ECON 4245
ECONOMICS OF THE FIRM

Course content

- Why do firms exist? And why do some firms cease to exist?
- How are firms financed?
- How are firms managed?

These questions are analysed by using various models based on various *information* problems within the firm, or between the firm and its stakeholders (owners, creditors, etc.)

Students should

- get knowledge of the basic models within the economics of information (models of non-verifiable information, adverse selection, and moral hazard)
- and their application to the economics of the firm.

Teaching - time and place (ECON4245 - autumn 2007)

Lecture

- Wednesday 10:15 -12:00, (22. August to 21. November)

Tone Ognedal, Hans Henrik Christian Borchgrevink, Vidar Christiansen

Schedule is posted on the web site.

Seminars

10 seminars. First are 4. and 7. of September. (Note: No seminar the subsequent week.) Schedule will be posted on web site.

Seminars 1

- Friday 14:15 -16:00, Aud. 5 Eilert Sundts hus

Seminars 2

- Tuesday 08:15 -10:00
  Room 1220 Eilert Sundt building

Syllabus:

is posted on the web site of the course…..

In addition – for those interested I, for my lectures, recommend the following two books:

Tirole: The theory of industrial organization
and
Tirole: The theory of corporate finance (2006)

Contact students
You must coordinate and decide for two (or three) contact students, one from each seminar series.

Introduction:

Economics of information

- Adverse selection
  - financing the firm
- Moral hazard
  - managing the firm

In addition we will study another (though related) information problem:

- Unverifiable information – incomplete contracts
  - theory of the firm

Incomplete contract is the central element in the first chapters of Hart's book.

Brief review of economists' thoughts on why firms exist?, and why firms look like they do (firm size)?:

A key sub-question: Make or buy? (outsourcing debate)

- Economist do not have very convincing answers

1. Neo-classical theory
   - The firm is a set of production opportunities
   - Profit maximizing black box (nothing about internal issues)

2. Principal-agent theory
   - Incentives inside the firm.
   - Nothing about optimal firm boundaries

3. Transaction costs theory
   - Internalisation (merger) reduces transaction costs

4. "Nexus of contracts"
   - The firm is simply a set of contracts

5. Property rights approach
   - Capital (non-human) is essential
   - Residual control of capital is a central issue
   - Contains elements from 1)-4); better on cost-benefit of integration

From Hart FCFS and *An Economist's Perspective on the Theory of the Firm*, (1989)

Hart and we will focus on no. 5. Sometimes difficult to determine what is from which theory tradition – not very important. Concentrate on grasping what Hart explains in his book.

Incomplete contracts:

Contracts are incomplete
- unforeseen contingencies
- difficult to agree on terms
- costly to write contracts

Examples:

• Unforeseen contingencies: A in Paris is supposed to deliver equipment to B in Oslo. But neither have anticipated a strike among air-traffic controllers.
  • Other possible unforeseen contingencies:
    - an unanticipated change in demand for B's products
    - a change in regulations of A's and/or B's businesses

• Simplicity: The contract specifies that A sends one item in each delivery, because it is too complicated to specify exactly under which conditions more than one item is needed.

• Limitations: The contract is limited to one year, because it is difficult for B to see what her demands will be after that, and it is difficult for A to see what his abilities to deliver will be.

When a contract is incomplete, property rights matter!

If something happens that is unspecified in the contract, who has the right to decide what to do?

Answer: the one with *residual control* of the asset in question: The owner.

By residual we mean outside of what the contract specifies.

Example: You rent a house. The contract says: You have the right to rent the house until you die provided you do all standard maintenance (possibly specified as painting, fixing holes in the roof etc.). One day your rich uncle turns up and says he will pay for a balcony on the house if you want one.
Who has the right to accept the uncle's offer? The owner of the house.

Incomplete contracts makes renegotiation a big issue.

Example: Renegotiations are necessary when an unanticipated strike delays delivery.

More interestingly:
If you expect renegotiation you might want to invest less ex ante.
(we will soon look a lot more into these this)

Renegotiations

- take time and resources
- particularly because asymmetric information and opportunism makes it difficult to agree

These are *ex post* costs of renegotiation.

(We will soon describe *ex ante* costs of renegotiation.)

Note:
Renegotiation would not be chosen if it costs less to switch to new trading partners.

Why costly to switch?

- perhaps there are no alternatives to switch to
- perhaps all alternatives have higher direct costs (e.g. transportation costs)
- OR: cannot switch without costs (loss) because of *relationship-specific investments*.

Relationship-specific investments

Examples:

• B may have made investments in machinery that is customized to the equipment delivered by A

• A may have made investments in knowledge about the production process that is specific to the requirements of B.

Now to renegotiation, and ex ante relation-specific investment incentives:

Clue: Since the original negotiation (the contract) the relative bargaining strength of the two parties might have changed.

The party that has undertaken most relation-specific investment since writing the contract has a worse bargaining position.

Example: You order a portrait of your mother. The (non-famous) artist and you write a contract specifying a price. You pay nothing or little in advance. When the portrait is finished, you suddenly have a much stronger bargaining position relative to the artist. The artist has done a huge relation-specific investment because the market value of the portrait of your mother is close to zero.

This might lead the parties to invest less than socially optimum.
This is the *ex-ante* cost of renegotiation.

Another example:
Because of the risk of renegotiation later on, A and B use machinery and knowledge that are more general-purpose than what would be profitable for them if a complete contract could be written.

Opportunistic renegotiation:

If you know that the other party has done relation-specific investment, you should initiate renegotiation to exploit your improved bargaining position.

This is called the hold-up problem. (Williamson (1975))
Remark: Williamson is a transaction cost man, but as said, the property rights approach is based on earlier theory.

Note:
If a contract term is *unverifiable* the contract term is useless – even though it *is* covered in the contract – because it cannot be verified in court. Hence, one can start renegotiation about this term.

Brief recap: Contract incompleteness leads to:

- residual control being important
- *ex ante* and *ex post* cost of renegotiation

We can use this insight to say something about the key question, make or buy? (or integrate or not integrate)

If A and B continue as separate firms:

- the hold-up problem
- transaction costs

If they integrate:
Who is the owner of the integrated firm, A or B?
What about A and B's respective incentives to invest?
What does it mean to be *owner*?

We will use more formal theory to study this questions which are key in property rights approach.

The transaction-cost theory emphasizes the costs of non-integration.

The property-rights approach emphasizes that there are also costs of integration – for the non-owner.

Integration occurs when its benefits exceed its costs, relative to non-integration.

Integrate or not? – rule of thumb:
When writing the initial contract, the integration decision is made. The arrangement that maximizes their *combined expected profits* is chosen.

Hart's model

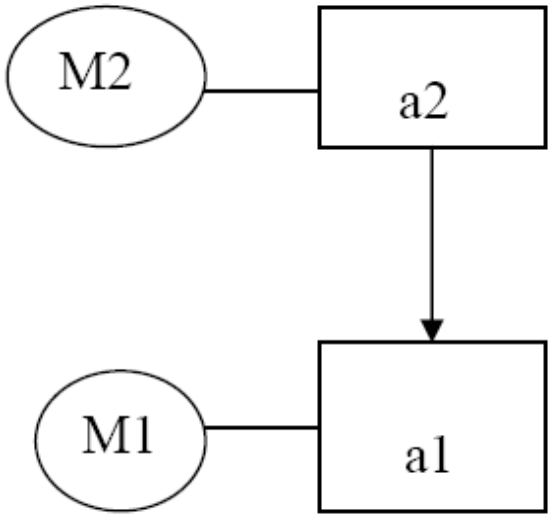
Integration vs. non-integration:

The benefit of integration:
The *acquiring firm*'s incentives to make relationship-specific investments

The cost of integration:
The *acquired firm*'s incentives to make relationship-specific investments

Downstream: Manager M1 - Asset a1

Upstream: Manager M2 - Asset a2



Time 0:

- Relationship-specific investments made
- Uncertainty about widget requirements

Time 1:

- The uncertainty about widget is resolved
- Widget is supplied

We will first consider a simple model with incomplete contract:

No information about which widget characteristics to be supplied from M2 to M1 when contract is signed

- At time 1: Negotiations from scratch about widget characteristics and price

This is like no contract at all signed at time 0.

Three possible arrangements of firms:

- *non-integration*: M1 owns a1; M2 owns a2.
- *upstream integration* (type 1): M1 owns both a1 and a2.
- *downstream integration* (type 2): M2 owns both a1 and a2.

Price determined during negotiations: p
Outside option: buy or sell at price p_0 (exogenous)

Relationship-specific investments:
Downstream M1 invests i.
Upstream M2 puts in effort e.

The relationship-specific investments are assumed *observable but non-verifiable*: They cannot be verified by a third party, such as a court, and cannot therefore be included in a contract.

The two parties' profits:

In case of a transaction between M1 and M2 (negotiations at time 1 successful):

M1 earns: $R(i) - p$
M2 earns $p - C(e)$
Total profit $R(i) - C(e)$

In case of no transaction, benefit and cost depend on ownership of assets:

M1 earns $r(i; A) - p_0$
M2 earns $p_0 - c(e; B)$
Total profit $r(i; A) - c(e; B)$,

where A is the set of assets available to M1 in case of no deal with M2:

no integration – $A = \{a1\}$
upstream integration – $A = \{a1, a2\}$
downstream integration – $A = \varnothing$

and B is the set of assets available to M2 in case of no deal with M1:

no integration – $B = \{a2\}$
upstream integration – $B = \varnothing$
downstream integration – $B = \{a1, a2\}$

Investments are relationship-specific:

$R(i) - C(e) > r(i; A) - c(e; B) \geq 0$

… also in a marginal sense:

$R'(i) > r'(i; a1, a2) \geq r'(i; a1) \geq r'(i; \varnothing) \geq 0$

$C'(e) < c'(e; a1, a2) \leq c'(e; a2) \leq c'(e; \varnothing) \leq 0$

Concavity: $R'' < 0$; $r'' \leq 0$; $C'' > 0$; $c'' \geq 0$

Consider: $R'(i) > r'(i; a1, a2)$

The difference between the two cases is M2's participation. The inequality states that M1's marginal return from investment is higher if M2 participates: M2's human capital matters for M1's investment return.

Consider: $r'(i; a1, a2) \geq r'(i; a1)$

Even without M2's participation, M1 may gain from at least having access to her asset, a2.

Solving the model (backwards):

Time 1:
Split the gains from trade 50-50: Gains from trade = $(R - C) - (r - c)$

M1's pay-off:
π_1 = [profit without trade] + [share of gain from trade] =
$[r - p_0] + \frac{1}{2}[(R - C) - (r - c)]$

Thus, p is determined such that this is true: $\pi_1 = R - p$, or:

$$p = p_0 + \frac{1}{2}(R - r) - \frac{1}{2}(c - C)$$

These negotiations

- are efficient: Trade always takes place at time 1.
- always give 50-50 sharing, independent of ownership: Being a owner does not give M1 a larger share, but rather improves on his bargaining position by affecting $r - p$ (the *threat point*). IMPORTANT!

Time 0:

In a perfect world, investments would be such that
$R(i) - i - C(e) - e$ is maximized:

$R'(i^*) = 1$

$C'(e^*) = -1$

With *incomplete* contracts, ownership becomes crucial:

$\max_i \pi_1 - i \Rightarrow \frac{1}{2}R'(i) + \frac{1}{2}r'(i; A) = 1$

$\max_e \pi_2 - e \Rightarrow \frac{1}{2}C'(e) + \frac{1}{2}c'(e; B) = -1$

Irrespective of ownership, there is underinvestment in relationship-specific projects.

Proof:

$R' > r' \Rightarrow R' > \frac{1}{2}R' + \frac{1}{2}r' = 1 = R'(i^*)$. $R'' < 0 \Rightarrow i < i^*$.

Similarly for e.

Investment incentives for M1 *are higher if he is owner:*

$i^* > i_1 \geq i_0 \geq i_2$

Similarly for M2:

$e^* > e_2 \geq e_0 \geq e_1$.

The two parties choose that kind of ownership that maximizes the total payoff,

$R(i) - i - C(e) - e$.

Definition 1:
Assets a1 and a2 are *independent* if having access to a2 does not affect M1's marginal investment return, and similar for M1 with respect to a1:

$r'(i; \text{a1}, \text{a2}) = r'(i; \text{a1})$,
$c'(e; \text{a1}, \text{a2}) = c'(e; \text{a2})$.

Result:
If a1 *and* a2 *are independent, then non-integration is optimum.*
Intuition: Integration with M1 as owner of both assets will not affect M1's incentives, since the assets are independent, but will weaken M2's incentives, and similarly with M2 as owner.

Definition 2:
Assets a1 and a2 are *strictly complementary* if having access to only one of them is useless:

$$r'(i; a1) = r'(i; \varnothing),$$

and $c'(e; a2) = c'(e; \varnothing)$.

Result:
When assets are strictly complementary, then any integration is better than non-integration.

Definition 3:
M1 (or, rather, his human capital) is *essential* if:
$c'(e; a1, a2) = c'(e; \varnothing)$.
M2 is essential if:
$r'(i; a1, a2) = r'(i; \varnothing)$.

Result:
If M1 *is essential, then the optimum is integration with* M1 *as owner.*

Some implications:

- If only one person has an investment to make, then this person should own the assets.
- Complementary assets should be owned by the same person.
- Independent assets should have separate owners.
- If an asset is complementary with several other assets, then this asset should be jointly owned.

Extensions: The analysis can be extended to include …

… 1) workers

What is the difference between a worker and a supplier?

- a supplier owns assets in addition to his human capital;
- a worker only owns his human capital;
- a supplier's bargaining power is stronger than that of a worker

Consider a case with only one asset, a2, and disregard managers' incentives to invest: $R'(i) = C'(e) = 0$.

The worker can learn to use the asset a2, but it takes a non-verifiable investment x. By using the asset, he will then generate revenue $y > x$.

Suppose M1 is essential, and that the worker is unable to own a2 himself.
The worker's incentives depend on who, among the other two, is the manager. In optimum, the asset a2 *is owned by the essential manager* M1.

Suppose that revenue is evenly shared. If M2 owns, he has to include the essential M1. The worker invests if $y/3 \geq x$. If M1 owns, M2 is left out. The worker invests if $y/2 \geq x$.

… 2) investments in physical capital

Investments in physical capital are transferable to another owner. How to get the parties to make such investments?

Suppose there are two parties, M1 and M2, and one asset, a*.

By investing i, M1 can increase the value of a* by $R > i$.

By investing $\hat{i}$, M2 can increase the value of a* by $\hat{R} > \hat{i}$.

One owner is not efficient:

- If M1 is owner, then M2 does not invest.
- If M2 is owner, then M1 does not invest.

Joint ownership, with veto power over the use of the asset, may be efficient.

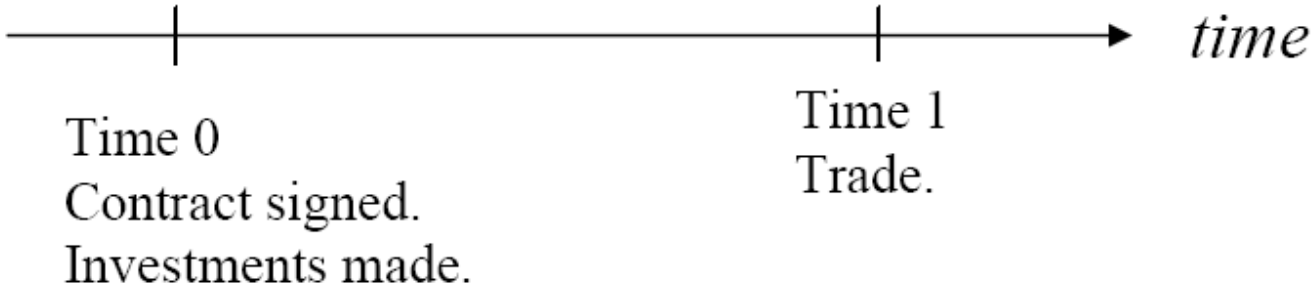
If a* is owned 50-50, then both M1 and M2 invest if:

$R/2 > i$, and

$\hat{R}/2 > \hat{i}$.

Why are contracts incomplete?

What if the parties try to write a contract at time 0?



As benchmark a slightly smaller model (initially without contract):

Suppose only M1 has a relationship-specific investment to make: $R'(i) > 0$, $R''(i) < 0$, $R'(0) > 1$, $C = C^*$.

There is no outside option: $r = 0$, $c = \infty$.

Gains from trade: $R(i) > C^*$.

First best: i^* such that $R'(i^*) = 1$.

Repeat previous analysis (no contract at time 0):

At time 1: M1 gets $\frac{1}{2}[R(i) - C^*]$.

At time 0: M1 invests such that: $R'(\hat{i}) = 2$, *i.e.*, $\hat{i} < i^*$.

Can a contract at time 0 reduce the hold-up problem?
Yes, in some cases.

1. Specific performance. If M1 knows what kind of widget he needs, (and a description of it is verifiable,) they can write the following contract at time 0:
"If M2 supplies the correct widget, then M1 pays p^* to M2. If not, then M2 pays a huge amount to M1."

Thus, underinvestment hinges on the unability to describe what widget is needed at the time of investments.

2. Verifiable investments. Now, the parties can agree to share the investment costs. For example:
"If M1 invests i^*, then M2 pays B to M1. Otherwise, M1 pays a huge amount to M2."

So far ok. What about following:

3. Delayed specification. (we'll do this one on the first seminar…)

Are there ways out?

- Committing not to renegotiate? (..but against the law?) (examples? willingly, and seemingly unnecessarily, making it very costly to renegotiate)
- Contracting with a third party? (..but collusion (Tirole))

Financing the firm – control aspects

Hart chapter 5

Recap:

- Incomplete contracts and relationship-specific investment lead to a hold-up problem. Can be solved by transferring ownership and control over assets between the parties.

- And a person should own an asset if he is *essential* in the use of it.

Question: What if this person does not have funds available for securing the ownership?

A new conflict of interest emerges: Between those with ideas (entrepreneurs) and those with finances (capitalist).

Simple model:
(Aghion & Bolton, *Rev. Econ. Stud.* 1992.)

Entrepreneur (*E*) vs *Capitalist* (*C*).
Capital needed: K
E's initial wealth: w
Investment decision: $a \in A \subset \boldsymbol{R}$

Payoffs from investment:

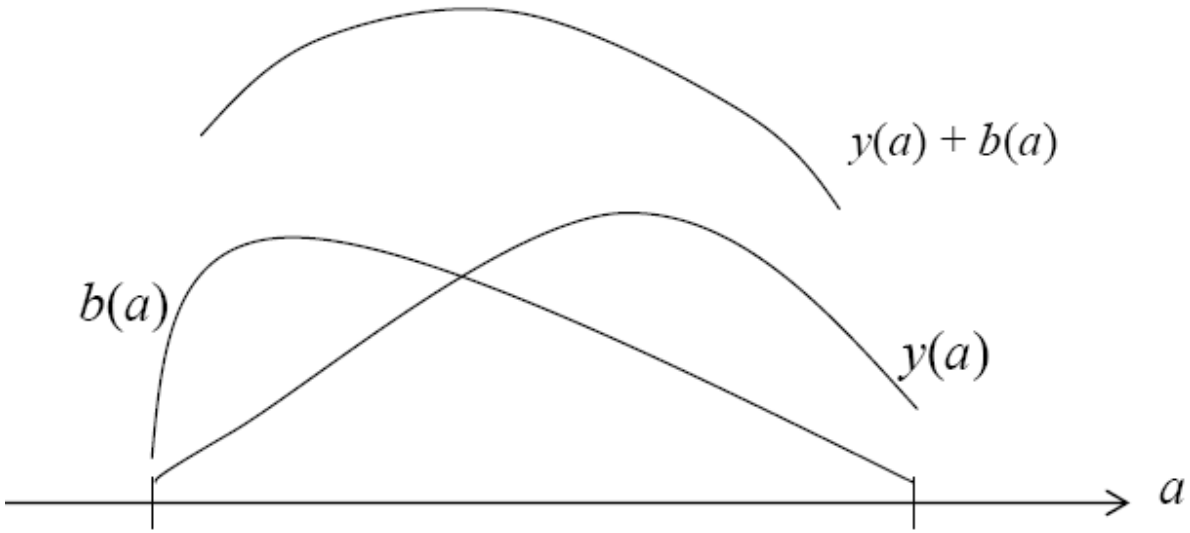
- pecuniary and verifiable: $y(a)$
- non-pecuniary and non-verifiable: $b(a)$

What is $b(a)$?
– Utility, measured in monetary equivalents, from the project obtained by *E*.

- perquisites
- family business
- other emotional ties to the firm

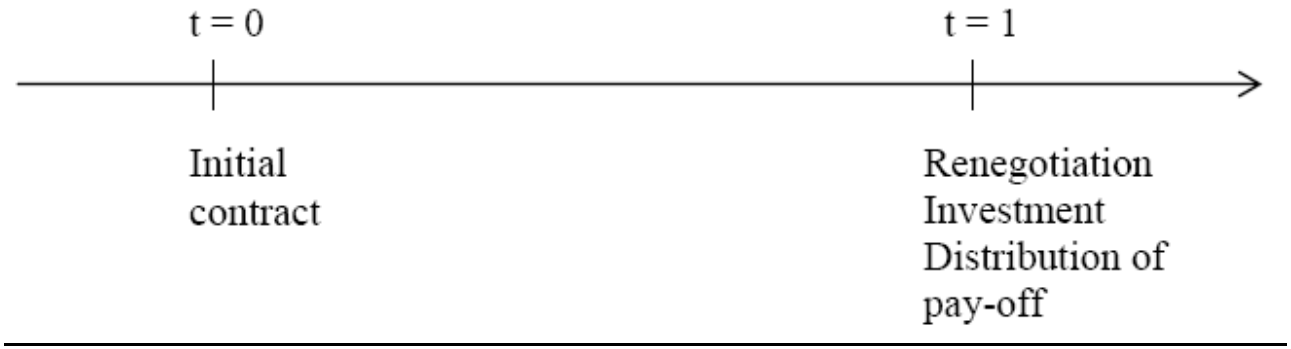
Assumptions: $y''(a) < 0$; $b''(a) < 0$.

Conflict of interest: $y(a)$ and $b(a)$ are maximized for different values of a.



1. Suppose first that E has enough wealth: $w \geq K$.
E's decision is the best possible:
$a^* = \text{argmax}_a [b(a) + y(a)]$

2. But what if E is wealth constrained? Put $w = 0$.



Assumption on initial contract:
C gets the pecuniary part: $u_C = y(a)$
E gets the non-pecuniary part: $u_E = b(a)$
The choice of a is non-verifiable and cannot be contracted upon.

Before signing initial contract: Allocation of control rights.
Two extreme cases:

2.1 *E* has control
2.2 C has control

2.1 *E* has control

Initial contract: *C* gets shares without voting rights, but he also gets all the dividend.
(*E* keeps all shares with voting rights.)

Investment decision: *E* chooses $a_E = \text{argmax } b(a)$

Without renegotiation: *C* gets $y(a_E)$

Scope for renegotiation?
Yes, a Pareto improvement is possible as $b(a_E) + y(a_E) \leq b(a^*) + y(a^*)$ and *C* has money to make an (more than) offsetting payment to *E*.

That is, *E* may offer to choose a^* if *C* pays him $y(a^*) - y(a_E) \geq 0$
(assuming *E* has all bargaining power in renegotiation (simplifying))

C accepts and is left with:
$y(a^*) - [y(a^*) - y(aECu_E)] = y(a_E)$

E gets:
$b(a^*) + y(a^*) - y(aEEu_E) \geq b(a_E)$

C invests if: $y(a_E) \geq K$.

2.2 *C* has control

As if *C* owns the firm; he has all shares with voting rights, *and* he gets all the dividend.

Investment decision: *C* chooses $a_C = \text{argmax}\, y(a)$

Scope for renegotiation? – Pareto improvement exists, but *E* has no funds available to offer in the renegotiation.

C invests if: $y(a_C) \geq K$