Entry Dynamics and the Decline in Exchange-Rate Pass-Through

Chris Gust (FRB)
Sylvain Leduc (FRBSF)
and Rob Vigfusson (FRB)

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Motivation

• Evidence that U.S. PT has declined since early 1990s
  - From 50% in the 1980s to 10-20% today
  - Clearer for finished goods’ imports

• GLV (2010) emphasize trade integration and pricing complementarities
  - Low cost producers set relatively high an variable markups
  - Decline in trade costs lowers PT

• What about the extensive margin?
  - Entry/exit of firms over time
  - Lower and less variable markups, upward pressure on PT
What we do

• Study the effect of exporter entry/exit decisions on PT in the presence of trade integration

• Key features:
  - variable demand elasticity: firm’s pricing decision depends on prices of competitors:
    - Good specific fixed costs of exporting

• As in GLV (2010), relate the decline in PT to:
  - lower tariff and transport costs
  - foreign exporters’ relative increase in productivity
Findings

• Factors leading to greater trade integration account for a significant part of the decline in PT

• Entry is essential for trade:
  - Model assigns 75% of the rise in US import share since the early 1980s to new goods

• But effect of firm entry/exit on PT is small
  - variations in exporters’ markups along the intensive margin largely dominate the effect of entry
Data

- **We focus on a price index for imported finished goods:**
  - An aggregation over end use categories of automotive products, consumer goods, and capital goods
  - Excludes services, computers, commodities

- **Index of the price of imported finished goods relative to domestic consumer goods (durables and nondurables)**

- **Real exchange rate:**
  - A 39 country trade weighted exchange rate with weights based on all non-oil imports
Share of finished goods in total imports
A naïve estimate of PT
Other estimates of PT

\[ \log P_m = \log(\mu^*) + \log(\varepsilon) + \log(mc^*) \]
Fall in ERPT using disaggregated data

- We look at 40 finished goods industries pre- and post-1990
## Summary statistics

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<thead>
<tr>
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<tbody>
<tr>
<td>a. $\beta_{pm,t}$</td>
<td>0.35</td>
<td><strong>0.55</strong></td>
<td><strong>0.13</strong></td>
</tr>
<tr>
<td>(a = b*c)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. $\sigma_{p_{-t}}/\sigma_q$</td>
<td>0.47</td>
<td>0.60</td>
<td>0.25</td>
</tr>
<tr>
<td>c. $\text{corr}(q, p_{m})$</td>
<td>0.75</td>
<td>0.92</td>
<td>0.51</td>
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<table>
<thead>
<tr>
<th>Moment (HP-Filtered)</th>
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<tbody>
<tr>
<td>a. $\beta_{pm,q}$</td>
<td>0.46</td>
<td>0.59</td>
<td>0.17</td>
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<tr>
<td>(a = b*c)</td>
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<tr>
<td>b. $\sigma_{p_{-t}}/\sigma_q$</td>
<td>0.54</td>
<td>0.61</td>
<td>0.29</td>
</tr>
<tr>
<td>c. $\text{corr}(q, p_{m})$</td>
<td>0.85</td>
<td>0.95</td>
<td>0.60</td>
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$$\beta_{pm,q} = \frac{\text{cov}(\Delta p_{mt}, \Delta q_t)}{\text{var}(\Delta q_t)} = \text{corr}(\Delta p_{mt}, \Delta q_t) \frac{\text{std}(\Delta p_{mt})}{\text{std}(\Delta q_t)}$$
DGE model

- DGE model with 2 countries producing differentiated traded goods

- HH demand variety of domestic and foreign goods. Demand aggregator has non-constant elasticity of substitution (NCES)

- Firms are monopolistic competitors

- Production is linear in labor: \( Y=Z*L \)

- Trade costs allow firms to price-to-market

- Endogenous export decision

- Complete domestic and int’l financial markets
Household demand aggregator

- HH minimize total expenditures:

$$\min \left( \int_0^1 p_d(i)c_d(i)di + \int_0^{\omega^*} p_m(i)c_m(i)di \right)$$

$$s.t. \quad D(c_d(i), c_m(i)) = 1$$

- $C_{mt}(i)$ indexed over $i \in [0, \omega_t^*]$, where $\omega_t^*$ endogenously determined fraction of foreign goods

- $D(.,.)$ allows for NCES across goods
Household demand

- **Demand curve for import good i:**

  \[
  c_{mt} (i) = \frac{1}{1 + \omega_t^*} \left[ \frac{1}{1 + \eta} \left( \frac{p_{mt} (i)}{p_{mt}} \right)^{\frac{1}{\gamma-1}} \left( \frac{p_{mt}}{\Gamma_t} \right)^{\frac{\rho}{\rho-\gamma}} + \frac{\eta}{1 + \eta} \right] C_t
  \]

- **Γ is a price index for all of a firm’s competitors:**

  \[
  \Gamma = \left[ \left( \frac{1}{1 + \omega_t^*} \right) p_d^{\frac{\gamma}{\gamma-\rho}} + \left( \frac{\omega_t^*}{1 + \omega_t^*} \right) p_{mt}^{\frac{\gamma}{\gamma-\rho}} \right]^{\frac{\gamma-\rho}{\gamma}}
  \]
Firm’s pricing decision in domestic market

- Firms set prices at home and abroad. Problem for setting domestic price:

\[
\max(p_{dt}(i) - \frac{w_t}{Z_t})c_{dt}(i) \quad \quad p_{dt}(i) = \mu_{dt}(i) \frac{w_t}{Z_t}
\]

- In a symmetric equilibrium, the markup is given by:

\[
\mu_{dt} = \left[1 - \frac{1}{\varepsilon_{dt}}\right]^{-1} = \gamma + \eta(\gamma - 1)\left(\frac{p_{dt}}{\Gamma_t}\right)^{\frac{\rho}{\rho-\gamma}}^{-1}
\]

- If \(\eta<0\):

\[
\downarrow \left(\frac{p_{dt}}{\Gamma_t}\right) \quad \Rightarrow \quad \uparrow \mu_{dt}
\]
Export entry/exit decision of a domestic firm

- Each period, a firm faces a fixed cost of exporting, which varies with a good’s type and is paid in units of labor:

\[ f_x(i) = \frac{f}{1 - \alpha_x i}, \quad \alpha_x \geq 0 \]

- The entry decision is made before the realization of the shocks. Firms will decide to export if:

\[ E_{t-1} \left[ \lambda_{t-1,t} \left( \pi_{xt}(i) - f_x(i)w_t \right) \right] > 0 \]

- Where profits in the foreign market are:

\[ \pi_{xt}(i) = \left( q_t p_{mt}^*(i) - \frac{D_t w_t}{Z_t} \right) c_{mt}^*(i) \]
Experiment

- Linearize system of equations around 2 steady states

- First SS has high trade costs and relatively low foreign productivity

- Second SS has low trade costs and relatively high foreign productivity

- $D = D^* = 1.1$ and set the decline in $D$s to 5 ppt
  - Decline based on US transport costs and tariff data
  - Conservative estimate

- Set the level of foreign productivity 35% higher than at home in the second SS
Other calibrated numbers

• Set $\eta$, $\sigma_z$, and $\sigma_d$ so that, for 1980-89, we match:
  - $\sigma_y$, $\sigma_{pm}/\sigma_{RER}$ and $\rho(P_m,RER)$
  \[ \Rightarrow \beta_{p_m,q} \text{ is pinned down on pre-1990 data} \]
  \[ \Rightarrow \eta = -3.05 \]

• Set $f$ so that the import share is initially 10%

• Set $\alpha_x$ so that the import share rises 4 ppt in the second SS
Some properties of the model

1. Demand Curve

2. Demand Elasticity

3. Profits

4. Markup
A direct measure of ERPT

- **Foreign exporter’s pricing equations:**
  \[ p_{mt} = \mu_{mt} D_t^* \frac{W_t^*}{Z_t^*} q_t \]

- **Linearized:**
  \[ \hat{p}_{mt} = k_m \left( \hat{D}_t^* + \hat{w}_t^* - \hat{Z}_t^* + \hat{q}_t \right) + (1 - k_m) \hat{\Gamma}_t \]

- **The direct measure of pass-through:**
  \[ k_m \equiv \frac{\partial \ln(p_m)}{\partial \ln(q)} = \frac{1}{1 - \eta \mu_m \left( \frac{\rho(\gamma - 1)}{\gamma - \rho} \right) \left( \frac{\Gamma}{p_m} \right)^{\frac{\gamma - \rho}{\rho}}} \]
  \[ \text{With } \eta < 0: \quad k_m < 1 \]
Trade integration and ERPT

\[ MR_m(j) = P_m(j) \left[ 1 - \frac{1}{\varepsilon_m(j)} \right] \]
Fall in trade costs and increase in foreign productivity

<table>
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<tr>
<th>Parameter</th>
<th>Value</th>
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<tbody>
<tr>
<td>Trade Costs (D, D*)</td>
<td>-5 ppt</td>
</tr>
<tr>
<td>Foreign Productivity (Z*)</td>
<td>35 %</td>
</tr>
<tr>
<td>Foreign Exporter’s Marginal Cost (qD<em>mc</em>)</td>
<td>-23.8 %</td>
</tr>
<tr>
<td>Home Import Price (p_m)</td>
<td>-9.9 %</td>
</tr>
<tr>
<td>Foreign Exporter’s Markup (μ_m)</td>
<td>13.9 %</td>
</tr>
<tr>
<td>Direct Pass-Through (κ_m)</td>
<td>-11.6 ppt</td>
</tr>
<tr>
<td>Pass-through (β_{pm,q})</td>
<td>-14.7 ppt</td>
</tr>
<tr>
<td>Home Firm’s Markup at Home (μ_d)</td>
<td>-1.7 %</td>
</tr>
</tbody>
</table>
$B_{pm,q}$ is related to this direct measure of PT by:

$$
\beta_{pmq} \equiv km + k_m \left( \frac{\text{cov}(\Delta(D^* + \hat{w}^* - \hat{Z}^*, \Delta\hat{q}_t))}{\text{var}(\Delta\hat{q}_t)} \right) + (1 - km) \frac{\text{cov}(\Delta\hat{\Gamma}_t, \Delta\hat{q}_t)}{\text{var}(\Delta\hat{q}_t)}
$$
Entry and ERPT (1)
Entry and ERPT (2)
Conclusion

• Economic forces that lower foreign exporters’ marginal costs in US dollars lead to:
  - Higher and more variable exporters’ markups
  - Lower ERPT

• Entry is important to account for rise in trade

• But effect of entry on PT is limited in our model

• Overall, less puzzling to see declining PT along with greater trade openness
Entry and PT (3)