

Advanced Game Theory

3. Hold Up, Ownership and Vertical Integration

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Organizational design

- Should you integrate with your supplier?
- What is the alternative to integration?
 - ▶ how can two firm regulate their relationship in case they are not integrated?

What does it mean to “own” something?

Ownership

The residual right of control.

- i.e. the right to decide what to do with an asset in **case a contingency not specified in a previous contract occurs.**
- **Key problem:** contracts are often incomplete. Not every relevant contingency can be specified in it.
- What can be specified in a contract depends on:
 - ▶ technology: it allows to measure some types of investments,
 - ▶ law: prevents certain types of clause to be written.

Today: contract incompleteness as determinant of firms' organizational structure

Contract incompleteness



Hold up problem



Vertical integration

Leading example: Fisher body and GM



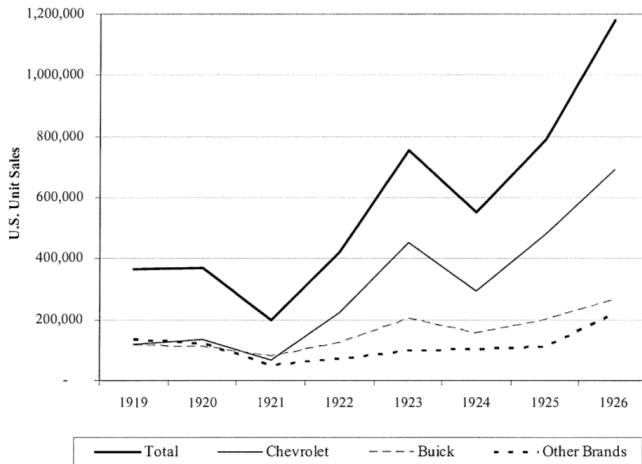
Fisher body and GM

- Fisher body was an independent supplier of GM.
- **Problem:**
 - ▶ GM wanted Fisher body to expand its capacity,
 - ▶ Doing so required substantial *GM-specific* investment,
 - ▶ Fisher body fears to be held up by GM.

Fisher body and GM

- **Solution:** in 1919 they negotiate a 10 years contract.
 - ▶ Fisher Body makes significant *GM-specific* investments and becomes the only supplier able to produce certain types of car bodies for GM.
 - ▶ GM agrees to rely exclusively on Fisher Body for certain types of car bodies.
 - ▶ GM agrees to pay for car bodies using a cost-plus formula.
 - ★ the “costs” used to compute the remuneration of Fisher body excluded capital costs.
 - ★ the “plus” was meant to cover capital costs.
- 1922: huge surge in demand for the GM models.

GM Unit sales



Source: "The Economic Lessons of Fisher Body-General Motors" by Benjamin Klein

1920 Chevrolet



Fisher body and GM (cont.)

- The surge in demand leads to a dispute between GM and Fisher body
 - ▶ GM wants Fisher Body to build new plants within existing GM facilities.
 - ▶ Fisher Body wants to expand its existing plants.
- Fisher Body build new plant within existing facilities but GM covers a large fraction of the capital cost.
 - ▶ Because of the cost-plus formula, huge wealth transfer from GM to Fisher Body
- 1926: GM buys Fisher Body

Takeaway points

- 1 **Problem 1:** the original agreement did not include a provision for “what happens in case of a surge in demand”
 - ▶ contracts are, in general, *incomplete*, as they do not include all possible contingencies.
- 2 **Problem 2:** GM could not buy from a different supplier / Fisher body could not sell to another car maker.
 - ▶ Each side could **hold up** the other.
- 3 **Way out:** GM merges with Fisher Body
 - ▶ GM decides on the location for Fisher Body’s factories.

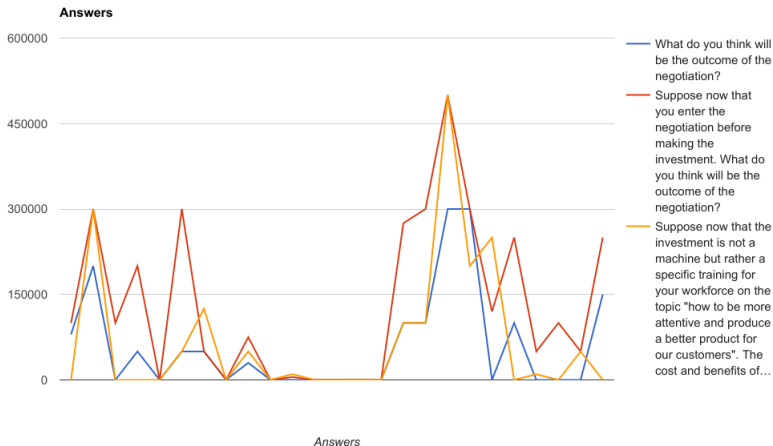
Today's game: investing and bargaining vs bargaining and investing

The problem

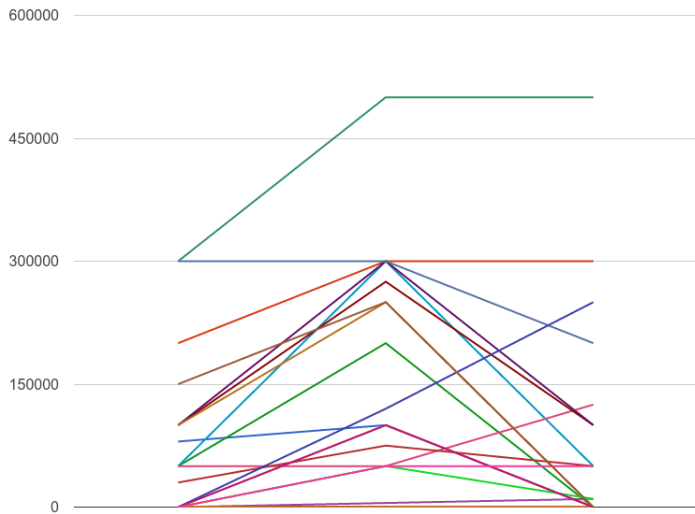
You are one of the supplier of ACME labs, a firm producing fireworks. You just spent 100k USD in a new machine. This machine produces better quality powder to be used in the production of fireworks. This machine does not change your variable cost of production but generates savings for ACME equal to 500k USD (over the lifetime of the machine). You want to be compensated for the investment made and therefore you start a negotiation with ACME labs.

- 1 What do you think will be the outcome of the negotiation?
- 2 Suppose now that you enter the negotiation before making the investment. What do you think will be the outcome of the negotiation?
- 3 Suppose now that the investment is not a machine but rather a specific training for your workforce on the topic "how to be more attentive and produce a better product for our customers". The cost and benefits of this investment are the same described above. You have not made the investment yet. What do you think will be the outcome of the negotiation?

Your answers



Your answers



A model of bargaining with investment

A simple model of hold up

- Buyer and seller, both with outside options equal to zero
 - ▶ i.e. there are no alternative buyers or alternative sellers.
- The seller can invest or not invest:
 - ▶ if the seller invests, the buyer valuation of the object is \bar{v} .
 - ▶ if the seller does not invest, the buyer valuation of the object is $\underline{v} < \bar{v}$.
- Cost of investing is $c < \bar{v} - \underline{v}$
 - ▶ Investing is efficient: the benefit of investing are greater than the cost of investing.
 - ▶ **Problem**: the benefit of investing accrue to the buyer, while the costs accrue to the seller.

Case 1: complete contracts

- Buyer and seller bargain both about the price and about whether there will be an investment.
 - ▶ investment/no-investment can be specified in a contract, and courts can inflict a punishment in case of a breach of contract.
- The problem can be split in two:
 - ① *Maximize the pie* (or better, *total surplus*): specify in a contract that the seller will invest.
 - ② *Split the pie*: agree on a price that shares the surplus equally.
- What is the buyer's BATNA? What is the maximum price he is willing to accept? \bar{v}
- What is the seller's BATNA? What is the minimum price he is willing to accept? c .
- If the outcome of the negotiation is the midpoint of the ZOPA, what is the agreed price? $p = \frac{\bar{v}+c}{2}$

Case 2: incomplete contracts with pre-bargaining investment

- It is not possible to specify the level of investment in a contract. The seller decides whether to invest or not, and then the players bargain on the price.
- **If the seller did not invest:**
 - ▶ Buyer's BATNA (expressed as price): v
 - ▶ Seller's BATNA (expressed as price): 0
 - ▶ Transaction price: $\frac{v}{2}$
- **If the seller invested:**
 - ▶ Buyer's BATNA (expressed as price): \bar{v}
 - ▶ Seller's BATNA (expressed as price): 0
 - ▶ Transaction price: $\frac{\bar{v}}{2}$
- The seller invests if $c < \frac{\bar{v}-v}{2}$, and does not invest otherwise.

Case 2: incomplete contracts with pre-bargaining investment.

The seller is being **held up** by the buyer: the buyer does not reward the seller for the investment made.

Anticipating this, the seller may fail to invest.

Inability to contract on investment creates a hold up problem, and generates an inefficiently low level of investment.

Case 3: incomplete contracts with post-bargaining investment.

- It is not possible to specify the level of investment in a contract. Seller and buyer agree on a price, and then the seller decides whether to invest.
- Claim: the seller never invests, price is $\frac{v}{2}$
 - ▶ why?

Case 4: Vertical integration: buyer “buying” the seller.

- We add a period 0 to the game, in which buyer and seller can vertically integrate (i.e. the buyer can buy the seller).
 - ▶ in case of vertical integration, **the buyer decides on the level of investment.**
 - ▶ assume $c > \frac{\bar{v}-v}{2}$ (in case 2 above, the seller does not invest in quality).
- **suppose buyer and seller integrate vertically:** the buyer invests. The integrated firm earns $\bar{v}-c$.
- **suppose buyer and seller do not integrate:** the seller does not invest. The players bargain and earn $\frac{v}{2}$ each.

Case 4: Vertical integration: buyer “buying” the seller.

- Surplus generated by the vertical integration

$$\underbrace{\bar{v} - c}_{\text{payoffs in case of integration}} - \underbrace{\left[\frac{v}{2} + \frac{v}{2} \right]}_{\text{payoffs in case of no agreement = BATNA}} = \bar{v} - \underline{v} - c > 0$$

- They should **integrate and share the surplus equally**
 - exercise: what price will the buyer pay for the seller?

Main takeaway points

- 1 If contracts are complete, there is no reason to integrate.
 - ▶ Ownership structure does not affect payoffs.
- 2 Vertical integration may be beneficial if some relevant investments cannot be specified in a contract.

Summary for today

Summary

- **Hold up:** relation-specific investment may lead to the hold up problem (and underinvestment) when contracts are incomplete.
 - ▶ i.e. when some relevant aspects cannot be specified in a contract.
- **Vertical integration:** as a way to solve the hold up problem.
- **Ownership:** is well specified only if contracts are incomplete
 - ▶ otherwise you can always replicate a “ownership” relationship with a contract - and it does not matter who owns what.

Example: Apple

- Outsource all the production:
 - ▶ no point in bothering “owning” a factory when you can write fairly “complete” contracts with the suppliers.
- Keep a tight control over its retail business:
 - ▶ hard to explain in a contract what the “apple experience” for a customer should be.

Administration

Administration

- The next pre-class game requires some input from me. You will receive an email from me with your “evaluation”. Keep it confidential.
- The next in-class game requires some input from me. You will receive an email from me with your “type” in the next couple of days. Keep it confidential.
 - ▶ Also, next time bring a laptop/tablet.