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

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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

Mean China Import Share

- Consumer goods
- All (non ITA)
- ITA only
- Capital goods

Line types:
- All (non-ITA)
- ITA only
- Capital Goods (non-ITA)
- Consumer Goods (non-ITA)
**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 deprecation 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 \((s_yN_y, s_xN_x)\), 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 ($s_x > s_y$).

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

- 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.

\[
\frac{d \ln(e_y p_y)}{d \ln e_x} = \frac{N_x}{(2N - 1)} > 0
\]

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

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<tr>
<th></th>
<th>Pass-through no entry</th>
<th>Pass-through free entry</th>
<th>$N_x$</th>
<th>$%\Delta N_x$</th>
<th>$N_y$</th>
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<td>0.649</td>
<td>0.258</td>
<td>4.07</td>
<td>-4.1%</td>
<td>13.09</td>
<td>27.9%</td>
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<tr>
<td>$\gamma = 0.5$</td>
<td>0.632</td>
<td>0.335</td>
<td>5.27</td>
<td>-3.5%</td>
<td>22.79</td>
<td>20.9%</td>
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<tr>
<td>$\gamma = 5$</td>
<td>0.700</td>
<td>-0.149</td>
<td>2.19</td>
<td>-6.4%</td>
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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:

\[ \ln P_m = \frac{1}{N-1} + [1 - B(s_yN_y)] \ln \tilde{E}_m + B(s_yN_y) \ln(\bar{e}_yw_y) \]

\[ + \left( \frac{\alpha_x - \alpha_y}{\gamma} \right) B(s_yN_y)(1 - s_yN_y). \]

where \( \ln \tilde{E}_m \equiv [(s_xN_x) \ln(e_xw_x) + (s_yN_y) \ln(\bar{e}_yw_y)] \)

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.
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.
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<th>FE-OLS</th>
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<td>0.416**</td>
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<td>0.430**</td>
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<td>0.328**</td>
<td>0.330**</td>
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<td><em><em>Share</em>(1-share)</em>*</td>
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<td><strong>R² or φ</strong></td>
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<td>φ=-0.17**</td>
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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 $0.95 \times 0.05 = 0.047$, 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.
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<td>Export price</td>
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<td>Share*exch rate</td>
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<td>China share</td>
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<td>4.81**</td>
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<tr>
<td>$R^2$ or $\phi$</td>
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<td>0.632</td>
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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.