The Theory of the firm

What is a firm?
How does a firm behave?

• A firm should transform efficiently inputs into outputs.
• The objective of the firm is to maximize its profit.
• BUT manager and owners can have different objectives (principal-agent model).
• Horizontal and vertical aspects of a firm’s size.
  – Horizontal: refers to the scale (or scope) of production.
  – Vertical: reflects the extent to which goods are produced in-house.
• What is the internal organization of a firm?
• Is it better to produce everything indoor, or to buy certain products to other firms?
1 What is a firm?

What determines the size of a firm?
- Efficiency reason for integration or disintegration.

1.1 Exercise of monopoly power

- A firm is vertically integrated if it participates in more than one successive stage of the production of goods.
- Why integration? to legally have a monopoly power on the product market.
- Because some practices are banned by antitrust laws.
  - Price discrimination (to avoid being accused of treating differently consumers / to avoid arbitrage)
  - Intermediate price controls (to generate unobservable transaction)
    * price imposed by the government
    * sale taxes
    * rate-of-return regulation
- A firm can be horizontally integrated.
1.2 Static Synergy (technological view)

Why will a firm decide to gather activities indoor? (in a static contract)

⇒ To exploit economies of scale or of scope.

- Single product cost function:
  \[ C(q) = \begin{cases} 
  F + \int_0^q C'(x) \, dx & \text{if } q > 0 \\
  0 & \text{otherwise} 
  \end{cases} \]

  where \( F > 0 \) is the fixed cost.

- Marginal cost:
  \[ MC(q) = C''(q) \]

- Average cost
  \[ AC(q) = \frac{C(q)}{q} \]

- \( MC \) is decreasing if \( C'''(q) < 0 \) for any \( q \);

- \( AC \) is decreasing if 
  \[ \frac{C(q_1)}{q_1} > \frac{C(q_2)}{q_2} \text{ for } q_2 > q_1 > 0. \]

- Subadditive costs function if 
  \[ \sum_{i=1}^{n} C(q_i) > C\left(\sum_{i=1}^{n} q_i\right) \]
• See graph

• When \( MC < AC \) **economies of scale**, 
• when \( MC > AC \) **diseconomies of scale**, 
• when \( MC = AC \), **constant return to scale**.

**Result 1**  When the \( MC \) is decreasing then the \( AC \) is decreasing.

**Proof:** to show

**Result 2**  When the \( AC \) is decreasing, we have subadditivity.

**proof** to show

• Natural monopolies  
  – Regulator has complete information on \( C(q) \)

**Definition 1** (Baumol et al. (1982)) An industry is a natural monopoly if the cost function is subadditive over the relevant range of outputs.
• In unregulated industry
  – $n$ identical firms
  – $\Pi(n)$ profit of a single firm
  – $\Pi'(n) < 0$

**Definition 2** An industry is a natural monopoly if $\Pi(1) > 0 > \Pi(2)$

• Multiproduct firm: **Economies of scope** if
  $$c(q_1, 0) + c(0, q_2) > c(q_1, q_2).$$

• Examples of natural monopolies
  – long distance telecommunication in US (AT&T) in 1950s,
  – airline services for some cities,
  – electricity distribution,
  – railroad companies produces passenger travel + freight transport.

• Economies of scale encourage integration.

• But firms can contract instead of doing everything indoor.
1.3 Long run relationship

- Why rules that govern trade tomorrow have to be determined today if possible?

- LR relationships are often associated to (Williamson (1976))
  - switching costs
  - or specific investment.

1.3.1 Bilateral monopoly pricing and the *ex post* volume of trade.

- Vertical relationship between a supplier and a buyer.
  - 2 periods:
    * \( t = 1 \) (*ex ante*). Contract
    * \( t = 2 \) (*ex post*). Bargaining
  - At \( t = 2 \)
    * they learn how much they will earn from trading at \( t = 2 \)
    * trade: 1 or 0 unit of a good
    * value: \( v \) to the buyer
    * production cost: \( c \) to the supplier.
* Gain from trading: $v - c$
* If $p$ is the price:
  * buyer’s surplus: $v - p$
  * supplier’s surplus: $p - c$

**No contract at** $t = 1$

- Bargaining at $t = 2$
- If symmetric information
  \[\Rightarrow\] efficient amount of trade if $v \geq c$.

\[\Rightarrow\] Bargaining under symmetric information is efficient.

- If asymmetric information
  \[\Rightarrow\] inefficient outcome
- See example
• Thus, as long as
  – private information on \( v \) and \( c \)
  – \( v \) can be smaller than \( c \)
  – parties are free not to trade

\[ \Rightarrow \text{Bargaining creates some inefficiency} \]

**Contract at** \( t = 1 \)

• The *ex post* trade inefficiency gives the parties incentives to contract *ex ante*.

• If \( v \) is private information (buyer), what to do?
  give the “informed party” the right to choose the price
  As \( c \) is known, \( p = c \)

• If \( c \) is private information (supplier)
  supplier should choose the price to get efficiency

• if bilateral asymmetric information
  this is no longer efficient
1.3.2 Specific Investment and the hold-up problem.

- At \( t = 1 \)
  - supplier invests in cost reduction
  - buyer invests in value enhancement.
  - But specific investment.

No contract

- The two parties bargain at \( t = 2 \) over trade and price
- Suppose that the \( ex \ post \) volume of trade is efficient
- what about the \( ex \ ante \) specific investment?

  The investment is suboptimal

- example

- The supplier cannot capture all the cost saving
- The buyer can use the threat of not trading to appropriate these savings

  \[ \Rightarrow \] opportunism (Williamson (1975))

Contract

- The two parties can write a contract
• LR relationships suggests that firms should write long and detailed contracts when it is possible and not too costly...

• But not true if outside opportunities (now or in the future)...

1.4 Incomplete contract

• In reality contracts are incomplete because of transaction costs (Coase (1937), Williamson (1975))

• Some occur at the date of the contract
  – it is impossible to specify all the contingencies,
  – even if they are known: too many.

• some occur later
  – monitoring the contract may be costly
  – enforcing contracts: huge legal costs.

• Vertical integration is more likely (relative to a long-term contract) when transaction costs are high.
1.5 The profit-Maximization Hypothesis

• We assume that the objective of the firms is to maximize their payoff.
• But the manager may have other objectives
  – maximize their firm size
  – minimize the working time...
• Separation of ownership and control.
• Incentive theory: principal-agent model.