

Bonuses bite back

Intuition, incentives, and data driven discovery

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D|ONE

common sense



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Overview

- Fundamentally interested in how people make decisions; how people respond to incentives.
- Intuition about what is effective
- Formal theory (Neoclassic economics) Perfect rationality
- Experimental approach (data driven)

Overview

I will present results from two experiments:

1. Risk

(Individual dynamic risky decision making; decision theory)

2. Risk and competition for a bonus

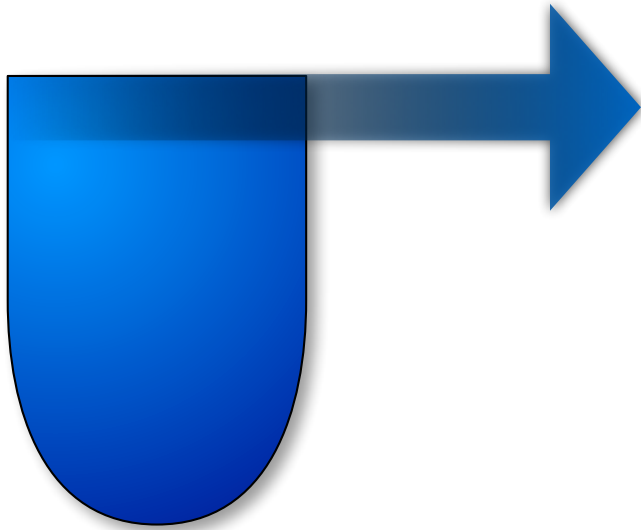
(Non-constant sum game; game theory)

Snakes



- A brief story...
- British government in Delhi India had a problem
- Offer a reward for each dead snake
- Locals will take care of the messy implementation
- How does this story end?

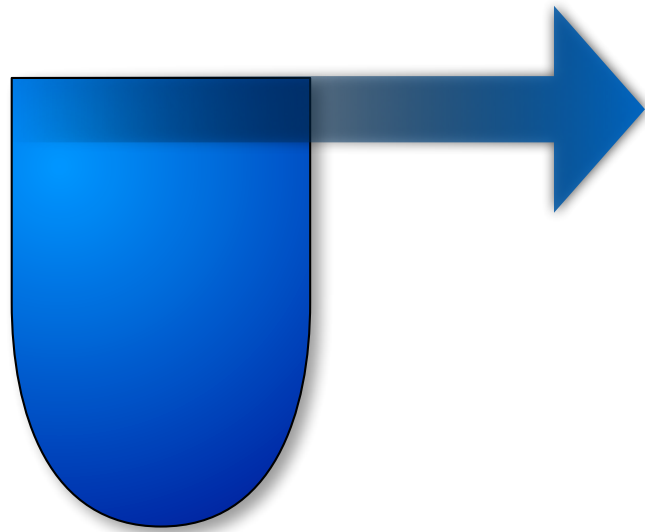
Simple risky decision task



90% good

10% bad

Simple risky decision task




90% good

10% bad

- Good draws are worth 1
- A bad draw results in bankruptcy and the termination of the task
- Draws are made with replacement
- The decision maker (DM) may make one draw at a time
- The choice for the DM is when to stop making draws

Simple risky decision task

Example

 Instructions

Task status

Round: 1 of 90
Draw: 0
Good draw probability: 0.90
Bad draw probability: 0.10
Good draw value: 1
Bad draw end result: 0

Task information

Your current holdings are:

0

What do you choose to do?

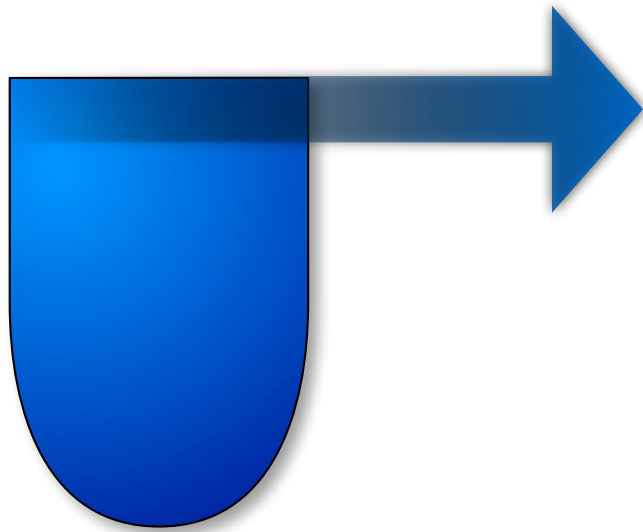
Stop

Draw

http://vlab.ethz.ch/seq_draw/

Simple risky decision task

Optimal policy



90% good

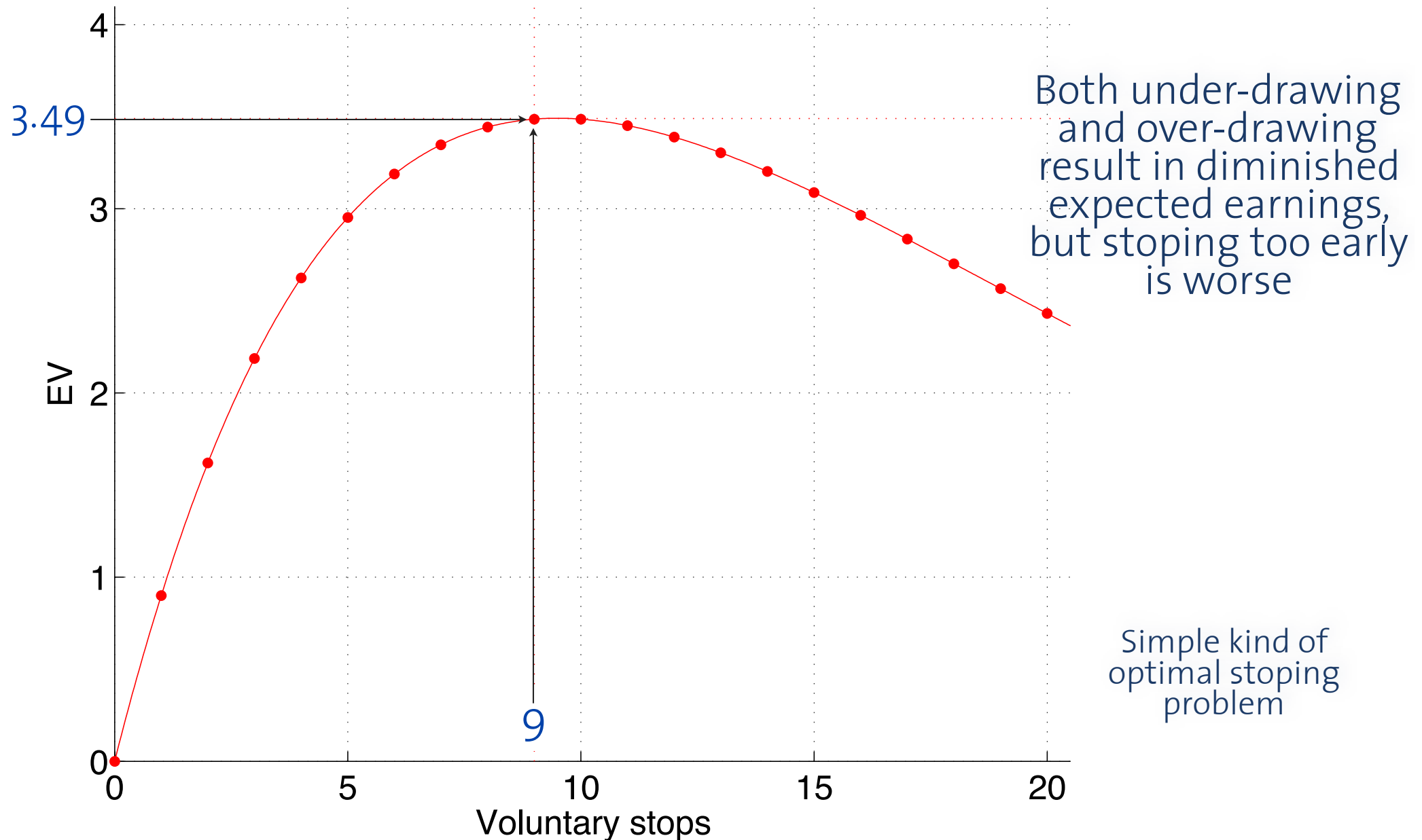
10% bad

- At each stage, the DM is choosing between:
- The sure payoff of their current holdings (h)
- The risky option to marginally increase their holdings by 1 with win probability p .
- Stop drawing as soon as:

$$h \geq p \cdot (h + 1)$$

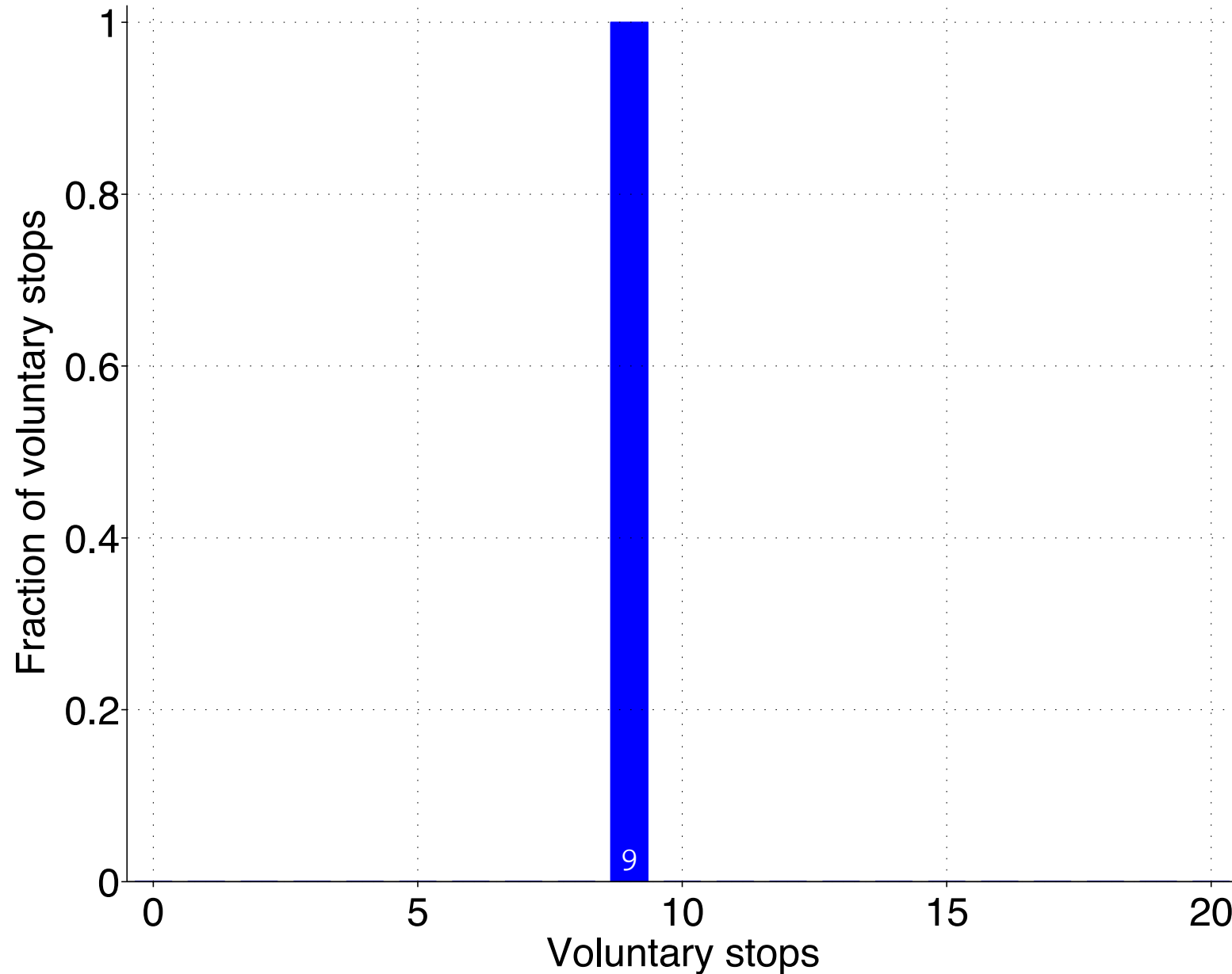
Simple risky decision task

Optimal policy



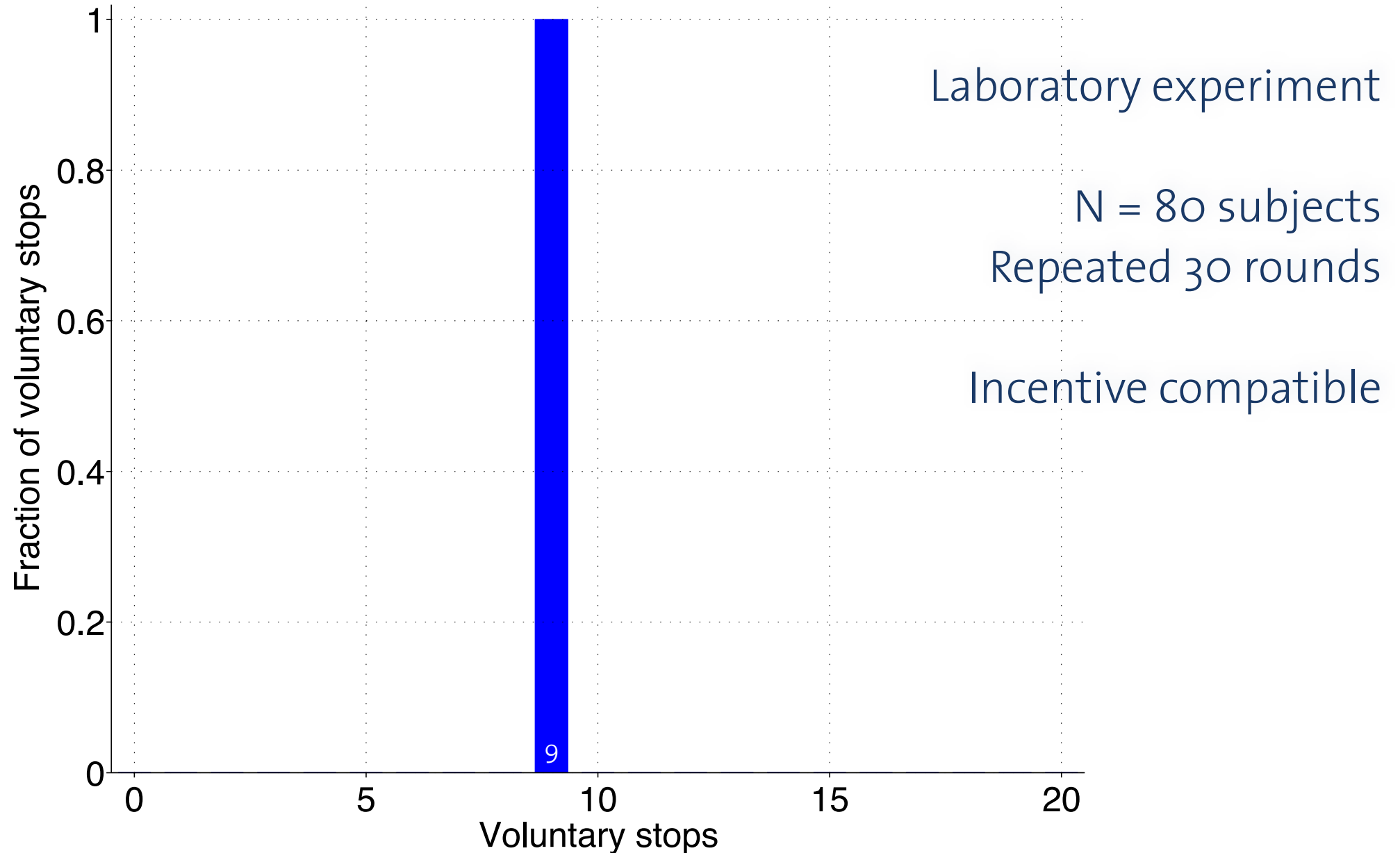
Simple risky decision task

Optimal policy



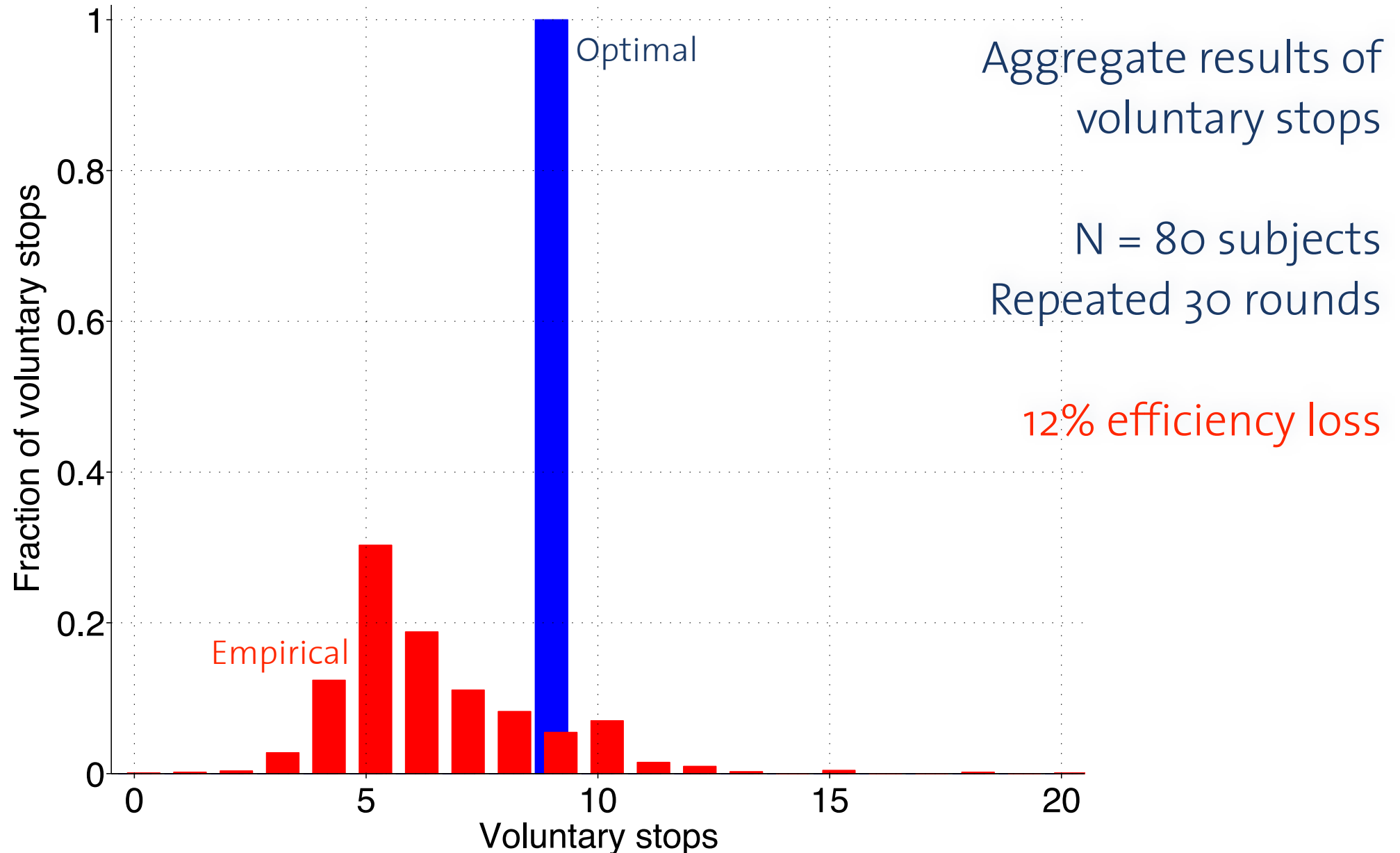
Simple risky decision task

Experiment 1



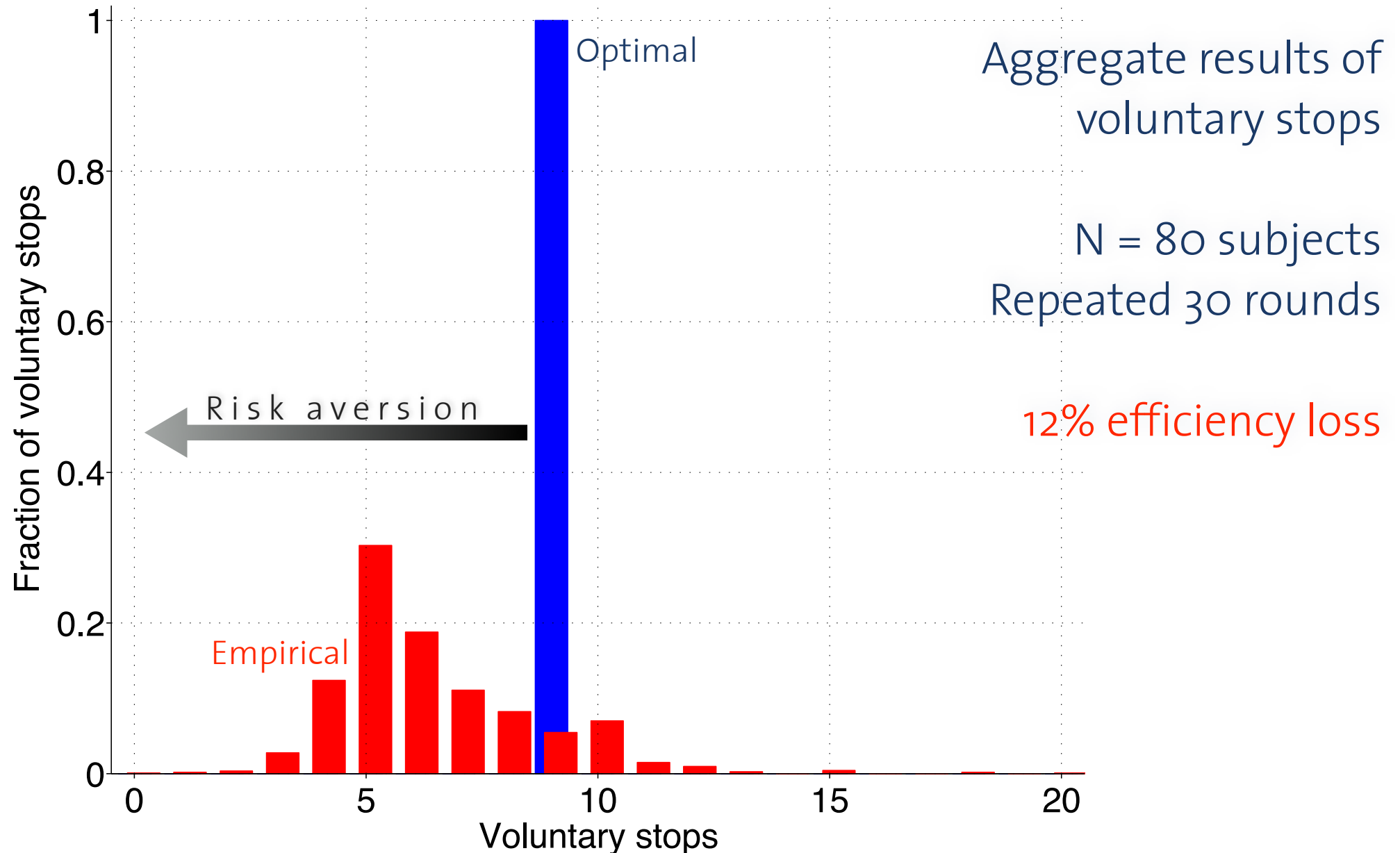
Simple risky decision task

Experiment 1: Testing the optimal policy



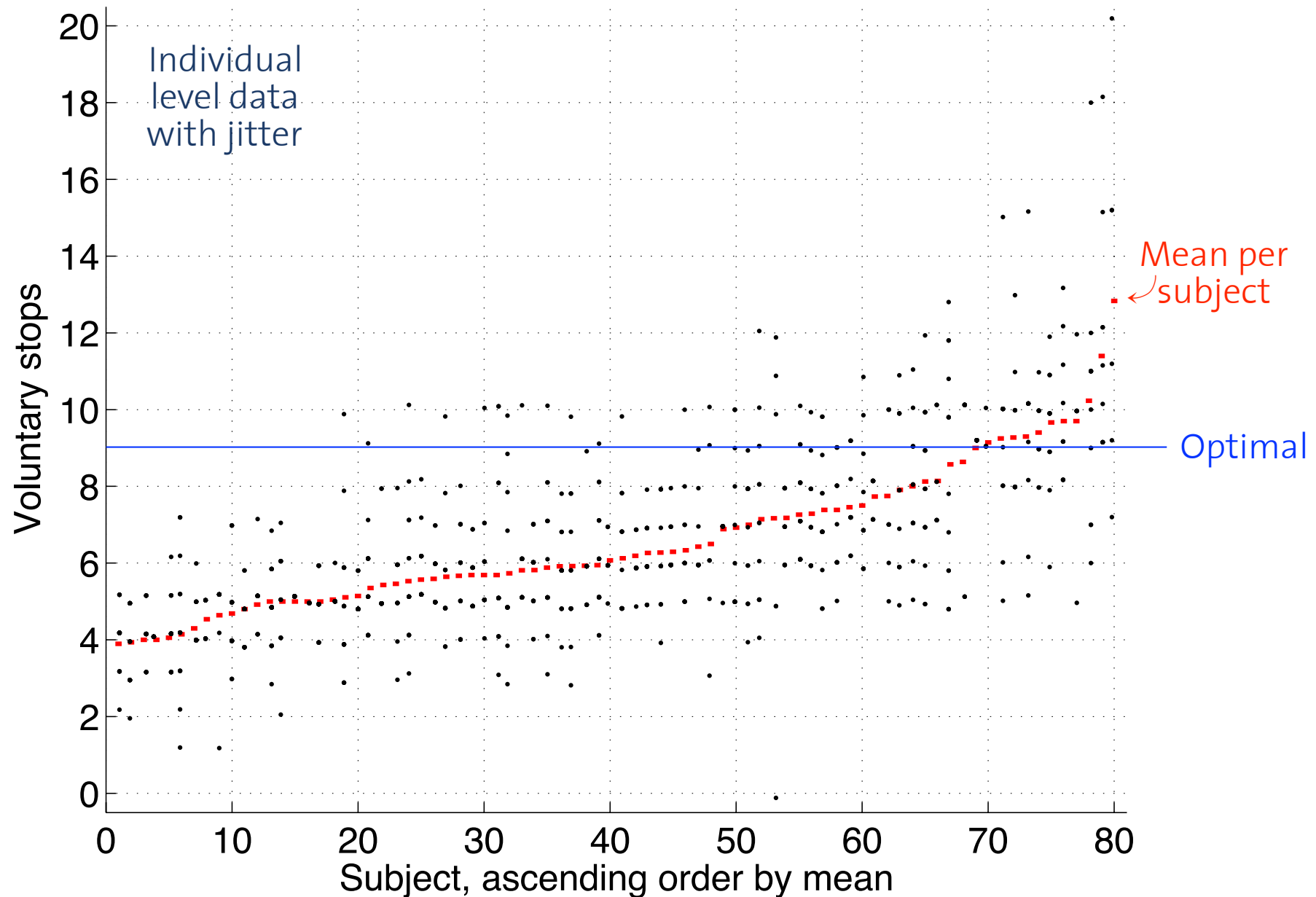
Simple risky decision task

Experiment 1: Testing the optimal policy



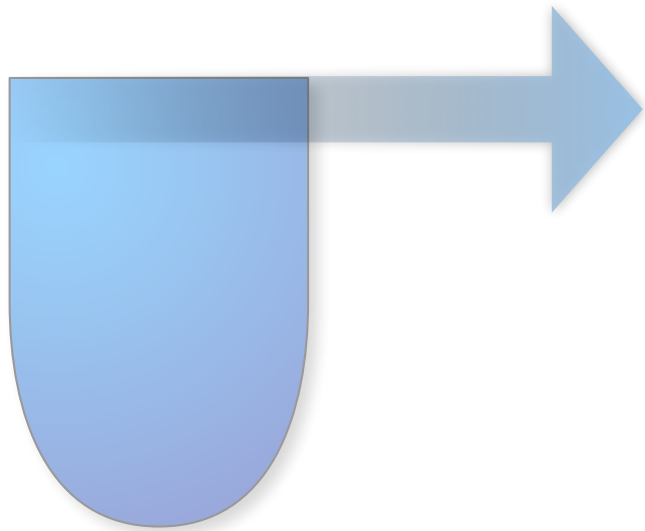
Simple risky decision task

Experiment 1: Testing the optimal policy



Simple risky decision task

Experiment 1 results



- Persistent inefficiency in how people use a well defined stochastic process
- Observed behavior is consistent with risk aversion
- Maybe there are different incentive schemes that can be implemented that improve performance...

Risk and competition

Experiment 2: A stochastic game with a bonus

- Consider two players each in the previously defined task
- These players make their draws simultaneously (i.e., privately and in ignorance of the other player's choices or status).
- At the end of a round, the player with the most earnings via draws, wins an additional bonus of 15 CHF; the other player keeps her earnings from draws but receives no bonus.
- Ties are randomly broken if necessary.
- All this information is common knowledge.

Risk and competition

Experiment 2: A stochastic game with a bonus



$p = 0.9$
 $v = 1 \text{ CHF}$



$p = 0.9$
 $v = 1 \text{ CHF}$

- Potential earnings can come from two sources: draws and a bonus.
- Mixed motive game
- What is the normative (i.e., perfect rationality) solution to this game?

Simultaneous and private draws

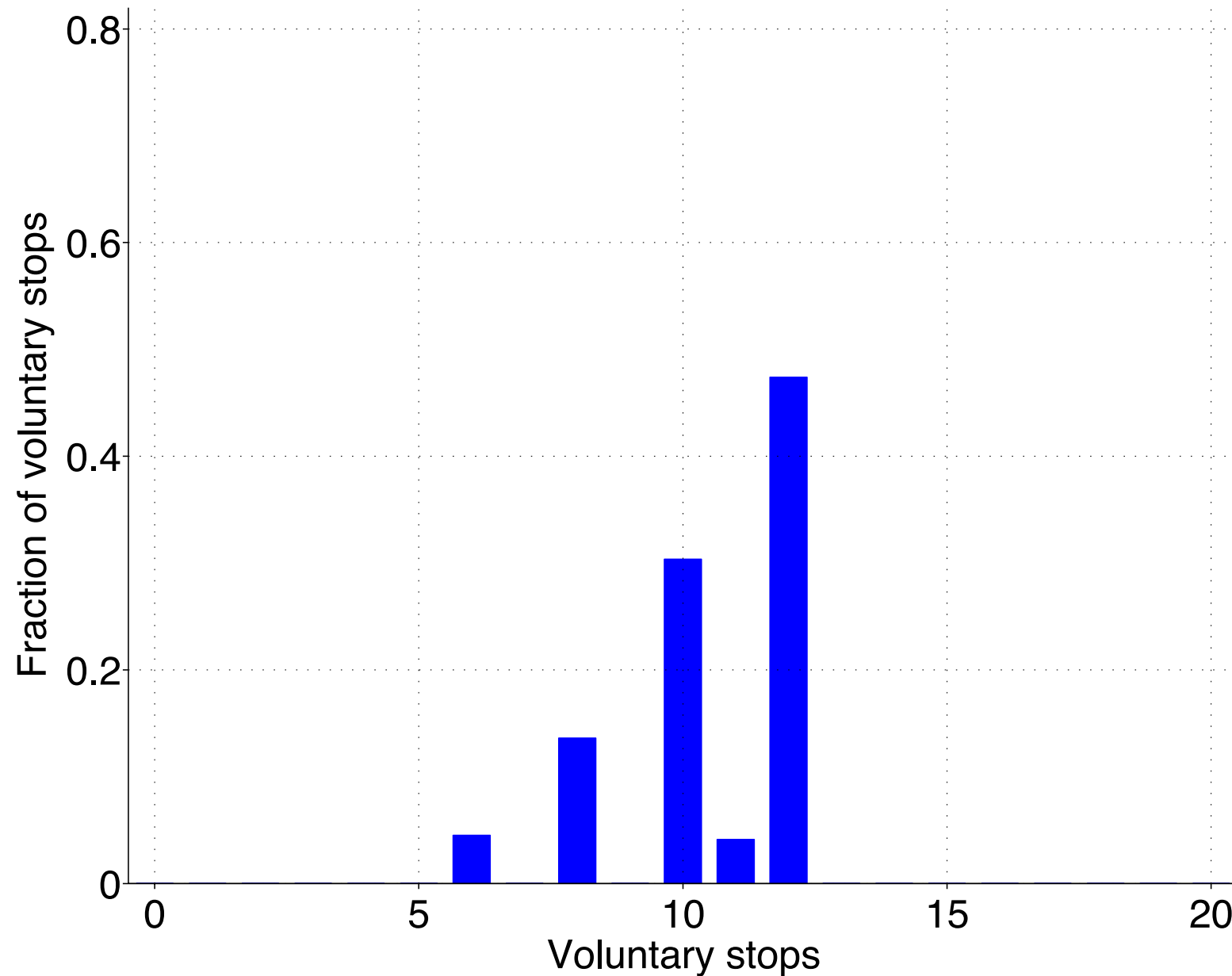
Players earn their kept draws

The player with the most earnings from draws wins an extra bonus worth 15 CHF

Ties broken randomly

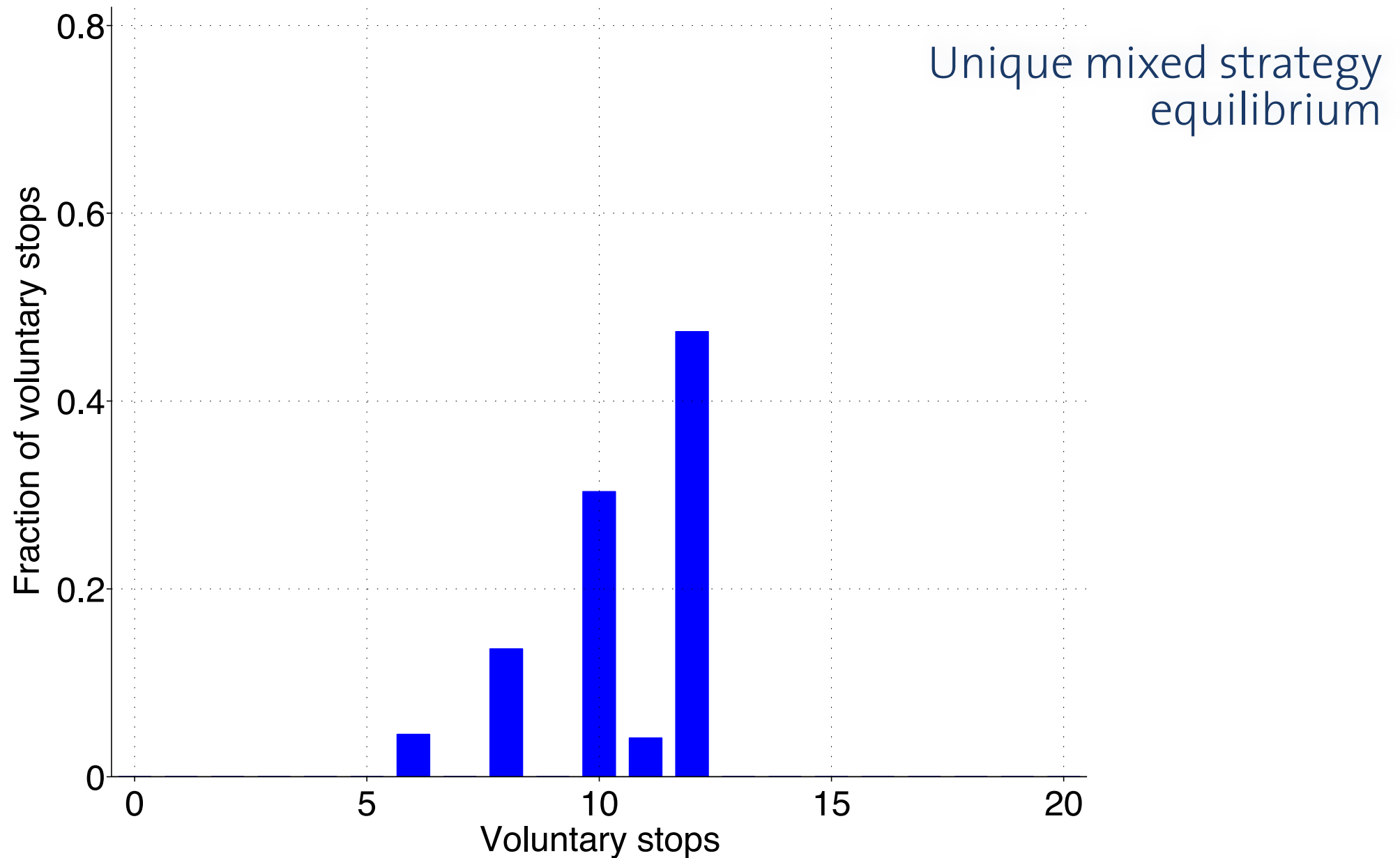
Risk and competition

Experiment 2: Normative solution



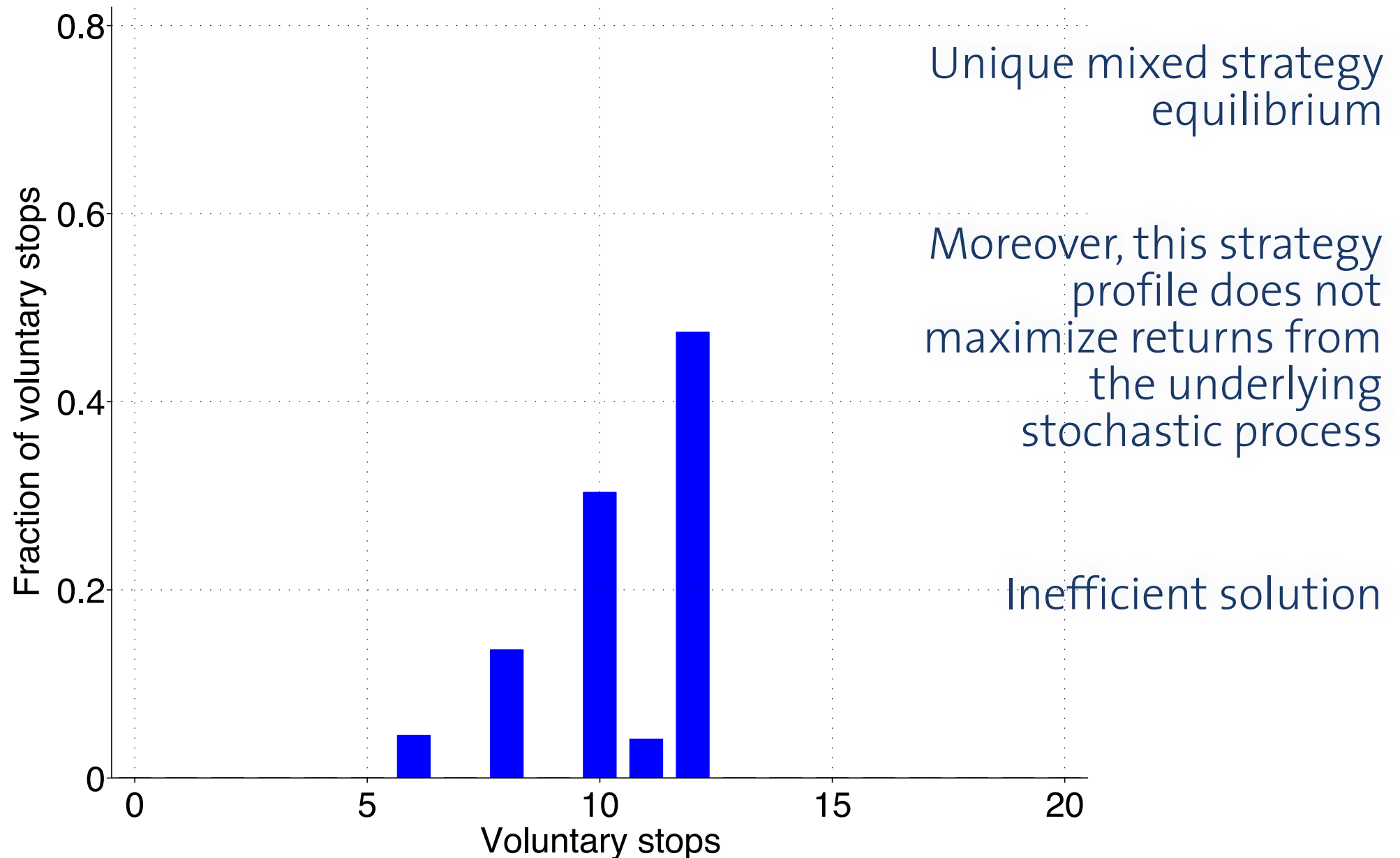
Risk and competition

Experiment 2: Normative solution



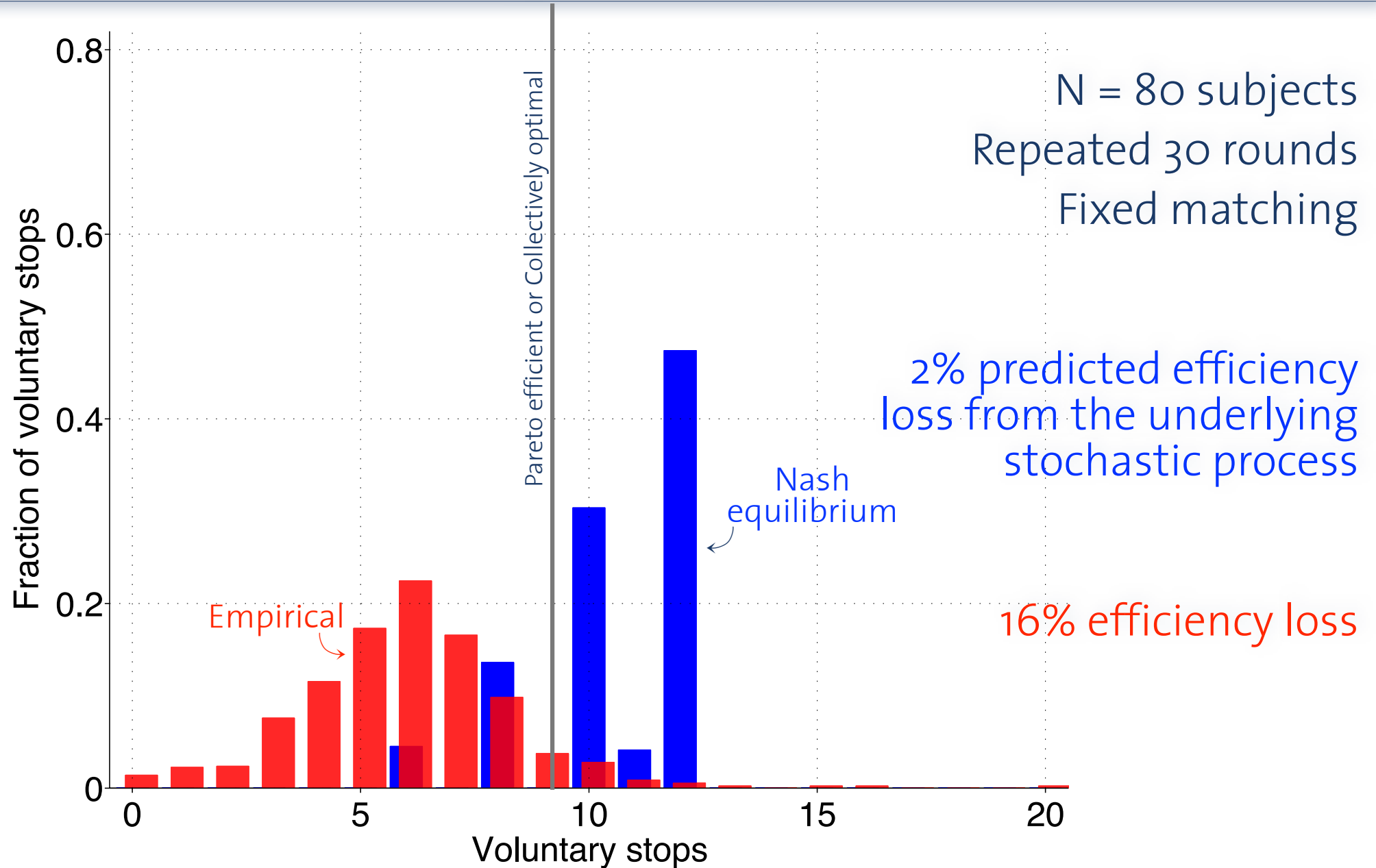
Risk and competition

Experiment 2: Normative solution



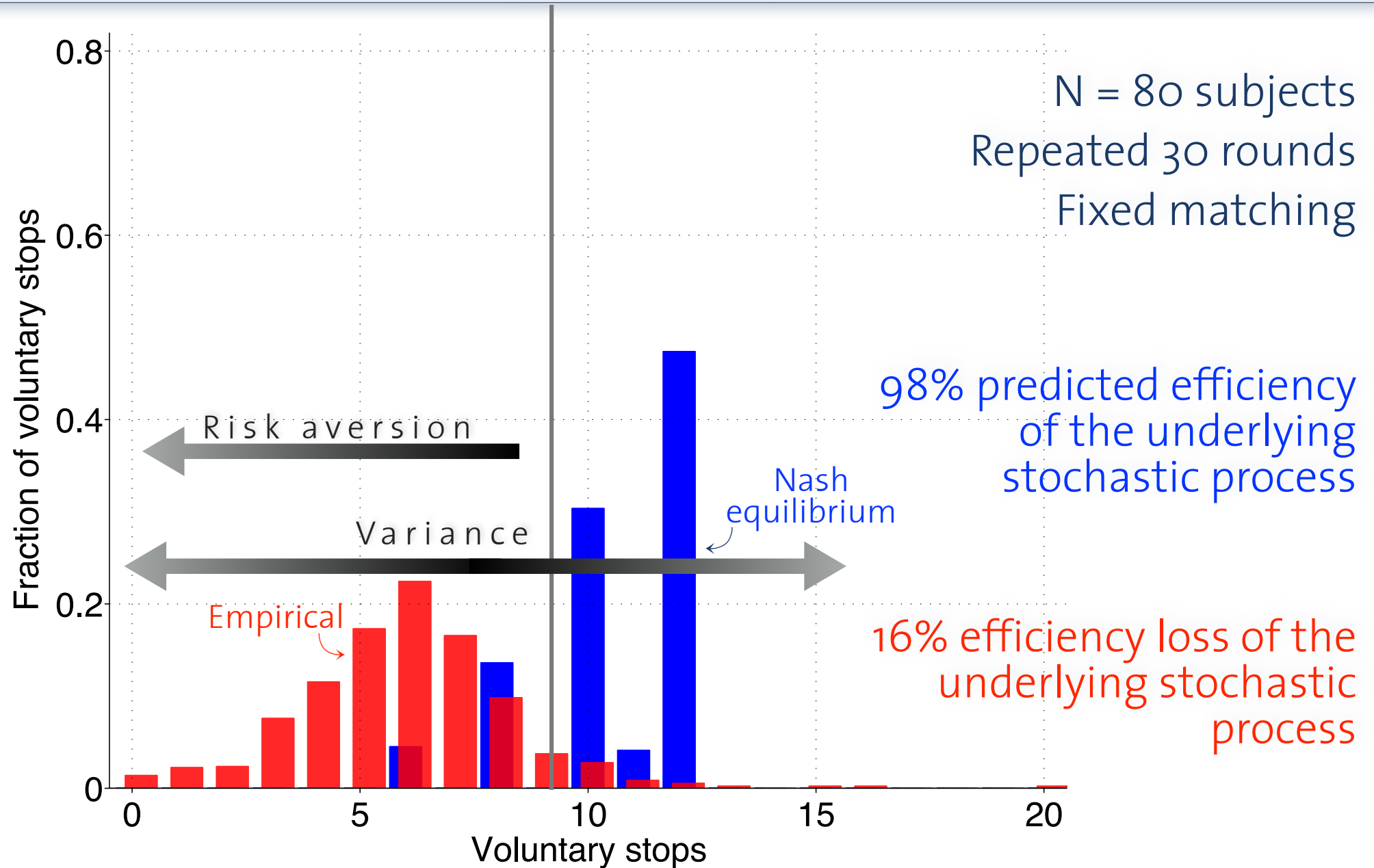
Risk and competition

Experiment 2: Results



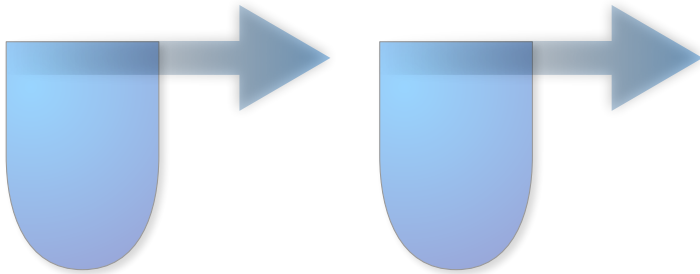
Risk and competition

Experiment 2: Results



Risk and competition

Experiment 2: Main conclusions



- Everyone could do better but both risk aversion and competition for the bonus promotes inefficient behavior
- The strategic interaction here amplifies inefficiency and makes things worse in at least two ways
 - Costs more to implement
 - Induces worse behavior



Overall results

	Predicted efficiency <small>Formal theory</small>	Observed inefficiency <small>Data driven</small>
Risky task	100%	12%
Game with competition for a bonus	98%	16%



Michel Barnier, the EU's financial services chief, has proposed that bank investors should have set maximum ratios on the size of their bonuses compared with their fixed pay.

Bonuses that are a “large” multiple of fixed pay “are likely to encourage excessive risk taking and undermine confidence in the financial sector generally,” according to the plans.

Conclusions

- Incentives schemes that appear sensible (intuitively appealing) can lead to inefficiency and ultimately be counterproductive
- Learning is minimal even with full feedback
- Intuition $\overset{\curvearrowright}{\rightarrow}$ Formal models $\overset{\curvearrowright}{\rightarrow}$ Data driven
- Understand data at the individual level

