Risk-sharing or risk-taking? Counterparty risk, incentives and margins

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The views expressed are solely those of the authors.

Research questions

- Financial contracts enable risk-sharing (e.g., forwards, credit-default swaps)
- But they may also lead to more risk-taking
  - "Has financial development made the world riskier?" (Rajan, 2006)

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- Is there a conflict between risk-sharing gains from trade and risk-taking incentives?
- Can hedging and margins lead to more aggregate risk?

Incentives, counterparty risk and margins

- Sellers of protection are subject to moral-hazard
  - if news arrive that a hedge is likely to be loss-making $\longrightarrow$ the position is a "liability" for the seller
  - undermines seller's incentives to control balance sheet risk (akin to debt overhang)

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- Can margins help with incentives?

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- Can margins help with incentives?
- If sellers trade contracts, do markets implement information-constrained optimum?

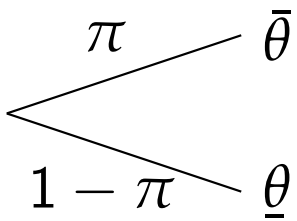
Outline

1. Model and first-best (no moral-hazard)
2. Equilibrium with moral-hazard but no margins
3. Equilibrium with moral-hazard and margins
4. N protection sellers

1. Model and first-best (no moral-hazard)

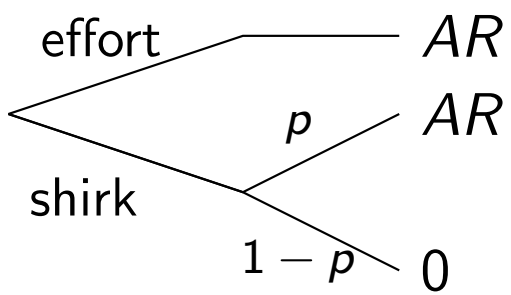
Protection buyer (principal)

- Risk averse (concave utility u)
- Endowed with a risky position $\tilde{\theta}$



Protection seller (agent)

- Risk neutral
- Endowed with risky assets-in-place $A\widetilde{R}$ (independent of $\tilde{\theta}$)
- Can exert unobservable effort to control down-side risk



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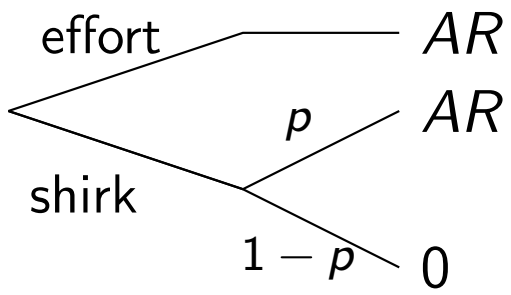

- Shirking carries private benefit AB
- Protected by limited liability $\longrightarrow$ moral hazard
- Risk-control effort efficient: $(1-p)R > B$

Early liquidation and margins

- Only this seller can manage assets A and obtain return $\widetilde{R}$
- A fraction α of assets can be liquidated for cash, which earns zero net return
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- A fraction α of assets can be liquidated for cash, which earns zero net return
- Cash can be deposited outside the seller (margin account)
- Margin is inefficient: loss $\alpha A(R-1)$
- Margin reduces cost of risk-control by αAB

Information structure

- Public information $\tilde{s}$ about the hedged risk $\tilde{\theta}$ becomes available
- The signal is informative: $\text{prob}[\underline{\theta}|\underline{s}] > \text{prob}[\underline{\theta}]$

Contract

- Transfer τ depending on
  - the realization of the buyer's risky position $\tilde{\theta}$
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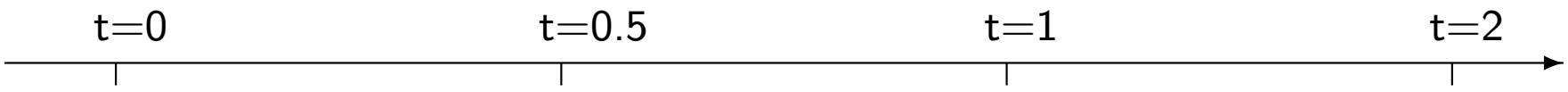
- Liquidation of fraction α of seller's assets contingent on signal $\tilde{s}$ (and deposit the cash on the margin account)

Sequence of events



Risk-averse protection buyer proposes contract $\tau(\tilde{\theta}, \tilde{s}, \tilde{R})$ to risk-neutral seller.

[Initial margin]

Public information $\tilde{s}$ about the hedged risk $\tilde{\theta}$ arrives.

[Variation margin]

Seller chooses whether or not to exert effort to control her own risk.

Risk underlying the transaction $\tilde{\theta}$ realizes.

Risk of the seller's assets $\tilde{R}$ realizes.

Transfer τ from seller to buyer.

[Transfer of margin to buyer if seller defaults]

First-best

- Protection buyer request seller's effort and solves

$$\max_{\tau,\alpha} E[u(\tilde{\theta}+\tau)]$$

$$\text{subject to} \quad AR \leq E[\alpha A + (1-\alpha)AR - \tau] \qquad [PC]$$

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- In the first-best
  - full insurance
  - contract does not depend on the signal $\tilde{s}$
  - margins are not used
  - contract is actuarially fair, $E[\tau] = 0$

2. Equilibrium with moral-hazard but no margins

Incentive constraint (depends on signal $\tilde{s}$)

- Expected profit of protection seller under effort

$$AR - E[\tau|s]$$

- Expected profit without effort

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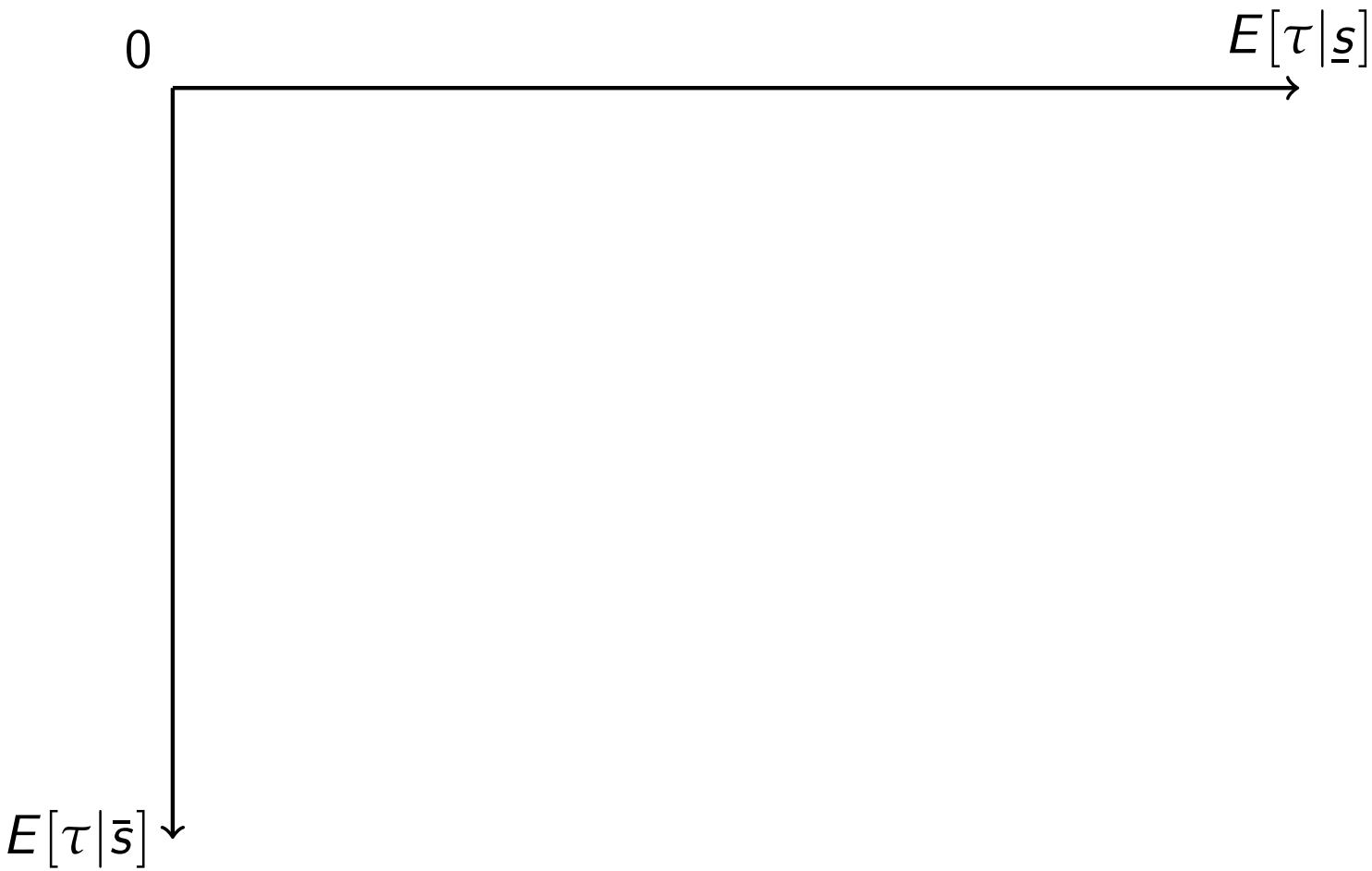
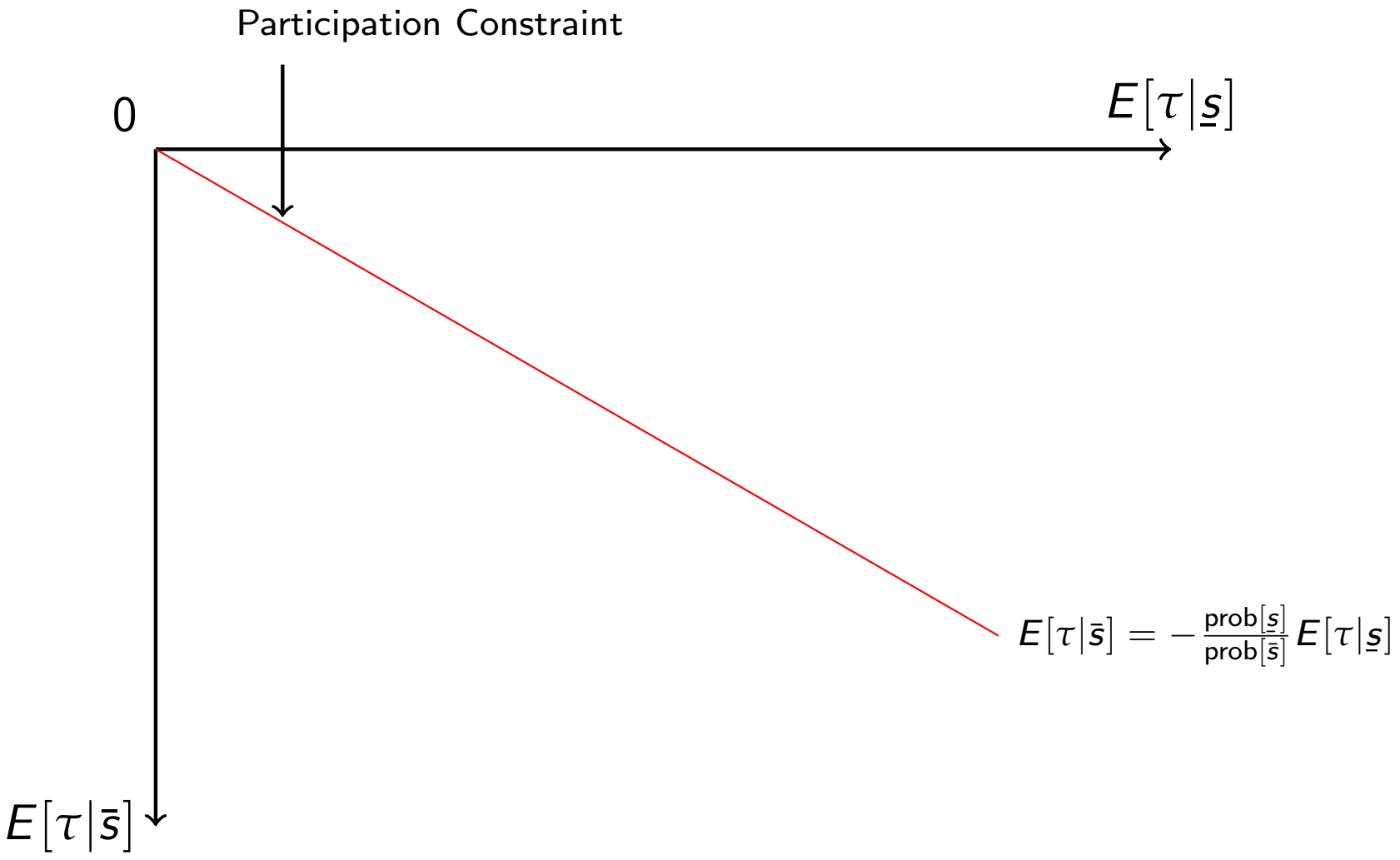
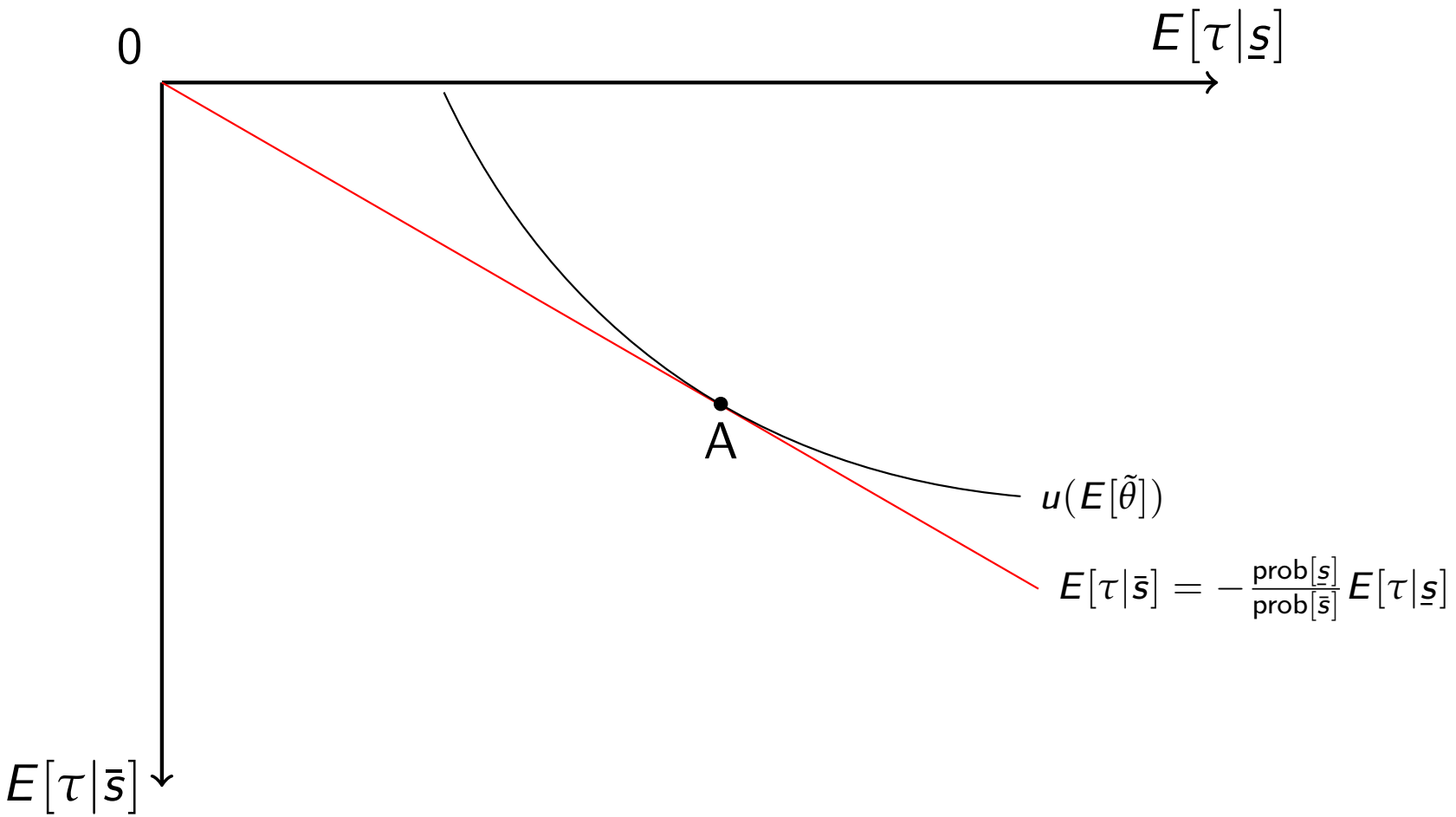
A graphical illustration



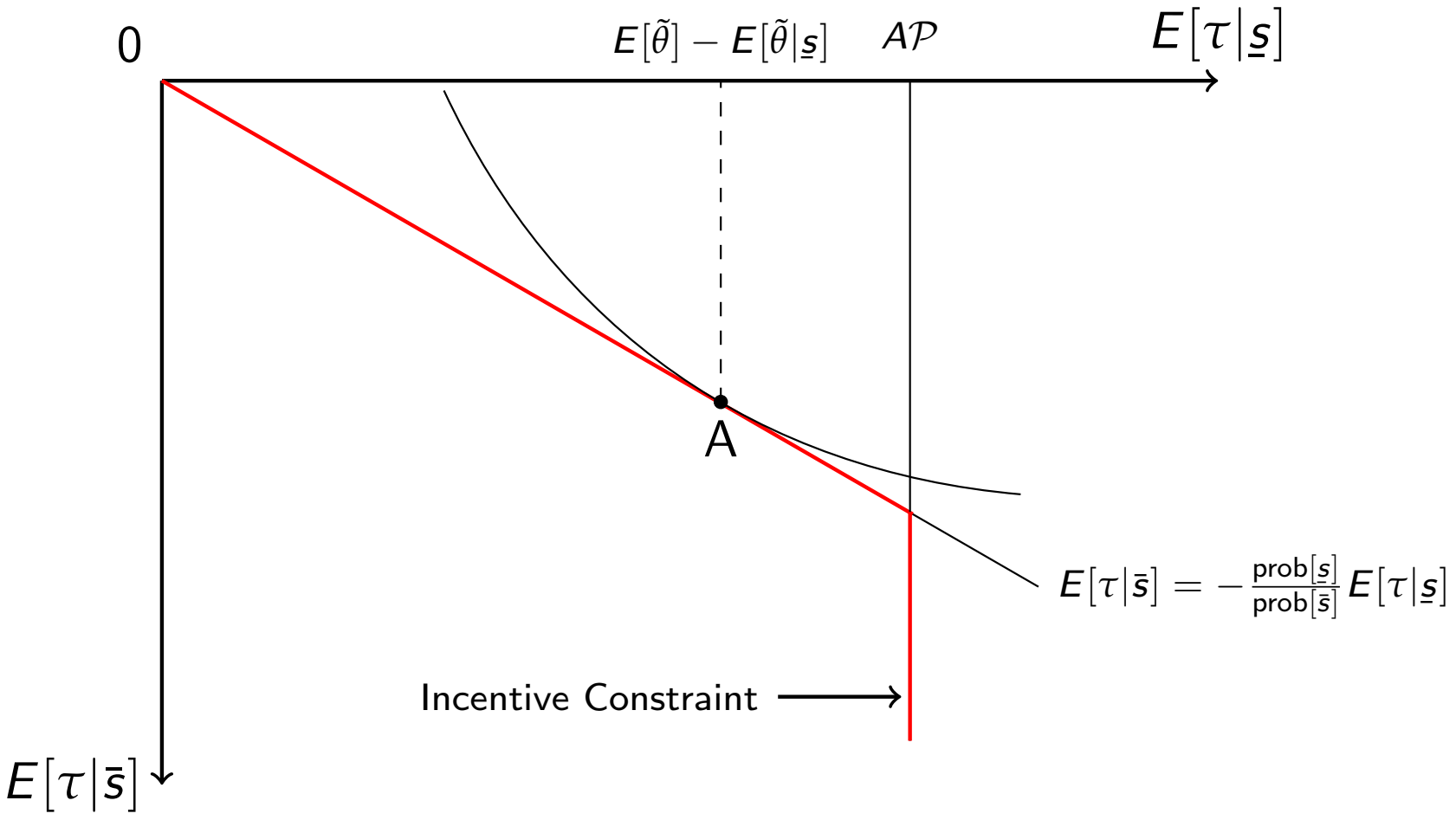
Seller's participation constraint



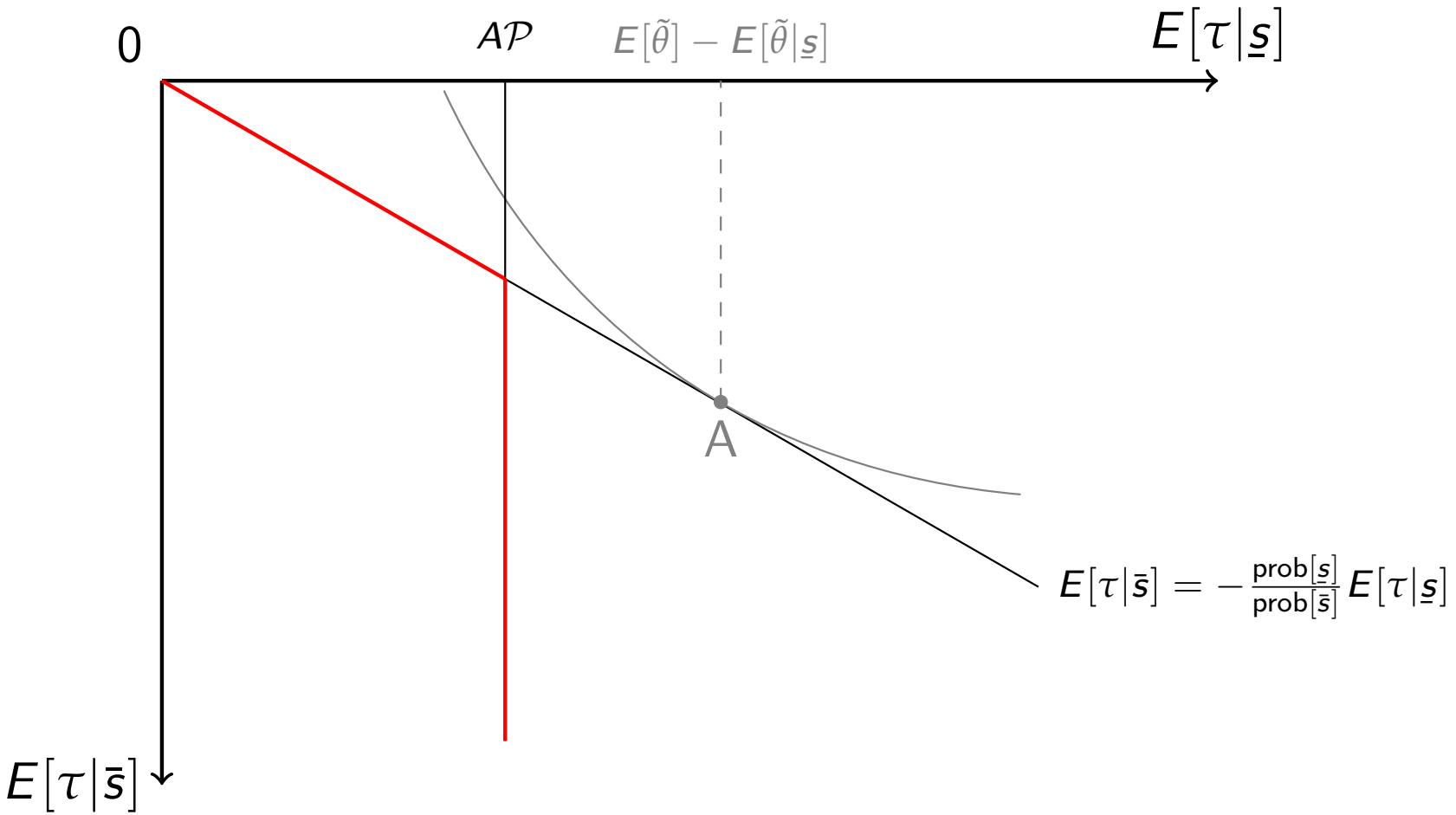
First-best


0
$E[\tau|\underline{s}]$
A
$u(E[\tilde{\theta}])$
$E[\tau|\bar{s}] = -\frac{\text{prob}[\underline{s}]}{\text{prob}[\bar{s}]} E[\tau|\underline{s}]$
$E[\tau|\bar{s}]$

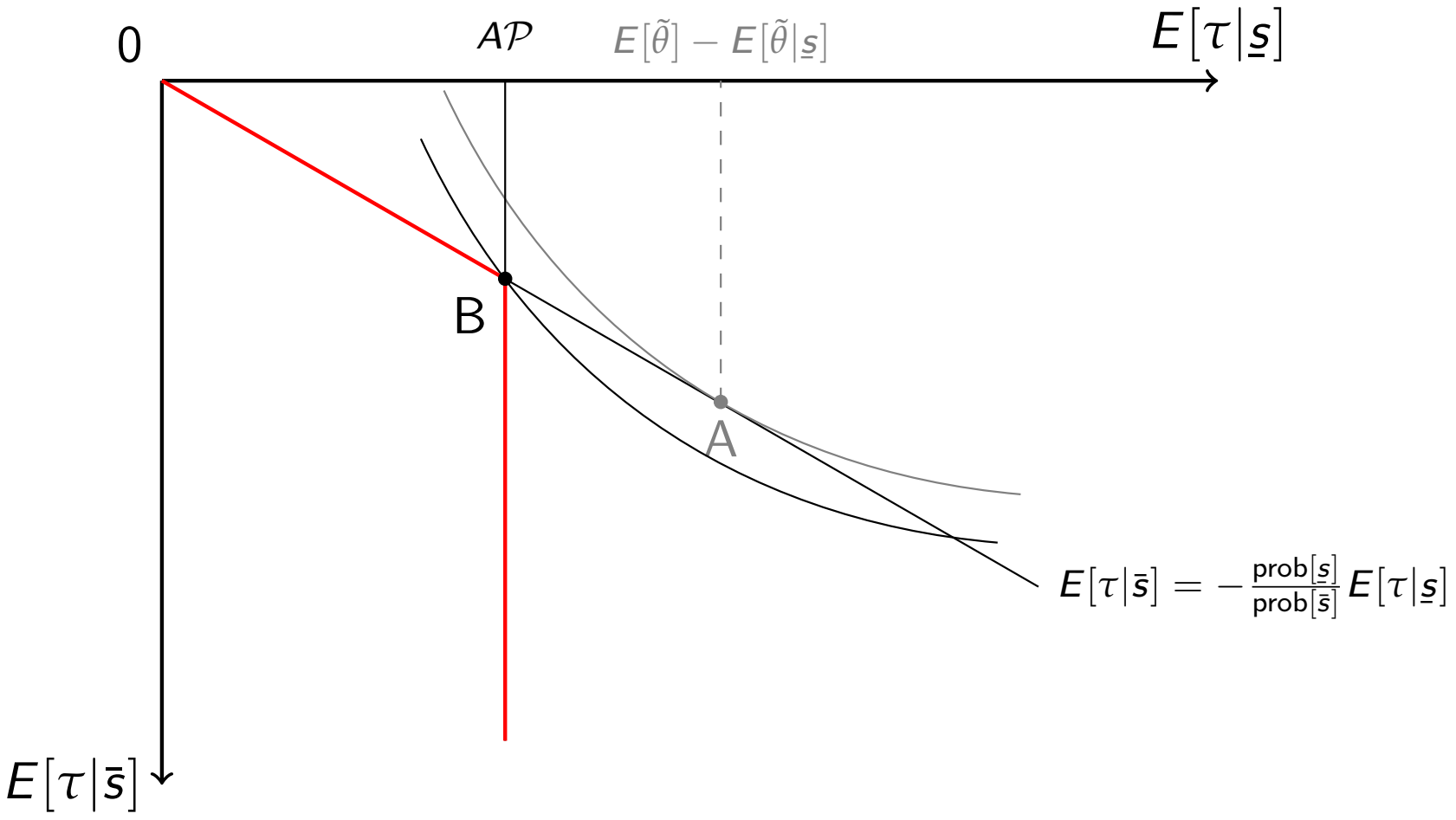
Moral-hazard: first-best achievable



Moral-hazard: first-best not achievable



Moral-hazard: implement risk-control effort



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- Protection buyer exposed to *signal risk*
- Alternative: give up on incentives after bad news $\longrightarrow$ exposure to *counterparty risk*

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  - contract is not actuarially fair
- Contract with risk-taking chosen when probability of default is small $\longrightarrow$ hedging leads to aggregate risk

3. Equilibrium with moral-hazard and margins

Margins when seller effort implemented

- Incentive problem only after bad signal $\longrightarrow$ margin only called after $\underline{s}$ (variation margin)
- Margin tightens participation constraint

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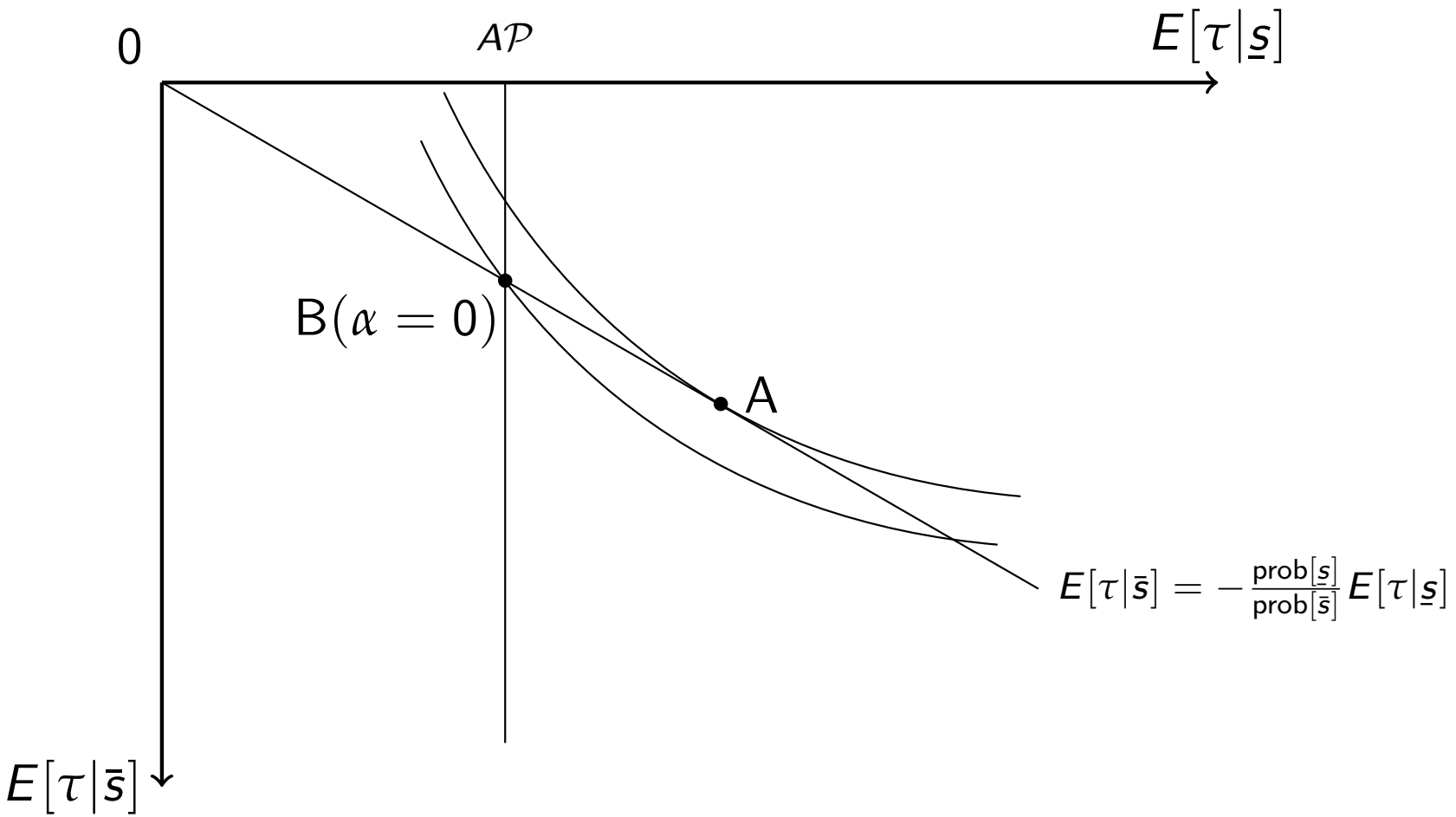
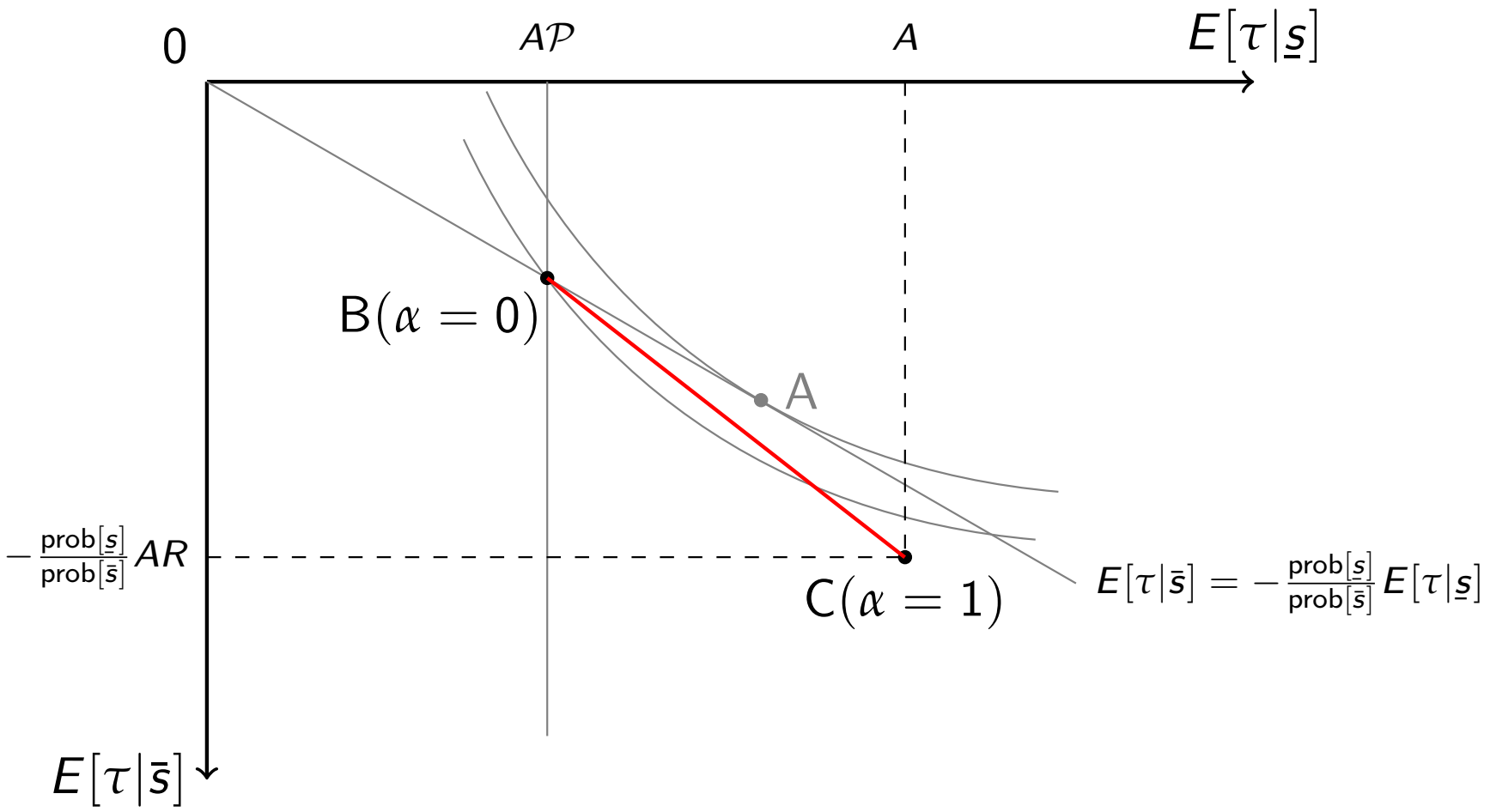
- Margin relaxes incentive constraint if $\mathcal{P} < 1$

$$E[\tau | \underline{s}] \leq \alpha A + (1 - \alpha) A \mathcal{P}$$

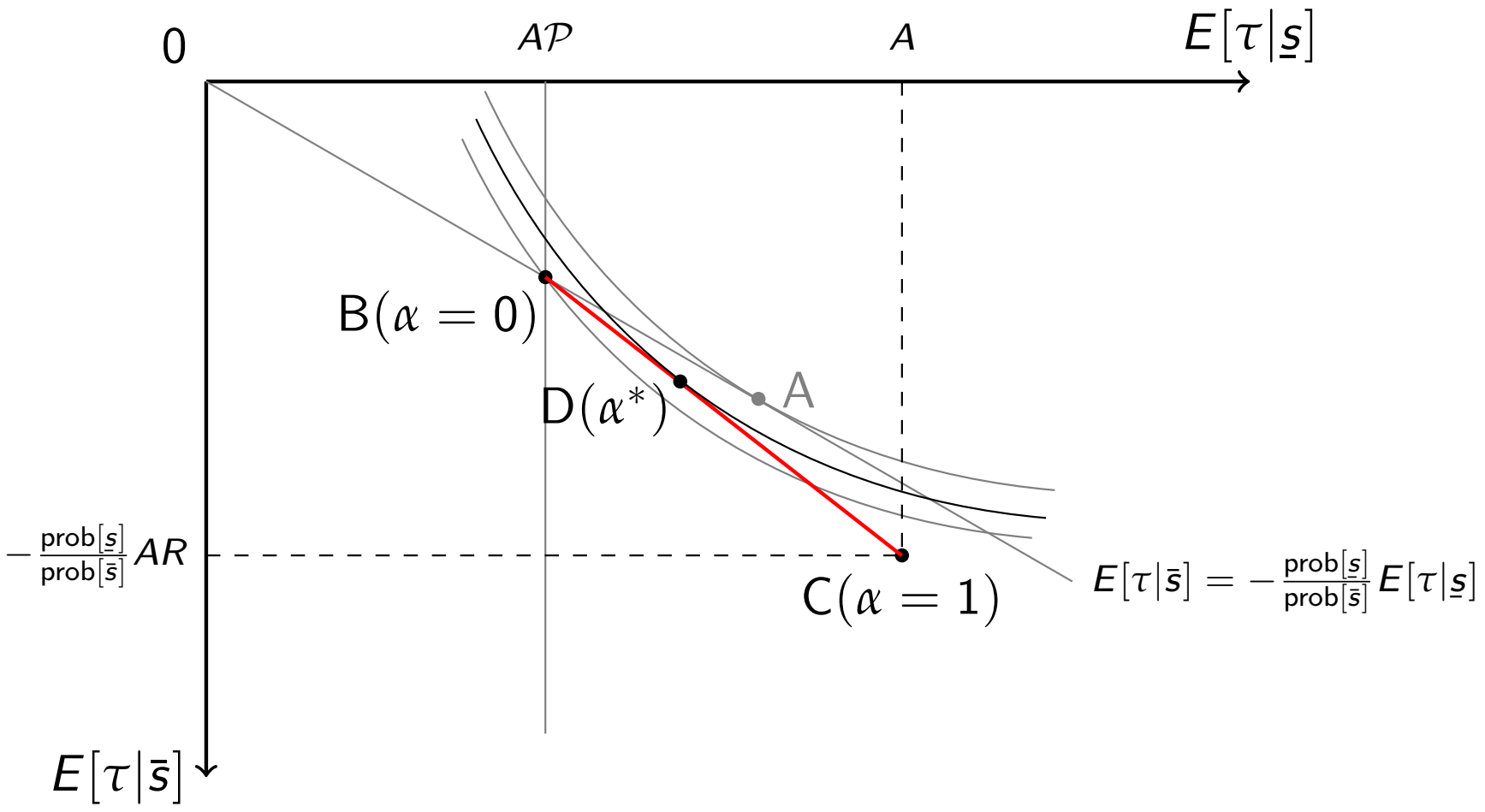
Recap: situation without margin



Implement risk-control effort: margin enhances risk-sharing opportunities



Implement risk-control effort: optimal margin



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4. N protection sellers

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$\longrightarrow$ Our model is representative of an "insurance" sector taking correlated risks

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- Seller 2 shirks and obtains rent exploiting limited liability
- Anticipating this, buyer does not enter second-best contract (market failure)

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- Out-of-equilibrium threat
- Scope for intervention (e.g., forcing certain contracts on exchanges)
  - build-up of positions needs to be monitored (e.g., by CCP)

Concluding remarks

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- Imposing initial margins restores constrained efficiency