Multinationals and the Globalization of Production

Horizontal FDI 2

Penn State // Fall 2016

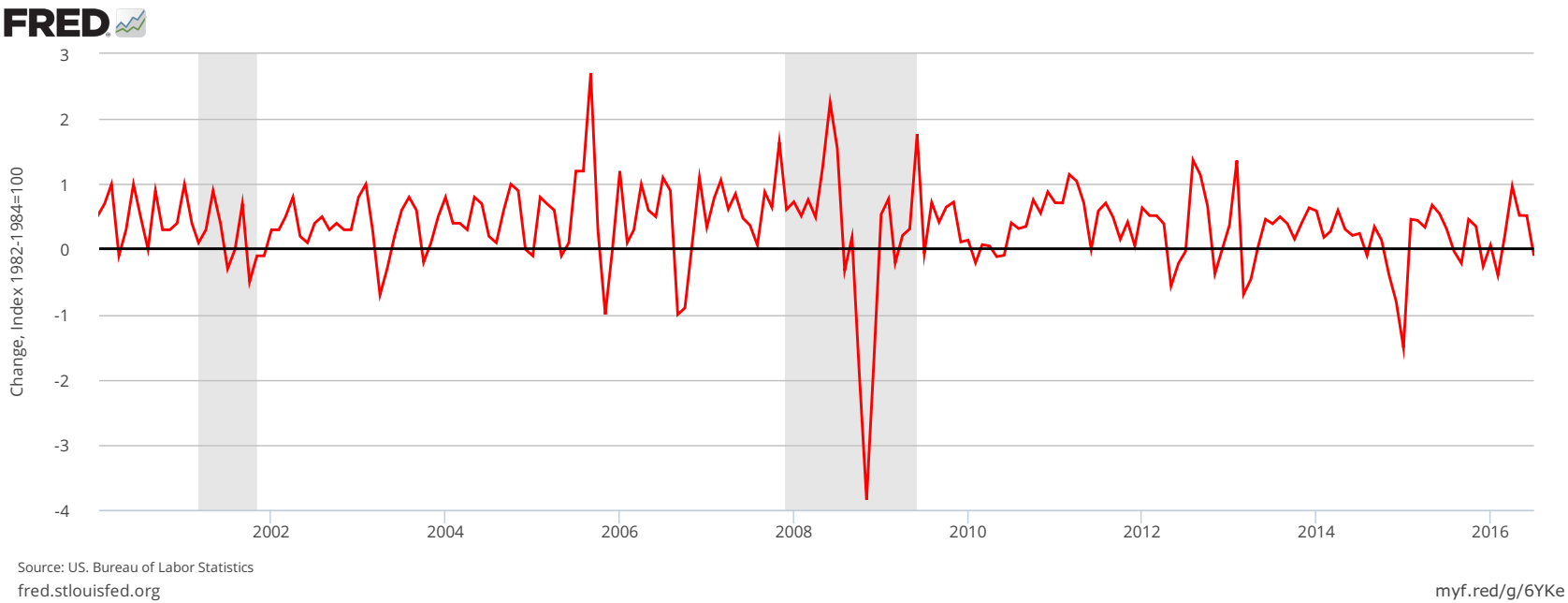
Administrative things

- Sit in the first 3 rows!
- Arkaive.com course code: 3D0Y
  - Please sign in
- Problem set #1: due Thursday September 8, end of class
  - Print out copy, hand in to folder (no e-submission)
  - Can discuss with classmates, but turn in your own work
  - Read “problem set guidelines”

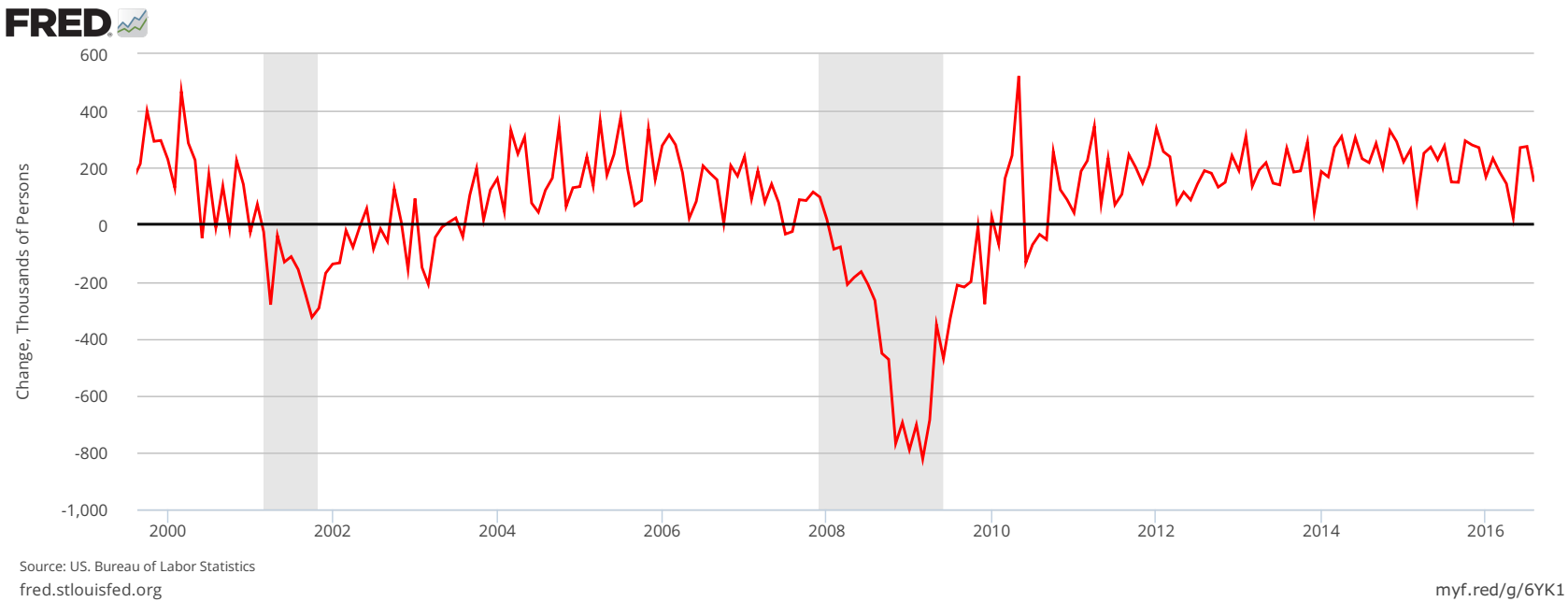
August 2016 Employment Situation

- Released on Friday // Key data:
  - Change in payroll — net number of jobs created
  - Unemployment statistics
- What happened?
  - Net change in payroll = 151,000 (expected 180,000 or so)
  - Unemployment rate about the same = 4.9%
- FOMC meeting September 20–21
  1. "Stable prices"
  2. "Full employment"
- How will this affect FOMC decisions?

CPI inflation



Nonfarm payroll



Roadmap

- Past: Towards a model of horizontal FDI
  - Introduce a model of competition
  - The closed economy
- Present: Add a second country
  - Open economy with exporters
  - Introduce multinationals to the model
- Future: Formalize the proximity-concentration tradeoff

Model overview (same as the other models)

- Two countries ("markets"), $i = 1, 2$
- Total expenditure in each country is E_i
- Two kinds of firms
  - Domestic firms: only produce in their home country, export
  - Multinational firms: produce in both countries
- Many firms of each type
  - n_i = number of domestic firms in i
  - m_i = number of multinational firms in i

Model overview

- Two stages to the model
  1. Create firms and decide to be domestic or multinational
  2. Firms produce and earn profits
- Stage 1 is about determining n_1, m_1, n_2, m_2
- Stage 2 takes n_1, m_1, n_2, m_2 as given

- Solve the model by working backwards
  - First: given n_1, m_1, n_2, m_2 compute profits
  - Second: given domestic and MNE profits, choose n_1, m_1, n_2, m_2
- Today we work on stage 2 first, then stage 1

Domestic (exporter) firm profits

- Use country 1 as an example, analogous problem in country 2
- Country-1 domestic firm profits are

$$\pi_1 = \frac{s_1 E_1}{\epsilon_1} + \frac{\rho s_2 E_2}{\epsilon_2} - w_1 f^h - w_1 f^p.$$

- E_i, ρ, w_i, ϵ_i, f^h, f^p are model parameters: take as given
- Use the adding up constraint to find s_1 and s_2

Multinational-firm benefits

- Country-1 multinational serves country 2 by producing in 2
- Eliminates export costs, so market share is s_2, not ρs_2
  - Benefit of horizontal multinational production
  - Serve the foreign market at lower marginal cost
  - More competitive firm earns larger market share

Multinational-firm costs

- Must pay production fixed cost in country 2
- Exporter fixed costs = $w_1 f^h + w_1 f^p$
- Multinational fixed costs = $w_1 f^h + w_1 f^p + w_2 f^p$
  - Cost of horizontal multinational production
  - Firm pays larger fixed costs

Profits

- Country-1 multinational's profit

$$\pi_1^m = \frac{s_1 E_1}{\epsilon_1} + \frac{s_2 E_2}{\epsilon_2} - w_1 f^h - w_1 f^p - w_2 f^p$$

- Compare to an exporter's profit

$$\pi_1 = \frac{s_1 E_1}{\epsilon_1} + \frac{\rho s_2 E_2}{\epsilon_2} - w_1 f^h - w_1 f^p$$

- Need to find shares to compute profits

Finding shares

- Shares sum to 1 (as always), but now with m_1 and m_2
- In country 1

$$1 = (n_1 + m_1 + m_2)s_1 + n_2\rho s_1$$
$$s_1 = \frac{1}{n_1 + m_1 + m_2 + n_2\rho}$$

- In country 2

$$1 = (n_2 + m_1 + m_2)s_2 + n_1\rho s_2$$
$$s_2 = \frac{1}{n_2 + m_1 + m_2 + n_1\rho}$$

In class problem: Multinationals

- 5-10 min, work with those around you
- $w_1 = w_2 = 2$, $E_1 = E_2 = 100$, $\epsilon_1 = 2$, $f^h = 0.5$, $f^p = 0.05$, $\rho = 0.9$
- $n_1 = n_2 = 10$ and $m_1 = m_2 = 2$

1. What are country-1 domestic firm's profits?

2. What are country-1 multinational firm's profits?

3. Why is $\pi_1 < \pi_1^m$?

Domestic or multinational?

- Second stage: given n_i, m_i we can find profits ✓
- First stage: choose to be domestic or multinational

- Suppose there are n_1, n_2, m_1, m_2 firms in the economy
- Would a domestic firm want to become a multinational?
  - Compare profits from each type of firm, choose largest

One more multinational

- If a country-1 domestic firm becomes a multinational
  - One less country-1 domestic firm: $n_1 \to n_1 - 1$
  - One more country-1 multinational firm: $m_1 \to m_1 + 1$
- Compute domestic profit with n_1, n_2, m_1, m_2
- Compute multinational profit with $n_1 - 1, n_2, m_1 + 1, m_2$
- Compare the two

Domestic firm with n_1, n_2, m_1, m_2

$$\pi_1 = \frac{s_1 E_1}{\epsilon_1} + \frac{\rho s_2 E_2}{\epsilon_2} - w_1 f^h - w_1 f^p$$

- Shares are

$$s_1 = \frac{1}{n_1 + m_1 + m_2 + n_2\rho} \qquad s_2 = \frac{1}{n_2 + m_1 + m_2 + n_1\rho}$$

- Substitute the share expressions

$$\begin{aligned}\pi_1(n_1, n_2, m_1, m_2) = &\left(\frac{1}{n_1 + m_1 + m_2 + n_2\rho}\right) \times \frac{E_1}{\epsilon_1} \\ &+ \left(\frac{\rho}{n_2 + m_1 + m_2 + n_1\rho}\right) \times \frac{E_2}{\epsilon_2} \\ &- w_1 f^h - w_1 f^p\end{aligned}$$

Multinational firm with $n_1 - 1, n_2, m_1 + 1, m_2$

$$\pi_1 = \frac{s_1 E_1}{\epsilon_1} + \frac{s_2 E_2}{\epsilon_2} - w_1 f^h - w_1 f^p - w_2 f^p$$

- Shares are (note: s_1 does not change)

$$s_1 = \frac{1}{n_1 - 1 + m_1 + 1 + m_2 + n_2\rho} \qquad s_2 = \frac{1}{n_2 + m_1 + 1 + m_2 + (n_1 - 1)\rho}$$

- Substitute the share expressions

$$\begin{aligned}\pi_1^m(n_1 - 1, n_2, m_1 + 1, m_2) = &\left(\frac{1}{(n_1 - 1) + (m_1 + 1) + m_2 + n_2\rho}\right) \times \frac{E_1}{\epsilon_1} \\ &+ \left(\frac{1}{n_2 + (m_1 + 1) + m_2 + (n_1 - 1)\rho}\right) \times \frac{E_2}{\epsilon_2} \\ &- w_1 f^h - w_1 f^p - w_2 f^p\end{aligned}$$

Comparing ways to serve the foreign market

- Subtract

$$\begin{aligned}\pi_1(n_1, n_2, m_1, m_2) = &\left(\frac{1}{n_1 + m_1 + m_2 + n_2\rho}\right) \times \frac{E_1}{\epsilon_1} \\ &+ \left(\frac{\rho}{n_2 + m_1 + m_2 + n_1\rho}\right) \times \frac{E_2}{\epsilon_2} \\ &- w_1 f^h - w_1 f^p\end{aligned}$$

from

$$\begin{aligned}\pi_1^m(n_1 - 1, n_2, m_1 + 1, m_2) = &\left(\frac{1}{(n_1 - 1) + (m_1 + 1) + m_2 + n_2\rho}\right) \times \frac{E_1}{\epsilon_1} \\ &+ \left(\frac{1}{n_2 + (m_1 + 1) + m_2 + (n_1 - 1)\rho}\right) \times \frac{E_2}{\epsilon_2} \\ &- w_1 f^h - w_1 f^p - w_2 f^p\end{aligned}$$

Comparing ways to serve the foreign market

- The difference in profits from switching to multinational

$$\pi_1^m(n_1 - 1, n_2, m_1 + 1, m_2) - \pi_1(n_1, n_2, m_1, m_2) =$$
$$\left[\frac{1}{n_2 + (m_1 + 1) + m_2 + (n_1 - 1)\rho} - \frac{\rho}{n_2 + m_1 + m_2 + n_1\rho}\right]\frac{E_2}{\epsilon_2}$$
$$-w_2 f^p$$

- First term is positive: gain from better market access
- Second term is negative: cost of replicating production

In class problem: Become a multinational?

- 5-10 min, work with those around you
- $w_1 = w_2 = 2$, $E_1 = E_2 = 100$, $\epsilon_1 = 2$, $f^h = 0.5$, $f^p = 0.05$, $\rho = 0.9$
- $n_1 = n_2 = 10$ and $m_1 = m_2 = 2$

1. How much extra profit would a country-1 domestic firm earn if it became a multinational?

2. Why is this different than the $\pi_1^m - \pi_1 = 0.118$ in the earlier problem?

The proximity-concentration tradeoff

The number of multinational firms, relative to domestic firms is larger

1. the larger is the foreign market (larger E_j)
2. the larger are export costs (smaller ρ)
3. the smaller are production fixed costs (smaller $w_j f^p$)

Takeaways

- How number and type of firms affects profits
  - Exporters are disadvantage because they pay higher costs
  - Multinationals skip higher export costs, but pay more fixed costs
- Proximity-concentration tradeoff
  - More multinationals relative to domestic firms when
    - larger foreign market
    - more expensive exporting
    - smaller fixed production costs