Contract Check-List

- When designing a contract, keep in mind:
  - Who are the parties?
  - What are their objectives?
  - What constraints are they facing?
  - Who knows/observe what
  - Who is bearing the risk of the transaction?
  - What is the cost of failure?

Lesson 3

Organizing Production with Contracts

The Poultry Processing Industry

- Approximately 90% of trade in the poultry industry is organized via contracts.
  - Why? Design attributes!
  - Tyson Food (USA) was the leading innovator in contractual organization (since late 1990's)
  - Nowadays almost all poultry processors use contracts

What we will learn from this example

- New technology may need new form of coordination
  - Designing an efficient contract is as important as choosing a leading technology

- Contracts can be used to manage complex problems
  - Simultaneity
  - Moral hazard
  - Risk sharing

A New Technology

- In 1990's a new technology emerged in poultry processing with HUGE economies of scale.
  - Very large processing plants are possible, driving average cost of production down
- Such plants are expensive and need input supply that is:
  - High volume
  - Steady supply
  - 'Standard' supply (poultry size and weight)

The Problem

- Chicken and broilers are costly to transport
  - Supply must be ‘reasonably’ local
- In order to buy the new plant the processor needed a large and reliable local production.
- A large and reliable local production makes sense *only if* there is a large processing plant on site.
  - *A typical simultaneity problem*

What Are the Farmers' Major Concerns?

- Building the poultry-house was perceive as a 'non-negligible' risk. A large share of personal wealth is required to finance the investment.
- Bankruptcy
  - What if the plant will not open?
  - What if I cannot cover production costs?
  - What if I cannot recover the large capital investment?
- Risk and production volatility
  - Too many factors beyond control
  - How can I manage risk?

The Farmers' Point of View

- Would you invest a sizable amount of money on the promise that the processor will open a processing plant?
- Consider:
  - Is the processor's commitment credible?
  - The *hold-up* problem

The Hold-Up Problem

- Consider a specific asset (say a large poultry housing facility)
  - A ‘specific asset’ is an asset whose value is much greater in a given use than in the next-best alternative (if the transaction fails, the investor loses a large share of the investment)
- The investor might be forced to accept an *ex-post* worsening in the contract condition

The Hold-Up Problem

- Assume that a farmer invests €200,000 in a poultry-housing facility. The salvage value of the housing is €50,000.
- If the transaction with the poultry processor fails (for whatever reason) the farmer loses €150,000.
- Assume that the counterpart can renegotiate the terms of the contract with a loss for the farmer of €80,000. What can the farmer do?

The Processor's Point of View

- In order to solve the synchronization problem, the processor must offer a credible commitment to:
  - Open the facility
  - Do not renegotiate the contract

What is a Credible Commitment?

- Can we believe someone's word?
  - Repeated vs. one-shot games
- A commitment is credible if:
  - Honoring the commitment is profitable
  - Deviating (renegotiating) is impossible or implies non-negligible profit loss: $\pi_D < \pi_H$
- A commitment is credible if it is in the subject's best interest to honor it

How to Solve the Simultaneity Problem?

- The Processor must offer a credible commitment
  - The processing plant is a specific asset
  - If the plant is built, the processor will need input
- Ask farmer to build the housing after the construction of the processing plant has begun
  - Need to offer farmers a ‘good deal’

How to Solve the Hold-Up Problem

- Credible commitment:
  - The processor must lose money if the contract is renegotiated (if the contract terms are worsened ‘too much’)
- Reduce the asset specificity
  - Buyback (not the case)
  - Co-financing: the processor gives guarantee for part of the mortgage. If contracts are renegotiated and the farmer cannot pay the mortgage, the processor will lose money.
- The processor has a clear interest in NOT driving farmers to bankruptcy.

Standardization

- Need for a standardized product
  - Processing
  - Consumer demand
- Processors needs that the farmers delivers animals of the ‘agreed upon’ size and weight
  - Feed control
  - Genetic control

Processor's Problem

- Make sure that the right size and weight are delivered
- Transaction failure is costly.
  - Denial of delivery of out-of-standard product is costly
    - Assembly line stops
    - Delivery to supermarkets fails
    - Large inventory is required
    - Potential for litigation

Solving the Standardization Problem

- Farmers must achieve higher profits when they deliver the agreed quality than otherwise.
  - Self-enforcing contract: it is in the farmer's best interest to fulfill the obligation
- Critical issues
  - Input use (genetics, feedstuff)
  - Poultryhouse management (heating, antibiotics, etc.)

Input Use

- Farmers might use lower quality input or sub-optimal feeding strategies.
  - Delivery denial is costly
  - Processor's cost is large if low quality input are used
- Penalty (price-reduction)
  - Unobservable random effects
- Production contract
  - Input are supplied by processor

Poultry-House Management

- A typical Moral Hazard problem. Low quality may depend on:
  - Unobservable random variables (chill, diseases, etc.)
  - Unobservable shirking
  - Need to disentangle the two effects
- An efficient incentive system punishes shirking and insures against random shocks
  - The processor is less risk adverse than the farmer

Poultry-House Management

- Solution concept:
  - Random events are systemic (affect many farmers)
  - Shirking is an individual behavior
- Solution: **Relative Compensation**
  1. Set a performance indicator (PI)
  2. Rank farmers according the PI
  3. The best farmer obtains the highest price, the second best a lower price and so on.
- Compensation (price per pound) depends on the ranking, not on the absolute value of the PI

An Example of Relative Compensation

- $PI = \alpha - \beta \times DR - (1-\beta) \times \Sigma (w_i - TW)^2$
  - α: base
  - DR: death rate of animals
  - w_i: actual weight of animal i
  - TW: target weight
  - β: weight
- Price = X/Rank
  - X: base price (best price)
  - Rank

An Example of Relative Compensation

- Assume that a sudden drop in temperature increases the death rate of animals (PI↓)
- PI decreases for all farmers

  $dPI/dDR = \beta$
- The rank changes only if farmers react to the temperature drop with different efficiency
  - f.e. they fail to adjust the heating

Relative Compensation

- Ensure farmers against systemic shocks
  - Farmers might be more keen to enter the contract
- Leave farmers fully responsible for their action
  - Incentive compatible
  - Self-enforcing

Lessons from Production Contracts

- New technology may require new organization solutions.
  - The new slaughterhouses could not be built if the spot market was the only coordination device
- Coordination requires a good understanding of agents' incentives
  - The processor designed a contract taking care of farmers' concerns
- Self-enforcing contracts
  - Farmers maximize profits when they act according the processor's instructions.
  - Farmers want to maximize effort.