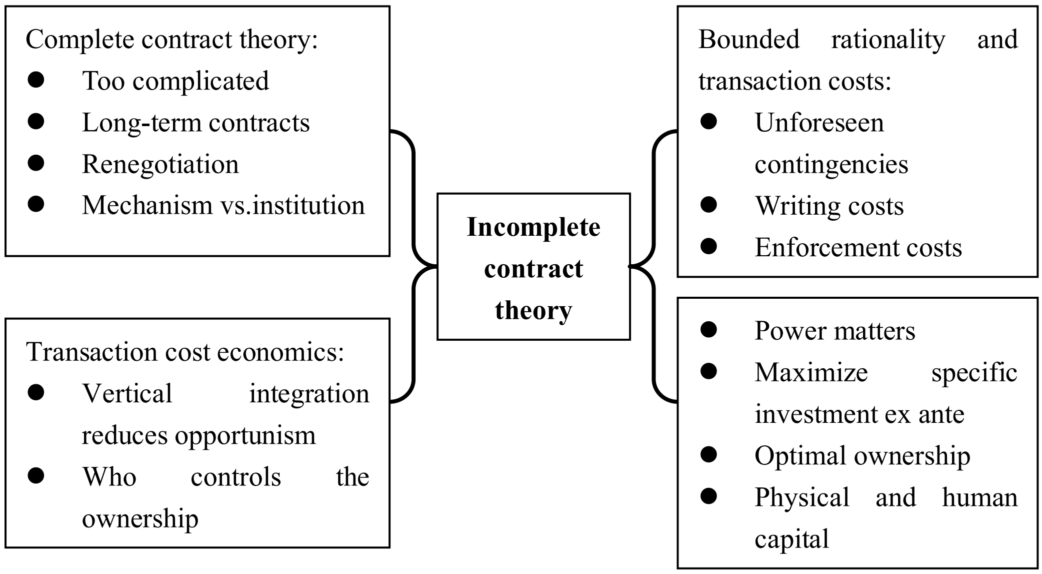
5. Incomplete Contracts

Huihua NIE
School of Economics
Renmin University of China
www.niehuihua.com
niehuihua(at)vip.163.com

5.2 Property-rights Theory I

5.2.1 Background



Definition:

A complete/comprehensive contract is one that specifies each party's obligations in every conceivable eventuality.

[Note 1] A complete contract is a functionally complete contract, but not *vice versa*.

Fox example, A and B sign a contract that specifies that A provides a widget to B at a price 8 at date 2. The value for B is 12. A knows that the production cost is 10 by the probability of 50%, and is 2 by 50%. Obviously, the contract is functionally-complete and efficient *ex ante*, but it is not perfectly-complete, i.e., it is incomplete contract. Because it doesn't specify what they should do when the cost is 10, so it is not optimal *ex post*.

5.2.2 Holdup/GHM model

(1) A classic case

The main problem caused by incomplete contracts is the issue of transaction costs resulting from holdup. The acquisition case of Fisher Body by General Motors (Coase, 2000; Freeland, Robert F., 2000; Klein, 2000) demonstrates the problem and its solution.

The initial case summary is as follows: In 1919, General Motors (GM) signed a 10-year contract with Fisher Body. The contract stipulated that GM would hand over all the closed metal body business to Fisher at a cost (excluding loan interest) plus a profit of 17.6%. But this price cannot be higher than the average price of other similar suppliers, and in the event of a price dispute, arbitration will be resorted to. Both sides did not anticipate that the market's demand for GM would increase significantly in a few years. GM believed that due to adopting a cost plus system, Fisher Body adopted a relatively inefficient and labor-intensive technology, which significantly increased General Motors' purchasing costs. In addition, Fisher Body refused to build its factory near GM' assembly plant. Due to Fisher Body's tendency to adopt inefficient production methods and refusal to build factories near GM, GM could not tolerate this kind of holdup behavior, so it completely acquired Fisher in 1926. The reasons for acquisitions mentioned above have become the focus of debate since then（聂辉华和李金波，2008）.

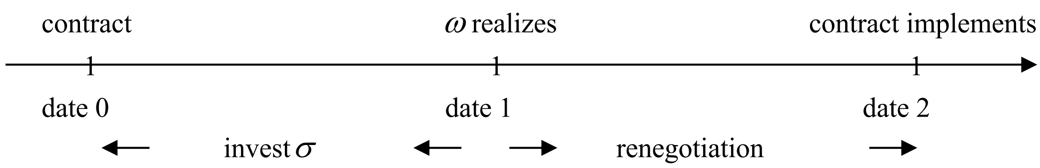
The logic of property-rights theory: incomplete contracts + asset specificity→holdup→residual rights of control→asset ownership→bargaining power→residual distribution→*ex ante* investment incentive. Once the allocation of ownership is decided, the boundary of the firm is decided.

(2) Setting

Grossman-Hart (1986) and Hart-Moore (1990) build the foundation of property-rights theory of the firm, hereafter GHM model. And PRT is gradually extended to incomplete contract theory applying to more situations including organizational structure, corporate finance, international trade, and so on.

The state game is a simplified version of Hart-Moore (1990) and cited from Halonen (1999). A seller uses an asset a_1 and his specific human capital investment σ to supply a buyer who in turn uses asset a_2 to supply consumers. The situation is so complex that the specific investment, input trade and wage are noncontractible (observable but nonverifiable) *ex ante*, but contractible *ex post*, so ex ante contracts can only be written on the allocation of ownership.

Timing:



Assumption 1 (specific investment): $C(0)=0$, $C'(\sigma)>0$ and $C''(\sigma)>0$.

Assumption 2 (outside options): $v(i\,|\,\{\phi\})=0$ [1], $v(1\,|\,\{a_1\})=\mu\sigma$, $v(2\,|\,\{a_2\})=\mu V$, $v(i\,|\,\{a_j\})=\mu A_j$, $v(1\,|\,\{a_1,a_2\})=\lambda_2(\sigma+A_2)$ and $v(2\,|\,\{a_1,a_2\})=\lambda_1(V+A_1)$ for

[1] It means that the asset is **essential** to the agent, but not *vice versa*.

$i, j = 1, 2$ and $i \neq j$.[1]

Assumption 3: $0 \le \mu \le \lambda_i \le 1$ [2] for all $i, j = 1, 2$ and $0 \le A_1 \le \bar{A}$, $0 \le A_2 \le V$.

(3) Basic results

The benchmark is the first best. We have

(FB) $V + \sigma - C(\sigma)$

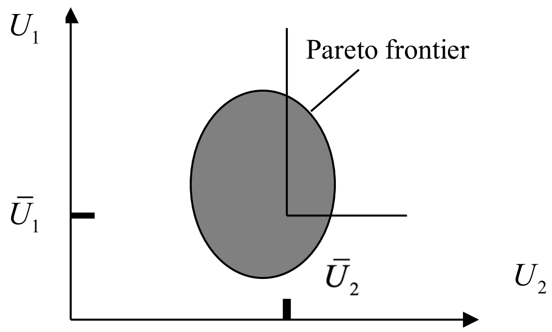
$$\Rightarrow C'(\sigma^*) = 1 \tag{13-1}$$

In reality, agent 1 (the seller) chooses the investment noncooperatively. After the realization of state, according to Coase theorem, the bargaining is efficient *ex post*. Suppose that they split the surplus according to Nash bargaining solution, i.e. by 50:50.

Background:

By Nash (1950), we know the solution for two person's cooperative-game problem is

$$U^* = \arg\max_{U \in X, U \ge \bar{U}} (U_1 - \bar{U}_1)(U_2 - \bar{U}_2)$$



Formally, we have $U_i = \bar{U}_i + \frac{1}{2}(U - \bar{U})$

Generally, we have Shapley value[3]:

$$B_i = \sum_{S|i \in s} \frac{(s-1)!(I-s)!}{I!}[v(S, A) - v(S \setminus \{i\}, A)]$$

Think

☛ What can we know about the level of specific investment?

There are five possible ownership structures:[4]

Nonintegration (NI):

[1] When the assets are strictly **complementary** in physical property or another agent in the economic relationship is not substitutable, then $\mu = 0$; economically **dependent** or alternative for $\mu = 1$. For λ_i, if agent i is **indispensable** to asset i, $\lambda_i = \mu$, otherwise $\lambda_i = 1$.

[2] An agent cannot do worse when he owns both assets than when he owns only one, which ensures superadditivity.

[3] $0 < s \le I$. When $I = 2$, it reduces to Nash bargaining solution.

[4] We rule out profit-sharing agreements, see Hart-Moore (1990) for the justification of these assumptions.

$$U_1^{NI} = \mu\sigma + \frac{(1-\mu)(V+\sigma)}{2} - C(\sigma)$$

$$\Rightarrow C'(\sigma^{NI}) = \frac{1+\mu}{2} \qquad (13\text{-}2)$$

$$U_2^{NI} = \mu V + \frac{(1-\mu)(V+\sigma)}{2}$$

Integration I (1I):

$$U_1^{1I} = \lambda_2(\sigma + A_2) + \frac{(V+\sigma) - \lambda_2(\sigma + A_2)}{2} - C(\sigma)$$

$$\Rightarrow C'(\sigma^{1I}) = \frac{1+\lambda_2}{2} \qquad (13\text{-}3)$$

$$U_2^{1I} = \frac{(V+\sigma) - \lambda_2(\sigma + A_2)}{2}$$

Integration II (2I):

$$U_1^{2I} = \frac{(V+\sigma) - \lambda_1(V + A_1)}{2} - C(\sigma)$$

$$\Rightarrow C'(\sigma^{2I}) = \frac{1}{2} \qquad (13\text{-}4)$$

$$U_2^{2I} = \lambda_1(V + A_1) + \frac{(V+\sigma) - \lambda_1(V + A_1)}{2}$$

Joint ownership (JO):

$$U_1^{JO} = \frac{V+\sigma}{2} - C(\sigma)$$

$$\Rightarrow C'(\sigma^{JO}) = \frac{1}{2}$$

(13-5)

$$U_2^{JO} = \frac{V+\sigma}{2}$$

Cross ownership (CO):

$$U_1^{CO} = \mu A_2 + \frac{(V+\sigma) - \mu(A_1 + A_2)}{2} - C(\sigma)$$

$$\Rightarrow C'(\sigma^{CO}) = \frac{1}{2} \qquad (13\text{-}6)$$

$$U_2^{CO} = \mu A_1 + \frac{(V+\sigma) - \mu(A_1 + A_2)}{2}$$

Lemma:

$$\sigma^* \geq \sigma^{1I} \geq \sigma^{NI} \geq \sigma^{2I} = \sigma^{CO} = \sigma^{JO}$$

Proposition 1:

Assumptions 1-3 hold, comparing to the first best, the specific investment of human capital usually is *inefficient*.

Proposition 2:

Assumptions 1-3 hold, the optimal ownership is to give all the assets to the investing agent 1.

Proposition 3:

Assumptions 1-3 hold, if the assets are economically independent ($\mu = 1$) or agent 2 is indispensable ($\lambda_2 = \mu$), then nonintegration and integration by agent 1 are equally good.

If there is two-side investment, then NI will be the only optimal.

Proposition 4:

Assumptions 1-3 hold, joint ownership, cross ownership and integration by agent 2 are strictly dominated for any μ and $\lambda_2 > 0$.

Proposition 5:

$$\frac{\partial \sigma^{NI}}{\partial \mu} \geq 0 \text{ and } \frac{\partial \sigma^{1I}}{\partial \lambda_2} \geq 0.$$

5.2.3 Applications of property-rights theory

a. Corporate finance: Aghion-Bolton (1992); b. Organization authority: Aghion-Tirole (1997); c. Public ownership: Hart-Shleifer-Vishny (1997), Besley-Ghatak (2001); d. International trade: Antras (2003, 2005); e. Social contracts: Aghion-Bolton (2003).

References:

Grossman, Sanford, and Oliver Hart, 1986, “The Costs and Benefits of Ownership: A Theory of Vertical and Lateral Integration”, *Journal of Political Economy*, 94(4): 691-719

Hart, Oliver, and John Moore, 1990, “Property Rights and Nature of the Firm”, *Journal of Political Economy*, 98(6): 1119-1158

杨瑞龙、聂辉华，2006，《不完全契约理论：一个综述》，《经济研究》，第2期

聂辉华、杨其静，2007，《产权理论遭遇的挑战及其演变——基于2000年以来的文献》，《南开经济研究》，第4期

聂辉华，2009，《声誉、契约与组织》，中国人民大学出版社

聂辉华，2011，《不完全契约理论的转变》，《教学与研究》，第 1 期

聂辉华，2017，《契约理论的起源、发展和分歧》，《经济社会体制比较》，第 1 期