Multinationals and the Globalization of Production

Horizontal FDI 3

Penn State // Fall 2016

Administrative things

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

- Problem Set #2
  - Available online
  - Due, end of class, Thursday September 22

Roadmap

- A model of horizontal FDI
  - Introduce a model of competition
  - The closed economy
  - Open economy: exporting and MNE
- Present: Formalize the proximity-concentration tradeoff
  - Where do multinationals occur?
- Future: Firm-level heterogeneity (MNE fact #4)
  - MNEs are larger and more productive than domestic firms.

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

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

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

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

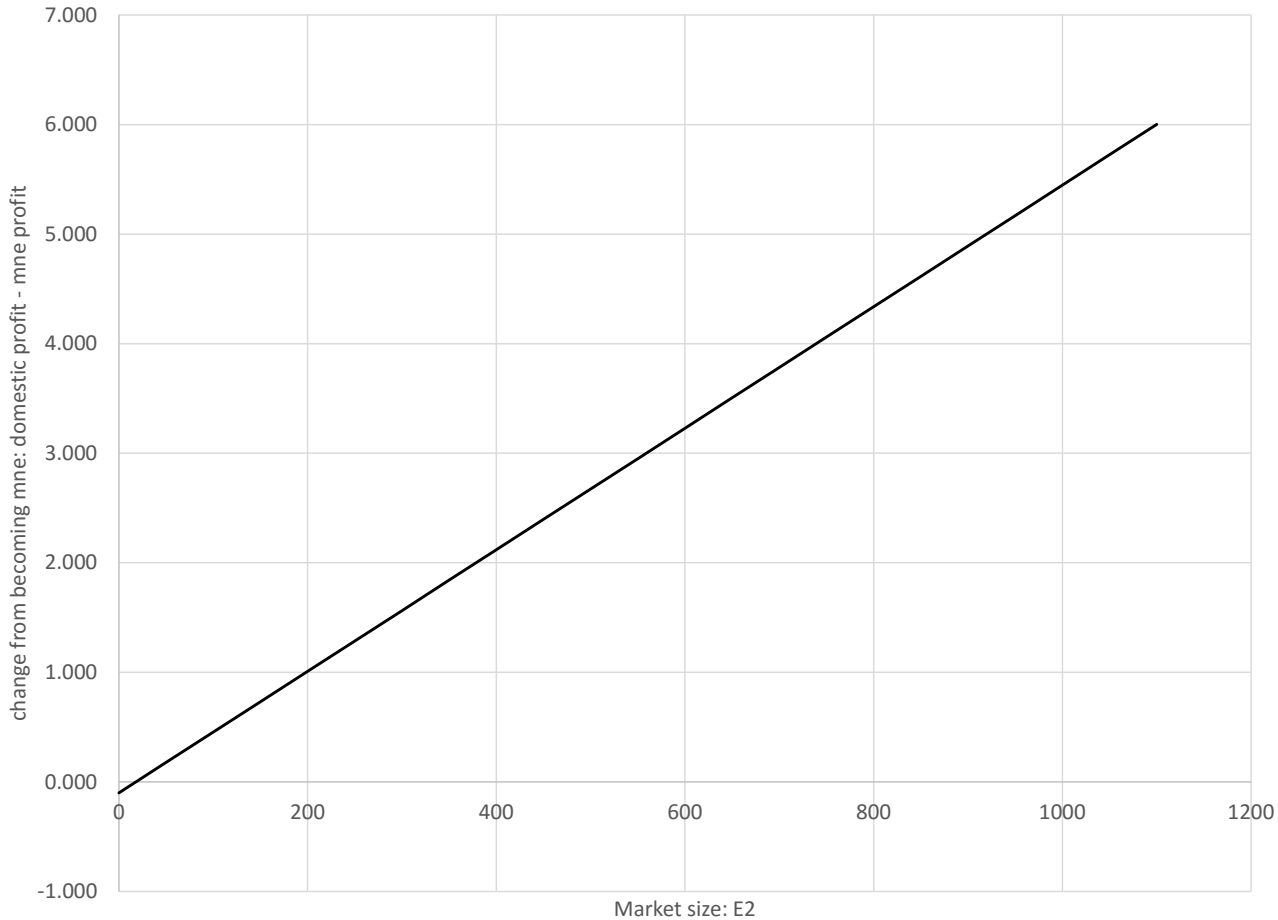
The gain from multinational production

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

- Next three slides
  - Hold fixed n_i, m_i
  - Change E_2: foreign market size
  - Change ρ: exporter penalty
  - Change f^p: production fixed cost
- How does the gain from being a MNE change?

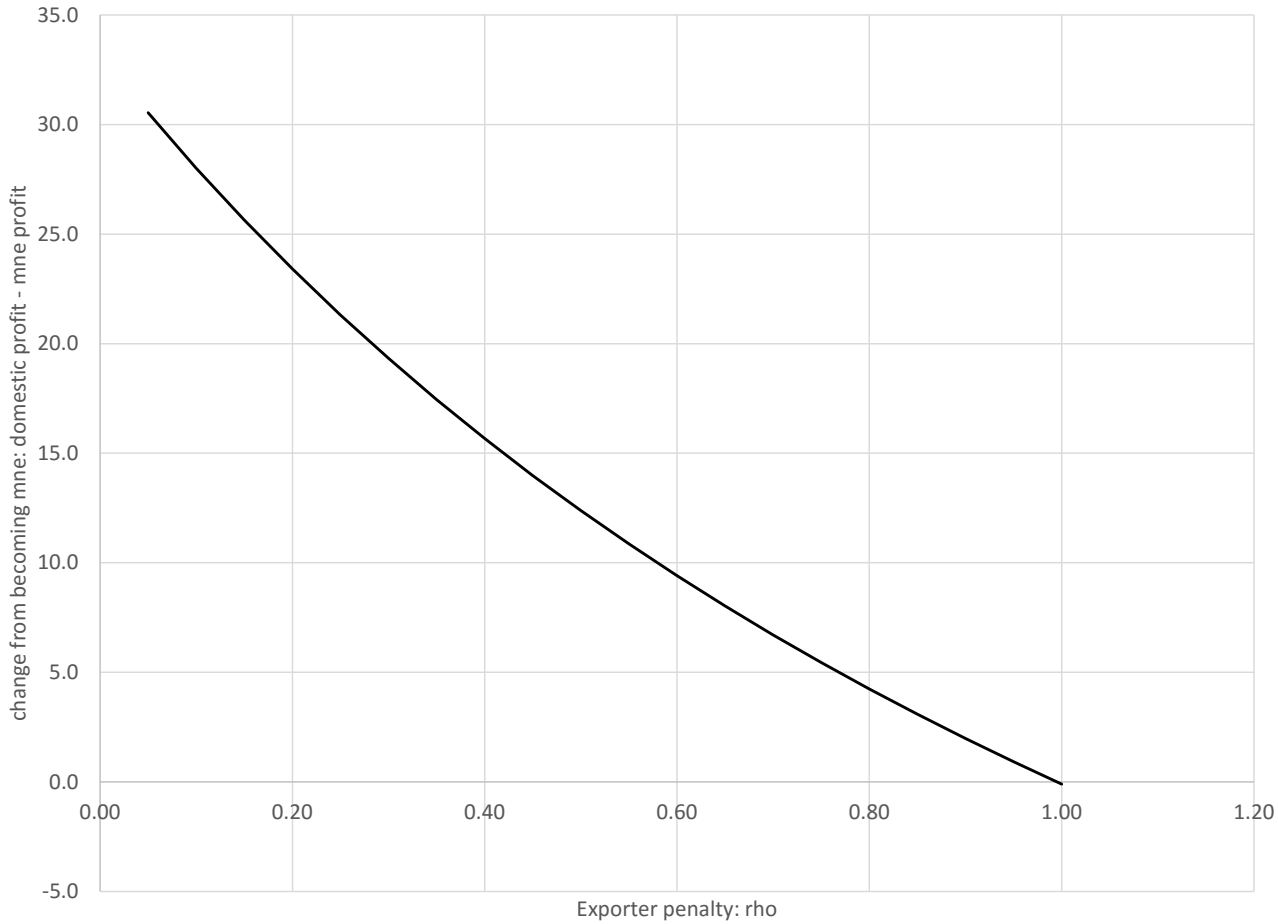
MNE gain vs. foreign market size (E_2)

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



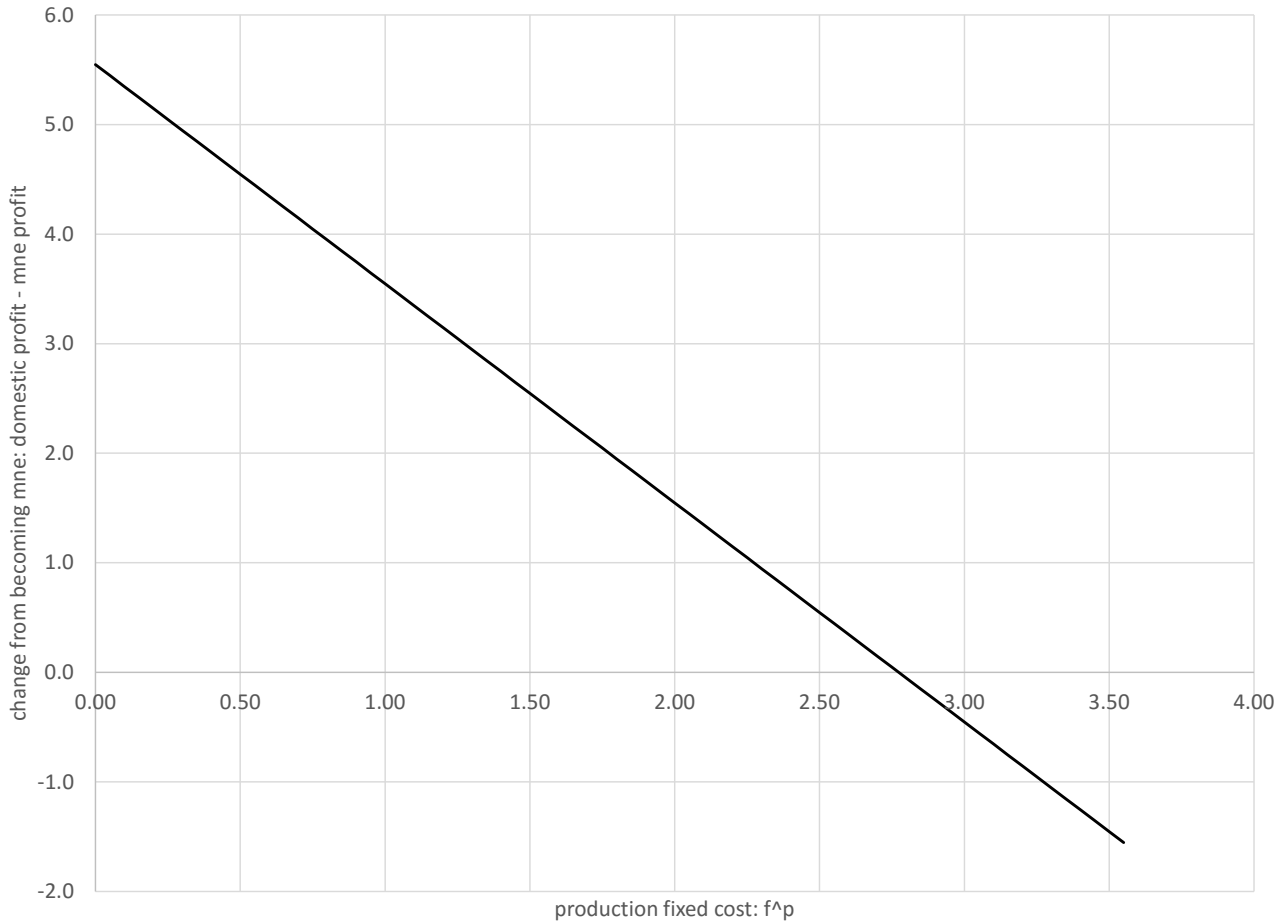
MNE gain vs. exporter penalty (ρ)

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



MNE gain vs. production fixed cost (ρ)

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



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 $w_j f^p$)

Multinational facts

#1. Multinationals are concentrated in developed countries

#3. Multinational activity falls off in the distance from the parent, *but exports fall off faster* [we have the second part, not the first]

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

A model in which firms are different

- Our model has identical firms
- Fact #4 says that MNEs are productive, and large

- Modify model to make firm heterogenous in productivity
- Study how firm differences affect export/MNE decision

- Much of the model stays the same
- Need to add a few new elements

Change #1: market structure

- Each firm sells a differentiated product (shoes, fast food, beer)
- Consumers like to consume many varieties

- Each firm has a monopoly over its variety
- But imperfect substitutes mean only some price power
- Call this *monopolistic competition*

- Formalize this as a demand function

$$x(p) = E_i \times p^{-\epsilon}$$

Change #2: heterogeneous productivity

- Firms have different productivity, φ
- Take differences in productivity as given
- Production function

$$x = \varphi \ell$$

- Marginal cost of production is $1/\varphi \times w$
  - How does this differ from our earlier model?

Change #3: export fixed costs

- Still have "old" fixed costs: f^p, f^h

- Add export fixed cost: f^e
- What fixed costs might be associated with exporting?

- Setting up export operation cheaper than a new factory: $f^e < f^p$

Firm profits

- Three kinds of firms
- Non-exporting (domestic only) firms; exporters; multinationals
- Two countries, $i = 1, 2$
- Work through country-1 firm decision problems...

Non-exporting firms

- Only sell at home
- Choose price p to maximize profit

$$\pi_1(\varphi) = \left(p - \frac{1}{\varphi} w_1\right) E_1 p^{-\epsilon_1} - w_1 f^h - w_1 f^p$$

- The solution is a mark-up over marginal cost

$$p = \frac{1}{\varphi} w_1 \frac{\epsilon_1}{\epsilon_1 - 1}$$

- How does price change with productivity?

Non-exporting firms

- Substitute price back into profit function

$$\pi_1(\varphi) = \cancel{\frac{1}{\epsilon_1 - 1}} \; \frac{1}{\epsilon_1} \left(\frac{\epsilon_1}{\epsilon_1 - 1} \frac{1}{\varphi} w_1 \right)^{1-\epsilon_1} E_1 - w_1 f^h - w_1 f^p$$

- How do profits change with productivity?

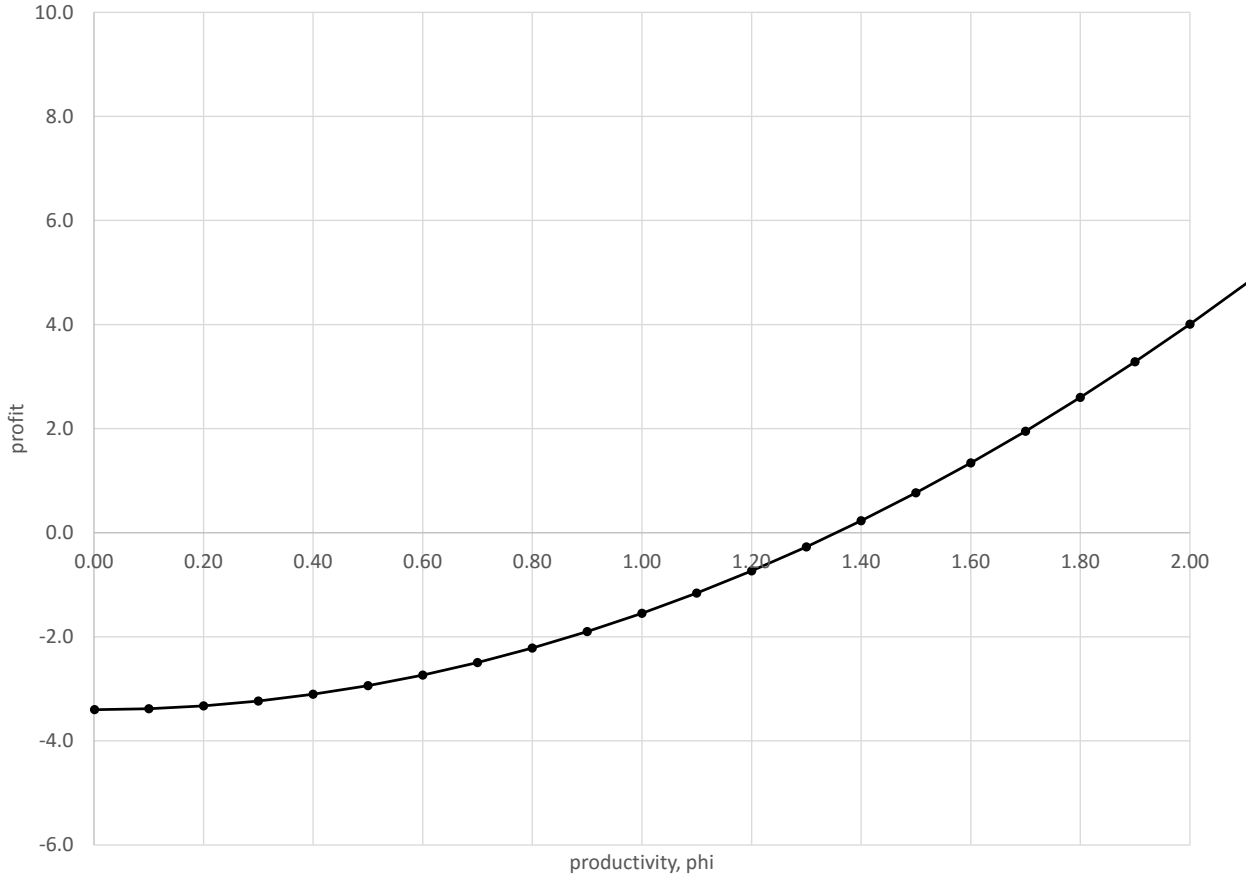
In class problem: productivity and profit

- 5-10 min, work with those around you
- $w_1 = 2, E_1 = 50, \epsilon_1 = 3, f^h = 0.2, f^p = 1.5$

1. What price does a non-exporter with $\varphi = 0.001$ charge in the home market? What are the firms profits? Should this firm be producing?

2. What price does a non-exporter with $\varphi = \cancel{1.2}$ 1.5 charge in the home market? What are the firms profits? Should this firm be producing?

Profits and productivity



- What firms can profitably operate?

Exporting firms

- Pay export fixed costs, pay trade cost τ
- How much profit does the firm earn from exporting?
- Choose price p_e to maximize profit

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

- The solution is a mark-up over marginal cost

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

- Price rises to offset export costs (similar to having smaller φ)

Exporting firms

- Substitute price back into profit function

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

- How do profits change with productivity?
- How does τ impact profit?

Multinational firms

- Pay export production fixed cost abroad; avoid τ and f^e
- How much profit does the firm earn from affiliate sales?
- Choose price p_m to maximize profit

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

- The solution is a mark-up over marginal cost

$$p_m = \frac{1}{\varphi} w_2 \frac{\epsilon_2}{\epsilon_2 - 1}$$

- Marginal cost now w_2

Multinational firms

- Substitute price back into profit function

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

- How do profits change with productivity?
- How does this compare to export profit?

Exporting vs. multinational production

- Exporter: $p_e = \frac{1}{\varphi} w_1 \frac{\epsilon_2}{\epsilon_2 - 1}(1+\tau)$

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

- MNE: $p_m = \frac{1}{\varphi} w_2 \frac{\epsilon_2}{\epsilon_2 - 1}$

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

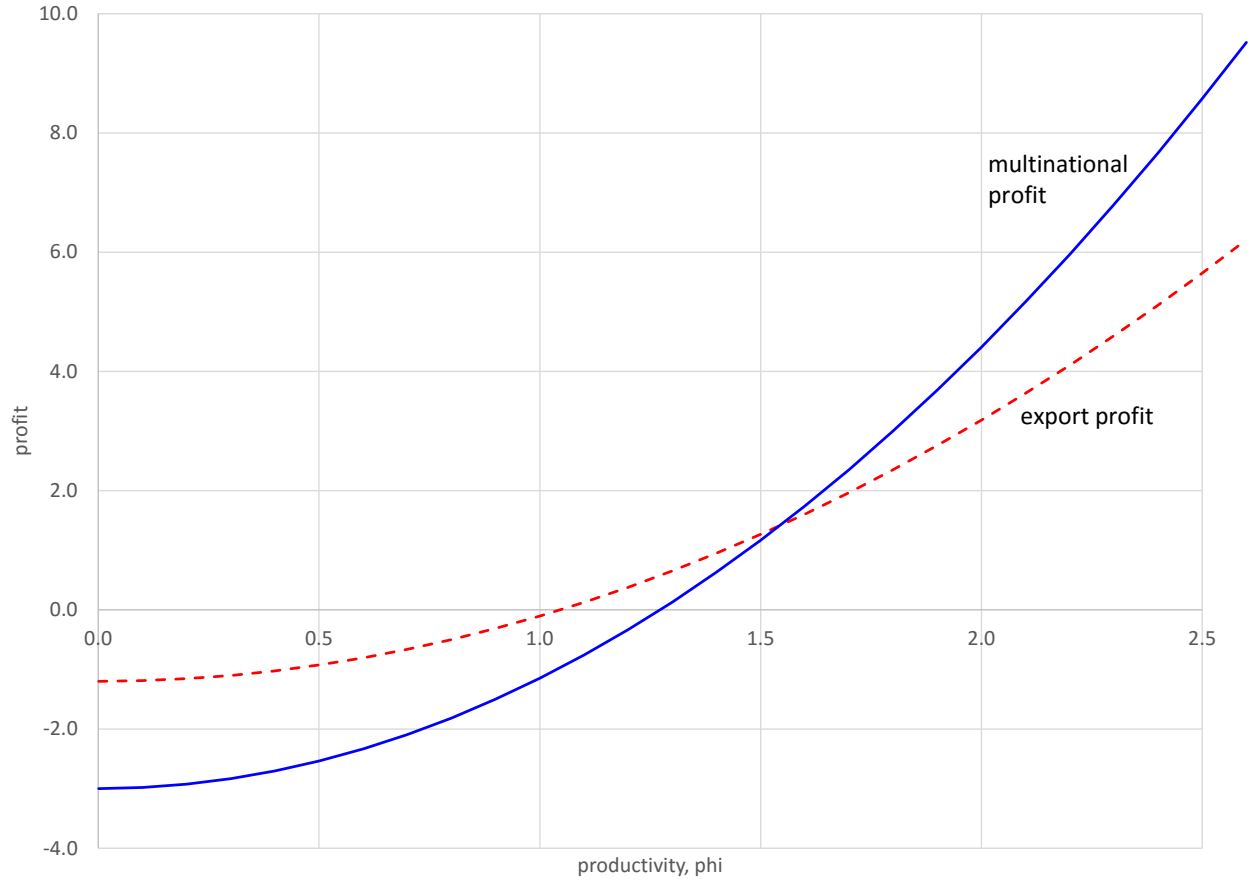
In class problem: exporting vs. MNE

- 5-10 min, work with those around you
- $w_1 = w_2 = 2, E_2 = 50, \epsilon_2 = 3, f^p = 1.5, f^e = 0.6, \tau = 0.3$

1. Should a firm with $\varphi = \cancel{1.20}$ 1.5 export to serve the foreign market or use a foreign affiliate?

2. Should a firm with $\varphi = \cancel{1.50}$ 2.0 export to serve the foreign market or use a foreign affiliate?

Profits and productivity



- Which firms export? Which firms become MNEs?