Lecture 7 Production Cost and Theory of the Firm
Business 5017 Managerial Economics

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Implicit and Explicit Costs

- Explicit costs are out-of-pocket expenses. For a firm the major components are wages, rentals, cost of materials and energy, services from other contractors, etc.
- Implicit costs are opportunity costs. Examples are physical capital owned by the firm, good wills, brand name recognition, patents, copyrights, other forms of intellectual properties.
- Sunk cost is money spent but cannot be recovered. Any capital investments which have little rental or scrap value are considered sunk cost.
- A rational manager should ignore sunk cost when making decisions. Most common mistakes:
  - “We won’t let our soldiers died in vain . . . ”
  - Homeowners put off selling their houses when the price goes down.
Profits

- Accounting (or book) profit: Total revenue minus explicit costs. This is from the profit and loss account for the company’s share holders, corporation tax, and the annual report, etc.
- Normal profit: Implicit costs and the risk premium of doing business.
- Economic profit: Accounting profit minus normal profit. When it is negative we say the firm incurs an economic loss.
- Generally economists define profit as economic profit.
Output Decision

- One of the most important decisions facing a manager is choosing the output level of the firm.
- We assume that the objective of the firm is to maximize profit.
- It turns out that an important concept is the marginal cost of production.
- Definition: the cost of producing one additional unit of good or service.
- In the short run, the quantities of one or more inputs are fixed.
- Consequently, diminishing marginal returns eventually kicks in when output quantity increases. This means that it requires more and more of the variable inputs to produce an additional unit of output.
- Marginal cost is therefore increasing in output level eventually.
A Delicious Example

Suppose an entrepreneur has built a new restaurant. In the short run the number of tables and the size of the kitchen are fixed.

The marginal cost of serving the first meal is quite high. The restaurant needs to hire a chef and at least one waiter.

The marginal costs of serving more meals will go down at first, as it will be more efficient to divide the jobs in the kitchen and waiting tables.

But eventually more chefs and more waiters will not help much, and diminishing marginal returns set in.

Conclusion: The marginal cost of serving meals first declines and then becomes increasing.
Marginal Cost and Output

Marginal cost of producing tomatoes on a fixed plot of land:

![Graph showing marginal cost per bushel of tomatoes]

- Marginal cost per bushel: $5, $10, $15, $20, $25, $30
- Bushels of tomatoes: 0, 1, 2, 3, 4, 5
Marginal Revenue

- Recall that in a perfectly competitive market, firms are price takers. That is, production decision of each firm does not influence the market price.
- A firm can sell as many units of good or service at the prevailing price \( P \).
- Definitions:
  - Total revenue: \( R = PQ \).
  - Marginal revenue is the additional revenue by selling one more unit:

\[
MR = \frac{dR}{dQ} = P,
\]

which means that for a competitive firm, marginal revenue is equal to the market price.
**Optimal Output**

- If the firm wants to maximize profit, what should be the optimal output level \( Q \)?
- The firm should keep producing more as long as marginal revenue is greater than marginal cost. Once MC is higher than MR, the firm is making a loss at the margin.
- Therefore the profit maximizing output level is when marginal cost and marginal revenue are equal, that is

\[
MC = MR = P.
\]

- Another way to look at it: Profit is \( \Pi(Q) = R(Q) - C(Q) \). To find the maximum, set

\[
\frac{d\Pi}{dQ} = \frac{dR}{dQ} - \frac{dC}{dQ} = 0.
\]
Given market price $P$, a competitive firm maximizes profit by producing at an output level on the marginal cost curve. In other words, the upward sloping part of the MC curve is the firm’s supply function.
Market Supply Function

To obtain the market supply function, add up the quantities supplied from each firm at each price.
Firms and Market Efficiency

- Classical economics treats firms as a black box. They are there, combining and transforming input factors into well-defined products.
- But if market is efficient in every step of the production process, each entrepreneur can buy an unfinished product, contribute her/his time in an intermediate input, and sell the value added product to the next entrepreneur.
- Large corporations such as GM, Boeing, and Apple are then unnecessary.
- Observation: Less than 30% of all economic transactions are market transactions. The rest are done internally through firms.
- Economist Ronald Coase (1937) took the first stab at the problem: Firms exist to replace the pricing system to reduce overall transaction cost.
Economist Douglass North suggests that transaction costs are information costs:

1. Searching and matching,
2. Measuring the valuable attributes of what is being exchanged,
3. Negotiating terms of the contracts,
4. Protecting property rights,
5. Policing and enforcing agreements.
Why are these activities costly? Economist Oliver Williamson points out two important characteristics of economic agents:

1. Limited cognitive competence (bounded rationality) and capacity for conscious foresight (cf. rational expectation)
2. Opportunism—adverse selection, moral hazard, shirking, subgoal pursuit, mostly are results of informational costs
We Are All Human

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Hebert Simon’s Idea of Bounded Rationality:

- Most of our daily decisions are regular and repetitive. There are existing institutions that reduce uncertainty and narrow our choices.
- There are other decisions that involve impersonal and non-repetitive exchanges. The more complex and unique the situations, the more uncertain the outcomes.

Consequence: complex contracts are unavoidably incomplete.
Incomplete Contracts

1. Some contingencies which the parties will face may not be foreseeable at the contracting date.
2. Even if they could be foreseen, there may be too many contingencies to write into the contract.
3. Monitoring the contract may be costly.
4. Enforcing contracts may involve considerable legal costs.
5. Bounded rationality and opportunism result in contractual hazards for many market transactions.

Wallis and North (1986) estimate that total transaction cost for the U.S. economy amounts to 25% of GDP a century ago to 45% in the modern time.
Williamson’s Contractual Scheme

Figure 1: Williamson’s Contractual Schema
Governance Structure of Contracts

- Alternative modes—spot markets, incomplete long term contracts, and firms.
- \( h = \text{contractual hazards}, \ s = \text{safeguards} \)
- Source of hazards—high costs of court ordering, bilateral dependency, weak property rights, undisclosed quality, health and safety hazards, failure of polity.
- Each node represents a governance structure with the associate transaction costs.
- Complex governance entails more security but increases agency costs.
- Public bureau—organization form of last resort
Market Structure

We can apply the contractual schema to a firm’s decisions on outsourcing and internal production:

- Node A—competitive markets
- Node B—fly-by-night transactions, lemons, rare
- Node C—credit commitments: reputation effects and product warranties, regulation
- Node D—Internal production with no market transaction
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Conclusion: Firms exist when market transaction costs exceed internal coordination costs:

- Entrepreneurs hire workers in long-run contracts to avoid the high transaction cost of short-run employment.
- Workers enter the contract to reduce the risk of unemployment.
The Agency Problem

- Complex governance entails more security but increases bureaucratic costs.
- The most common cause is from the principal-agent problem.
- The principals are the entrepreneurs or share holders who own the firm. Their objectives are survival of the firm and profit maximization.
- The agents are the managers and workers hired by the principals to implement their objectives. The agents’ objectives may not be aligned with the principals’.
- Common problems includes shirking, excessive risk taking for short-term gain, wasteful expenditure, pursuing personal goals at the expense of the firm, theft, etc.
- Under the assumption of opportunism, the agency problem fits in with the prisoners’ dilemma framework we looked at before.
Why Some Firms are Big and Some are Small?

- A common answer by economists is that firm size depends on the economy of scale.
- If the average cost of production falls with output level, the firm will keep expanding.
- This usually happens when the production process involve a large fixed cost (more on this later). But this does not explain why firms within the same market vary in size.
- Here we take a transaction cost approach to explain firm size.
- As a firm’s size increases to opposite transaction costs are at work:
  1. internal agency and communication costs,
  2. external safety to alleviate contractual hazards.
What Do We Mean by Firm Size?

Biggest companies by market capitalisation
July 29th 2009, $bn

- PetroChina (China)
- Exxon Mobil (US)
- Ind & Comm Bank of China (China)
- China Mobile (HK)
- Microsoft (US)
- Wal-Mart Stores (US)
- China Construction Bank (China)
- Johnson & Johnson (US)
- Procter & Gamble (US)
- Royal Dutch Shell (Netherlands/Britain)
- HSBC (Britain)
- Petrobras (Brazil)

% change on a year earlier
- -46.8
- -30.9
- -26.4
- -39.9
- -15.9
- -4.6
- -5.6
- -11.9
- -11.3
- -38.6
- -17.8
- -33.3

Source: Bloomberg
Or by Revenue?

The power and the glory
Share of national/state-controlled companies’ capitalisation on MSCI national stockmarket index
June 2011, % of total

China
Russia
Brazil

Biggest global listed companies by revenue, 2010, $bn

Walmart | Royal Dutch Shell | Exxon Mobil | BP | Sinopec Group | China National Petroleum Corporation | State Grid | Toyota | Japan Post Holdings | Chevron

Sources: Deutsche Bank; Fortune; The Economist
Number of Employees and Customers

Facebook nation
2011 or latest
Population bn
Russia: 0.14
Brazil: 0.20
Indonesia: 0.24
US: 0.31
Facebook*: 0.84
India: 1.22
China: 1.34

Market capitalisation $bn
Boeing: 56
Amazon: 82
Facebook†: 90
McDonald’s: 101
Toyota: 132
Google: 188
Apple: 425

Number of employees '000
Facebook: 3.2
Google: 32
Amazon: 56
Apple: 60
Boeing: 172
Toyota: 322
McDonald’s‡: 1,700

Sources: Bloomberg; press reports; UN; The Economist

*Active monthly users as of December 2011
†Estimate
‡Includes franchise employees
Internal Agency and Communication Costs

- Evidences have shown that as a firm grows, contributions of individual worker become less detectable. Workers therefore have less incentive to work diligently.
- Eventually the inclination to shirk on the job increases (Table 2.1).
- The more complex hierarchical organizational structure of large firms also increase communication costs between top managers and front-line workers.
- Communication from the front line up the hierarchy is particularly problematic. The resulting communication costs become progressively greater as the decision rights are moved up the pyramid.
- On the other hand, agency costs increase as decision rights are moved down.
- Managers must find the optimal distribution of decision rights to balance the two opposite forces.
The presence of contractual hazards entail small firm to allocate resources to install safeguards.

When the costs of market safeguard exceed internal administrative costs, the firm vertically integrate the operation and become larger in size.

Conclusion: external transaction costs decrease with firm size.

An important task for the manager is to minimize total internal and external coordination costs by finding the optimal firm size.
Optimal Firm Size

(a) Cost

- External coordination cost
- Internal coordination and operation cost

(b) Cost

Vertical sum of two curves in panel (a)

Optimum firm size $S_1$
Firm Size Dynamics

- Market conditions and technological shocks change the optimal firm size over time in a particular industry.
- For example, improvement in property rights protection and information technology reduce external transaction costs. This causes the external coordination cost curve to shift downward.
- This provides incentives for firms to rely more on market transaction, lowering the optimal firm size (downsizing).
- On the other hand, information technology can lower the cost of work monitoring. This reduces internal coordination cost and shifts the curve downward, resulting in a larger optimal firm size.
To lower transaction costs, a firm faces the challenge of finding the right incentive structure and building a corporate culture to overcome agency costs and contractual hazards. Examples:

- Travelling expenses such as corporate jets and first-class seats
- Specific assets such as pipe lines.
- Buying a specialized equipment and rent it to subcontractors
- General store and housing problem in company town
- Building a reputation of not pursuing opportunistic behaviours.