

ADVANCED MICROECONOMICS: LECTURE NOTE 8

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2022 Spring

- 1 So far we have considered models in which the agents face **no constraints on the form of contracts** they can agree upon: the only limit is observability.
- 2 The contracts we considered can include prescriptions for every possible instance (or “state of the world”). These contracts are called **complete**.
- 3 There is controversy on whether second-best contracts under adverse selection and moral hazard (the so-called comprehensive contracts in some literature) are complete or not.
 - Since the second-best contracts are not based on agent's type θ or action a (state of the world), they are not complete.
 - The principal could suggest an action for each type. Although the principal cannot observe types (types are not contractible), he can deduce them. Thus, the second-best contracts are complete from this point of view.
- 4 Most contracts in the real world are incomplete. In most situations, it is virtually **impossible, ex ante, to consider explicitly all the possible future events**, either because the agents ignore even the possibility of certain events or because there are too many possible instances and there is no contract that can take them all into account.
 - 出现了 covid-19, 工作受到影响, 要不要延期? 这个也没法提前写, 因为设计合约的时候没法想到 covid-19。只能等到这个事情出现了, 再临时协商。
 - 解释权归 XXX。

When contracts are incomplete, institutional arrangements such as ownership titles, decision-making rules and authority matter.

- 5 Tirole (1999) provides a good example.
 - Patents exist to reward innovation.
 - In a world of complete contracts, innovation could be rewarded with a prize proportional to the social value of the innovation.
 - It is difficult to estimate this value when the innovation is introduced (and also after), and it would be hard to establish a reliable institution providing this prize.
 - Patents are a less-than-socially-efficient way to reward innovation. Patents give monopoly power, but information is a public good and therefore efficiency would require to distribute it freely.
- 6 The key difference between complete contract and incomplete contract is whether there are “**nondiscrivable states**”.
- 7 Reasons for contractual incompleteness:

- Bounded rationality: Parties cannot write long-term state-contingent contracts. They cannot foresee all possible future states.
 - Transaction cost: Conditioning long-term contract on all possible future states prohibitively costly.
 - Nonverifiability: Some information observable but not verifiable vis-a-vis court and mechanism cannot be used
- 8 Incomplete contracts have been primarily considered in the context of organizational economics: the study of the determinants of [the size of the firm](#) and [the allocation of authority within a firm](#).

1 Traditional theories on the firm

9 Neoclassical theory of the firm:

- A firm is a production function (black box) that transforms inputs into outputs.
- Manager of the firm maximizes profits.
- No incentive problems within the firm.
- U-shaped average cost function (because some factors of production cannot be redoubled) → boundaries of the firm are determined by the minimum of the average cost curve.

10 Problems:

- Theory explains the size of a production plant but not the size of the firm.
- Coase: If the market is an efficient method of resource allocation, then why do so many transactions take place within firms?
- “Selective intervention” and “Williamson Puzzle”:
 - Large firm employs CEO who controls subdivisions.
 - Let subdivisions produce independently. Then welfare remains the same as if subdivisions were independent firms.
 - But it is possible to selectively intervene and coordinate production if a Pareto improvement exists.
 - Hence, large firm will be never worse off but sometimes better off than independent firms.
 - Why isn’t it always optimal to merge two firms?
- The “firm” itself is not well defined.
 - What is the difference between a contract of the owner of the firm with his workers and a contract of the owner with his suppliers?
 - Why do the workers belong to the firm, while the suppliers are outside of the firm?
 - What determines the boundary of the firm?
- Samuelson: In a neoclassical world it does not make a difference whether the capitalists hire workers or whether the workers hire capitalists.

11 Principal-agent theory deals with conflicts of interest and asymmetric information:

- Incentives problems are taken seriously and modeled explicitly.
- Theory characterizes the optimal structure of a “comprehensive” contract.

12 Problems:

- There is no difference between an incentive contract within a firm and an incentive contract between two separate firms.
- No solution to the “Williamson Puzzle”.

Conclusion: If comprehensive contracts are being written, the organizational structure does not play a role. Any allocation that can be implemented through a given organizational structure could be implemented within any other organizational structure through the appropriate choice of a comprehensive contract.

2 Transaction cost approach

13 Coase (1937): When does a transaction take place within a firm and when is it carried out on a market?

- Markets: Allocation through the price mechanism
- Firms: Allocation by authority, commands, etc.

14 Coase noted a number of **transaction costs** involved in using the market;

- The cost of obtaining a good or service via the market actually exceeds the price of the good.
- Other costs, including search and information costs, bargaining costs, keeping trade secrets, and policing and enforcement costs, can all potentially add to the cost of procuring something from another party.

Different allocation mechanisms give rise to different transaction costs.

- In small groups fiat is the more efficient allocation mechanism.
- But: the larger the group (the “firm”), the higher are “bureaucracy costs” and the more efficient is the price mechanism.

Firms will arise which can internalise the production of goods and services required to deliver a product, thus avoiding these costs.

15 Coase theorem: If trade in an externality is possible and there are sufficiently low transaction costs, bargaining will lead to a Pareto efficient outcome **regardless of the initial allocation of property**.

In practice, obstacles to bargaining or poorly defined property rights can prevent Coasean bargaining. It thus highlights the importance of the property right.

16 Alchian and Demsetz (1972):

- No difference between prices and fiat: Grocer story.
- Theory of property rights based on monitoring. Who monitors the monitor? The owner.

17 Klein, Crawford and Alchian (1978), Williamson (1975, 1985):

Transaction costs in writing a contract induce parties to write incomplete contracts:

- Costs to think through all possible states of the world.
- Costs to write down all possible contingencies (using legal code).
- Difficulty to describe a contingency unambiguously so that it can be verified by the courts even if the contingency is obvious to the contracting parties.

Hence, parties write incomplete contracts ex ante that have to be completed and renegotiated as they go along.

However, this will yield inefficiencies for several reasons:

- Haggling in renegotiation yields delay and inefficient decisions.
- Asymmetric information may arise during the relationship which prevents the implementation of an ex post efficient allocation.
- These costs would not matter very much, if the parties could easily switch to alternative contracting parties. However, in many situations the parties are locked in with each other and a break up would be very inefficient. In these situations, the hold-up problem (套牢问题) arises.

18 Consider a buyer-seller relationship. Seller can produce good at zero cost.

- At date 1, buyer can make relationship-specific investment of \$0 or \$60. Investment is nonverifiable (e.g. investment in human capital).
- If buyer invests \$0, then utility from transaction with seller is 0.
If buyer invests \$60, then the utility is 100.
- Investment is efficient ($100 - 60 = 40 > 0$) and should be carried out.
- Buyer and seller cannot write long-term contract regarding price of investment.
- Question: Will buyer invest?
- Suppose buyer invests. At date 2, investment is sunk and buyer's utility from transaction is 100. Parties will bargain over price. Nash bargaining yields 50:50 division of surplus: Buyer makes loss of $50 - 60 = -10$. Therefore, buyer will not invest.

19 Ingredients of hold-up problem:

- Nonverifiable investment: If investment was verifiable, seller could pay buyer 20 conditional upon investment. Buyer would get $50 - 60 + 20 = 10$ and invest.
- Relationship-specific 关系专用性 (or asset-specific 资产专用性) investment: If investment was not specific, buyer could threaten to trade with other seller unless he sells for 20. Buyer would get $100 - 20 - 60 = 20$ and invest.
- Sunk investment: If investment was not sunk, buyer could threaten to undo investment unless seller sells for 20.
- Impossibility to write long-term contract: If long-term contract was possible, parties could set price at 20.

20 The hold-up problem can be described as follows:

- The parties must make "relationship specific investments" ex ante that increase the potential surplus that can be generated in their relationship.
- These investments are (at least partially) sunk and lose their value when the relationship breaks up.
- It is not possible to contract ex ante on the investments nor on how to share the surplus ex post.
- When the parties negotiate on how to share the surplus ex post, the ex ante investments are already sunk and do not affect the bargaining outcome. Hence, the parties get wrong investment incentives.

21 Examples for asset-specific investments:

- a worker acquires specific skills that are valuable only in one particular firm;

- a worker builds his house close to the firm he works for;
 - a company invests in capacity that can only be used for one particular customer;
 - a company develops a product that is specific to the needs of one particular customer.
- 22 A solution to hold-up problem: Buyer and seller merge (vertical integration 垂直一体化或纵向一体化).
- At date 1, buyer buys seller's firm for 20.
 - At date 2, transaction takes place (at price of 0) and buyer gets $100 - 60 - 20 = 20$.
 - Therefore, buyer invests.
- 23 Does transaction cost theory solve the Williamson puzzle? Not really:
- Does not explain why buyer's bargaining power increases after vertical integration (above assumed that seller delivers at price of 0, i.e. buyer has full bargaining power).
 - Seller could threaten to quit \Rightarrow parties bargain (within firm) \Rightarrow same problem as under non-integration.
 - Mechanism that determines bargaining power as consequence of integration must be spelled out more clearly.
 - Does not explain disadvantages of integration. So why isn't there just one fully integrated firm? (Williamson names bureaucracy cost as cost of integration. But argued earlier that this doesn't solve puzzle).
- 24 These problems are solved by the property rights approach of Grossman, Hart and Moore.

3 Property rights approach

- 25 The early "Property Rights" literature emphasized the importance of clearly defined property rights (Coase, 1960). But, this theory cannot explain **to whom the property rights of an asset should be allocated**.
- 26 Ownership rights (Hart, 1995): An owner of an asset has the **residual control rights** (剩余控制权) over that asset: the right to decide all usages of the asset in any way not inconsistent with a prior contract, custom, or law.
- 资产所有权与剩余控制权相伴相生，所有者有权以任何方式使用资产，而不必与以前的合同、习惯或任何法律保持一致。
- 27 Remarks:
- "Specific control rights" can be contracted away.
 - "Residual control rights" remain with the owner.
 - Distinction between "physical capital" and "human capital". Ownership on physical assets can be traded but not ownership on human assets.
- 28 Definition of a "firm": A firm consists of the physical assets that it owns.
- 企业是由它所拥有或控制的资产构成的。他们并不区分企业的所有权和控制权，实际上是将所有权定义为实施控制的权力。
- 29 哈特：企业合约关系存在的关键在于**缔约方谁拥有剩余控制权**。

3.1 The yacht example A

30 At an island,

- One asset: luxury yacht.
- Three agents: skipper, chef, tycoon.

31 Example A:

- Service is to provide gourmet dinner for tycoon during sea cruise at date 2.
- At date 1, chef can invest in preparing a special dish.

Cost of investment is 100, value to tycoon is 240 \Rightarrow investment is efficient.

- Substitutes for skipper and chef are easy to find at date 2 \Rightarrow skipper and chef are dispensable.
Both the skipper and the chef can be replaced on the market (but the replacements have not invested).
- There is only one tycoon on the island who can afford this dinner \Rightarrow tycoon is indispensable.
- The investment costs 100 to the chef and is not transferable to other yachts (or there is only one yacht at this island) \Rightarrow chef's investment is asset-specific.

Question: Who should own yacht?

32 Case A1: The skipper owns the yacht.

			T	C	S
T	C	S	0	0	240
T	S	C	0	240	0
S	T	C	0	240	0
S	C	T	240	0	0
C	T	S	0	0	240
C	S	T	240	0	0
			80	80	80

- In each row, entries depict marginal contributions of agents to coalition represented by permutation in same row. Agents can only enter coalitions from the right.
- Take first row and start at left cell.
 - Tycoon can enter coalition \emptyset (no agent to the left of tycoon). Whether he enters or not, value of coalition is 0. Hence, tycoon's marginal contribution is 0.
 - Next, chef can leave tycoon alone or form coalition. In either case, value of coalition (and hence chef's marginal contribution) is 0 because yacht is needed to generate the 240.
 - Finally, skipper can join coalition by tycoon and chef or stay out. If he joins, value of coalition is 240; if he stays out, value is 0. Thus, skipper's marginal contribution is 240.
- In this example, all three agents are needed to create positive surplus. Therefore, only agent who enters last (third column) has positive marginal contribution.
- Each permutation occurs with probability $\frac{1}{6}$. Multiplying each cell in agent i 's column with $\frac{1}{6}$ yields agent i 's expected marginal contribution or Shapley value. Here, Shapley value is 80 for each agent. One can also derive Shapley value with the standard formula.
- Intuition: All three agents are needed to generate surplus:

- Tycoon because he consumes gourmet meal.
- Skipper because he owns yacht.
- Chef because he made investment.

Consequence: Agents split surplus by three, and each agent gets 80.

The chef will not invest, because the expected payoff of 80 does not cover investment cost of 100.

33 Case A2: The tycoon owns the yacht.

			T	C	S
T	C	S	0	240	0
T	S	C	0	240	0
S	T	C	0	240	0
S	C	T	240	0	0
C	T	S	240	0	0
C	S	T	240	0	0
			120	120	0

- (a) Since skipper is dispensable, only tycoon and chef are needed to generate surplus.
 (b) Thus, skipper has no bargaining power, tycoon and chef divide surplus by two.

The chef will invest, because the expected payoff of 120 covers investment cost of 100.

Chef owns yacht in neither case. Nonetheless, investment decision is different whether tycoon or skipper owns yacht.

- If tycoon is owner, chef must only bargain with tycoon—surplus split by two.
- If skipper is owner, chef must bargain with both tycoon and skipper—surplus split by three and chef doesn't get enough to cover investment cost.

34 Case A3: The chef owns the yacht.

Same as case A2. Again, only tycoon and chef are needed to generate surplus.

35 Tycoon and chef are always needed to generate surplus: Tycoon because he is indispensable, and chef because he makes investment.

The chef is more likely to invest in a skill that is tycoon-specific if the asset is owned by the chef or by the tycoon.

36 General result:

- In only one agent invests, he should own all assets.
- In agent i is indispensable to asset a , he should own a .

3.2 The yacht example B

37 Example B:

- In addition to chef, skipper can also make investment at date 1 (can learn history of local islands to entertain tycoon with anecdotes).

- Cost of skipper's investment is 100, value to tycoon is another 240.
Hence, if both skipper and chef invest, value to tycoon is 480.
- Both the skipper and the chef can be replaced on the market (but the replacements have not invested).

38 Case B1: The skipper owns the yacht.

			T	C	S
T	C	S	0	0	480
T	S	C	0	240	240
S	T	C	240	240	0
S	C	T	480	0	0
C	T	S	0	0	480
C	S	T	480	0	0
			200	80	200

Take first row and start at left cell.

- Tycoon can enter coalition \emptyset . Whether he enters or not, value of coalition is 0. Hence, tycoon's marginal contribution is 0.
- Next, chef can leave tycoon alone or form coalition. In either case, value of coalition (and hence chef's marginal contribution) is 0 because yacht is needed to generate the surplus.
- Finally, skipper can join coalition by tycoon and chef or stay out. If he joins, value of coalition is 480; if he stays out, value is 0. Thus, skipper's marginal contribution is 480.

Skipper invests but chef doesn't.

39 Case B2: The chef owns the yacht.

			T	C	S
T	C	S	0	240	240
T	S	C	0	480	0
S	T	C	0	480	0
S	C	T	480	0	0
C	T	S	240	0	240
C	S	T	480	0	0
			200	200	80

Chef invests but skipper doesn't.

40 Case B3: The tycoon owns the yacht.

			T	C	S
T	C	S	0	240	240
T	S	C	0	240	240
S	T	C	240	240	0
S	C	T	480	0	0
C	T	S	240	0	240
C	S	T	480	0	0
			240	120	120

Skipper and chef both receive $120 - 100 > 0$ as opposed to 0 if they hadn't invested \Rightarrow both invest.

41 If tycoon is indispensable, he should own yacht even though he makes no investment. It shows that investment is not necessary condition for ownership.

In general, if an agent is indispensable, it is efficient to assign to the property right to her, regardless of whether she has the option to take an investment ex-ante.

3.3 The yacht example C

42 Example C:

- Yacht consists of two parts, the galley and the hull, which are complementary.
- Assume that all three agents can be replaced in period 2 (all are dispensable).
- Each agent can take an investment that increases the value by 240, and costs c_T , c_C and c_S respectively.

43 Compare two ownership structures:

- Non-integration: chef owns the gallery, skipper owns the hull.
- Integration: chef owns gallery and hull.

Which ownership structure is more efficient?

	tycoon invests iff	chef invests iff	skipper invests iff
Non-integration	$c_T \leq 80$	$c_C \leq 120$	$c_S \leq 120$
Integration	$c_T \leq 120$	$c_C \leq 240$	$c_S \leq 120$

44 Non-integration: The tycoon requires the chef and the skipper to generate his surplus of 240, so he gets only 80. The skipper and the chef only require each other to generate their surpluses of 240, so they get 120.

45 Integration: The tycoon only requires the chef to generate his surplus of 240, so he gets 120. The same holds for the skipper. The chef can generate his surplus alone, so he gets 240.

46 If two or more assets are complementary, they should be owned together.

Joint ownership is dominated because it precludes outside opportunities and therefore offers neither party further protection from expropriation.

4 Implications

47 Financial contracts

One important application has been in financial contracts.

- Suppose, in the example of the manager, that true performance is difficult to use in a contract because the manager is able to divert the firm's profits.
- The best solution may be for the manager to become an entrepreneur and own the firm herself—an entrepreneur can freely decide how to run the firm, and make the appropriate trade-off between actions that raise profits and actions that increase her private benefits.
- The limitation of this solution is that the manager sometimes cannot afford to buy the firm, so that outside investors have to finance the purchase.

- (d) But if profits cannot be contracted on, how can investors be sure they will get their money back?
- (e) One solution is to promise them a [fixed future payment \(regardless of profits\) with collateral](#): if the payment is not made, ownership is transferred to the investors, who can liquidate the firm's assets.
- (f) This is actually how most bank loans work—and the theory explains why.
- (g) More generally, incomplete-contract theory predicts that [entrepreneurs should have the right to make most decisions in their firms as long as performance is good](#), but [investors should have more decision rights when performance deteriorates](#).
- (h) This feature is typical of real-world financial contracts, such as the sophisticated contracts signed by entrepreneurs and venture capitalists.

48 Privatisation

Another application concerns the division between the private and public sectors.

- (a) Should providers of public services, such as schools, hospitals, and prisons, be privately-owned or not?
- (b) According to the theory, this depends on the nature of non-contractible investments.
- (c) Suppose a manager who runs a welfare-service facility can make two types of investment: some improve quality, while others reduce cost at the expense of quality.
- (d) Additionally, suppose that such investments are difficult to specify in a contract.
- (e) If the government owns the facility and employs a manager to run it, the manager will have little incentive to provide either type of investment, since the government cannot credibly promise to reward these efforts.
- (f) If a private contractor provides the service, incentives for investing in both quality and cost reduction are stronger.
- (g) The desirability of privatisation therefore depends on the [trade-off between cost reduction and quality](#).
- (h) Federal authorities in the United States are in fact ending the use of private prisons, partly because—according to a recently released U.S. Department of Justice report—conditions in privately-run prisons are worse than those in publicly-run prisons.

Task

- Reading: [Popular Science Background](#) and [Scientific Background](#) on the Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel 2016, [Prize Lecture by Hart](#).
- Understanding: