Theories of the Firm

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Coase (1937)

If the market is an efficient method of resource allocation, as argued by neoclassical economics, then why do so many transactions take place within firms?

Coase's (informal) answer:

- There are costs of making transactions through both the market and the firm: *transaction costs*.
- The firm's size is determined by optimizing with respect to these costs.

But what exactly are these costs? Why do they differ in the market and in the firm?

A theory of the firm should explain the costs and the benefits of transacting in the market vs. the firm.

The neoclassical theory of the firm

- Production function $f(x_1, ..., x_n)$ and input prices $\{w_i\}_{i=1}^n$
- Cost function: $C(Q) = \min \sum_{i=1}^n w_i x_i \quad s.t.\ f(x_1, ..., x_n) \geq Q$
- With fixed costs and increasing marginal costs, $C(Q)/Q$ has a U-shape, reaching a minimum at some Q^*.
- So economies of scale (or scope) explain why production activities up to scale Q^* should be concentrated within one "firm" rather than being distributed across multiple producers.
- But this isn't a theory of the firm. Rather it is a theory of plant size.
- Need to go further: What determines whether several plants have the same owner or different owners?

A "theory of the firm" has two possible meanings:

1. a theory of the *boundaries* of the firm — **our focus here**
2. a theory of the *internal organization* of the firm, i.e. its internal structure and policies.

Focus (largely) on decisions about "vertical integration":

- Where a supplier produces an intermediate good for a producer,
  - should the producer own the supplier (backward integration)?
  - or should the supplier own the producer (forward integration)?
  - or should the supplier and producer be separate firms (non-integration)?
- This is often referred to (ignoring the second option) as the "make or buy decision".

Sources of transactions costs and the need for contracts

Some transactions occur in spot markets

- e.g. casual labor; wholesale fish market

Efficient spot markets have many participants on each side

"Thin" spot markets often generate inefficiencies:

- Ex post inefficiencies
  - specific investments (investments whose value is greater in the current transaction than in any alternative use) generate "quasi-rents" (i.e. an ex post surplus)
  - parties may waste resources in haggling over how to split this ex post surplus
- Ex ante inefficiencies
  - even if ex post bargaining is efficient, parties may make inefficiently low levels of specific investments ex ante

Ex ante inefficiencies: illustration

Seller (S) supplies an intermediate good (a widget) to a buyer (B).

- S's production cost is 0, but by exerting ex ante effort e, at convex cost $C(e)$, S can improve widget's quality.
- B values widget at $\Pi(e) = \pi e$.
- B has no alternative supplier, and S has no alternative purchaser.
- The socially optimal (first-best) effort maximizes $\pi e - C(e)$, so satisfies $\pi = C'(e^{FB})$.

Suppose there is no contract between B and S, so ex post, they bargain over the price.

- Ex post, S's investment in quality has been sunk, and both parties' outside options are 0, so Nash Bargaining Solution $\Longrightarrow p = \frac{\pi e}{2}$.
- Ex ante, S anticipates this outcome, so chooses e to maximize $\frac{\pi e}{2} - C(e) \Longrightarrow$ S's effort satisfies $\frac{\pi}{2} = C'(e^{SB})$: **there is ex ante underinvestment by the seller.**

The role for contracts

If S's effort could be verified by a court, a contract could solve the underinvestment problem: contract would specify price $p = \pi e - k$.

- This contract would give the seller efficient incentives, and k could be chosen to give any desired split of the surplus.

Is this a theory of the firm? No!

- The contract $p = \pi e - k$ could work between two independent firms or between two units of the same firm.
- With this (complete) contract, the boundaries of the firms would be irrelevant.

Complete vs. incomplete contracts

Complete contract: specifies actions and payments in all possible future contingencies.

- With complete contracts, never any need for ex post decision-making.
- If all contracts were complete, it wouldn't matter whether the parties to the contracts were members of the same or different firms.
- Therefore, **"incompleteness" of contracts is necessary for a theory of the boundaries of firms**.

In practice, **contracts are incomplete**. Why? It is difficult

- to foresee all future contingencies
- to decide in advance what should be done in each case
- to describe the above in a way enforceable by a court

Whenever contracts are incomplete, there is a need for ex post decision-making. **And the boundaries of firms (ownership of the assets used in transactions) will matter because they will affect how decisions are made ex post.**

Three theories of the firm

1. **"transaction cost economics":** due to Coase (1937), Williamson (1975,79,85) and Klein, Crawford, and Alchian (1978)

2. **"property rights theory":** due to Grossman and Hart (1986) and Hart and Moore (1990)

3. **"incentive system theory":** due to Holmstrom and Milgrom (1991,1994)

- Surveyed in Gibbons (2005)
- Each theory assumes that contracts are incomplete.
- Each gives a different explanation for why and how decision making depends on firm boundaries.
- So each yields different predictions about how firm boundaries affect the efficiency of transactions.

Transaction cost economics (1)

The famous case of General Motors and its supplier Fisher Body

- In 1919, General Motors (GM) entered a 10-year agreement with Fisher Body (FB) for the supply of metal closed bodies
  - exclusive dealing clause by which GM purchased closed bodies only from FB
  - price fixed
- Demand for closed bodies later increased dramatically
  - GM wanted to reduce the price, since FB's average costs had decreased
  - FB refused to locate plants near GM's assembly plants
  - result: inefficient haggling ex post and inefficient ex ante investment decisions
- By 1924, GM began negotiations to purchase FB, which it did in 1926

Transaction cost economics (2)

- Coase; Williamson; Klein, Crawford & Alchian
- The theory is *informal*
- Stresses incompleteness of contracts and "lock-in"
  - "Lock-in" arises from specific investments (investments whose value is greater in the current transaction than in any alternative transaction). Specific investments generate "quasi-rents" (i.e. ex post surplus).
- Costs of market transactions (non-integration): ex post haggling over quasi-rents (and perhaps underinvestment ex ante in specific assets).
  - These costs are greater with greater specificity of assets and more uncontracted-for contingencies.
- These transaction costs of using the market disappear under integration, where decisions can be imposed by fiat.
  - Focus is usually on backward integration.
- But integration has "bureaucratic" costs.

Transaction cost economics (3)

Main empirical prediction: higher quasi-rents are more likely to lead to integration.

- Generally, this is confirmed.
- For ex., Joskow (1985) studies transactions between coal mines and electric utilities
  - *Main finding:* electricity plants located next to a coal mine are more likely to own their coal source than are plants not so located.
  - *Interpretation:* degree of lock-in, and hence size of quasi-rents, is greater for plants located next to a coal mine.

Problems with the transaction cost theory of the firm:

- Why does haggling stop inside the firm? What about rent-seeking behavior inside firms? (see Gibbons (2005) and Meyer, Milgrom, and Roberts (1992))
- What are the "bureaucratic" costs?

The property rights theory of the firm: overview

Grossman and Hart; Hart and Moore

- In this theory, the firm = set of jointly-owned physical assets (machines, buildings, land, patents, etc.)
- Contracts are incomplete: in at least some states of the world, future uses of physical assets are left unspecified.
- Ownership of physical assets matters because
  - in states where contract is silent, owner of assets has *residual control rights* over how the assets are used
  - residual control rights thus influence ex post bargaining power, hence ex post distribution of surplus
  - anticipated ex post distribution of surplus influences ex ante incentives for specific investments, hence ex ante expected surplus
- Prediction of the theory: ownership of physical assets will be determined to maximize ex ante expected surplus.

The property rights theory of the firm—example

Aghion-Holden (2011): Transaction btw. seller (S) of an intermediate good (widget) and buyer (B), who uses widget to produce a final good.

- S can make a privately costly investment (cost=5) in the widget machine which reduces his cost of producing the widget from 16 to 10.
- B can make a privately costly quality investment (cost=5) in the final-good machine which raises his sales revenue from 32 to 40.
  - Only S can make cost-reduction investment, and only B can make quality-enhancement investment.
- Neither S nor B has any alternative transaction partner.
- S and B can both observe whether or not the other has invested, but a court cannot verify these investments. Hence B's payment to S cannot be made contractually contingent on the investment choices: *incomplete contract assumption*.
- So the price will be determined by ex post bargaining, *after* the investment decisions.
- Socially efficient outcome: S and B both invest, and widget is sold by S to B. First-best social surplus$= 40 - 10 - 5 - 5 = 20$.

The property rights theory of the firm—example

- Non-integration: S owns widget machine and B owns final-good machine
  - Ex post (after the investment decisions), S and B bargain over the price. Assume price determined by Nash Bargaining Solution $\longrightarrow$ S and B split ex post surplus from trade 50:50.
  - B anticipates that if he invests (cost=5), surplus rises by 8 but his share rises by only $\frac{1}{2}(8)$, so B will choose not to invest. Similarly, investment by S would cost 5 but raise S's share by only $\frac{1}{2}(6)$, so S, too, will not invest.
  - Social surplus under non-integration $= 32 - 16 = 16$.
- Forward integration: S owns both machines
  - Ex post, S no longer needs to reach agreement with B: S can operate both machines and capture the whole ex post surplus.
  - S therefore chooses to invest, since cost $= 5 < 6 =$ S's gain.
  - B chooses not to invest, since he captures none of the increase in surplus.
  - Social surplus under forward integration $= 32 - 10 - 5 = 17$.
- Backward integration: B owns both machines
  - Ex post, B no longer needs to reach agreement with S: B can operate both machines and capture the whole ex post surplus.
  - B therefore chooses to invest, since cost $= 5 < 8 =$ B's gain.
  - S chooses not to invest, since he captures none of the increase in surplus.
  - Social surplus under backward integration $= 40 - 16 - 5 = 19$.

The property rights theory of the firm—example

Conclusion from the example: None of the three ownership structures achieves the first-best surplus, but backward integration is best here.

Key messages:

1. When contracts are incomplete, asset ownership matters because it affects ex ante inefficiencies from underinvestment in specific assets.
2. Residual rights of control over assets should be allocated to the party whose marginal investment is more productive.

The property rights theory of the firm—model (1)

Manager 1 uses asset a_1 to produce final good with an input (widget) produced by manager 2 with asset a_2.

Timeline:

- $t = 0$: managers can buy and sell the two assets
- $t = 1$: manager i invests e_i, at cost $c(e_i) = \frac{1}{2}e_i^2$, in human capital specific to a_i
- $t = 2$: bargaining determines whether or not widget is produced and exchanged, and its price

Assumptions:

- **Incomplete contract:** contract (written at $t = 0$) cannot specify investments at $t = 1$ or decisions at $t = 2$ but only ownership of assets; ownership of assets confers control rights over their use at $t = 2$.
- Managers have **symmetric information** throughout the game, so
  - at $t = 2$, both observe (e_1, e_2) chosen at $t = 1$; period-2 bargaining is efficient and yields Nash Bargaining Soln., with disagreement payoffs determined by asset ownership
  - at $t = 0$, trading of assets yields ownership structure that maximizes ex ante expected surplus.

The property rights theory of the firm—model (2)

- Denote by $A_i \subseteq \{a_1, a_2\}$ the set of assets owned by manager i
- Ownership structures:
  - no integration: manager i owns a_i

    $$\rightsquigarrow A_1 = \{a_1\}, A_2 = \{a_2\}$$
  - type-1 (backward) integration : manager 1 owns both assets

    $$\rightsquigarrow A_1 = \{a_1, a_2\}, A_2 = \{\emptyset\}$$
  - type-2 (forward) integration: manager 2 owns both assets

    $$\rightsquigarrow A_1 = \{\emptyset\}, A_2 = \{a_1, a_2\}$$
- Ownership of assets determines who has control rights over their use at $t = 2$, but does not affect who can invest in assets at $t = 1$: only manager i can invest in a_i.
- Asset ownership does not affect managers' information or preferences.

The property rights theory of the firm—model (3)

- At $t = 2$, transacting yields revenue

$$\pi(e_1, e_2) = \pi_1 \cdot e_1 + \pi_2 \cdot e_2$$

- First-best investments (benchmark under complete contracts):

$$\max_{e_1, e_2} \pi(e_1, e_2) - \frac{1}{2}e_1^2 - \frac{1}{2}e_2^2 \quad \Longrightarrow \quad \pi_i = e_i^{FB} \text{ for } i = 1, 2$$

- Disagreement payoffs at $t = 2$: $D_i(e_i, A_i) = d_i(A_i) \cdot e_i$
  - $d_i(A_i)$ measures the *marginal* effect of i's investment on his disagreement payoff and depends on A_i
  - i's disagreement payoff is not affected by e_j
- Assume $\pi_i \geq d_i(\{a_1, a_2\}) \geq d_i(\{a_i\}) \geq d_i(\{\emptyset\})$, for $i = 1, 2$.
- Hence, for all ownership structures,

$$\pi(e_1, e_2) \geq D_1(e_1, A_1) + D_2(e_2, A_2),$$

$\Longrightarrow$ ex post, always efficient for widget to be traded.

Solving the model

At $t = 2$, investments (e_1, e_2) are observable. Managers bargain ex post under symmetric information $\Longrightarrow$ Nash Bargaining Solution: widget is traded, and price p paid by manager 1 solves

$$\max_p \left(\pi(e_1, e_2) - p - D_1(e_1, A_1)\right)\left(p - D_2(e_2, A_2)\right).$$

Hence bargaining yields payoff S_i for manager i at $t = 2$ of

$$S_i = D_i\left(e_i, A_i\right) + \frac{1}{2}\left[\pi\left(e_1, e_2\right) - D_1\left(e_1, A_1\right) - D_2\left(e_2, A_2\right)\right].$$

- S_i is increasing in manager i's disagreement payoff, D_i: owning more assets, by conferring more residual control rights, improves ex post bargaining power

At $t = 1$, given ownership structure (A_1, A_2), each mgr i solves

$$\max_{e_i} S_i\left(e_1, e_2; A_1, A_2\right) - \frac{1}{2}e_i^2 \quad \Longrightarrow \quad \frac{1}{2}\left[\pi_i + d_i\left(A_i\right)\right] = e_i^{eqm}$$

Since first-best efforts satisfy $\pi_i = e_i^{FB}$, **for any ownership structure, eqm. investment levels of both managers are inefficiently low:** $e_i^{eqm} \leq e_i^{FB}$**,** $i = 1, 2$**.**

Solving the model

$$\frac{1}{2}\left[\pi_1 + d_1\left(A_1\right)\right] = e_1^{SB} \qquad \text{and} \qquad \frac{1}{2}\left[\pi_2 + d_2\left(A_2\right)\right] = e_2^{SB}$$

Effects of ownership structure:

- **Ownership of assets increases incentives:** Since $d_i\left(\{a_1, a_2\}\right) \geq d_i\left(\{a_i\}\right) \geq d_i\left(\{\emptyset\}\right)$, it follows that

$$e_i^{eqm}\left(\{a_1, a_2\}\right) \geq e_i^{eqm}\left(\{a_i\}\right) \geq e_i^{eqm}\left(\{\emptyset\}\right).$$

- **Therefore, changes in ownership structure have both benefits and costs: type-i integration increases manager i's incentives but reduces manager j's.**

Choice of ownership structure

$$\frac{1}{2}\left[\pi_1 + d_1\left(A_1\right)\right] = e_1^{SB} \qquad \text{and} \qquad \frac{1}{2}\left[\pi_2 + d_2\left(A_2\right)\right] = e_2^{SB}$$

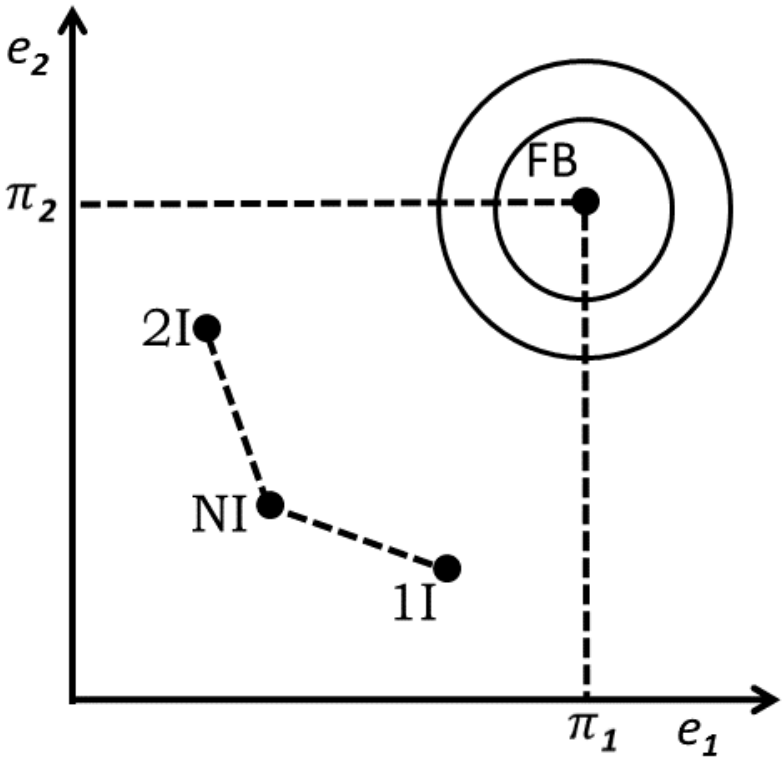
- What can be said about the optimal ownership structure?
  - assets are *independent* if for both managers, $d_i\left(\{a_1, a_2\}\right) = d_i\left(\{a_i\}\right)$
    $\Longrightarrow$ no-integration (NI) is optimal
  - assets are *complementary* for manager 1 if $d_1\left(\{a_1\}\right) = d_1\left(\{\varnothing\}\right)$
    $\Longrightarrow$ type-2 integration (2I) dominates no-integration
  - manager 2's *human capital is essential* if $d_1\left(\{a_1, a_2\}\right) = d_1\left(\varnothing\right)$
    $\Longrightarrow$ type-2 integration (2I) is optimal

- Other things equal, the larger is π_i, the bigger the efficiency gain from boosting i's incentives by transferring assets to him.

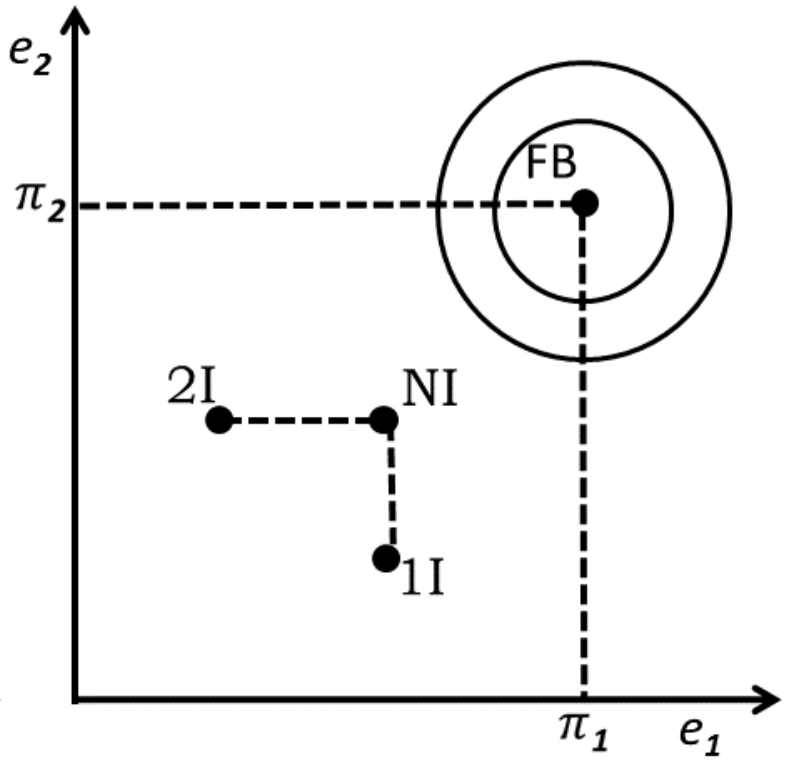
- In our earlier example, the assets are *complementary* for both B and S: neither has a positive outside option unless he owns both machines.
  - $0 = d_i(\{\emptyset\}) = d_i(\{a_i\}) < d_i(\{a_1, a_2\}) = \pi_i$
  - Therefore, both B-integration and S-integration dominate no-integration.
  - B-integration induces B but not S to invest; S-integration does the reverse.
  - The optimal type of integration induces investment from the party for whom $\pi_i = d_i(\{a_1, a_2\})$ is larger.

Choice of ownership structure

Social surplus $= -\frac{1}{2}(\pi_1 - e_1)^2 - \frac{1}{2}(\pi_2 - e_2)^2 + \frac{1}{2}(\pi_1)^2 + \frac{1}{2}(\pi_2)^2$



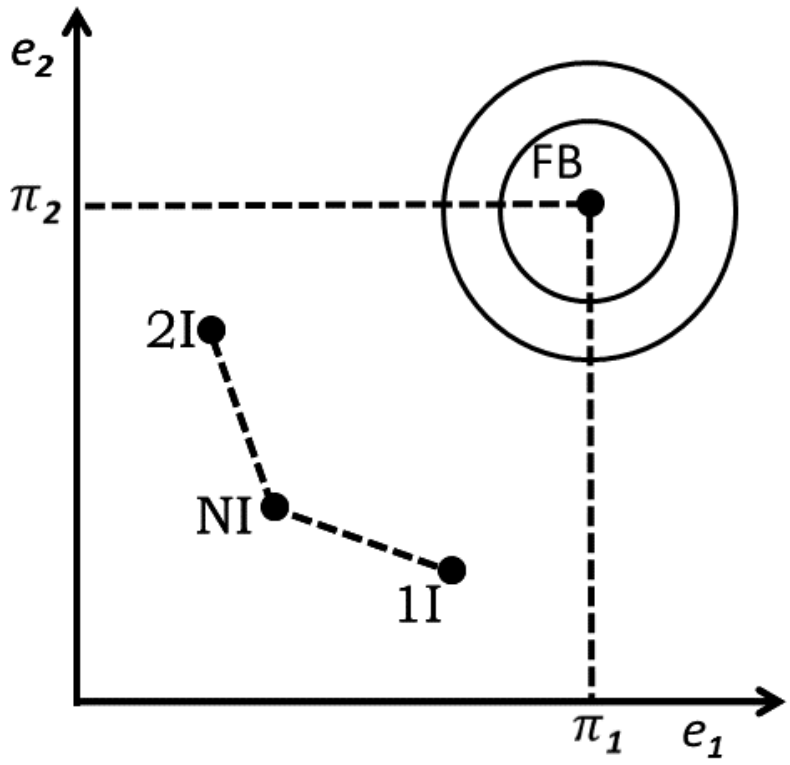
general case



assets are independent for both managers⇒ NI is optimal

Choice of ownership structure

Social surplus $= -\frac{1}{2}(\pi_1 - e_1)^2 - \frac{1}{2}(\pi_2 - e_2)^2 + \frac{1}{2}(\pi_1)^2 + \frac{1}{2}(\pi_2)^2$



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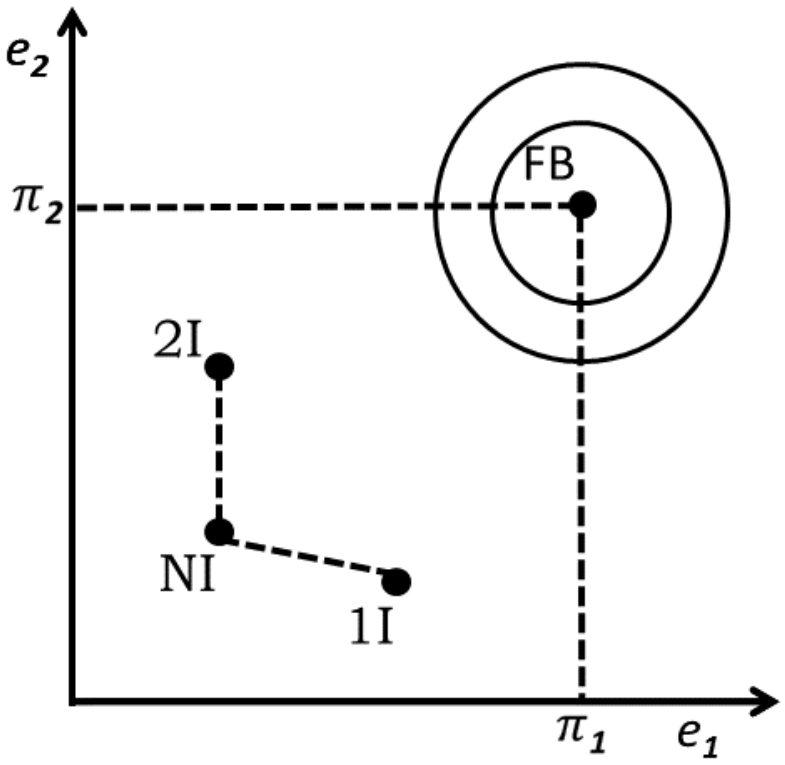
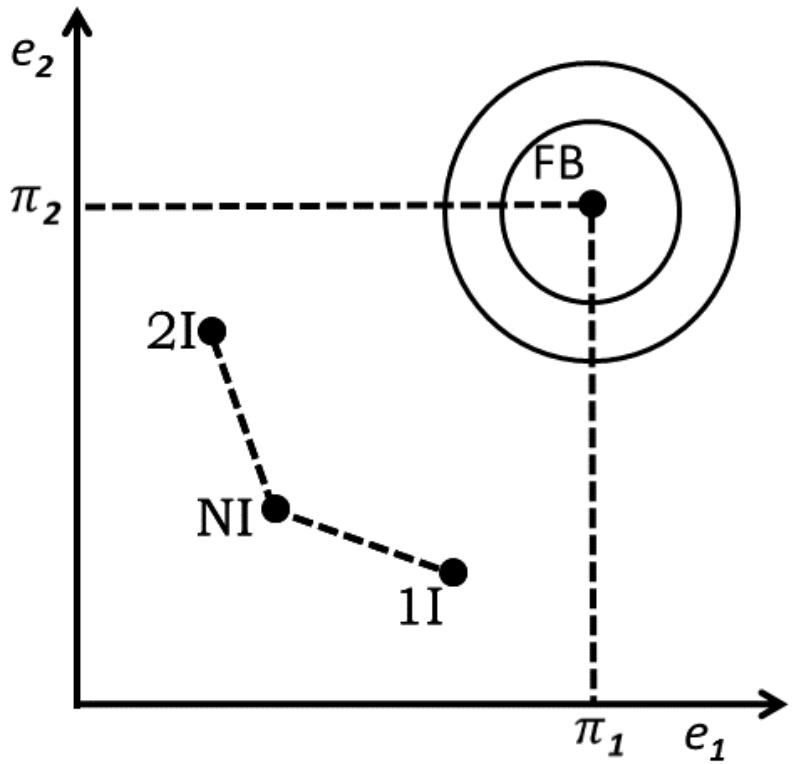


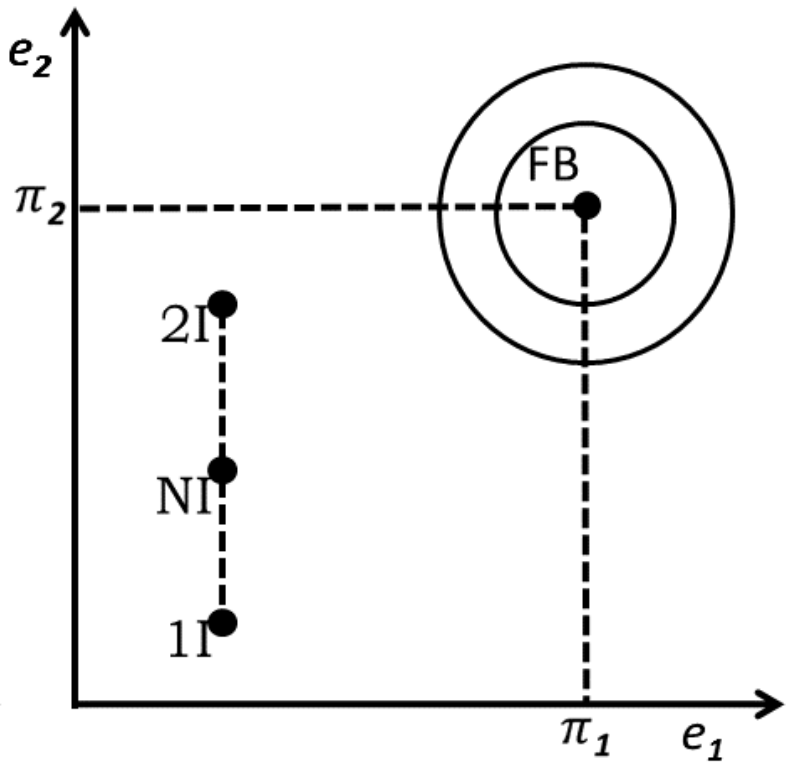
assets are complementary for manager 1⇒ $2\mathrm{I} \succ \mathrm{NI}$

Choice of ownership structure

Social surplus $= -\frac{1}{2}(\pi_1 - e_1)^2 - \frac{1}{2}(\pi_2 - e_2)^2 + \frac{1}{2}(\pi_1)^2 + \frac{1}{2}(\pi_2)^2$



general case



manager 2's human capital is essential ⇒ 2I is optimal

The property rights theory of the firm: a critical view

- Main empirical prediction: transferring ownership raises incentives of new owner and lowers incentives of previous owner.
  - More formally, marginal effects of investments on both transaction revenue and disagreement payoffs D_1 and D_2 determine ex ante incentives and hence optimal ownership structure.
  - But how to measure marginal effects on disagreement payoffs?
  - Not much evidence, but see Whinston (2003).
- The theory better explains small entrepreneurs than large firms.
- Broader lesson from property rights theory: *When contracts are incomplete, allocation of decision rights matters for efficiency* $\Longrightarrow$ *important to understand how decision rights are allocated.*
  - wide application of this idea in organizational economics, corporate finance, macro, public economics, and international trade.

The incentive system theory of the firm—overview

Holmstrom and Milgrom; Holmstrom

- Firms and markets are different approaches to resolving multi-task incentive problems.
- Ownership of an asset confers the right to receive the return stream from that asset.
- **Incomplete contract assumption:** Contracts basing payments on changes in asset values (esp. values of intangible assets) may be infeasible.
  - because verifiable measures of changes in asset values too costly to produce
- Assigning an agent ownership of an asset can give him strong incentives to maintain the value of the asset.
- But these incentives may divert his efforts from other activities, e.g, producing output, unless he's given strong output-based incentives.
- Ownership of asset will be determined to optimally resolve this tradeoff.

The incentive system theory of the firm: model (1)

A risk-averse agent (A) performs a set of tasks for a risk-neutral principal (P), using a transferable asset. If P owns the asset, A is an employee of P; if A owns the asset, A is an independent contractor.

- Examples:
  - P=producer; A=retailer
  - P=fast-food restaurant; A=franchisee or employee
  - P=trucking company; A=truck driver
- Asset can be physical (e.g. machine, vehicle, property) or intangible (e.g. reputation for quality or service)

Extend the earlier multi-task LEN principal-agent model:

- How do optimal contracts differ for employees and independent contractors?
  - **Result 1:** Explicit output-based incentives are weaker for employees than for independent contractors.
- Under what conditions is it optimal for A to be an employee and under what conditions an independent contractor?
  - **Result 2:** The more accurately A's output can be measured and the more important is asset-maintenance effort, the more likely A is to be an independent contractor.

The incentive system theory of the firm: model (2)

- Agent privately chooses efforts (e_1, e_2) at cost $C(e_1 + e_2) = 0$ if $e_1 + e_2 \leq \bar{e}$ and $C(e_1 + e_2) > 0$ if $e_1 + e_2 > \bar{e}$.
  - e_1: effort on production/sales task
  - e_2: effort to develop/maintain value of asset
- Socially efficient efforts maximize $B(e_1) + V(e_2) - C(e_1 + e_2)$
  - $B(e_1)$ is expected revenue from production/sales, and $V(e_2)$ is expected change in asset value
  - $B(0) = V(0) = 0$; $B'(0) > 0$; $V'(0) > 0$; $e_1^{FB} + e_2^{FB} > \bar{e}$.
- Verifiable performance measure for production/sales task $= z_1 = e_1 + x_1$, where $x_1 \sim N(0, Var(x_1))$
- No verifiable performance measure for task 2
- But actual change in asset value accrues to asset owner and $= V(e_2) + \epsilon$, where $\epsilon \sim N(0, Var(\epsilon))$
- Linear compensation contract for agent: $w = \alpha + \beta_1 z_1$

The incentive system theory of the firm: model (3)

- Recall $C(e_1 + e_2) = 0$ if $e_1 + e_2 \leq \bar{e}$ and $C(e_1 + e_2) > 0$ if $e_1 + e_2 > \bar{e}$.
- Socially efficient efforts maximize expected social surplus (SS) $= B(e_1) + V(e_2) - C(e_1 + e_2)$
- Define $\pi^1 \equiv \max_{e_1} B(e_1) - C(e_1)$ — maxed SS when $e_2 = 0$
- Define $\pi^2 \equiv \max_{e_2} V(e_2) - C(e_2)$ — maxed SS when $e_1 = 0$
- Define $\pi^{12} \equiv \max_{e_1} B(e_1) + V(\bar{e} - e_1)$ — maxed SS when $e_1 + e_2 = \bar{e}$
- If $\pi^{12} > \max\{\pi^1, \pi^2\}$, there is a strong social preference for "balanced efforts":
  - SS from low total effort $e_1 + e_2 = \bar{e}$, optimally allocated across tasks, exceeds max. surplus if effort is devoted to only 1 task.

The incentive system theory of the firm: results (1)

Result 1: If $\pi^{12} > \max\{\pi^1, \pi^2\}$, then

i) if A is an employee, the optimal contract pays a fixed wage: $\beta_1 = 0$ (low-powered incentives are optimal for employees);

ii) if it is optimal for A to be an independent contractor, then the optimal contract sets $\beta_1 > 0$ (high-powered incentives are optimal for independent contractors).

Proof: i) If $\beta_1 > 0$ for employee, then A chooses $e_2 = 0$ and e_1 such that $\beta_1 = C'(e_1)$. Total certainty equivalent (TCE) equals

$$B(e_1) - C(e_1) - \frac{1}{2} r Var(x_1)(\beta_1)^2 < \pi^1 < \pi^{12}.$$

If $\beta_1 = 0$ for employee, then A is willing to allocate total effort $\bar{e}$ in socially optimal way, so TCE $= \pi^{12}$. Thus, optimal β_1 for an employee is 0.

ii) If $\beta_1 = 0$, then an A who is an indep. contractor sets $e_1 = 0$, and TCE $< \pi^2 < \pi^{12} =$ TCE when A is an employee and $\beta_1 = 0$. Hence, if it is optimal for A to be an indep. contractor, optimal $\beta_1 > 0$. ■

The incentive system theory of the firm: results (2)

Result 2: If $\pi^{12} > \max\{\pi^1, \pi^2\}$, then

i) depending on the values of $(r, Var(\epsilon), Var(x_1))$, either employment or independent contracting can be optimal;

ii) lowering any of $(r, Var(\epsilon), Var(x_1))$ makes independent contracting more likely to be optimal.

Proof: i) Suppose first $Var(x_1) = Var(\epsilon) = 0$. Then first-best is achievable with independent contracting, and $\beta_1 = B'(e_1^{FB})$.
But first-best is not achievable with A an employee, since either $e_2 = 0$ (when $\beta_1 > 0$) or total effort is too low (when $\beta_1 = 0$). Hence independent contracting is optimal.
But if $rVar(\epsilon)$ gets large, employment becomes optimal.

ii) TCE under optimal employment ($\beta_1 = 0$) is indep. of $rVar(x_1)$ and $rVar(\epsilon)$, while TCE under indep. contracting decreases in these terms.
■

Incentive system theory: empirical evidence

Anderson and Schmittlein (1984) studied employment status and compensation of sales agents in electronic components industry.

- Both employment and independent contracting were common.
  - in line with Result 2i)
- Difficulty of measuring sales of individual agents (because of team-selling or costly record-keeping) was best empirical predictor of likelihood of sales agents being employees.
  - in line with Result 2ii)

Baker and Hubbard (2004) studied trucking industry, focusing on driver vs. company ownership of trucks.

- On long-haul routes, more scope for drivers to shirk on asset-maintenance effort, by driving at highly variable speeds.
- Empirical findings:
  i) Driver ownership is greater for long hauls — in line with Result 2ii)
  ii) Introduction of on-board computers (monitoring speed of driving, etc.) reduces driver ownership, esp. for long hauls — if a noisy measure of asset-maintenance effort became available in the model, it would raise TCE from employment more than TCE from independent contracting.

Conclusion (1)

All three theories argue that *the boundaries of firms matter because contracts are necessarily incomplete.*

- Transaction cost economics:
  - Ownership affects ex post decision-making.
  - Integration reduces costly haggling but entails bureaucratic costs.
  - Gibbons (2005) argues there are actually two different theories here, one focusing on haggling ("rent seeking") and one focusing on adapting to uncertainty.
- Property rights:
  - Ownership of an asset $\Longrightarrow$ control rights over that asset.
  - Ownership affects ex ante incentives for investment.
- Incentive systems:
  - Ownership of an asset $\Longrightarrow$ receive return stream from that asset.
  - Ownership affects incentives for investments in assets and, because of the effort-substitution problem, also indirectly affects incentives for other activities.
  - Ownership is one of many instruments used by firms to manage multi-task incentive problems.

Conclusion (2)

Other theories (see Cremer (2010)) have provided different answers to the question: What changes when the boundaries of firms change? For example, a firm that purchases its supplier might

- obtain **better information** about its supplier's costs—Riordan (1990) and Cremer (1995) show that this can be a double-edged sword: this can allow more efficient decision-making by the buyer, but may also make it harder for the buyer to credibly threaten to punish the supplier for poor performance
- obtain **authority** over its supplier's personnel—Meyer, Milgrom, and Roberts (1992) show that this, too, can have a cost as well as a benefit, giving these personnel incentives for "influence activities" (i.e. rent-seeking).