

The role of exogenous risk in structuring contracts

Objectives:

- To illustrate a kind of transaction cost driven by information asymmetry and differential preferences with respect to risk allocation
- Logical sequence
 - Information asymmetry → impossible to contract on effort → need to contract on results or performance
 - Inefficient risk allocation emerges when:
 - Performance not fully under the control of agent
 - Agent more risk averse than principal
- Importance of risk in economic life
 - Scarce in empirical studies: mainly, Allen and Lueck (evidence and refs.), but always proxies of risk and sectorial studies
 - Huge in economic theory of contracts—an issue of tractability?
 - Most likely overstated, hard to say for how much
 - Management: main failure of incentives seems to be ‘gaming’ not risk
- Literature review:
 - Visit <http://www.bris.ac.uk/cmpo/incentives/incentindex.html>

1. Principal-agent model with moral hazard

Data

Agent utility: $U(S, e) = \sqrt{S} - e$

Employer profit: $B = 0,20 V - S - 10$

Relationship effort-results (e.g., sales):

<i>Effort (e)</i>	<i>Sales, m € (V)</i>	
	<i>100</i>	<i>200</i>
2	0,25	0,75
1	0,75	0,25

Probability grows with effort → sales 'inform' on effort

Reservation utility = best alternative job

$$U(S = 4, e = 1) = \sqrt{4} - 1 = 2 - 1 = 1$$

Observable effort

Observability → can contract on effort terms. ¿Low or high effort?

Assumption: wage equal reservation utility:

$$U(e=2) = \sqrt{S_2} - 2 = 1 \rightarrow S_2 = 9$$

$$U(e=1) = \sqrt{S_1} - 1 = 1 \rightarrow S_1 = 4$$

Profit will be 16 and 11 m:

$$B(e=2) = 0,20 (0,25 \times 100 + 0,75 \times 200) - 9 - 10 = 16$$

$$B(e=1) = 0,20 (0,75 \times 100 + 0,25 \times 200) - 4 - 10 = 11$$

Efficient to contract high effort.

Non observable effort

Possible solutions: contract $e = 1$ or motivate $e = 2$

To motivate $e = 2$, contract on V paying S_1 ó S_2 if $V = 100$ or 200

Objective

$$\begin{aligned} (\text{Max}) B &= 0,20 (0,25 \cdot 100 + 0,75 \cdot 200) - (0,25 S_1 + 0,75 S_2) - 10 = \\ &= 25 - (0,25 S_1 + 0,75 S_2). \end{aligned}$$

Subject to:

(a) agent participation and (b) interest in effort = 2:

a) Participation constraint:

utility w. $e=2 \geq$ reservation utility:

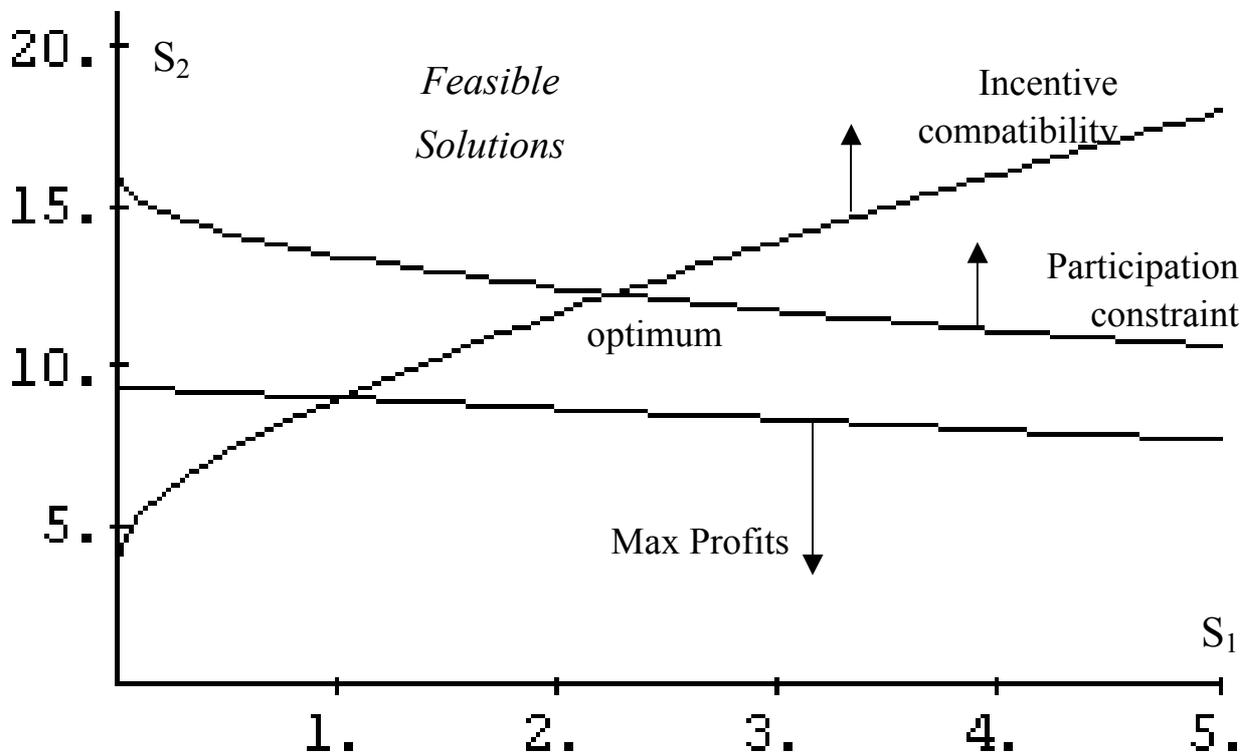
$$\begin{aligned} 0,25 U(S_1, e=2) + 0,75 U(S_2, e=2) &\geq 1 \\ \rightarrow 0,25 \sqrt{S_1} + 0,75 \sqrt{S_2} &\geq 3. \end{aligned}$$

b) Incentive compatibility

expected utility w. $e = 2 \geq$ expected utility w. $e = 1$

$$\begin{aligned} 0,25 U(S_1, e=2) + 0,75 U(S_2, e=2) &\geq \\ &\geq 0,75 U(S_1, e=1) + 0,25 U(S_2, e=1) \\ \rightarrow -0,50 \sqrt{S_1} + 0,50 \sqrt{S_2} &\geq 1. \end{aligned}$$

Figure 1. Optimisation



- Optimal contract:
Wage 2,25 or 12,25 if sales 100 or 200
- Average wage cost:
 $0,25 \cdot 2,25 + 0,75 \cdot 12,25 = 9,75$
- Gross expected utility for agent equal that of fixed wage of 9:
 $0,75 \sqrt{12,25} + 0,25 \sqrt{2,25} = 3 = 1\sqrt{9}$
- Difference between wages = risk premium:
 $(9,75 - 9) = 0,75$
- Profit:
 $0,20 (0,25 \cdot 100 + 0,75 \cdot 200) - 9,75 - 10 = 15,25$
- Exercise. Examine the case $V = 100, 150$.

Discussion

- Contracting in terms of performance constraints the allocation of risk in a manner that may be inefficient
- Assumptions:
 - Effort unobservable, forgetting control technologies
 - Results perfectly observable, forgetting measurement problems (quality, etc.).
 - Unobservability of exogenous impact on results, diminishing role of knowledge development and possibility of target revisions under asymmetric contracting
 - Opposing relative risk preferences
 - One transaction (affects risk and observability)
- Evidence:
 - Risk plays at most a limited or ambiguous role (and more frequently none) in explaining contractual patterns (sharing), better explained by measurement problems (in, among other industries, farmland, gold mining, franchising, timber sales or natural gas).
- Summary
 - Emphasis on risk provides tractability at a very high cost: Useless and often dangerous (bias-inducing) as framework for management
 - Presence of other problems (double-sided moral hazard, multi-task agency, measurement costs) make risk allocation less important
 - Models of these problems show different tradeoffs but risk allocation keeps prominence (e.g.; Milgrom and Roberts (1992: 207) summary: “efficient contracts balance the costs of risk bearing against the incentive gains that result”).

Application

Using as a basis the standard principal-agent model, design and discuss an incentive system for the Chief Executive officer or CEO, i.e., the boss, of a firm such as General Motors. Please, make explicit your assumptions about the preferences of the shareholders and the CEO. You might want to provide a discussion of: (1) the features of the situation or problem; (2) the basic solution; (3) the problems with such a solution; and (4) some potential solutions to such problems.

Some general issues are the following: (1) It is a moral hazard situation or problem, with asymmetric information. Performance is affected by the CEO effort and exogenous variables. (2) The basic solution is to pay the CEO with shares. (3) However, if the CEO is risk-averse, inefficient risk allocation (aggravated if the CEO has firm-specific investments in terms of human capital) motivates the CEO to adopt inefficient financial investment and hedging policies to reduce his risk. Using share options, which yield asymmetric compensation, thus guaranteeing the CEO a floor, provides a solution to this problem. (4) However, they may induce him to adopt extremely risky strategies even if they reduce value. Furthermore, when granted they are usually “in the money” (i. e., they would already yield a profit if they were exercised at that moment). As a consequence, managers tend to behave conservatively. For information on the current discussion of these a related issues see the articles “Cream” and “The Need for Greed” in *The Economist* (May 4th., 1996, pp. 12 and 80).

Two possibilities worth thinking about are: (a) Using lower-intensity incentives (“low-powered incentives” in Williamson’s jargon), like profit sharing, which might have many drawbacks, but solve some of the previous problems. (b) Letting the CEO do insider trading on the company shares, as argued by Henry Manne et al. since Manne’s 1966 book. The latter possibility would be illegal nowadays in most civilized countries and some European ones.
