Relational Contracts and Their Interactions with Formal Arrangements

—Lecture III—

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April 13, 2004

III. Relational Contracts and Ownership

Extensions of the Holdup Model

1. Suppose there is one asset to be allocated.
   - Seller owns the asset ⇒ nonintegration (outsourcing)
   - Buyer owns the asset ⇒ integration (employment)

	Outsourcing (Seller owns asset)	Employment (Buyer owns asset)
Spot	SO	SE
Relational	RO	RE

2. Three levels of investment $a \in \{a_0, a_1, a_2\}$ by the seller

- Cost of investment: $0 = d_0 < d_1 < d_2$
- Assume $\Delta_d \equiv d_2 - d_1 > d_1$
- The buyer's value for the product: $v_0 < v_1 < v_2$
- For simplicity: $\Delta_v \equiv v_2 - v_1 = v_1 - v_0$
- Alternative-use values: m_0, m_1, m_2
- Assume $v_0 \geq \max\{m_0, m_1, m_2\}$
- For simplicity: $\Delta_m \equiv m_2 - m_1 = m_1 - m_0$
- Assume $\Delta_v > \Delta_m$
- Assume that the first-best action is a_2:

$$\Delta_v > \Delta_d \tag{6}$$

3. Renegotiation follows the Nash bargaining solution
4. Initial fixed payment allowed, only for redistributional purposes

Spot Outsourcing (SO)

- Modification of the renegotiation process: the price is determined by the Nash bargaining solution
- Threat point: $(0, m_i)$ if $a = a_i$
- The renegotiated price: $p_i' = (v_i + m_i)/2$

$$\text{Seller's ex post payoff} = p_i' = \frac{1}{2}(v_i + m_i)$$

$$\text{Buyer's ex post payoff} = v_i - p_i' = \frac{1}{2}(v_i - m_i)$$

- Seller chooses $a^{SO} = a_i$ that maximizes $p_i' - d_i$
- Assume $a^{SO} < a_2$:

$$\Delta_v + \Delta_m < d_2 \tag{7}$$

- The optimal investment under SO:

$$a^{SO} = \begin{cases} a_1 & \text{if } \Delta_v + \Delta_m \geq 2d_1 \\ a_0 & \text{if } \Delta_v + \Delta_m < 2d_1 \end{cases}$$

- Define if $a^{SO} = a_i$,

$$\pi_S^{SO} = \frac{1}{2}(v_i + m_i) - d_i \quad \pi_B^{SO} = \frac{1}{2}(v_i - m_i) \quad s^{SO} = v_i - d_i$$

Spot Employment (SE)

- The buyer owns the asset → She can exclude the seller from use of the asset (residual control right)
- Assumptions
  - The seller's outside payoff is $0 \leq m_0$, irrespective of his investment
  - The seller is indispensable to the asset: the buyer cannot gain anything without the seller

- Renegotiation:
  - Threat point $(0, 0)$
  - The renegotiated price: $p_i' = v_i/2$

$$\text{Seller's ex post payoff} = p_i' = \frac{1}{2}v_i$$

$$\text{Buyer's ex post payoff} = v_i - p_i' = \frac{1}{2}v_i$$

- Seller chooses $a^{SE} = a_i$ that maximizes $p_i' - d_i$
- Assume $a^{SE} < a_2$:

$$\Delta_v < d_2 \tag{8}$$

- The optimal investment under SE:

$$a^{SE} = \begin{cases} a_1 & \text{if } \Delta_v \geq 2d_1 \\ a_0 & \text{if } \Delta_v < 2d_1 \end{cases}$$

- Define if $a^{SE} = a_i$,

$$\pi_S^{SE} = \frac{1}{2}v_i - d_i \quad \pi_B^{SE} = \frac{1}{2}v_i \quad s^{SE} = v_i - d_i$$

Comparison Between SO and SE

- $\Delta_m > 0 \Rightarrow s^{SO} \geq s^{SE}$
  - $s^{SO} > s^{SE}$ if $d_1 > \Delta_v > d_1 - \Delta_m$
  - SO dominates because it can utilize aligned "market incentives"
- $\Delta_m < 0 \Rightarrow s^{SO} \leq s^{SE}$
  - $s^{SO} < s^{SE}$ if $d_1 - \Delta_m > \Delta_v > d_1$
  - SE dominates because it eliminates conflicting "market incentives"

Ownership under Relationships: Some Issues

1. What will happen to the asset after reneging?

   Case 1 Renegotiation costs are so high that the ownership structure will not be renegotiated.

   Case 2 Renegotiation costs are low enough to allow the parties to negotiate over the asset ownership.

2. What will happen after regenging, within the same period?
   - Assume that after reneging, renegotiation occurs whether the seller or the buyer owns the asset
   - Alternative assumption: there is no renegotiation under buyer ownership because the buyer owns the product as well.

3. What are initial contracts?
   - Assume that following the property rights approach a la Grossman, Hart, and Moore, there is a fixed transfer w at the beginning of each period
   - In addition, relational contracts include b_i, paid from the buyer to the seller, when investment is a_i

Case 1: No Renegotiation of Ownership

Relational Outsourcing (RO)

- At the beginning of each period, the seller and the buyer agree on (w, b_0, b_1, b_2), with the seller's promising $a = a_2$.
- Deviation results in spot governance (spot outsourcing) from the next period on
- Solve the optimal contract that supports the implementation of a_2 at the lowest possible discount factor.

- The buyer honors the agreement if and only if for all $i = 0, 1, 2$,

$$b_i - \frac{1}{2}(v_i + m_i) \leq \frac{\delta}{1-\delta}(v_2 - w - b_2 - \pi_B^{SO})$$

- The seller honors the agreement if and only if for all $i = 0, 1, 2$,

$$-(b_i - \frac{1}{2}(v_i + m_i)) \leq \frac{\delta}{1-\delta}(w + b_2 - d_2 - \pi_S^{SO})$$

- The dynamic enforcement constraint:

$$\max_i \left(b_i - \frac{1}{2}(v_i + m_i)\right) - \min_i \left(b_i - \frac{1}{2}(v_i + m_i)\right) \leq \frac{\delta}{1-\delta}(s_2 - s^{SO}) \tag{9}$$

- The seller's (IC): $b_2 - b_1 \geq \Delta_d$ and $b_2 - b_0 \geq d_2$

- a_2 can be implemented under RO if and only if

$$d_2 - (\Delta_v + \Delta_m) \leq \frac{\delta}{1-\delta}(s_2 - s^{SO}) \qquad \text{(C0-RO)}$$

if $\Delta_v < 2d_1 - \Delta_m \Leftrightarrow s^{SO} = s_0$

$$\Delta_d - \frac{1}{2}(\Delta_v + \Delta_m) \leq \frac{\delta}{1-\delta}(s_2 - s^{SO}) \qquad \text{(C1-RO)}$$

if $\Delta_v \geq 2d_1 - \Delta_m \Leftrightarrow s^{SO} = s_1$

Relational Employment (RE)

- The buyer honors the agreement if and only if for all $i = 0, 1, 2$,

$$b_i - \frac{1}{2}v_i \leq \frac{\delta}{1-\delta}(v_2 - w - b_2 - \pi_B^{SE})$$

- The seller honors the agreement if and only if for all $i = 0, 1, 2$,

$$-(b_i - \frac{1}{2}v_i) \leq \frac{\delta}{1-\delta}(w + b_2 - d_2 - \pi_S^{SE})$$

- The dynamic enforcement constraint:

$$\max_i \left(b_i - \frac{1}{2}v_i\right) - \min_i \left(b_i - \frac{1}{2}v_i\right) \leq \frac{\delta}{1-\delta}(s_2 - s^{SE}) \tag{10}$$

- The seller's (IC): $b_2 - b_1 \geq \Delta_d$ and $b_2 - b_0 \geq d_2$

- a_2 can be implemented under RE if and only if

$$d_2 - \Delta_v \leq \frac{\delta}{1-\delta}(s_2 - s^{SE}) \qquad \text{(C0-RE)}$$

$$\text{if } \Delta_v < 2d_1 \Leftrightarrow s^{SE} = s_0$$

$$\Delta_d - \frac{1}{2}\Delta_v \leq \frac{\delta}{1-\delta}(s_2 - s^{SE}) \qquad \text{(C1-RE)}$$

$$\text{if } \Delta_v \geq 2d_1 \Leftrightarrow s^{SE} = s_1$$

Comparison Between RO and RE

1. Aligned market incentives ($\Delta_m > 0$)

- Under this condition, SO dominates SE
- If $\Delta_v \geq 2d_1$ (so that $s^{SE} = s^{SO} = s_1$), the right-hand side of the conditions coincides, and only the left-hand side (reneging temptation) matters:

RO: $$\Delta_d - \frac{1}{2}(\Delta_v + \Delta_m) \leq \frac{\delta}{1-\delta}(s_2 - s_1) \qquad \text{(C1-RO)}$$

RE: $$\Delta_d - \Delta_v \leq \frac{\delta}{1-\delta}(s_2 - s_1) \qquad \text{(C1-RE)}$$

- Hence RO dominates RE

- Similarly, if $\Delta_v < 2d_1 - \Delta_m$ (so that $s^{SE} = s^{SO} = s_0$), only the left-hand side (reneging temptation) matters:

$$\text{RO:} \qquad d_2 - (\Delta_v + \Delta_m) \leq \frac{\delta}{1-\delta}(s_2 - s_0) \qquad \text{(C0-RO)}$$

$$\text{RE:} \qquad d_2 - \Delta_v \leq \frac{\delta}{1-\delta}(s_2 - s_0) \qquad \text{(C0-RE)}$$

- Hence RO again dominates RE

- If $2d_1 > \Delta_v \geq 2d_1 - \Delta_m$ (so that $s^{SE} = s_0 < s_1 = s^{SO}$)...

RO: $$\Delta_d - \frac{1}{2}(\Delta_v + \Delta_m) \leq \frac{\delta}{1-\delta}(s_2 - s_1) \qquad \text{(C1-RO)}$$

RE: $$d_2 - \Delta_v \leq \frac{\delta}{1-\delta}(s_2 - s_0) \qquad \text{(C0-RE)}$$

- Larger future loss under RE than under RO
- Larger reneging temptation under RE than under RO
- RE may dominate RO

2. Conflicting market incentives ($\Delta_m < 0$)

- Under this condition, SE dominates SO
- If $s^{SO} = s^{SE}$, then RE dominates RO
- If $2d_1 - \Delta_m > \Delta_v \geq 2d_1$ (so that $s^{SE} = s_1 < s_0 = s^{SO}$), RO may dominate RE

Case 2: Renegotiation of Ownership

- After reneging, the buyer and the seller negotiate over asset ownership: the optimal spot governance (SO or SE) is chosen
- Implication: future loss after reneging does not depend on the initial ownership structure
- Only the magnitude of reneging temptation determines the optimal relational structure
- The spot optimal ownership structure is also optimal under relational contracting

“Bringing the Market Inside the Firm?”

- Continue to assume that asset ownership is renegotiated after reneging.
- Suppose that SO can implement the efficient investment a_2, but SE cannot.
- Can RE replicate SO? → No!

$$d_2 - \Delta_v \leq \frac{\delta}{1-\delta}(s_2 - s^{SO}) \qquad \text{if } s^{SE} = s_0$$

$$\Delta_d - \frac{1}{2}\Delta_v \leq \frac{\delta}{1-\delta}(s_2 - s^{SO}) \qquad \text{if } s^{SE} = s_1$$

- Now suppose that SO can implement a_1, but SE cannot.
- Can RE replicate SO? $\rightarrow$ No!

$$d_1 - \frac{1}{2}\Delta_v \leq \frac{\delta}{1-\delta}(s_1 - s^{SO})$$

- Note that it is still possible for RE to improve both spot alternatives.

When Is Integration Optimal?

- Our analysis: integration is optimal when $\Delta_m < 0$, that is, when outsourcing introduces conflicting market incentives.
- Integration may be optimal even under $\Delta_m > 0$, if market incentives are so strong that there is an overinvestment problem under outsourcing.

Relational Employment Revisited

- Different from the previous formulation, suppose now that integration changes the bargaining power: the buyer, the owner of the asset, also owns the product, and hence can take it without paying anything to the seller.
- Change: under integration, there is no renegotiation after reneging within the same period.
- SE: the seller chooses $a^{SE} = a_0 \to s^{SE} = s_0$
- RE: Continue to allow renegotiation over asset ownership after reneging

- a_2 can be implemented under RE if and only if

$$d_2 \leq \frac{\delta}{1-\delta}(s_2 - s^{SO})$$

- RO may be optimal even though market incentives are conflicting ($\Delta_m < 0$)
- If the "total market incentives" are negative ($\Delta_v + \Delta_m < 0$), then RE is optimal.
- RE may dominate RO even though only reneging temptation matters.

Some Remaining Issues

1. Interaction of formal contracts, relational contracts, and ownership
2. Both the seller and the buyer invest
3. Ownership shares: concentrate or disperse?
4. Applications