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

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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**

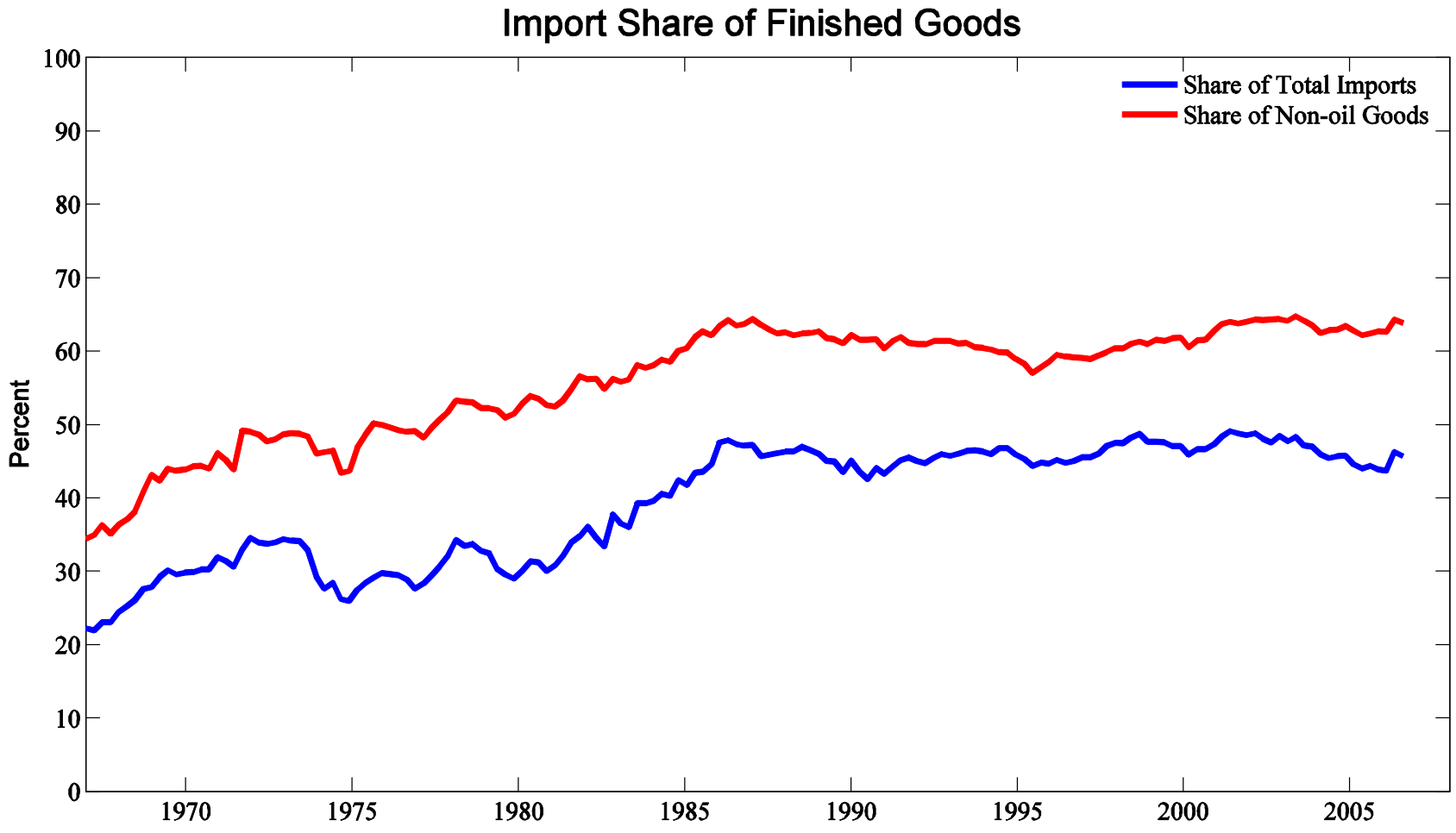
Data

- **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

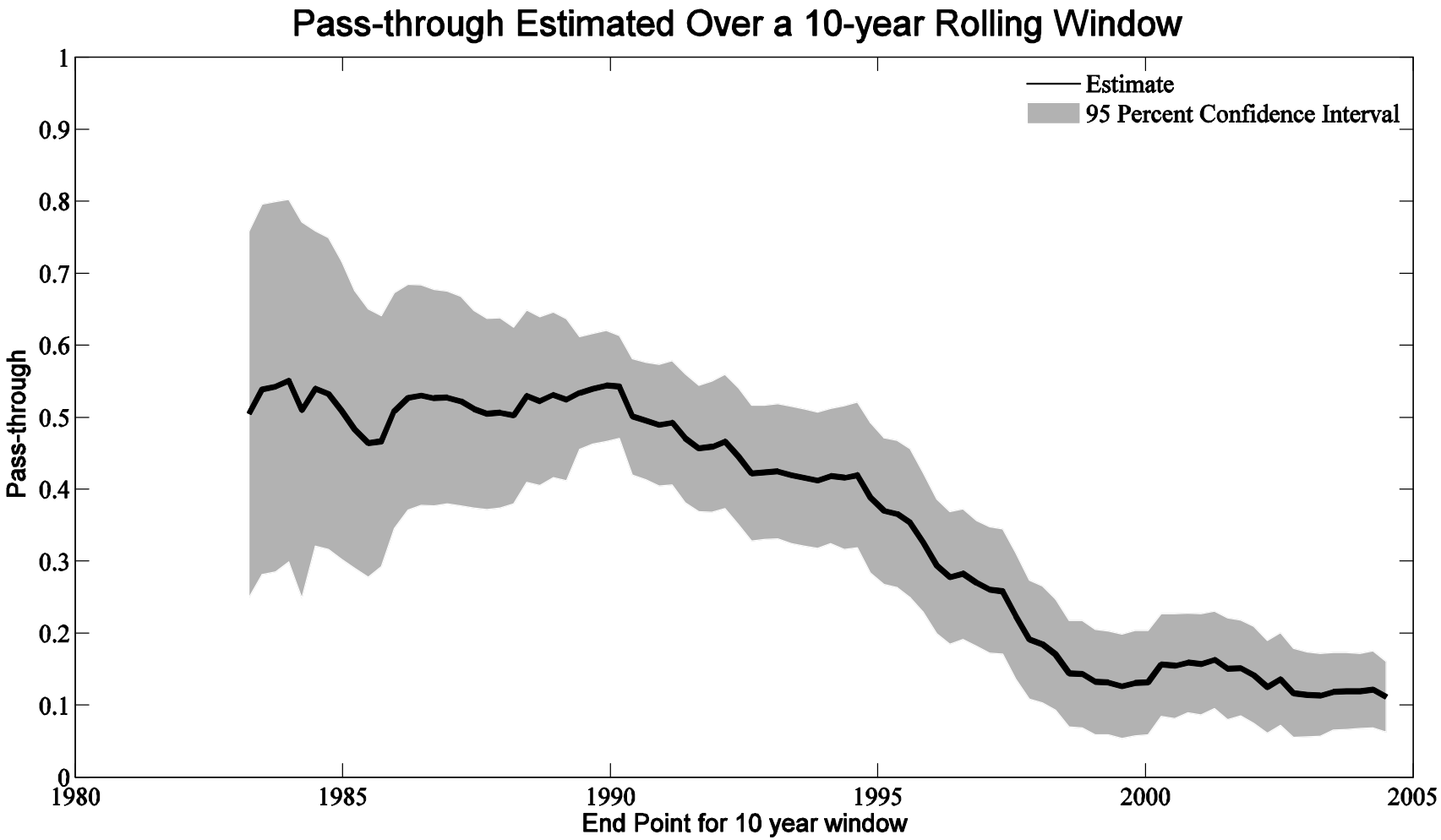
- **Index of the price of imported finished goods relative to domestic consumer goods (durables and nondurables)**

- **Real exchange rate:**
  - a 39 country trade weighted exchange rate with weights based on all non-oil imports

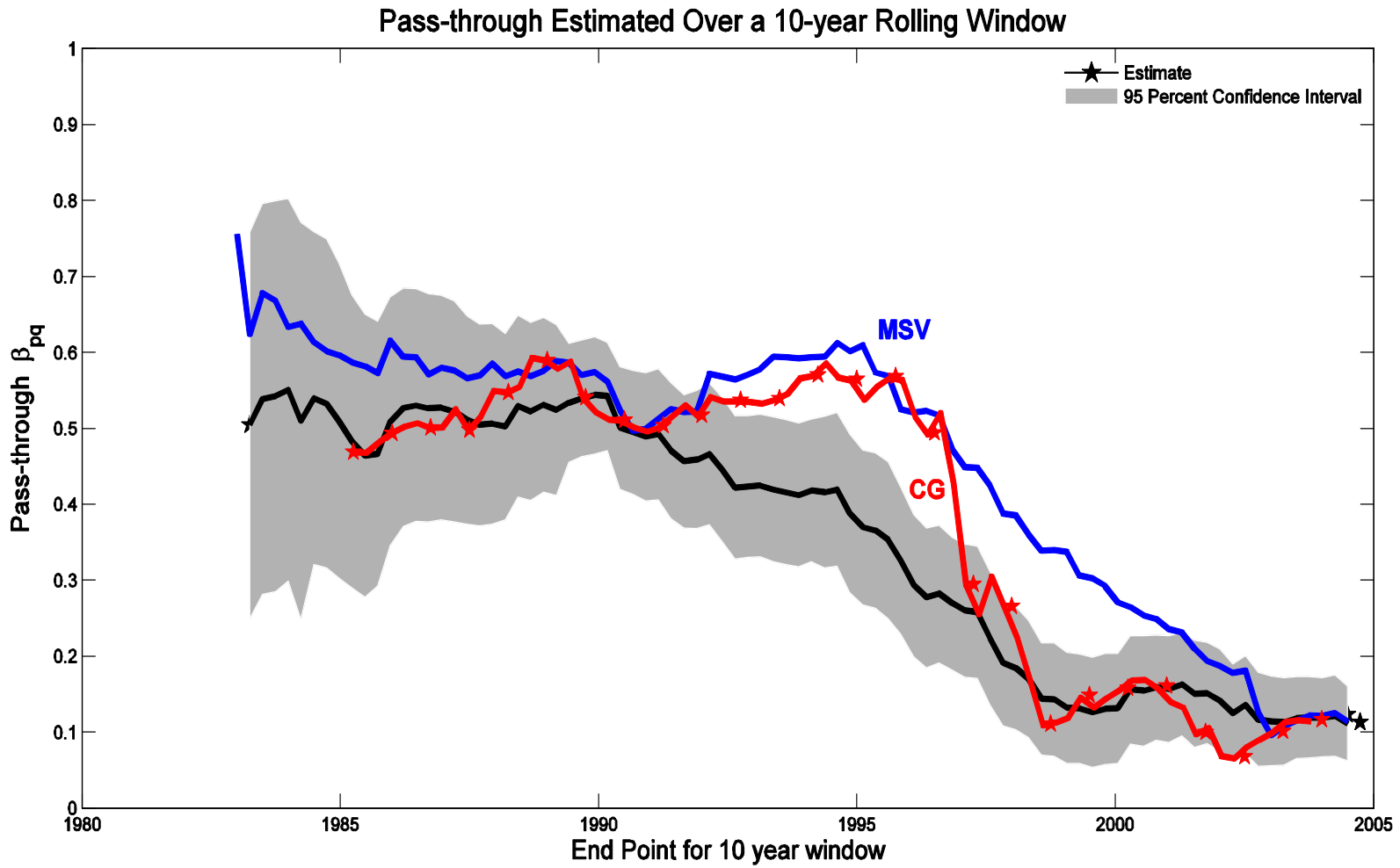
Share of finished goods in total imports



A naïve estimate of PT



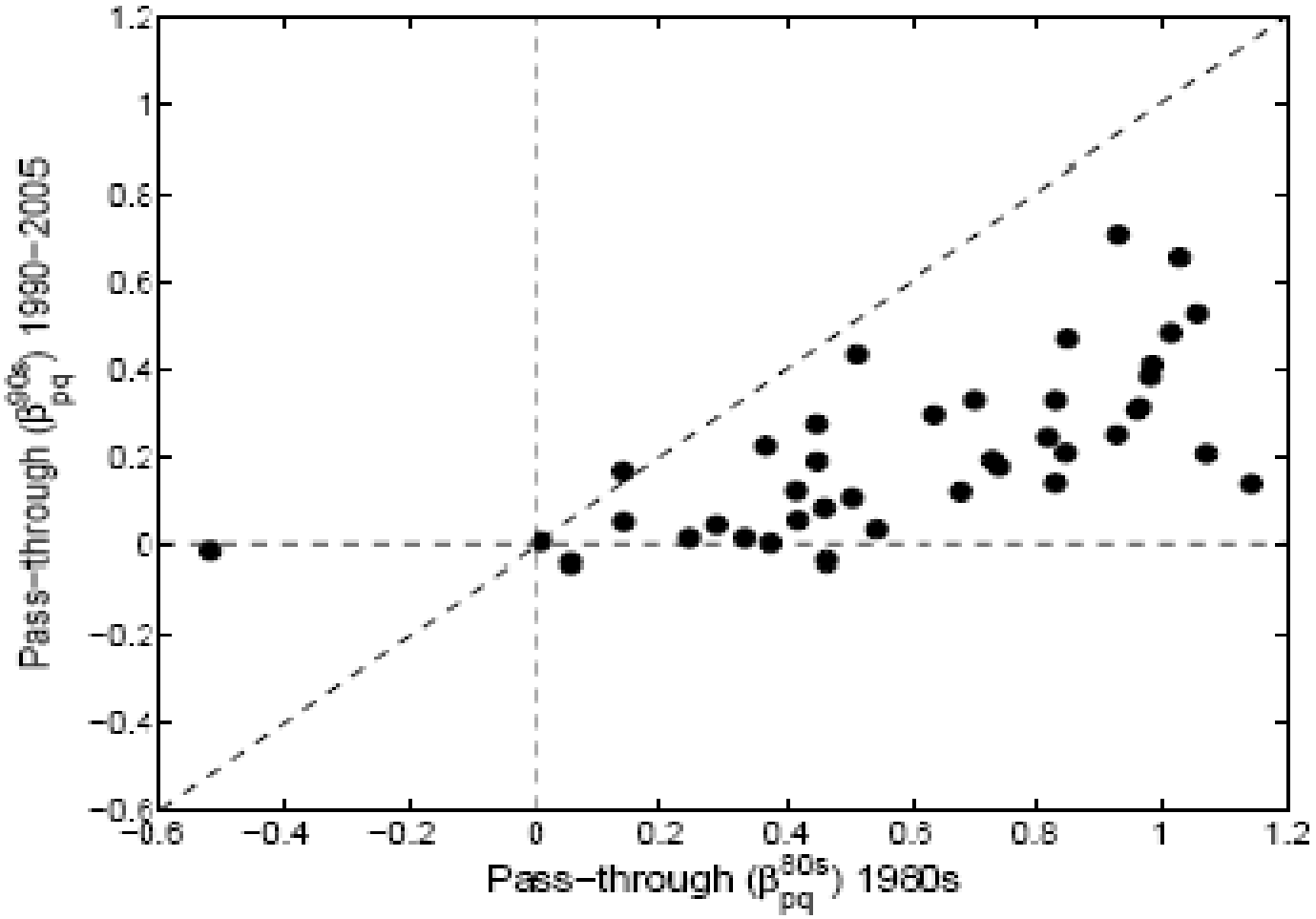
Other estimates of PT



$$\log P_m = \log(\mu^*) + \log(\varepsilon) + \log(mc^*)$$

Fall in ERPT using disaggregated data

- **We look at 40 finished goods industries pre- and post-1990**



Summary statistics

Moment (Differenced)	Full Sample	1980:1-1989:4	1990:1-2004:4
a. $\beta_{p_m,q}$ (a = b*c)	0.35	0.55	0.13
b. σ_{p_m}/σ_q	0.47	0.60	0.25
c. $\text{corr}(q, p_m)$	0.75	0.92	0.51
Moment (HP-Filtered)			
a. $\beta_{p_m,q}$ (a = b*c)	0.46	0.59	0.17
b. σ_{p_m}/σ_q	0.54	0.61	0.29
c. $\text{corr}(q, p_m)$	0.85	0.95	0.60

$$\beta_{p_m,q} = \frac{\text{cov}(\Delta p_{mt}, \Delta q_t)}{\text{var}(\Delta q_t)} = corr(\Delta p_{mt}, \Delta q_t)\frac{std(\Delta p_{mt})}{std(\Delta q_t)}$$

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 ω_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:**

$$\max(p_{dt}(i) - \frac{w_t}{Z_t})c_{dt}(i) \qquad p_{dt}(i) = \mu_{dt}(i)\frac{w_t}{Z_t}$$

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

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

- **If η<0:** $\downarrow \left(\frac{p_{dt}}{\Gamma_t}\right) \Rightarrow \uparrow \mu_{dt}$

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 Ds 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

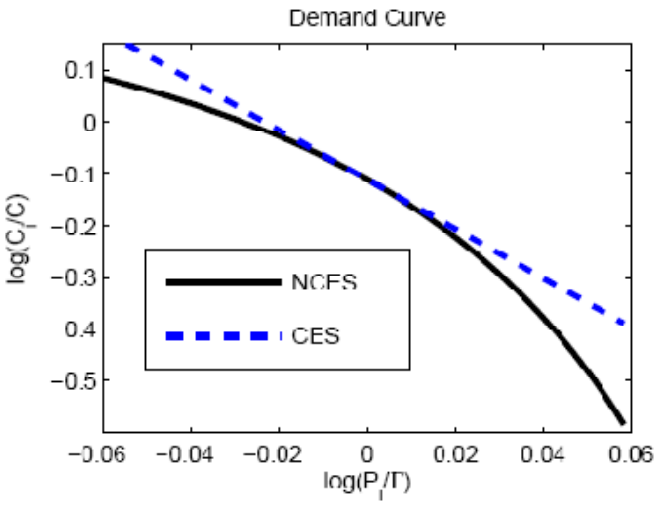
- **Set η , σ_z, and σ_d so that, for 1980-89, we match:**
  - **σ_y, σ_{pm}/ σ_{RER} and ρ(P_m ,RER)**

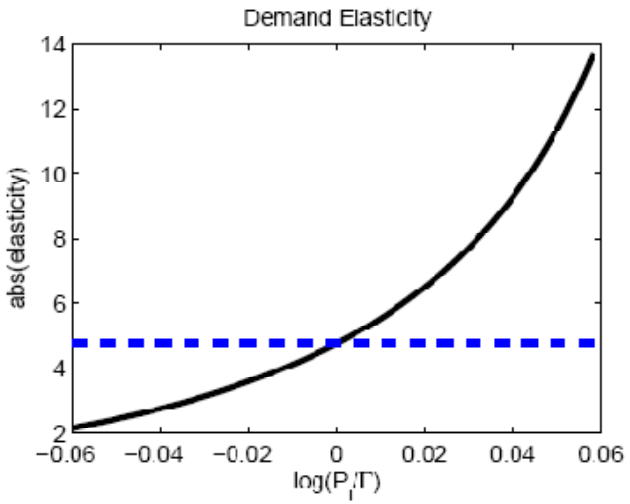
    $\Rightarrow \beta_{p_m,q}$ **is pinned down on pre-1990 data**

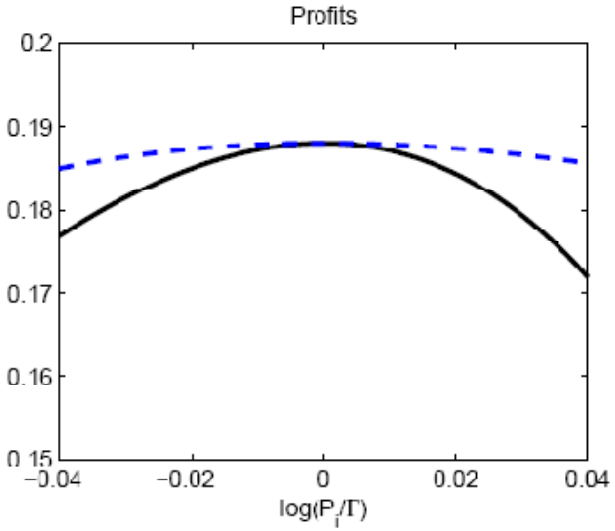
    $\Rightarrow \eta = -3.05$

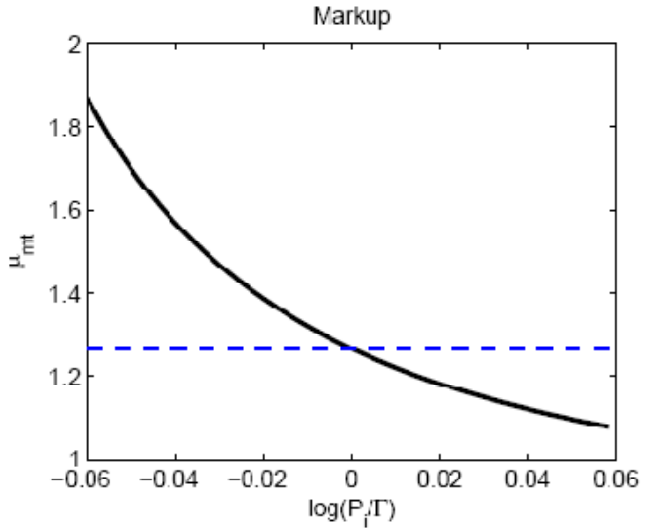
- **Set *f* so that the import share is initially 10%**
- **Set α_x so that the import share rises 4 ppt in the second SS**

Some properties of the model









A direct measure of ERPT

- **Foreign exporter's pricing equations:** $p_{mt} = \mu_{mt} D_t^* \frac{w_t^*}{Z_t^*} q_t$

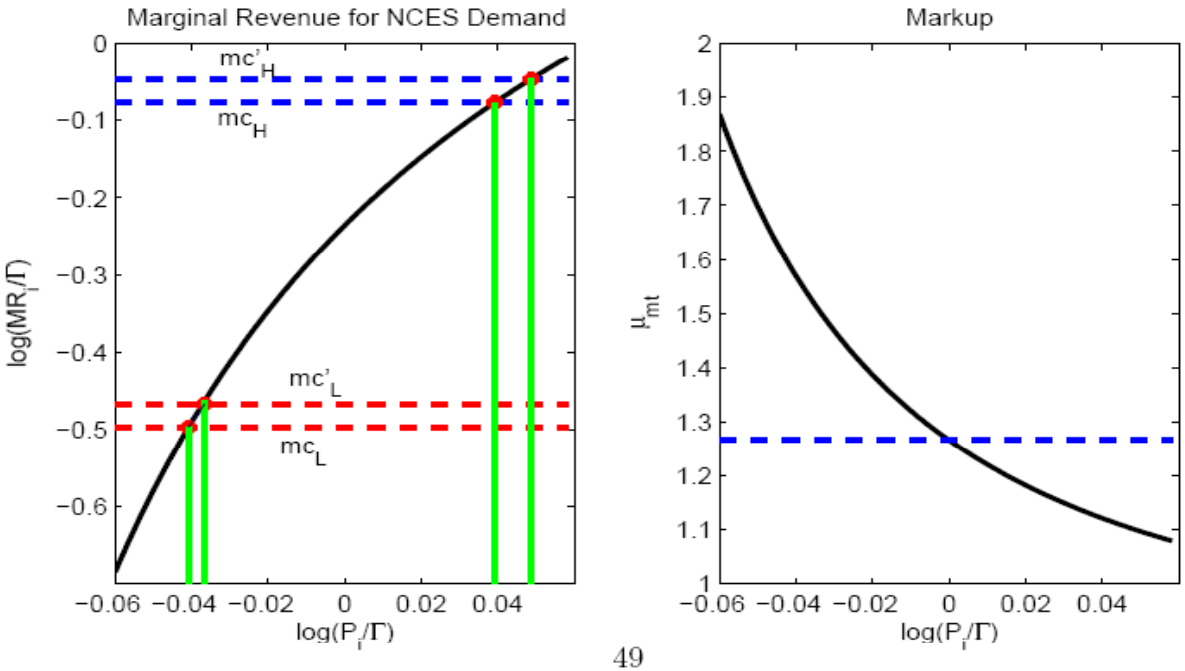
- **Linearized:** $\hat{p}_{m_t} = k_m \left(\hat{D}_t^* + \hat{w}_t^* - \hat{Z}_t^* + \hat{q}_t \right) + (1 - k_m) \hat{\Gamma}_t$

- **The direct measure of pass-through:**

$$k_m \equiv \frac{\partial \ln(p_m)}{\partial \ln(q)} = \frac{1}{1 - \eta \mu_m \left(\frac{\rho(\gamma - 1)}{\gamma - \rho} \right) \left(\frac{\Gamma}{p_m} \right)^{\frac{\gamma - \rho}{\rho}}}$$

- **With η<0:** $k_m < 1$

Trade integration and ERPT



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$$MR_m(j) = P_m(j)\left[1 - \frac{1}{|\varepsilon_m(j)|}\right]$$

Fall in trade costs and increase in foreign productivity

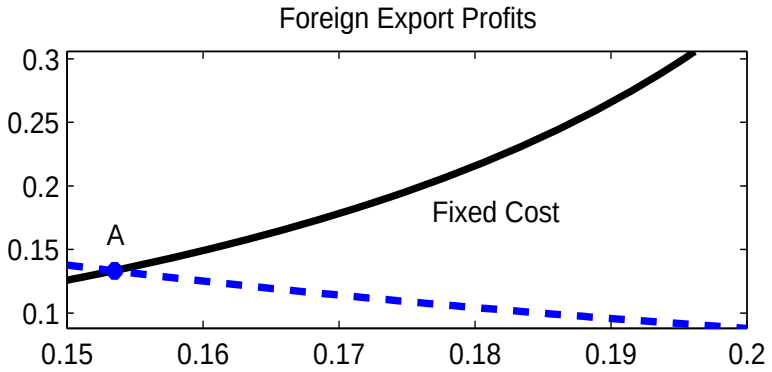
Trade Costs (D, D^*) Foreign Productivity (Z^*)	-5 ppt 35 %
Foreign Exporter's Marginal Cost (qD^*mc^*)	-23.8 %
Home import Price (p_m)	-9.9 %
Foreign Exporter's Markup (μ_m)	13.9 %
Direct Pass-Through (κ_m)	-11.6 ppt
Pass-through ($\beta_{pm,q}$)	-14.7 ppt
Home Firm's Markup at Home (μ_d)	-1.7 %

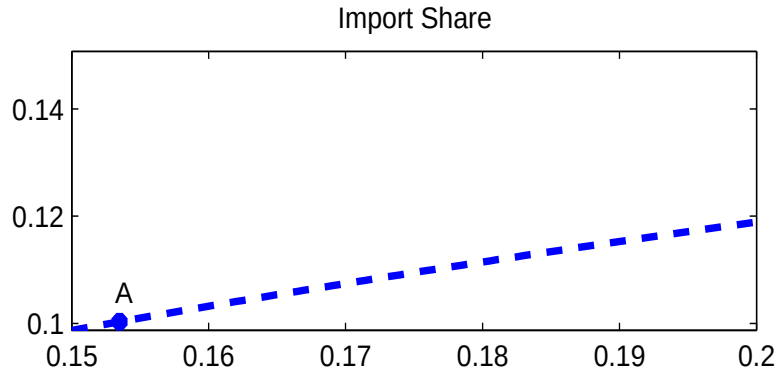
ERPT

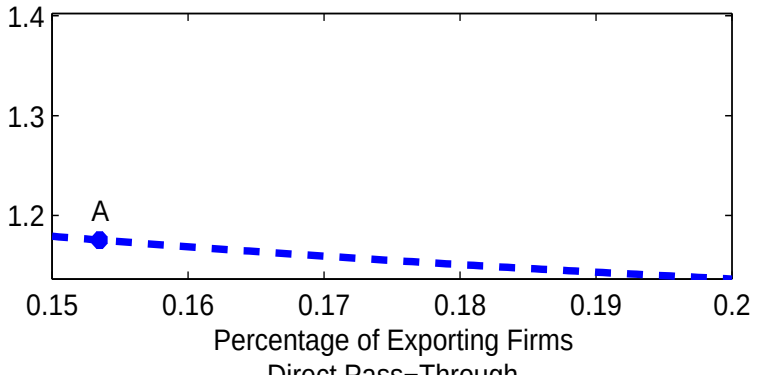
$B_{pm,q}$ is related to this direct measure of PT by:

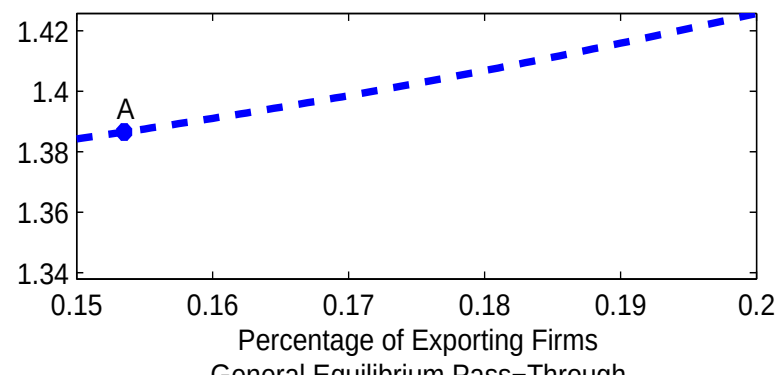
$$\beta_{p_m q} \equiv k_m + k_m \left(\frac{\operatorname{cov}(\Delta(\hat{D}_t^* + \hat{w}_t^* - \hat{Z}_t^*, \Delta \hat{q}_t)}{\operatorname{var}(\Delta \hat{q}_t)} \right) + (1 - k_m) \frac{\operatorname{cov}(\Delta \hat{\Gamma}_t, \Delta \hat{q}_t)}{\operatorname{var}(\Delta \hat{q}_t)}$$

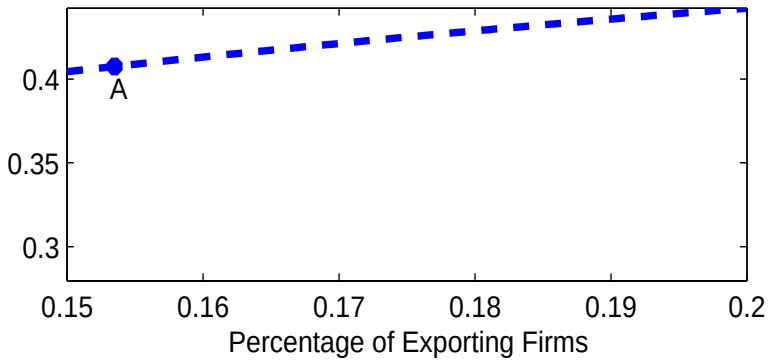
Entry and ERPT (1)

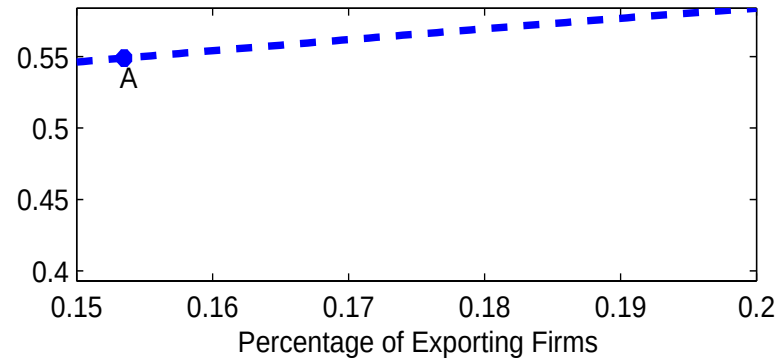




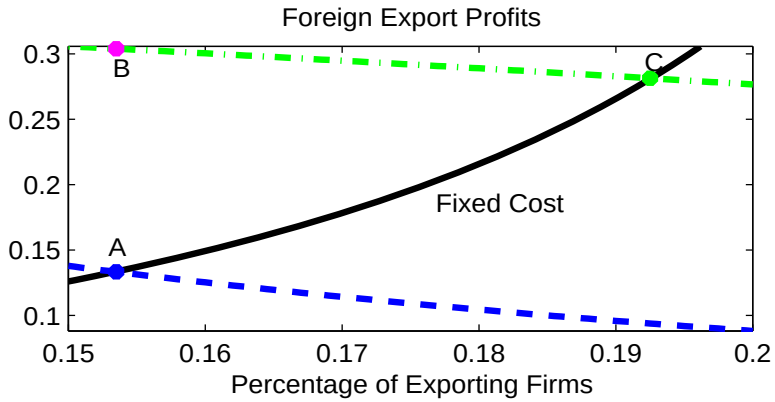


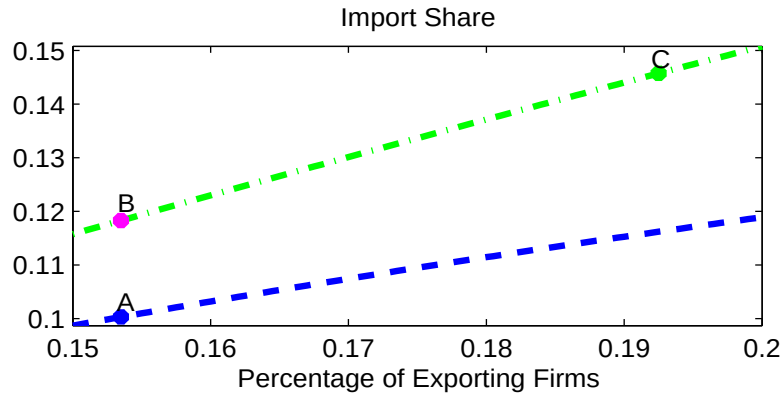


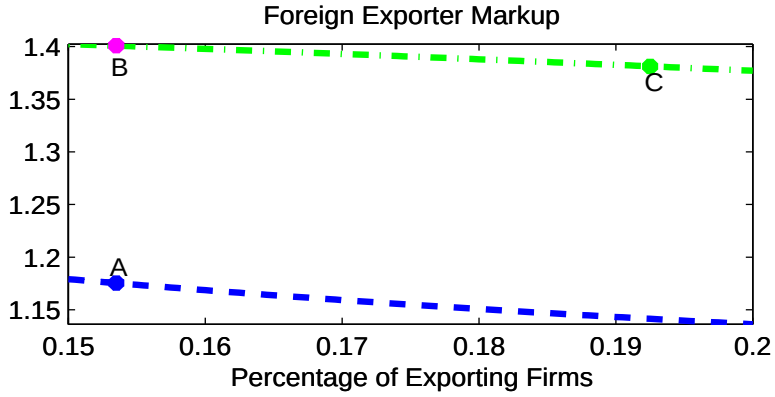


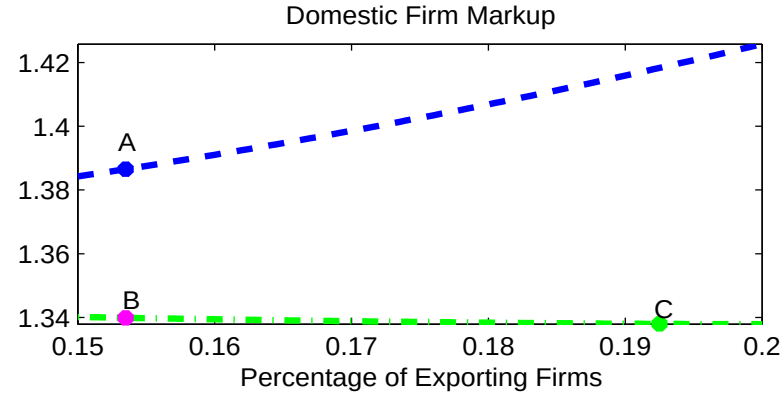


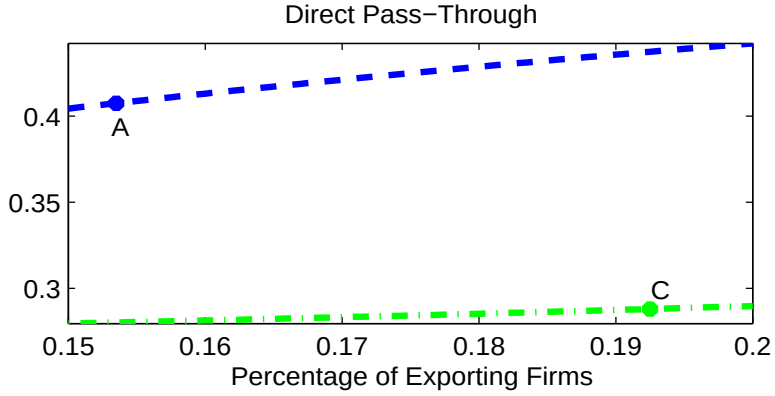
Entry and ERPT (2)

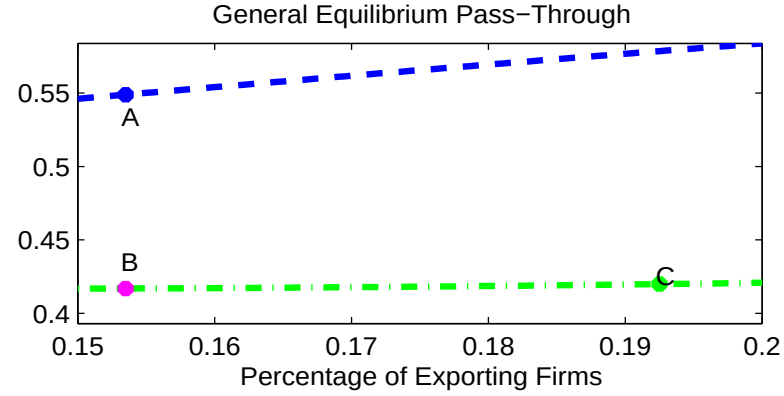












Conclusion

- **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)