

OPTIMAL CONTRACTS  
WITH ADVERSE SELECTION AND MORAL HAZARD:  
ARE INCENTIVES HIGH- OR LOW-POWERED?

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## General framework

A principal delegates production to an agent who has conflicting objective and private information

- E.g. Laffont & Martimort, 2002
- Adverse selection (AS): *Chap. 2*  
Revealing the type through a menu of contracts  
⇒ information rent
- Moral hazard (MH): *Chap. 4*  
Inducing the effort with performance pay + limited liability (LL)  
⇒ limited-liability rent
- Distortions: efficiency/rent-extraction trade-off
- If both AS and MH: **Generalized-agency or mixed models**

- Many settings
  - agent couples production and quality of service
  - natural monopoly regulation
  - basic contract + contingent payment
  - price discrimination + optional service
- Contribute to contract theory by mixing AS and MH
- Literature: many papers (false MH, sequential...), but true MH?

- Determining optimal contract under AS, MH and LL
  - how do trade-offs between efficiency and rent(s) extraction interact?
- With a fixed random benefit and no initial wealth
  - Compared with AS alone, higher-powered incentives for production and lower-powered incentives for bonus
  - Compared with MH alone, lower-powered incentives for production and higher or lower-powered incentives for bonus
  - Contract is almost separating: pooling may occur for the upper tail of the distribution only.
  - MH more harmful than AS for the principal for high types

- Principal-agent model
- Simple production setting à la Baron-Myerson  
Production  $q$  generates a surplus  $S(q)$  at a linear cost  $\theta q$
- Simple effort setting à la Grossman-Hart (2 outcomes)  
Non observable effort  $e$  generates an fixed extra benefit  $B$  with probability  $p(e) = e$  with disutility  $\psi(e)$
- $\theta \in [\underline{\theta}, \bar{\theta}]$  agent's marginal cost (= privately known): **room for AS**
- $e \in [0, 1]$  agent's effort: **room for MH with LL**

- Menu of contracts:  $\langle t(\hat{\theta}), q(\hat{\theta}), w(\hat{\theta}) \rangle$ 
  - for any agent's report  $\hat{\theta}$ 
    - payment
    - quantity  $\mapsto$  AS control (slope of info rent)
    - bonus in the event of success  $\mapsto$  MH control (slope of LL rent)
- Principal:  $V = S(q) - t + p(e)(B - w)$
- Agent :  $U = t - \theta q + p(e)w - \psi(e)$ 
  - reservation utility: 0
  - protected by LL, no cash losses:  $t - \theta q \geq 0$
- Stakeholders risk neutral (but LL)

- Objective function  $\max_{\{t(\theta), q(\theta), w(\theta)\}} \mathbb{E}_\theta (V)$
- Constraints
  - Incentives
    - Obedience:  $e(\theta) = \epsilon(w(\theta))$  such that  $w(\theta) = \psi'(\epsilon(w(\theta)))$
    - Honesty:  $\hat{\theta} = \theta \Rightarrow q(\theta)$  non-increasing,  $U(\theta)$  decreasing and convex
  - Participation:  $U(\theta) \geq 0 \Rightarrow U(\bar{\theta}) \geq 0$
  - Limited liability becomes

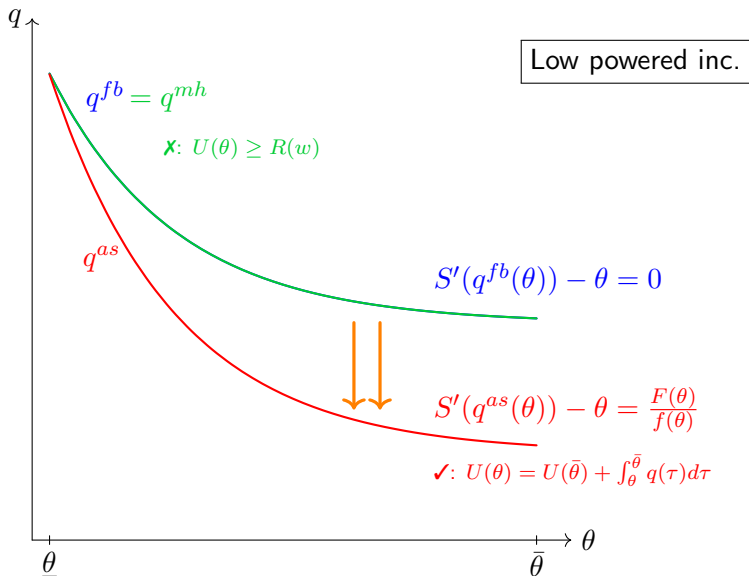
$$U(\theta) \geq R(w(\theta)) = \epsilon(w(\theta))w(\theta) - \psi(\epsilon(w(\theta)))$$

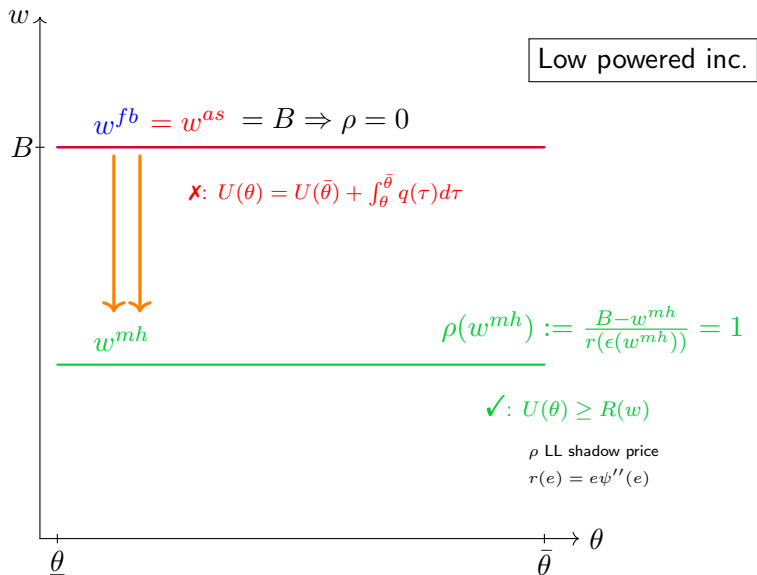
- Objective function reformulated

$$\max_{\{U(\theta), q(\theta), w(\theta)\}} \int_{\underline{\theta}}^{\bar{\theta}} [S(q(\theta)) + \epsilon(w(\theta))B - \theta q(\theta) - \psi(\epsilon(w(\theta))) - U(\theta)] f(\theta) d\theta$$

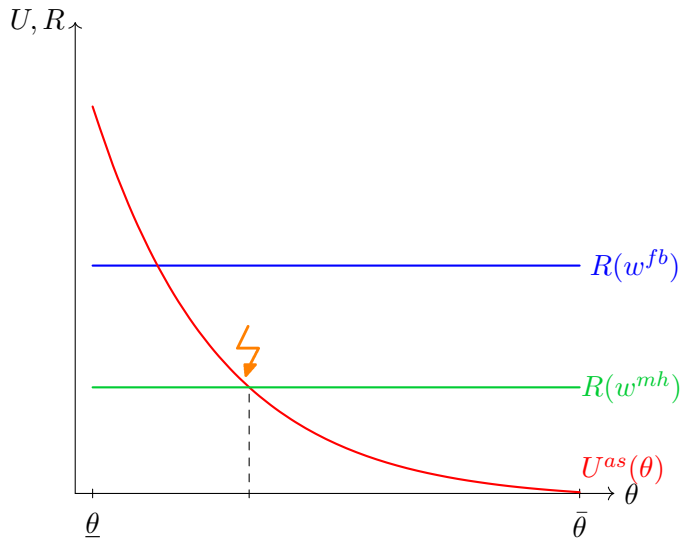
- **First-best**:  $\theta$  and  $e$  observable, no LL
- **AS**:  $\theta$  non-observable,  $e$  observable, no LL
- **MH**:  $\theta$  observable,  $e$  non-observable, LL







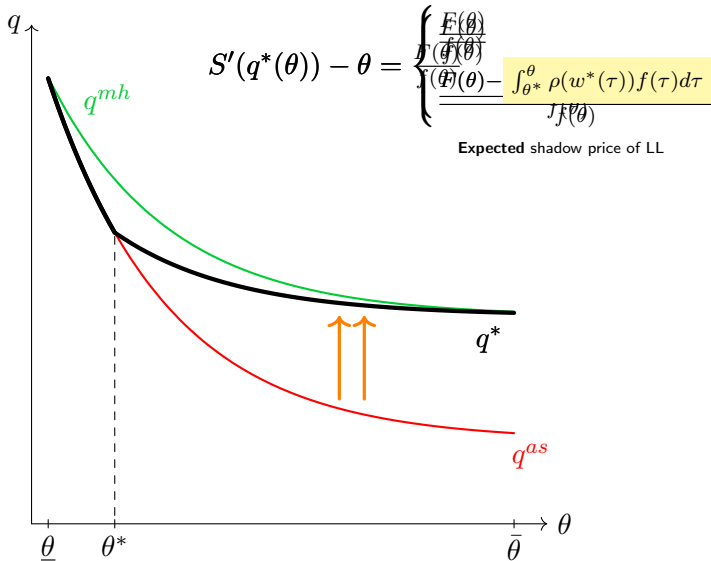
- Benchmark contracts: **dichotomy**
- **Low-powered incentives** for both production and bonus
- Turning back to the main problem: mixed contracts.
- How to shape productions, bonuses and rents?



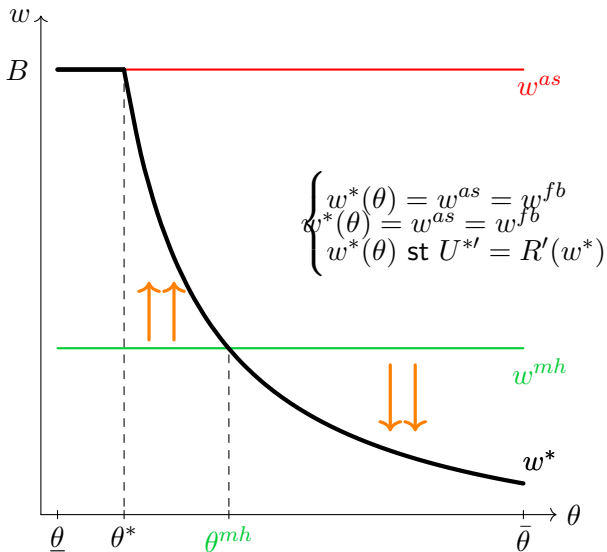
## Optimal rents

- There exists  $\theta^*$  such that:
  - if  $\theta < \theta^*$  then  $U^*(\theta) > R(w^*) \Rightarrow$  information rent
  - if  $\theta \geq \theta^*$  then  $U^*(\theta) = R(w^*) > 0 \Rightarrow$  limited-liability rent
- Production/bonus entanglement and interdependence

## Optimal quantities



## Optimal bonuses



## Main conclusions

When  $U = R$  (for intermediate values of  $B$ )

- dichotomy vanishes
- trade-off between efficiency and limited-liability rent extraction but conditional on truthful report
- Calls for high/low-powered incentives on bonuses and higher-powered incentives on production
- For high types: MH more harmful than AS for the principal

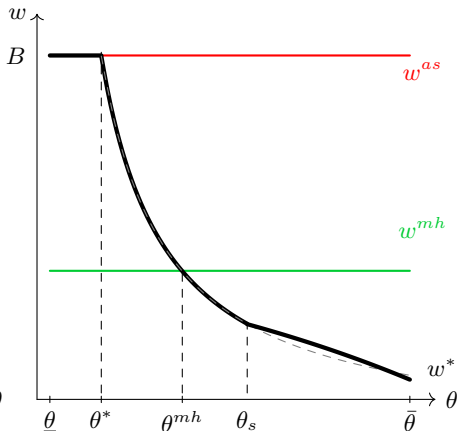
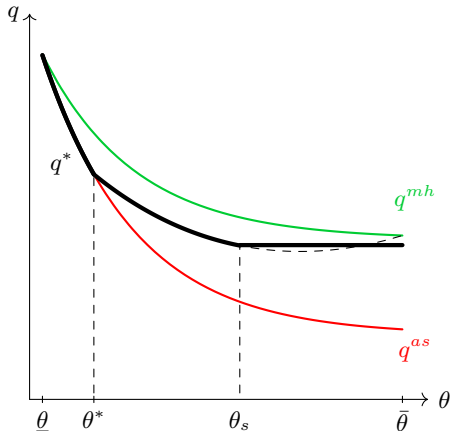


- More in the paper
- Agent with positive initial wealth: 11 contract profiles
- Private cost overrun instead of bonus: *idem* but fines rather than bonuses
- Variable additional benefit: countervailing incentives arise  $\Rightarrow$  higher-powered incentives for both production and bonus.

**Thank you for your attention!**

Low  $B$ : Graphic solution

$$B \searrow \Rightarrow R(w^{fb}) \searrow \Rightarrow \theta^* \nearrow \text{ but } \theta^* < \bar{\theta}$$



High  $B$ : Graphic solution

$$B \nearrow \Rightarrow R(w^{fb}) \nearrow \Rightarrow \theta^* \rightarrow \underline{\theta}$$

