

Multinationals and the Globalization of Production

Horizontal FDI 1

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”

Apple and the EU

- ▶ European Commission rules Irish tax treatment of Apple illegal
 - ▶ Issue: Ireland treating MNEs different than other EU countries
 - ▶ Irish multinationals channel profits to tax havens
- ▶ EU wants Ireland to collect \$14 bil. in back taxes
- ▶ Irish government reluctant to do so
 - ▶ Discourage future MNE investment
 - ▶ Ireland is famous for its low corporate tax rate
 - ▶ Admit that something wrong happened
- ▶ Apple: <http://www.apple.com/ie/customer-letter/>

Roadmap

- ▶ Past: OLI framework
 - ▶ Identify MNE advantage
 - ▶ High-level analysis
- ▶ Present: Towards a model of horizontal FDI
 - ▶ Introduce a model of competition
 - ▶ The closed economy
 - ▶ Open economy with exporters
- ▶ Future: Introduce multinationals to the model

Horizontal FDI

- ▶ Horizontal FDI: Use affiliates to serve foreign market
- ▶ Relevant facts
 - ▶ More multinational activity in bigger markets
 - ▶ More multinational activity (compared to exports) with distance
- ▶ Important model ingredients
 - ▶ Exporting requires additional costs
 - ▶ Building a foreign affiliate requires a fixed cost
- ▶ Key tradeoff in the model
 - ▶ Saving on transport costs vs. saving on fixed costs
 - ▶ Called the “proximity-concentration tradeoff”

Model overview

- ▶ 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
 - ▶ 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 national 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

Firm profits

- ▶ Each firm is identical (we will relax this in the future)
- ▶ Constant marginal cost of w_i
- ▶ Inverse demand curve $p(x_i)$
 - ▶ Sell x_i , the price is $p(x_i)$
 - ▶ This curve slopes down
- ▶ Fixed costs [compared to marginal costs]
 - ▶ f^h = fixed headquarters cost
 - ▶ f^p = fixed production cost
 - ▶ domestic firm pays $f = f^h + f^p$
 - ▶ two-country multinational firm pays $f = f^h + f^p + f^p$

Firm profits

- ▶ Firm operating in country i has profits

$$\pi_i = (p(x_i) - w_i) \times x_i - w_i f_i$$

- ▶ Q: How much should a firm produce?
- ▶ A: Set marginal revenue = marginal cost

$$p_i (1 - 1/\epsilon_i) = w_i$$

Elasticity and price

- ▶ ϵ_i = price elasticity of the good
- ▶ What is the price elasticity? What does it mean?

$$p_i (1 - 1/\epsilon_i) = w_i$$
$$p_i = w_i \times \frac{1}{1 - 1/\epsilon_i}$$

- ▶ The markup over marginal cost is $1/(1 - 1/\epsilon_i)$
- ▶ What is the markup when $\epsilon = 4$? $\epsilon = 10$?

Algebra: simplify the profit equation

- ▶ Substitute $p_i (1 - 1/\epsilon_i)$ for w_i in

$$\pi_i = (p(x_i) - w_i) \times x_i - w_i f_i$$

- ▶ Result

$$\pi_i = \frac{p_i x_i}{\epsilon_i} - w_i f_i$$

Algebra: simplify the profit equation

- ▶ Define the firm's *share* of total expenditure as

$$s_i = \frac{(p_i \times x_i)}{E_i}$$

- ▶ So that the firm's profit is

$$\pi_i = \frac{s_i E_i}{\epsilon_i} - w_{if_i}$$

- ▶ If I know the firm's share of the market, I know its profit

- ▶ So let's figure out the firm's share...

The closed economy

- ▶ Only one country: no trade, no MNEs
- ▶ We are taking n_1 be given (second stage of the model)
- ▶ Since each firm is identical, they get identical shares

$$s_i = \frac{1}{n_i}$$

- ▶ Example: if there are 10 firms, each gets 1/10 of the market
- ▶ Now we know s_i so we can compute profits

In class problem: Closed economy

- ▶ 5-10 min, work with those around you
- ▶ Assume: $w_1 = 2$, $E_1 = 100$, $\epsilon_1 = 2$, $f^h = 0.5$, $f^p = 0.25$

1. If $n_1 = 10$, what are a firm's profits?

2. If $n_1 = 20$, what are a firm's profits?

3. Why did profit fall by more than one half when we doubled n_1 ?

Two-country model with exporters

- ▶ Add a second country to the model
 - ▶ Today: countries are identical [do not have to be]
- ▶ Still no MNEs, $m_1 = m_2 = 0$
- ▶ Allow domestic firms to export

- ▶ How is exporting different than selling locally?
 - ▶ Exporting is more expensive: tariffs, transport, etc.
 - ▶ Higher costs mean smaller market share
 - ▶ s_i = share of domestic firm in country i
 - ▶ $\rho \times s_i$ = share of exporter selling in country i
 - ▶ $\rho \leq 1$, so exporter has smaller share than domestic firm

Two-country model with exporters

- ▶ The rest of the model is the same as closed economy
- ▶ Profit of a firm in country 1 are

$$\pi_1 = \frac{s_1 E_1}{\epsilon_1} + \frac{\rho s_2 E_2}{\epsilon_2} - w_1 f_1$$

- ▶ π_1 = profit from selling at home + profit from exporting - fixed costs
 - ▶ Again, need to solve for shares
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- ▶ If n_1 and n_2 firms, what are shares?

Finding shares

- ▶ How many firms sell in country 1?
 - ▶ n_1 domestic firms with share s_1
 - ▶ n_2 exporters with share ρs_1
- ▶ Shares must sum to 1

$$1 = n_1 \times s_1 + n_2 \times \rho s_1$$

Computing profits

- ▶ Domestic firm share in country 1: $s_1 = \frac{1}{n_1 + \rho n_2}$
- ▶ Export from 2 selling to 1 has share: ρs_1
- ▶ Since countries are identical
 - ▶ Domestic firm share in country 2: $s_2 = \frac{1}{n_2 + \rho n_1}$
 - ▶ Exporter from 1 selling to 2 has share: ρs_2
- ▶ Now compute profits

$$\pi_1 = \frac{s_1 E_1}{\epsilon_1} + \frac{\rho s_2 E_2}{\epsilon_2} - w_1 f_1$$

- ▶ ... What are the fixed costs of a domestic firm? Of an exporter?

In class problem: Two-country economy

- ▶ 5-10 min, work with those around you
 - ▶ $w_1 = w_2 = 2, E_1 = E_2 = 100, \epsilon_1 = \epsilon_2 = 2, f^h = 0.5, f^p = 0.25, \rho = 0.9$
1. If $n_1 = 10$ and $n_2 = 10$, what are country 1 firm's profits, π_1 ?
 2. In this model, 20 firms sell to country 1. In the closed economy example, 20 firms sell to country 1. Why is s_1 different in the two models?

Takeaways

- ▶ Model of identical firms competing in a market
- ▶ Two stage model: We worked on stage 2 today
- ▶ Closed economy model
 - ▶ How number of firms affects profits
- ▶ Open economy model
 - ▶ Exporters compete with domestic firms
 - ▶ Exporters are disadvantage because they pay higher costs
- ▶ Key to solving both models is to find market shares