
Pass-through of Exchange Rates and Competition Between Mexico and China

Paul R. Bergin

University of California at Davis and NBER

Robert C. Feenstra

University of California at Davis and NBER

Background

- Observation: Several recent papers found evidence of a fall in the pass-through of exchange rates into U.S. import prices (% change in import prices divided by % change in exchange rate.)
- Examples: Marazzi et al., 2005; Olivei, 2002; Gust et al., 2006.
- Estimates indicate a fall in the pass-through coefficient from 0.5 in 1980s to around 0.2.
- Example: the significant depreciation in value of dollar recently has lead to a much less than proportionate rise in import prices in dollar terms.

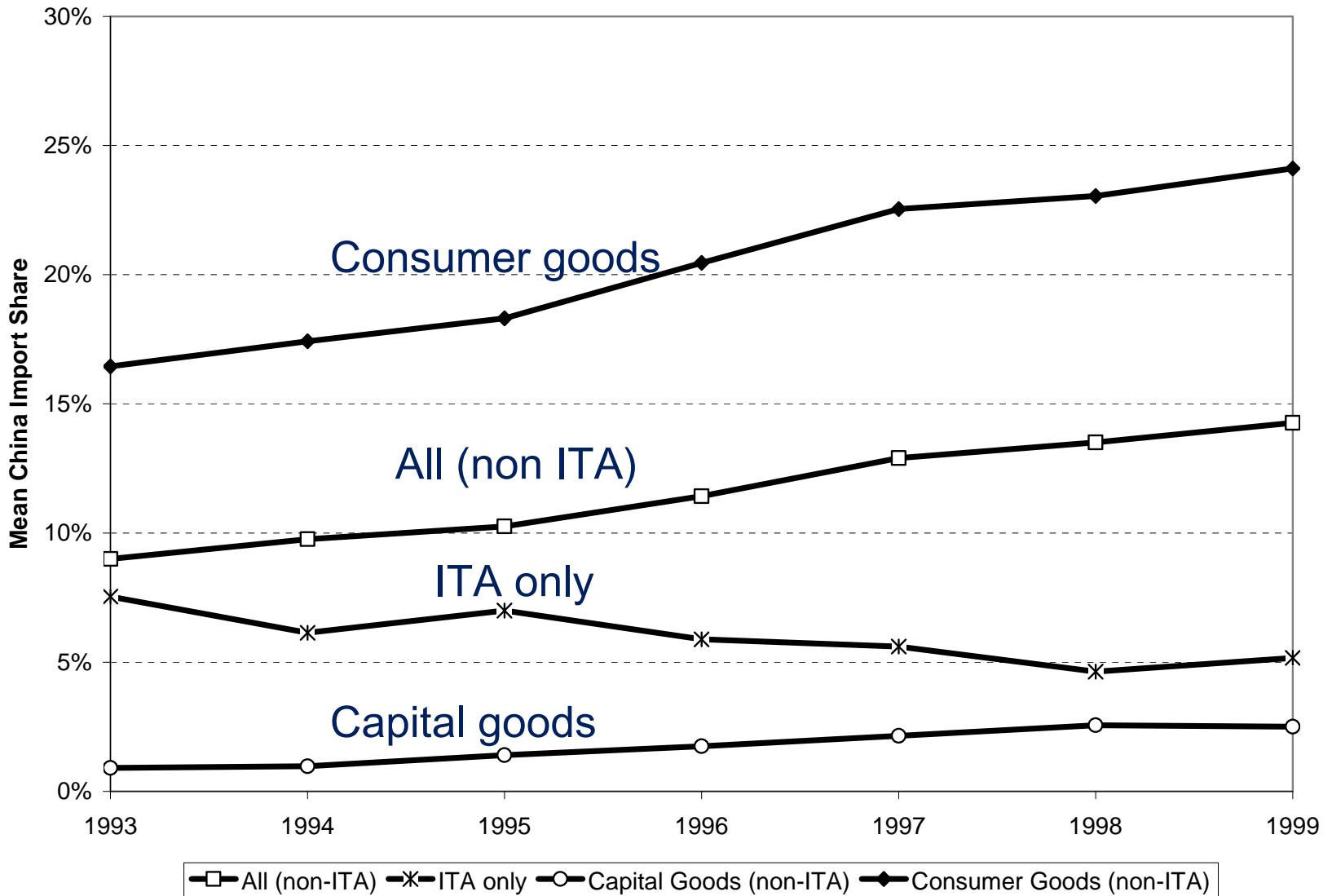
Background, cont.

- Several potential explanations proposed:
 - Lower inflation environment has lowered the incentive to reset prices (Taylor 2000).
 - Import composition has shifted toward manufactured goods, which are less sensitive to exchange rates than energy imports (Campa and Goldberg 2005).
 - Trade integration has increased competition and affected markup behavior (Gust et al 2006)
 - Rise China's share of imports has increased competition in U.S. market (Marazzi et al 2006).

Goal of this paper

- Develop a theoretical model to understand how a rise in the Chinese share of U.S. imports could alter the competitive environment in the U.S. and lower pass-through.
- Provide some supportive empirical evidence from panel data at industry level, that the fall in pass-through is associated with the rise in China share.

Fig 1. China share of U.S. imports



Intuition for a “China explanation”

- Because China has had a stabilized exchange rate, a dollar depreciation does not raise Chinese production costs in dollar terms. So there is no need to raise prices after a dollar depreciation.
- But China’s share in U.S. imports remains too small to explain the large fall in pass-through on its own through purely the direct effect.
- Effect amplified if exporters from other countries are reluctant to raise their prices relative to Chinese competitors; instead they lower markups.
- Note: this explanation does not depend on a low average level of Chinese production costs, but rather on a smaller change in costs. So it applies both to dollar appreciations and depreciations.

Preview of theoretical findings

- Certain conditions are needed to make a “China explanation” work. These include a bias in U.S. preferences toward non-Chinese goods.
- Free entry amplifies this effect, since a dollar depreciation encourages new entry of firms whose costs are protected by a fixed exchange rate (raising the China share endogenously).
- The theoretical model implies a (nearly) log-linear structural equation for pass-through regressions, indicating how to include the China share.

Model Description

- Three-countries: U.S., China, Mexico
- Money introduced by cash in advance constraint.
- China has fixed nominal exchange rate with U.S.; Mexico flexible exchange rate.
- Labor is only factor of production.
- Predetermined nominal wages.
- Free entry of new firms if profits exceed fixed entry cost.
- Variable markups due to translog preferences.
- Balanced trade in goods; no asset trade.

Model: Market structure

- U.S. produces a homogeneous good to consume at home and export to China and Mexico.
- China and Mexico produce a homogeneous good for domestic consumption, and also a differentiated good for export just to the U.S.
- Preferences imply constant expenditures shares over domestic good and imported goods.

Model: translog preferences

- The allocation of U.S. import expenditure over imported varieties follows a translog functional form.
- This implies the elasticity of demand rises with the number of competing firms, and so markups fall.
- Note: extending translog preferences to this context required us to solve for the reservation prices of varieties not available in the market. But this turns out to take a very convenient form.
- The translog specification includes a parameter that allows for taste bias between Mexican and Chinese varieties.

Analytical solution (fixed number of firms)

- Solve for optimal price for Chinese and Mexican firms (p_y, p_x) , which depends on the number of firms from each country (N_y, N_x) .
- Aggregate into import price index (p_m) , using trade share weights $(s_y N_y$ and $s_x N_x$, where s is share per firm.)
- Compute multilateral nominal exchange rate (E_m) , using same trade share weights.
- Analytically solve for pass-through elasticity $(d\log(p_m)/d\log(E_m))$.

Analytical solution, cont.

- Finding #1:
 - Multilateral pass-through is less than unity,
 - and it falls with a rise in the number of Chinese firms (N_y),
 - provided the per-firm share of Mexico exceeds that of China ($s_x > s_y$).

$$\frac{d \ln P_m}{d \ln E_m} = 1 - \frac{N_y}{(2(N_y + N_x) - 1)} \left(\frac{s_x - s_y}{s_x} \right) < 1 \quad \text{iff} \quad s_x > s_y$$

- One way to guarantee this last condition is to specify a bias in consumer preferences toward Mexican goods, due to proximity or NAFTA.

Logic of finding

- Suppose a dollar depreciation...
- Mexican prices: Under translog preferences, Mexican firms will limit their pass-through depending on the number of Chinese competitors.

$$\frac{d \ln(e_x p_x)}{d \ln e_x} = 1 - \frac{N_y}{(2(N_y + N_x) - 1)} > 0$$

- Chinese prices: But on the other hand, Chinese firms will raise their prices to some degree in response to the number of Mexican competitors.

$$\frac{d \ln(\bar{e}_y p_y)}{d \ln e_x} = \frac{N_x}{(2N - 1)} > 0$$

(note: China raises its prices even though there is zero change in its bilateral exchange rate.)

Logic of finding, cont.

- To lower multilateral pass-through, we want:
 - A high number of Chinese firms (N_y), to induce low Mexican pass through.
 - But this also raises the overall trade share for China ($s_y N_y$), implying a smaller change in the multilateral exchange rate, which raises the multilateral pass-through ratio.
 - This implies we want a low per-firm (per-good) share in China ($s_y < s_x$).

Solution under free entry

- Conjecture: if we allow free entry of firms, this should strengthen the “China effect.”
- Logic:
 - A dollar depreciation forces Mexican firms to lower their markup, and allows Chinese firms to raise their markup.
 - This should raise the relative profits of Chinese firms and encourage entry; the opposite for Mexican firms.
 - A rise in the number of Chinese firms was seen above to further reduce Mexican pass-through.
- We need to solve this case by simulation.

Table 2: Simulate 1% dollar depreciation

	Pass-through no entry	Pass-through free entry	N_x	$\% \Delta N_x$	N_y	$\% \Delta N_y$
Benchmark	0.649	0.258	4.07	-4.1%	13.09	27.9%
Robustness checks:						
$\gamma = 0.5$	0.632	0.335	5.27	-3.5%	22.79	20.9%
$\gamma = 5$	0.700	-0.149	2.19	-6.4%	3.39	55.9%
Zero China share:	1.000	1.000	5.00	0%	0	-

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Simulation results

- In the benchmark case, free entry reduces pass through significantly, from 65% to 26%.
- Depending on the calibration of preference parameters, pass-through can easily fall to become negative.
- If the China share is set to zero, pass-through is complete (100%) in the simulated model.

Empirical Investigation

Theory under fixed entry implies regression equation:

$$\ln P_m = \frac{1}{(N-1)} + [1 - B(s_y N_y)] \ln \tilde{E}_m + B(s_y N_y) \ln(\bar{e}_y w_y) + \left(\frac{\alpha_x - \alpha_y}{\gamma} \right) B(s_y N_y) (1 - s_y N_y).$$

where

$$\ln \tilde{E}_m \equiv [(s_x N_x) \ln(e_x w_x) + (s_y N_y) \ln(\bar{e}_y w_y)]$$

Includes:

- Multilateral exchange rate adjusted for wages (\tilde{E}_m)
- Exchange rate interacted with China share
- China share scaled by wage (constant or trend)
- China share * (1 - China share)
- We also will include U.S. export price as proxy for domestic competitors' prices (not in model).

Data

- Use a dataset constructed by Feenstra *et al* (2007).
- Detailed monthly price data gathered by the International Price Program (IPP) at the BLS.
- Data run from September 1993 to December 1999.
- Constructed Törnqvist price indices for 5-digit Enduse industry using annual trade weights.
- Remove Information Technology Agreement (ITA) classifications requiring special treatment for tariffs.
- Construct analogous Törnqvist index for exch. rate.
- China share data annual from Feenstra *et al* (1989).

Regressions

- Panel analysis across the 42 Enduse categories and 76 months.
- Begin with Fixed effects OLS (FE-OLS).
- Conducted first differences (not reported).
- Conduct panel cointegration analysis based on pooled mean group estimator (PMG).
- PMG estimates long-run pass-through as the cointegrating vector pooled across industries, allowing for heterogeneous short-run dynamics.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Table 2A. Consumer goods, capital goods, autos and chemicals (Enduse 1-4)							
	FE-OLS				PMG		
Exchange rate	0.400** (0.02)	0.416** (0.02)	0.448** (0.02)	0.480** (0.02)	0.400** (0.01)	0.430** (0.01)	0.427** (0.02)
Export price	0.337** (0.02)	0.328** (0.02)	0.330** (0.02)	0.324** (0.02)	0.195** (0.03)	0.206** (0.03)	0.212** (0.03)
Share*exch rate		0.025** (0.01)	-0.401** (0.12)	-0.945** (0.16)		-0.598** (0.13)	-0.618** (0.15)
China share			1.87** (0.55)	4.01** (0.68)			
Import tariff				-0.187 (0.12)			-0.159 (0.11)
Share*time				-0.017 (0.016)			
Share*(1-share)				0.712** (0.17)			
Observations	2,905	2,905	2,905	2,905	2,634	2,634	2,634
R² or ϕ	0.641	0.642	0.644	0.647	$\phi=-0.17^{**}$	$\phi=-.18^{**}$	$\phi=-0.18^{**}$

Empirical results

- The pass-through coefficient (exclusive of China effect) is between 0.4 and 0.5 for all cases
- The China estimate effect becomes negative once the theoretically prescribed controls are added.
- China effect estimate of 0.95 in column 4 implies: The increase in the Chinese share from 9% to 14% from 1993-99 lowers pass-through by $0.95 * 0.05 = 0.047$, or roughly 10%.
- Cointegration results strongly support significance of the China effect (Note: controls dropped by Stata in first differences since observations are annual.)
- Estimate of China effect larger for consumer goods.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Table 2B. Consumer goods only (Enduse 4)							
	FE-OLS				PMG		
Exchange rate	0.331** (0.03)	0.363** (0.03)	0.476** (0.04)	0.536** (0.02)	0.350** (0.02)	0.465** (0.04)	0.466** (0.04)
Export price	0.088** (0.03)	0.078* (0.03)	0.073* (0.03)	0.086** (0.03)	0.136** (0.04)	0.172** (0.04)	0.172** (0.04)
Share*exch rate		0.024* (0.01)	-0.58** (0.17)	-1.16** (0.20)		-0.73** (0.17)	-0.730** (0.17)
China share			2.68** (0.73)	4.81** (0.86)			
Import tariff				-0.54** (0.17)			0.002 (0.12)
Share*time				0.006 (0.017)			
Share*(1-share)				0.958** (0.20)			
Observations	1,371	1,371	1,371	1,371	1,242 $\phi =$	1,242 $\phi =$	1,242
R² or ϕ	0.628	0.632	0.635	0.645	-0.20**	-0.21**	$\phi = -0.21$ **

Conclusions

- The rising China share in U.S. imports can explain a part of the fall in exchange rate pass through.
- This can be understood theoretically in a model with variable markups.
- Exports from a country with fixed exchange rates affect the competitive market and pricing behavior of other exporters.
- It requires certain conditions to hold: a large number of firms from that country, but not necessarily a large share in overall trade.
- This effect is amplified by allowing free entry to respond endogenously to exchange rates.