Multinationals and the Globalization of Production

Exam 1 Review

Penn State // Fall 2016

Administrative things

- Arkaive.com course code: 3D0Y
  - Please sign in

- Problem Set #2
  - Pick up from up front

- Exam I
  - In class, Thursday September 29

Exam I: Thursday 9/29

- Exam duration is 75 minutes
- We will start on time; arrive early
- Bring
  - Calculator
  - One page of notes (8.5″x11″)
  - No wireless devices or other materials
- Show your work!

Roadmap

- Big picture
  1. OLI framework
  2. Basic FDI facts
  3. Horizontal FDI
  4. Export platform FDI
- Practice problems

OLI Framework

- Multinational production is expensive
  - Language, legal, communication, shipping, ...
- What are the benefits of multinational production?
  - Ownership advantage (tangible/intangible)
  - Location advantage (horizontal/vertical)
  - Internalization advantage (make/buy)
- Examples of each?

Six facts about multinational production

- Six questions to get to six facts
  1. Where do MNEs operate?
  2. What goods do MNEs produce?
  3. How far do MNEs go from home?
  4. How do MNEs compare to domestic firms?
  5. What do parents do? Affiliates?
  6. How do multinationals expand?

Six facts

1. Multinationals are concentrated in developed countries
2. Multinationals are concentrated in R&D- and capital-intensive goods
3. Multinational activity falls off in the distance from the parent
4. MNE parents and affiliates, compared to domestic firms, are larger, more productive, more R&D intensive, and more likely to export
5. MNE parents specialize in R&D, affiliates in selling to foreign markets
6. Mergers and acquisitions make up a large part of MNE expansion

- Focus on facts 1 & 4 . . . How do they relate to our models?
- . . . but don't ignore the other the facts completely.

Models of horizontal FDI

1. Identical firm model
   - Number of firms determined market shares
   - Study proximity-concentration tradeoff
   - Study impact of competition from MNEs (practice exam Q6)
2. Heterogeneous firm model
   - Firms differ in productivity φ
   - More productive firms have lower prices, larger shares
   - Better firms more likely to be MNEs
3. Export platform model
   - Foreign affiliates can sell to other countries
   - Study how geography and marginal cost matter

Horizontal FDI with identical firms

- Shares depend on number and type of firms

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

- Profit of domestic firm

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

- Profit of multinational

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

Identical firm model

- Would a firm want to switch from domestic to MNE?

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

- Market size (E_2), export costs (ρ), and return to scale (f^p)

Horizontal FDI with heterogeneous firms

- Shares depend on firm productivity (through price)

$$p_e = \frac{w_1}{\varphi}\frac{\epsilon_2}{\epsilon_2 - 1}(1+\tau) \qquad p_m = \frac{w_2}{\varphi}\frac{\epsilon_2}{\epsilon_2 - 1}$$

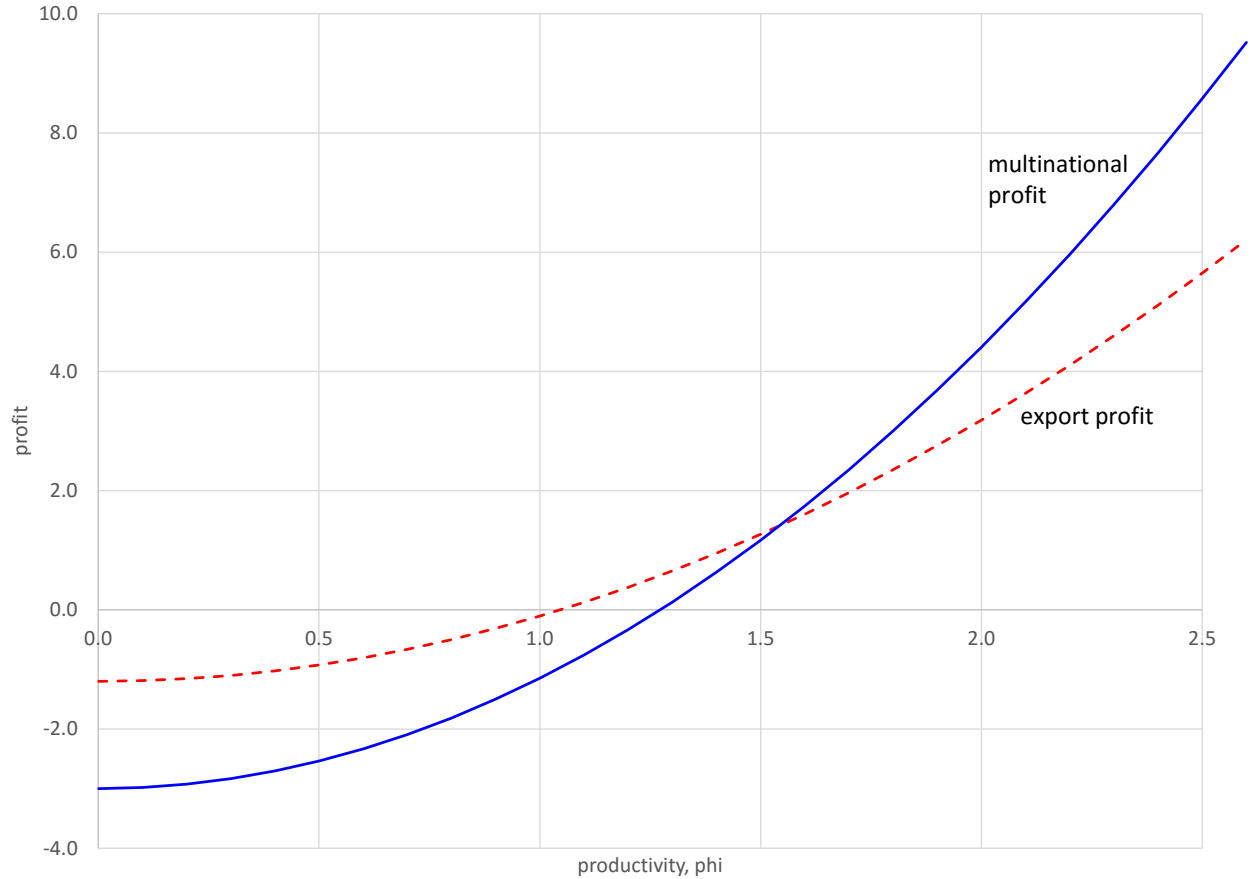
- Export profit

$$\pi_1^e(\varphi) = \left(\frac{\epsilon_2}{\epsilon_2 - 1}\frac{1}{\varphi}w_1(1+\tau)\right)^{1-\epsilon_2}\frac{E_2}{\epsilon_2} - w_1 f^e$$

- Multinational profit

$$\pi_1^m(\varphi) = \left(\frac{\epsilon_2}{\epsilon_2 - 1}\frac{1}{\varphi}w_2\right)^{1-\epsilon_2}\frac{E_2}{\epsilon_2} - w_2 f^p$$

Profits and productivity



- Which firms export? Which firms become MNEs?

Export platform FDI

- A US firm wants to serve Ireland and EU
- Six ways to do so
  1. Export to *eu* from *us*, export to *ir* from *us*
  2. Multinational affiliate in *eu*, export to *ir* from *us*
  3. Export to *eu* from *us*, multinational affiliate in *ir*
  4. Multinational affiliate in *eu*, multinational affiliate in *ir*
  5. Multinational affiliate in *eu*, export to *ir* from *eu*
  6. Export to *eu* from *ir*, multinational affiliate in *ir*
- As number of countries grows, number of choices explodes

Simplify the model

- Six ways to configure the firm
- The usual approach: compute profits from each, compare
  - Drawback: tedious
- Make some assumptions to simplify and focus our analysis
- Assumption 1: $\tau_{us,eu}$ and $\tau_{us,ir}$ are very large
  - US firm always wants to be MNE (proximity-concentration)
  - Rules out configurations where US firm exports: #1– #3
- Assumption 1: $w_{ir} < w_{eu}$
  - Rules out EU as an export platform: #5

Firm profit

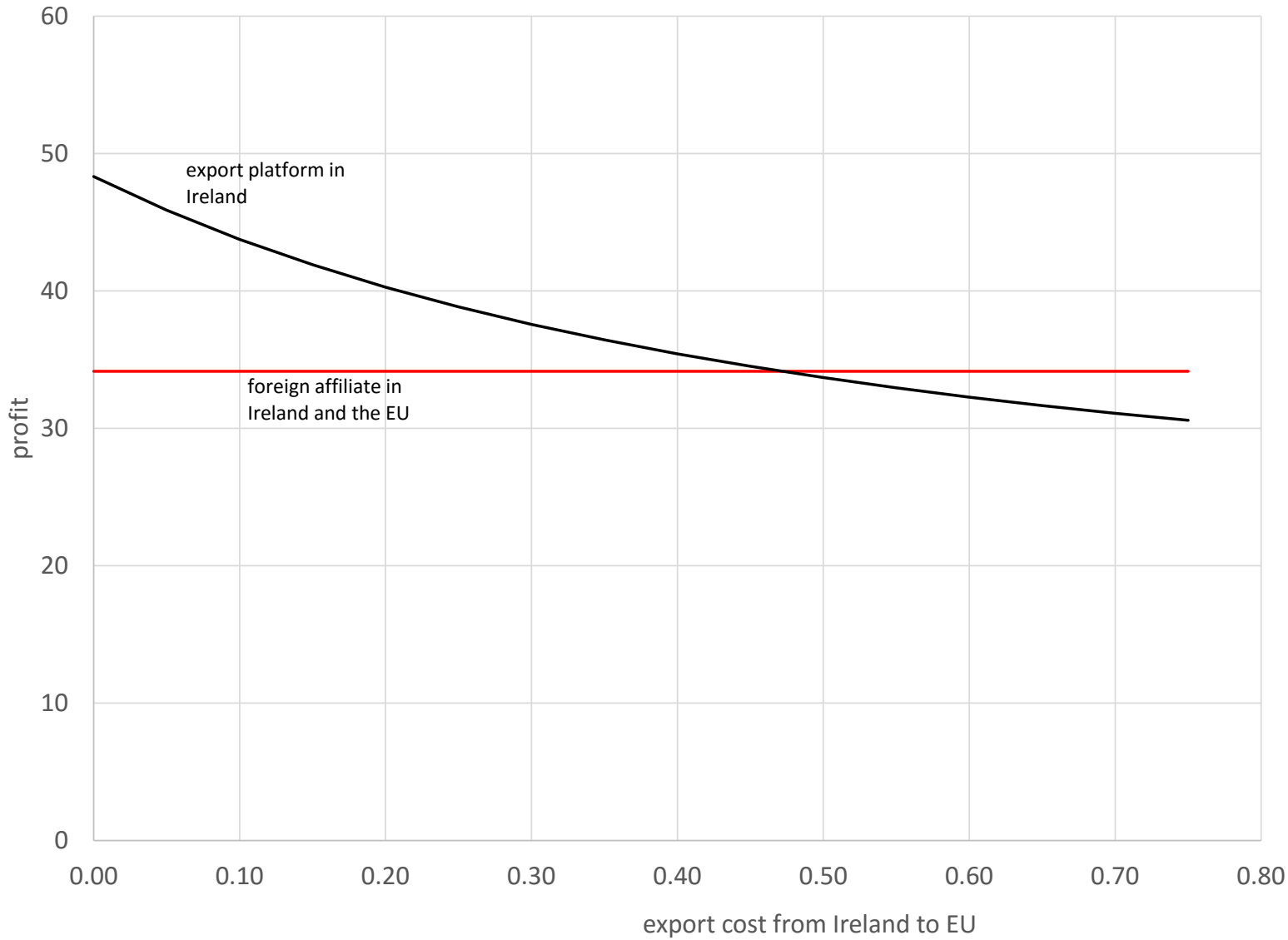
- Affiliates in both countries (#4)

$$\pi_{us}^{m,m}(\varphi) = \frac{E_{ir}}{\epsilon_{ir}} \left(\frac{\epsilon_{ir}}{\epsilon_{ir}-1} \frac{w_{ir}}{\varphi} \right)^{1-\epsilon_{ir}} + \frac{E_{eu}}{\epsilon_{eu}} \left(\frac{\epsilon_{eu}}{\epsilon_{eu}-1} \frac{w_{eu}}{\varphi} \right)^{1-\epsilon_{eu}} - w_{ir} f^p - w_{eu} f^p$$

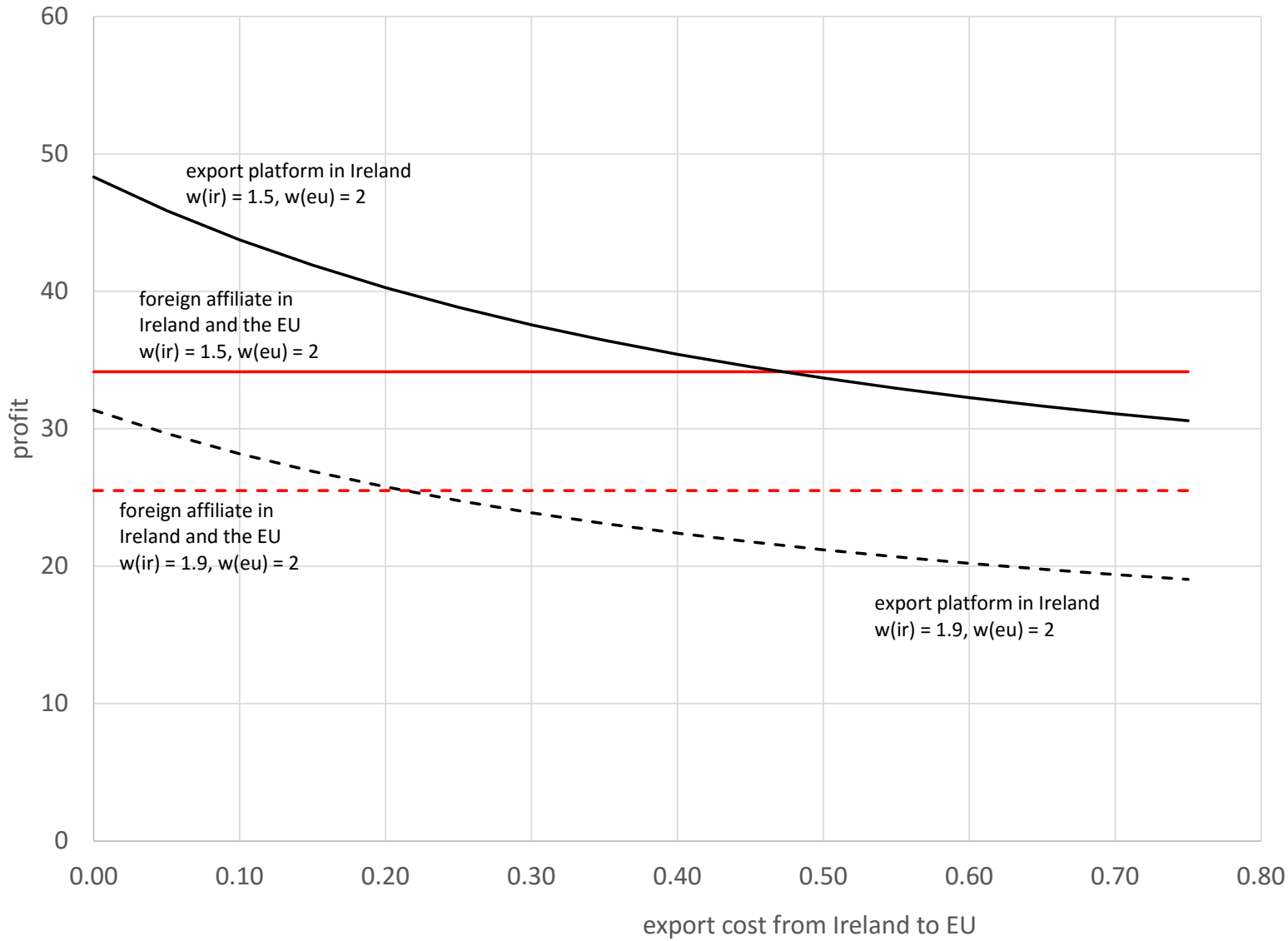
- Affiliate in Ireland, export to EU from IR (#6)

$$\begin{aligned}\pi_{us}^{xp,m}(\varphi) = & \frac{E_{ir}}{\epsilon_{ir}} \left(\frac{\epsilon_{ir}}{\epsilon_{ir}-1} \frac{w_{ir}}{\varphi} \right)^{1-\epsilon_{ir}} + \frac{E_{eu}}{\epsilon_{eu}} \left(\frac{\epsilon_{eu}}{\epsilon_{eu}-1} \frac{w_{ir}}{\varphi} (1+\tau_{ir,eu}) \right)^{1-\epsilon_{eu}} \\ & - w_{ir} f^p - w_{ir} f^e\end{aligned}$$

Profit


60
50
40
30
20
10
0
profit
export platform in Ireland
foreign affiliate in Ireland and the EU
0.00
0.10
0.20
0.30
0.40
0.50
0.60
0.70
0.80
export cost from Ireland to EU

Profit, increasing the Irish wage



Practice Problems

Heterogeneous firm model, low productivity

- $w_1 = w_2 = 2, E_2 = 50, \epsilon_2 = 3, f^p = 1.5, f^e = 0.6, \tau = 0.3$
- Let $\varphi = 1.5$. Compute p_e, p_m. Should the firm export to serve the foreign market or use a foreign affiliate?

Heterogeneous firm model, high productivity

- $w_1 = w_2 = 2$, $E_2 = 50$, $\epsilon_2 = 3$, $f^p = 1.5$, $f^e = 0.6$, $\tau = 0.3$
- Let $\varphi = 2.0$. Compute p_e, p_m. Should the firm export to serve the foreign market or use a foreign affiliate?

Heterogenous firm model

- More practice: Redo the previous, but
  1. Change $w_1 = 2, w_2 = 2.2$
  2. Change $E_2 = 100$
  3. Change $\epsilon_2 = 5$
- How does the difference in profits change? Why?
- How would the break-even φ for exporting and MNE change?

Homogeneous firm model

- $\epsilon_1 = \epsilon_2 = 3$, $w_1 = w_2 = 2$, $f^h = 0.5$, $f^p = 0.2$, $E_1 = 100$, $E_2 = 100$
- If $n_1 = 10$, $n_2 = 10$, $m_1 = 2$, $m_2 = 2$, and $\rho = 0.7$, would a firm from country 1 want to become an MNE?

Homogeneous firm model, trade liberalization

- $\epsilon_1 = \epsilon_2 = 3$, $w_1 = w_2 = 2$, $f^h = 0.5$, $f^p = 0.2$, $E_1 = 100$, $E_2 = 100$
- If $n_1 = 10$, $n_2 = 10$, $m_1 = 2$, $m_2 = 2$, and $\rho = 0.8$, would a firm from country 1 want to become an MNE?

More practice

- More practice: Redo the previous (keep $\rho = 0.7$), but
  - Change $f_p = 0.3$
  - Change $n_1 = n_2 = 12$
- Problem set #2, Q1

Export platforms

- Assume that $\tau_{us,ir}$ is large enough to rule out exporting from US
- $\epsilon_{ir} = \epsilon_{eu} = 3$, $w_{eu} = 2$, $f^p = 2$, $E_{eu} = E_{ir} = 100$, $\varphi = 2$, $f^e = 0.9$, $\tau_{ir,eu} = 0.3$
- When $w_{ir} = 1.0$, would the US firm use an export platform in Ireland, or operate an affiliate in both countries?

Export platforms, Ireland "develops"

- Assume that $\tau_{us,ir}$ is large enough to rule out exporting from US
- $\epsilon_{ir} = \epsilon_{eu} = 3$, $w_{eu} = 2$, $f^p = 2$, $E_{eu} = E_{ir} = 100$, $\varphi = 2$, $f^e = 0.9$, $\tau_{ir,eu} = 0.3$
- When $w_{ir} = 2.0$, would the US firm use an export platform in Ireland, or operate an affiliate in both countries?

Export platforms

- Irish GDP per capita is about equal to the EU average. Would expect to see much new FDI in Ireland? Why or why not?
- More practice: Redo the previous (keep $w_{ir} = 1.0$), but
  - Change $\tau_{ir,eu} = 0.1$
  - Change $E_{eu} = 200$
- If w_{ir} and w_{eu} are similar, when might the US firm want to build the export platform in the EU?