The model

- Also called: Agency Theory or Economic Theory of Incnetives
- It deals with incentives: reasons and motivations for having someone else do something she would not be doing otherwise
- It deals with the ways to attain efficiency and maximize the surplus from a social relation when individual aims do diverge.

The model

- The first actor is a Principal (henceforth P).
- The second actor is an agent (henceforth A)
- P owns an organization (say, a firm)
- P does not have time or competencies to personally carry out those tasks and jobs that create value for her firm
- P can however hire an agent A to work for her in producing value that she will appropriate and pay him a wage.
- At this point students are called to represent this situation in a perfectly competitive (labor) market.

The model

- After hiring A, however, P's and A' interests do actually diverge (note: this would not happen in a perfectly competitive market)
- P wants A to work as hard as he can and produce as much value as possible for the firm. P can either monitor A or motivate A (but both activities are either hard to carry out or costly)
- On the other hand, once A has been hired he has any reason to make his commitment and effort as small as possible
- As A's actions are partly hidden or not observable, moral hazard takes place: a form of post-contractal opportunistic behavior whose main consequence is a loss of efficiency

Cornerstones

The model is about nothing but motivation.

Motivation means incentives

Beating MH and restoring efficiency using appropriate contracts

Non observability and uncertainty will be our most fierce enemies

Building Blocks: Production Technology

1. Contribution. Have it denoted with y. It is A's contribution to value for P. E.g. harvest, increase in stocks prices. Contribution is assumed to be easy to observe, measure, and easy to be used in court
2. Effort. Have it denoted with e. This is "how hard A works", "how much effort he puts in his work". Effort is non observable, hardly measurable, not usable in court. We will assume that e can take on three values higher to lower: e_H, e_M, e_L.
3. Uncertainty. Have it denoted with ϵ. This is "the effects of uncertain events that have an influence on y but do not depend on A's effort". E.g. it rains, bad economic trend...

Building Blocks: Production Function

Our production function will thus be:

$$y = f(e, \epsilon)$$

Building Blocks: Production Technology

We will initially adopt a most simplified model of uncertainty.

1. Let $y_1 < \ldots < y_n$ be possible outcomes of A's work (ranked worst to best)
2. Let us assume that only one y_i will be realized
3. Let p_i^H, p_i^M, p_i^L the probabilities associated with y_i being realized when A works with e_H, e_M, e_L
4. It then follows that the expected result if A works with effort e_M will be: $E^M(y) = \Sigma_{i=1}^n p_i^M y_i$
5. Finally, we will assume that effort is productive, i.e. higher effort gets you higher expected contributions (but remember uncertainty: prob that contribution is miserable with highest effort is small but non null!)

Building Blocks: Contracts

That is: how to have A work (hard) for P.

1. Problem e can't be observed (this is what we call an *asymmetry of info*)
2. Thus: contracts can't be based on e
3. Solution: have contracts be based on y i.e. have y be a proxy for e
4. That is, we will have: $w = w(y)$.

Building Blocks: Contracts

We will consider a particular class of contracts: linear contracts.

1. These will set wage to be formed by a fixed (i.e. not depending on y) plus a variable part (i.e. depending on y).
2. Contracts will thus have the form: $w = a + by$
3. by is what we call an *incentive*

Building Blocks: P's Results

For the sake of simplicity, we will initially assume that both P and A are risk neutral (thus they are only interested in result's expected value and uncertainty has no cost for them). We will soon drop this assumption.

1. P she gets y but has to pay w. Thus her expected result is:

$$\pi(a, b) = E(y - w) = E(y) - E(w) = E(y) - a - b \cdot E(y)$$

2. Thus, assuming risk neutrality:

$$\pi(a, b) = e - a - b(e) = (1 - b)e - a$$

3. That is: P's result is given by the value created by A minus what P has to pay to incentivate him.

Building Blocks: A's Results

These will depend on the following consideration: if A accepts the contract he will receive a wage w but he will have to put effort in his work and thus bear some costs.

1. Let $c(e)$ be A's cost function. $c(\cdot)$ value corresponds to its monetary cost.
2. $c(e)$ is an increasing, convex function. $c'(e)$ will thus be increasing.
3. A's expected result will thus be given by the following utility function (assume a separable function for the sake of simplicity):
$$U_A(w, e) = U(w) - V(e)$$
4. As we assumed A to be risk neutral, we will have:

$$U_A(w, e) = a + b \cdot y - V(e)$$

Building Blocks: A's Results

1. If A does not accept the contract, he will receive his reservation utility $U_A(0) = U_0$.
2. That is: the result of his best alternative option or the utility he derives from leisure.

Temporal Sequence

1. P proposes to A a contract $w = a + b \cdot y$
2. A subscribes to the contract iff $U_A(w, e) \geq U_0$
3. If A subscribes to the contract, then he decides between e_H, e_M, e_L without having P be able to observe his choice.
4. P and A (and possibly a court) do execute the contract.
5. P gets $\pi(a, b) = y(e) - a - b(y)$ and A receives $U_A(w, e) = a + b \cdot y - V(e)$

Have a close look at Figures 1.1, 1.2, 1.3 on MSPC pp. 8, 9, 10 and the discussion therein.

Let us have everything formalized

P's problem:

$$max \sum_{i=1}^{n} p_i^H (y_i - w(y_i))$$

Let us have everything formalized

Participation constraint:

$$\sum_{i=1}^{n} p_i^H [U(w(x_i) - V(e_H)] \geq U_0$$

Let us have everything formalized

Incentive compatibility constraint:

$$\sum_{i=1}^{n} p_i^H [U(w(x_i) - V(e_H)] \geq \sum_{i=1}^{n} p_i^M [U(w(x_i) - V(e_M)]$$

$$\sum_{i=1}^{n} p_i^H [U(w(x_i) - V(e_H)] \geq \sum_{i=1}^{n} p_i^L [U(w(x_i) - V(e_L)]$$

A neat (tough) problem

It might well happen that the solution to this problem be too costly for P.

Total utility for P might not indeed be maximized by e^H but rather by e^M.

This happens when the difference between y and w (i.e. her profits) is not maximized by e^H but rather by e^M or even by e^L.

This is called *productivity constraint*. It requires that the increase in y obtained as a result of an increase in e be higher than the increase in b thet P has to pay in order to have a higher e.

Formal solution to this problem is real hard. We will deal with it only by some examples.