Firm Input Choice Under Trade Policy Uncertainty

(Preliminary)

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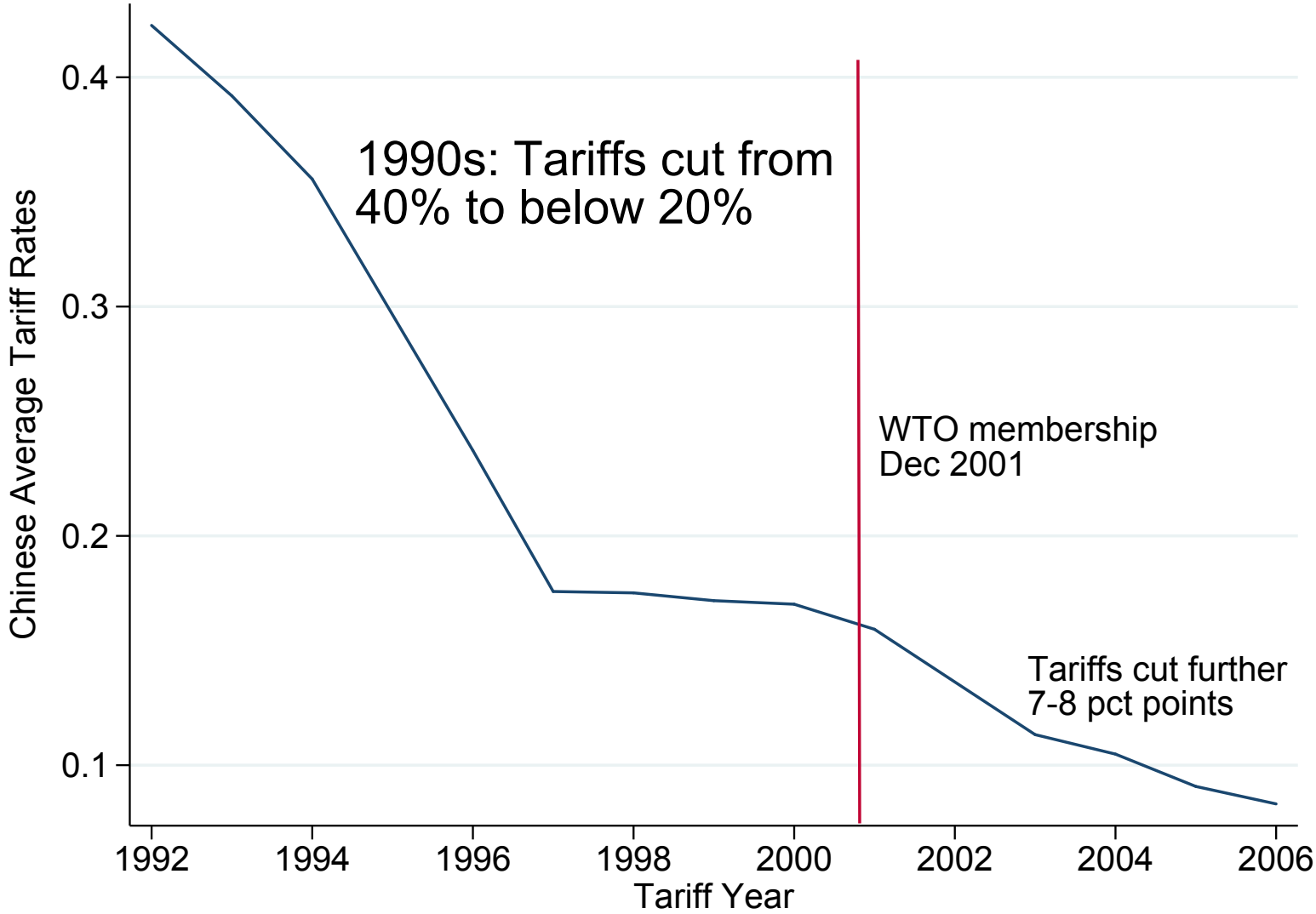
Input Sourcing under Uncertainty & Value of Agreements

- Large & growing share of intermediate input trade
  - importance for firm productivity/vertical specialization
  - static/parametric models of trade policy

- Why are trade agreements valuable?
  - Internalize terms-of-trade–considerable theory+evidence (Bagwell/Staiger '99)
  - Reduce TPU – most work focused on export access (Handley & Limao, 2015, Carballo et al. 2018), but not complex input sourcing (Antras et al,'17)
  - $\nearrow$ credibility of domestic commitments (Maggi & Rodriguez-Clare, 2007), much less evidence (Maggi, 2014)

China's WTO accession→ commitment to import tariff cuts



- Unilateral cut in 90's: 40% to below 20%, bound after 2001
- Long and uncertain process from 1986-2001 [Timeline]

Outline

- Theory of input demand under TPU
- Map into estimation method, results, and robustness
- Preliminary quantification of WTO commitment effects

Model overview and main insight

Output and Input Demand:

- Output & mkt structure: differentiated & monopolistic competition
- Production: Love of variety over intermediate, adopted with sunk costs
- Relative price of imported intermediate: $\tau_i^t \propto$ advalorem tariff

Trade Policy Uncertainty on Input Cost

- High (h) vs Low (l) tariff schedule
- Probability γ of input price jump $\tau_i^h/\tau_i^l > 1$

Basic mechanism and insight:

- Greater input variety reduces marginal cost of composite bundle, each new variety requires sunk costs
- If WTO accession reduces γ, then imported inputs should rise
- Largest effects in products i with higher reversal risk, τ_i^h/τ_i^l

Preview of Main Empirical Findings

- Pre-WTO: less imported inputs from applied tariff cuts because...
  - Threat of tariff reversal
  - Associated lower tariff trade elasticity
- Post-WTO commitment increased input imports by
  - Securing existing cuts, reducing reversal threat (over half)
  - More than doubling applied tariff elasticity

Demand, Production and Inputs

- Final demand facing each firm: $q = Ep^{-\sigma}$ with $\sigma > 1$.
- Firm with productivity φ produces final output according to:

$$y = \varphi l^{1-\alpha} \Pi_{i=1}^{N} x_i^{\alpha_i}$$

- Continuum of varieties for input i–domestically & possibly foreign sourced–aggregated with CES $\theta > 1$:

$$x_i = \left[\int_{\nu \in \Omega \cup \Omega^*} x_i(\nu)^{\frac{\theta-1}{\theta}} d\nu \right]^{\frac{\theta}{\theta-1}}$$

Domestic and Foreign Sourcing of Varieties

- Adoption sunk cost per variety $x_i(\nu)$: K and K^*.
- Measure of domestic sourced varieties n_i with price δ_i
- Measure of foreign sourced varieties n_i^*
  - Tariff-inclusive price of an imported variety is equal to the tariff wedge τ_i

Varieties Cost Index & Operating Profits

- **CES cost index** of input i decreasing in varieties n_i, n_i^*:

$$z_i^{\frac{1}{1-\theta}} \equiv \left[n_i \delta_i^{1-\theta} + n_i^* \tau_i^{1-\theta} \right]^{\frac{1}{1-\theta}}$$

- **Operating Profits**

$$\pi(z) = A \varphi^{\sigma-1} \Pi_{i=1}^{N} z_i^{\frac{\alpha_i(\sigma-1)}{\theta-1}}$$

$A \equiv E\sigma^{-\sigma}(\sigma-1)^{\sigma-1}(\tilde{\alpha})^{1-\sigma}$: industry conditions

- **Profit properties**
  - Increasing in n_i and n_i^* and decreasing in τ_i.
  - Supermodular in z (z_i increases marginal profit of input j)
  - Strictly concave if $\theta > \sigma$.

Optimal Inputs under TPU: Firm Decision

- Equilibrium $\mathbf{n} \equiv \{n_i \geq n_i^a, n_i^* \geq 0\}$ under A2 maximizes PDV of net profits:

$$\tilde{\mathbf{n}} \equiv \arg_n \max \frac{\pi(\mathbf{n};\tau^l)}{1-\beta} U\left(\mathbf{n},\tau^l,\tau^h,\gamma\right) - \sum_{i=1}^{I} \left[K\left(n_i - n_i^a\right) + K^* n_i^*\right]$$

- Uncertainty factor U reduces PDV if $\gamma > 0$ and $\tau^h > \tau^l$

$$U\left(\mathbf{n},\tau^l,\tau^h,\gamma\right) \equiv \frac{1 + u\left[\pi(\mathbf{n};\tau^h)/\pi(\mathbf{n};\tau^l)\right]}{1+u} \in (0,1]$$

where $u \equiv \frac{\gamma\beta}{1-\beta}$: expected duration of τ_i^h.

Optimal Inputs under TPU: Equilibrium cutoffs

- Relative cost of n_i^* adoption w/out TPU: $\rho_i^t \equiv \frac{K^*}{K}\left(\frac{\tau_i^t}{\delta_i}\right)^{\theta-1}$
- Equilibrium cutoff for n_i^*: $\rho_i^t \leq \bar{\rho}_i^l$ from FOC for $\mathbf{n}$

$$\bar{\rho}_i^l = 1 - \frac{u\left[\pi^h/\pi^l\right]}{1+u\left[\pi^h/\pi^l\right]}\left[1-\left(\frac{\tau_i^h}{\tau_i^l}\right)^{1-\theta}\right]$$

  - No TPU: Adopt all imported inputs $i \in M$ s.t. $\rho_i \leq 1$
  - TPU: only adopt $i \in M$ with $\rho_i \leq \bar{\rho}_i^l$: $n_i^* > 0$ and $n_i^u = n_i^a$, otherwise $n_i^* = 0$ and $n_i^u \geq n_i^a$.
  - TPU lowers adoption cutoff $\bar{\rho}_i^l$ and thus n_i^u
    –via a profit effect, π^h/π^l,
    –variety specific risk of tariff hike, τ^h/τ^l

Optimal Inputs under TPU: Equilibrium values and varieties

- Equilibrium imported value for $i \in M$

$$m_i^l = s_i^l \cdot \alpha_i \pi^l (\sigma - 1)$$

  - Share of imported input i: $s_i = \left[\frac{n_i^* \left(\tau_i^l\right)^{1-\theta}}{n_i \delta_i^{1-\theta} + n_i^* \left(\tau_i^l\right)^{1-\theta}} \right]$
  - $\alpha_i \pi^l (\sigma - 1)$: total expenditure on i

- Equilibrium imported varieties for $i \in M$

$$n_i^* = \alpha_i \pi^l B^* \cdot U (1 - \psi_i) - \left[(1 - \psi_i) \rho_i^l + \psi_i \rho_i^h \right] \cdot n_i^a (K/K^*)$$

- $\psi_i \in [0, 1]$: input-specific uncertainty; 0 if $\tau_i^h = \tau_i^l$ (or $\gamma = 0$)

[Derivation]

Optimal Inputs under TPU: Substitution and Profit Effects

- 1^{st} order expansion of $\ln n_i^{*u}$ around $\rho_i^l = \rho_i^h = \rho_0$ if $n_i^a = \pi^a \alpha_i B$:

$$\ln n_i^* \propto \ln n_0^* - \underbrace{\frac{1-s_0}{s_0}\varrho_i}_{Substitution} - \underbrace{\frac{\Theta-1}{s_0}\sum_{j\in M}\frac{\alpha_j}{\alpha}\varrho_j}_{Profit} \quad \text{all } i \in M$$

  –Varieties n_0^* & import share s_0 under certainty at $\rho_i = \rho_0$

- Relative price increase: ρ_0 to ρ_i^l & then to ρ_i^h

$$\varrho_i \equiv \ln\left(\frac{\rho_i^l}{\rho_0}\right) + \frac{u}{1+u}\ln\left(\frac{\rho_i^h}{\rho_i^l}\right)$$

- Imported varieties of i are decreasing in
  - own (substitution) & aggregate (profit) relative price ↑
  - current tariffs, via ρ_i^l
  - tariff risk: $\ln \rho_i^h/\rho_i^l = (\theta-1)\ln \tau_i^h/\tau_i^l$

Theory to Estimation: Brief Version

- 1^{st} order approx. *around* ρ_0 (as above) but also arbitrary $n_i^a, \varphi_f, \alpha_i$ (common for all i, f) yields substitution effects for
  - Varieties, n_i^*
  - Participation, $\Pr(m_i > 0) = \Pr\left(\ln \rho_i^t / \bar{\rho}_i^l \leq 0\right)$
  - Values, m_i, with rescaled ϱ_i^m
- Empirical model for relative import price excluding tariff, δ_{it}:
  $\ln \rho_{it}^l = (\theta - 1) \ln \tau_{it} + (\theta - 1) \left(\ln \delta_I \delta_t + e_{it}^{\delta}\right) + \ln \frac{K_t^*}{K_t}$.
- Firm tariff threat belief

$$\ln \tau_{it}^h = (1 - h) \ln \tau + h \ln \tau_{i0}^h + e_{ih}^t$$

  - Constant τ: unobservable possible tariff level
  - $\ln \tau_{i0}^h$: Historical mean before accession
  - Belief weight on observable high tariff: $h \in [0, 1]$

Econometric Specifications

Explore variation across i and t to estimate substitution effects while controlling for profit effects

$$y_{it} = \left(\beta^y_{\tau,pre} + \Delta\beta^y_{\tau} \times \mathbf{I}_{wto}\right) \ln \tau_{it} + \left(\beta^y_{h,pre} + \Delta\beta^y_{h} \times \mathbf{I}_{wto}\right) \ln \frac{\tau^h_{i0}}{\tau_{it}} + \mathbf{a}_{I,f,t} + e_{ift}$$

- y ={Varieties $\ln n^*$, Values $\ln m$, Participation $1\,(m > 0)$}
- WTO accession modelled as shock: $\gamma_{t=pre,wto}$ using indicator for post WTO entry $\mathbf{I}_{wto}$
- $a_{I,f,t}$: set of fixed effects for industry, firm, time or combination
- Applied tariff controls: $\ln \tau_{it}$, ad-valorem tariff factor
- Tariff threat risk factor: $ln\frac{\tau^h_{i0}}{\tau_{it}}$

Predicted coefficients across all outcomes

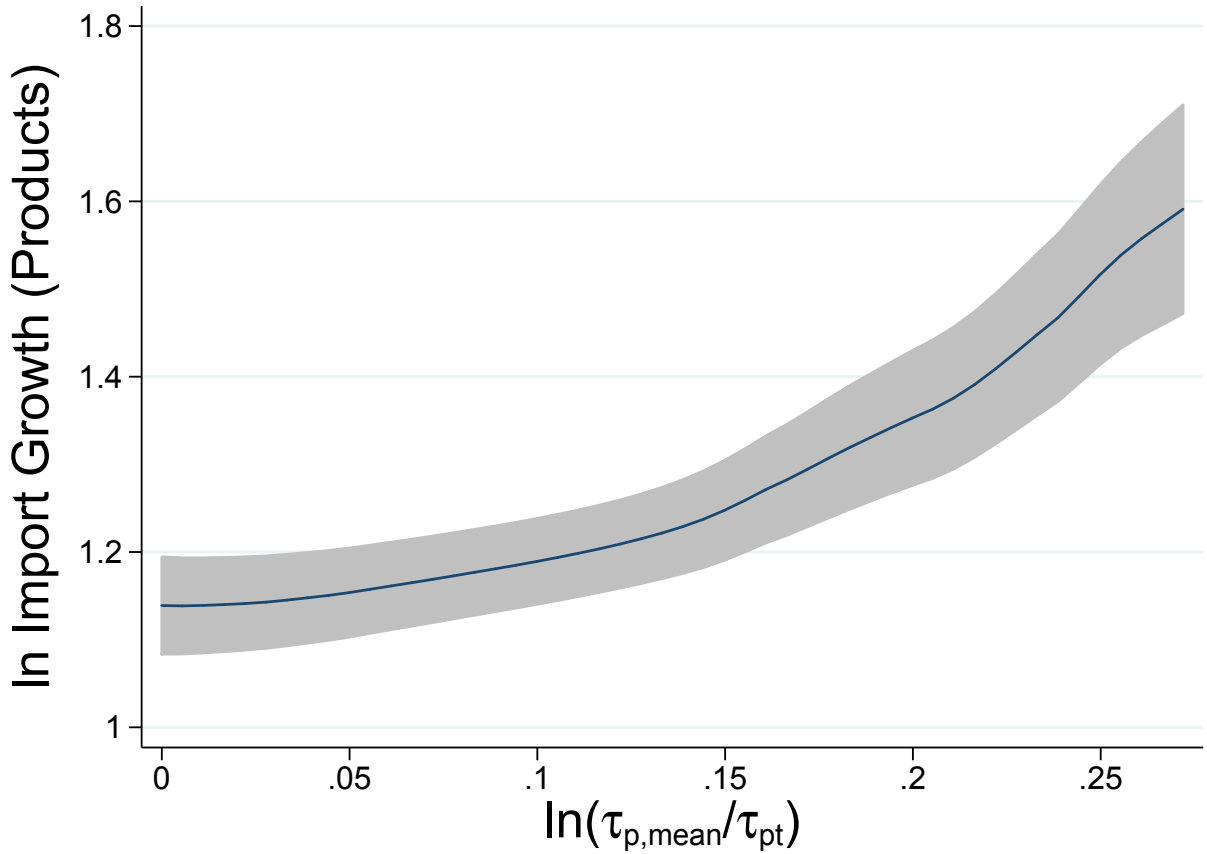
$$y_{it} = \left(\beta^y_{\tau,pre} + \Delta\beta^y_\tau \times \mathbf{I}_{wto}\right) \ln \tau_{it} + \left(\beta^y_{h,pre} + \Delta\beta^y_h \times \mathbf{I}_{wto}\right) \ln \frac{\tau^h_{i0}}{\tau_{it}}$$

- **Input TPU:** $\beta^y_{ht} < 0$ iff $\gamma_t > 0$ and $h > 0$
- **Reduction in input TPU** iff $\gamma_{wto} < \gamma_{pre}$
  - $\Delta\beta^y_h \equiv \beta^y_{h,wto} - \beta^y_{h,pre} > 0$ (if $h > 0$)
  - $\Delta\beta^y_\tau \equiv \beta^y_{\tau,wto} - \beta^y_{\tau,pre} < 0$ (if $h < 1$)
- **Estimated Beliefs:** $\hat{h} = \frac{\Delta\beta^y_h}{\Delta\beta^y_h - \Delta\beta^y_\tau}$

Firm-Level Import/Export Data + Product Level Tariffs

- Trade: Chinese customs export/import transactions 2000-2006
  - includes firm name, ownership, contact information, etc.
  - product (HS8), country, date, value
  - Trade type (ordinary or processing)—we exclude processing trade
- Tariffs: World Bank WITS at HS6-country-year level
- Intermediate inputs defined based on the UN BEC classification

Product Import Growth vs Initial Product TPU



- Intermediate import contribution large portion of this
- Similar results for kernel density and high/low diffs

Firm Imports (log value) of Intermediates by Product

Table 3a-3a. Firm-product-year Level Import Value - Intermediates

Dependent Variable = Imports(ln)

	1	2	3	4
Uncertainty			-7.970***	-7.903***
			[0.515]	[0.522]
Uncertainty×Post			4.558***	4.531***
			[0.567]	[0.577]
Tariffs (ln)	-3.656***	-3.581***	-2.512***	-2.365***
	[0.464]	[0.457]	[0.441]	[0.437]
Tariffs(ln)×Post	-2.119***	-2.320***	-3.208***	-3.481***
	[0.588]	[0.578]	[0.581]	[0.563]
Fixed Effects	f+t+s	ft+s	f+t+s	ft+s
N	4,680,193	4,591,741	4,680,193	4,591,741
R^2	0.287	0.33	0.293	0.336

Holds for all products [All products] and for aggregated product-country import values [Values]

Number of Imported Intermed. Varieties (Firm×HS8)

Table 9. Firm-product-year Level Import Varieties

Dependent Variable = Number of Imported Varieties(ln)

	All Firms	
	All Products	Intermediates
	1	2
Uncertainty	-0.136**	-0.144**
	[0.0567]	[0.0694]
Uncertainty×Post	0.169***	0.179**
	[0.0630]	[0.0831]
Tariffs (ln)	-0.345***	-0.195***
	[0.0483]	[0.0544]
Tariffs(ln)×Post	-0.334***	-0.343***
	[0.0623]	[0.0795]
Fixed Effects	ft+s	ft+s
N	7,435,142	4,591,741
R^2	0.193	0.21

[Production Firms-Robust]

Mechanism: Probability (LPM) that Firm Imports a Product

Table 12a. Firm-product-year Level Import Participation Decision

Dependent Variable = Import Dummy (1 if import, 0 else)

	All Firms All Products		All Firms Intermediates	
	1	2	3	4
Uncertainty	-0.237***	-0.0971***	-0.399***	-0.187***
	[0.0191]	[0.0168]	[0.0357]	[0.0354]
Uncertainty×Post	0.149***	0.0824***	0.110***	0.150***
	[0.0212]	[0.0194]	[0.0394]	[0.0377]
Tariffs (ln)	-0.0508***	-0.0491***	-0.0417***	-0.0292**
	[0.0145]	[0.0138]	[0.0145]	[0.0129]
Tariffs(ln)×Post	-0.225***	-0.114***	-0.221***	-0.146***
	[0.0204]	[0.0187]	[0.0426]	[0.0387]
Fixed Effects	ft	ft+s	ft	ft+s
N	40,099,329	40,099,329	7,267,902	7,267,902
R^2	0.296	0.297	0.735	0.740

WTO Commitments lower TPU & increase Tariff Elasticities

Table 16: WTO Impacts via TPU and Applied Tariffs for Intermediates

	Implied Parameters from Firm Estimates
Post-WTO Trade Tariff elasticity	-5.840
% Growth in TPU: u/(1+u)	-0.57
	Firm Import Growth from a 1 S. D. increase in:
TPU pre-WTO	-0.553
TPU post-WTO	-0.236
Applied tariff pre-WTO	-0.118
Applied tariff post-WTO	-0.292
	Relative Importance of 1 S. D. TPU vs. Applied Tariffs
TPU tariff equiv pre-WTO	4.69
TPU tariff equiv post-WTO	0.81
Source:	3a-3a col 4

- Similar implied probability of high tariff (h) w/ input adoption & somewhat stronger effect [Adoption Quant.]

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Robustness

- Beyond excluding retail/wholesale: Production Census
- Not driven by export TPU from permanent MFN in U.S. – import result hold for never exporters, always exporters, and new exporters Exporter Status
- Robust to aggregation by product-exporter-year with exporter-time+sector effects to absorb quality diffs Imp. values
- Qualitative effects present in State Owned and non-State Owned Enterprises SOE

Conclusion and Future Work

- Theory: input TPU reduces imported input adoption and value
- Empirics: Chinese TPU reduced its firm's import participation before WTO increased credibility liberalization
- Implications for current tensions: US-China, Brexit,NAFTA renegotiation
- Additional controls for input demand suggested by discussant!
- Measure tariff indexes on input bundles, accounting for TPU & interactions w/ output markets

Backup slides

Uncertainty of Accession

86-01	3 presidencies – including death and succession of Deng Xiaoping
1989	Tiananmen Square Protests
90-92	House revokes MFN 3 times (90-92). Pres. Bush vetoes bill placing substantial conditions on MFN in 1992.
95-96	Taiwan Strait Crisis provoked by Lee Teng-Hui's visit to U.S.
1997	Hong Kong returned to Chinese sovereignty
1999	NATO bombs Chinese embassy in Serbia, Clinton signs agreement with China for permanent MFN that US Congress must approve
2000	US Congress passes US-China Relations Act, effective Oct 10, 2000, but contingent on China's WTO accession and reserve right to invoke Article XIII and opt-out of granting PNTR
2001	US spy plane collides with Chinese fighter jet, protracted WTO negotiations require Congress to vote to extend MFN again in summer of 2001.

Robustness: Production Firm Imports, Industry×Time

Table 6. Firm-product-year Level Import Value - Robustness to Firm and Product Group Characteristics

Dependent Variable = Imports(ln)

	Baseline	Production Firms	
	Intermediates	All Products	Intermediates
	1	2	3
Uncertainty	-7.903***	-8.462***	-6.188***
	[0.522]	[0.526]	[0.511]
Uncertainty×Post	4.531***	5.622***	3.389***
	[0.577]	[0.588]	[0.585]
Tariffs (ln)	-2.365***	-0.813*	-1.575***
	[0.437]	[0.459]	[0.437]
Tariffs(ln)×Post	-3.481***	-4.346***	-3.330***
	[0.563]	[0.645]	[0.567]
Fixed Effects	ft+s	ft+s	ft+s
N	4,591,741	2,615,800	1,685,399
R^2	0.336	0.284	0.286

Firm Product Imports: SOE vs non-SOE Sample

Table 15a. Firm-product-year Level Import Value - SOE and non-SOE

Dependent Variable = Imports(ln)

	State Owned		Non-State Owned	
	1	2	3	4
Uncertainty	-13.30***	-11.64***	-11.50***	-8.460***
	[0.602]	[0.627]	[0.541]	[0.487]
Uncertainty×Post	8.626***	7.091***	8.440***	5.852***
	[0.659]	[0.683]	[0.602]	[0.541]
Tariffs (ln)	-1.196**	-0.865*	-3.092***	-2.083***
	[0.561]	[0.503]	[0.499]	[0.404]
Tariffs(ln)×Post	-5.489***	-5.232***	-6.855***	-5.087***
	[0.687]	[0.626]	[0.669]	[0.562]
Fixed Effects	ft	ft+st	ft	ft+st
N	1,927,349	1,927,349	5,507,793	5,507,793
R^2	0.238	0.27	0.308	0.339

Firm Imports by Firm: Baseline Intermed. vs. Final Goods

Table 17. Firm-product-year Level Import Value - Final Goods

Dependent Variable = Imports(ln)

	All Firms	
	Intermed. Baseline	Final Goods
	1	2
Uncertainty	-7.903***	-2.001***
	[0.522]	[0.655]
Uncertainty×Post	4.531***	1.452**
	[0.577]	[0.671]
Tariffs (ln)	-2.365***	-1.116*
	[0.437]	[0.633]
Tariffs(ln)×Post	-3.481***	-1.835***
	[0.563]	[0.686]
Fixed Effects	ft+s	ft+s
N	4,591,741	655,738
R^2	0.336	0.401

Firm Imports by Firm & Product Characteristics

Table 6. Firm-product-year Level Import Value - Robustness to Firm and Product Group Characteristics

Dependent Variable = Imports(ln)

	Baseline	Production Firms	
	Intermediates	All Products	Intermediates
	1	2	3
Uncertainty	-7.903***	-8.462***	-6.188***
	[0.522]	[0.526]	[0.511]
Uncertainty×Post	4.531***	5.622***	3.389***
	[0.577]	[0.588]	[0.585]
Tariffs (ln)	-2.365***	-0.813*	-1.575***
	[0.437]	[0.459]	[0.437]
Tariffs(ln)×Post	-3.481***	-4.346***	-3.330***
	[0.563]	[0.645]	[0.567]
Fixed Effects	ft+s	ft+s	ft+s
N	4,591,741	2,615,800	1,685,399
R^2	0.336	0.284	0.286

Estimates: Firm Imports by Product

Table 3a-1a. Firm-product-year Level Import Value - All Products

Dependent Variable = Imports(ln)

	1	2	3	4
Uncertainty			-9.108***	-8.904***
			[0.435]	[0.429]
Uncertainty×Post			5.807***	5.706***
			[0.470]	[0.468]
Tariffs (ln)	-2.456***	-2.472***	-0.805**	-0.824**
	[0.366]	[0.360]	[0.395]	[0.390]
Tariffs(ln)×Post	-2.040***	-2.125***	-4.717***	-4.763***
	[0.480]	[0.476]	[0.527]	[0.515]
Fixed Effects	f+t+s	ft+s	f+t+s	ft+s
N	7,531,534	7,435,142	7,531,534	7,435,142
R^2	0.27	0.314	0.277	0.321

Production Firms & Intermediates: Number of Imported Intermed. Varieties (Firm×HS8)

Table 10. Firm-product-year Level Import Varieties - Intermediates, Prod'n Firms

Dependent Variable = Number of Imported Varieties (ln)

	1	2	3	4
Uncertainty	-0.194***	-0.137**	-0.110*	-0.0884
	[0.0612]	[0.0651]	[0.0653]	[0.0695]
Uncertainty×Post	0.256***	0.229***	0.229***	0.134**
	[0.0742]	[0.0865]	[0.0829]	[0.0605]
Tariffs (ln)	-0.171***	-0.163***	-0.193***	-0.329***
	[0.0496]	[0.0591]	[0.0589]	[0.0559]
Tariffs(ln)×Post	-0.497***	-0.319***	-0.359***	-0.208***
	[0.0889]	[0.0909]	[0.0730]	[0.0537]
Fixed Effects	ft	ft+s	ft+hs2	ft+hs4
N	1,685,399	1,685,399	1,685,399	1,685,386
R^2	0.204	0.209	0.215	0.246

Robustness by Export Status of Firm Importer

Table 14. Firm-product-year Level Import Value - All Products by Export Status

	Dependent Variable = Imports(ln)					
	Never Exporters		Always Exporters		New Exporters	
	1	2	3	4	5	6
Uncertainty	-5.903***	-5.525***	-10.03***	-9.929***	-8.850***	-8.116***
	[0.389]	[0.392]	[0.472]	[0.468]	[0.529]	[0.500]
Uncertainty×Post	4.079***	3.634***	6.015***	6.096***	6.299***	5.580***
	[0.431]	[0.438]	[0.501]	[0.503]	[0.578]	[0.557]
Tariffs (ln)	-0.741**	-0.752**	-0.479	-0.475	-1.210**	-1.039**
	[0.347]	[0.371]	[0.431]	[0.422]	[0.496]	[0.487]
Tariffs(ln)×Post	-3.323***	-3.361***	-5.423***	-5.457***	-4.273***	-4.385***
	[0.476]	[0.495]	[0.552]	[0.540]	[0.652]	[0.638]
Fixed Effects	f+t+s	ft+s	f+t+s	ft+s	f+t+s	ft+s
N	881,227	850,963	2,599,746	2,589,769	497,887	491,860
R^2	0.446	0.486	0.217	0.257	0.285	0.34

Quantification: Impact on Values vs. Adoption of Imported Inputs

Table 18: WTO Impact via TPU vs. Applied Tariff on Value vs. Adoption of Intermediates

Outcome	Import Value	Adoption Probability
	Implied Parameters from Firm Estimates	
Probability of mean tariff conditional on increase (h)	0.57	0.52
	Relative Importance of 1 S. D. TPU vs. Applied Tariffs	
TPU tariff equiv pre-WTO	4.69	12.0
TPU tariff equiv post-WTO	0.81	0.19

- Same implied probability of high tariff (h) from both regressions
- TPU more important to input adoption channel
  - $\approx 2.5\times$ larger tariff equivalent of TPU in pre-period
  - Much smaller tariff equivalent smaller in post-WTO period

Derivation/Interpretation of optimal n_i^* and Ψ_i

$$\psi_i \equiv \frac{1}{2} - \frac{1}{2}\left\{1 - 4\frac{u}{1+u}\frac{\pi^h}{\pi^a}\left(\rho_i^h - \rho_i^l\right)\left(\frac{\pi^l}{\pi^a}U + \rho_i^h - \rho_i^l\right)^{-2}\right\}^{1/2}$$

Derivation of n_i^* in slide equivalent to paper using definition of U and ρ
Re-arranging n_i^* to interpret, use B, B^*, ρ definitions and re-arrange

$$\begin{aligned} n_i^* &= \frac{\pi^l U}{1-\beta}\frac{\sigma-1}{\theta-1}\frac{\alpha_i}{K^*}\left(1-\psi_i\right) - \left[\left(1-\psi_i\right)\left(\frac{\tau_i^l}{\delta_i}\right)^{\theta-1} + \psi_i\left(\frac{\tau_i^h}{\delta_i}\right)^{\theta-1}\right] n_i^a \\ &= \alpha_i \pi^l \frac{\sigma-1}{\theta-1}\frac{U\left(1-\psi_i\right)}{\left(1-\beta\right)K^*} - \left[\left(1-\psi_i\right)\left(\tau_i^l\right)^{\theta-1} + \psi_i\left(\tau_i^h\right)^{\theta-1}\right] n_i^a \left(\delta_i\right)^{1-\theta} \end{aligned}$$

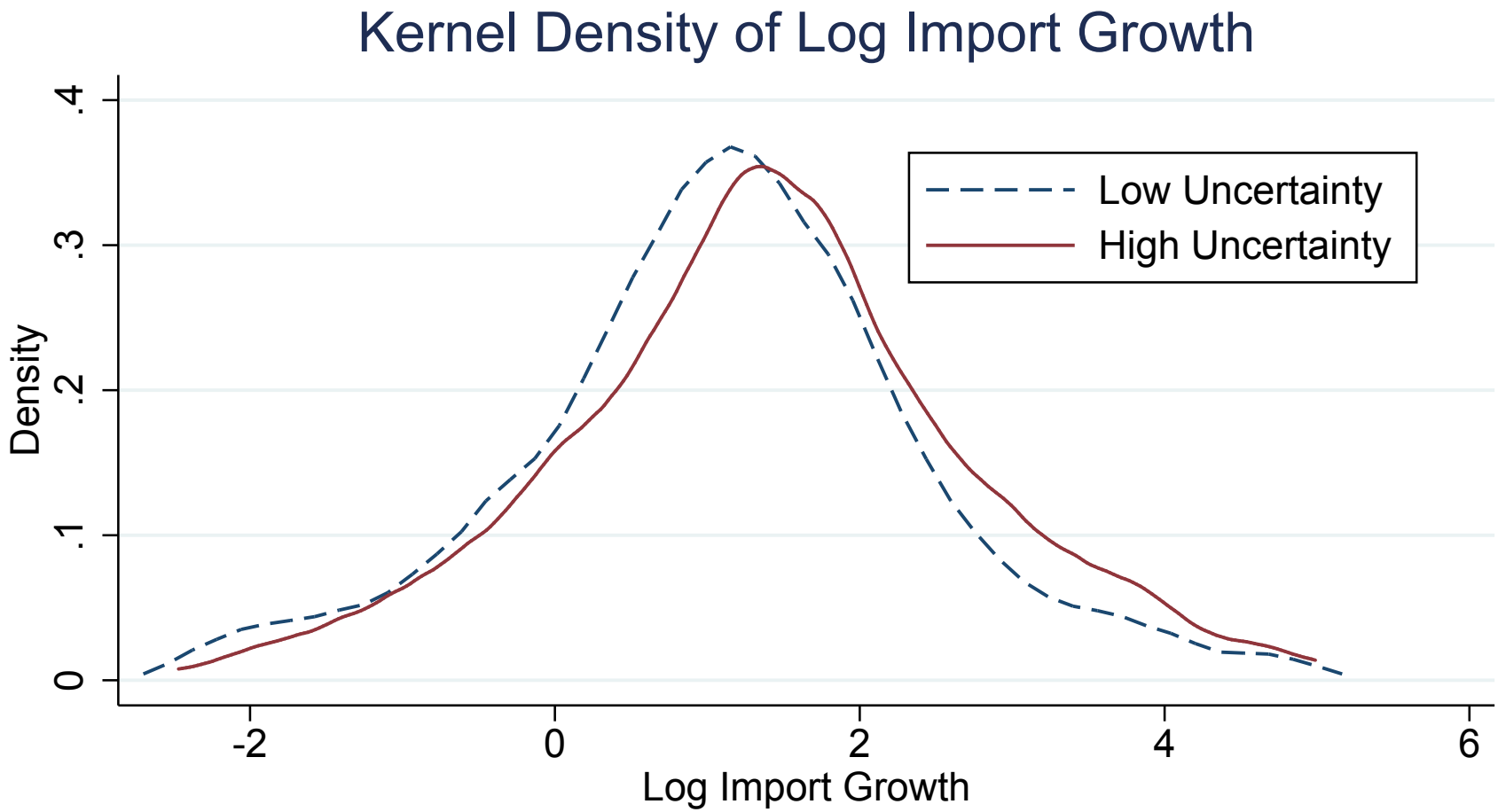
- Increasing in total expenditure on i captured by $\alpha_i \pi^l \left(\sigma - 1\right)$
- Decreasing in:
  - foreign sourcing cost K^*
  - uncertainty via U and ψ_i
  - existing adoption of n_i^a (all else equal)
  - expected tariff : $\left(1-\psi_i\right)\left(\tau_i^l\right)^{\theta-1} + \psi_i\left(\tau_i^h\right)^{\theta-1}$

Import Growth in High vs Low TPU Products

	Uncertainty(2000)	
	Low[a]	High[a]
Chinese import value growth(Δln)[b]	1.13	1.33
	[1.71]	[1.65]
Chinese import variety growth(Δln)[b]	0.26	0.45
	[0.51]	[0.55]
Change in MFN tariff (Δln)	-0.06	-0.10
	[0.07]	[0.08]
Uncertainty (2000)	0.03	0.14
	[0.04]	[0.04]
	3,177	1,584

- Reject equality of growth rates between high and low ranking

Import Growth in Initially High vs Low TPU Products



kernel = epanechnikov, bandwidth = 0.2010
Equality of distributions rejected with p-value of 0 in Kolmogorov-Smirnov test

- High TPU FOSD low TPU for continuing HS-6 pairs

Aggregate Intermediate Imports by Product-Exporter

Table 2a-3a. Product-country-year Level Import Value, Intermediates

Dependent Variable = Imports (ln)

	1	2	3	4
Uncertainty			-10.34***	-7.798***
			[0.755]	[0.665]
Uncertainty×Post			5.894***	4.627***
			[0.801]	[0.699]
Tariffs (ln)	-5.103***	-3.585***	-3.408***	-3.011***
	[0.392]	[0.380]	[0.405]	[0.387]
Tariffs(ln)×Post	-5.986***	-5.063***	-5.766***	-5.134***
	[0.562]	[0.537]	[0.562]	[0.551]
Fixed Effects	ct	ct+s	ct	ct+s
N	371,285	371,285	371,285	371,285
R^2	0.131	0.165	0.145	0.171