

Multinationals and the Globalization of Production

Leontief Production

Penn State // Fall 2017

Administrative things

- ▶ Sign in to Arkaive.com (course code: 84ST)
 - ▶ If not working, sign in up front

- ▶ Exam I (65 submissions)
 - ▶ Pick up from the front table
 - ▶ Mean = 71, max = 99
 - ▶ [25th, 50th, 75th] percentile = [65, 76, 83]
 - ▶ Solutions online

True/False

1. Our model of horizontal FDI predicts that Walmart should be a multinational firm.

True/False

2. Apple, Inc. designs iOS — the iPhone operating system — in California and the iPhone itself is assembled by Foxconn (a company unaffiliated with Apple). iOS is one of Apple's location advantages.

True/False

3. Most R&D performed by multinationals takes place in high-income countries.

True/False

4. According to our model of horizontal FDI, the markup in the gasoline industry should be larger than the markup in the snack foods industry.

Question 5: Export or MNE?

- a. How should the firm serve country 2? As a multinational or an exporter? Provide a calculation to support your answer.
- b. A second US firm would also like to sell its product in country 2. Again, using the model of horizontal direct investment, the relevant data are: $E_2 = 1000$, $\epsilon_2 = 4$, $w_{us} = 1.5$, $w_2 = 1.75$, $f^p = 10$, $f^e = 1.25$, $\varphi = 2.0$, and $\tau = 0.2$. How should the firm serve country 2? Provide a calculation to support your answer.

Question 5: Export or MNE?

- c. What is different about the two firms? Give the economic intuition why this difference leads the firms to choose different ways of serving the foreign market.

Question 6: FDI and growing countries

- a. In the last few decades, Chinese GDP per capita has been growing rapidly. How should we expect inward foreign direct investment to change in China?

- b. State the relevant version of the proximity-concentration tradeoff that justifies your answer to part a.

- c. Explain how the proximity-concentration tradeoff accounts for your answer in part a.

Question 7: Export platform in the UK or Slovakia?

- a. Where will the US firm locate its plant? What is the total profit earned by the firm in these two markets?
- b. Where should the firm locate its plant when $\tau_{uk,sk} = \tau_{sk,uk} = 0.0$? Explain your answer.

Regrading

- ▶ Points added wrong? See me after class.
- ▶ Would like a question regraded?
 - ▶ Look over the solution (on course website).
 - ▶ Complete exam regrade request form (on course website).
 - ▶ On the form, explain why your answer is correct.
 - ▶ Turn in regrade form and your exam to me.
 - ▶ Entire exam is regraded. Score could decrease.
- ▶ Deadline for regrade request: end of class Tuesday 10/17

Roadmap

- ▶ Past: Horizontal FDI/export platform
 - ▶ FDI for market access
- ▶ Present: Vertical FDI: break up production across countries
 - ▶ FDI to save on factor costs (factors = inputs)
 - ▶ Need a model with multi-stage production
- ▶ Today: work through the production function
- ▶ Thursday: start on vertical FDI

Fixed-proportions production function

- ▶ Often called the *Leontief production function*
- ▶ Big idea: Inputs are used in fixed proportions
 - ▶ No ability to substitute inputs
- ▶ Examples (simplified)
 - ▶ 4 tires + 1 motor + 2 windshield wipers = 1 car
 - ▶ 2 sq. yds. denim + 1 zipper + 3 ft. thread = 1 pair jeans
 - ▶ 1 screen + 1 keyboard + 1 case = 1 laptop
- ▶ Too few inputs → no output (car with 3 tires?)
- ▶ Too many inputs → inputs go unused (jeans with two zippers?)

Fixed-proportions production function

- ▶ Output = x
- ▶ Two inputs
 - ▶ ℓ_s = skilled labor
 - ▶ ℓ_u = unskilled labor
- ▶ Unit input requirements
 - ▶ θ_s = hours of skilled labor needed to make one unit output
 - ▶ θ_u = hours of unskilled labor needed to make one unit output

$$x = \min \left\{ \frac{\ell_u}{\theta_u}, \frac{\ell_s}{\theta_s} \right\}$$

Fixed-proportions production function

- ▶ $\theta_u = 2$ and $\theta_s = 1$

$$x = \min \left\{ \frac{\ell_u}{2}, \frac{\ell_s}{1} \right\}$$

- ▶ How much output is produced from
 - ▶ hiring 2 hours of unskilled labor and 1 hour of skilled labor?
 - ▶ hiring 3 hours of unskilled labor and 1 hour of skilled labor?
 - ▶ hiring 1 hour of unskilled labor and 1 hour of skilled labor?
 - ▶ hiring 4 hours of unskilled labor and 2 hours of skilled labor?

Factor intensity

- ▶ Two goods, a and b
- ▶ Good a : $\theta_{ua} = 5$ and $\theta_{sa} = 1$
- ▶ Good b : $\theta_{ub} = 1$ and $\theta_{sb} = 10$
- ▶ Good b is *skilled-labor* intensive
 - ▶ Good a skilled to unskilled labor ratio = $1/5$
 - ▶ Good b skilled to unskilled labor ratio = $10/1$
- ▶ Factor intensity is a relative concept

Unit costs

- ▶ How much does it cost to produce one unit?
- ▶ Wages w_s and w_u
- ▶ The unit cost is

$$c(w_u, w_s) = \theta_u w_u + \theta_s w_s$$

- ▶ Note: the unit cost is a function of the wages

Two stage production

- ▶ The final good is made up of two parts
 1. Component parts b (b for circuit *boards*)
 2. Assembly services a
- ▶ 1 unit of parts and 1 unit of assembly combine to make the final good

$$x = \min \{x_a, x_b\}$$

- ▶ The unit cost of the final good is

$$c(w_u, w_s) = c_a(w_u, w_s) + c_b(w_u, w_s)$$

In class problem: Where to produce?

- ▶ $\theta_{ua} = 5$ and $\theta_{sa} = 1$; $\theta_{ub} = 1$ and $\theta_{sb} = 10$
- ▶ Two locations that differ by wages
 - ▶ Location 1: $w_u = 7$ (\$/h) and $w_s = 25$ (\$/h)
 - ▶ Location 2: $w_u = 2$ (\$/h) and $w_s = 30$ (\$/h)
- ▶ What is the unit cost of the final good in location 1?
- ▶ What is the unit cost of the final good in location 2?
- ▶ What is the unit cost of the final good when components and assembly are carried out in the cheapest locations?

Takeaways

- ▶ Leontief production = fixed input proportions
- ▶ Leontief production functions have easy to compute unit costs
- ▶ Looking ahead to vertical FDI
 - ▶ Factor intensity differences and factor cost differences generate desire to move parts of the production process across locations