

Lecture 1: Communication Design

Vijay Krishna

with John Morgan

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Designer Craze

Mechanism Design



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Designer Craze

Mechanism Design

Market Design



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Designer Craze

Mechanism Design

Market Design

Information Design

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Designer Craze

Mechanism Design

Market Design

Information Design

Communication Design?

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Communication Design in Two Contexts

Sender-receiver games

Communication Design in Two Contexts

Sender-receiver games

Repeated games

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Part I

Sender-receiver games

Joint with John Morgan

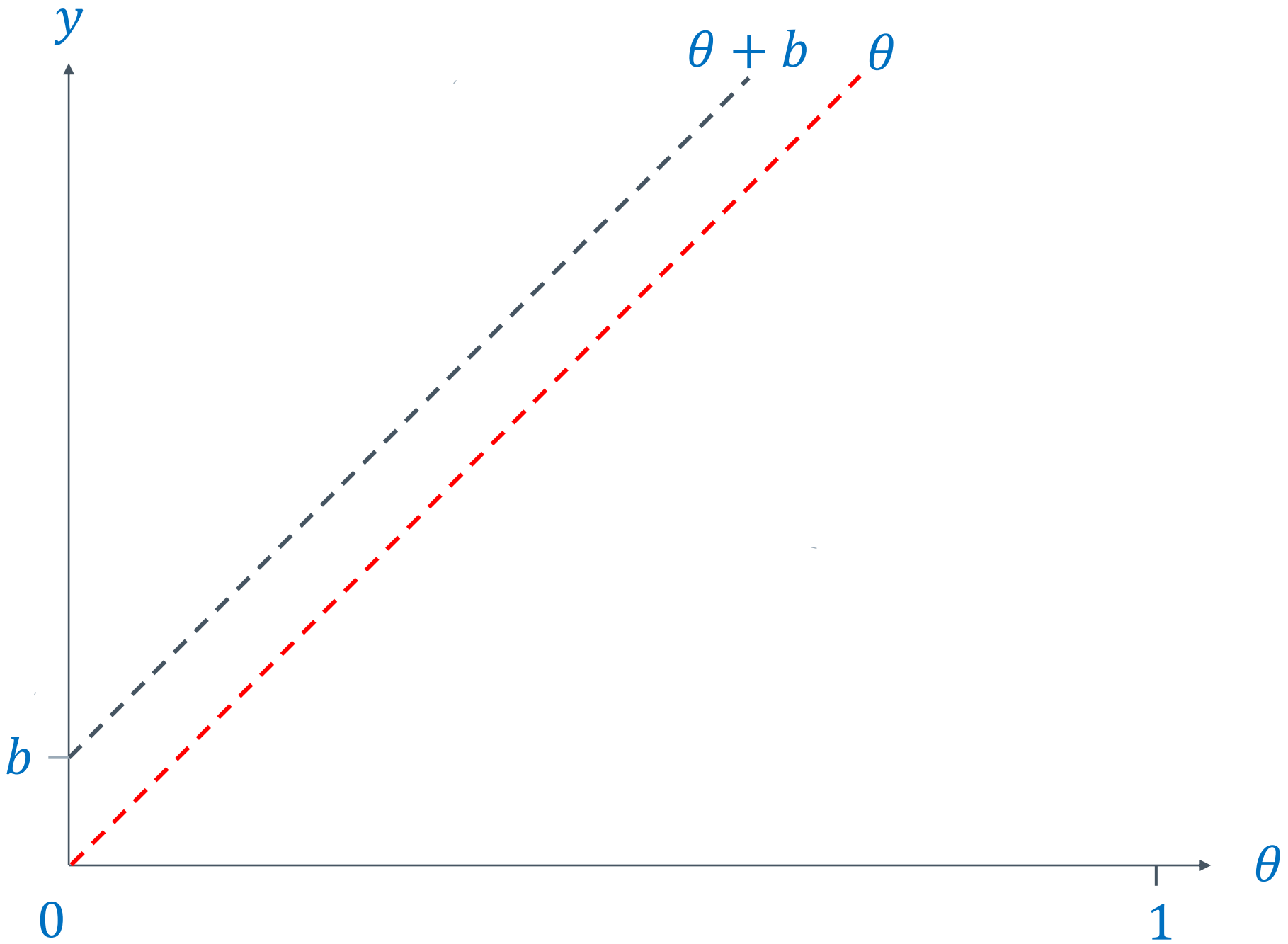
Information Transmission

- › Signalling games (Spence 1970)
 - Indirect communication via costly choices
- › Sender-receiver games (Crawford & Sobel 1982)
 - Direct communication without costs
- › How much information can be transmitted?

Sender-receiver game

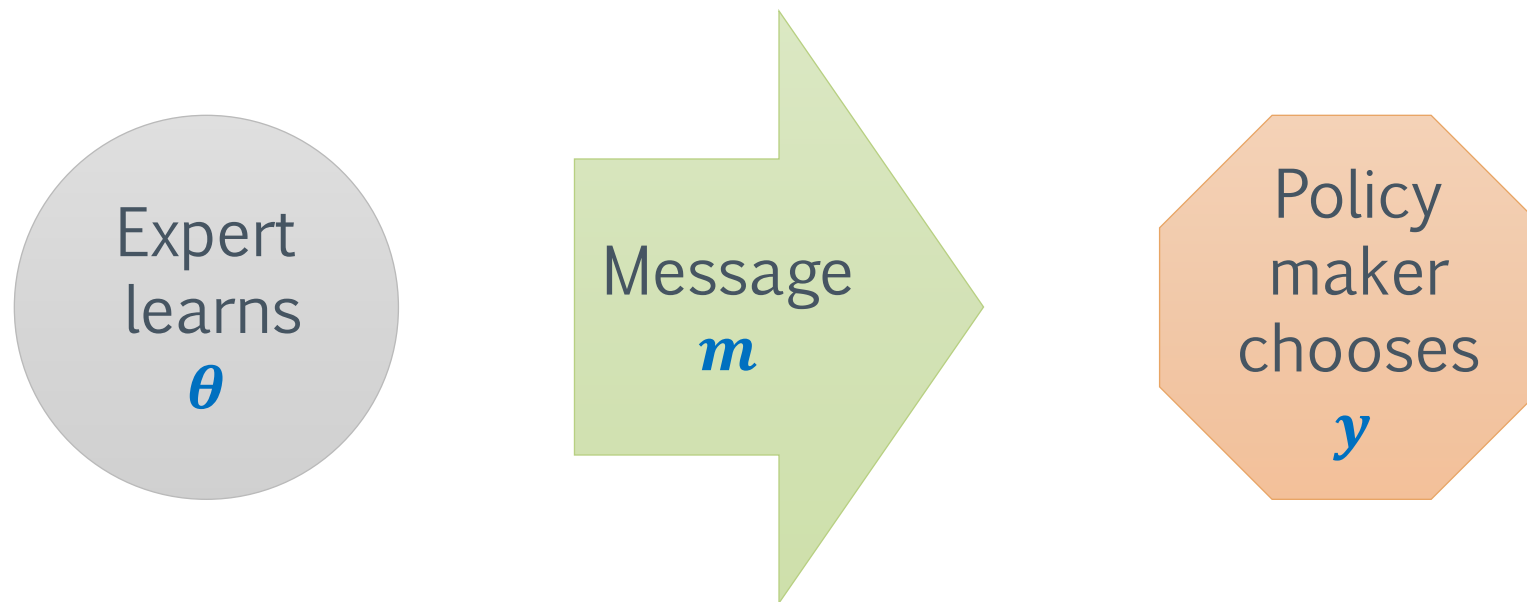
- › Policy maker must choose $y \in \mathbb{R}$
- › State $\theta \in [0,1]$ uniformly distributed
- › Expert knows θ

- › Payoffs
 - policy maker $-(y - \theta)^2$
 - expert $-(y - \theta - b)^2$
- › $b > 0$ is “bias” of expert



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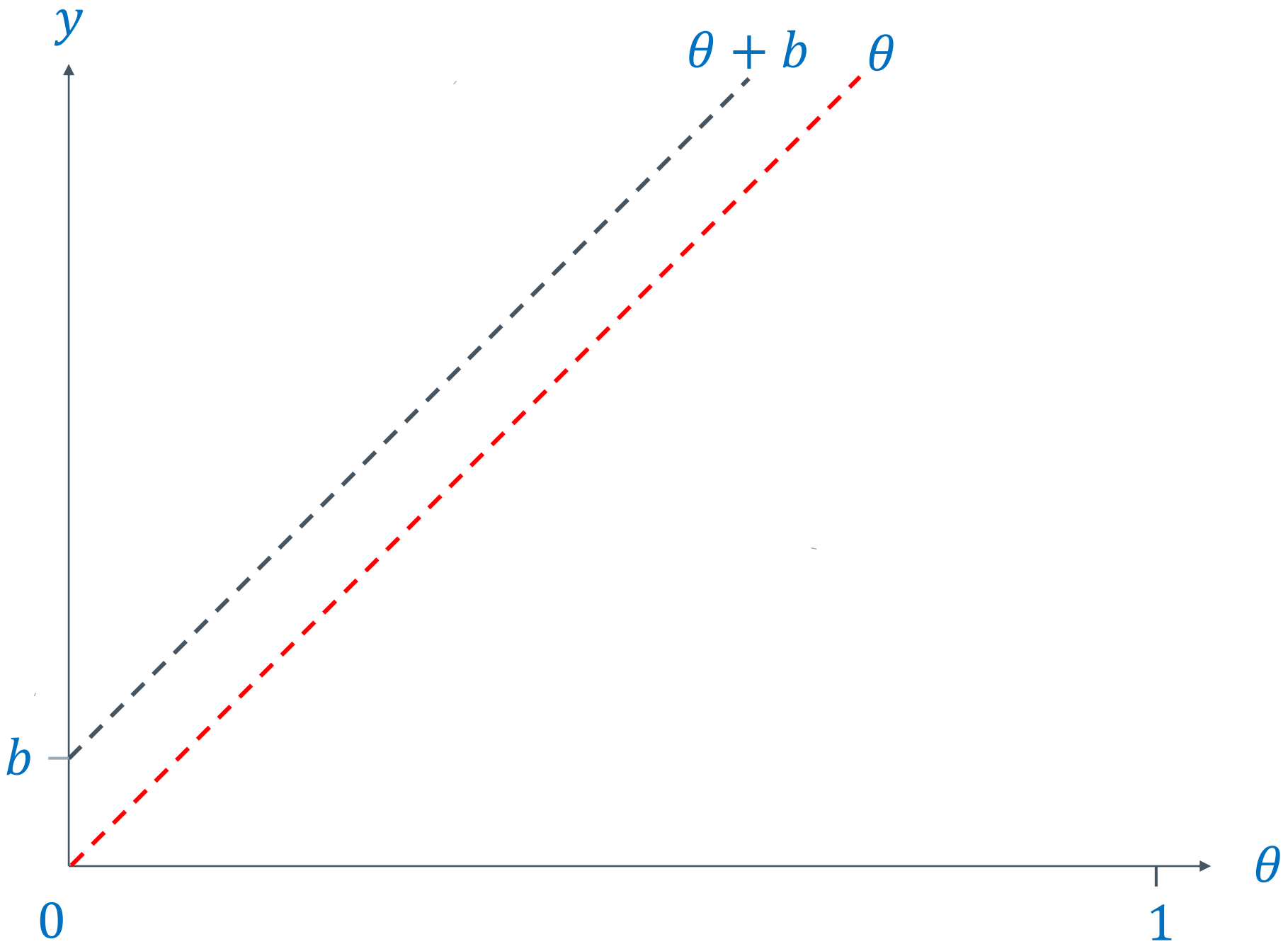
One-stage communication



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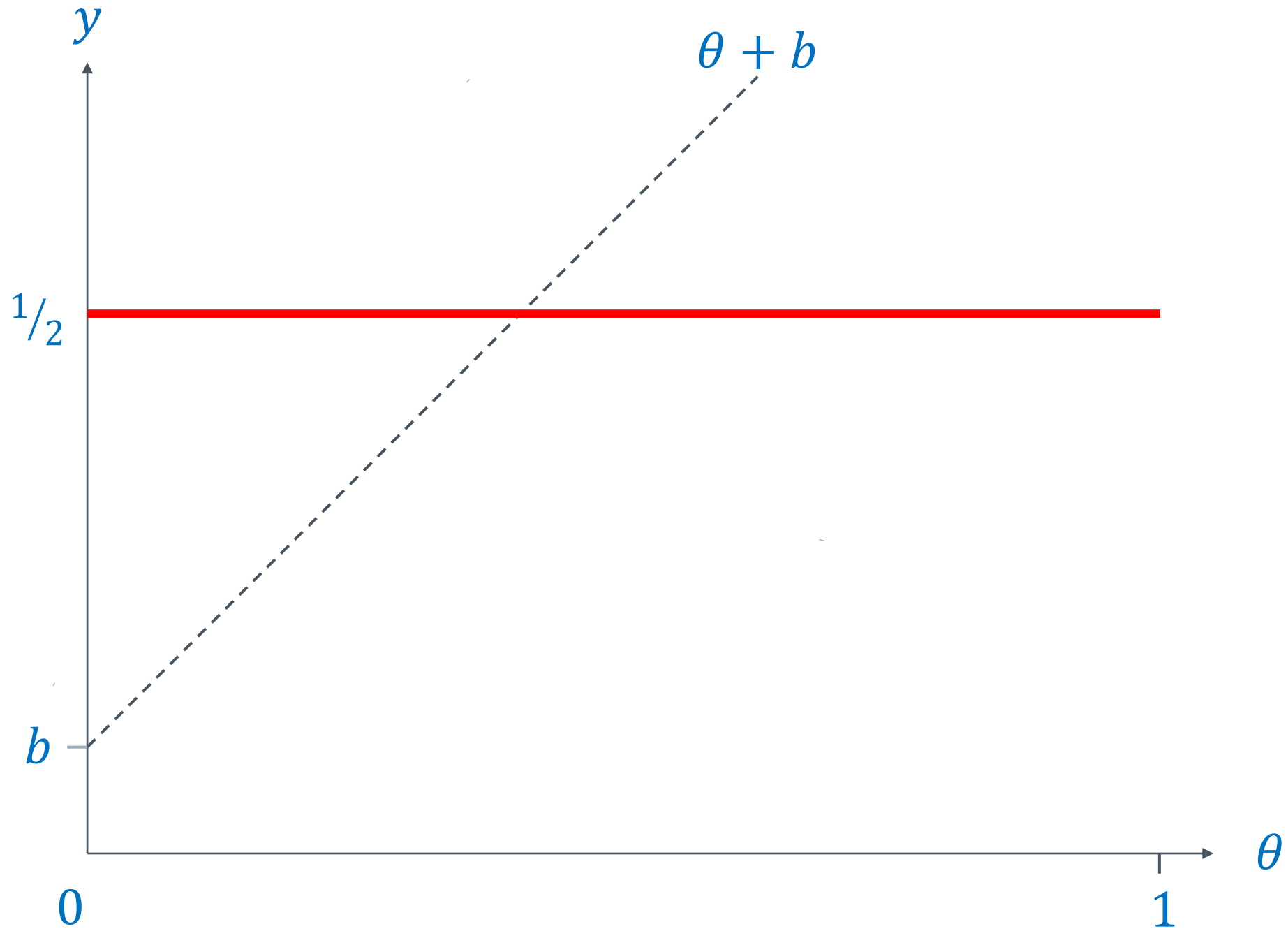
Equilibrium

- › Full revelation is never an equilibrium ($b > 0$)



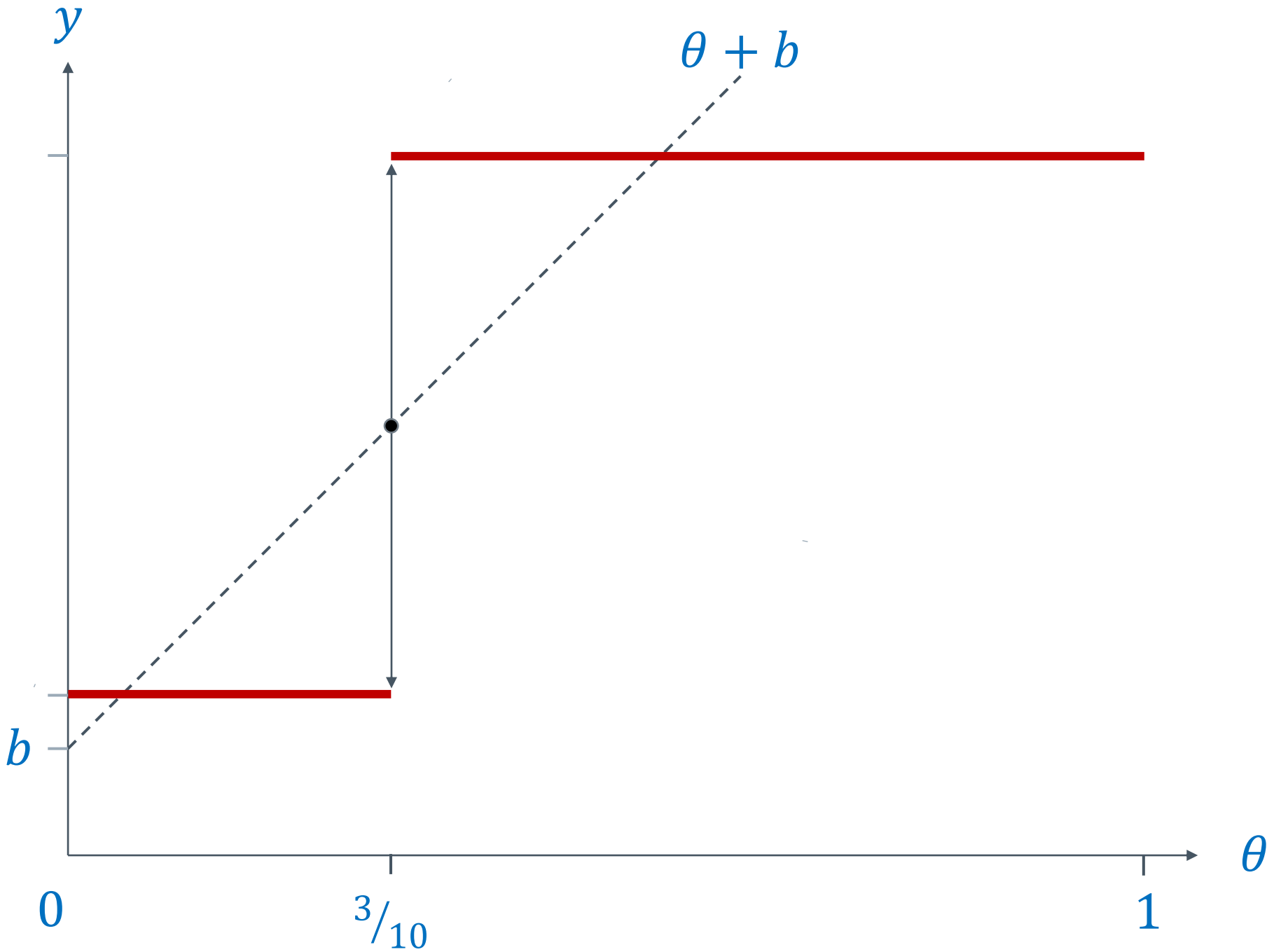
Equilibrium

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- › “Babbling” is always an equilibrium



Equilibrium

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- › “Babbling” is always an equilibrium
- › For all $b < 1/4$ there are partially revealing equilibria



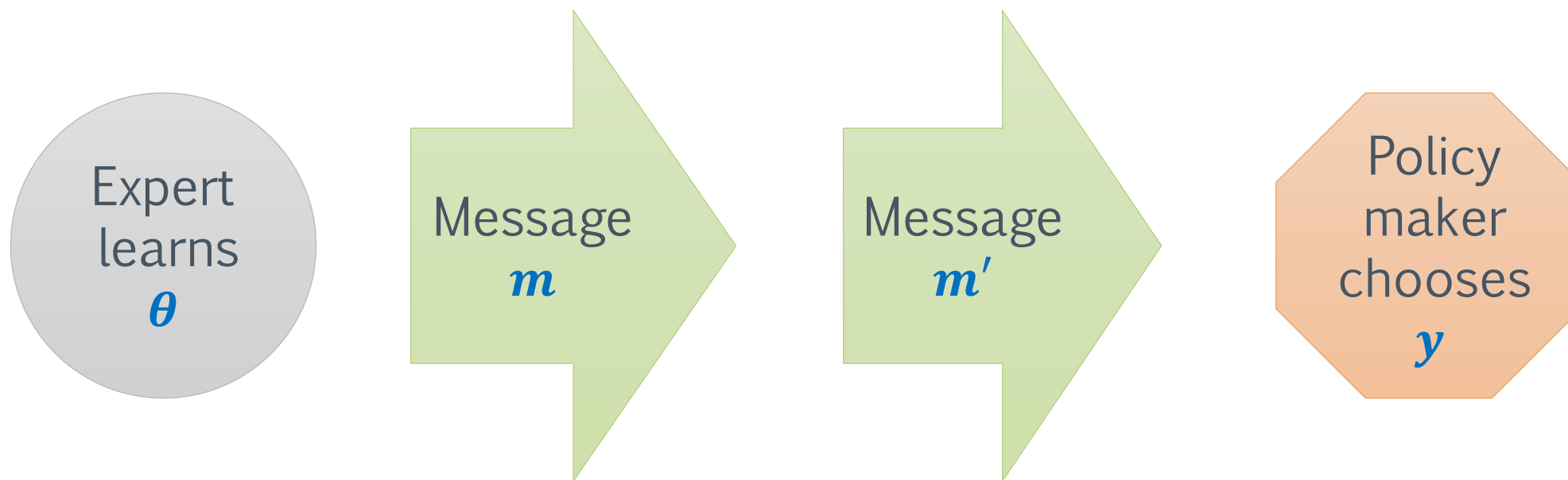
Equilibrium

- › Full revelation is never an equilibrium ($b > 0$)
- › “Babbling” is always an equilibrium
- › For all $b < 1/4$ there are partially revealing equilibria
- › Equilibria are
 - Partitional
 - Finite in number
 - Pareto ranked

- › Substantial information loss

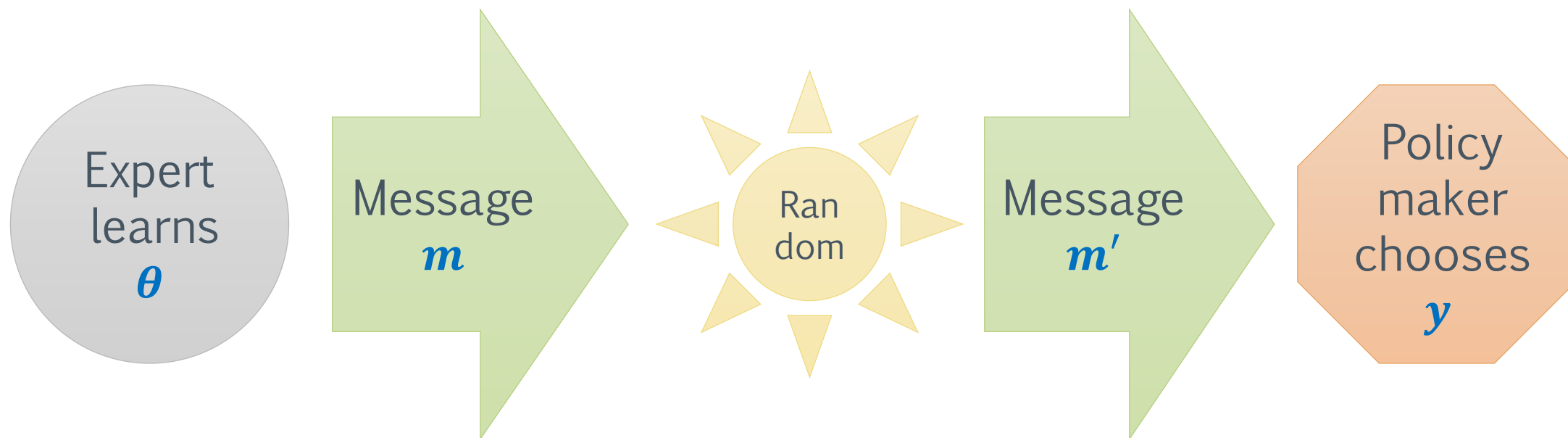
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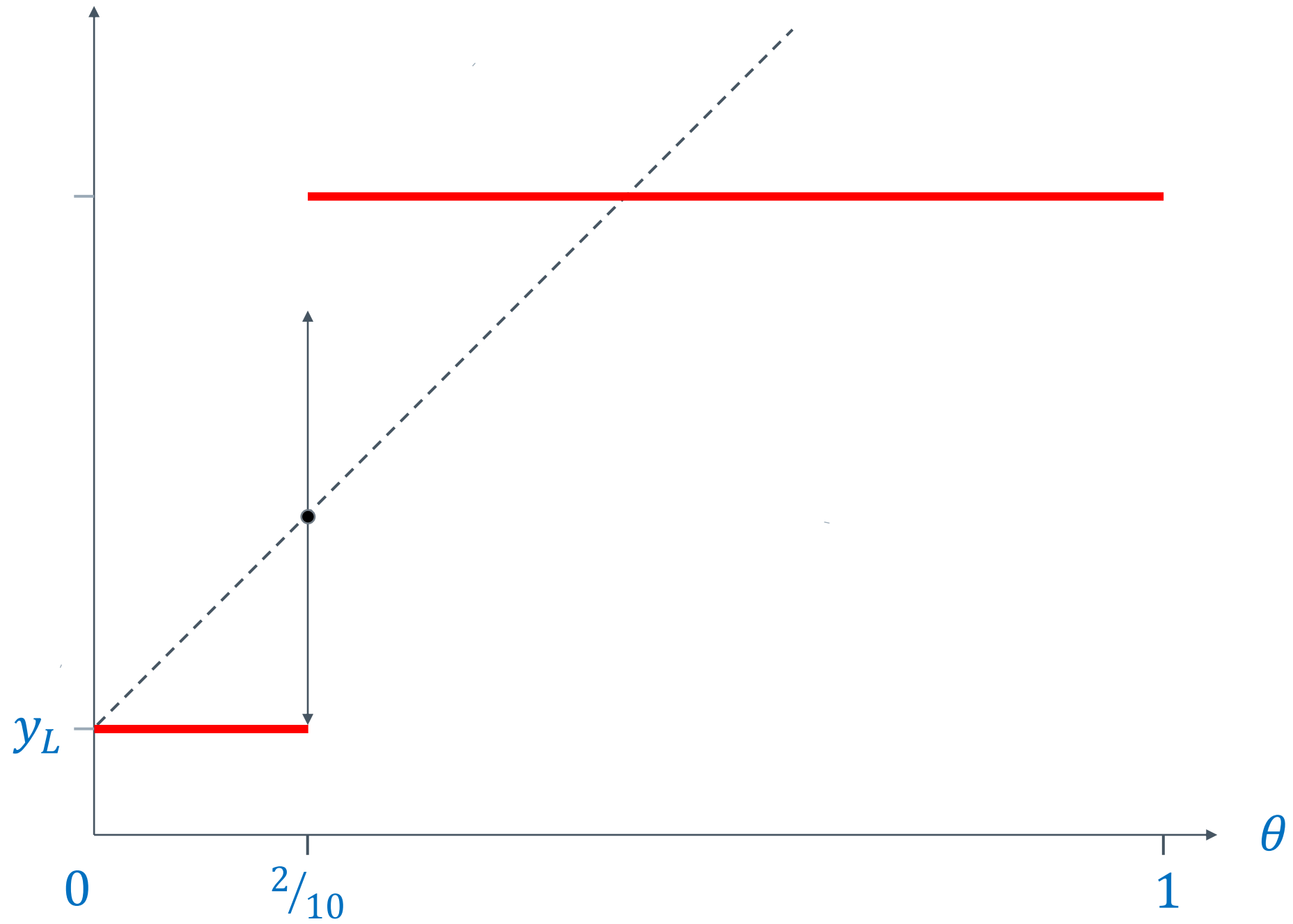
Two-stage communication

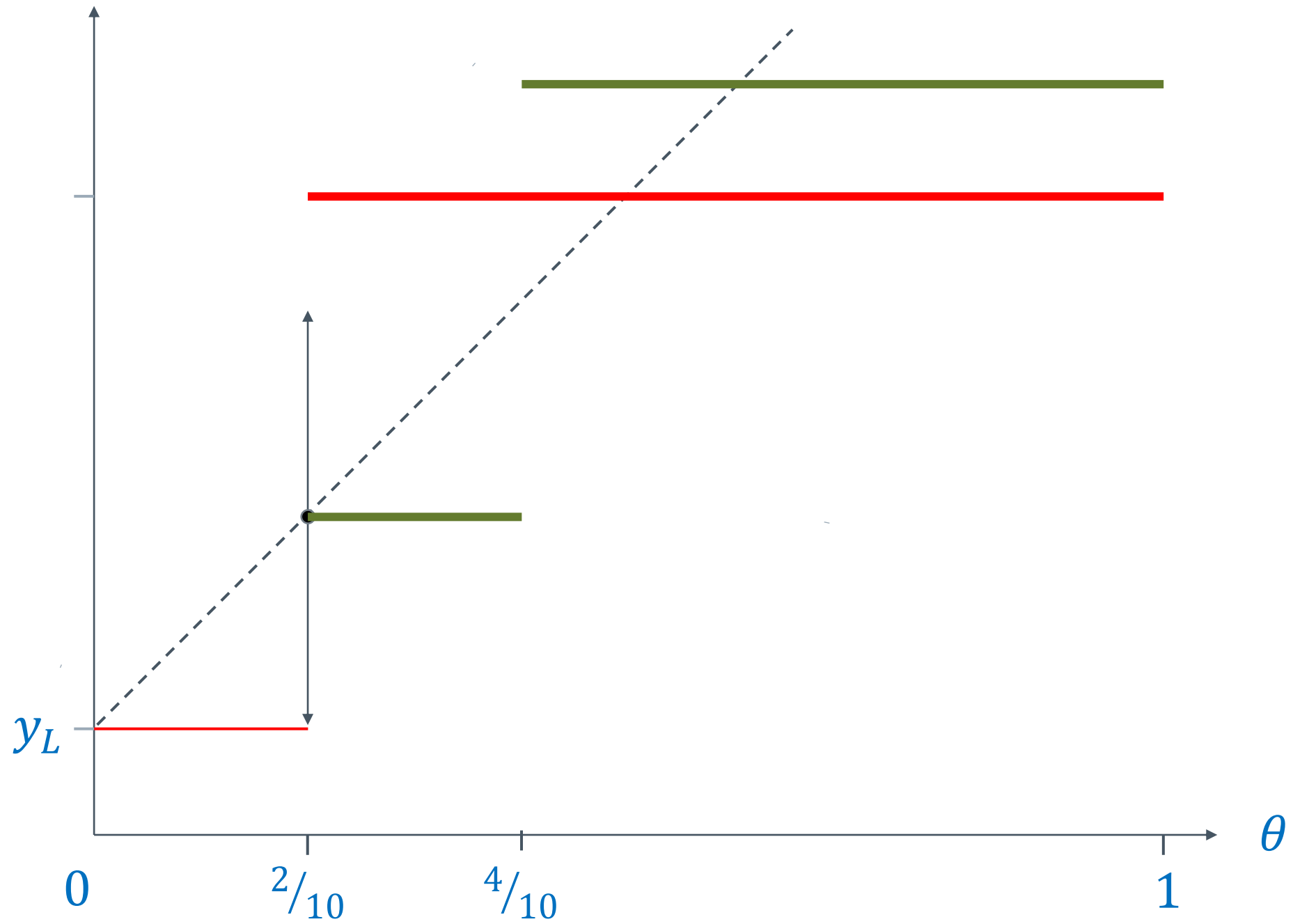


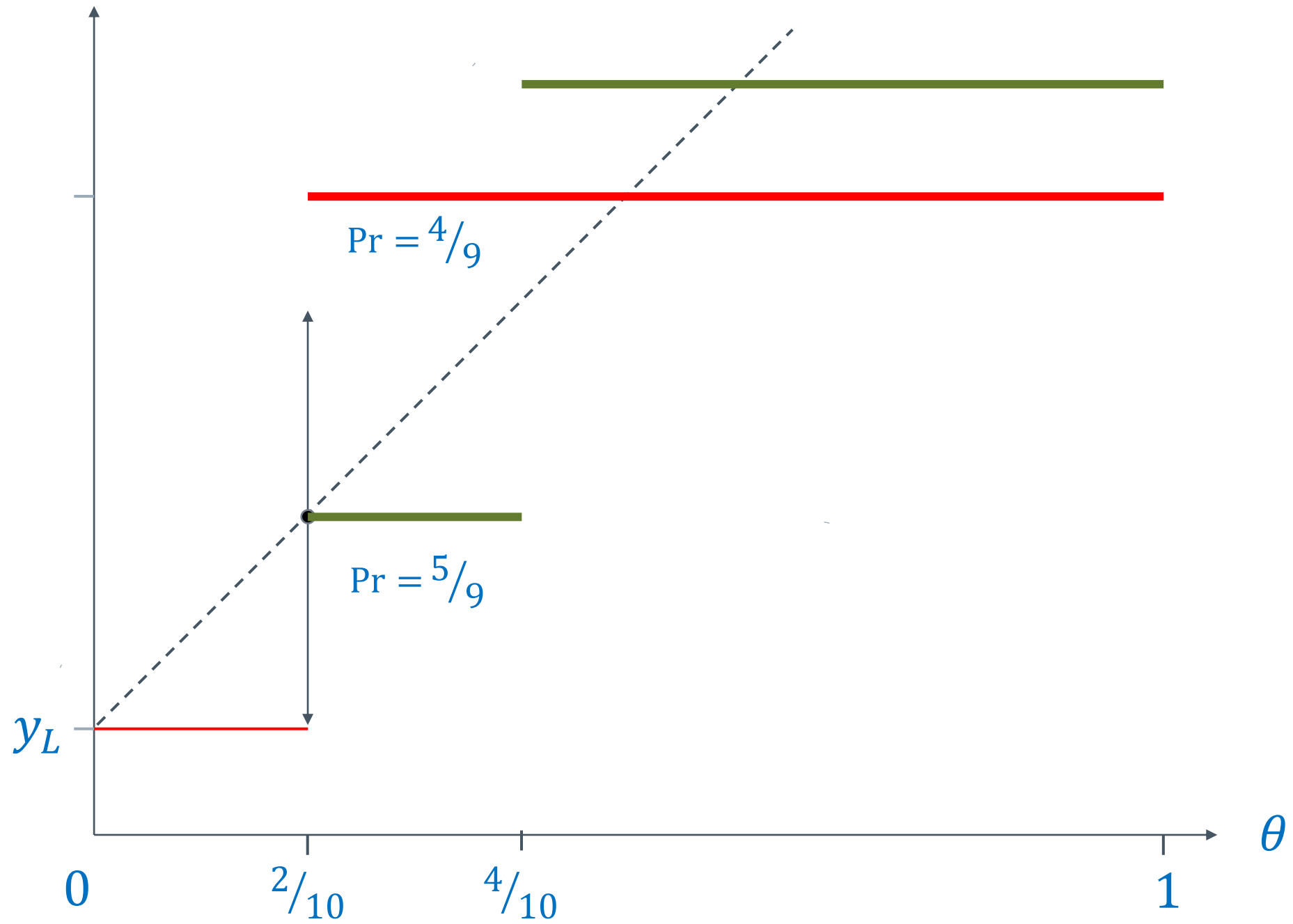
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Two-stage communication with sunspots









Two-stage communication with sunspots

Proposition: For all $b < 1/\sqrt{8}$ there exists an equilibrium with two-stage communication that is better than any equilibrium with one stage.

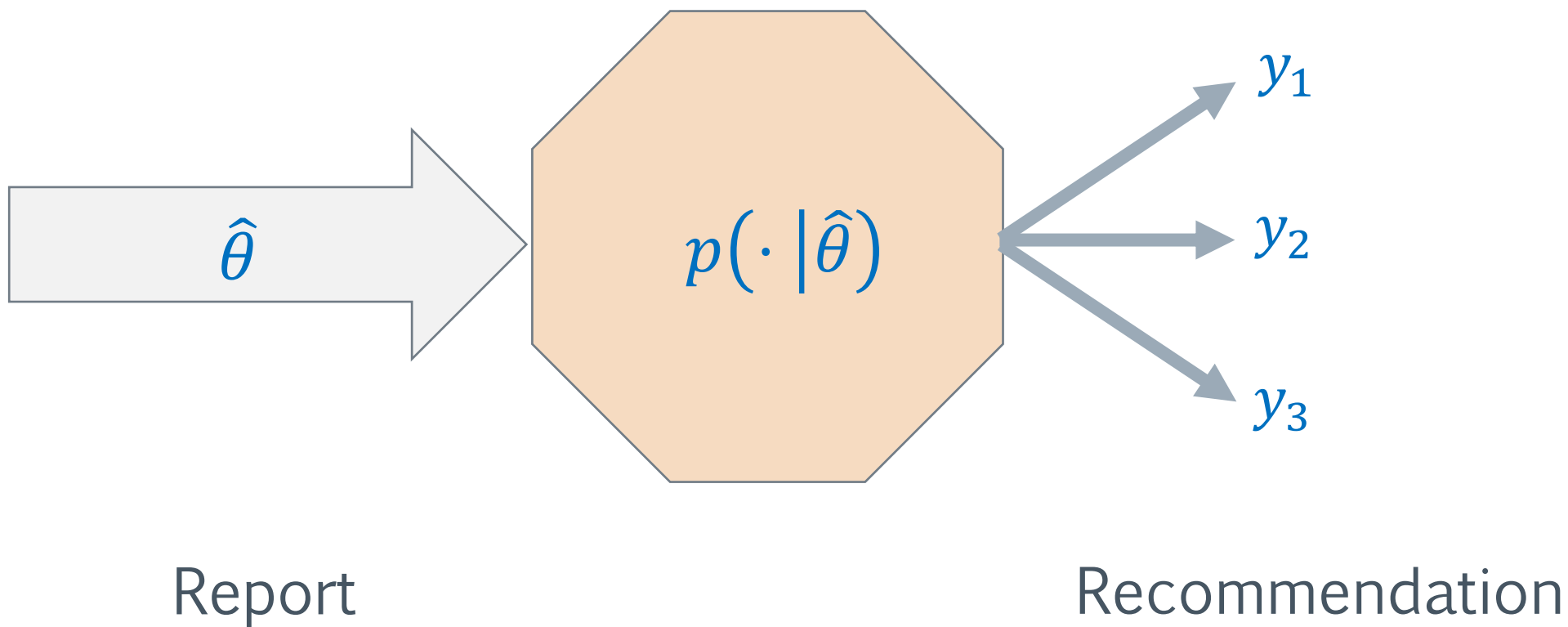
Communication design matters!

Two-stage communication with sunspots

Proposition: For all $b < 1/8$ there exists an equilibrium with two-stage communication that is **optimal** over all communication protocols.

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Mediator



Mediator

- › Expert learns θ and reports $\hat{\theta}$
- › Mediator recommends y according to $p(\cdot | \hat{\theta})$
- › Policy maker hears y and takes action \hat{y}
- › Incentive compatibility
 - Expert reports truthfully $\hat{\theta} = \theta$
 - Policy maker follows recommendation $\hat{y} = y$

A revelation principle

Proposition: Every equilibrium of any communication protocol can be implemented via a mediator.

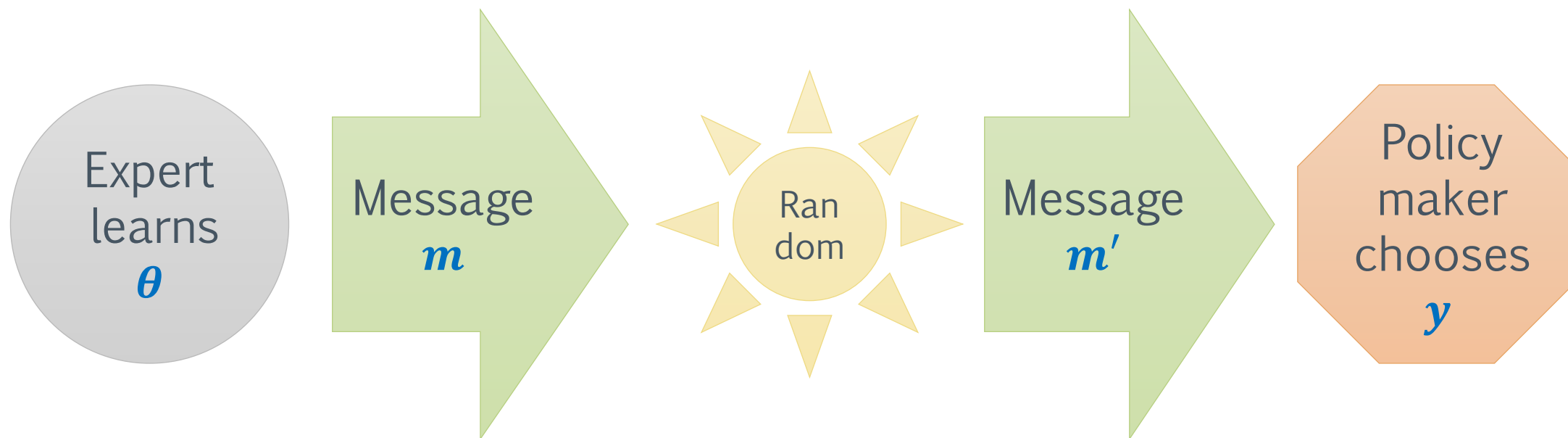
Two-stage communication with sunspots

Proposition: For all $b < 1/8$ there exists an equilibrium with two-stage communication that is **optimal** over all communication protocols.

Proof: Payoffs from two-stage communication equilibrium equal those from optimal mediator.

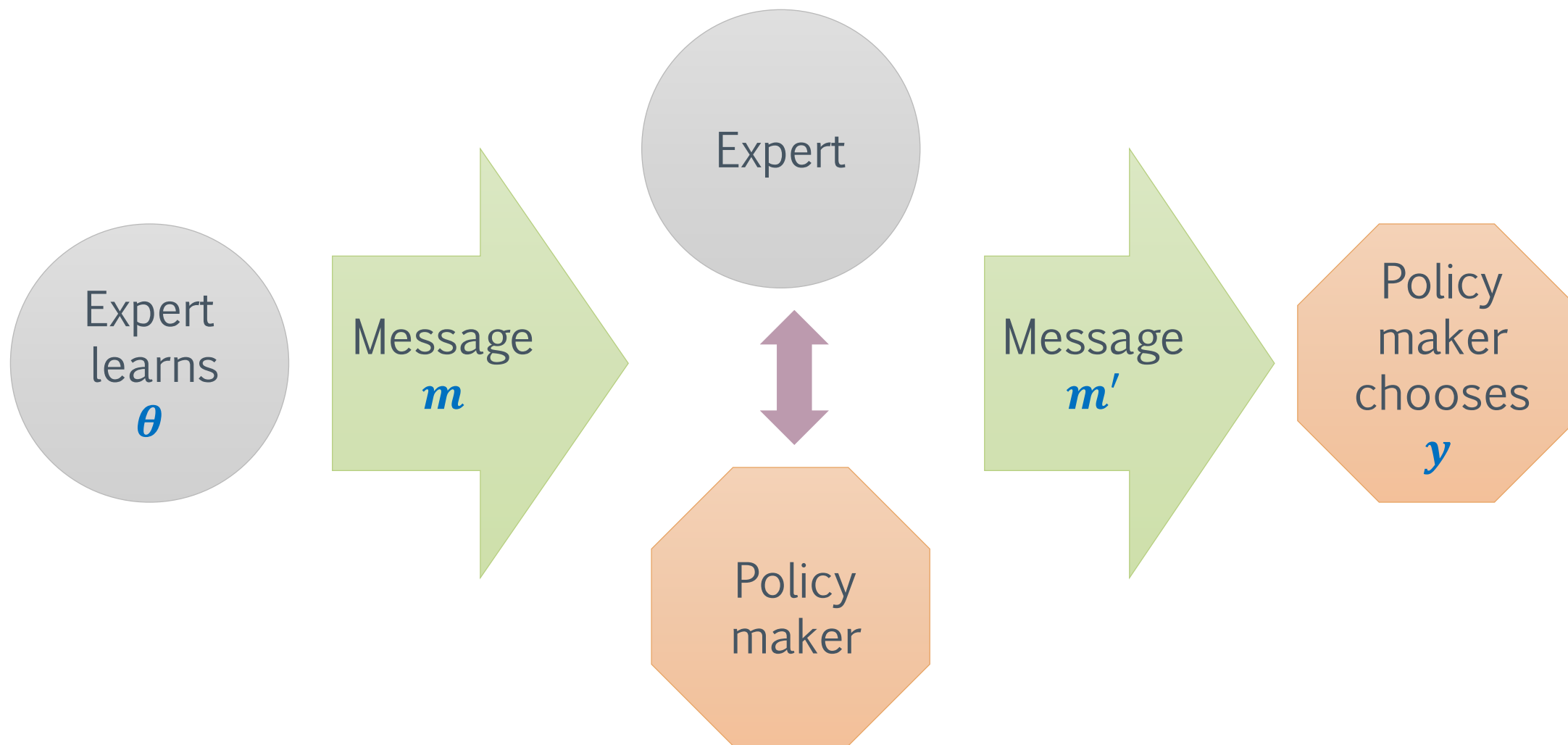
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Two-stage communication with sunspots



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Replacing sunspots with communication



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Jointly Controlled Lottery with $p = 5/9$

	A	B	C	D	E	F	G	H	I
A	1	1	1	1	1				
B		1	1	1	1	1			
C			1	1	1	1	1		
D				1	1	1	1	1	
E					1	1	1	1	1
F	1					1	1	1	1
G	1	1					1	1	1
H	1	1	1					1	1
I	1	1	1	1					1

Open problems

- › What is the optimal communication design when bias is not small?
- › What is the optimal design outside uniform-quadratic model?