

# Multinationals and the Globalization of Production

## *Internalization*

Penn State // Fall 2017

## Administrative things

- ▶ Sign in to Arkaive.com (course code: 84ST)
  - ▶ If not working, sign in up front
- ▶ PS #5
  - ▶ Due end of class December 7
  - ▶ Posted on course website
- ▶ Final exam
  - ▶ Review session Thursday December 7
  - ▶ Monday December 11, 8:00AM–9:50AM
  - ▶ Osmond Lab 101
- ▶ SRTE open now until December 10

## Roadmap

- ▶ Past: Where do firms locate?
  - ▶ FDI for market access (Horizontal/Export platform)
  - ▶ FDI for factor cost savings (Vertical)
  - ▶ FDI for tax motives
- ▶ Present: Why do firms own affiliates?
  - ▶ Why not purchase from another firm?
  - ▶ Today: hold-up problems and contracts

## OLI framework

- ▶ Being a multinational comes with costs
- ▶ What are the benefits?
- ▶ For a firm we ask what *advantage* comes from
  - ▶ ownership? [Patents, brands, good ideas...]
  - ▶ location? [HFDI, VDFI, tax FDI]
  - ▶ internalization?

What is the benefit from **owning** the foreign producer?

## The hold-up problem

- ▶ Many reasons a firm may want to own an affiliate
- ▶ Today, study contract incompleteness
- ▶ Decision makers
  - ▶ A final-good firm that needs component parts
  - ▶ A potential supplier firm that can produce components cheaper than final good firm
- ▶ Components
  - ▶ Components are specific to the final-good firm: value to other firms is very low (zero, for simplicity)
  - ▶ Hard for an outside party to verify component quality

## Contract difficulties

- ▶ Suppose final-good firm and supplier write contract that specifies some dimensions of quality, quantity to produce, and the price
- ▶ Supplier produces the components
- ▶ Both firms now have an incentive to renegotiate the contract
  - ▶ Final good firm: the (final-good specific) components are worthless to the supplier; wants a lower the price
  - ▶ Supplier: final-good technology worthless without components; wants a higher price
  - ▶ These are “hold up” problems
- ▶ A good contract keeps them from being able to do this
- ▶ Difficulty in verifying quality makes it hard to write a good contract

## Fisher Body & GM

- ▶ Early 1900s: Fisher Body Corp. supplies auto bodies to GM



## Fisher Body & GM

- ▶ Early 1900s: Fisher Body Corp. supplies auto bodies to GM
- ▶ Fisher is the exclusive dealer of bodies to GM
  - ▶ GM promised to buy bodies only from Fisher for 10 years at cost + margin
- ▶ In 1920, unforeseen increase in demand for GM cars: value of Fisher body parts more valuable
- ▶ Fisher demands higher price as “costs” have increased
  - ▶ Hard to verify if costs really increased



## Integrated firms

- ▶ One way to avoid hold up is to make the product yourself
  - ▶ We say the firm is *integrated*
- ▶ If an employee/manager attempts to hold up the firm, fire them
  - ▶ Better able to incentivize employees
  - ▶ Integration may have other costs
- ▶ In 1926, GM acquires Fisher Body

## A hold-up model

- ▶ A final-good firm  $i$  owns the final good production function

$$q = A_i m^\alpha$$

- ▶ Need components  $m$  to produce (if  $m = 0$ , then  $q = 0$ )
- ▶ Sell the final good for price  $p$

## Components

**Relationship specificity.** The components are relationship specific. The components are specially tailored to the final-good firm's application. The components have no value to anyone else but the final-good firm.

**Difficult verification.** It is difficult to verify the quality of the components. The final-good firm and the supplier can judge the quality of the components, but outside parties — like a court — cannot.

- ▶ This will make contracting difficult

## Component costs

- ▶ A potential *supplier* firm can produce components for cost  $p_m$  per unit
- ▶ The final-goods firm can produce components
  - ▶ Cost of  $\gamma p_m$  per unit,  $\gamma > 1$
  - ▶ Fixed cost of operating the production line  $f^I$
- ▶ Buying from a supplier is “cheaper,” but not necessarily the best. . .

## Contracting environment

- ▶ In everything we have done (and in most of your econ. classes)
  - ▶ Contracts are complete and enforceable
  - ▶ Can write a contract that anticipates any future outcome
  - ▶ Contract is always followed
- ▶ A useful abstraction when studying other decisions
- ▶ But incomplete (or unenforceable) contracts are a feature of reality
- ▶ Today we want to relax this assumption

## Contracting in our model

- ▶ Assumption: Hard to verify quantity of components  $m$ 
  - ▶ Think of  $m$  as a quantity-quality mixture
- ▶ Final-good firm and supplier know if components are right, but outside parties, like a judge cannot tell
- ▶ This makes it impossible to enforce the contract
  - ▶ This is the extreme case; could have partial enforceability
- ▶ The firms understand that the contract cannot be enforced, so they do not write the contract in the first place

## Hold up

- ▶ No contract + relationship specificity → hold up problem
- ▶ After components are produced:
- ▶ Final-good firm: “these components are junk, lower your price”
  - ▶ Supplier has already incurred cost of producing
  - ▶ Parts have no value to other firms
- ▶ Supplier: “you need my components to produce, raise the price”
  - ▶  $m = 0 \rightarrow q = 0$
  
- ▶ Firms will resort to bargaining

## Final-good firm choices

- ▶ Given this setup, firm can choose to
  1. **Integrate.** Both stages of production are done within the final good firm.
  2. **Outsource.** Contract with an arm's-length firm (the supplier) to produce the components and produce the final good in house.
- ▶ Firm will choose whichever structure maximizes profit
- ▶ We will study 3 choice problems
  1. Complete contracts (set a benchmark, not available to the firms)
  2. Outsourcing
  3. Integration



## Best-case scenario

- ▶ Suppose we could write complete and enforceable contracts
- ▶ Such a contract would maximize joint profit
  - ▶ Would need a rule for splitting the joint profit
  - ▶ We do not need to know the profit split
  - ▶ We only want to know the “best” choice of  $m$
- ▶ Provides a benchmark to measure the distorted decisions in the no-contracts case

## Best-case scenario

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- ▶ Choose  $m$  to maximize joint profit

$$\max_m \pi_F + \pi_S = pA_i m^\alpha - p_m m.$$

- ▶ First-order condition

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- ▶ First-order condition

$$\alpha p A_i m^{\alpha-1} - p_m = 0$$

- ▶ Solution is the amount of  $m$  that delivers the most joint profit

$$m^* = \left( \frac{\alpha p A_i}{p_m} \right)^{\frac{1}{1-\alpha}}$$

## Numerical example

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- ▶  $\alpha = 0.75, A = 2, p_m = 1.1, p = 1.5$
- ▶ What is  $m^*$ ? What are the associated quantity of final goods  $q^*$ , revenues  $R^* = p^* q^*$ , and joint profits  $\pi_S^* + \pi_F^*$ ?

## Option 1: Outsourcing

- ▶ What are profits if the final-good firm buys from the supplier?
- ▶ Contracts are not possible
  1. The supplier chooses how much  $m$  to produce.
  2. The final good firm and supplier bargain over the revenue the components will generate.
  3. The final good is made and sold at price  $p$ .
  4. The revenue from selling the final good is split between the two firms according to the deal struck in step 2.
- ▶ We are assuming the deal reached in step 2 is enforceable
  - ▶ Outsider can observe revenue earned from selling  $q$

## Bargaining

- ▶ How does bargaining work?
- ▶ Potentially very complicated
- ▶ Something simple
  - ▶ Supplier has bargaining power  $\beta \in [0, 1]$
  - ▶ Final-good firm has bargaining power  $1 - \beta$
- ▶ The outcome of a *Nash Bargaining* protocol yields
  - ▶ Supplier gets share  $\beta$  of revenue
  - ▶ Final-good firm gets share  $1 - \beta$  of revenue

## Supplier choice problem

- ▶ Supplier understand it gets  $\beta$  of future revenues
- ▶ Choose  $m$  to maximize its profits (not joint profits!)

$$\max_m \pi_S = \beta p A_i m^\alpha - p_m m$$

- ▶ First-order condition

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- ▶ First-order condition

$$\alpha \beta p A_i m^{\alpha-1} - p_m = 0$$

- ▶ Solution

$$m^B = \left( \frac{\alpha \beta p A_i}{p_m} \right)^{\frac{1}{1-\alpha}}$$



## Underprovision of $m$

- ▶ The suppliers choice is

$$m^B = \left( \frac{\alpha \beta p A_i}{p_m} \right)^{\frac{1}{1-\alpha}} = \beta^{\frac{1}{1-\alpha}} \left( \frac{\alpha p A_i}{p_m} \right)^{\frac{1}{1-\alpha}} = \beta^{\frac{1}{1-\alpha}} m^*$$

- ▶ Since  $\beta < 1$  and  $\alpha < 1 \rightarrow \beta^{\frac{1}{1-\alpha}} < 1$
  
- ▶ The supplier does not produce as many components (or enough quality) because it knows it cannot earn its full value in the bargaining stage

## In-class example: Outsourcing

- ▶ Take 5 minutes, work with someone next to you
- ▶  $\alpha = 0.75, A = 2, p_m = 1.1, p = 1.5, \beta = 0.7$
- ▶ What are  $m^B, q^B, R^B, \pi_F^B,$  and  $\pi_S^B$ ?
- ▶ How do joint profits compare to those in the best-case scenario?

## Inefficiency

- ▶ Incomplete contracts  $\rightarrow$  under production ( $q^* = 17.1, q^B = 5.9$ )
- ▶ And lower joint profit ( $\pi^* = 6.45, \pi^B = 4.17$ )
  - ▶ Not only about bargaining
  - ▶ The size of the profit to bargain over has shrunk
- ▶ If the firms could write a contract both could be better off
  - ▶ Best production yields ( $6.45 - 4.17 =$ ) 2.28 more profit
  - ▶ Can give **both** firms more profits compared to bargaining
  
- ▶ Better contracts lead to more efficient production

## Institutional quality

- ▶ In our case, can't enforce contract because the component quality is difficult to observe
- ▶ Poor contract enforcement can arise from poor legal institutions
- ▶ Attempt to measuring institutional quality
  - ▶ World Bank's [Doing Business](#)

## Option 2: Integrate the firm

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- ▶ Final good firm produces components
- ▶ Avoids hold-up bargaining problem, pays higher costs
- ▶ Final-good firm chooses  $m$  to solve

$$\max_m \pi_F = pA_i m^\alpha - \gamma p_m m - f^I$$

- ▶ First-order condition

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- ▶ First-order condition

$$\alpha p A_i m^{\alpha-1} - \gamma p_m = 0$$

- ▶ Solution

$$m^I = \left( \frac{\alpha p A_i}{\gamma p_m} \right)^{\frac{1}{1-\alpha}}$$

## Choice of $m$

- ▶ The final-good firm chooses

$$m^I = \left( \frac{\alpha p A_i}{\gamma p_m} \right)^{\frac{1}{1-\alpha}} = \left( \frac{1}{\gamma} \right)^{\frac{1}{1-\alpha}} m^*$$

- ▶ Again, less  $m$  is chosen compared to  $m^*$
- ▶ The reason is different, though,
  - ▶ Incentives are aligned: marginal revenue = marginal cost
  - ▶ Marginal cost is higher  $\gamma > 1$

## In-class example: Integration

- ▶ Take 5 minutes, work with someone next to you
- ▶  $\alpha = 0.75, A = 2, p_m = 1.1, p = 1.5, \beta = 0.7, \gamma = 1.3, f^I = 0.25$
- ▶ What are  $m^I, q^I, R^I, \pi_F^I$ ?
- ▶ Should the final good firm integrate, or purchase from a supplier, despite the ex post bargaining?



## Taking stock

- ▶ Best-case (but unobtainable)  $m$

$$m^* = \left( \frac{\alpha p A_i}{p_m} \right)^{\frac{1}{1-\alpha}}$$

- ▶ When outsourcing, distorted by bargaining

$$m^B = \beta^{\frac{1}{1-\alpha}} m^*$$

- ▶ When integrating, face higher costs

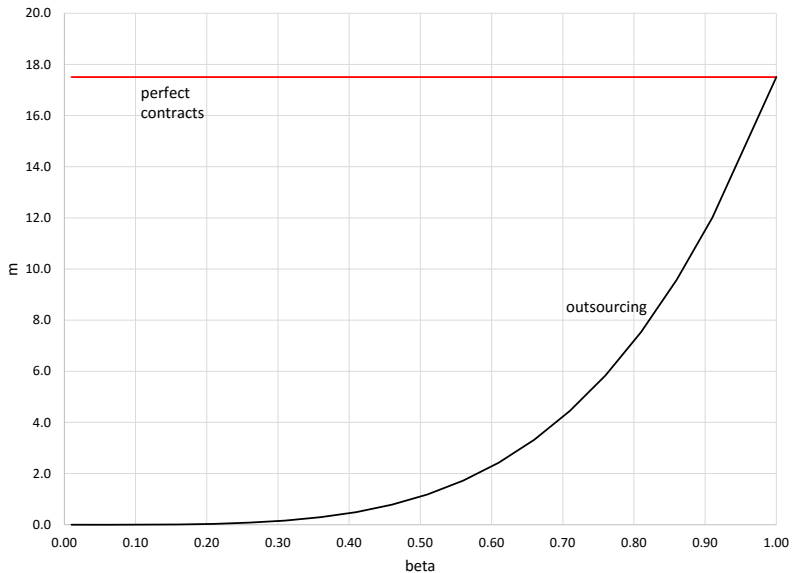
$$m^I = \left( \frac{1}{\gamma} \right)^{\frac{1}{1-\alpha}} m^*$$

- ▶ Both options generate smaller joint profit than the best-case

## Bargaining power effects

- ▶  $\beta$  is not a choice in this model
- ▶ But we can learn more about the model by changing  $\beta$

## Input choice and $\beta$

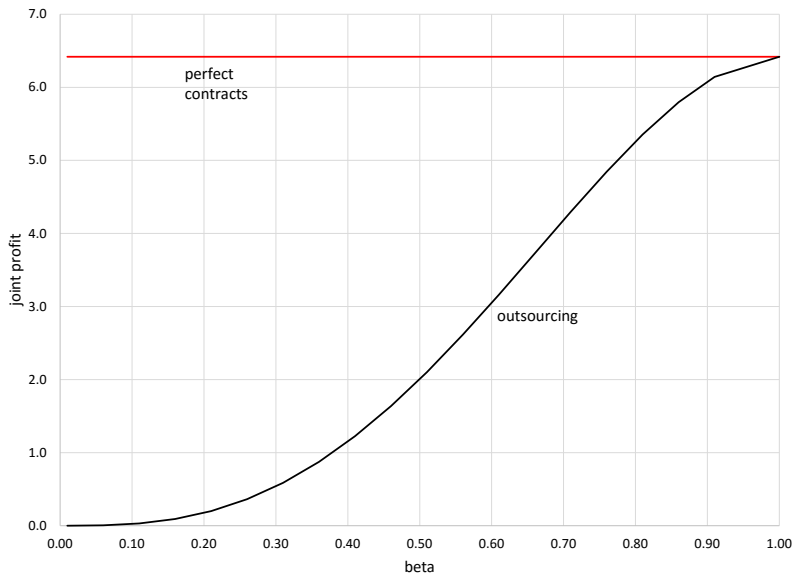


## Bargaining power effects

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- ▶  $\beta$  is not a choice in this model
- ▶ But we can learn more about the model by changing  $\beta$
- ▶ As we increase  $\beta$ 
  - ▶ Supplier delivers more inputs ( $\beta = 1 \rightarrow m = m^*$ )

## Joint profit and $\beta$

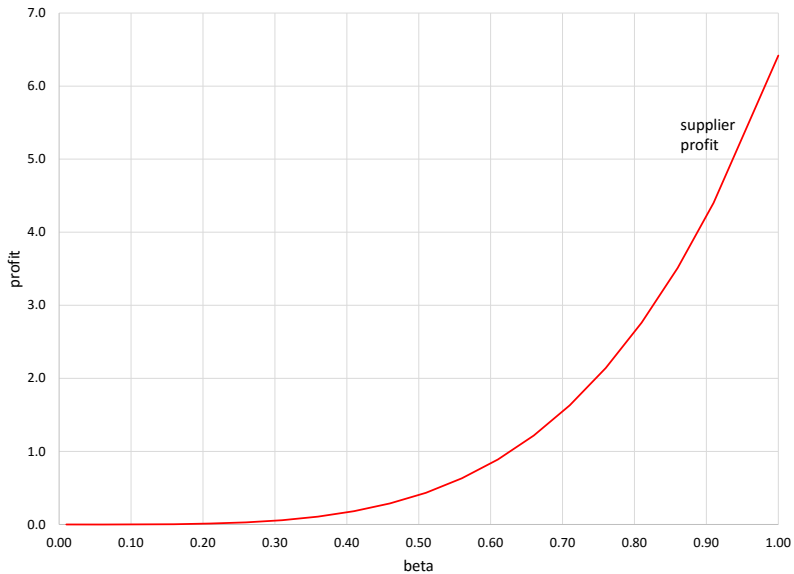


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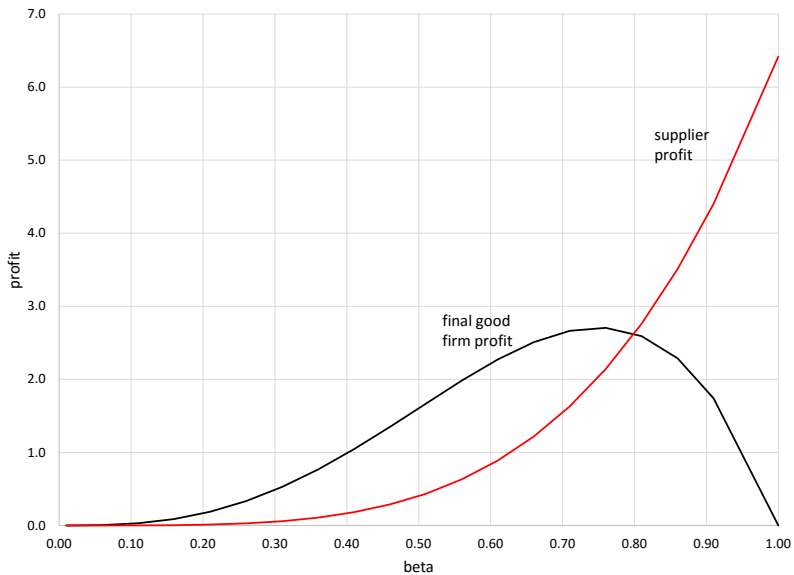
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  - ▶ Joint profit increases ( $\beta = 1 \rightarrow \pi_F^B + \pi_S^B = \pi_F^* + \pi_S^*$ )

## Profit and $\beta$



## Profit and $\beta$





## Bargaining power effects

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  - ▶ Joint profit increases ( $\beta = 1 \rightarrow \pi_F^B + \pi_S^B = \pi_F^* + \pi_S^*$ )
  - ▶ Supplier profit increases
  - ▶ Final-good firm profit increases, then decreases

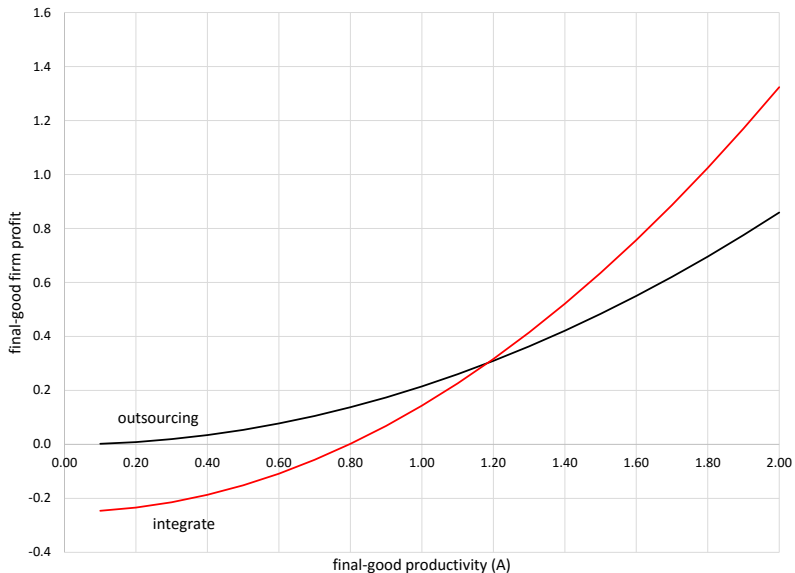
## Bargaining power

- ▶ Tension between two forces
  1. Increase  $\beta \rightarrow$  improve supplier incentives
  2. Increase  $\beta \rightarrow$  give up share of revenues
- ▶ When  $\beta$  is low, 1. dominates
- ▶ When  $\beta$  is high, 2. dominates

## Final-good firm productivity

- ▶ Final-good firms differ by productivity,  $A_i$
- ▶ Increasing  $A$  increases profit level,  $\pi_F$
- ▶ Fixed cost of component production
- ▶ Leads to “cutoff” productivity for make/buy decision

## Final-good firm profit and productivity



## Apple

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- ▶ Apple Inc., does not own Foxconn
- ▶ iStuff manufacturing requires very specialized equipment
  - ▶ A relationship-specific investment
  - ▶ Subject to under-investment by Foxconn
- ▶ Apple invests in equipment instead of Foxconn
  - ▶ Buys/builds equipment, places it in Foxconn
  - ▶ Could lead Foxconn to hold up Apple
- ▶ Apple “CapEx”  $\approx$  10 bil. USD per year ( $\approx$  GM CapEX)
- ▶ Bonus: Use tax-deferred foreign profits to make investments!
- ▶ Not Apple’s only reason to own equipment...

## Summary

- ▶ When contracts are difficult to enforce...
  - ▶ Poor enforcement from government
  - ▶ Hard to verify contract parameters
- ▶ ...and investment is relationship specific
- ▶ Hold-up problems tend to lead to under-investment
- ▶ Ex post bargaining distorts firm incentives
- ▶ Inefficient production shrinks joint profit
- ▶ Solutions
  - ▶ Integrate all production into the firm
  - ▶ Firm with more bargaining power makes bigger investment
  - ▶ Next up: License the technology