THE BASIC AGENCY MODEL AND ITS USES

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THEMES

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- **The basic agency model and its uses (Hendrikse, Chpt. 5 & 6).**
- **Incentive management: Watered down version of Holmström & Milgrom (1991).**
- **Exercise.**
- **End at 11.45 …. Higly relevant seminar at SMG, 1st floor w/ TL Hill & Ram Mudambi, Temple U.: ”Longing to Belong and the Governance of Knowledge Intensive Organizations.”**

gets from observing a itself. As Mirrlees' (1974) example (p. 248) indicates, this value may occasionally be negligible.

Some indications of the value of the signal can be found by studying (13). Roughly speaking, the more variation a signal causes in f_a/f, the more valuable it will be. This seems difficult to formalize, and I believe that on a general level signals can only be compared by using Blackwell's notion of fineness (see Blackwell (1951) and also remark 4 above).

6. Asymmetric information

■ In many respects the model we have analyzed is very primitive. One unrealistic feature is the assumption that the agent chooses his action having the same information as the principal, that is, before anything about θ is revealed. Commonly this will not be the case. After the sharing rule is fixed, the agent will often learn something new about the difficulty of his task or the environment in which it is to be performed. The following extension of our model applies to such cases.[17]

Let z be a signal about θ which the agent observes prior to choosing a, so that his choice becomes a function $a(z)$. As before, we suppress θ and write $f(x,y,z,a)$ for the joint density function, where y is some additional information observed by both parties. The best sharing rule $s(x,y)$ can be determined by solving the program:

$$\max_{s(x,y),a(z)} \int G(x - s(x,y))f(x,y \mid z,a(z))p(z)dxdydz \tag{22}$$

subject to
$$\int U(s(x,y))f(x,y \mid z,a(z))p(z)dxdydz - \int V(a(z))p(z)dz \geq \bar{H}, \tag{23}$$

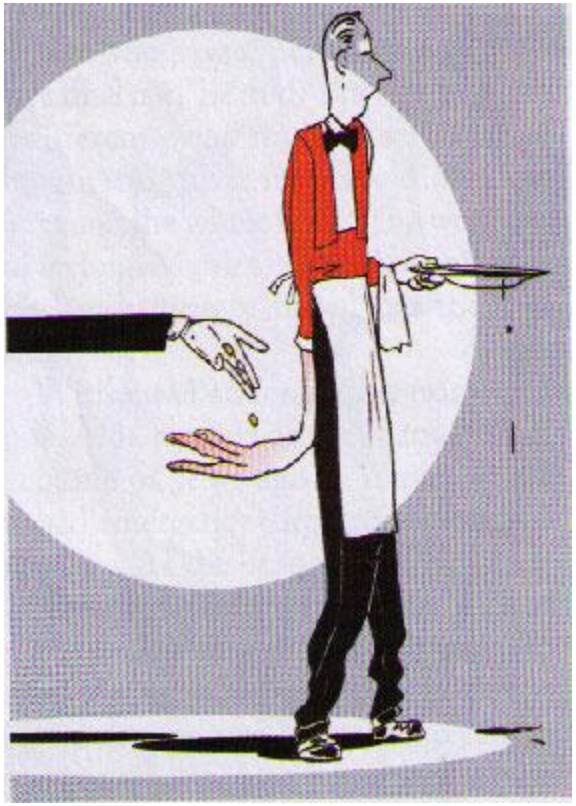
$$a(z) \in \underset{a' \in A}{\operatorname{argmax}} \int U(s(x,y))f(x,y \mid z,a')dxdy - V(a'), \forall z. \tag{24}$$

Here $f(x,y \mid z,a)$ is the conditional density of x and y, given z and the action a, and $p(z)$ is the marginal density of z. Letting $\mu(z)p(z)$ be the multiplier function for (24) and λ the multiplier for (23), point-wise optimization gives the characterization:

$$\frac{G'(x - s(x,y))}{U'(s(x,y))} = \lambda + \frac{\int \mu(z) \cdot f_a(x,y \mid z,a(z))p(z)dz}{\int f(x,y \mid z,a(z))p(z)dz}. \tag{25}$$

This equation closely resembles equation (13). Again the second term on the right-hand side indicates deviations from a first-best solution, and qualitatively one can draw conclusions similar to those for the earlier model. The difference is that the deviation from first-best risk sharing is determined by a weighted average of the incentive effects in the various states z, with the weight $\mu(z)p(z)$ being dependent on the probability of z and the desirability (or cost) of forcing

[17] This corresponds to Model 2 in Harris and Raviv (1976).

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”The Soviet manager’s success indicator was a measure of gross output, such as weight, quantity, square feet, or surface area. Gross output indicators played havoc with assortments, sizes, quality, and so on. Nikita Khrushchev complained of chandeliers so heavy “that they pull the ceilings down on our heads.” A famous Soviet cartoon depicted the manager of a nail factory being given the Order of Lenin for exceeding his tonnage. Two giant cranes were pictured holding up one giant nail.”

-- Paul Craig Roberts

Table I Ringelmann's rope-pulling experiment

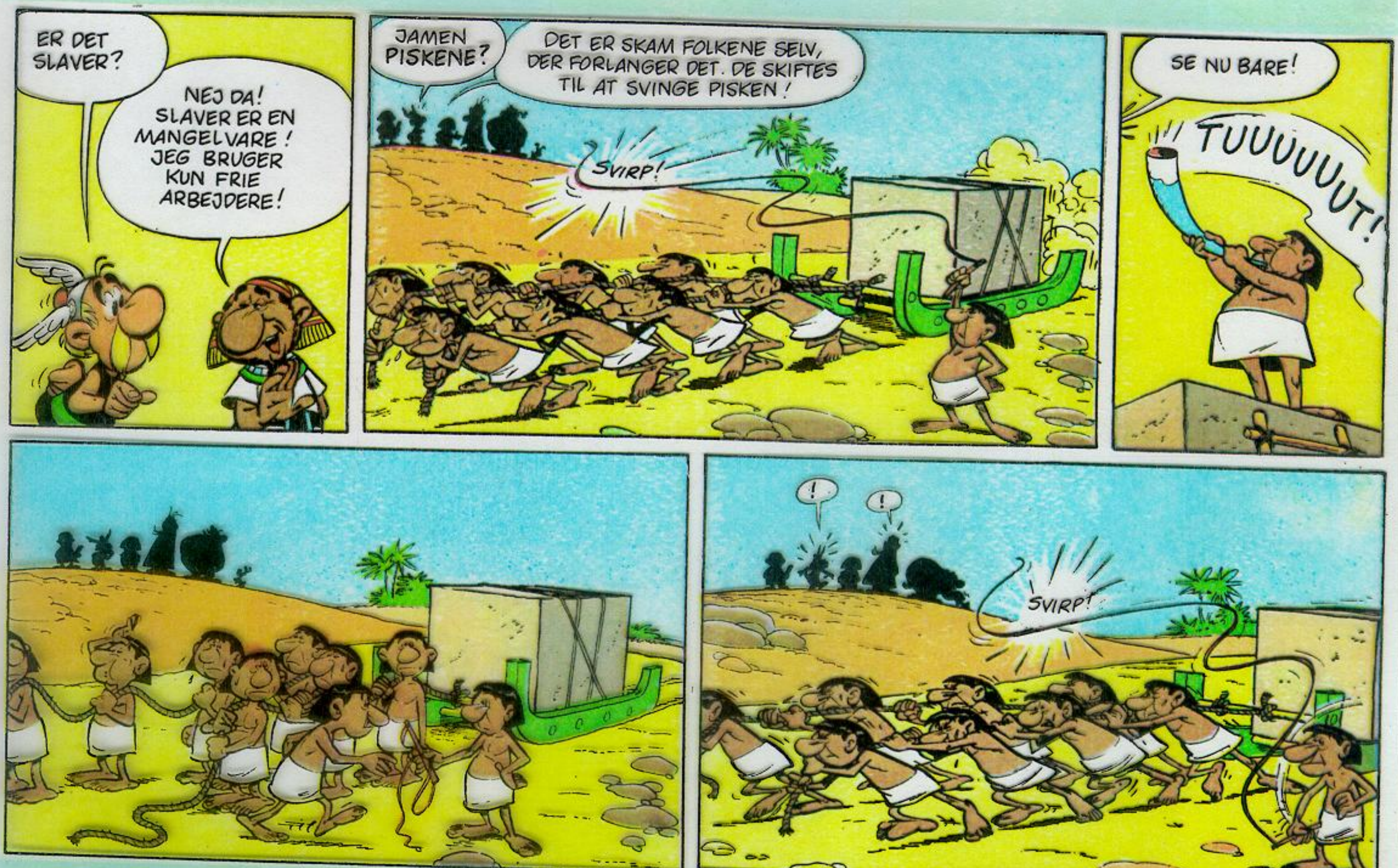
Number of rope pullers	Total weight	Average weight per rope puller	Added weight per rope puller
1	1.00	1.00	1.00
2	1.86	0.93	0.86
3	2.55	0.85	0.69
4	3.08	0.77	0.53
5	3.50	0.70	0.42
6	3.78	0.63	0.28
7	3.92	0.56	0.14
8	3.92	0.49	0.00

Source: Ringelmann (1913, p. 9)

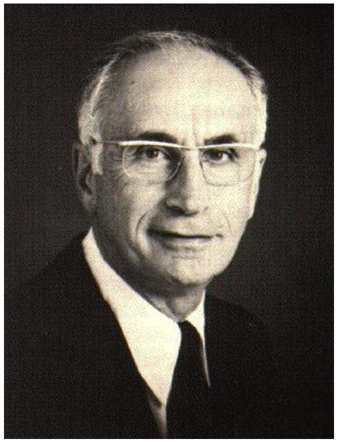
Ringelmann, M. (1913). « Recherches sur les moteurs animés: travail de l'homme; » *Annales de l'Institut National Agronomique,* 12, 1-40.

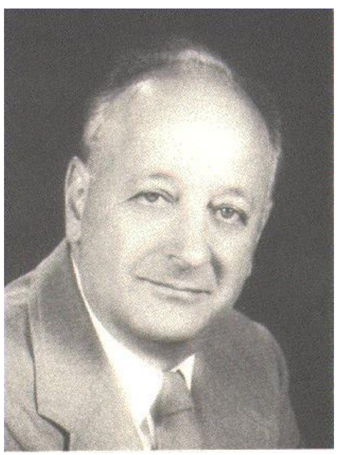
Steven Cheung (1983: 5) claims that riverboat pullers who towed wooden boats along shore line in Pre-communist China agreed to hire monitors to whip them to restrict shirking.

Asterix og Kleopatra



TEAM PRODUCTION THEORY OF THE FIRM





- Alchian & Demsetz (1972, AER).
- Certain activities are best carried out by teams.
- Individual productivity is costly to measure; team productivity isn't → Externality.
- Team members shirk – and can use the team as a cover for shirking.
- Shirking is viable in equilibrium.
- Does labor market competition help?
- Monitor with rights to sanction team-members.
- Who monitors the monitor?
- Make the monitor a residual claimant.
- The essence of the ”classical capitalist firm.”

USES OF AGENCY THEORY IN MANAGEMENT RESEARCH

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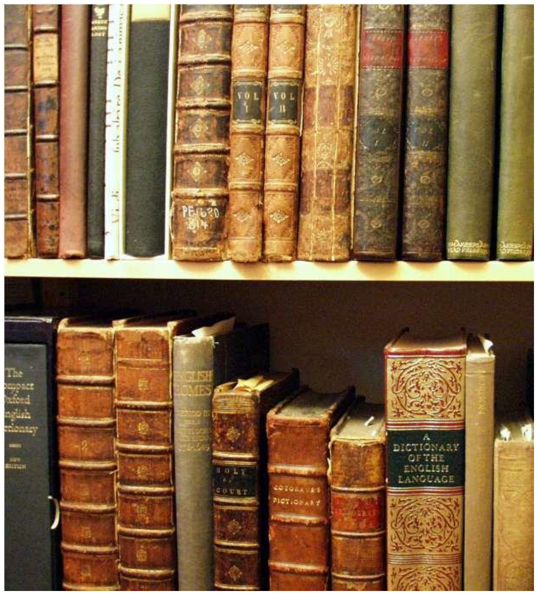
- **International business – e.g., compensation of subsidiary managers (Roth & O'Donnell, 1996, AMJ)**
- **Strategic management – e.g., relatedness (Bergh, 1995, SMJ), ownership structure and diversification (Amihud & Lev, 1999, SMJ).**
- **Entrepreneurship – e.g., hierarchies and entrepreneurship (Jones & Butler, 1992, SMJ), corporate entrepreneurship and ownership (Zahra, 1996, AMJ), the internal organization of entrepreneurship (Foss, Foss & Klein, 2007, Org Studies).**
- **Organization theory – e.g., stakeholder vs agency theory (Hill & Jones, 1992, AMJ).**
- **HRM – E.g., compensation strategies (Stroh et al., 1996, AMJ).**

WE KNOW ALREADY THAT …



- TOF and NIE generally look at deviations from ideal benchmarks.
- The Coase Theorem & the Welfare Theorems.
- Asymmetric information, ”imperfect” contracting, inefficient risk allocation.
- Consequences of such deviations in terms of the choice of contracts, organizational forms, institutions, etc.

CONTRACTING

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Contract	Is everything *observable* to everyone?	Is the observable information also *verifiable*?
Complete contingent	yes	yes
Complete	no	yes
Incomplete	no	no

General equilibrium/first welfare theorem world

Agency theory world

World of transaction cost economics

BEHAVIORAL ASSUMPTIONS

- A self-interested person focuses on his own interests, while honouring (implicit and explicit) agreements and showing respect for others.

- An opportunistic person focuses on his own interests, and uses all possible means (even not honouring agreements, manipulating, cheating, stealing, etc.) to achieve them (“self-interest seeking with guile”).

ASYMMETRIC INFORMATION

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One party to a transaction has relevant information whereas the other(s) does not

→

- Producers, who promise to deliver high quality but deliver bad quality, when quality is costly to observe.
- Programmers who are paid for the amount of code they write and therefore write too much code (ATT)
- CEOs who expect a short tenure in a firm and promote strategies that lead to long-run losses but short-run gains.
- Taxi drivers who don’t own the car, but pay the gasoline and therefore tends to drive the case in gears that save gasoline but harms the engine.

Principal … has a certain task which he likes to be executed by somebody else.
Agent ... (may) execute task

Task	*Principal*	*Agent*
Growing crop	Land owner	Farmer
Invest	Shareholder	Manager
Health	Patient	General practitioner
Education	Student	Professor
Solve exercise	Professor	Student

INGREDIENTS

- **Surplus available/gains from trade -- There is a basis for the relationship, i.e. there are opportunities for value generating exchange.**
- **Conflict of interests -- … when the increase of a variable benefits one party and goes at the expense of the other party.**
  - **How much effort should the agent supply?**
  - **How much risk should the agent bear?**
- **Asymmetric information -- The agent has superior information compared to the principal.**
- **Given these ingredients, a PA problem may arise – i.e., P has a problem of inducing A to act on his behalf.**

BASIC STRUCTURE

Assumptions

- A Principal and an Agent
  1. P is uninformed and risk-neutral.
  2. A is informed and risk-averse.
  3. Both maximize expected utility
     - A has ”disutility of effort.”
     - A has a ”reservation utility” (opportunity cost)
     - P’s utility (income, profit) depends on A’s effort.
  4. P and A both know 1) - 3).

- A can choose between different effort levels. His effort cannot (or at best imperfectly) be observed by P.

BASIC STRUCTURE – CONT'D

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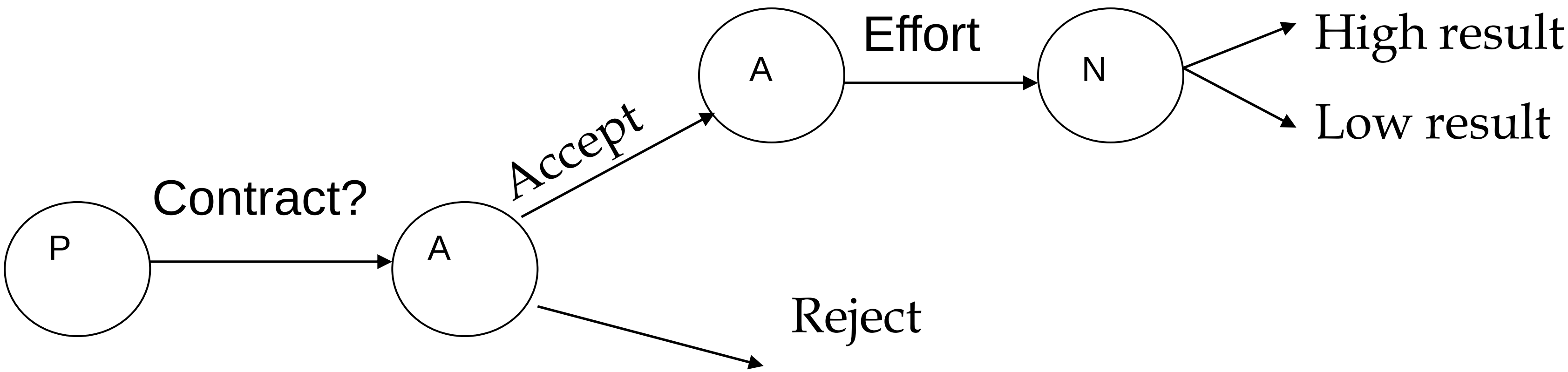
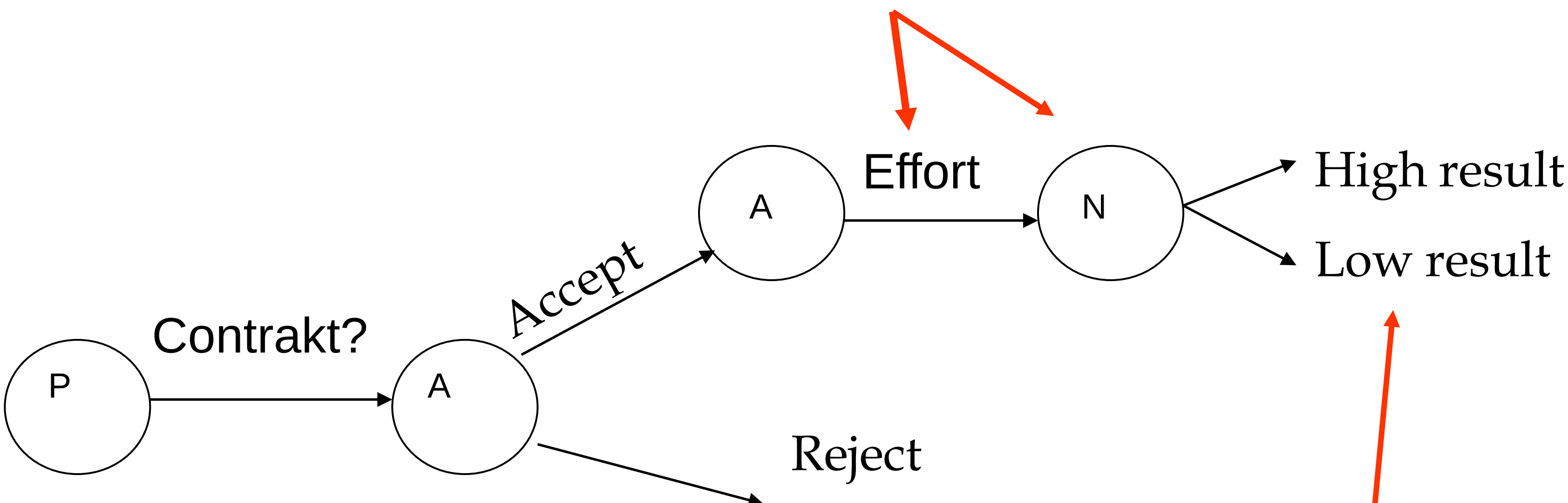
- Uncertain factor impacts the production result (e.g. how much does it rain?)

- Both P and knows that there is uncertainty and knows that the other knows, etc. (i.e., the pdf is common knowledge).
- Only A observes the realization of the stochastic variable (e.g., how much it rains).
- P and A can contract costlessly over the observable variables, and these variables are also verifiable by a third party (e.g., a court)
- P offers A a contract on a take-it-or-leave-it basis (0 bargaining costs; P has all the bargaining power).


P
Contract?
A
Accept
Reject
A
Effort
N
High result
Low result

Cannot **be observed by P**



Is observed by P

MORAL HAZARD

- **Definition: Moral hazard obtains when the agent can engage in post-contractual behavior that affects the utility of both; the principal can only observe an imperfect signal on the agent's effort (the outcome), and the action the agent will take spontaneously is not optimal.**

- **The principal wants to control/eliminate/reduce such moral hazard.**

- **What are the conditions under which moral hazard causes problems?**

INFORMATION?

- **P's problem: How to make A supply a high effort?**
  - **Assume** symmetric **information: No problem – P can observe effort and uncertainty and reward A, when A chooses a high effort level.**

	Plenty of rain (0,5)	Little rain (0,5)
High e	8	6
Small e	3	2

- **Assume A's cost of high effort = 1**
- **Expected surplus = ½ x 8 + ½ x 6 - 1 = 6**
- **P reaps the entire surplus.**

UNCERTAINTY?

Now assume asymmetric information of A's effort, but no uncertainty: Still no problem, because effort and outcome correlates perfectly ($y = f(e)$, $f' > 0$).

P can simply choose a contract so that A is only paid if he supplies maximum effort.

	Plenty of rain (1)	Little rain (0)
High e	8	6
Small e	3	2

Assume ”plenty of rain.” Then P knows that if y = 3 A has been shirking.

Choose contract so that A is only rewarded if y = 8

RISK-PREFERENCES?

Assume both are risk-neutral (but uncertainty and asym info obtain): Not necessarily a problem because P can make a A full residual claimant.

A doesn't mind bearing all risk.

	Plenty of rain (0,5)	Little rain (0,5)
High e	8	6
Small e	3	2

E.g., "franchise"-contract

- **If the agent works for himself and pays P upfront, he will not choose "small e"**
- **Given a "high e," the expected surplus is 6.**
- **P can squeeze 6 out of A (he still gets an expected 1).**
- **A risk-neutral A will accept this.**

RISK-AVERSION

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1. Assume now that the agent is risk-averse.
2. Then he will no longer just accept 1 – he will demand ”insurance,” i.e., a risk-premium that compensates him in such a way that he gets the same utility as under full information.
3. P pays the premium – which diminishes his surplus.
4. Since A’s utility has not changed, there is a loss relative to the full information (first best) situation.
5. P will be able to diminish the risk premium if he himself shoulders some of the risk.
6. However, if P assumes some of the risk (”insures A”), A’s incentives are correspondingly diminished.

There is a tradeoff between insurance and incentives.

This is the fundamental tradeoff of agency theory

OPTIMAL CONTRACT

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P designs contract so that he carries exactly the risk that gives A the incentive to participate in the relation (participation constraint) and choose the efficient effort level (incentive constraint).

4. CONDITIONS

OUTSOURCER will solely accept tasks, given by the persons mentioned in Appendix III («APPENDIX_III») of this SLA or their formally appointed representatives.

The supplier will make certain that only employees, for whom this SLA has been agreed upon, will make use of the services rendered.

5. ASPECTS OF ORGANISATION

5.1. Representation

The customer will appoint a representative for the daily activities concerning this Service Level Agreement. This person will act as the contact person for the supplier.
The customer will remain the formal recipient of reports, sent by the supplier.

The supplier will appoint a representative for safeguarding the level of the services, agreed upon in this Service Level Agreement.

The customer's representative and the supplier's representative will, on a three monthly basis, discuss the progress and quality of the services rendered. The supplier's representative will initiate the meeting and, in interaction with the customer's representative, draw up the agenda.

5.2. Reporting

The supplier will report quarterly to the customer concerning the results of the previous quarter. This report will show a survey of the registered data concerning the performance indicators, as agreed upon per (critical) service.
By this way of working, the customer receives an insight in the achievements of the supplier, so that, when necessary, appropriate action(s) can be undertaken.
The customer is entitled to an intermediate evaluation of the achievements of the supplier. The customer will initiate the meeting with the representative(s) of the supplier.

5.3. Change Management

In case of changes in and/or updates of principles and/or specifications, as mentioned in this SLA, an OUTSOURCER Change Management procedure will be formalised.
This will also occur when the criteria change, which the services rendered have to meet.

The Change Management procedure implies that, with approval of the customer, the changes in specifications / numbers / services or tasks are described and that subsequently will be estimated what the consequences will be for the services rendered. This also applies in case the reality structurally deviates from the mutually agreed demand.

OUTSOURCER - 8 -

OPTIMALITY

- <u>First-best</u>: The best that is conceivable (e.g., first welfare theorem, Coase theorem; risk-neutral P assuming all risk).
- <u>Second-best:</u> The best that is possible (in the real world, i.e., in the presence of informational asymmetries and different risk preferences).

- When agency problem, first best outcome usually not feasible (notably, P and A cannot share risk efficiently).
- The parties aim for ”second-best” – i.e., the best they can do given informations-asymmetries and differential risk preferences.
- Moreover: P has to use resources on monitoring A.
- Agency costs = (first-best - second-best) + monitoring costs.
- Efficient contracts and organizations are those that have the lowest agency costs.

THE LINEAR FORMULATION

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$$W = \alpha + \beta\,(e + x + \gamma y)$$

- "Wage contract".
- Fixed component, α.
- β, a measure of the "incentive strength" of the contract.
- Variable component, $\beta\,(e + x + \gamma y)$.
- E.g., Agent a salesman – then $z \equiv (e + x)$ his sale on a local market and y is a measure of the sale of other salesmen.

$$W = \alpha + \beta\,(e + x + \gamma\, y)$$

e, x can only be observed by the employee.

Employer observes $z \equiv e + x$ and y.

$z + \gamma\, y$ is an estimate of e -- because 1) x, y are stochastic variables with E = 0 and 2) $E(z + \gamma\, y) = E(e + x + \gamma\, y) = e$

How to find the efficient contract?

I.e., choosing (α, β, γ) and influencing e so that value maximization obtains.

Efficiency = value max = sum of utilities expressed in monetary terms.

We work with a P (employer) and an A (employee).

I.e., choose (α, β, γ) so that the sum of their utilities expressed in monetary terms is max.

How can we do this in a handy manner when we have uncertainty into the picture?

Certainty equivalents.

CERTAINTY EQUIVALENTS

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- **Risk aversion: Preferring to receive w with certainty rather than an uncertain compensation with E (W) = w.**
- **If income uncertain $\Rightarrow$ risk premium.**
- **The expected (uncertain) compensation – risk premium = the certainty equivalent.**
- **CE = E (W) - ½ r Var (W).**
- **No uncertainty? Risk-neutrality?**
- **How to reduce the risk premium?**

EMPLOYEE'S CE INCOME

…. when his costs are C (e):

$$\alpha + \beta e - C(e) - \tfrac{1}{2} r \operatorname{var}[\alpha + \beta(e + x + \gamma y)]$$

because

1) $CE = E(W) - \tfrac{1}{2} r \operatorname{Var}(W)$,
2) $W = \alpha + \beta(e + x + \gamma y)$, and
3) $E(x)$ and $E(y) = 0$.

THE EMPLOYER'S CE INCOME

…. when his gross profits are P (e):

$$P(e) - (\alpha + \beta e)$$

(remember: Employer (principal) risk-neutral).

VALUE MAXIMIZATION

Max the sum of the employer's and the employee's CE incomes:

$$P(e) - C(e) - \tfrac{1}{2} r \operatorname{var}[\alpha + \beta(e + x + \gamma y)]$$

Choose the "right" (α, β, γ).

This is done through incentive management.

(NB: Note how all the "action" is concentrated in the expression for the risk premium).

$$W = \alpha + \beta (e + x + \gamma y)$$

- Management needs to decide on:

  1. The size of β ("*incentive intensity* ").

  2. The size of γ ("*information content*").

  3. The amount of resources needed to estimate e, i.e., the size of the variance on z + γ y we want ("*monitoring intensity*").

  4. The influence of *multi-tasking* on incentives ("equal compensation principle")?

INCENTIVE INTENSITY

β **depends on the**

- **profitability of extra effort;**
- **incentive elasticity of effort;**
- **degree of risk aversion of the employee;**
- **how precisely performance can be measured (including multi-tasking).**

- **Advantages and drawbacks of high β?**

EXERCISE

- **Foss and Laursen (2005), ”Performance Pay, Delegation, and Multitasking under Uncertainty and Innovativeness,” *Journal of Economic Behavior and Organization***
  - **Consider a sample of 1000 Danish firms (the firms in the DISKO sample with > 30 employees) (data from 1996).**
  - **Examine how these firms' adoption of high-powered performance rewards (employees are to a high degree residual claimants) varies with environmental uncertainty.**
  - **Finding I: *Firms that are exposed to much uncertainty will tend to adopt high-powered rewards*.**
  - **Finding II: *Such firms also adopt more multi-tasking.***
- **Are these findings consistent with agency theory?**
- **How will you explain their finding, i.e., what explains the correlation between uncertainty and high-powered performance rewards?**

INFORMATION CONTENT

$$W = \alpha + \beta (e + x + \gamma y)$$

- Concerns γ -- i.e., how important is y.
- Remember: $z + \gamma y$ is an estimate of e (and $z \equiv e + x$).
- Use γy if $Var (z + \gamma y) < Var (z)$.
- That will be the case when $Cov (z, \gamma y) > 0$.
- A better estimate of e increases value creation. Why?
- $P (e) – C (e) - \frac{1}{2} r \, var [\alpha + \beta (e + x + \gamma y)]$.
- In general: Use all information that improves the estimate of e! (IC Principle).
- Comparative performance evaluation.

EQUAL COMPENSATION PRINCIPLE

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- Activities equally valued by the employer should be equally valuable (in terms of compensation, including non-financial aspects such as pleasantness of the workplace) to the employee.

- Problem: employees may be engaged in several activities ("multi-tasking"); if some of these are not monitored or are monitored less heavily, these will be neglected, as activities with higher marginal returns to the employee are favoured.

- This suggest that low-powered incentives may rationally be chosen in multi-tasking environments.

- **We have six different activities that each consume the same amount of time and taken together will use the work time of two employees – who should do what?**

JOB DESIGN

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- **How measurable are these activities?**
  - **Difficult-to-measure activitities should be bundled in one job; easily measurable activities in another job.**
  - **This reduces the multi-tasking-problem.**
    - **Estimates of effort are improved on the easily measurable activities – i.e., we can give strong incentives on these**
    - **Weak incentives for the costly-to-measure activities.**
- **The use of performance pay for teachers?**