# Risk-sharing or risk-taking? Financial innovation, margin requirements and incentives

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Norges Bank

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The views expressed are solely those of the authors.

# Motivation

- Financial innovation enables risk-sharing (e.g., credit-default swaps)
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- Is there a conflict between risk-sharing gains from trade and risk-taking incentives?
- What are the consequences of counterparty risk?
- Is financial innovation destabilizing?
- Does it propagate and amplify shocks?

# Hidden leverage, incentives and margins

- Risk-sharing creates *hidden leverage*
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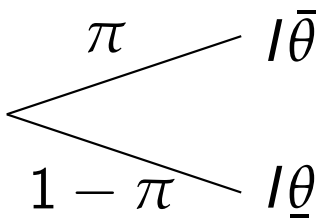
  - endogenous counterparty risk, propagation and amplification
- Can margins help?

# Protection buyer

- Bank, hedge fund, insurance company,...
- Risk averse (concave utility $u$)
- Endowed with a risky position $I\tilde{\theta}$



# Protection seller

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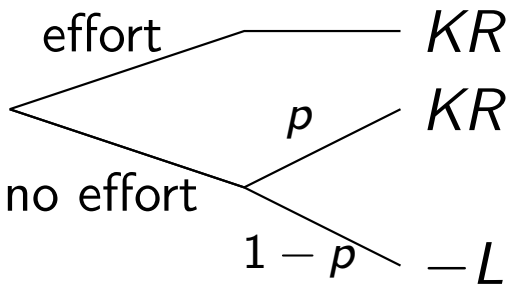
- Risk neutral
- Risky balance-sheet $K\tilde{R}$ (independent of $\tilde{\theta}$)
- Needs to exert unobservable effort to control balance-sheet risk



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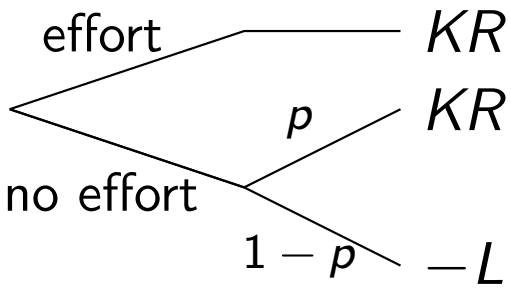



- Shirking carries private benefit $KB$
- Protected by limited liability $\longrightarrow$ moral hazard
- Competitive (for simplicity)

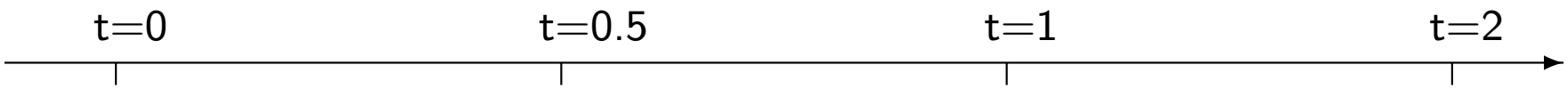
# Information structure

- Public signal $\tilde{s}$ about the buyer's risk $\tilde{\theta}$ becomes available
  - *after* the contract is written
  - *before* the seller chooses whether to control her own balance-sheet risk $\tilde{R}$
- The signal is informative: $\text{prob}[\underline{\theta}|\underline{s}] > \text{prob}[\underline{\theta}]$

# Financial innovation

- Ability to write a risk-sharing contract
- Contract specifies a transfer $\tau$ from the seller to the buyer depending on
  - the realization of the buyer's risky position $\tilde{\theta}$
  - the realization of the seller's risky balance-sheet $\tilde{R}$
  - the public signal $\tilde{s}$

# Sequence of events




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

Public information $\tilde{s}$ about the risk underlying the contract arrives.

Seller chooses whether or not to exert effort to control the risk of her balance-sheet.

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

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

Transfer $\tau$ from seller to buyer.

# First-best (observable effort)

- Protection buyer request seller's effort and solves

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

$$\text{subject to} \qquad E[\tau] \leq 0 \qquad [PC]$$

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- In the first-best
  - full insurance
  - contract does not depend on the signal $\tilde{s}$
  - contract is actuarially fair
  - seller obtains no rent

# Incentive constraint with unobservable effort

- Expected profit of protection seller under effort

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

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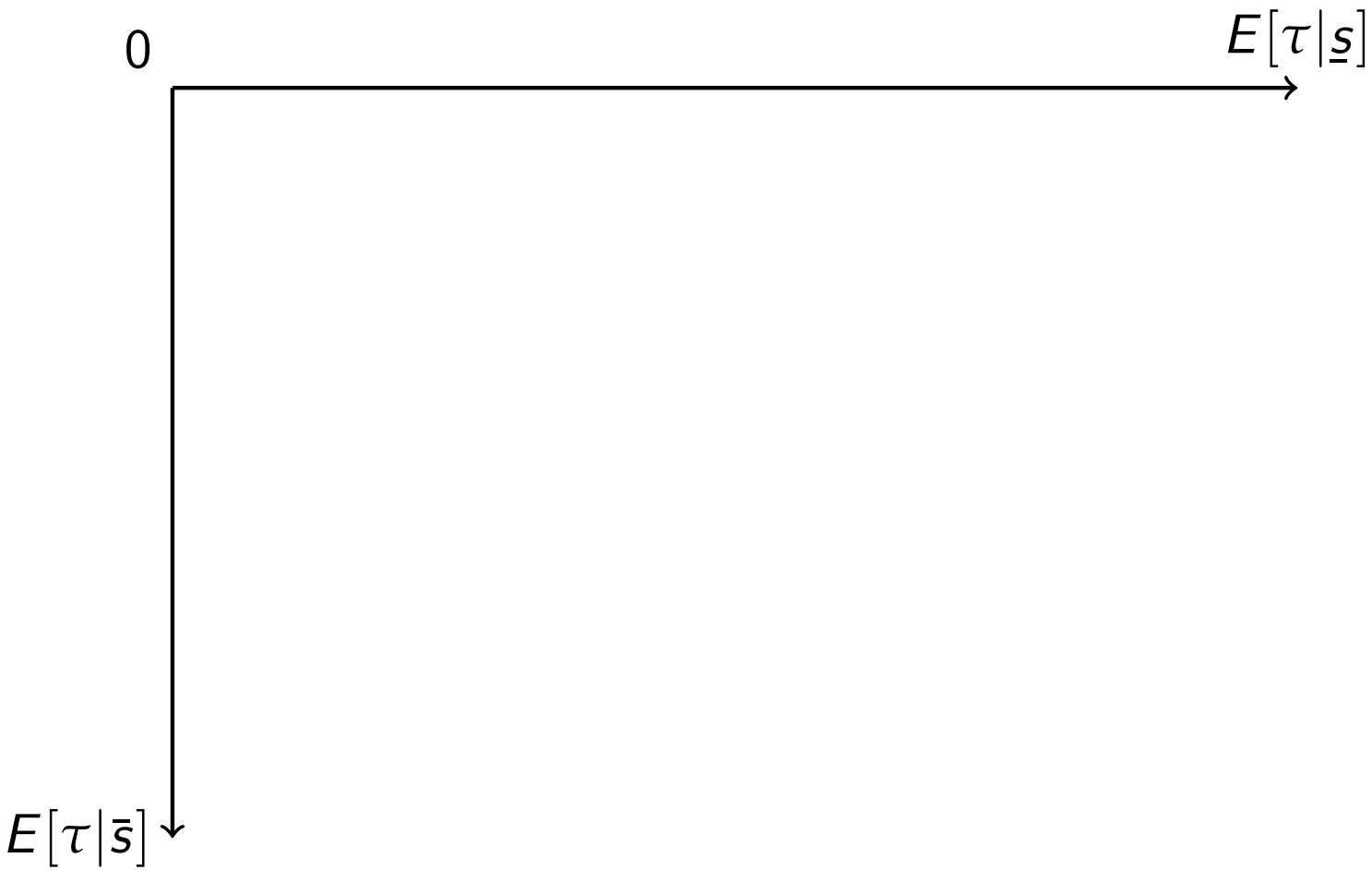

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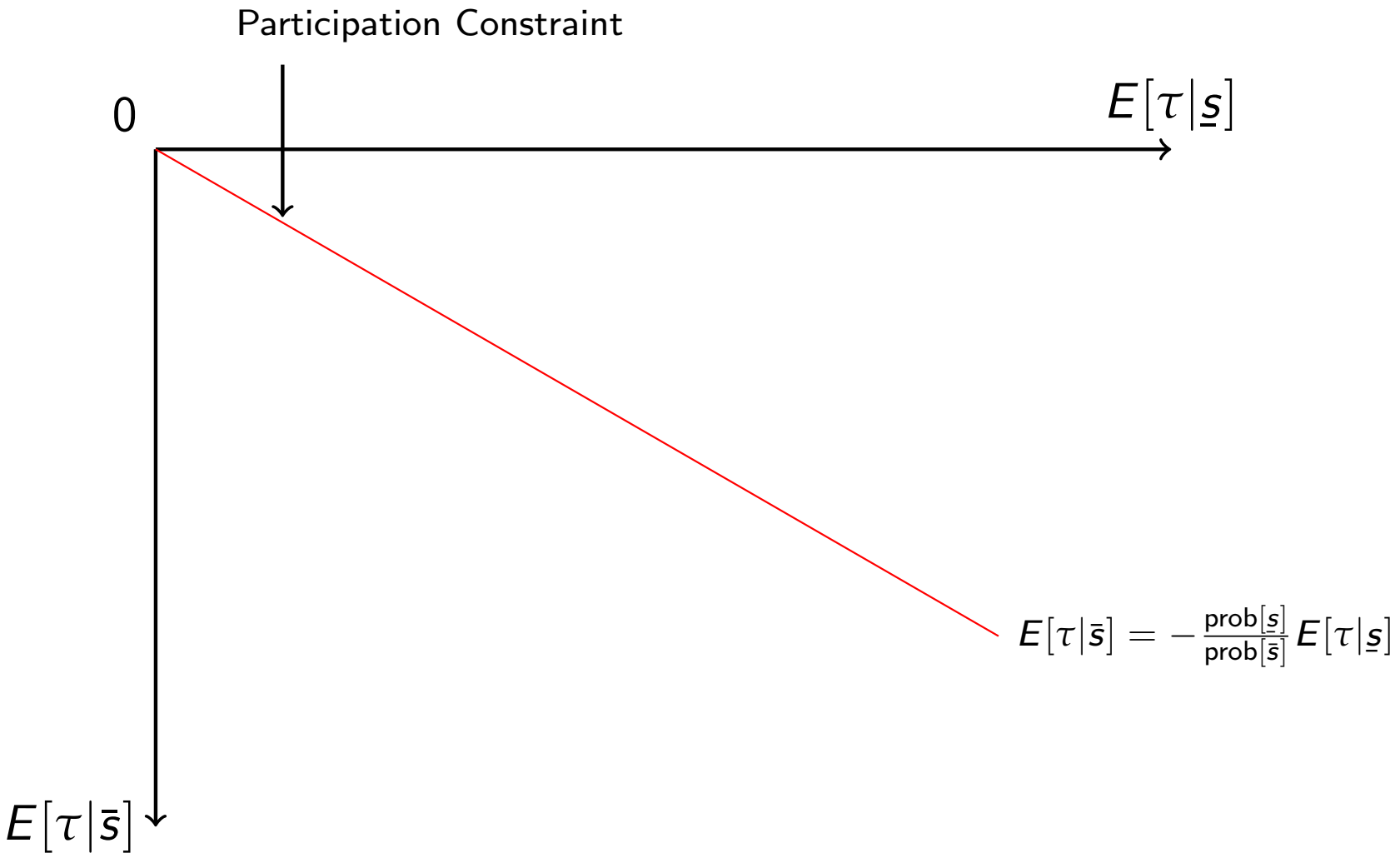

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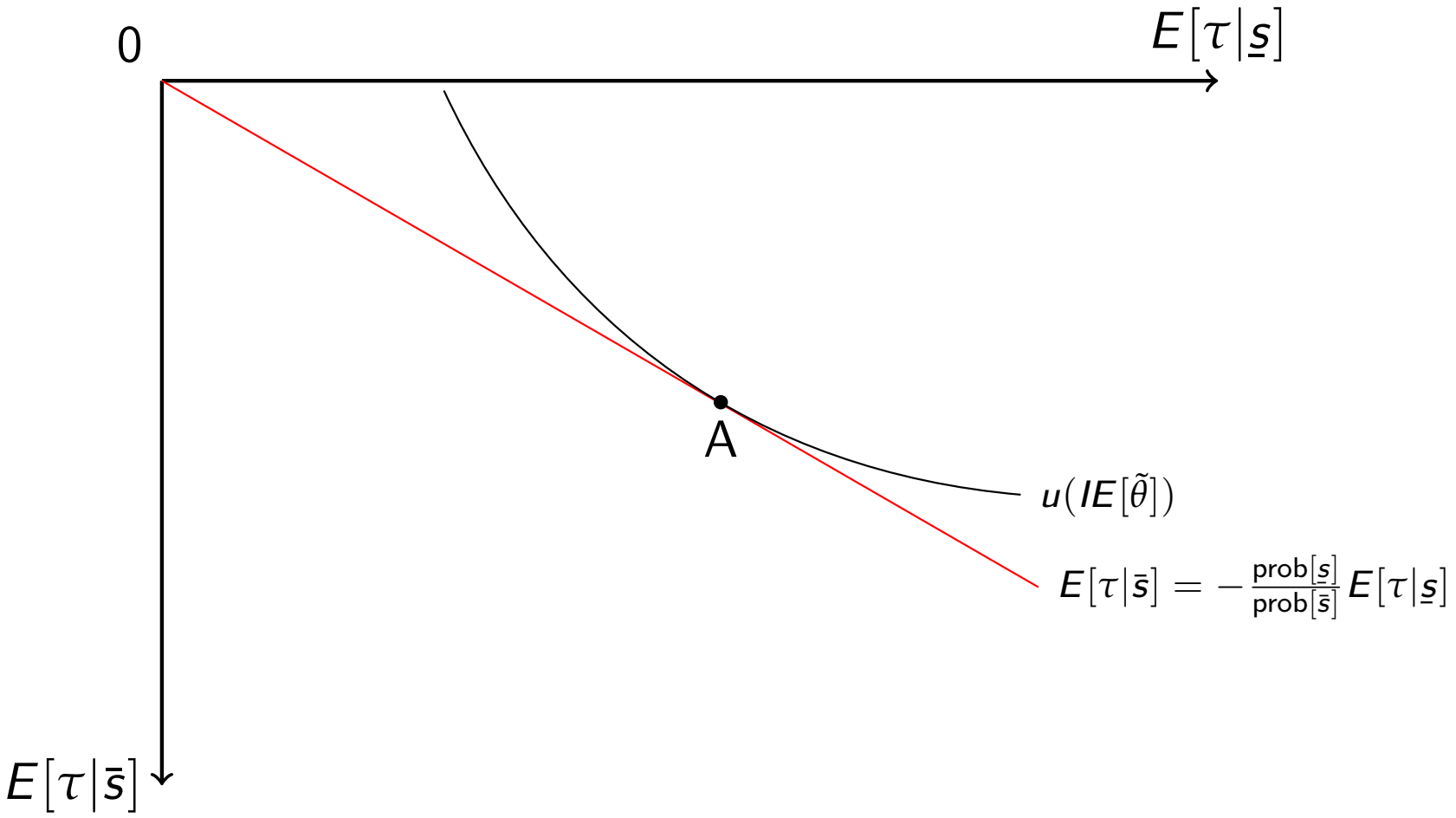

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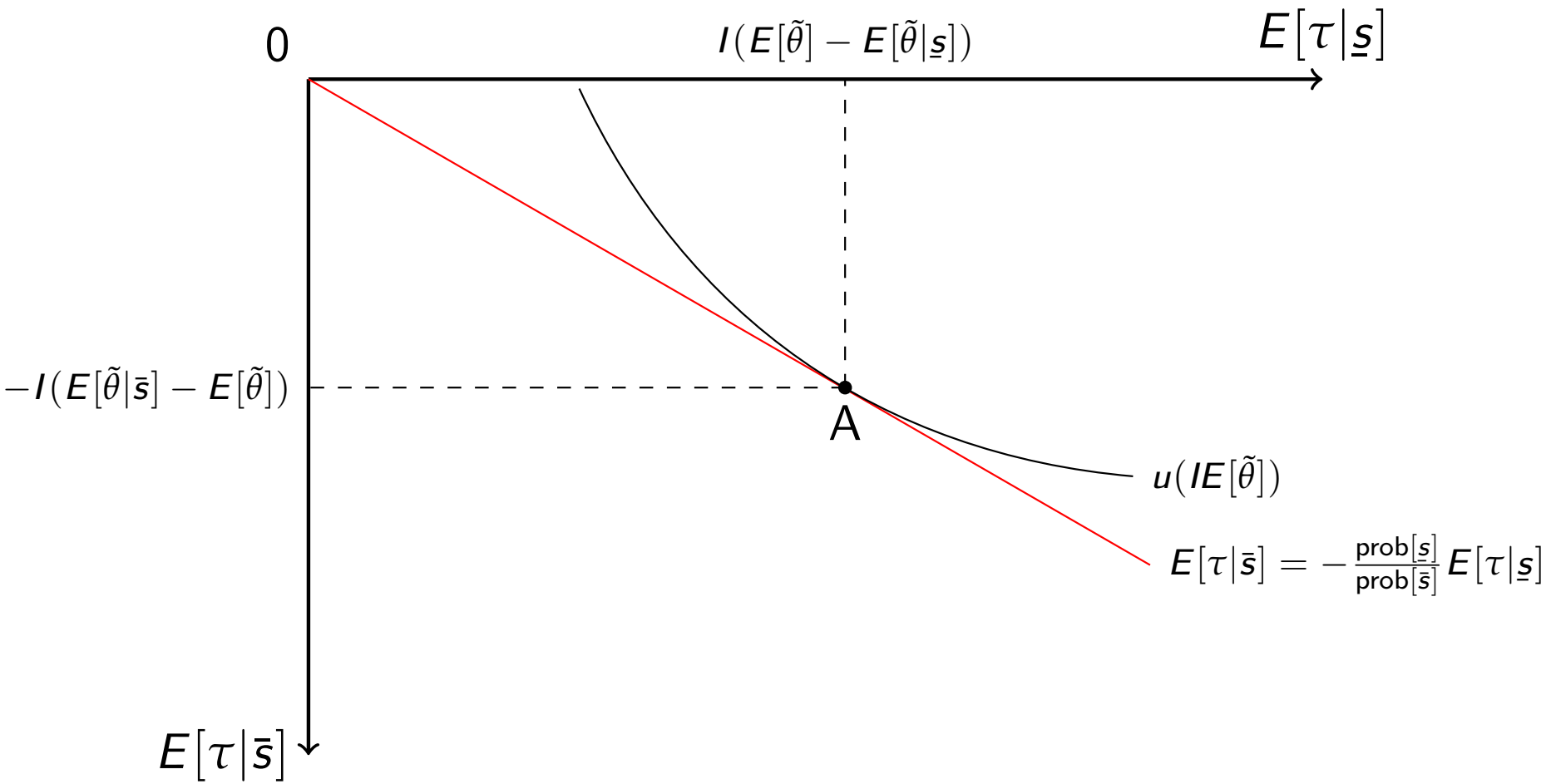
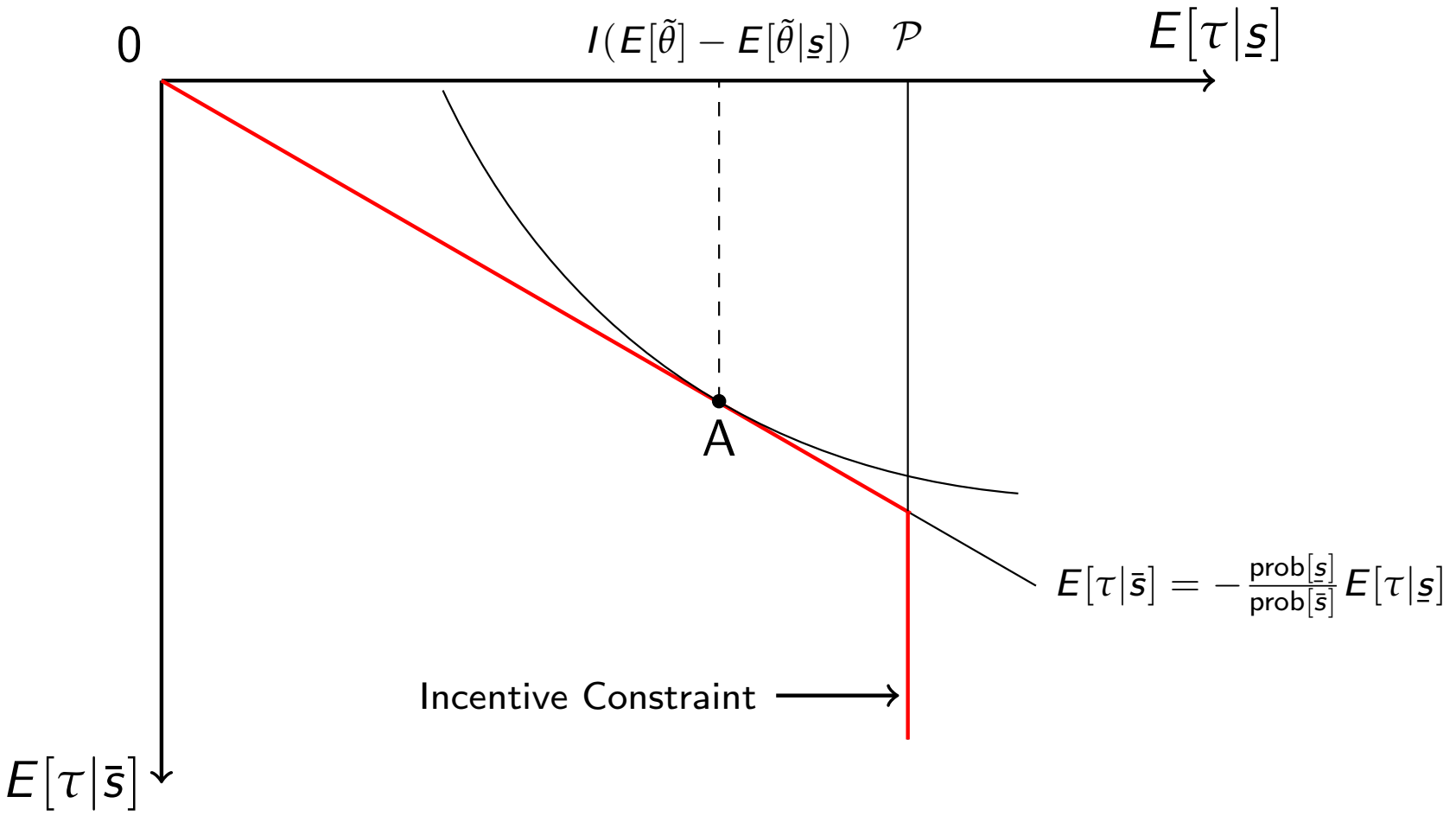


# Unobservable effort: first-best achievable



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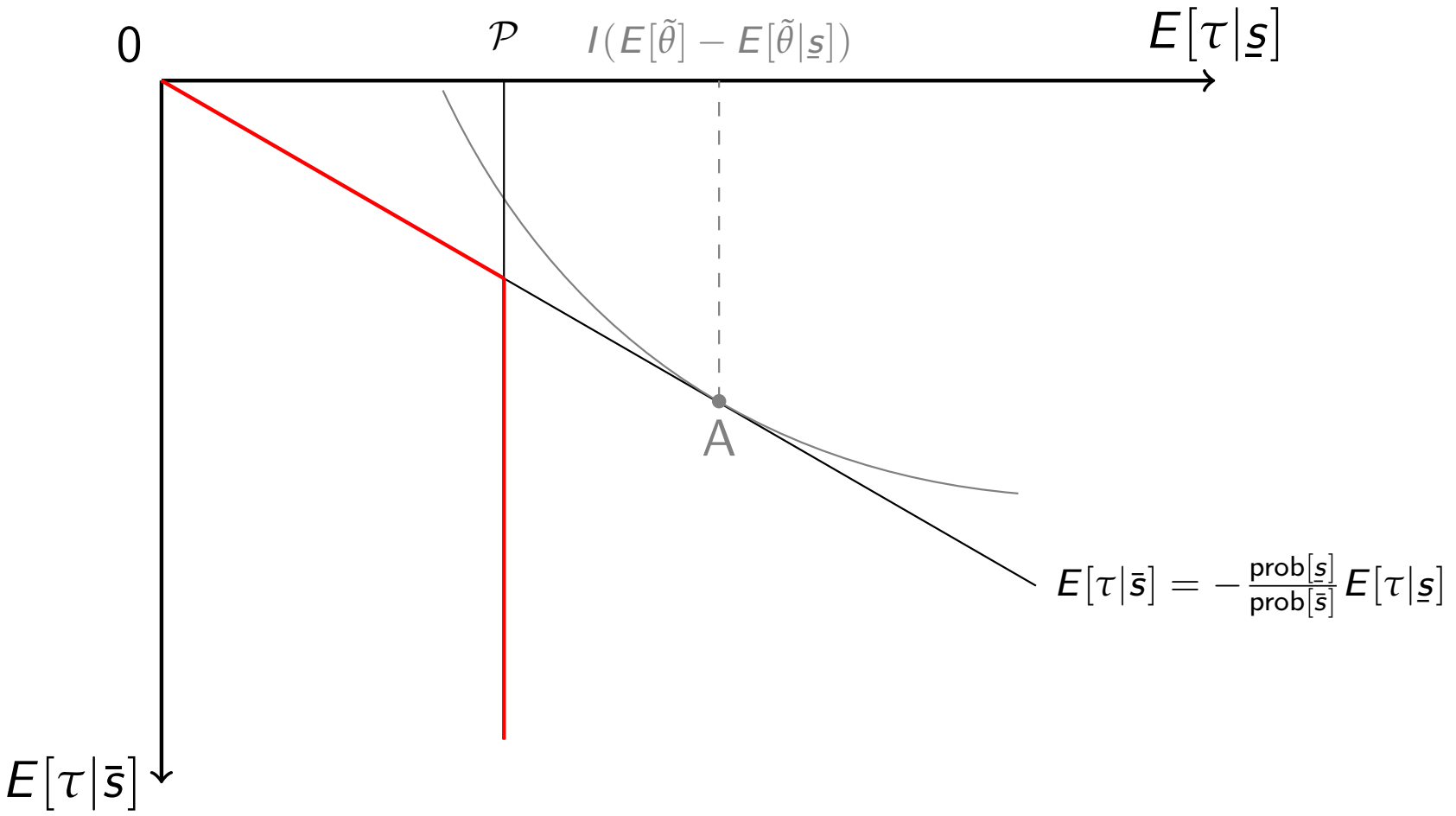

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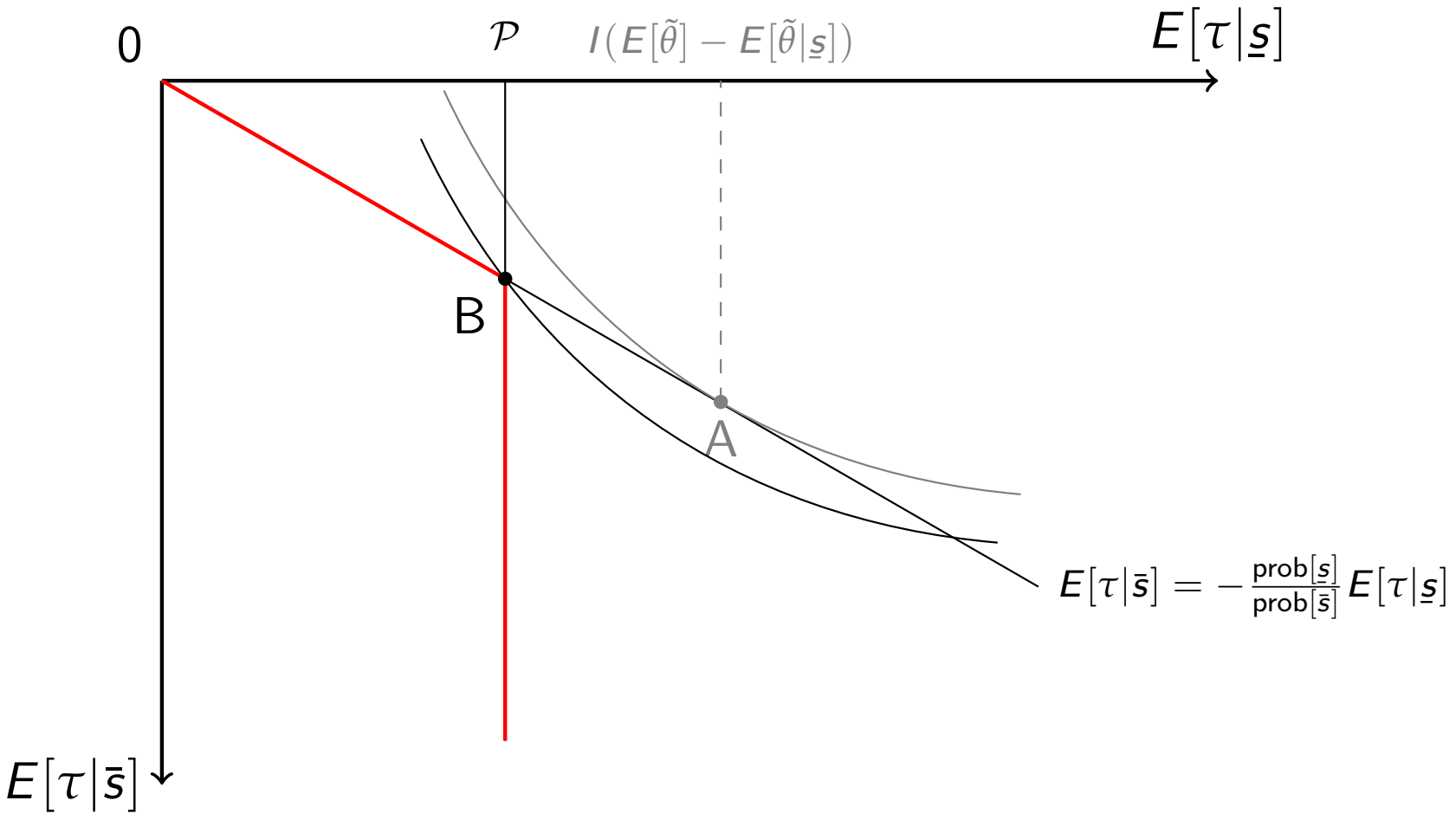

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- After bad signal $\longrightarrow$ risk-sharing contract (derivative) likely to be loss-making
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- Protection buyer exposed to *signal risk*

# Risk-sharing and risk-taking

- Trade-off when designing optimal contract
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- Choice between signal and counterparty risk

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- There is counterparty risk of seller defaulting
  - not socially optimal if large losses $L$ (disruptions in payment systems or interbank markets)

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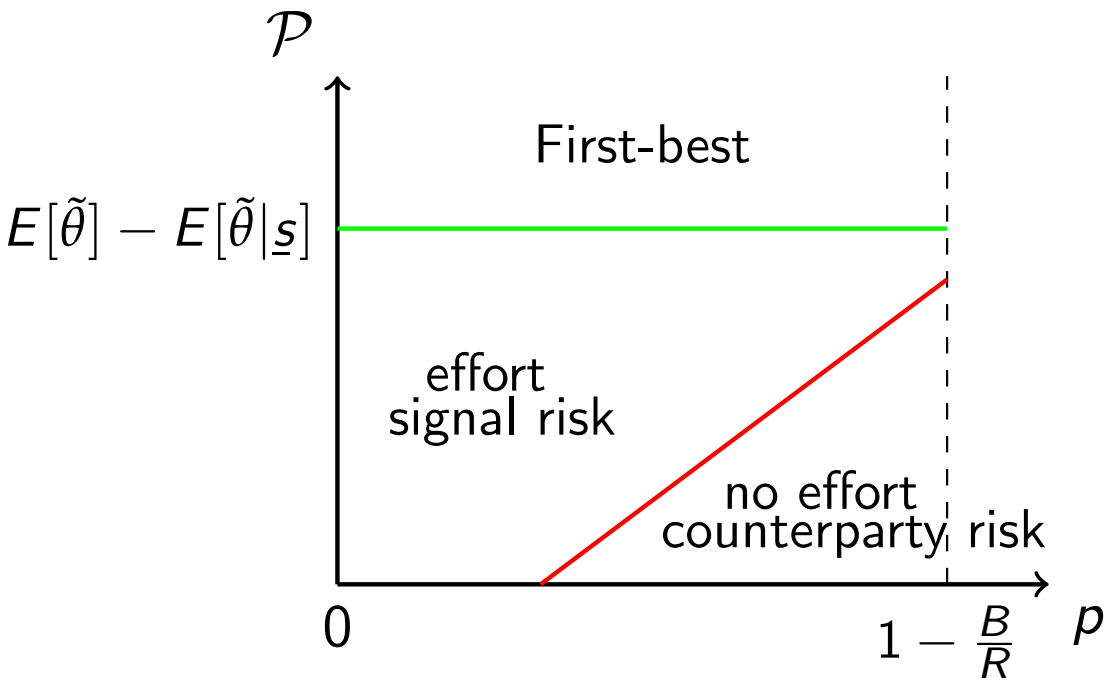
# Optimal contract



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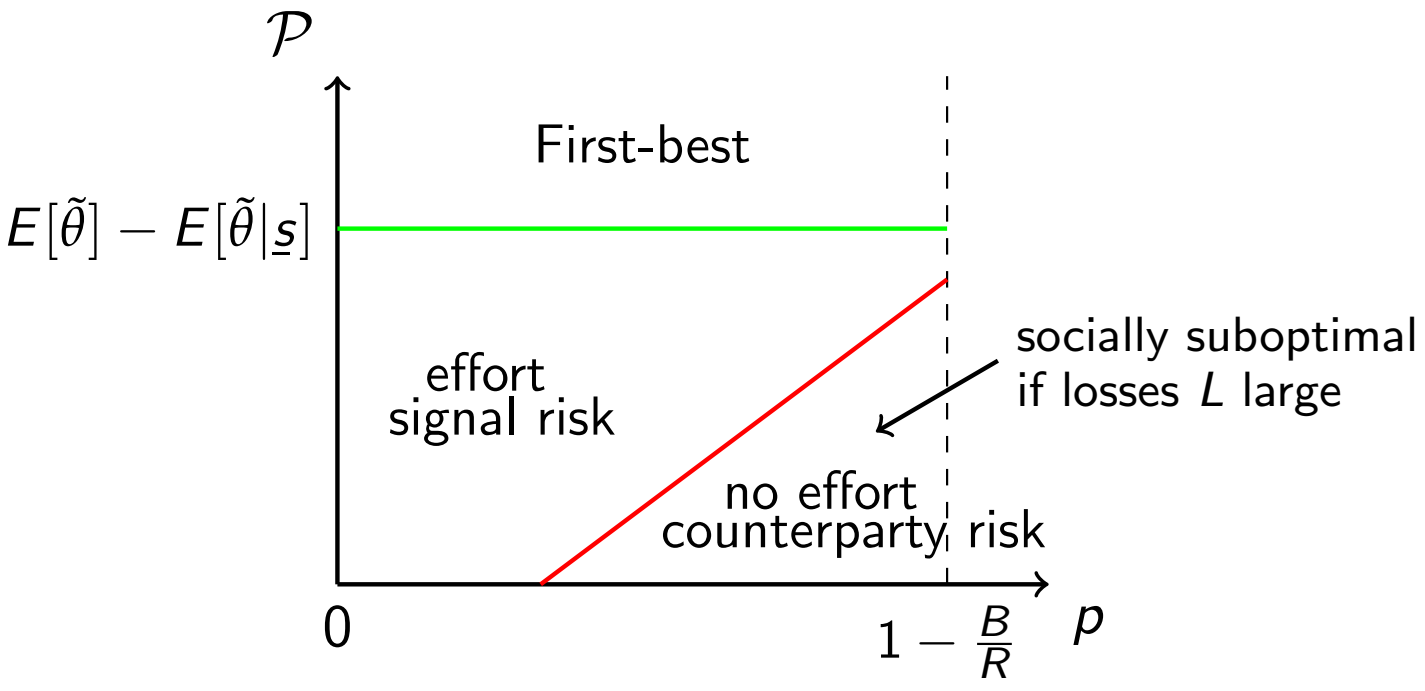

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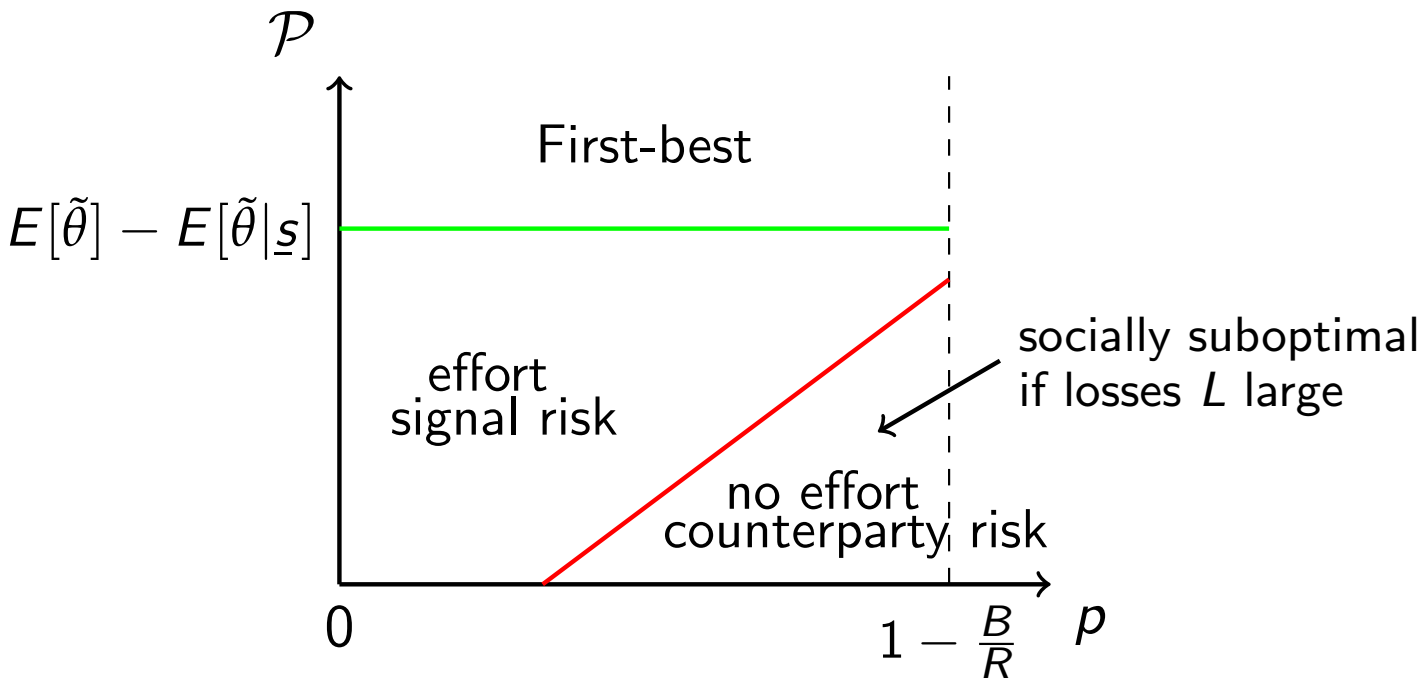


- Policy implications
  - ban derivative trading for institutions with low pledgeable income
  - or capital requirements as a function of derivative exposure

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- Bad news on protection buyer's risk $\tilde{\theta} \longrightarrow$ increased default risk of seller (propagation)
- Drop in pledgeable income (bad macro shock) $\longrightarrow$ shift from risk-control (effort) to risk-taking (amplification)

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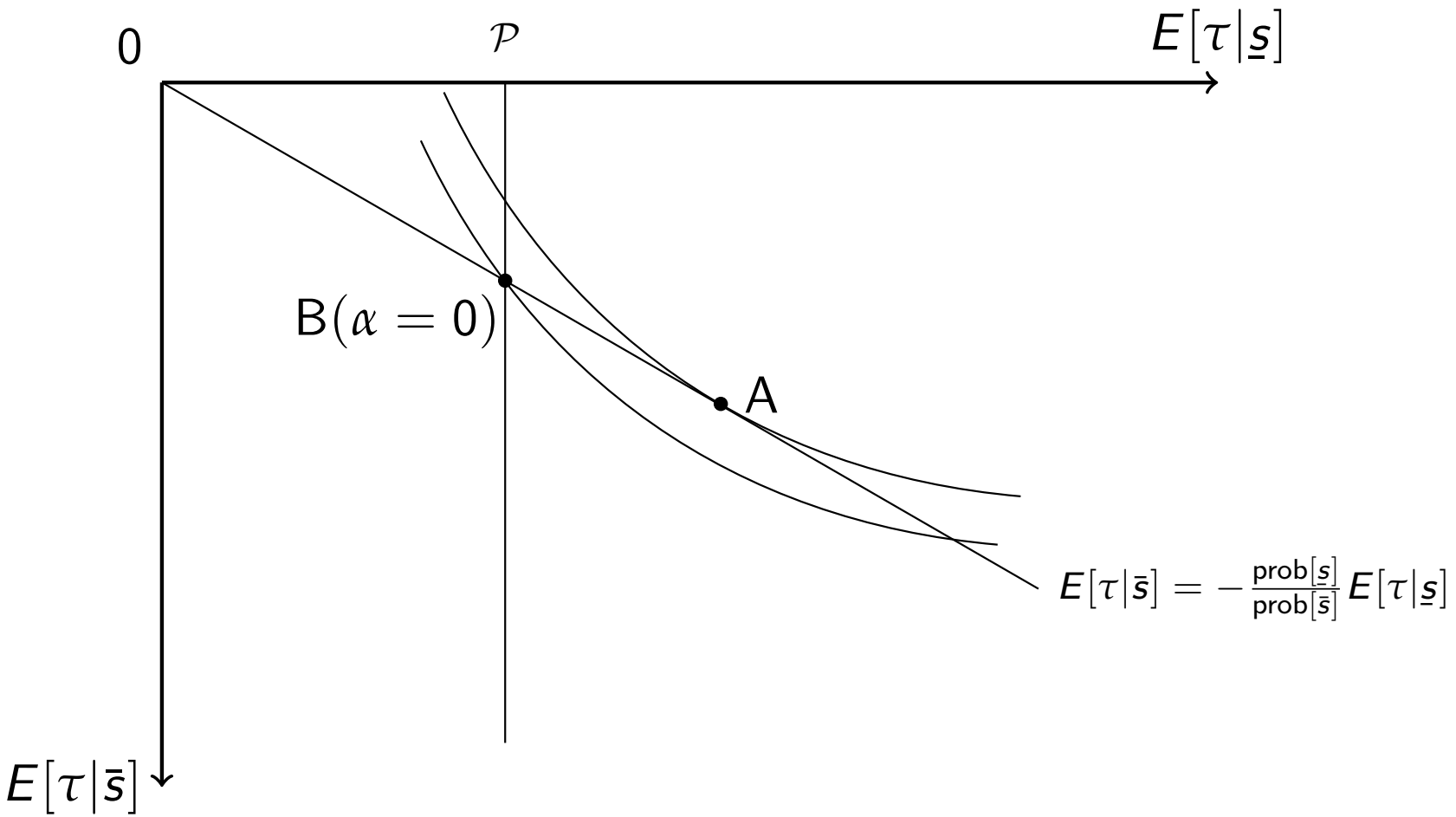
$$E[\tau] \leq \alpha K (1 - R)$$

- Deposited cash is ring-fenced from moral-hazard $\longrightarrow$ relaxes incentive constraint

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

# Optimal margin with induced effort



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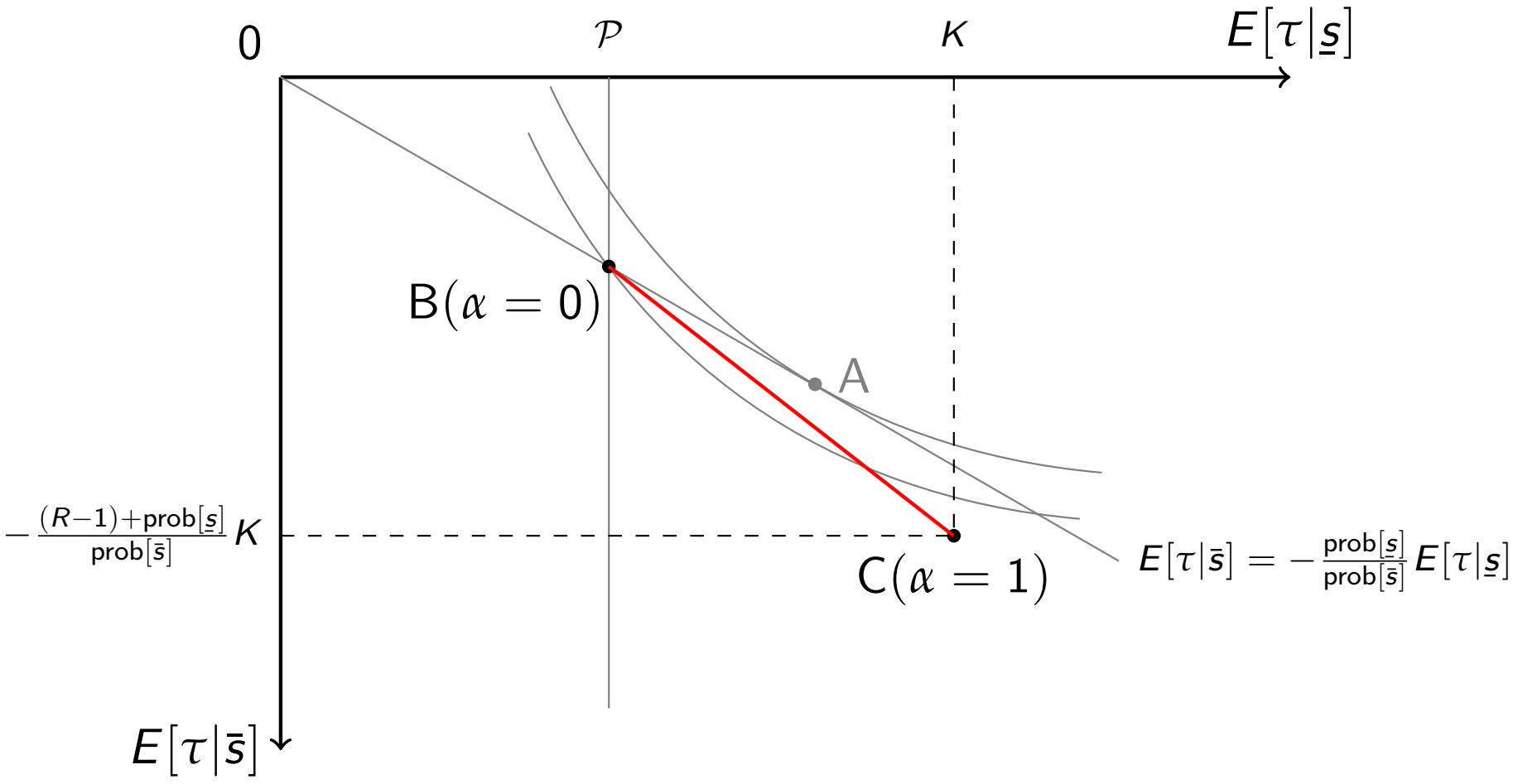

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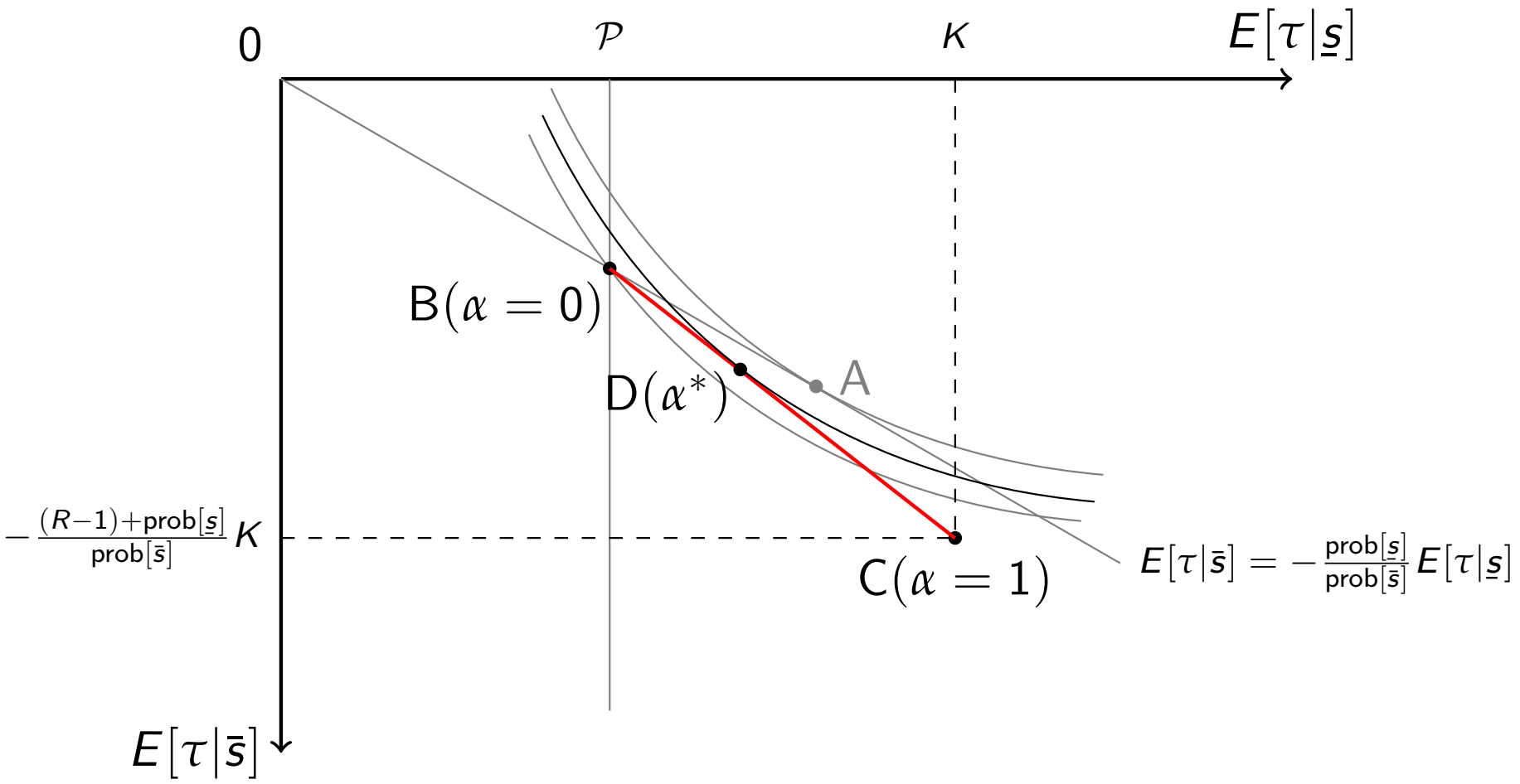

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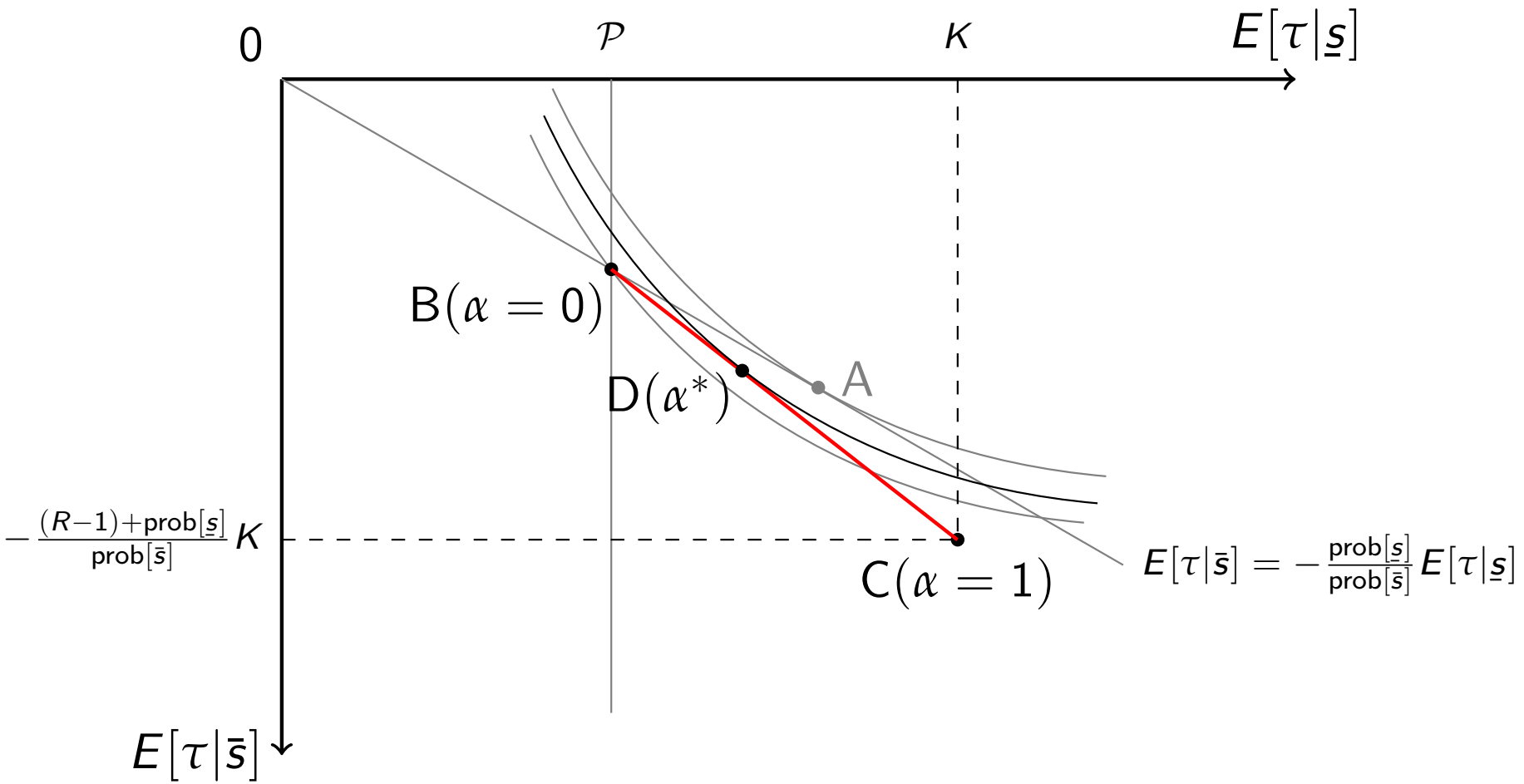
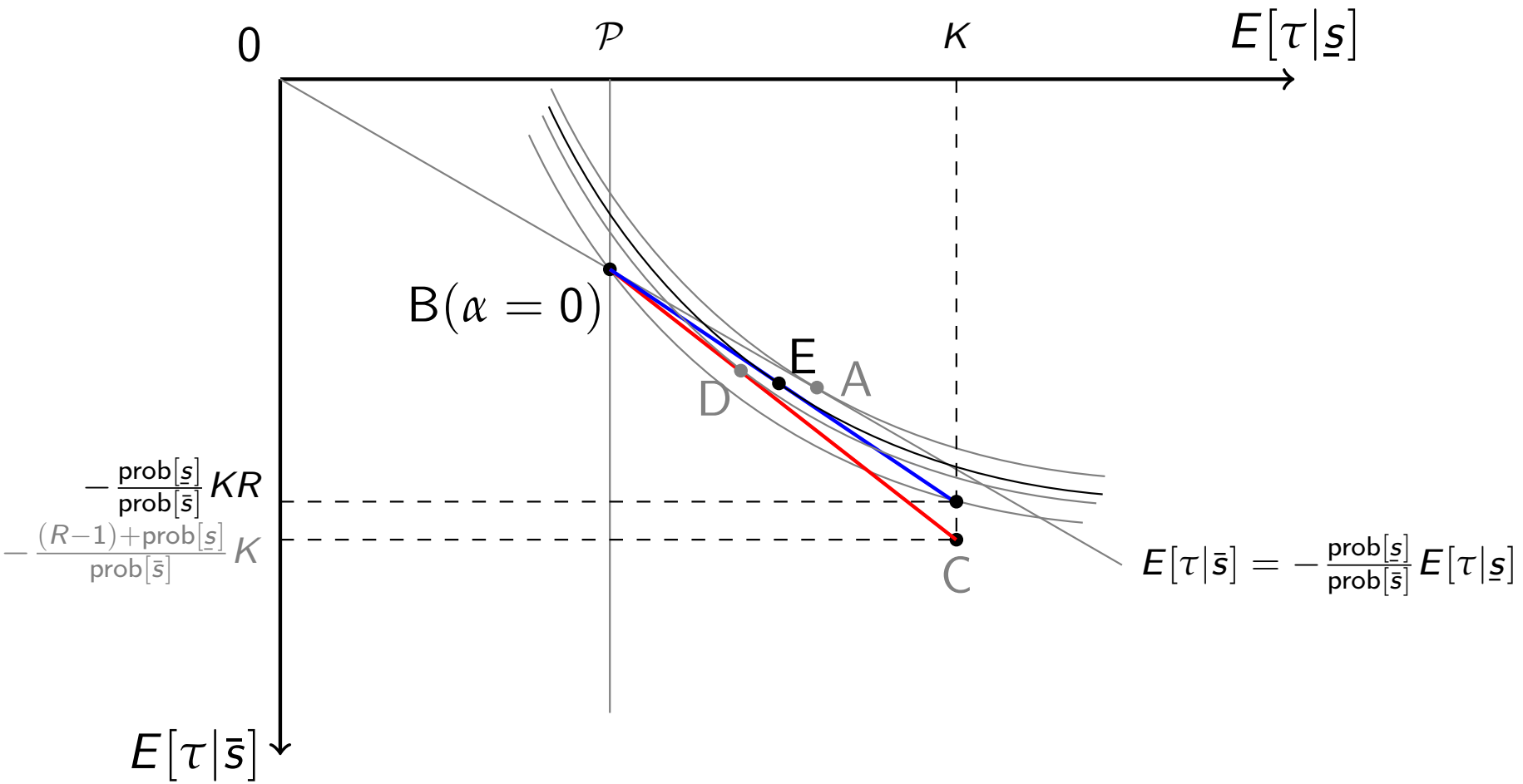
- Under effort, initial margins improve risk-sharing even though not paid out
- Under no-effort, they insure the buyer against counter-party risk
  - may lead to more-risk taking
- Overall effect of initial margins on risk is ambiguous

# Initial margin



# Variation margin

$$E[\tau] \leq \alpha K (1 - R) \, \text{prob}[\underline{s}]$$



# Conclusion

- Financial innovation enhances risk-sharing
- But with asymmetric information it can lead to
  - endogenous risk
  - propagation of risk
  - amplification of shocks
- Initial margins are no panacea
- Capital regulation to counter hidden leverage

# Extra: implementation

- First-best: forward $(q, F)$ with

$$\begin{aligned}\tau(\bar{\theta}, \bar{s}) = \tau(\bar{\theta}, \underline{s}) = I(E[\theta] - \bar{\theta}) &= q(F - \bar{\theta}) \\ \tau(\underline{\theta}, \bar{s}) = \tau(\underline{\theta}, \underline{s}) = I(E[\theta] - \underline{\theta}) &= q(F - \underline{\theta})\end{aligned}$$

$$\Rightarrow q = I \quad \text{and} \quad F = E[\theta]$$