The 'China Shock' in Trade Reconsidered

Robert C. Feenstra

UC Davis and NBER

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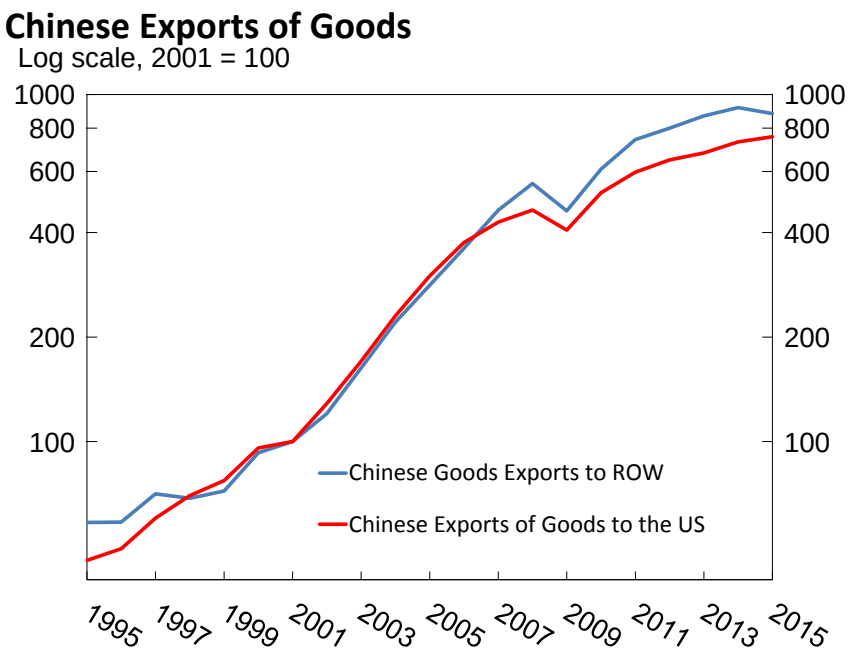
Introduction

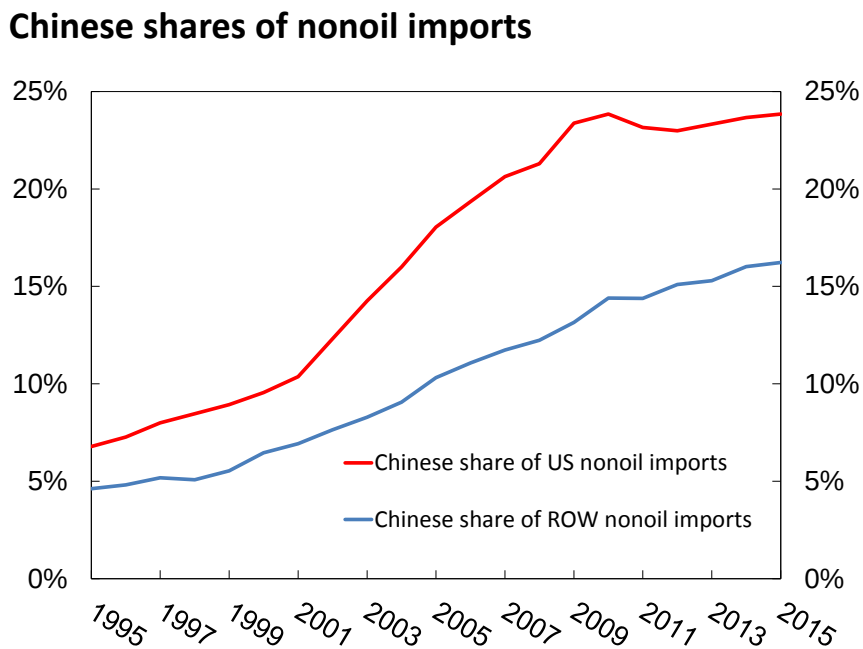
What is the impact of China's integration to the world economy?

- Employment, prices, productivity, and so on

Figure 1: Exports from China to the U.S. and the Rest of the World



Source: UN Direction of Trade Database



Source: UN Comtrade Database, World Integrated Trade Solution

Summary

Negative impacts of import penetration from China:

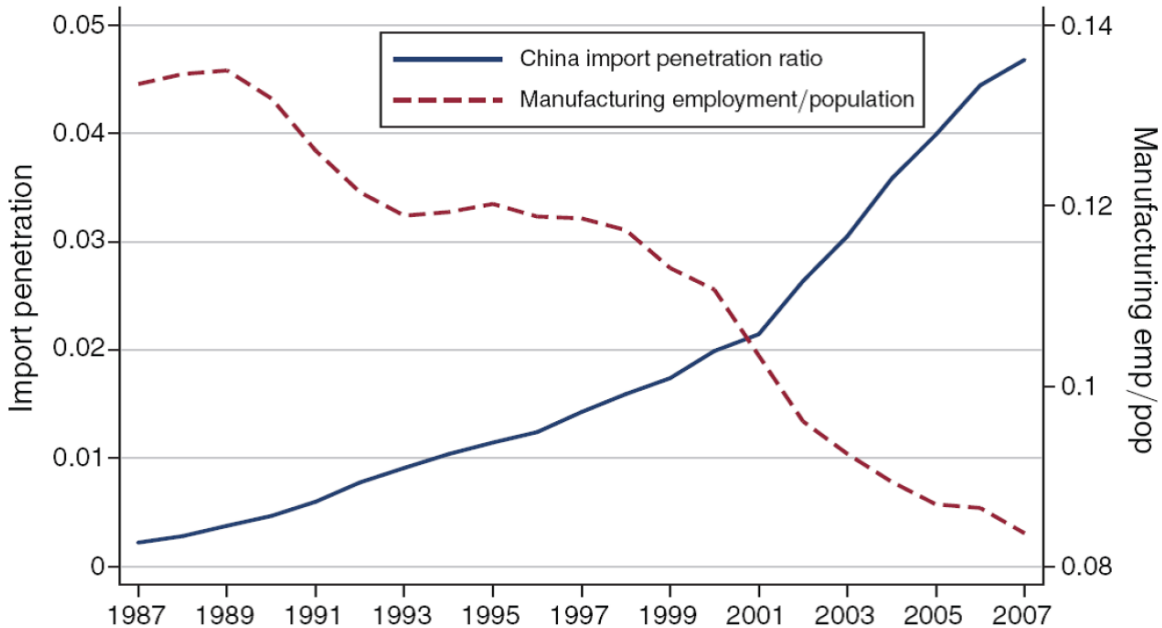
- U.S. employment (Autor, Dorn, and Hanson, 2013; Acemoglu, Autor, Dorn, Hanson, and Price, 2016; Pierce and Schott, 2016)
  - Other issues in the U.S.:
    - Housing value and housing debt (Feler and Senses, 2016; Barrot et al., 2017)
    - Marriage (Autor, Dorn, and Hanson, 2017)
    - Innovation (Autor, Dorn, Hanson, Pisano, and Shu, 2016)
    - Political polarization (Autor, Dorn, Hanson, and Majlesi, 2016)
- Response: Feenstra, Ma, and Xu (2017a)

Positive impacts of trade with China:

- Employment in the U.S. (Feenstra, Ma, and Xu, 2017b)
- Price levels and consumer welfare in the U.S. (Amiti, Dai, Feenstra, and Romalis, 2017)
- Employment in East Asia (Feenstra and Sasahara, 2017)

Feenstra, Ma, and Xu (2017a)

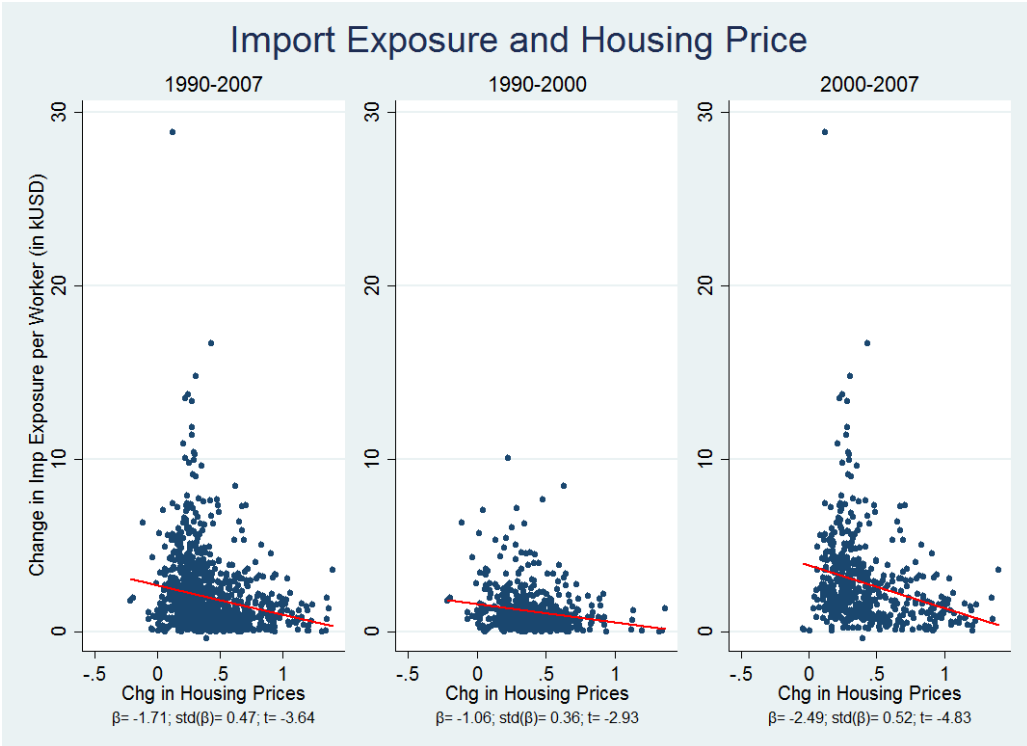
Figure 2: Import Penetration from China and U.S. Manufacturing Employment, Reproduced from Autor, Dorn, and Hanson (2013)



- Autor, Dorn, and Hanson (2013) — a negative employment effect of China on U.S. local labor markets during 1990-2007
- We argue that the negative impact of Chinese imports is overstated.

Feenstra, Ma, and Xu (2017a)

Figure 3: Import Competition and Housing Prices



- Locations that did not experience housing booms are exposed to fiercer import competition from China.
- A decline of employment in those locations is in large part explained by the geographical differences in macroeconomic conditions reflected in housing prices rather than import penetration from China.

Feenstra, Ma, and Xu (2017a)

- Concerns in identification:
  - Unobserved local conditions may affect employment and housing prices simultaneously. On the other hand, local job opportunities can also reversely affect housing prices.
  - Changes in local housing price may be the result of import exposure.
- Charles et al. (2016) suggest estimating for each local area an OLS regression with a structural break, and search for the break date that maximizes the R^2 of the regression:

$$\ln P_{it} = \omega_i + \tau_i t + \lambda_i (t - t_i^*) D_{it} + \epsilon_{it}, \tag{1}$$

- We estimate equation (1) for each local area separately over periods 1990-2000 and 2000-2007, and use the annualized size of the structural break λ_i as the instrument for the decadal changes in housing prices.

Feenstra, Ma, and Xu (2017a)

Table 1: Instrumenting for Housing: Estimation Results

	(1) Mfg emp	(2) Non-Mfg emp	(3) Total emp	(4) Unemp	(5) NILF
			Panel I: All education levels		
(Δ imports from China)/worker	-0.577***	0.219	-0.358	0.201***	0.157
	(0.086)	(0.236)	(0.234)	(0.070)	(0.232)
Δ housing price index	1.518***	5.189***	6.707***	-1.324**	-5.384***
	(0.480)	(1.189)	(1.542)	(0.537)	(1.246)
			Panel II: College education		
(Δ imports from China)/worker	-0.567***	0.479***	-0.088	0.120***	-0.032
	(0.133)	(0.175)	(0.152)	(0.047)	(0.140)
Δ housing price index	1.452***	3.477***	4.929***	-0.890**	-4.039***
	(0.500)	(0.340)	(0.584)	(0.385)	(0.432)
			Panel III: No college education		
(Δ imports from China)/worker	-0.548***	-0.006	-0.554	0.232**	0.322
	(0.098)	(0.343)	(0.379)	(0.109)	(0.371)
Δ housing price index	1.830***	7.262***	9.091***	-1.845**	-7.246***
	(0.566)	(2.133)	(2.560)	(0.745)	(2.090)

	First Stage Results	
	(1) (Δ imports from China)/worker	(2) Δ housing price index
(Δ imports from China to Other)/worker	0.569***	-0.022**
1st-stage F-stat.	13.55	91.18

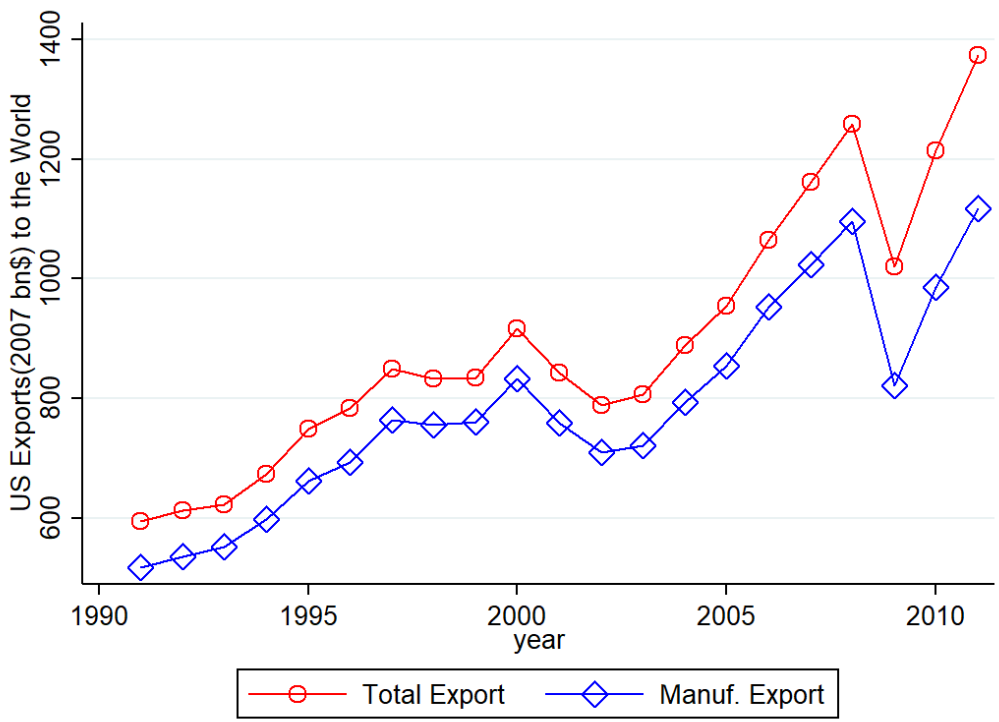
Feenstra, Ma, and Xu (2017a)

- The response of the total employment-to-population rate to import exposure falls by one-half and becomes statistically insignificant in a specification that includes local housing prices.
  - **Feenstra, Ma, and Xu (2017a)**: A reduction in manuf. employment of 1.33 million workers, but an increase in non-manuf. employment by 0.50 million. Altogether 0.83 million job losses.
  - **Autor, Dorn, and Hanson (2013)**: A reduction in manuf. employment of 1.53 million workers and additional 0.46 million job losses in non-manuf. Altogether 2 million job losses.
- Import competition from China has a positive spillover effect on non-manufacturing employment of college educated.

Feenstra, Ma, and Xu (2017b)

- International trade is a 'two-way' street — there are also large employment gains due to U.S. global export expansion.
- A more balanced view towards trade shocks should also account for potential gains in jobs due to U.S. export expansion.

Figure 4: Exports from the U.S. to the Rest of the World



Feenstra, Ma, and Xu (2017b)

Empirical Strategy - Instruments

- IV for ΔIP_{st}

$$\Delta IP_{st}^{OTH} = \frac{\Delta M_{s,t}^{OC}}{Y_{s,t_0} + M_{s,t_0} - E_{s,t_0}},$$

- IV1 for ΔEP_{st}: Export expansion by other high-income economies

$$\Delta EP_{st}^{OTH} = \frac{\Delta X_{s,t}^{OTH}}{Y_{s,t_0}}.$$

- IV2 for ΔEP_{st}: Predicting U.S. Exports

$$\ln X_{st}^{us,j} = \beta_0 + \beta_1 \ln(\tau_{st}^{us,j}) + \beta_2 \ln(\sum_{k \neq US} X_{st-1}^{k,j}) \quad + \beta_3 \ln(T_{st}^{j}) + \epsilon_{st}^{j}. \quad (2)$$

- $\ln(T_{st}^{j})$ measures a geometric mean of tariffs imposed by j on all other exporters (except the U.S.).

Feenstra, Ma, and Xu (2017b)

Table 2: The Impact of Export Expansion on Employment in the U.S.

	Dep var: 100 × annualized log change in industrial employment					
	(1)	(2)	(3)	(4)	(5)	(6)
	1991-2007	1991-2007	1991-2011	1991-1999	1999-2007	1999-2011
	OLS	2SLS	2SLS	2SLS	2SLS	2SLS
$\Delta Imports$	-0.73***	-1.30***	-1.40***	-2.87**	-1.08***	-1.21***
	(0.16)	(0.31)	(0.41)	(1.34)	(0.22)	(0.35)
$\Delta Exports$	0.39**	0.87***	0.59***	0.64**	0.95***	0.62**
	(0.15)	(0.20)	(0.22)	(0.32)	(0.20)	(0.24)
	First Stage Results					
Dep. var: $\Delta Imports$, Instruments: $\Delta Imports^{OTH}$, $\Delta Exports^{PRE}$ and $\Delta Exports^{OTH}$						
R-squared		0.686	0.642	0.243	0.701	0.672
F-stat.		28.0	26.0	11.0	31.2	23.2
Dep. var: $\Delta Exports$, Instruments: $\Delta Imports^{OTH}$, $\Delta Exports^{PRE}$ and $\Delta Exports^{OTH}$						
R-squared		0.406	0.391	0.555	0.277	0.271
F-stat.		26.7	24.7	13.1	32.7	32.3

Export expansion has a positive impact on employment in the U.S.

Feenstra, Ma, and Xu (2017b)

- With stacked long differences b/w 1991-1999 & 1999-2007 (col. 2)
  1. A 1 ppt rise in industry import penetration reduces domestic industry employment by 1.3 ppt.
  2. A 1 ppt rise in industry export expansion increases industrial employment by 0.87 ppt.
- Quantitative Results:

$$\Delta L_t = \sum_s \left(L_{s,t}(1 - e^{(\hat{\beta}_1 \Delta IP_{st} + \hat{\beta}_2 \Delta EP_{st})}) \right)$$

  - Export expansion *net of* China import penetration led to a net gain of 525,000 jobs in the 1st period 1991-1999, while it led to a net loss of 520,000 jobs for the 2nd period 1999-2007.
  - On balance over the entire 1991-2007 period, job gains and losses due to changes in U.S. global exports and Chinese imports were roughly balanced using these industry estimates (but not in the Commuting Zone regression).

Amiti, Dai, Feenstra, and Romalis (2017)

- **Question**: What proportion of change in U.S. price index is due to China's WTO entry in 2001 and how did this benefit consumers?
  - Permanent normal trade relations with the U.S.
  - Reduction in China's own tariffs on intermediate inputs

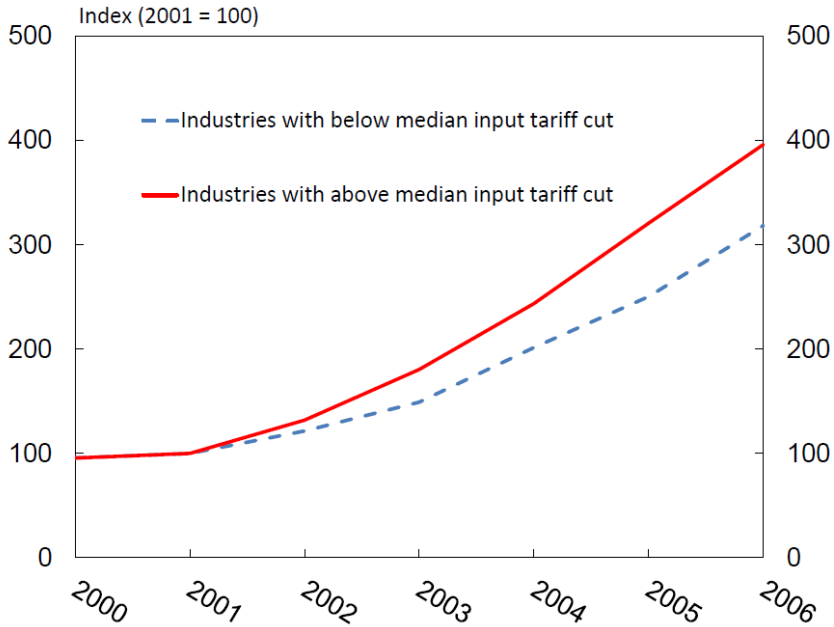


Figure 5: China's U.S. Exports and China's Import Tariffs
Source: Amiti, Dai, Feenstra, and Romalis (2017)

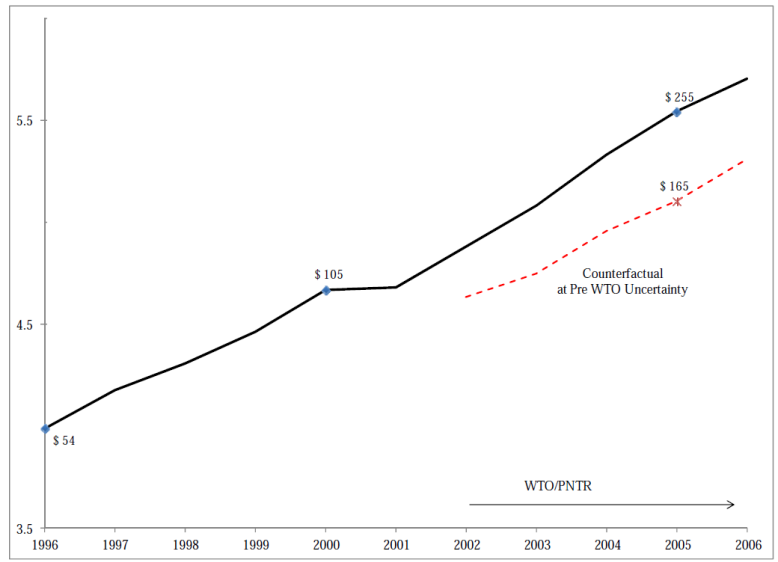


Figure 6: Aggregate Chinese Exports to U.S. 1996-2006: Observed and Counterfactual at Pre-WTO Uncertainty
Source: Handley and Limão (2013)

Amiti, Dai, Feenstra, and Romalis (2017)

Approach:

- Construct exact price indexes for U.S. imports from China, other U.S. imports, and overall U.S. price indexes
  - We measure both the variety and price effect

Result:

- China's WTO entry reduced the U.S. price index by 7.6% (around 1% per year during 2000-2006)
- The most significant effect on the U.S. price index is due to China's lower input tariffs, not the permanent normal trade with the U.S.

Amiti, Dai, Feenstra, and Romalis (2017)

$$\ln \frac{P_{gt}}{P_{g0}} = \underbrace{\ln \left[\prod_{\omega \in \bar{\Omega}_g^i} \left(\frac{p_{gt}^i(\omega)}{p_{g0}^i(\omega)} \right)^{W_{gt}^i w_{gt}^i(\omega)} \right]}_{ChinaP_g} + \underbrace{\ln \left[\prod_{j \in \bar{I}_g \setminus i} \prod_{\omega \in \bar{\Omega}_g^i} \left(\frac{uv_{gt}^i(\omega)}{uv_{g0}^i(\omega)} \right)^{W_{gt}^i w_{gt}^i(\omega)} \right]}_{OtherP_g}$$

$$+ \underbrace{\ln \left(\frac{\lambda_{gt}^i}{\lambda_{g0}^i} \right)^{\frac{W_{gt}^i}{\rho_g - 1}}}_{ChinaV_g} + \underbrace{\ln \left\{ \left[\prod_{j \in \bar{I}_g \setminus i} \left(\frac{\lambda_{gt}^i}{\lambda_{g0}^i} \right)^{\frac{W_{gt}^j}{\rho_g - 1}} \right] \left(\frac{\Lambda_{gt}}{\Lambda_{g0}} \right)^{\frac{1}{\sigma_g - 1}} \right\}}_{OtherV_g}$$

- $ChinaP_g$: Sato-Vartia price index for Chinese imports, constructed over common goods in industry g available for both years
- $OtherP_g$: Sato-Vartia index constructed over the unit-values $uv_{gt}^i(\omega)$ in industry g for all other exporting countries
- $ChinaV_g$: the gain from increased varieties from China, λ_{gt}^i = share of continuing Chinese exporting firms (Feenstra, *AER*, 1994) ▸ More details
- $OtherV_g$: the combined welfare effect (potentially a loss) of changing variety at the HS 6-digit level from other countries j and from the U.S. itself

Table 3: Chinese Firms U.S. Exports

Dependent variable	I^X_{fht} =1 if X_{fht} >0	$ln(s_{fht})/(1-\bar{\rho})$		$ln(price_{fht})$		
	(1)	(2)	(3)	(4)	(5)	(6)
$ln(TFP_{ft})$	1.918***	-0.938***	-1.062***	-1.000†	-1.000†	-1.000†
	(0.033)	(0.149)	(0.292)			
$ln(Input\tau_{gt})$	-1.948***			3.101***	3.645**	3.632**
	(0.452)			(1.167)	(1.583)	(1.594)
$ln(Input\tau_{gt}) \times Process_{fh}$	-0.198			-1.689***	-1.165**	-1.157**
	(0.153)			(0.572)	(0.516)	(0.518)
$Process_{fh}$	0.020			0.172**	0.113*	0.113*
	(0.012)			(0.066)	(0.064)	(0.064)
$ln(P^D_{gt})$	0.024			0.466**	0.470**	0.469**
	(0.096)			(0.188)	(0.187)	(0.187)
$ln(Gap_g) \times WTO_t$	0.070*					-0.034
	(0.036)					(0.111)
$ln(ShareEligible_{gt})$	-0.012					
	(0.024)					
$ln(ShareEligible_{gt}) \times Foreign_f$	0.251***					
	(0.017)					
HS6 Industry × Year FE	no	yes	yes	no	no	no
HS8 Industry FE	yes	no	no	yes	yes	yes
Year FE	yes	no	no	yes	yes	yes
Firm FE	yes	yes	yes	yes	yes	yes
Selection Control		no	no	no	yes	yes
# obs.	3,983,952	158,473	23,155	1,332,574	1,315,157	1,315,157
R^2	0.129			0.951	0.951	0.951

Amiti, Dai, Feenstra, and Romalis (2017)

$$\ln \frac{P_{gt}}{P_{g0}} = \underbrace{\ln \left[\prod_{\omega \in \bar{\Omega}_g^i} \left(\frac{p_{gt}^i(\omega)}{p_{g0}^i(\omega)} \right)^{W_{gt}^i w_{gt}^i(\omega)} \right]}_{ChinaP_g} + \underbrace{\ln \left[\prod_{j \in \bar{I}_g \setminus i} \prod_{\omega \in \bar{\Omega}_g^i} \left(\frac{uv_{gt}^i(\omega)}{uv_{g0}^i(\omega)} \right)^{W_{gt}^i w_{gt}^i(\omega)} \right]}_{OtherP_g}$$

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Amiti, Dai, Feenstra, and Romalis (2017)

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Amiti, Dai, Feenstra, and Romalis (2017)

Table 4: Decomposition of WTO Effect on the US Price Index

Independent Variable		US Price Index	$ChinaP_g$	$OtherP_g$	$ChinaV_g$	$OtherV_g$
		(1)	(2)	(3)	(4)	(5)
	Growth 2000-2006	0.031	0.013	0.049	-0.031	0.000
$\hat{ChinaP_g}$	-0.014	3.535***	1.266***	3.210***	-0.055	-0.885***
		(0.815)	(0.124)	(0.686)	(0.194)	(0.337)
growth x regression coefficient		-0.049	-0.018	-0.045	0.001	0.012
contribution		*65.2%*	*23.3%*	*59.2%*	*-1.0%*	*-16.3%*
$\hat{ChinaV_g}$	-0.016	1.607***	-0.086***	-0.003	1.744***	-0.049
		(0.157)	(0.024)	(0.132)	(0.037)	(0.065)
growth x regression coefficient		-0.026	0.001	0.000	-0.029	0.001
contribution		*34.8%*	*-1.9%*	*-0.1%*	*37.8%*	*-1.1%*
Total WTO effect		-0.076	-0.016	-0.045	-0.028	0.013
N		1,599	1,599	1,599	1,599	1,599
R^2		0.096	0.327	0.037	0.649	0.006

The U.S. price index declined by 7.6 percentage points due to WTO

- 65% of the effect is due to lower import prices from China

Amiti, Dai, Feenstra, and Romalis (2017)

Conclusions:

- China's WTO entry reduced the US Price Index by 1 percentage point per year during 2000-2006
  - The **price effect** accounts for 2/3 and the **variety effect** is responsible for the rest of this reduction
  - This is somewhat surprising, given the large growth in new varieties from China
- Most significant effect on the US price index is due to China's lower input tariffs
  - Mostly through **input tariffs** reducing Chinese prices
  - Partly through lower input tariffs increasing **TFP**, resulting in **more imported Chinese varieties** in the U.S.

Feenstra and Sasahara (2017)

Question: What is the employment impact of export opportunities to China on East Asian countries?

Approach: A computational analysis using international input-output tables

- The demand side analysis (Los, Timmer, and de Vries, 2015, *J. of Comparative Economics*)
- The hypothetical extraction exercise (Los, Timmer, and de Vries, 2016, *AER*)

Data: International IO tables from the EORA database

- 40 WIOD countries plus 11 ASEAN & East Asian countries that are not included in WIOD

Result:

Table 5: The Impact of China's Demand on the ASEAN + 3 Countries

	Demand side analysis				Hypothetical extraction	
		Normalized values				Normalized value
	The $ value of the employment effect	% of the emp. effect due to exports	% of the total employment compensation	% of GDP	The $ value of the employment effect	% of the total employment compensation
1990	19 billion US$	7%	1%	0.3%	0	0
2013	234 billion US$	25%	6.5%	1.7%	216 billion US$	5%

Feenstra and Sasahara (2017)

The demand side analysis

- The employment effect of final demand from China is estimated as

$$\underbrace{\mathbf{k}_t^C}_{(N\times S)\times 1} = \underbrace{\hat{\mathbf{p}}_t(\mathbf{I}-\mathbf{A}_t)^{-1}}_{(N\times S)\times(N\times S)} \underbrace{\mathbf{f}_t^C}_{(N\times S)\times 1} \tag{3}$$

where $N = \#$ of countries; $S = \#$ of sectors, $C =$ China

  - $\hat{\mathbf{p}}_t$ the share of labor compensation to output; $\mathbf{I}$ identity matrix; $\mathbf{A}_t$ Leontief matrix; $\mathbf{f}_t^C$ final demand from China

The hypothetical extraction exercise

- The employment effect of final demand from China *per se* is

$$\mathbf{k}_t^{Hypo} = \mathbf{k}_t^{All} - \mathbf{k}_t^{All*} \tag{4}$$

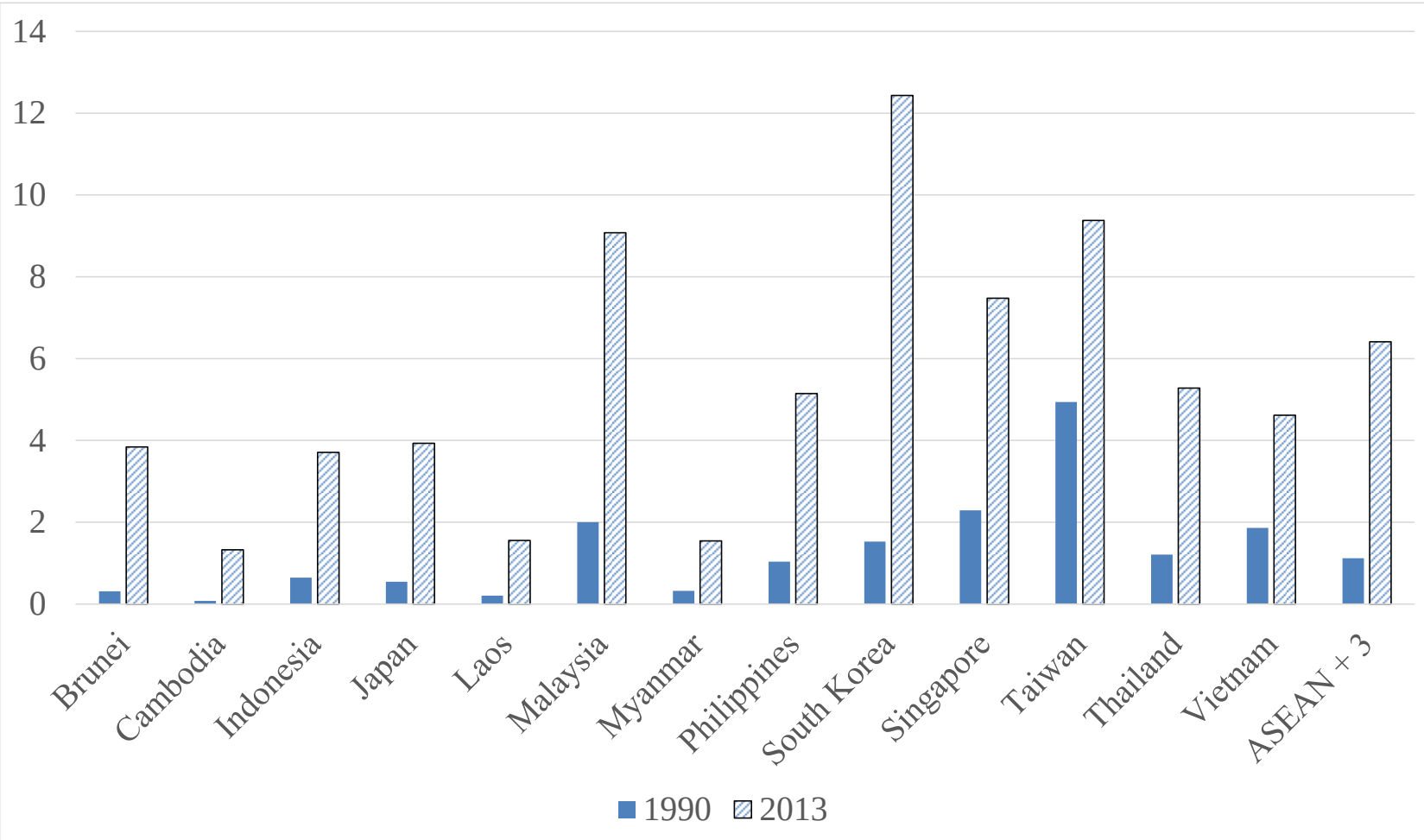
where

$$\mathbf{k}_t^{All} = \hat{\mathbf{p}}_t(\mathbf{I}-\mathbf{A}_t)^{-1}\mathbf{f}_t^{All} \text{ with } \mathbf{f}_t^{All} = \sum_k \mathbf{f}_t^k$$

$$\mathbf{k}_t^{All*} = \hat{\mathbf{p}}_t(\mathbf{I}-\mathbf{A}_t)^{-1}\mathbf{f}_t^{All*} \text{ with } \mathbf{f}_t^{All*} = \sum_{k\neq C} \mathbf{f}_t^k + \mathbf{f}_{1990}^C$$

Feenstra and Sasahara (2017)

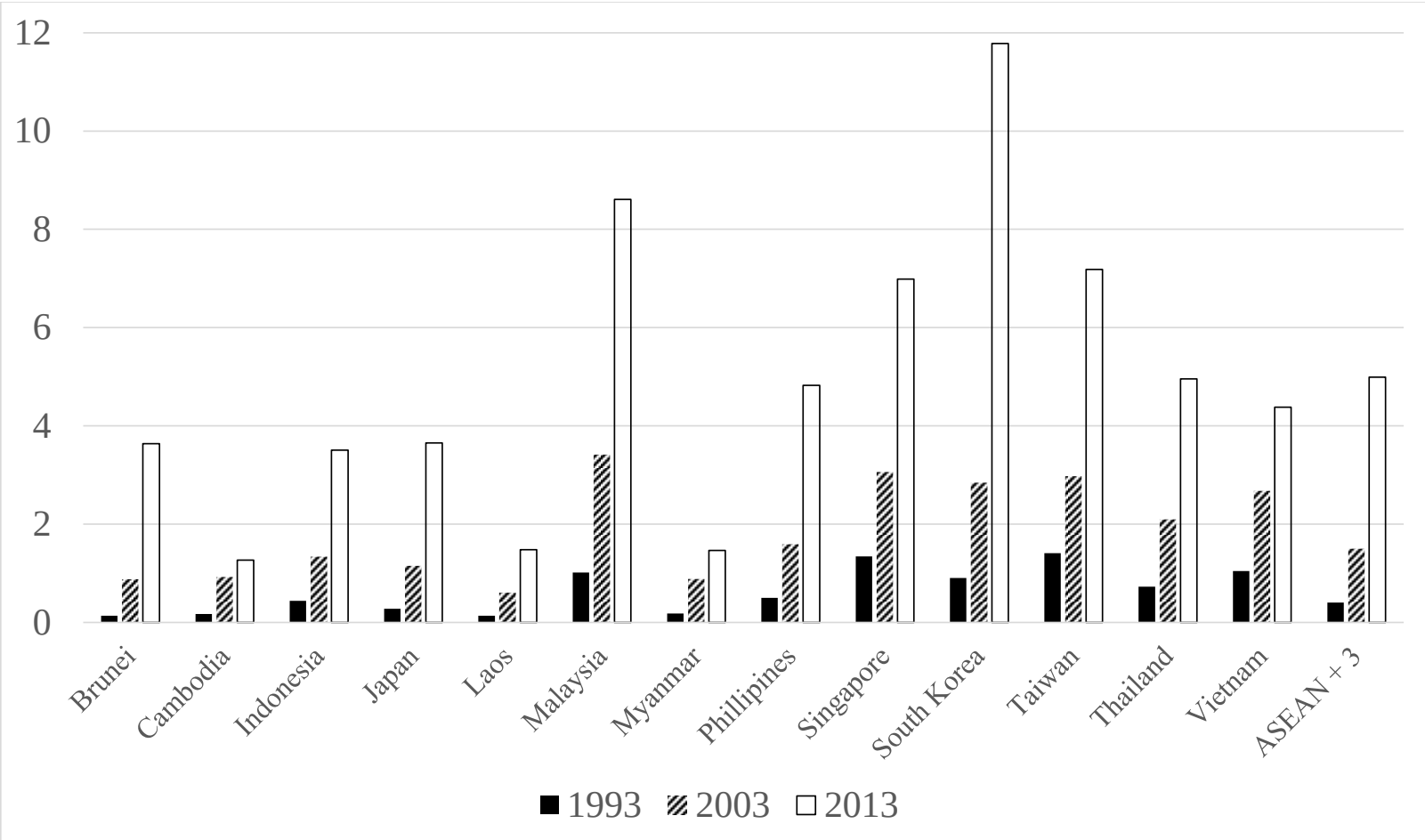
Figure 7: Result from the Demand Side Analysis, $100 \times \mathbf{k}_t^C / \mathbf{k}_t^{All}$



Notes: The figure shows $100 \times \mathbf{1}'\mathbf{k}_t^{i,C} / \mathbf{1}'\mathbf{k}_t^{i,All}$. The unit for the vertical axis is %. 'ASEAN + 3' is the weighted average of the China effect on the 'ASEAN + 3' countries.

Feenstra and Sasahara (2017)

Figure 8: Result from the Hypothetical Extraction, $100 \times (\mathbf{k}_t^{All} - \mathbf{k}_t^{All*})/\mathbf{k}_t^{All}$



Notes: The figure shows the employment effect driven by China's final demand *per se* in percentage of the actual employment effect of China, $100 \times (\mathbf{1}'\mathbf{k}_t^{i,All} - \mathbf{1}'\mathbf{k}_t^{i,All*})/\mathbf{1}'\mathbf{k}_t^{i,All}$, from the hypothetical extraction exercise for each country *i*. The unit for the vertical axis is %. 'ASEAN + 3' is the weighted average of the China effect on the ASEAN + 3 countries.

Feenstra and Sasahara (2017)

Table 6: Determinants of the Employment Effect of China

Dep. Var. = ln(Employment Effect of China from the Demand Side Analysis$_{i,s}$)

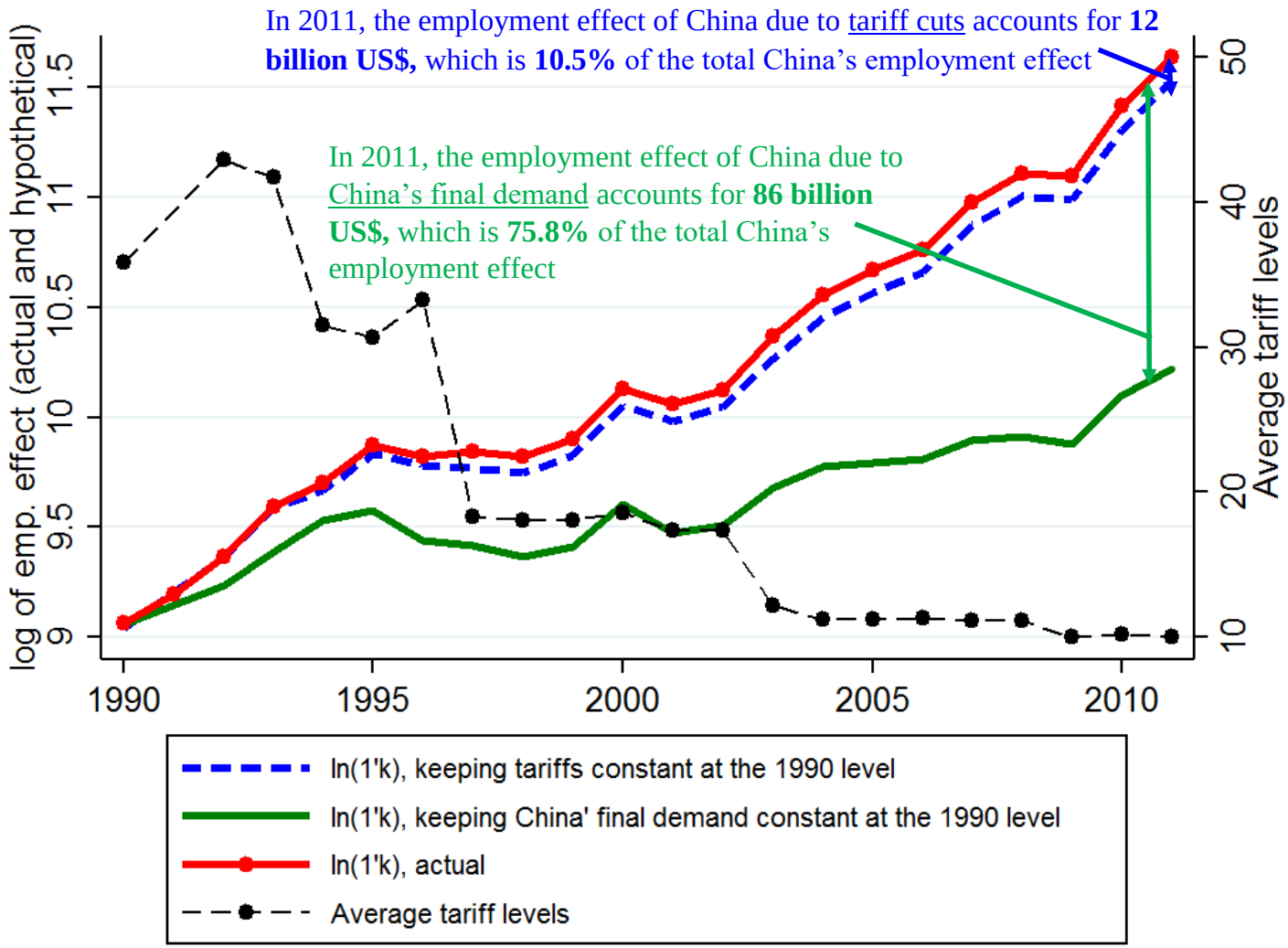
	OLS			PPML		
	(1)	(2)	(3)	(4)	(5)	(6)
ln(tariff imposed by China $_{i,s}$)	-6.319***	-2.328***	-0.485**	-8.766***	-5.285***	-1.152*
	(0.324)	(0.235)	(0.199)	(0.850)	(0.899)	(0.620)
ln(total emp. compensation $_{i,s}$)		1.311***	0.906***		1.574***	1.350***
		(0.041)	(0.084)		(0.094)	(0.181)
ln(China's final demand $_{i,s}$)			0.480***			0.510***
			(0.052)			(0.053)
ln(weighted average of tariffs $_{i,s}$)			0.213			0.372
			(0.239)			(0.308)
ln(GDP$_i$)			-0.108			-0.771***
			(0.116)			(0.238)
ln(nominal exchange rate against Chinese Yuan$_i$)			0.138***			0.012
			(0.033)			(0.058)
Country-sector fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.949	0.986	0.990			
# of observations	2,712	2,712	2,712	2,719	2,719	2,719
# of countries = 12, # of sectors = 11, the sample period = 1990-2011						

Notes: All variables are time-varying but time subscript is omitted. All regressions include a constant term, which is not reported in the table. Robust standard errors, clustered at the country-sector level, are in parentheses. ***, **, and * indicate the statistical significant at 1%, 5%, and 10% level, respectively.

ln(China's final demand$_{i,s}$) $= \ln(\sum_{k \neq i} x_{(k,s),C})$ and where $x_{(k,s),C}$ denotes the final good follows from sector s of country k to China. ln(weighted average of tariffs$_{i,s}$) $= \ln\left[\sum_{k \neq i} x_{(k,s),C} / \sum_{k \neq i} (\tau_{(k,s),C})^{1-\sigma_s} x_{(k,s),C}\right]$ with $\sigma_s = 6$ for all s.

Feenstra and Sasahara (2017)

Table 7: Unpacking China's Employment Effect



Notes: The hypothetical employment effects of China are computed based on the OLS estimates reported in column (3) of the regression result. In this hypothetical exercise, the tariff levels are fixed at the maximum level during 1990-1995 and the China's final demand is fixed at the minimum level during 1990-1995.

Conclusions

This presentation highlights the positive impact of China's integration to the global economy.

- **Feenstra, Ma, and Xu (2017a)**: The negative employment effect due to import competition from China on local labor markets in the U.S. estimated by Autor, Dorn, and Hanson (2013) are overstated
- **Feenstra, Ma, and Xu (2017b)**: Export expansion has a positive employment effect on local labor markets in the U.S.
- **Amiti, Dai, Feenstra, and Romalis (2017)**: China's WTO entry reduced the US Price Index by 1 percentage point per year during 2000-2006
- **Feenstra and Sasahara (2017)**: Export opportunities to China have a positive employment effect in East Asian countries

More Details on $ChinaV_g$

$$ChinaV_g \equiv \ln\left(\frac{\lambda^i_{gt}}{\lambda^i_{g0}}\right)^{\frac{W^i_{gt}}{\rho_g - 1}},$$

where

$$\lambda^i_{gt} \equiv \frac{\sum_{\omega\in\bar{\Omega}^i_{gt}} p^i_{gt}(\omega)q^i_{gt}(\omega)}{\sum_{\omega\in\Omega^i_{gt}} p^i_{gt}(\omega)q^i_{gt}(\omega)} = 1 - \frac{\sum_{\omega\in\Omega^i_{gt}\setminus\bar{\Omega}^i_{gt}} p^i_{gt}(\omega)q^i_{gt}(\omega)}{\sum_{\omega\in\Omega^i_{gt}} p^i_{gt}(\omega)q^i_{gt}(\omega)}.$$

- Ω^i_{gt} is a set of varieties in industry g (that is defined at an HS 6-digit code) of country i in period t.
- $\bar{\Omega}^i_{gt} \equiv \Omega^i_{gt} \cap \Omega^i_{g0}$ is the "common" varieties, available in periods t and 0.
- ρ_g denotes the elas. of sub. across varieties in sector g.
- W^i_{gt} is the Sato-Vartia weights.

Go back