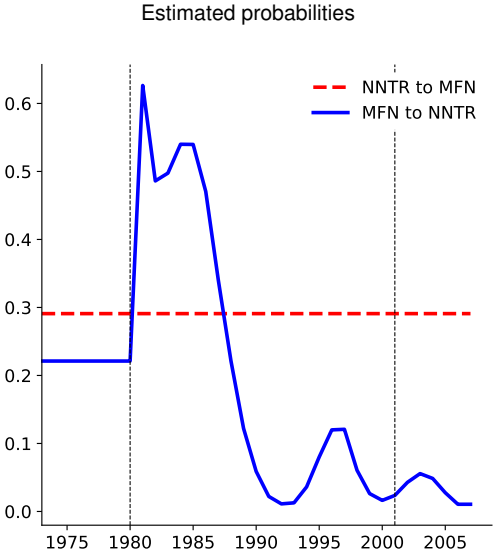
Calibrating to aggregate transition dynamics

- Match estimates of
  1. Aggregate trade elasticity dynamics
  2. Annual NTR-gap coefficients
- Indirect inference approach
  1. Run ECM regressions in the model $\rightarrow \sigma^{LR}$
  2. Run DiD regressions in the model $\rightarrow$ NTR gap coefficients 1974–2008
  3. #1 biased by TPU, #2 biased by slow adjustment. But biases present i
  - Reduced-form estimate, not structural parameter
  - Affected by presence of TPU

Parameter	Meaning	Value	Source/target
ρ_ξ	Prob. of keeping iceberg cost	0.87	ECM estimate of LR trade elasticity = 7.96
$\omega(1,0)$	Prob. NNTR to NTR	0.25	Avg. NTR gap during 1974–1979
$\omega_t(0,1)$	Prob. NTR to NNTR	Varies	NTR gap during 1980–2008

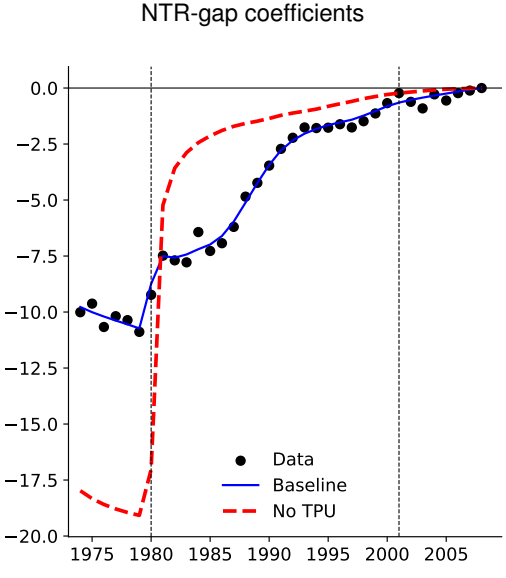
Model fit and estimated probabilities





Effects of policy uncertainty

- Compare benchmark model to a model with no policy uncertainty
- Model begins in 1971; all firms are nonexporters
- Counterfactual model: “no TPU”
  - 1971: Learn that autarky is over, in NNTR regime
  - 1980: Learn that NTR status has been granted (unforeseen)
  - No uncertainty, perfect foresight (no ω_t to calibrate)



Looking backward

Conventional narrative on U.S. trade policy on China needs amending

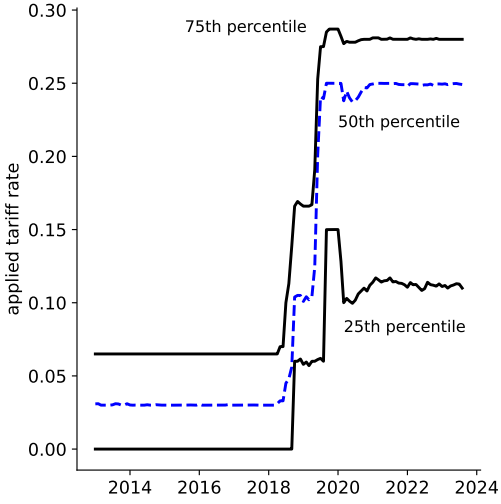
- In 1970s, possible future tariff cuts boosted trade in high tariff goods
- In early 1980s, lack of credibility reduced trade response to tariff cuts
- WTO ascension had a small impact, especially when compared to mid-1980s

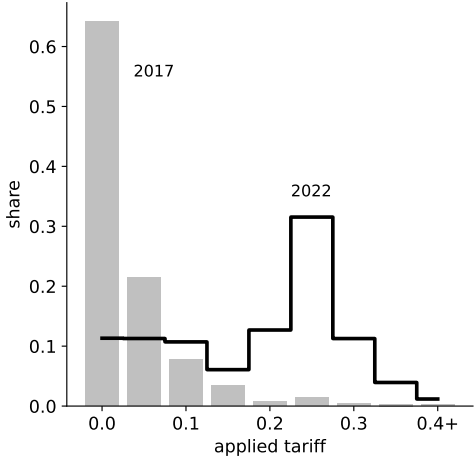
Looking forward

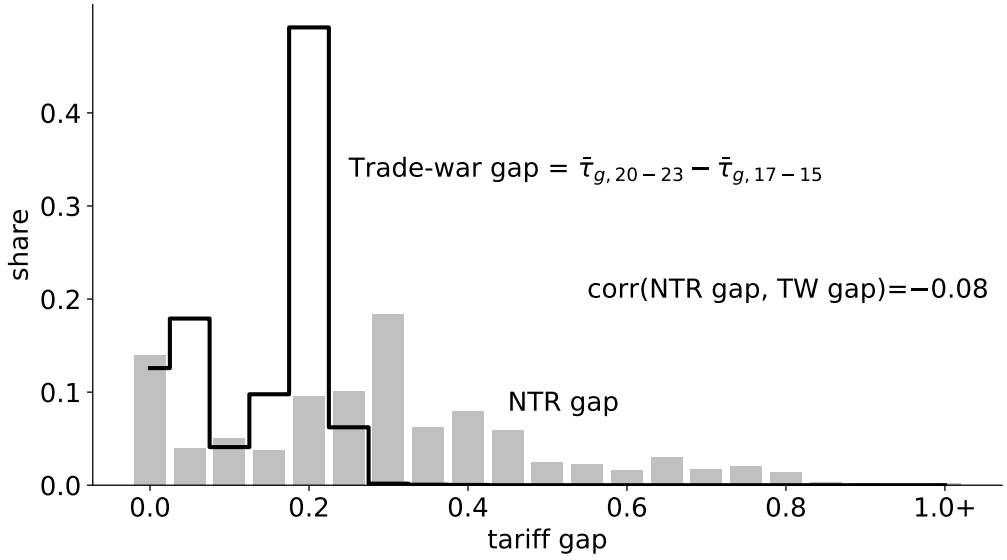
How long will the U.S.-China trade war last?

- Use the same methodology
- Substitution away from high trade-war gap goods
- Probability of trade peace initially high, now low

U.S. applied tariffs on Chinese goods






0.4
0.3
0.2
0.1
0.0
share
Trade-war gap = $\bar{\tau}_{g,20-23} - \bar{\tau}_{g,17-15}$
corr(NTR gap, TW gap)=−0.08
NTR gap
0.0
0.2
0.4
0.6
0.8
1.0+
tariff gap

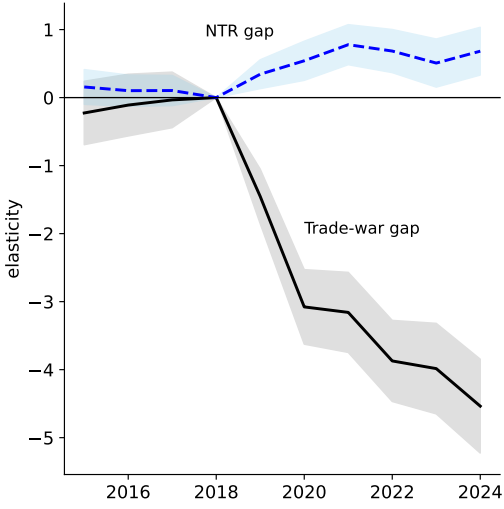
Elasticity to the trade gaps

- Same methodology

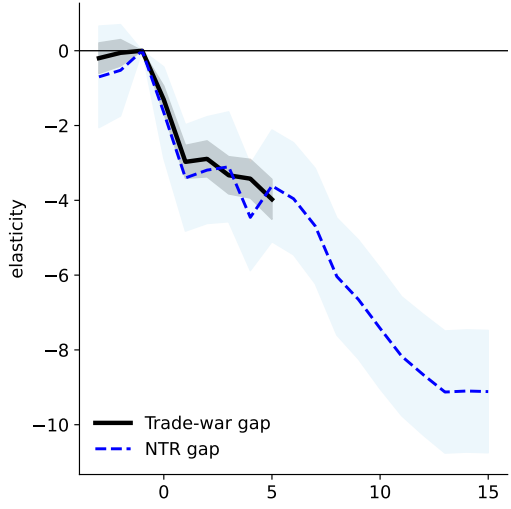
$$\log v_{igt} = \sum_{t'=2015}^{2023} \left(\beta_t^{NTR} X_g^{NTR} + \beta_t^{TW} X_g^{TW} \right) \mathbb{1}_{\{i=China \wedge t=t'\}} + \delta_{gt} + \delta_{ig} + \delta_{it} + \log c_{igt} + u_{igt}$$

Gap elasticities

TW and NTR gaps during trade war



TW gap 2015–2023 vs. NTR gap 1980–1995



Elasticity to the trade gap

- Same methodology

$$\log v_{igt} = \sum_{t'=2015}^{2023} \left(\beta_t^{NTR} X_g^{NTR} + \beta_t^{TW} X_g^{TW} \right) \mathbb{1}_{\{i=China \wedge t=t'\}} + \delta_{gt} + \delta_{ig} + \delta_{it} + \log c_{igt} + u_{igt}, \quad (1)$$

- Substitution
  - Modest initially, but growing
  - Path of substitution on par with dynamics of 1980 reform
  - Substitution to high NTR-gap goods
- Before 2018, no substitution away from
  - High tariff goods
  - High NTR-gap goods

Structural model

- Same model structure as before: slow adjustment, time-varying uncertainty
- 2015: “steady state” where NTR status has occurred for a very long time
- 2018: MIT shock that (i) starts trade war, and (ii) takes NNTR off the table
- Benchmark: “perfect foresight” over future transition probabilities from 2018 onward
- Surprises: alternative where changes in transition probabilities from one year to the next are unanticipated

Main goal: Estimate changes in probability of trade war ending

Secondary goal: Estimate change in probability of going back to NNTR

Tariff regimes

- Three tariff regimes, NNTR (N), NTR (M), TW (T)
- Regime-switching probabilities before the trade war
  - Downside risk is returning to NNTR
  - Zero probability of entering trade war

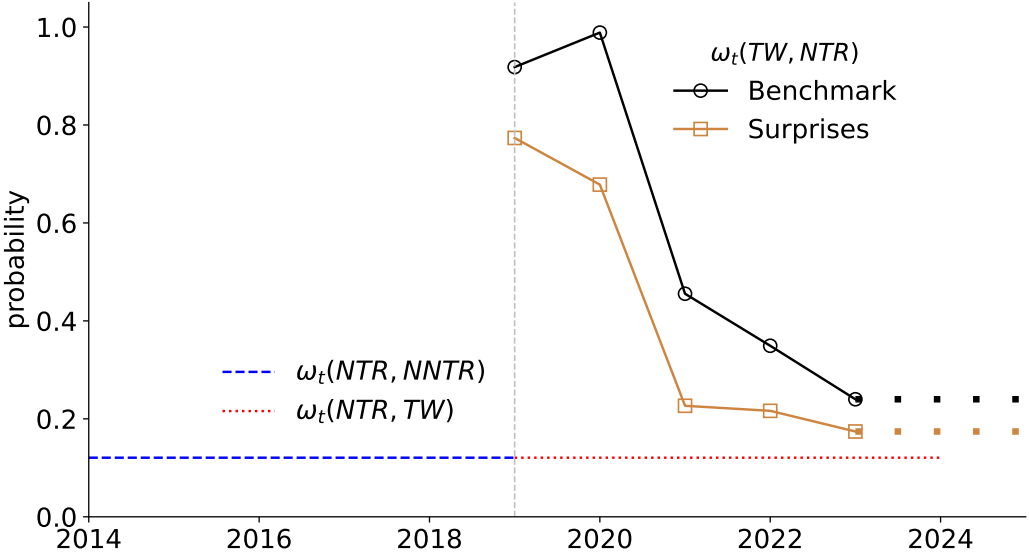
$$\Omega^M = \begin{bmatrix} \rho^M & 1-\rho^M & 0 \\ 1-\rho^N & \rho^N & 0 \\ 1-\rho^T_{18} & 0 & \rho^T_{18} \end{bmatrix}$$

- Regime-switching probabilities after the trade war
  - Downside risk is the trade war
  - Zero probability of returning to NNTR from either NTR or TW regimes

$$\Omega^T_t = \begin{bmatrix} \rho^M & 0 & 1-\rho^M \\ 1-\rho^N & \rho^N & 0 \\ 1-\rho^T_t & 0 & \rho^T_t \end{bmatrix}$$

- Estimate $\{\rho^T_t\}^{2023}_{t=2019}$ to match the annual TW-gap elasticities
- Estimate ρ^M to match the change in the NTR-gap elasticity after 2018

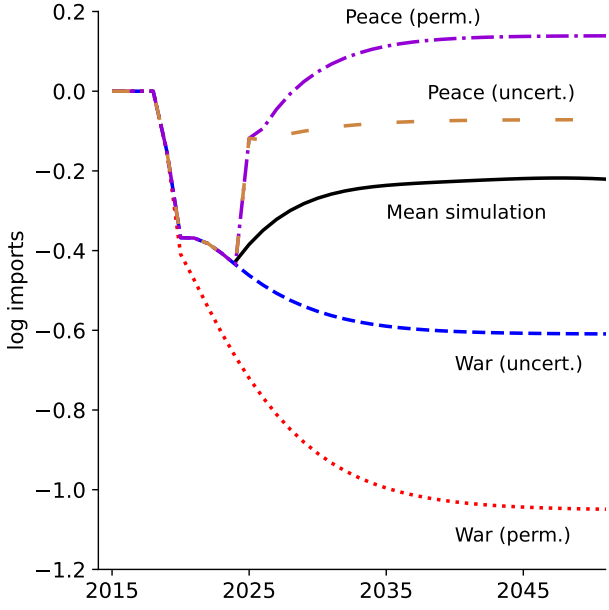
Regime-switching probabilities



Trade-policy innovations by administration

	Baseline		Surprises	
	Trump	Biden	Trump	Biden
Expected duration (years)	1.0	4.2	1.5	5.7
Change in mean discounted tariff (%)	–2.6	1.6	–4.7	5.1
Change in mean applied tariff (%)	17.2	0.0	17.2	0.0

Projections for the future



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