US Policy Spillover (?)

China's Accession to the WTO and Rising Exports to the EU

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Research Question and Hypothesis

Why did China's EU exports rise so fast after WTO entry?

- doubts about WTO effect on trade (Rose 2004)
- no obvious change in conventional channels (i.e. tariffs)

Explore new approach: reduced tariff uncertainty

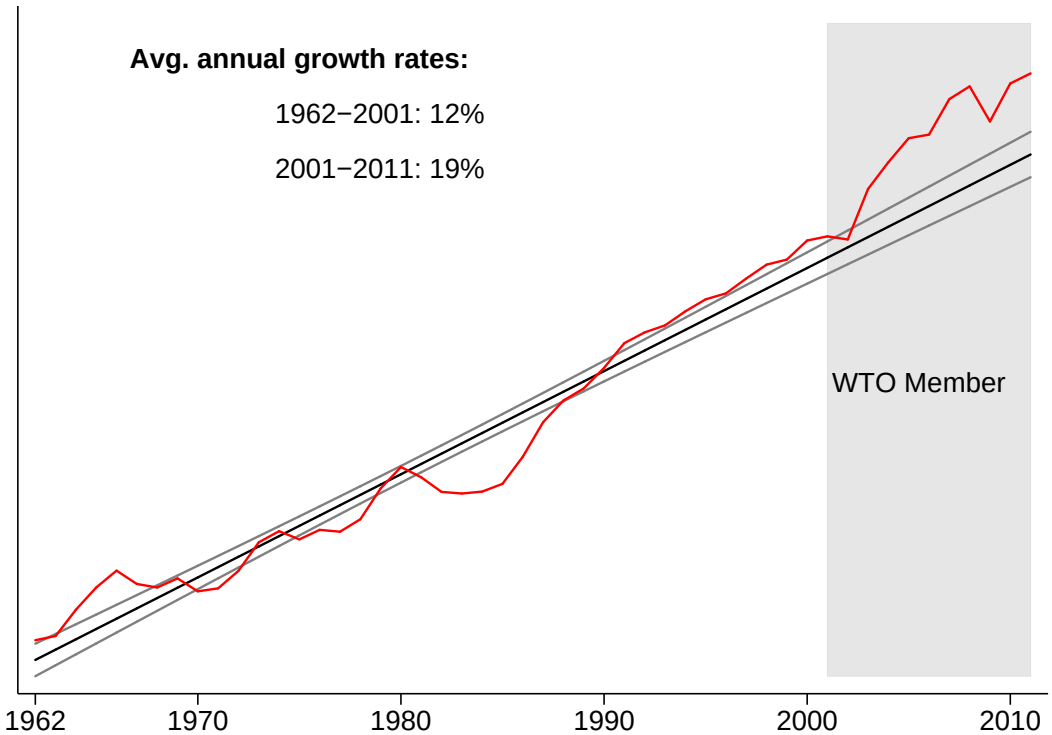
- China-US trade: more trade after policy change (Handley & Limão 2013)
- China-EU: no policy change

Hypothesis

Spillover of US policies on third countries through economies of scale

China's export boom after 2001

Real Exports to EU-15 countries 1962-2011



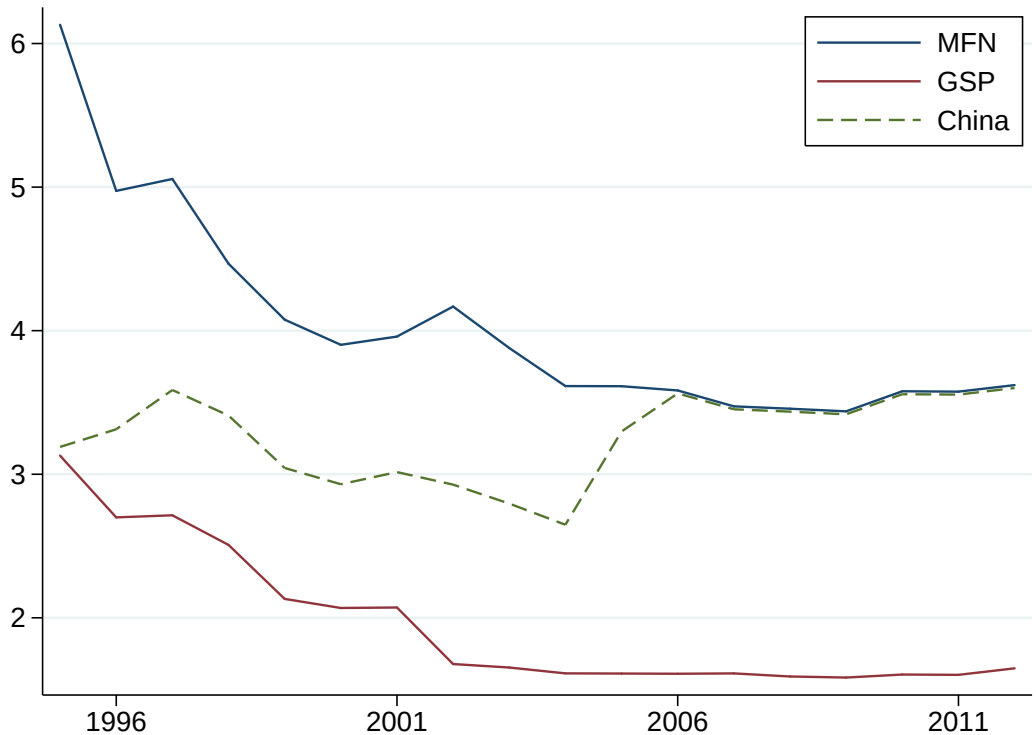
Data: NBER, Comtrade, and PWT 8.0

WTO Accession (Dec 2001):

- Tariffs
- Quotas
- Other policies

EU tariffs on Chinese goods

Applicable Tariffs (*ad valorem* equiv) 1995-2012



Data: WITS and EC Regulations (GSP)

WTO Accession (Dec 2001):

- Tariffs
- Quotas
- Other policies

EU trade policies towards China

MFA Quotas in Textiles, Clothing, Apparel

- Dismantling in 2002, 2005, and 2009
- Decreasing share (1992-2012): 45 $\rightarrow$ 20%
- Limited to HS 50-67 (Manuf.: HS 28-96)

Other policies

- Permanent normal trade relationships (PNTR)
- MFN/GSP status since 1979/1980
- No policy change upon WTO access

WTO Accession (Dec 2001):

- Tariffs
- Quotas
- Other policies

$\Rightarrow$ Find other source: US policy spillover?

US Policy Change and Related Studies

US trade relations with China

- provisional MFN status since 1980 (Title IV 1974 Trade Act)
- entailed annual approval by $\geq$50% votes in US Congress
- permanent "normal trade relations" (PNTR) since Jan 2002

The threat of increasing tariffs (before 2002)

- non-MFN tariffs ("Column-2") $\approx 30\%$ higher, on average
- no abolishment of MFN status but close, esp. in the 1990s
- e.g. Tiananmen square, NATO bombing, jet accident

Removal of tariff threat upon WTO entry

- Handley & Limão 2013: Rising exports to US and lower prices
- Pierce & Schott 2013: Less US manuf. employment, more trade
- Feng, Li, Swenson 2014: Increased firm entry, private vs SOEs

Roadmap

1. Motivation, Background, Literature ✓
2. Theory, Comparative Statics
3. Empirical Analysis/Results
4. Concluding Remarks
5. (Extension: Trade Diversion)

Theory: Setup

Develop model that allows for policy spillovers

- Setup: heterogeneous firms, monopolistic competition (Melitz 2003)
- Spillover: fixed cost with *bilateral* and *global* component (scale econ.)
- Tariff uncertainty: expected rate based on two possible scenarios

Setup: Demand, Supply, and Entry

- Demand for variety j: $x_j = \frac{E_J}{P_J}\left(\frac{p_j}{P_J}\right)^{-\sigma}$
- Price in destination n: $p_{jn} = \left(\frac{\sigma}{\sigma-1}\right)\frac{w}{\varphi_j} d_{Jn}\tau_{Jn}$
- ZPC productivity: $\varphi^*_{Jn} = \tau_{Jn}^{\frac{\sigma}{\sigma-1}}\left[\frac{f_{Jn}}{E_{Jn}(1-\epsilon)}\right]^{\frac{1}{\sigma-1}}\left(\frac{d_{Jn}w}{P_{Jn}\epsilon}\right)$; $\epsilon \equiv (\sigma-1)/\sigma$

$\rightarrow$ More firms export when tariffs and trade costs fall or prices and expend. rise

Theory: Bilateral Results

Similar to Handley & Limão 2013; Feng et al. 2014

Uncertainty in applied tariffs; two scenarios: $s = \{p, np\}$

- Preferential vs. non-preferential tariffs: $\tau^p \leq \tau^{np}$
- Probability of switching from p to np: $0 \leq \delta \leq 1$
- Expected tariff under uncertainty: $\tau^E = (\tau^{np})^{\delta}(\tau^p)^{1-\delta}$

Exports to n under uncertainty in n:

$$\ln R_{Jn} = -\frac{\sigma k}{\sigma - 1} \ln \tau^E_{Jn} - k \ln d_{Jn} + \frac{k}{\sigma - 1} \ln A_n + \ln \alpha_J - \frac{k - \sigma + 1}{\sigma - 1} \ln f_{Jn}$$

Note: A_n and α_J summarize country- and product-specific variables and parameters of the model, respectively.

$$\ln \tau^E_{Jn} = \ln \tau^p_{Jn} + \delta_n \underbrace{(\ln \tau^{np}_{Jn} - \ln \tau^p_{Jn})}_{\text{Tariff threat: } GAP_{Jn} \geq 0}$$

Lemma 1: *The removal of tariff uncertainty in country n, i.e. $\delta_n \to 0$, has a positive effect on exports to country n.*

Theory: Introducing Global Fixed Costs

Assumption (Hanson & Xiang, 2011): additive fixed costs; $f_{Jn} \equiv f_n + f_J$

Exporters consider all potential destinations:

$$\begin{aligned}
\tilde{\pi}_{j1} - f_J &= (1-\epsilon)\left(\frac{w}{\varphi_j \epsilon}\right)^{1-\sigma}\left(\frac{d_{J1}}{P_{J1}}\right)^{1-\sigma}\tau_{J1}^{-\sigma}E_{J1} - f_1 - f_J \\
+\tilde{\pi}_{j2} &= (1-\epsilon)\left(\frac{w}{\varphi_j \epsilon}\right)^{1-\sigma}\left(\frac{d_{J2}}{P_{J2}}\right)^{1-\sigma}\tau_{J2}^{-\sigma}E_{J2} - f_2 \\
&\vdots \\
+\tilde{\pi}_{jN} &= (1-\epsilon)\left(\frac{w}{\varphi_j \epsilon}\right)^{1-\sigma}\left(\frac{d_{JN}}{P_{JN}}\right)^{1-\sigma}\tau_{JN}^{-\sigma}E_{JN} - f_N \\
\Leftrightarrow \Pi_j &= (1-\epsilon)\left(\frac{w}{\varphi_j \epsilon}\right)^{1-\sigma}\sum_{n=1}^{N}\left[\left(\frac{d_{Jn}}{P_{Jn}}\right)^{1-\sigma}\tau_{Jn}^{-\sigma}E_{Jn}\right] - \sum_{n=1}^{N^*} f_n - f_J
\end{aligned}$$

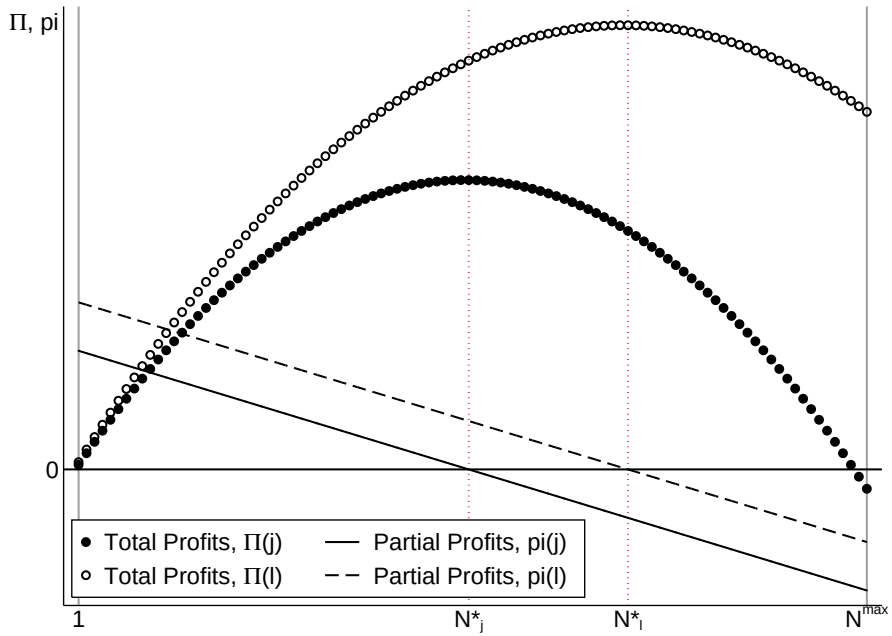
Setting $\Pi = 0$ gives the multilateral ZPC productivity

$$\Phi_J^* = \sigma^{\frac{1}{\sigma-1}}\left(\frac{w}{\epsilon}\right)\left[\sum_{n=1}^{N}[\tau_{Jn}]^{\frac{\sigma}{\sigma-1}}\frac{d_{Jn}}{P_{Jn}}\left(\frac{f_n + f_J}{E_{Jn}}\right)^{\frac{1}{\sigma-1}}\right]$$

Theory: Implications of Global Fixed Costs

Lemma 2: *Irrespective of global fixed costs f_J, a firm j exports to a destination n only if bilateral partial profits are positive, $\tilde{\pi}_{jn} \geq 0$.*

Partial and Aggregate Profits of two Firms



Ranking of Destinations:

- $\tilde{\pi}_{j1} \geq \ldots \tilde{\pi}_{jn} \geq \ldots \tilde{\pi}_{jN}$

Optimal # of Destinations:

- $\varphi(j) < \varphi(l) \Rightarrow N^*(j) < N^*(l)$

Global Fixed Cost Component:

- Large f_J or low $\varphi(j)$: $\Pi(N = 1...\underline{n}) < 0$

Lemma 3: *If $\tilde{\pi}_{j1} \geq \ldots \tilde{\pi}_{jn} \geq \ldots \tilde{\pi}_{jN}$, and if global fixed costs can be covered, a firm exports to all destinations for which $\tilde{\pi}_{jn} \geq 0$.*

Lemma 4: *If $N = N^*$ is the optimal number of destinations served by any firm j, then the productivity threshold Φ^* increases with N.*

Theory: Bilateral Tariff Uncertainty

Numerical example I: Removal of tariff uncertainty and ZPC thresholds Φ^*; two symmetric countries, set $\sigma = 3$

Baseline scenario:

- Tariff uncertainty country 1
- $\tau_{nJ}^{E} = (\tau_{nJ}^{np})^{\delta}(\tau_{nJ}^{p})^{1-\delta}$
- $\tau_{1J}^{np} = 2$; $\tau_{1J}^{p} = 1$; $\tau_{1J}^{E} \approx 1.4$

Computed ZPCs and Tariff Uncertainty

	(1) Φ_N^*	(2) Φ_1^*	(3) Φ_2^*
Baseline: $\tau_1^E = 1.4$	3.53	5.35	3.18
Treatment: $\tau_1^E = 1$	2.90	3.18	3.18

Uncertainty vs. removed uncertainty

$\Rightarrow$ First, lowest Φ^* in column (3); then in column (1)
$\Rightarrow$ Additional firms export to both countries

Theory: Bilateral Tariff Uncertainty

Numerical example II: Reduction of ZPC and size of the policy making country 1

Compute Φ for $N = n$

- asymmetric countries, $\sigma = 3$
- tariff uncertainty in $n = 1$
- $\tau_{nJ}^{np} = 2$; $\tau_{nJ}^{p} = 1$; $\tau_{nJ}^{E} \approx 1.4$

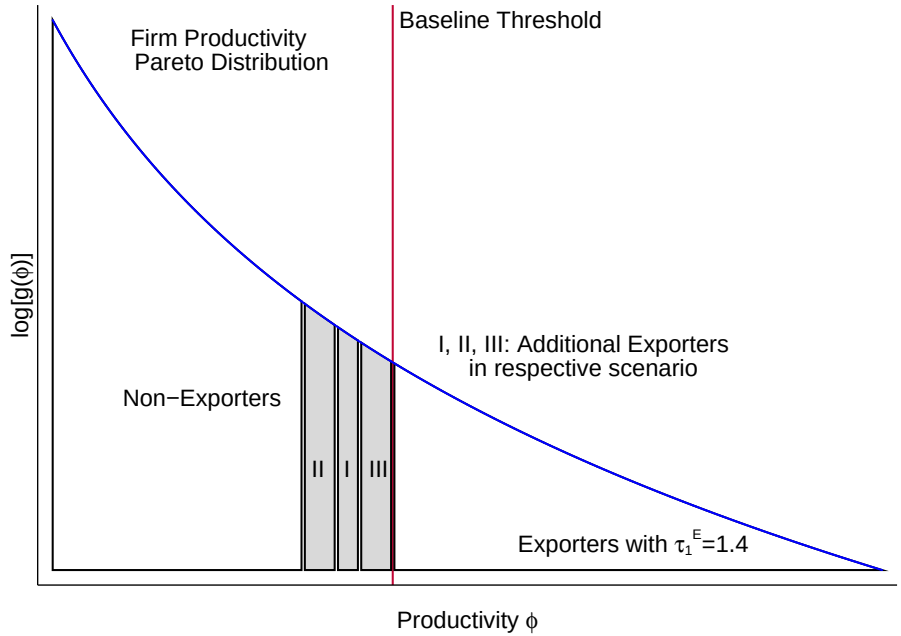
Scenarios: size of countries

I $E_1 = 1$; $E_2 = 2$; $E_3 = 0.5$

II $E_1 = 2$; $E_2 = 2$; $E_3 = 0.5$

III $E_1 = 0.5$; $E_2 = 2$; $E_3 = 0.5$

Computed ZPCs and Tariff Uncertainty



$\Rightarrow$ Larger countries have larger effect on multilateral threshold

$\Rightarrow$ Large countries absorb larger portion of global fixed cost burden

Theory: Predictions & Recap

Predictions: Exports to n with global fixed costs

$$\ln R_{Jn} = -\frac{\sigma k}{\sigma - 1} \ln \tau_{Jn}^{E} - k \ln d_{Jn} + \frac{k}{\sigma - 1} \ln A_n + \ln \alpha_J - \frac{k - \sigma + 1}{\sigma - 1} \ln \left(f_n + \theta_{Jn} f_J \right)$$

The parameter θ captures the fraction of f_J covered by n

Proposition 1: *A removal of tariff uncertainty in country $l \neq n$, increases exports to country n through a reduction of the global fixed cost burden $\theta_{nJ} f_J$.*

Proposition 2: *The reduction of the global fixed cost burden $\theta_{nJ} f_J$, $\forall n \neq l$ implies a reduced ZPC, Φ_J^*, and thereby an adjustment at the extensive margin.*

How realistic is the global fixed cost component?

- Hanson&Xiang (2011): strong evidence for services (i.e. US movies)
- Iacovone&Javorcik (2012): Mexican firms upgrade before exporting
- Amiti&Freund (2010): China's export growth driven by processing trade

- If Chinese firms export labor services $\rightarrow$ decision is not destination-specific

Empirical Analysis

Empirical strategy

$$\ln R_{Jn} = -\frac{\sigma k}{\sigma - 1} \ln \tau_{Jn}^{E} - k \ln d_{Jn} + \frac{k}{\sigma - 1} \ln A_n + \ln \alpha_J - \frac{k - \sigma + 1}{\sigma - 1} \ln \left(f_n + \theta_{Jn} f_J \right)$$

Analyze Chinese exports to EU15 after removal of US tariff uncertainty in 2002

- US tariff uncertainty as of 1999: $GAP_{J,99} \equiv \ln \tau_{J,US}^{Col2} - \ln \tau_{J,US}^{MFN}$
- Interaction with period dummy $D_t^T = 1$ if $t \geq 2002$

The policy spillover operates through θ

- No *change* in uncertainty in the EU: $\tau_{J,EU}^{E} = \tau_{J,EU}$
- Removal of US tariff uncertainty: $GAP_J^m \times D_t^T \Rightarrow \Delta\theta_{J,EU} f_J$

Estimation equation

$$\ln R_{Jnt} = b_1 (GAP_J^m \times D_t^T) + b_2 \ln \tau_{Jnt} + b_{Jn} + b_{nt} + b_{St} + \varepsilon_{Jnt} \qquad (1)$$

Data and variables

Main variables and data sources:

- Chinese exports to the EU: UN Comtrade, HS6 (Rev. 1992), 1995-2005
- Applied tariffs to China: WITS and EC Regulations of GSP, 1995-2005
- US Tariff threat: US Tariffs data: NBER, 1988-2001
- Post WTO-entry dummy: $D^T_{t<2002} = 0$; $D^T_{t\geq 2002} = 1$

Summary Statistics: Exports to EU, applied tariffs, tariff threat

Variable		Mean	Std. Dev.	Min	Max
(log) Exports	overall	11.516	2.628	0	22.411
	between		2.473	0	20.696
	within		1.374	1.936	19.040
(log) Tariffs	overall	0.033	0.036	0	0.535
	between		0.035	0	0.325
	within		0.011	-0.087	0.264
U.S. Tariff GAP	overall	0.272	0.137	0	1.048
$(t > 2001)$	between		0.137	0	1.048
	within		0	0.272	0.272

Results: Level of Chinese Exports I

Proposition 1: Level of Chinese exports increase after entry to WTO in products with higher GAP

Industry Range	Full (1)	excl. T&C (2)	Full (3)
Spillover $GAP^{U.S}_{J,99}$	0.647^{**}	0.237^{**}	0.405^{**}
	(0.076)	(0.091)	(0.077)
EU Tariff $\ln \tau^{EU}_{Jt}$	-0.386	0.283	-0.052
	(0.420)	(0.433)	(0.419)
EU Quota removal I $MFA^{EU}_{J,02}$			0.576^{**}
			(0.034)
EU Quota removal II $MFA^{EU}_{J,05}$			0.449^{**}
			(0.050)
Observations	$270,767$	$207,476$	$270,767$
R-squared	0.170	0.176	0.172
Fixed effects	Jn, nt, St	Jn, nt, St	Jn, nt, St

Linear panel regressions, based on Eq (1), using data for years 1995-2005 at HS6-destination level.
Fixed effects: product-destination (Jn), destination-year (nt), sector-year (St).

$\Rightarrow$ Average threatened product exported increase by 10.9 percent relative to non-threatened goods.
$\Rightarrow$ Given $k = 4.854$ (Head et al. 2014); Eq (1) and column (1) imply $\hat{\sigma} = 3.947$; larger in other columns.

Results: Level of Chinese Exports II

Non-parametric estimation

G1: $0 < GAP \leq p[25]$, G2: $p[25] < GAP \leq p[75]$, G3: $p[75] < GAP \leq p[100]$

Industry Range	Full (1)	excl. T&C (2)	Full (3)
G1: $0 < GAP \leq p[25]$	0.192^{**}	0.158^{**}	0.212^{**}
	(0.074)	(0.076)	(0.073)
G2: $p[25] < GAP \leq p[75]$	0.400^{**}	0.371^{**}	0.387^{**}
	(0.071)	(0.073)	(0.071)
G3: $p[75] < GAP \leq p[100]$	0.463^{**}	0.311^{**}	0.393^{**}
	(0.072)	(0.076)	(0.072)
EU Tariff	-0.524	0.088	-0.181
$\ln \tau_{Jt}^{EU}$	(0.421)	(0.435)	(0.420)
EU Quota removal I			0.576^{**}
$MFA_{J,02}^{EU}$			(0.034)
EU Quota removal II			0.446^{**}
$MFA_{J,05}^{EU}$			(0.049)
Observations	$268,499$	$205,966$	$268,499$
R-squared	0.171	0.177	0.173
Fixed effects	Jn, nt, St	Jn, nt, St	Jn, nt, St

Results: Extensive vs. Intensive Margin

Proposition 2: Policy spillover increases trade at the extensive margin; i.e. more destinations per product.

	Logistic Regressions		Linear Regressions		
	Odd Ratio	Coeff.	# Destinations	Norm. Growth	Log Growth
	(1)	(2)	(3)	(4)	(5)
Spillover	2.511^{**}	0.921^{**}	1.770^{**}	0.159^{**}	0.094^{a}
$GAP^{U.S}_{J,99}$	(0.201)	(0.080)	(0.275)	(0.034)	(0.048)
EU Tariff	0.406^{*}	-0.902^{*}	0.300	-0.010	-0.327
τ^{EU}_{Jt}	(0.169)	(0.417)	(1.071)	(0.327)	(0.405)
EU Quota removal I	1.157^{*}	0.146^{**}	0.920^{**}	0.090^{**}	0.082^{**}
$MFA^{EU}_{J,02}$	(0.040)	(0.034)	(0.144)	(0.017)	(0.023)
EU Quota removal II	2.115^{**}	0.749^{**}	1.234^{**}	0.691^{**}	0.683^{**}
$MFA^{EU}_{J,05}$	(0.148)	(0.070)	(0.210)	(0.039)	(0.060)
Observations	341, 814		44, 038	284, 134	204, 837
R-squared	0.177		0.364	0.056	0.010
Fixed effects	Jn, t		J, St	Jn, nt, St	Jn, nt, St

Alternative specifications using data for years 1995-2005.

$\Rightarrow$ All specifications suggest increased entry: Logit (binary); Destinations per J; normalized vs log growth.

$\Rightarrow$ Column (4) Normalized Growth rate: $g^N \equiv \frac{R_t - R_{t-1}}{0.5(R_t + R_{t-1})}$; $g^N \in [-2, 2]$

Robustness Check: Redistribution of Global Fixed Costs

Does a rise in $\theta_{J,US}$ really rise exports to the EU?

- Let θ_{Jn} correspond to avg. share of n in Chinese exports of J
- Replace GAP_J^{US} with $\Delta\bar{s}_J^{US} = \bar{s}_{J,US}^{post} - \bar{s}_{J,US}^{pre}$

	Baseline	Logit		Linear Regressions		
	Levels	Odd Ratio	Coeff.	# Dest.	Norm. vs.	Log Growth
	(1)	(2)	(3)	(4)	(5)	(6)
US Share	0.789^{**}	3.371^{**}	1.215^{**}	2.073^{**}	0.030	0.039
	(0.090)	(0.293)	(0.087)	(0.348)	(0.037)	(0.058)
EU Tariff	-0.073	0.429^{*}	-0.847^{*}	0.403	-0.000	-0.328
	(0.420)	(0.180)	(0.419)	(1.068)	(0.327)	(0.406)
EU Quota removal I	0.595^{**}	1.222^{**}	0.201^{**}	1.029^{**}	0.106^{**}	0.091^{**}
	(0.034)	(0.040)	(0.033)	(0.142)	(0.016)	(0.023)
EU Quota removal II	0.448^{**}	2.102^{**}	0.743^{**}	1.228^{**}	0.694^{**}	0.685^{**}
	(0.050)	(0.147)	(0.070)	(0.213)	(0.039)	(0.060)
Observations	367,870	$337,711$		$43,307$	$281,203$	$202,702$
R-squared	0.173	0.183		0.374	0.056	0.010
Fixed effects	Jn, nt, St	Jn, t		J, St	Jn, nt, St	Jn, nt, St

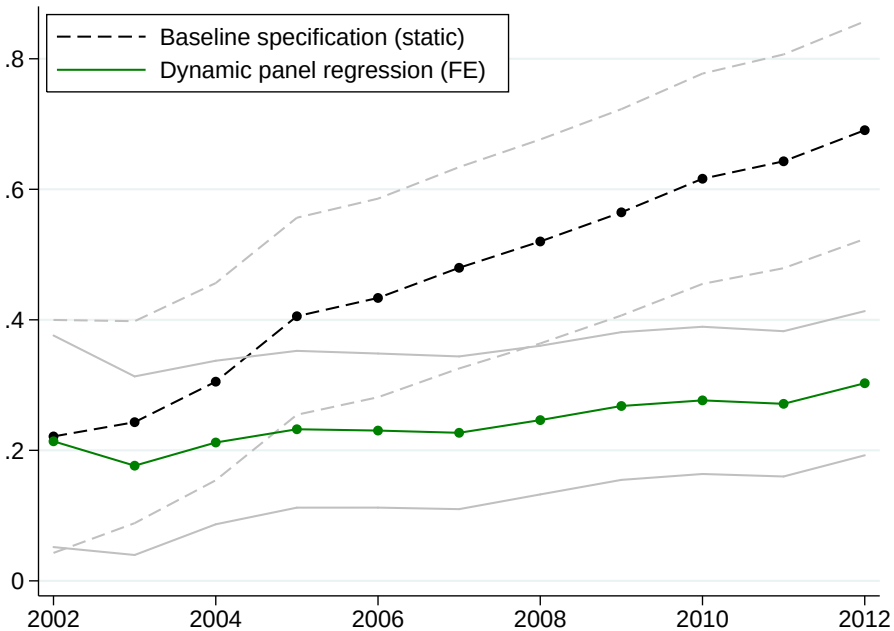
Alternative specifications using data for years 1995-2005.

$\Rightarrow$ Goods increasingly exported to the US also grow faster in the EU.

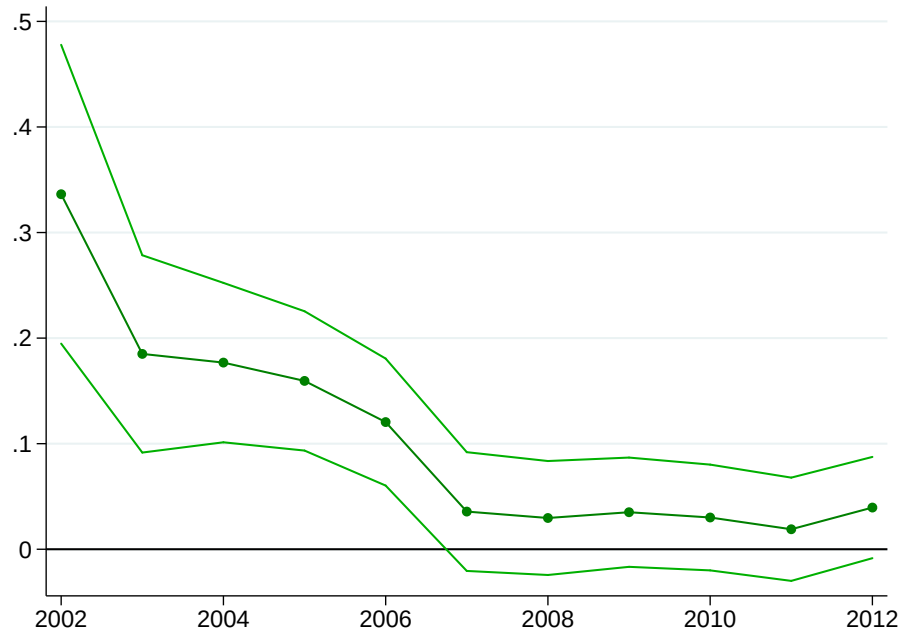
Robustness Checks: Transition Dynamics

Re-estimating the baseline model with different period length T
Estimated Coefficients $\hat{b}_1$ for periods 1995-T

Level Effect



Growth Effect



Static model biases level effect upwards (dashed line) as period is extended
$\Rightarrow$ Dynamic specification suggests immediate effect around $\hat{b}_1 = 0.214$; implies $\hat{\sigma} \approx 5$.
Strongest growth effect in 2002; levels out after few years $\Rightarrow$ Transitional growth

Summary & Conclusion

Question: Why did Chinese Exports to EU-15 grow so much faster after 2001?

Motivation: EU policies unchanged, except quota removal in textiles and apparel

Hypothesis: Spillover of US policy change that removed tariff uncertainty for China

Theory: Exporters face global and bilateral fixed costs $\Rightarrow$ economies of scale

Main Findings:

- Chinese exports increase more in products where policy change was most felt
- Increase through export of goods to more destinations (extensive margin)
- Full effect materializes gradually but within few years after WTO entry

Conclusion:

- Spillover uncovers important source of trade and international competition
- Global fixed costs suggest that Chinese firms export labor services

Extensions: *Ad hoc* structural estimates find displacement of US exports by China

Thank you for your attention!

Extension: Trade Diversion?

Does the policy spillover displace other countries' exports to EU?

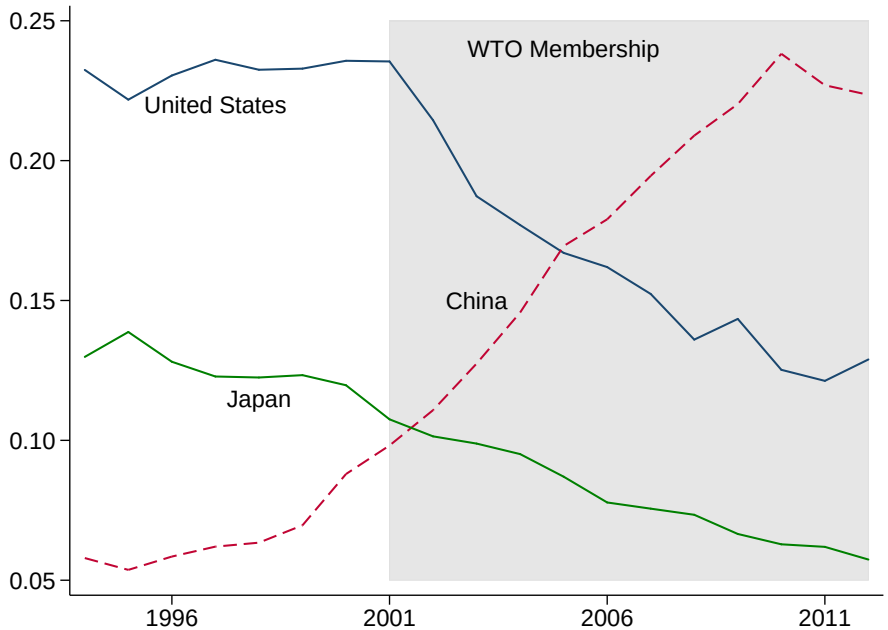
Pierce and Schott (2013)

- Fall of US manuf employment since 2001
- Increase of Chinese exports to the US
- More China-US firm-level transactions
- Relocation of production?

Fall in US market share and trade diversion?

- Direct effect of GAP on US market share
- Indirect effect (through increase of China's market share); 2SLS

Market shares in EU-15: 1995-2012



Data: UN Comtrade

Extension: Reduced Form vs Structural Estimation

Log EU Import Market Share, 1995-2005; Reduced Form vs Structural Estimation

Measure:	Reduced ($GAP^{U.S}_{J,99}$)			2SLS ($\ln Share^{CN}_{Jt}$)		
	USA (1)	JPN (2)	TUR (3)	USA (4)	JPN (5)	TUR (6)
EU tariff faced	-1.089	-2.059^{a}		-0.945	-0.964	
$\ln \tau^{i}_{Jt}$	(0.709)	(1.143)		(0.614)	(0.917)	
Policy Change	-0.260^{*}	-0.417^{**}	-0.003	-0.257^{*}	-0.110	-0.499^{**}
	(0.112)	(0.158)	(0.172)	(0.130)	(0.178)	(0.142)
EU Quota removal I	0.033	-0.103	-0.186^{**}			
$MFA^{EU}_{J,02}$	(0.065)	(0.084)	(0.069)			
EU Quota removal II	-0.161	0.387^{**}	0.007			
$MFA^{EU}_{J,05}$	(0.099)	(0.115)	(0.071)			
EU Tariff (China)	0.885	1.740^{a}	1.110			
$\ln \tau^{CN}_{Jt}$	(0.635)	(0.942)	(0.963)			
Observations	$43,749$	$39,330$	$32,692$	$38,402$	$35,782$	$30,212$
R-squared	0.109	0.038	0.081			
Underidentification (Kleibergen-Paap)				62.66	57.81	70.69
Weak-instruments (Cragg-Donald/KP)				15.92	19.67	17.99
Hansen J-Statistic (p-value)				0.03	0.00	0.21

US Policy Change

- Direct negative effects on US and Japan $\Rightarrow$ Production Relocation?
- Indirect effects on US and Turkey $\Rightarrow$ Chinese Competition / Trade Diversion?

Extension: Chinese Competition at Sector Level

EU Import Market Shares and Chinese Competition; 2SLS Estimation

		2SLS estimation ($\ln Share_{Jt}^{CN}$)		
		USA	Japan	Turkey
Sector	HS Chapter	(1)	(2)	(3)
Chemicals	28-38	-0.483^{**}	-0.158	0.697^{a}
		(0.129)	(0.172)	(0.370)
Plastics/Rubbers	39-40	-0.443^{*}	-0.097	0.548
		(0.178)	(0.275)	(0.639)
Hides/Leather	41-43	-0.545	-1.644^{*}	-0.035
		(0.362)	(0.688)	(0.519)
Wood Products	44-49	-1.497^{a}	0.034	3.678^{a}
		(0.777)	(0.239)	(1.905)
Textiles	50-60	-0.304^{**}	0.036	-0.418^{**}
		(0.010)	(0.110)	(0.106)
Apparel/Footwear	61-67	-0.542^{a}	1.235^{**}	-0.364
		(0.289)	(0.434)	(0.309)
Stone/Glass	68-71	-0.935	-0.675	-2.209
		(0.840)	(0.969)	(2.408)
Metals	72-83	-1.234^{*}	-1.186^{*}	-0.038
		(0.010)	(0.605)	(0.266)
Machinery/Electronic	84-85	-2.255^{*}	-1.051^{a}	-1.750
		(1.001)	(0.638)	(1.572)
Transportation	86-89	-0.818^{*}	-0.905^{a}	-1.441
		(0.395)	(0.172)	(0.915)
Other Manufactures	90-96	-1.287^{*}	0.825	-3.770
		(0.178)	(0.559)	(3.640)

Statistical significance: $a = 10\%$, $* = 5\%$, $** = 1\%$