

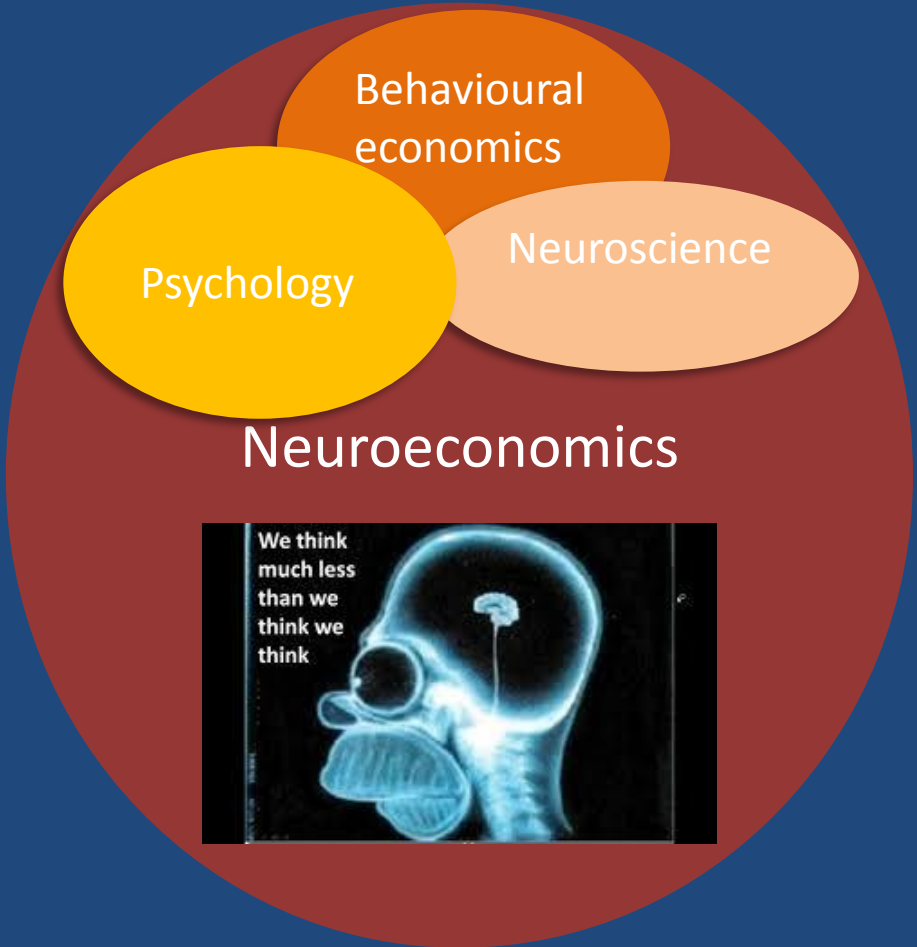


Neuroeconomics and management control

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Mathematics





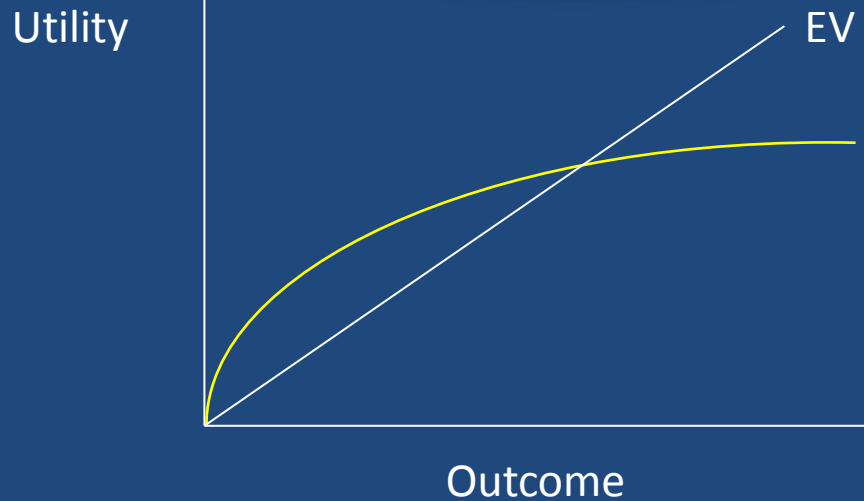
Now



Uncertain
In the future

rational decision-making = maximisation of utility

Economic decisions



Bernoulli, 1738

von Neumann &
Morgenstern, 1944

Violations of utility maximisation rule = *irrational* decision making

Allais, 1953



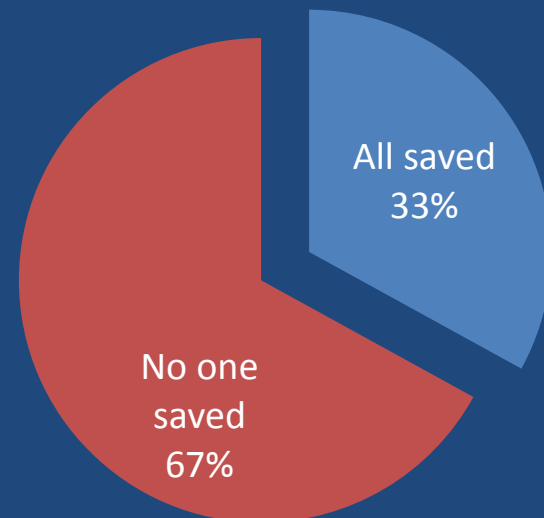
Ellsberg, 1961

Kahneman & Tversky, 1979: Prospect theory

Imagine that the country is preparing for the outbreak of an unusual Asian disease that is expected to kill **600** people. Two alternative programs to combat the disease have been proposed. Assume that the exact scientific estimates of the consequences of the programs are as follows:

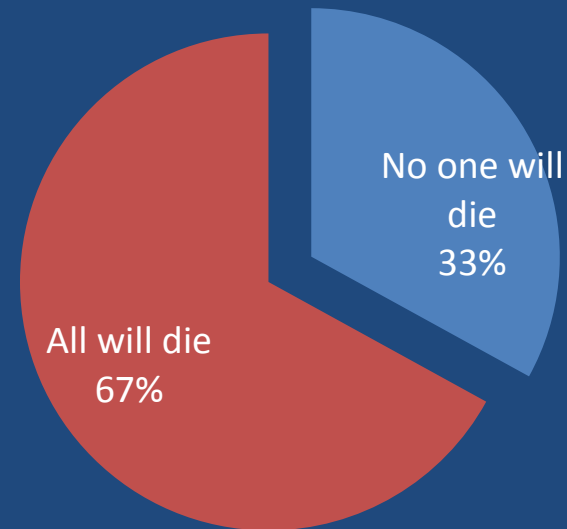
- If program A is adopted, **200** people will be **saved**.

- If program B is adopted, there is **one third** probability that 600 people will be **saved** and **two thirds** probability that **no one** will be **saved**.



- If program C is adopted, **400** people will **die**.

- If program D is adopted, there is one third probability that **no one will die** and two thirds probability that **600 people will die**.

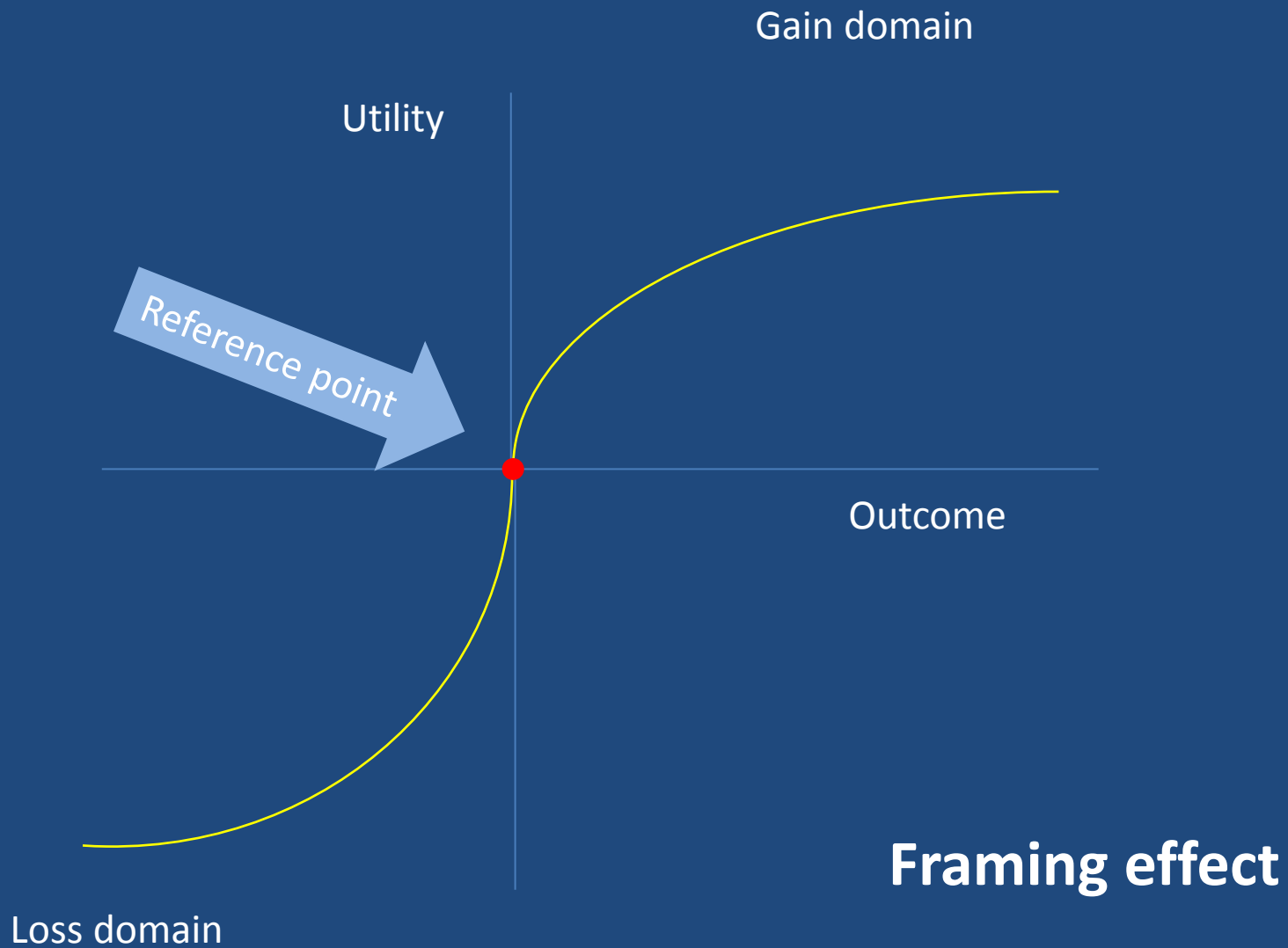


Make a choice

- **Option A brings you 50 EUR for sure.**
- **Option B is a lottery: You flip a coin and win 140 EUR for heads but lose 20 EUR for tails.**

Make a choice

- Option A makes you **lose** 50 EUR for sure.
- Option B is a lottery: You flip a coin and **lose** 140 EUR for heads or **win** 20 EUR for tails.



Thinking

Fast

+

Slow

System 1:

- Automatic
- Intuitive
- Instinctive
- Primary
- Rapid
- Blind
- “WYSIATI”

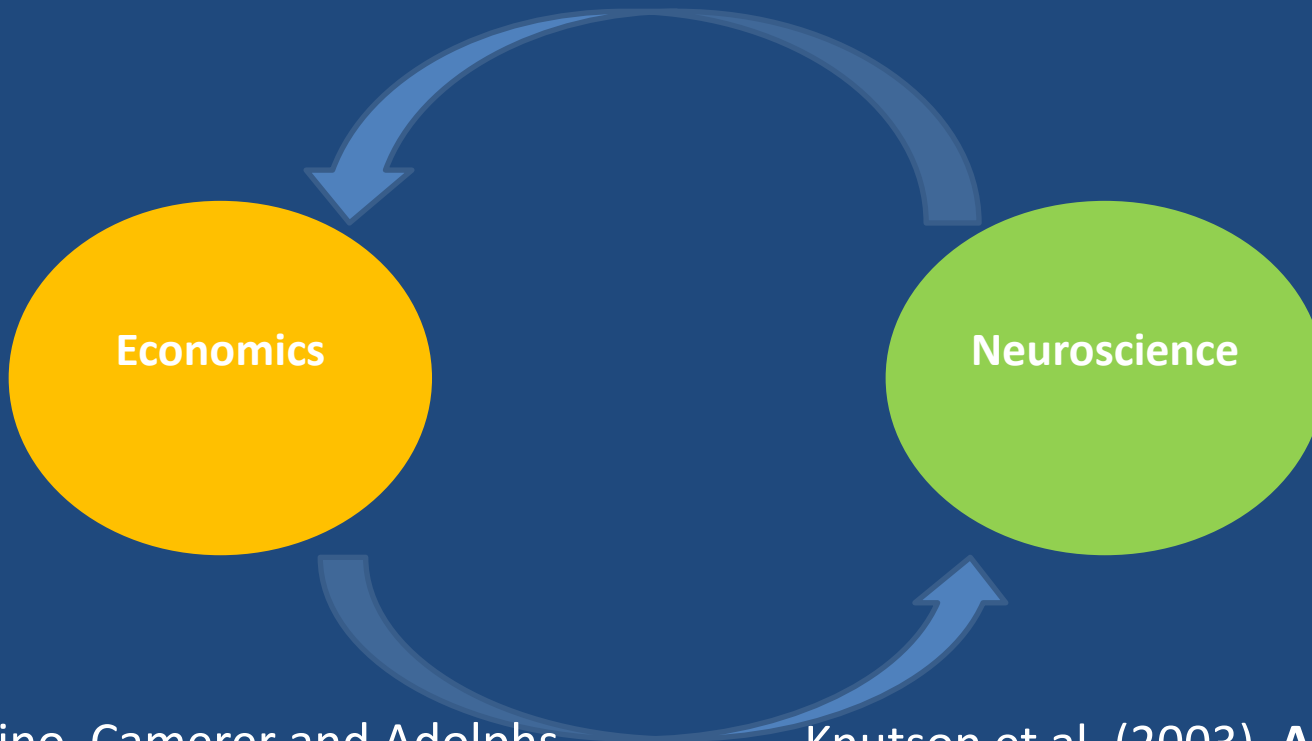
System 2:

- Considered
- Effortful
- Focused
- Secondary
- Slower
- Lazy

Which system is activated when people deviate from rational behaviour?

O'Neill & Schultz (2014).
Economic risk coding by single neurons in the orbitofrontal cortex

Glimcher et al. (2005).
Physiological utility theory and the neuroeconomics of choice



De Martino, Camerer and Adolphs (2010). **Amygdala damage eliminates monetary loss aversion.**

Knutson et al. (2003). **A region of mesial prefrontal cortex tracks monetarily rewarding outcomes.**

Monetary
incentives

Procedures/
Instructions

**Can management control
system effectively change
human risk inclination?**

Social pressure

Accountability
for outcomes

You are a manager who gets **10% bonus** for a **positive outcome** and nothing for a loss.

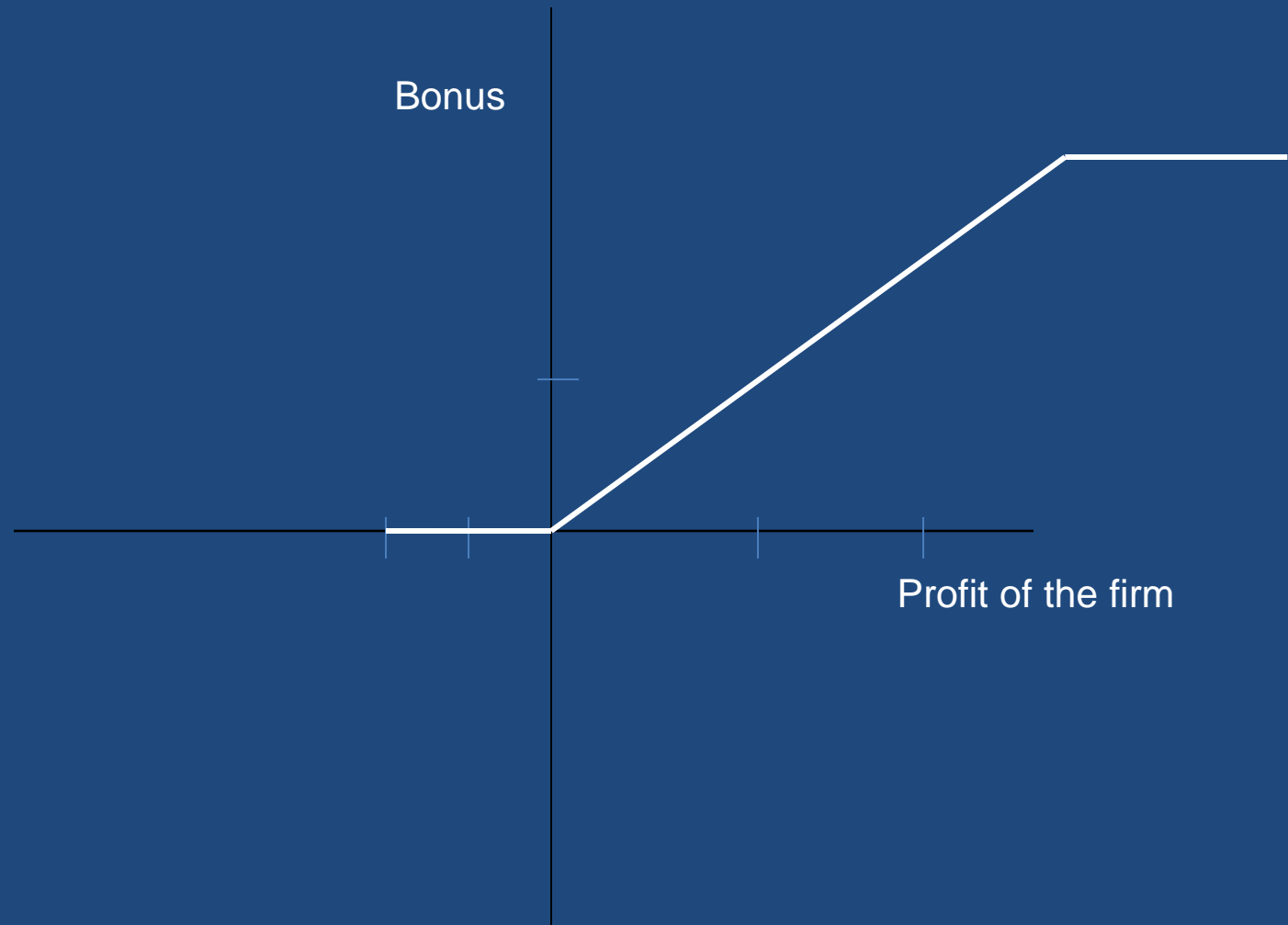
Make a choice:

- Option A brings 50 EUR for sure.
- Option B is a lottery: You flip a coin and make 140 EUR for heads but lose 20 EUR for tails.

$$EV = 5$$

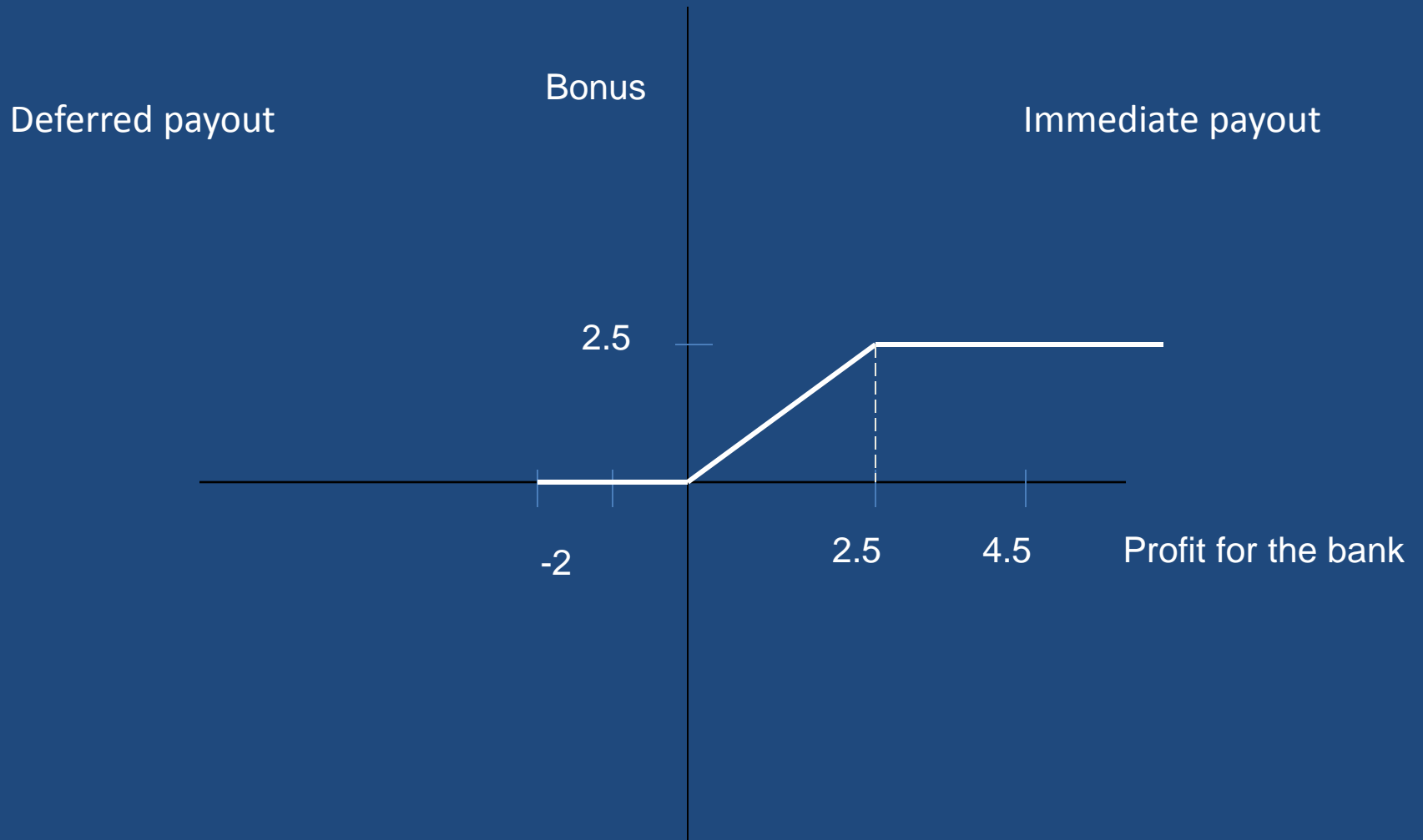
$$EV = (14 + 0) / 2 = 7$$

Traditional managerial compensation schemes

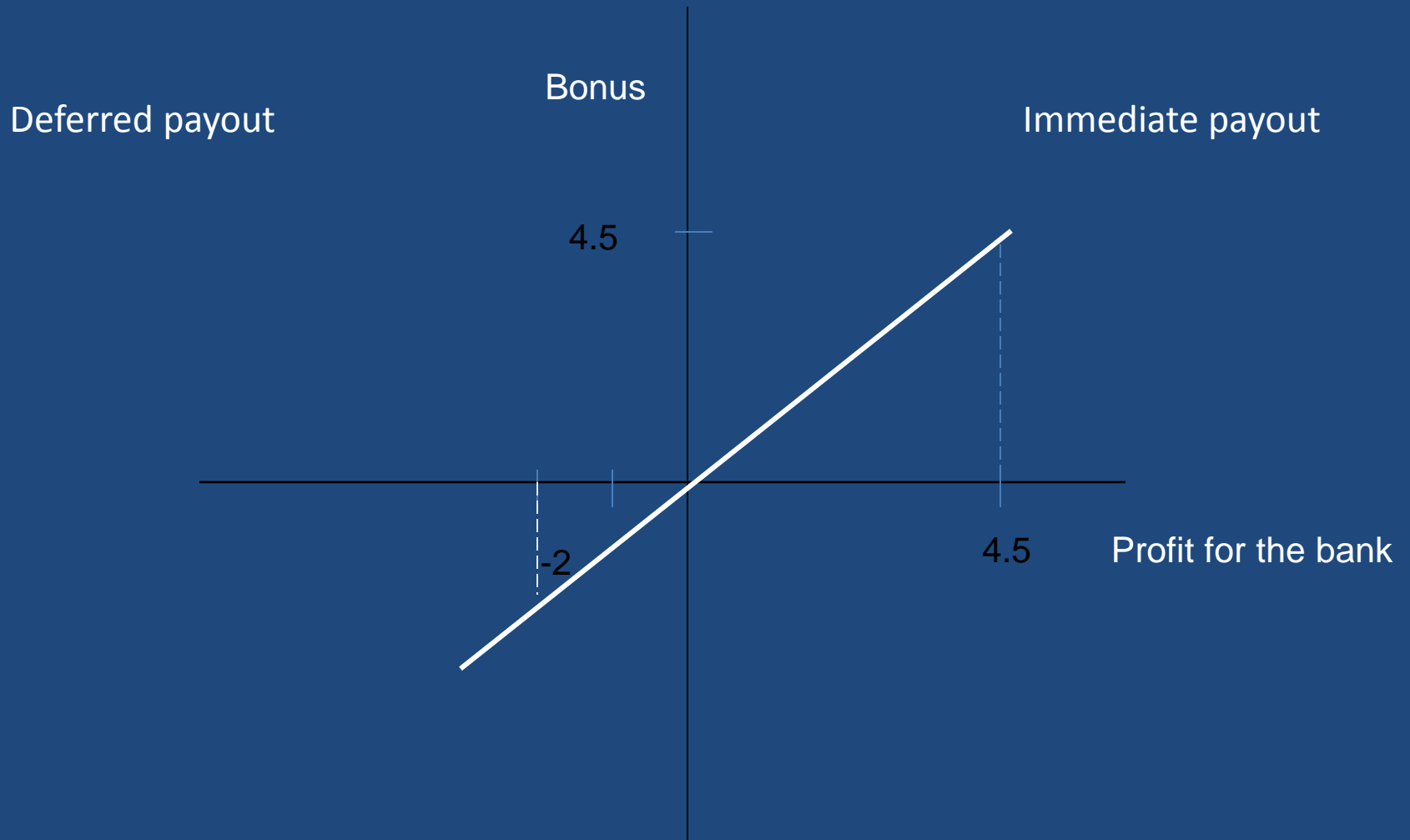


Hartmann & Slapničar (2014). An experimental study of the effects of negative, capped and deferred bonuses on risk taking in a multi-period setting.

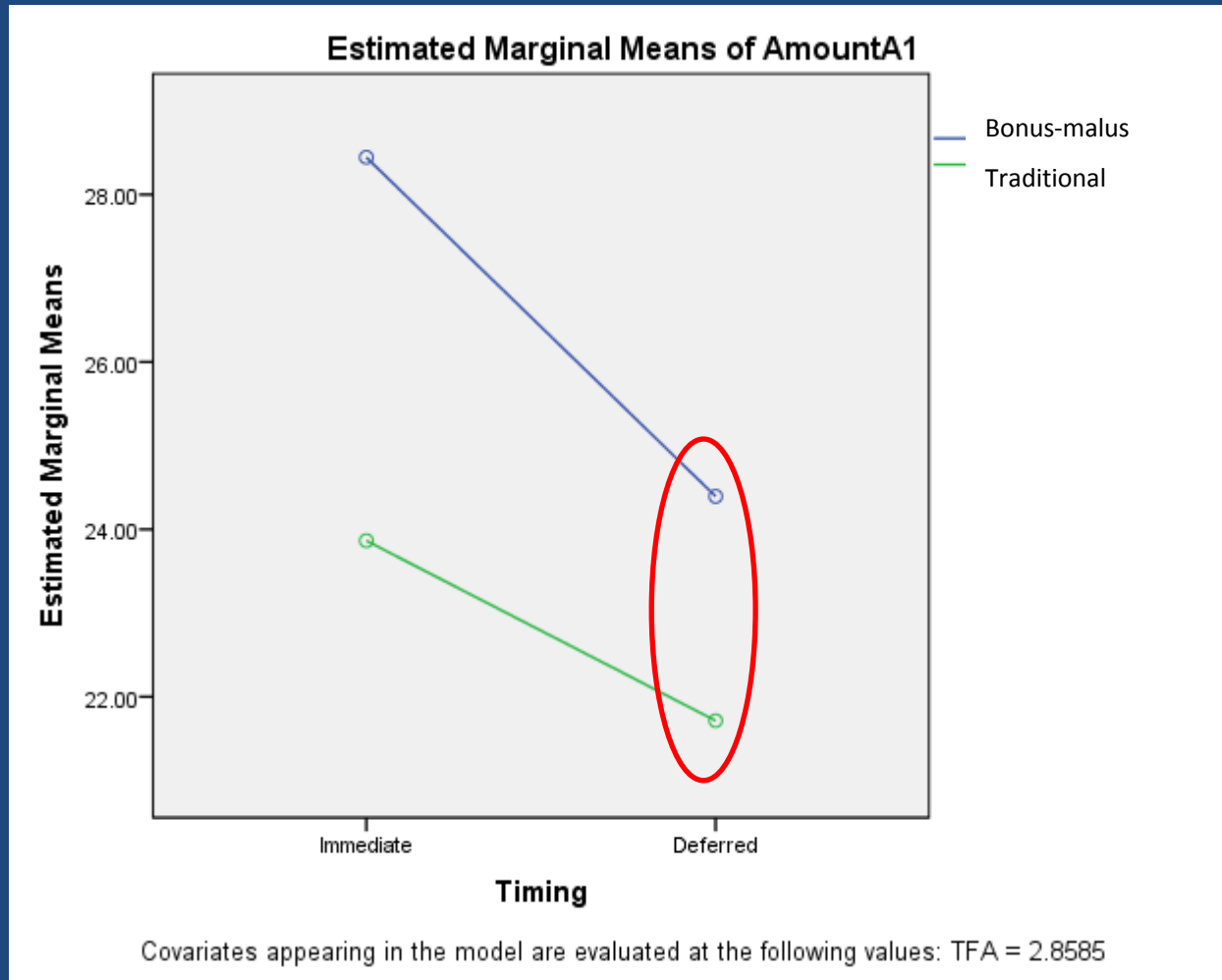
Capped bonus scheme



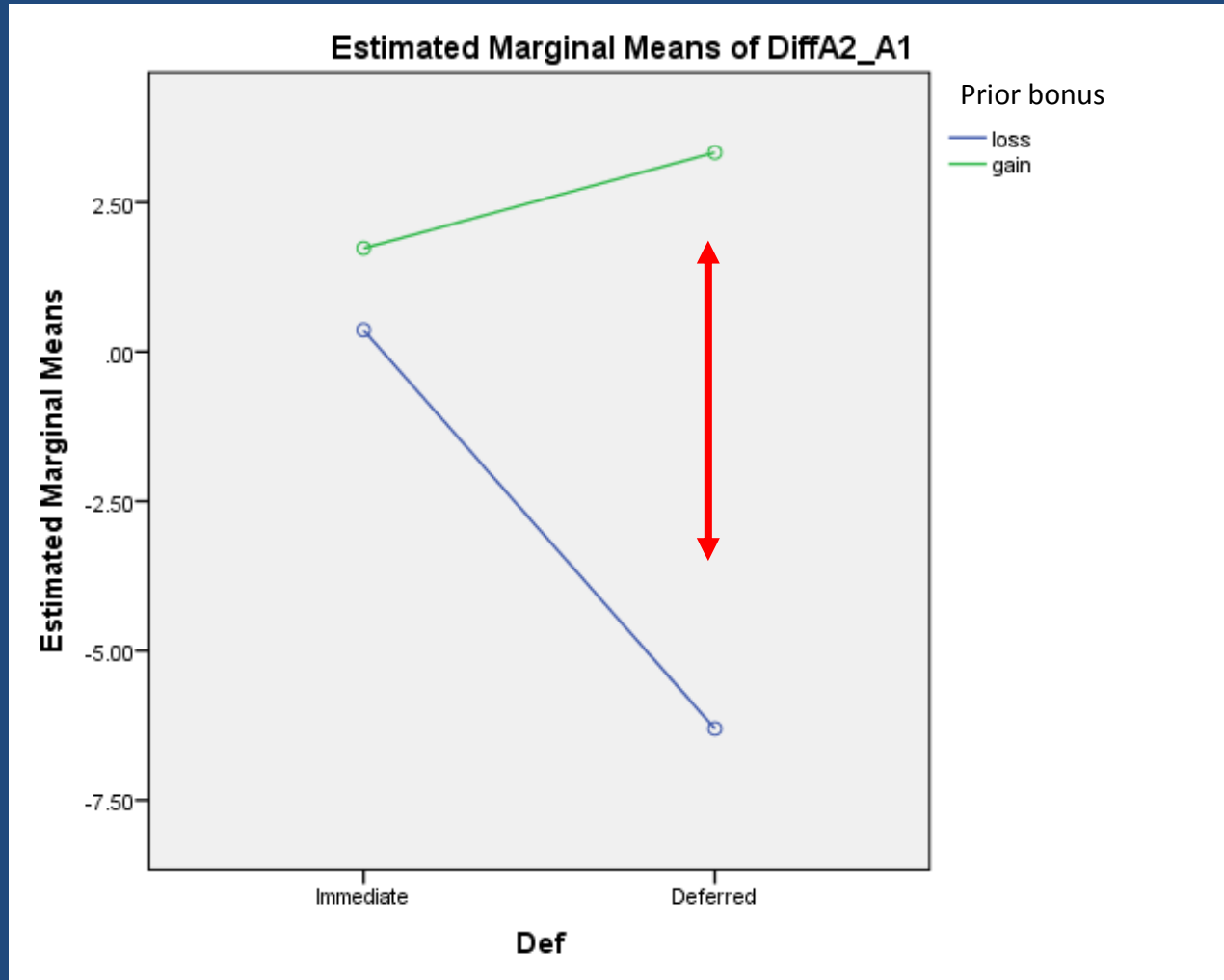
Bonus – malus scheme



The effect of the bonus scheme in the first round



The effect of the bonus scheme in the second round



Reactive control - responding to the presence of salient events by engaging control only if needed.

Monetary
incentive



Peer
pressure



Authority's
instructions



Cognitive control

Proactive control - preparing the cognitive system for upcoming events through the predictive use of context.

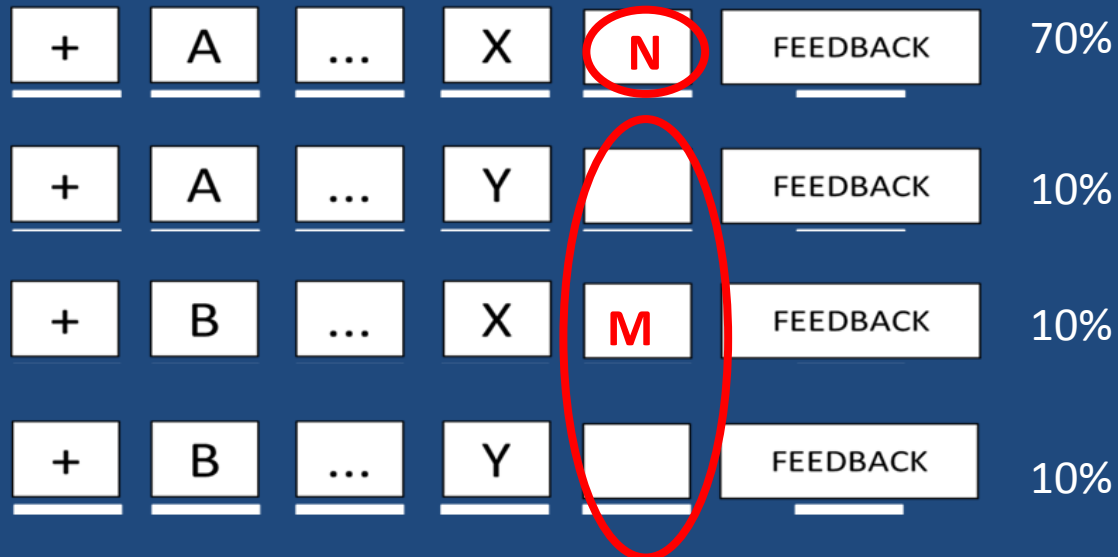
Godec, Hartmann, Repovš & Slapničar:
Does Accountability Enhance Cognitive Control? 2015

Can
management
control
mechanisms
affect
cognitive
control?

control
cognitive
affect
mechanisms

COGNITIVE CONTROL TASK

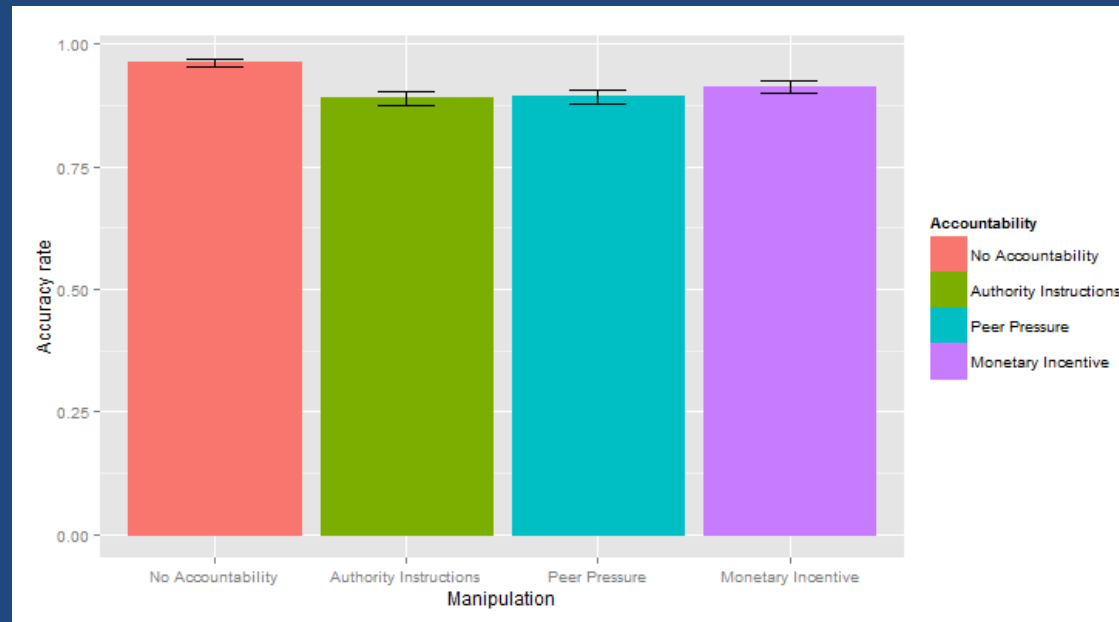
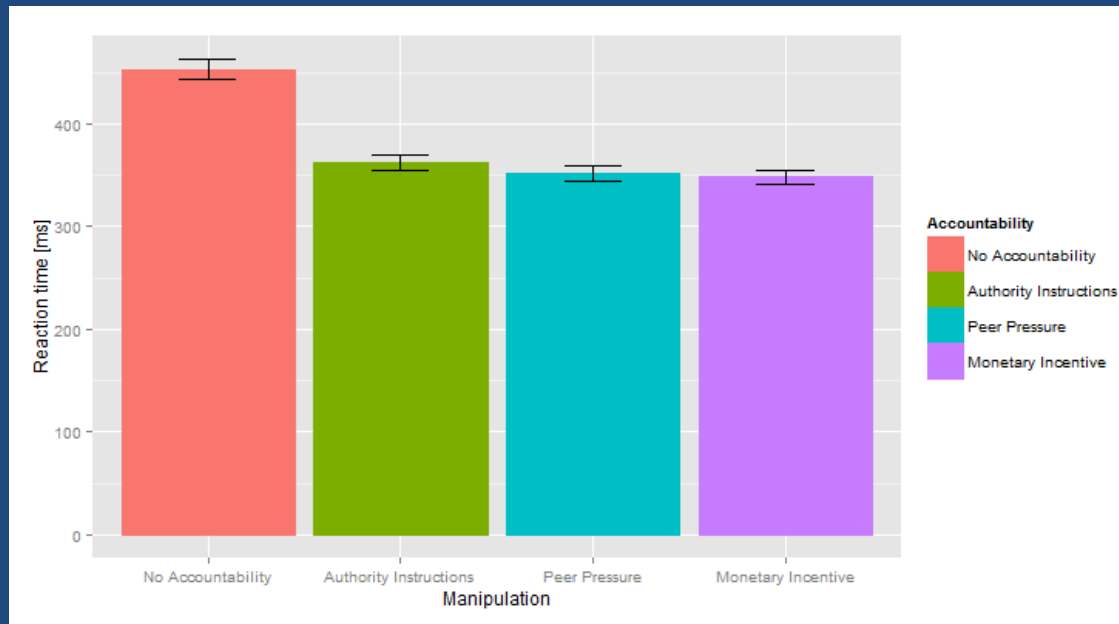
- **AX-CPT** task enables estimation of **proactive** and **reactive control mode**.
- 4 trial types: **AX, AY, BX, BY**



Reaction time



Accuracy

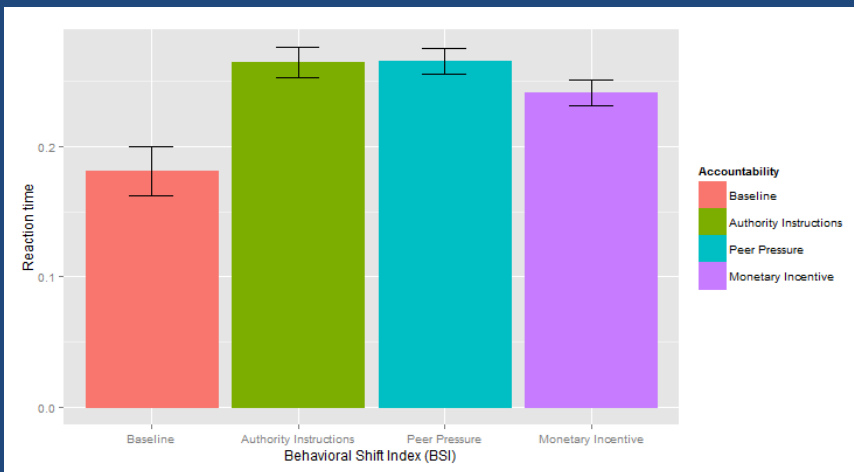


Trade-off effect under 6% of variance.

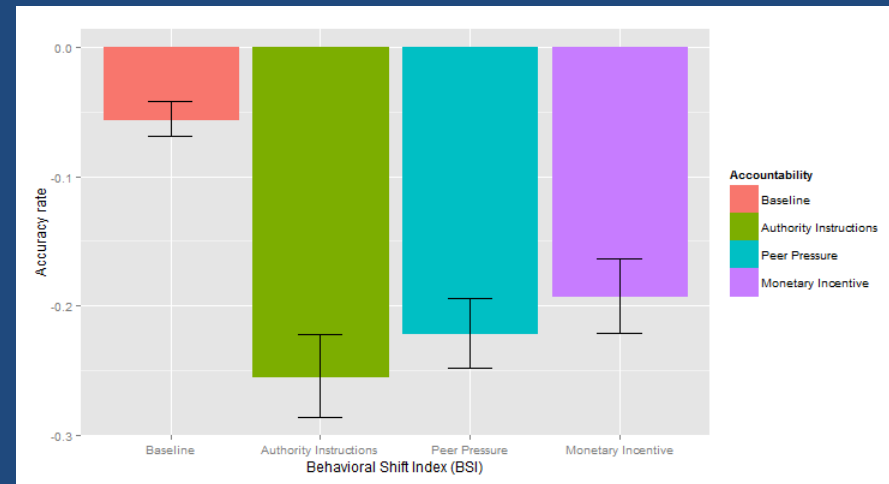
BEHAVIORAL SHIFT INDEX

$$\frac{AY - BX}{AY + BX}$$

Reaction time



Accuracy



The larger the difference, the faster responding for BX -> **proactive mode**

The larger the negative difference, the more accurate responding for BX -> **proactive mode**

CONCLUSION

- Non-monetary control mechanisms enhance cognitive control in a similar way as monetary incentives and **contribute to goal oriented cognition.**
- The **better we understand the effects of accountability pressures on human cognition,** the higher the chances of **long term effectiveness of management control systems in preventing dysfunctional behaviour.**