

Inside Firms: The Principle-Agent Problem

Our standard model of the firm hasn't talked about problems that arise in modern firms: many (bigger) firms are managed by people that are not the owners. This usually implies a conflict of interest, which is a frequent topic in the news: managers are not always acting in the best interest of the owners, which is to maximize the returns of the company. This kind of problem is called a principle-agent problem. The manager in our example is the agent for the owners (principle). One important assumption of these kind of problems is that the principle either cannot perfectly observe/monitor the behavior of the agent and/or cannot easily enforce the contracts directly. Another example of this kind are citizens voting for representatives.

The following two examples illustrate this problem and how it could be solved through the right kind of contract. The main difference between the examples is that the second one introduces uncertainty to the problem: the result of the manager's work not only depends on his own effort but also on broader economic circumstances.

1. The optimal contract

Problem: A company wants to hire a new CEO. The contract has to take care of two issues:

1. The salary must be high enough to outbid competing other firms.
2. The contract should provide incentives not to misuse the corporate jet fleet.

Model: Manager's utility function:

$$U(s, j) = \frac{\sqrt{s}}{10} + j, \quad j \in \{0,1\}$$

where s is the salary, and j is dummy variable for jet use

Outside opportunities (competitor's offers):

$$U=2$$

Profits:

$$800 \text{ if } j=0$$

$$162 \text{ if } j=1$$

Solution: To outbid the competing offers, s has to be greater than 400 (given that $j=0$), b/c

$$2 = \frac{\sqrt{s}}{10} + 0 \leftrightarrow s = 400.$$

However, if $j=1$ then the salary has to satisfy: $2 = \frac{\sqrt{s}}{10} + 1 \leftrightarrow s = 100.$

In the first case, since $s=400$, the remaining profit for the firm would be $\pi - s = 800 - 400 = 400.$

In the second case, where $j=1$: $\pi - s = 162 - 100 = 62.$

→ Firm would prefer the manager not to use the jet for private use

How the contract should then be designed?

Two Possibilities (at least):

1. Just write it into the contract: The manager shall not use the jet for private use ($j=0$), and the salary=400.

→ There is however, the problem of monitoring and enforcement, both of which are costly and not perfect.

2. Write an incentive compatible contract:

In this model, the firm would make the salary dependent on profits:

E.g.: $s=50\%$ of π

Check incentive feasibility:

$$\text{If } j=0, s=0.5 \cdot 800=400 \rightarrow U(400,0) = \frac{\sqrt{400}}{10} + 0 = 2$$

$$\text{If } j=1, s=0.5 \cdot 162=81 \rightarrow U(81,1) = \frac{\sqrt{81}}{10} + 1 = 1.9$$

→ In the case of profit dependent salary, the utility of the manager is higher if he chooses not to misuse the firm's jet than if he would do so. Thus this contract automatically

insures that the manager behaves optimal for the firm. Moreover, the firm has not to pay for monitoring and enforcement as would have to do in the first version of the contract.

2. Optimal contract and Uncertainty

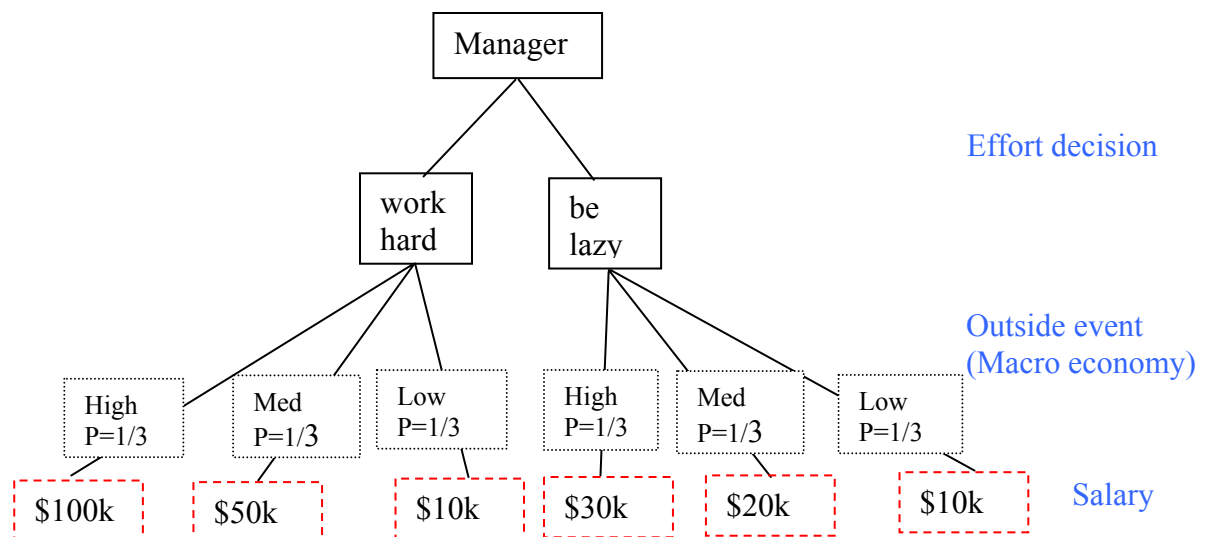
The above contract assumes that there is a perfect relationship between the manager's behavior/effort and the firm's profits. In the real world, the profits of firms depend however on many factors, including variables outside the reach of the manager (e.g. macroeconomic conditions).

The following model tries to incorporate this uncertain relationship between the manager's effort/behavior and profits into an optimal contract.

Let's consider first a contract purely based on the firm's profits:

Profits	Salary
$\pi \geq 1$ million	\$100,000
1 million $> \pi \geq 800,000$	\$50,000
800,000 $> \pi \geq 500,000$	\$30,000
500,000 $> \pi \geq 300,000$	\$20,000
300,000 $> \pi \geq 100,000$	\$10,000

Decision/Event tree:



In the above tree-diagram, the first stage describes the manager's effort decision, the second stage describes outside events. The outside state of the world (the overall performance of the economy for example) can be of three different kinds: High, medium and low. Where "high" means, that the economy is performing well and it is therefore easier for the firm to make high profits. Each of these events occur with equal probability ($p=1/3$ for each event). The last line of boxes gives the salary for the manager for each combination of events/decisions. In the diagram's last line, the above table that relates profits and salaries is already taken into account.

Now we can compute the expected or average salary for the manager if she/her works

hard:
$$\frac{100K + 50K + 10K}{3} = 56.3K .$$

Comparing to the payoff for being lazy:

$$\frac{30K + 20K + 10K}{3} = 20K ,$$

we see that the manager has an incentive to put effort into his work, since he gets more money. For the manager the question then is, whether the amount of extra money compensates for the extra money. An optimal contract therefore needs to account for the disutility the manager gets from putting (high) effort into her/his work.

This result, however, only holds on average, which empirically only would occur in a "very long" time period.

To make this point more clear, let's look at the payoff of the manager if she/he works hard, but the overall situation is "low": Then the manager earns \$10,000 according to our tree diagram. On the other hand, if the manager is lazy and times are good, the salary will be \$30,000. This result shows that a purely profit based compensation scheme could be very unfair to the manager. On the other hand, a fixed salary doesn't provide too much incentive for the manager. This trade-off is known in the economic literature as the problem of insurance versus incentive.

A simple compromise could be a compensation scheme that has a fixed and a profit-dependent part.