Behavioral and Experimental Economics

Session 3: Consumer behavior: rationality, biases & behavioral change

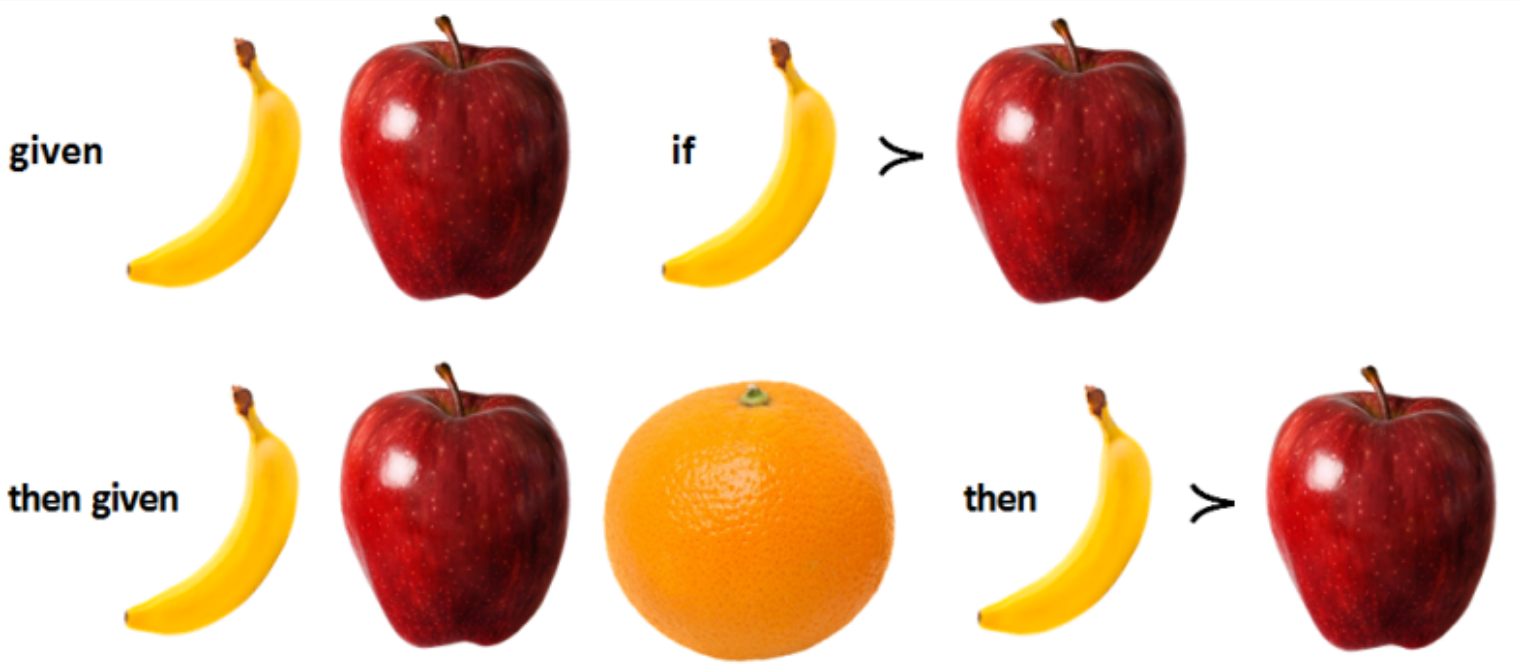
Paolo Crosetto

Failure of the *independence axiom*: the **Attraction Effect**

Independence

Independence assumes that if I give you an *irrelevant* alternative, you *shouldn't change* your order of preferences

- Do you prefer pasta to pizza?
- If I add kebab in the choice set, you should *still* prefer pasta to pizza.



Choosing pop-corn, 1

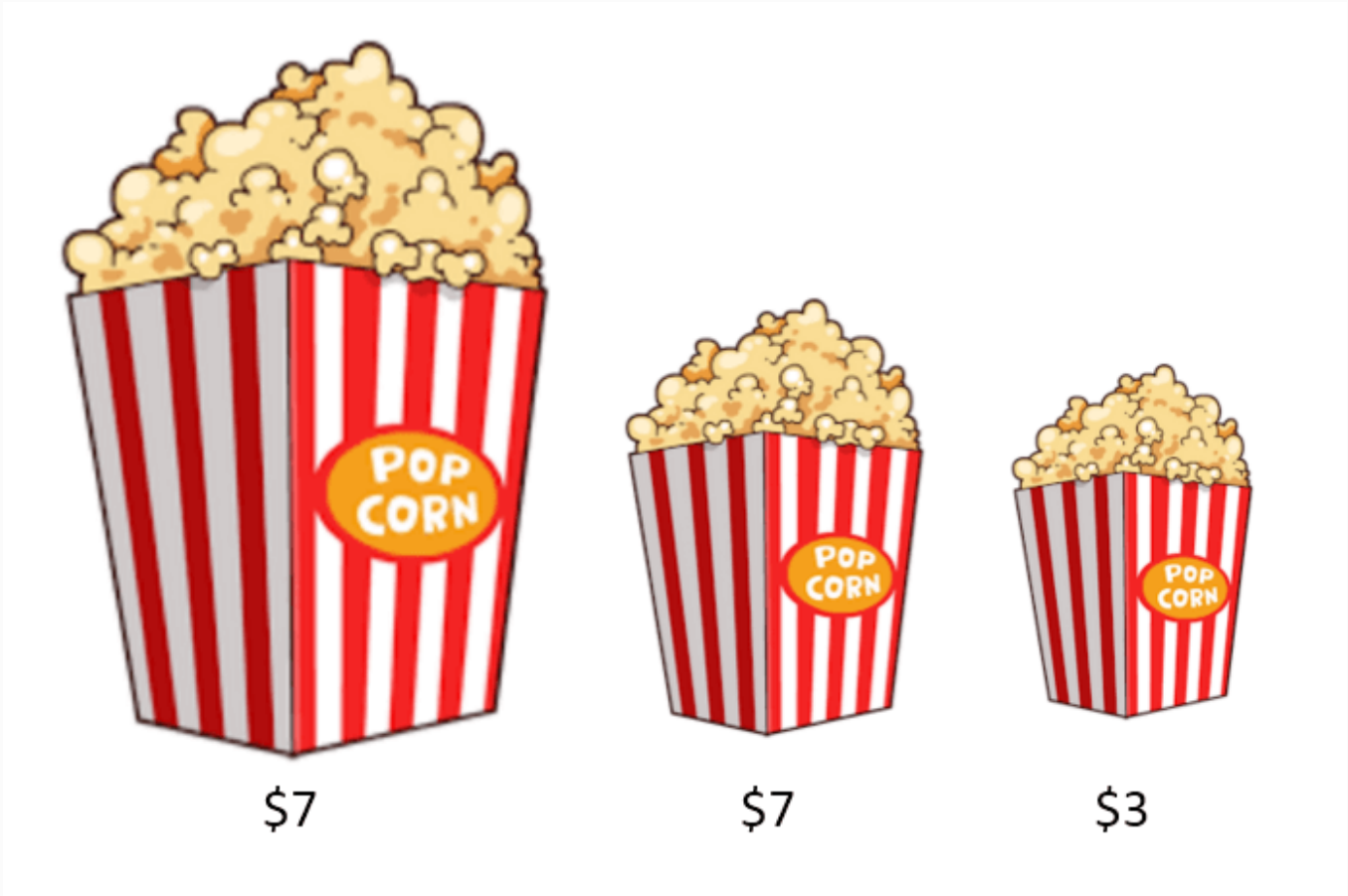
Please choose

$7

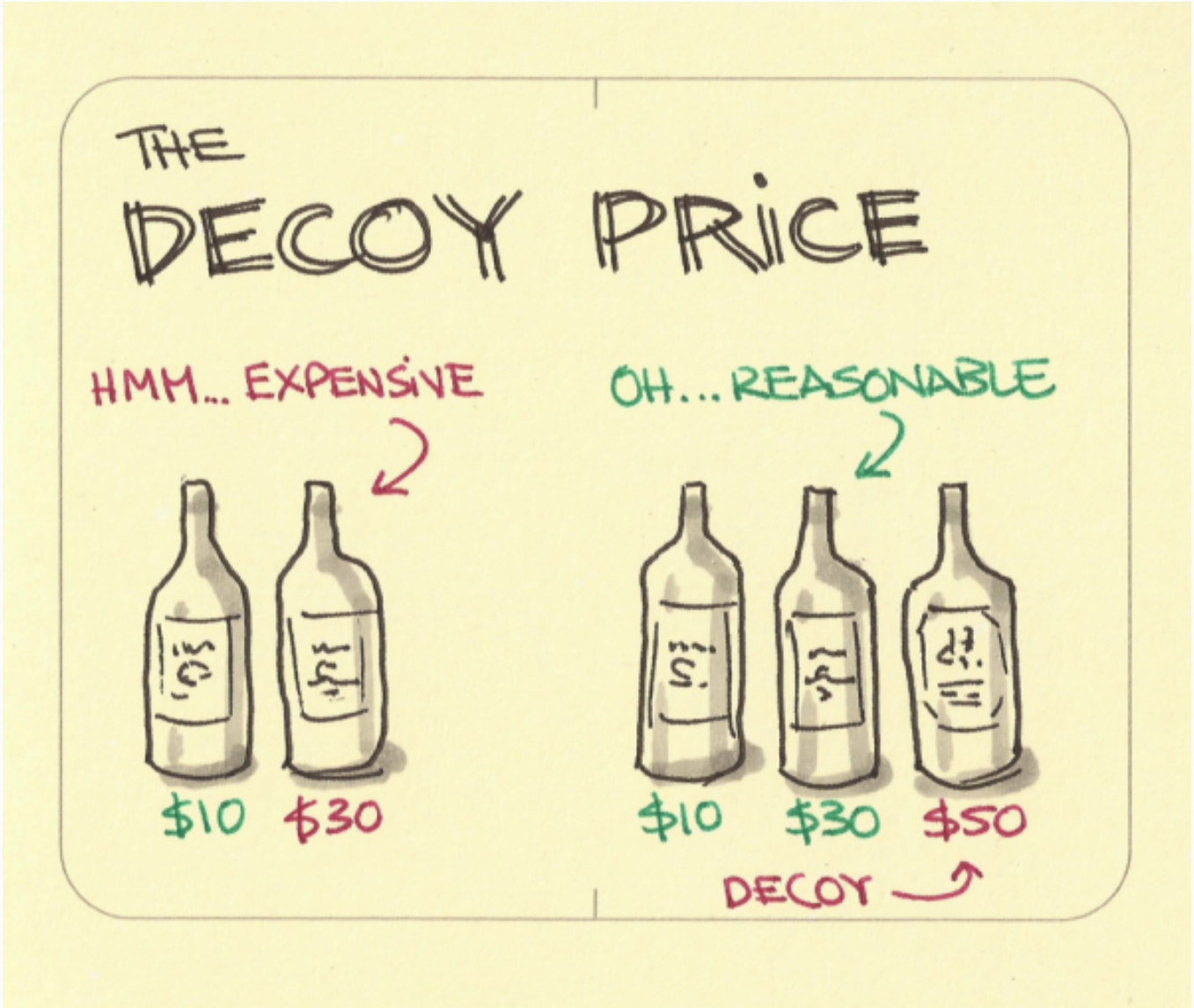
$3

Choosing pop-corn, 2

Please choose *again*



The decoy/attraction/asymmetric dominance effect



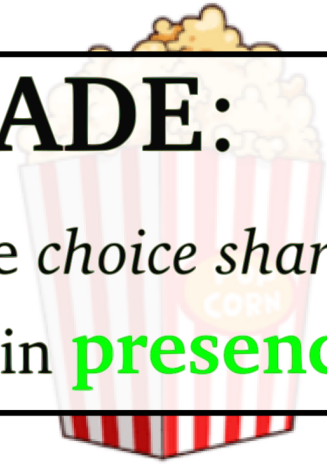
ADE

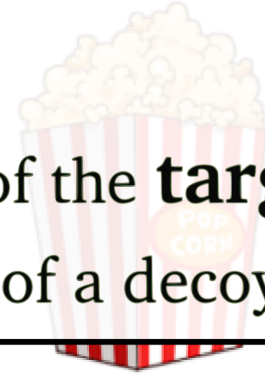
This is called the **Asymmetric Dominance Effect**.

Adding to a choice set an asymmetrically dominated option – that is, an option that is dominated by some but not all the alternatives in the set – increases the choice share of the now-dominant option, at the expense of the others.

Some terms:

Target	the asymmetrically dominant option
Decoy	the asymmetrically dominated option
Competitor	the other option





ADE:

an **increase** in the *choice share* of the **target** in **absence** *vs.* in **presence** of a decoy.

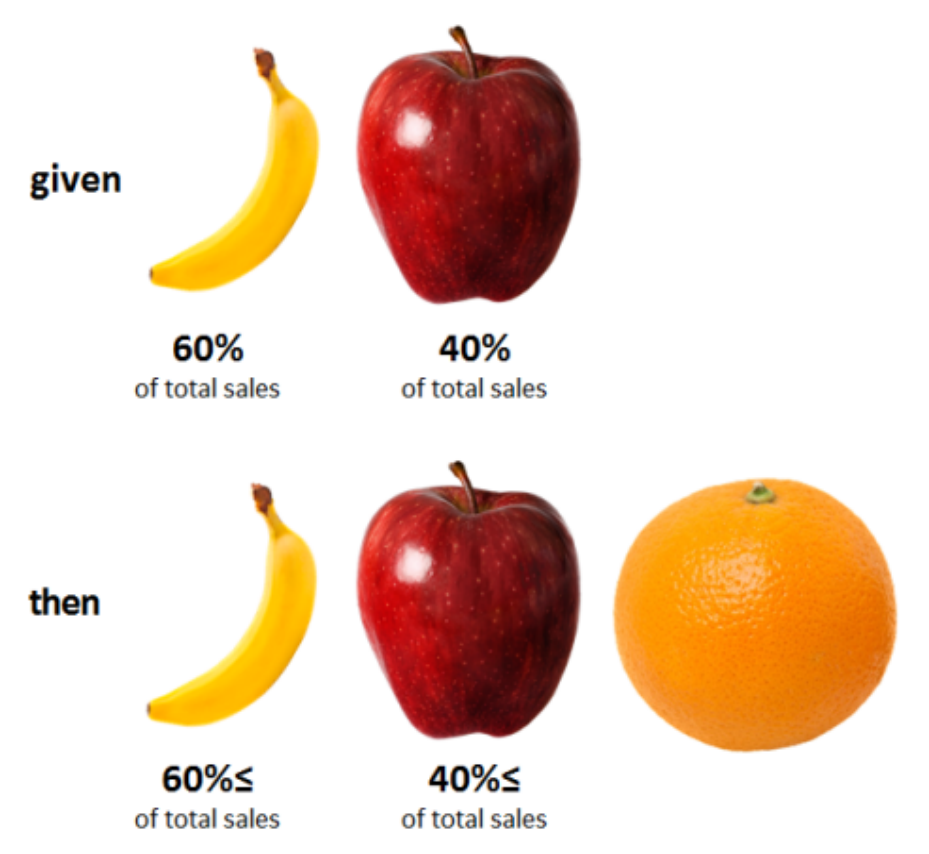
$7
Target

$7
decoy

$3
Competitor

ADE as a violation of regularity

One consequence of the Independence axiom is that...



This is called *regularity* and it is an aggregate property of markets

Why is this a problem?

ADE is a **violation** of the Independence to Irrelevant Alternatives axiom of rational choice.

Under I.I.A, if in the set

$$\{target, competitor\} \Rightarrow competitor \succcurlyeq target,$$

then in a set

$$\{target, competitor, decoy\} \Rightarrow target \not\succ competitor.$$

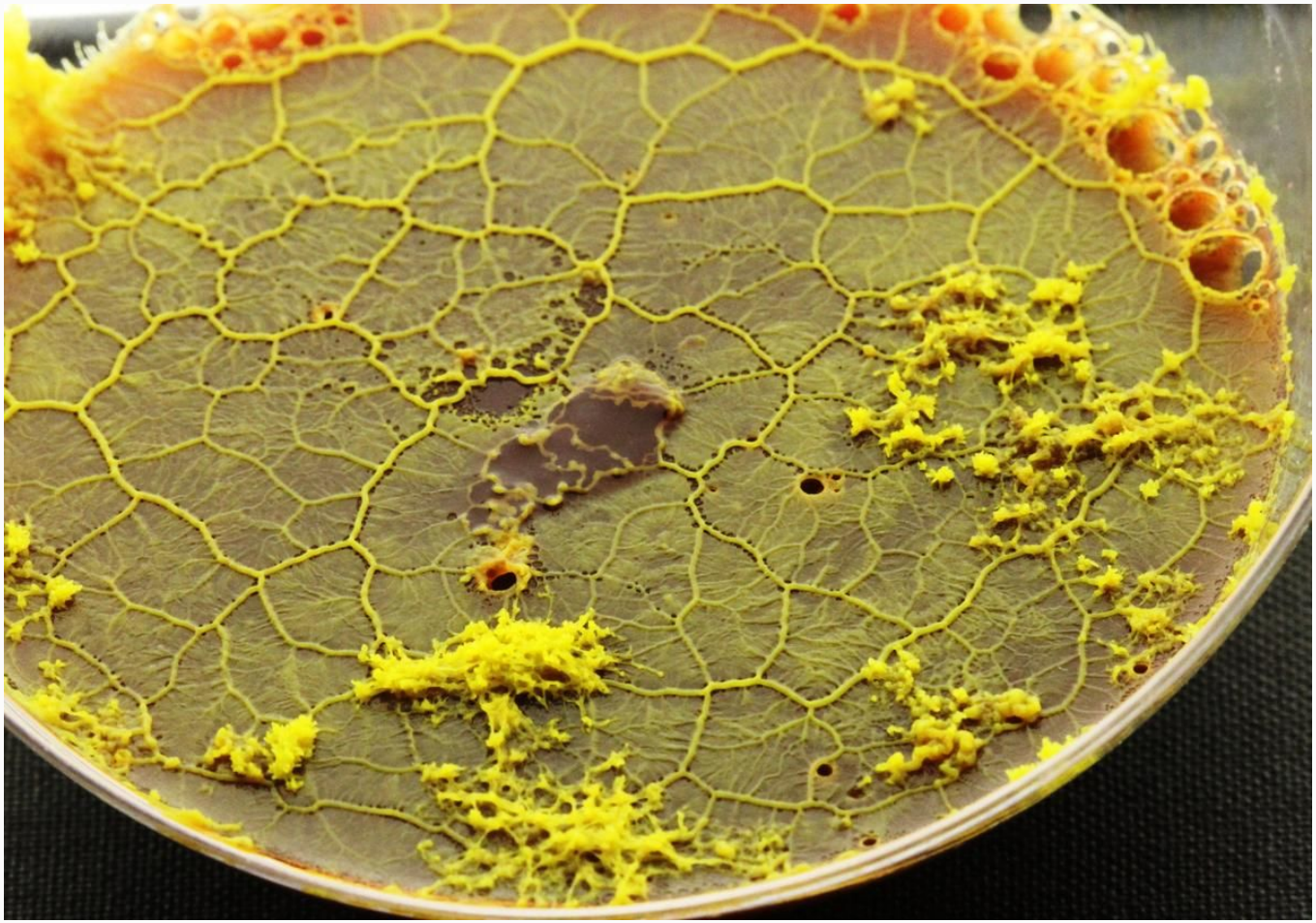
At the aggregate level, this implies *regularity*

$$Pr(target)\{target, competitor\} \leq Pr(target)\{target, competitor, decoy\}$$

That is, preferences are **context-independent**: changing the choice set should not affect choice

Evidence for ADE

- The ADE has been found in **product** choices among products:
  - beer 6-packs (quality *vs.* price) [Huber et al.]
  - cars (ride quality *vs.* gas mileage) [Huber et al.]
  - restaurants (distance *vs.* quality) [Huber et al.]
  - dates (good looking, bad looking twin, other) [Ariely et al.]
  - televisions (resolution *vs.* durability) [Pan and Lehman]
  - apartments (size *vs.* location) [Pan and Lehman]
  - Good vs Bad looking boys & girls [Ariely]
- **Herne** also found ADE in **political** opinions in Finland
- Curiously, the effect has been observed in **animals** (honeybees, gray jays: Shafir et al)



Limits to ADE

- ADE has shown to be **less prevalent** or absent when
  - products carry **brand name** [Ratneshwar et al., 1987]
  - product **description** is very **precise** [Mishra et al., 1993]
  - **visual** rather than numerical dimensions [Frederick et al., 2014]
  - **away** from **indifference** [Crosetto and Gaudeul 2016]
  - in **real-world** choices [Trendl et al., 2018]

- It is instead **amplified** when
  - subjects asked to **justify** choices [Simonson, 1989]
  - **dominance** is made more **focal** [Mishra et al., 1993; Król and Król, 2019]

ADE: why?

- dominance gives *at least one* reason to choose when uncertain: you know that the *target* is *at least better than the decoy*
- the choice might be complex, and you have an easy way to simplify it: look for dominance
- cognitive: similar (but dominant) things are seen bigger than not-dominant ones (because they are easier to compare)
- loss aversion: reference point switches to target; competitor perceived as potential loss.

ADE: why?

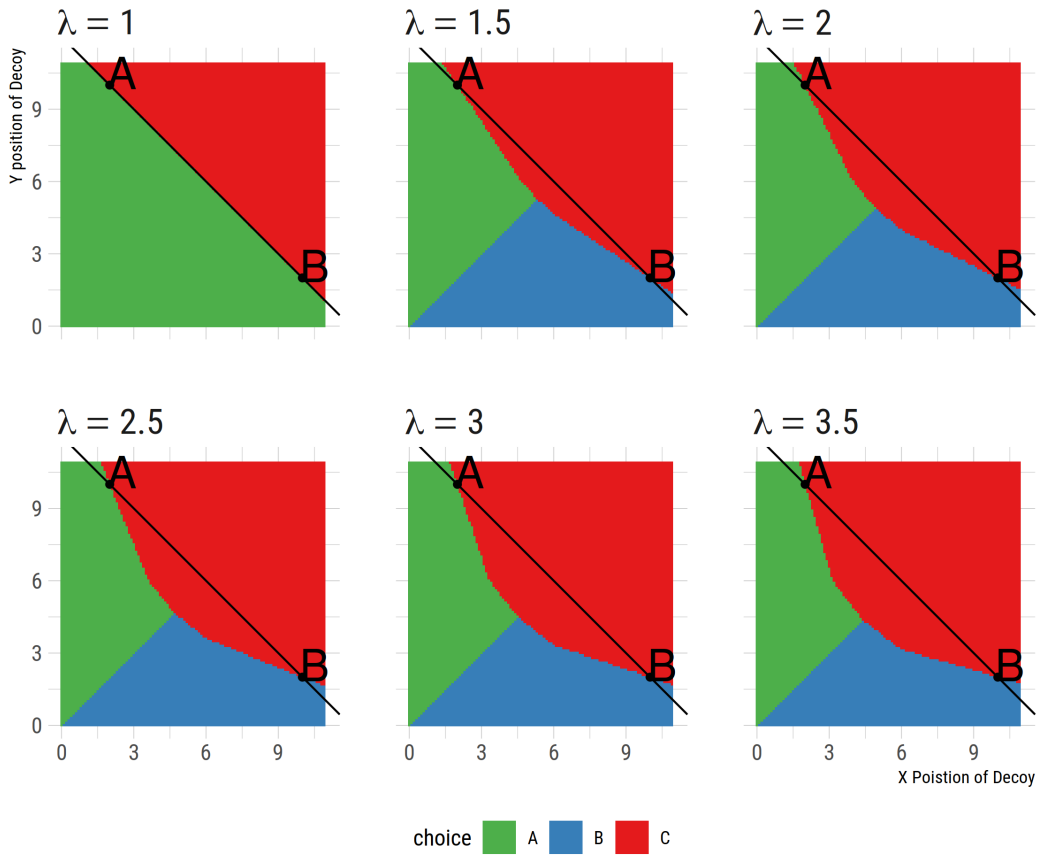
- loss aversion (Simonson & Tversky 1993)
- statistical thinking: if i.i.d., target stochastically dominates competitor
- anchoring to avoid regret (Connolly & Reb, 2012)
- justifiable choice (Simonson 1989)
- cognitive: dominant things are *seen* as bigger (Trueblood et al 2015)
- dominance provides a heuristic (Gigerenzer et al. 1999)
- various theories of attention shift (Ariely, Decision Field Theory)

ADE: why?

- **loss aversion** (Simonson & Tversky 1993)
- **statistical thinking** if i.i.d., target stochastically dominates competitor
- anchoring to avoid regret (Connolly & Reb, 2012)
- justifiable choice (Simonson 1989)
- cognitive: dominant things are *seen* as bigger (Trueblood et al 2015)
- dominance provides a **heuristic** (Gigerenzer et al. 1999)
- various theories of attention shift (Ariely, Decision Field Theory)

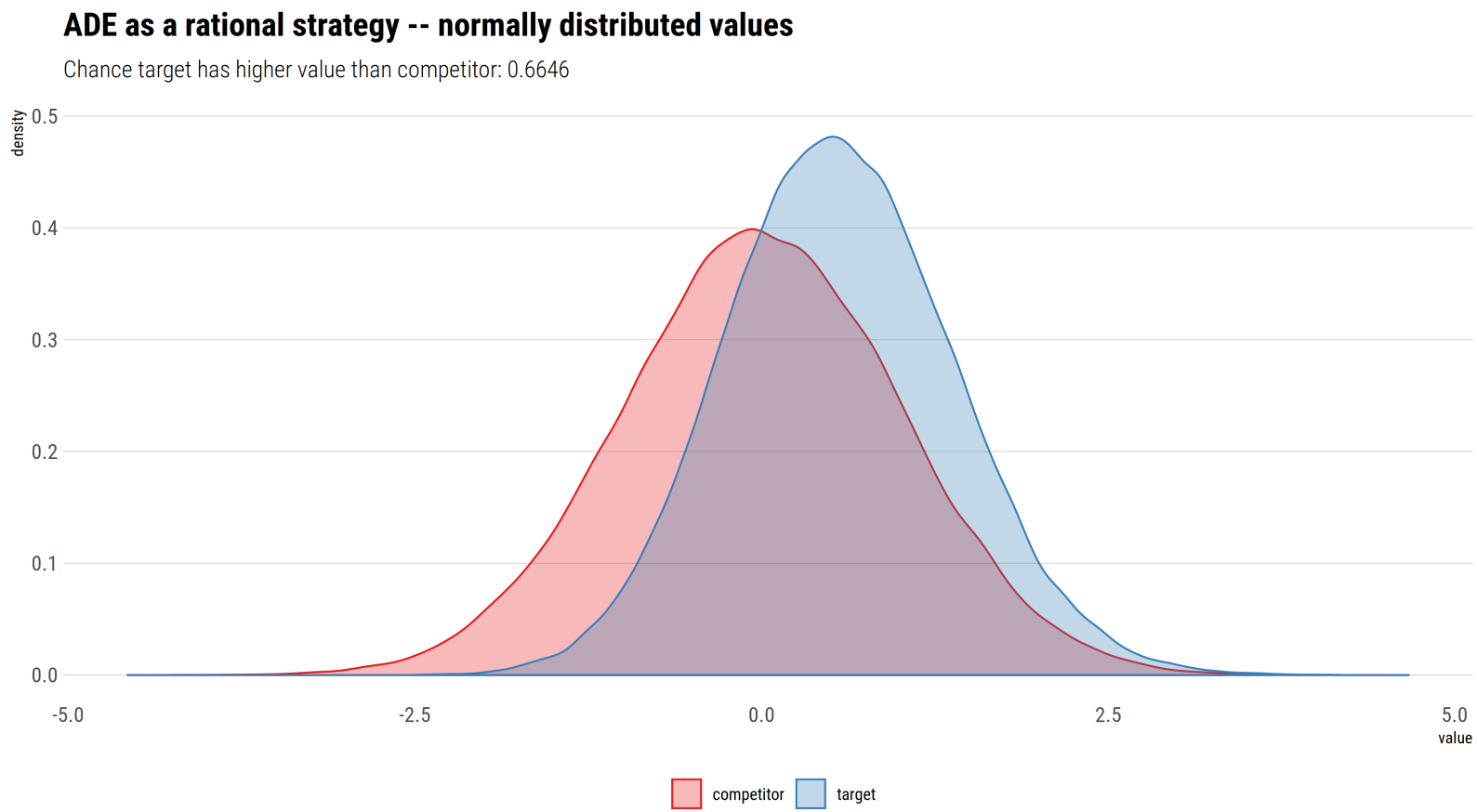
Why the ADE? Loss aversion

- Utility piecewise linear, kink due to loss aversion (λ)
- Subject evaluates options w.r.t. reference point
- Reference point is centroid of options in utility space
- (for simplicity) dimensions are perfect substitutes


λ = 1
λ = 1.5
λ = 2
λ = 2.5
λ = 3
λ = 3.5
A
B
Y position of Decoy
X Poistion of Decoy
0
3
6
9
choice
A
B
C

Why the ADE? Statistical thinking

- If value of A, B, C is i.i.d.
- Then prob$(\max\{A; B\} > C) = \frac{2}{3}$
- There is value to be gained in dominance
- (see the Monty Hall problem)


ADE as a rational strategy -- normally distributed values
Chance target has higher value than competitor: 0.6646
density
0.5
0.4
0.3
0.2
0.1
0.0
-5.0
-2.5
0.0
2.5
5.0
value
competitor
target

Why the ADE? Heuristic

- Heuristic: quick rule guiding choice in uncertain environments
- Selects a small, focal subset of information
- Leads to satisficing results
- Locally (ecologically) rational

This paper: what?

Testing the **theoretical nature** of the ADE:

Bias?	Heuristic?	Artifact?
Serious challenge to IIA	IIA mostly fine	No problem

ADE: bias or heuristic? Long or short term?

Experiment: buying water in a strange world

A real experiment!

- Instructions as in the real experiment (2021)
- Same software used back then
- Same incentives

- ...but no money here

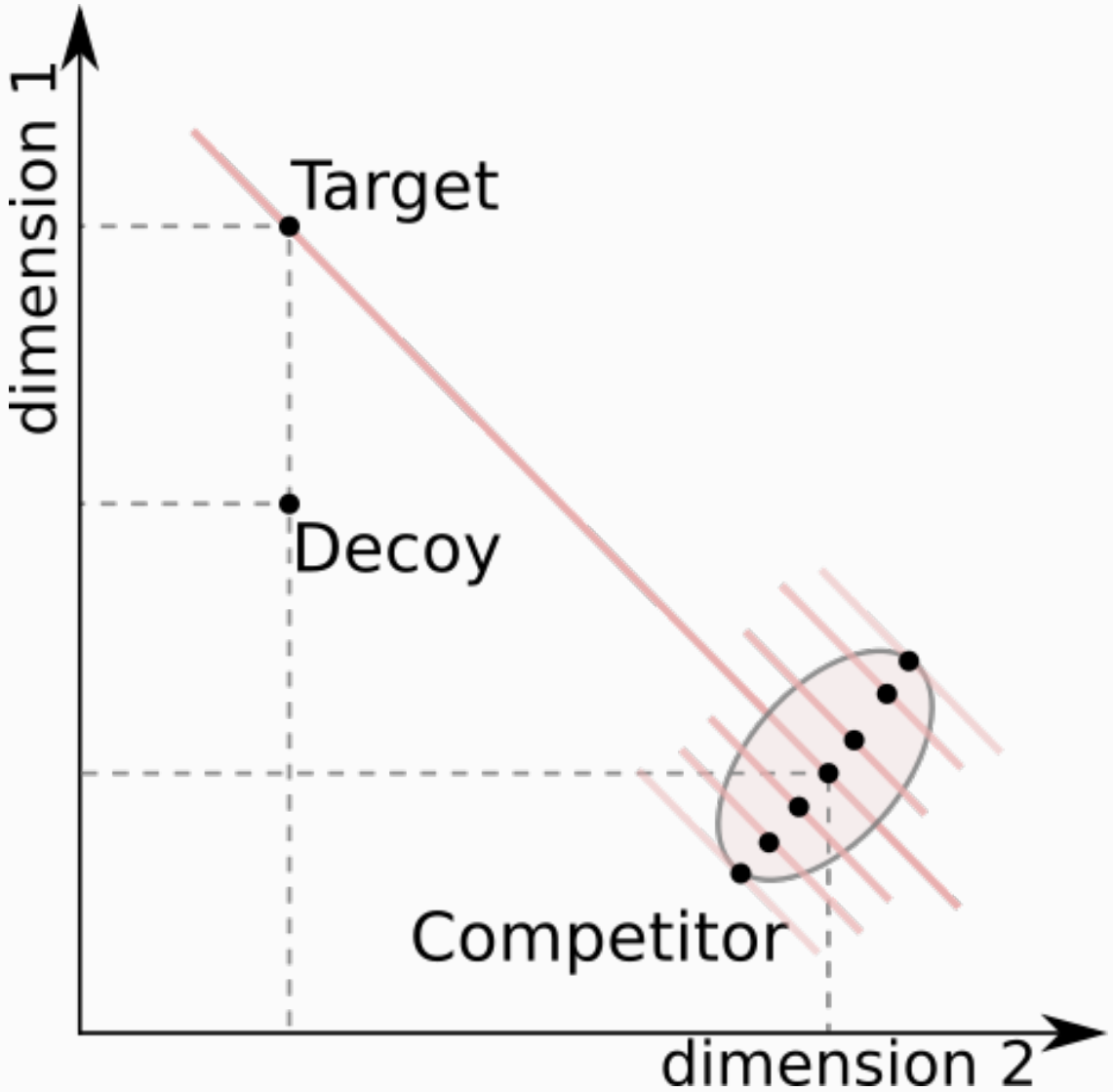
Link to the instructions

Let's play!

Experimental software to be found on https://gaelexperience.fr/

Then click on the green button

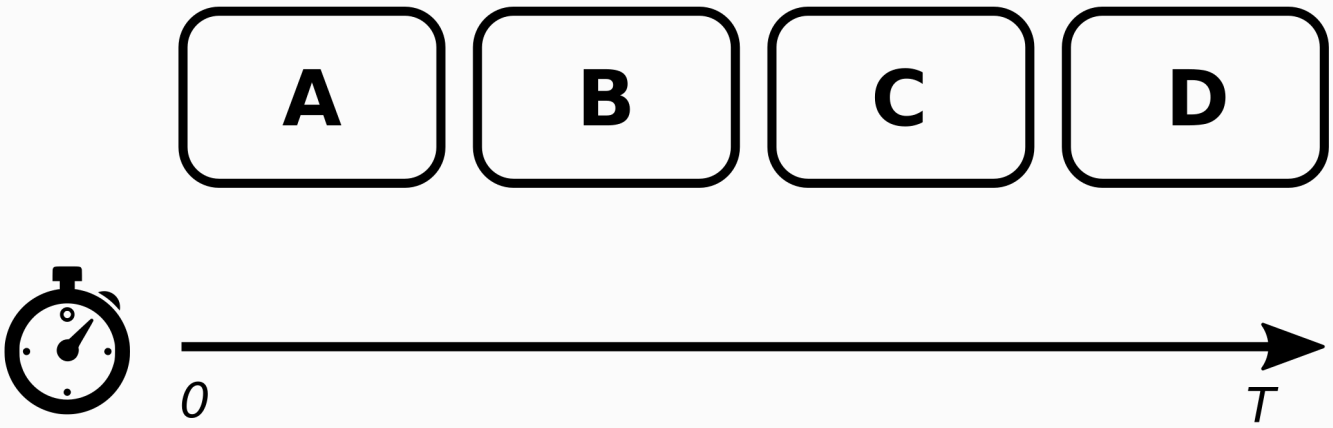
Within-subject design

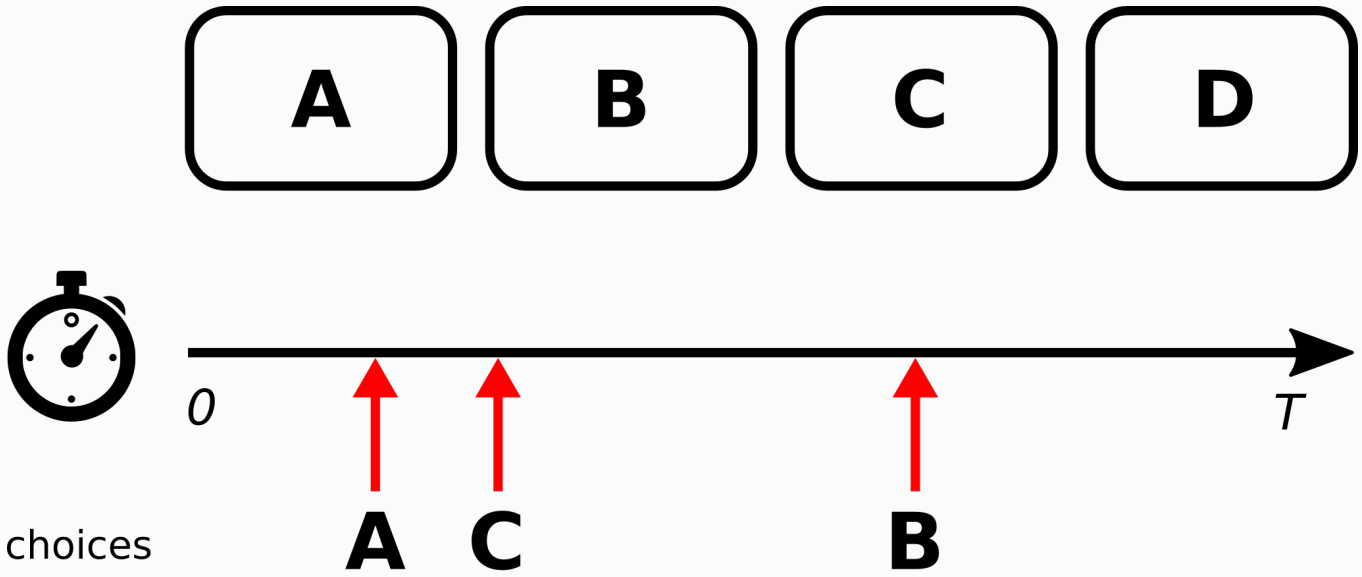


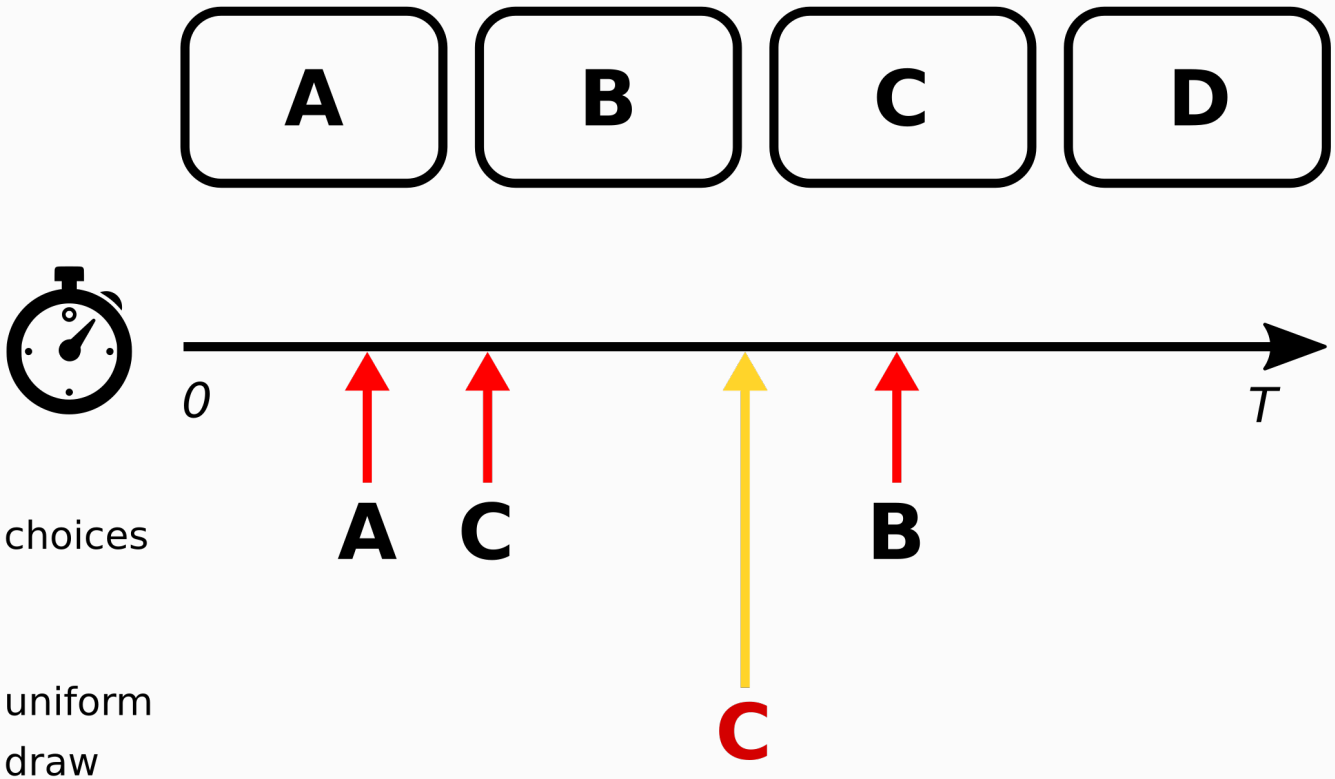
Time and choice process: exposing the *choice process*

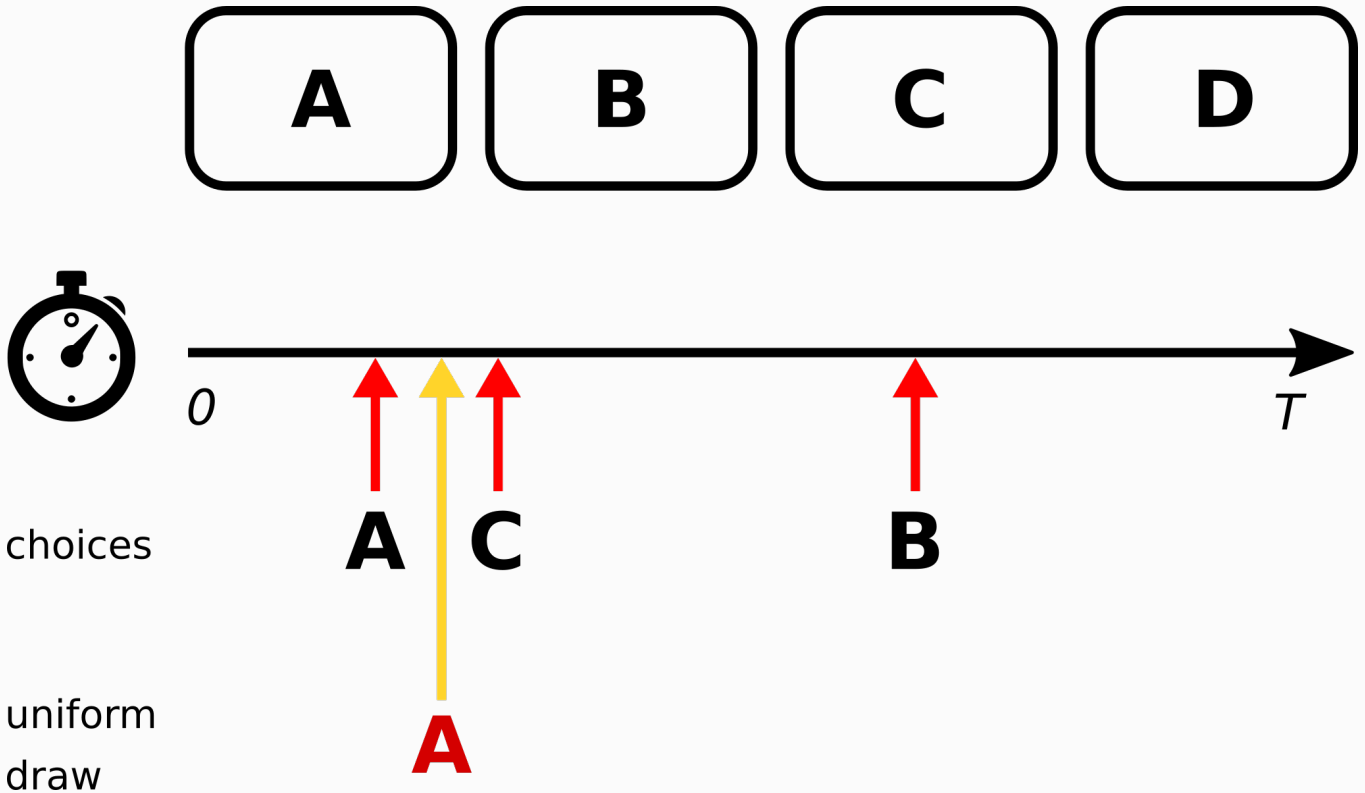
$\forall$ subject, $\forall$ choice, we want to capture

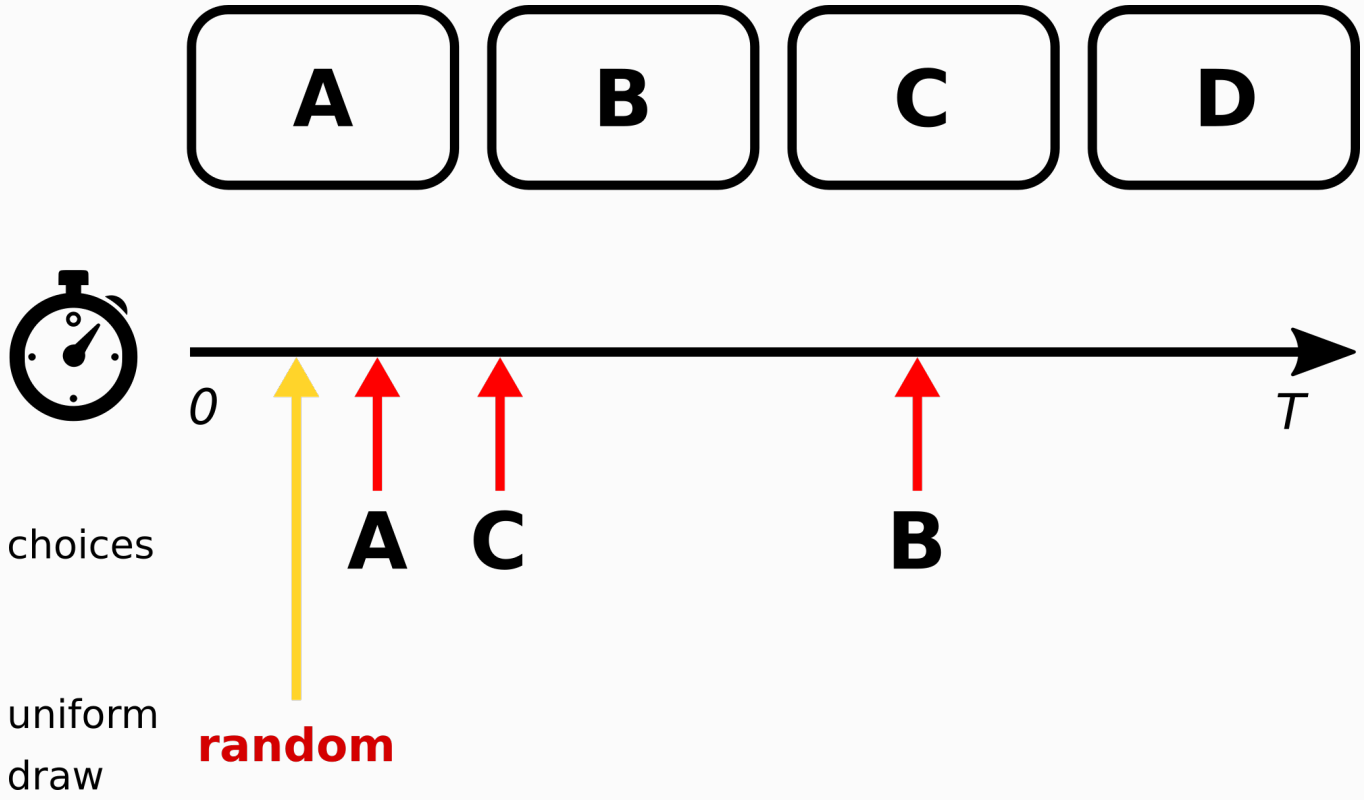
- the fast heuristics used (if any)
- *and* the slow reasoning applied (if any)
- *and* the moment the subject switched (if any)


A
B
C
D
0
T


A
B
C
D
0
T
choices
A
C
B


A
B
C
D
0
T
choices
A
C
B
uniform
draw
C


A
B
C
D
0
T
choices
A
C
B
uniform
draw
A



(adapted from Caplin et al., *Search and Satisficing*, AER 2011; also applied to guessing games (Agranov et al., JESA 2015); social preferences (Dyrkacz Krawczyk JBEE 2017))

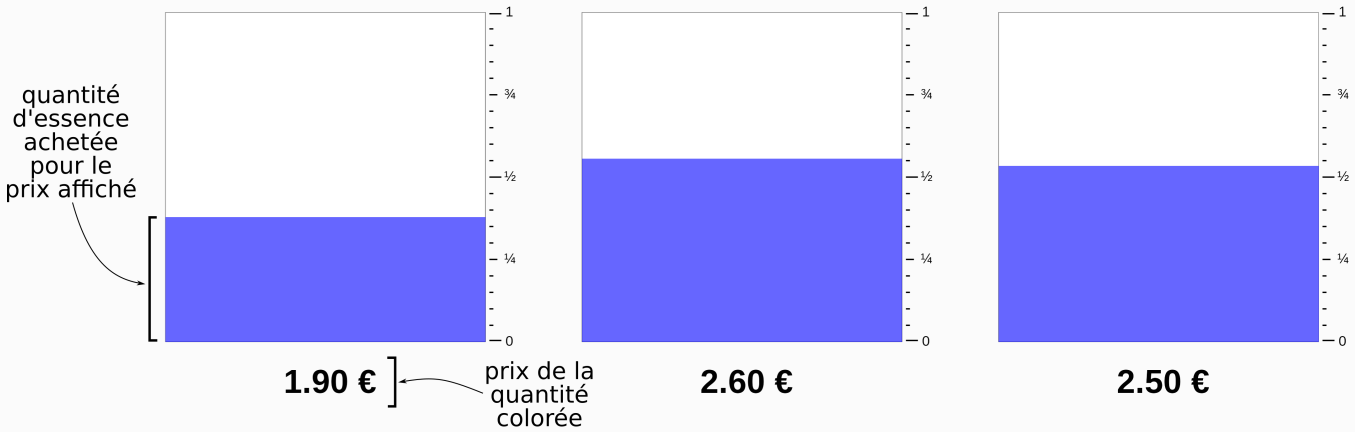
Expected behavior

- No choice $\Rightarrow$ random choice: incentive to *fast* reply
- Time is ticking: incentive to *change* first decision upon reflection

Notes:

- fast to slow *endogenous* (usually: exogenous)
- Data reveal choice *process* (usually: outcome)

Induced preferences



Notes

- Problem is *spuriously* bidimensional (**size**, **price**)
- But actually *monodimensional* (**money**)
- (*unobservable*) utility weighting $\Rightarrow$ (**observable**) cognitive exercise

- *no* homegrown preferences
- The optimal choice is always **computable**
- (but somehow hidden to subjects)

A dynamic dataset

So far we have seen only very limited or no dynamics, but here...

- Timing of decision is endogenous (milliseconds)
- Choice is inherently dynamic
- timing of choices *does* matter
- we are interested in the choice shares *in time*

Original data *vs* discretized data

For every subject, trial, we have

- the timing of each click (in milliseconds)
- the chosen item at each click
- chosen item characteristics
- subject characteristics
- treatment and screen characteristics (decoy, not decoy, relative price...)

But how to compare across people and screens? we need to discretize

The discretized dataset

We discretize on an interval of a tenth of a second

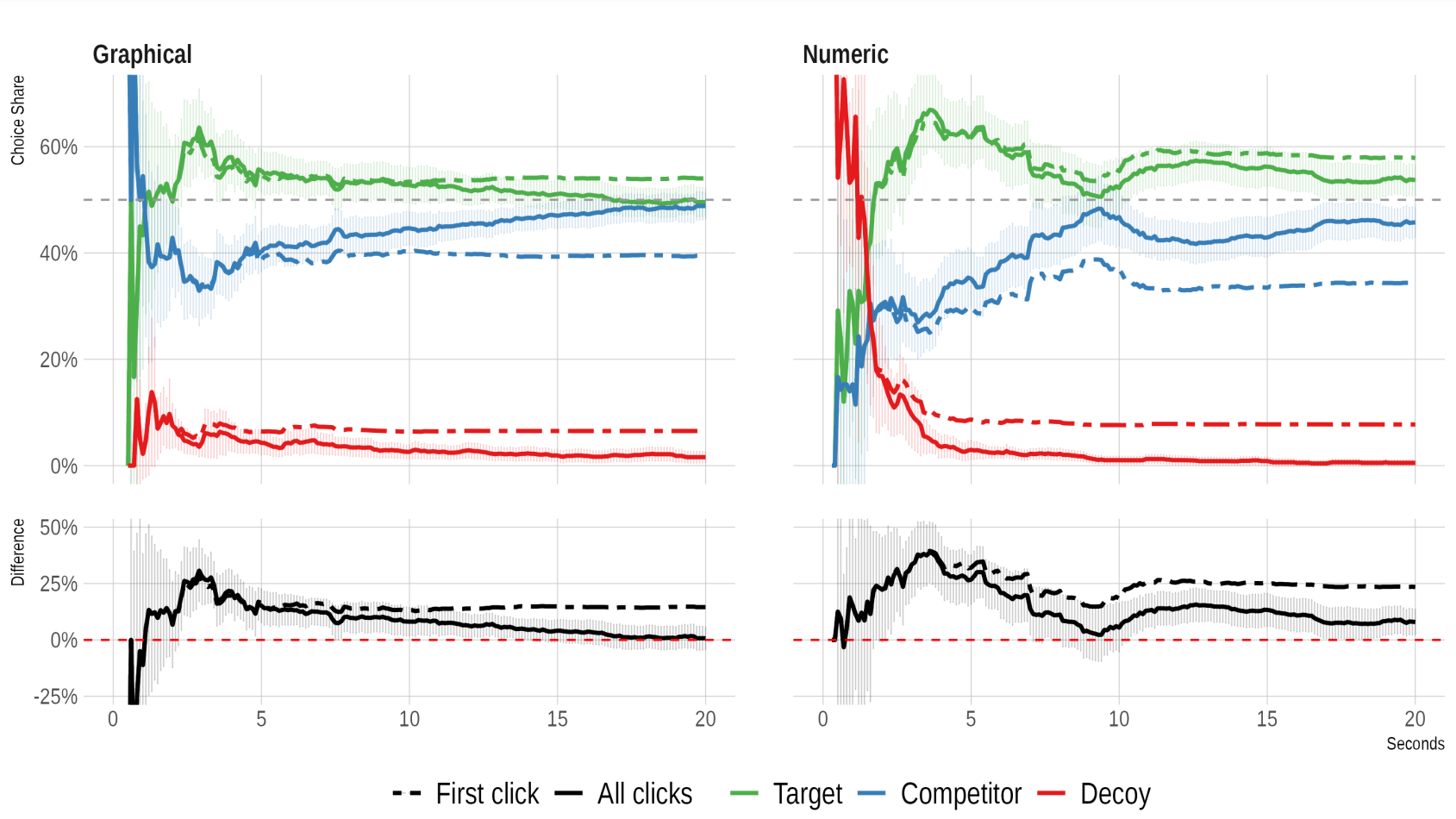
1. it contains the same data as before
2. but now *one observation per 1/10 second*

All data and scripts

All data and analysis scripts are hosted here

paper data on github

Results, 1: choice share dynamics



ADE is short-term, shoots up in the first seconds, dwindles to zero

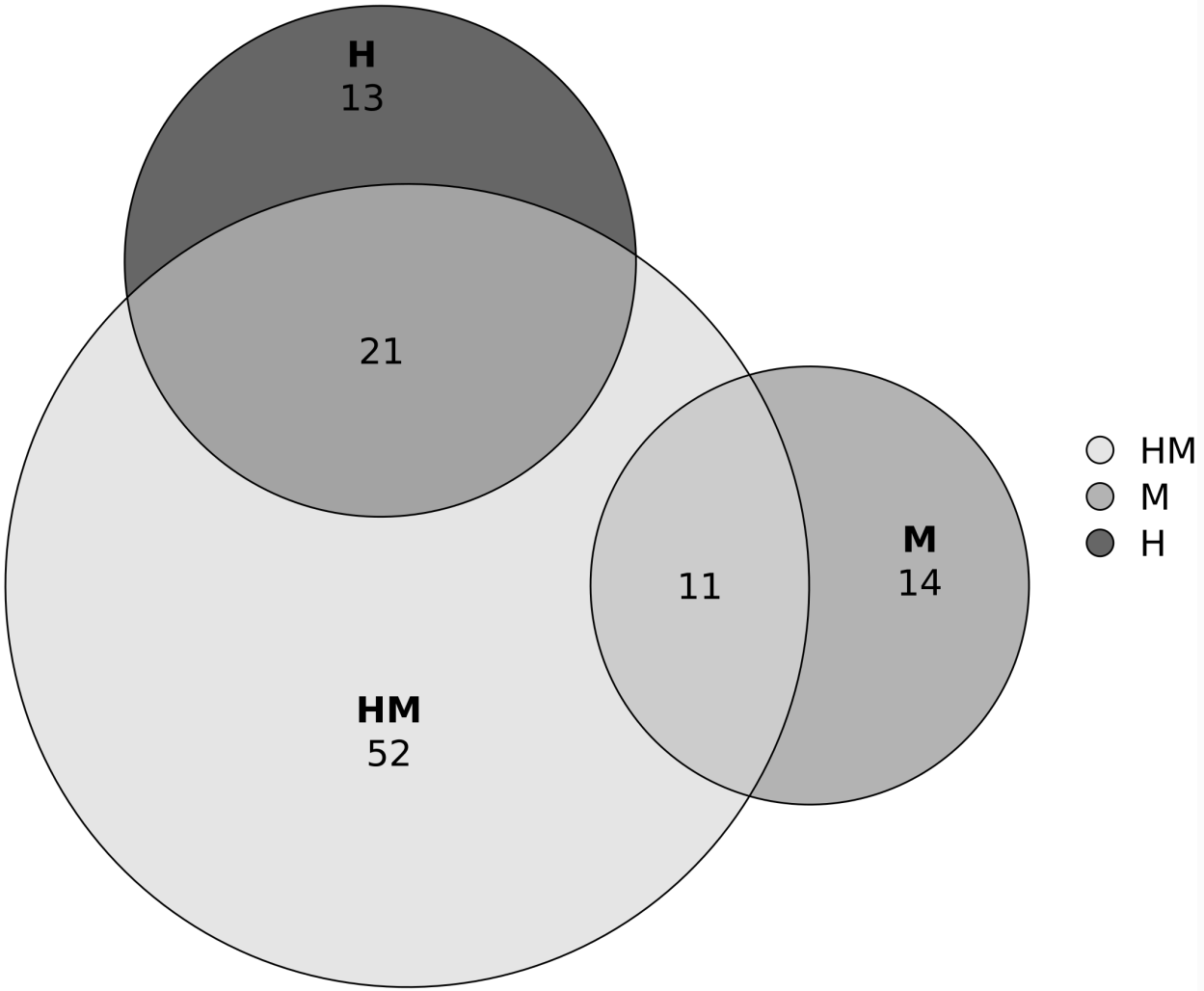
Results, 2: there are 3 decision types

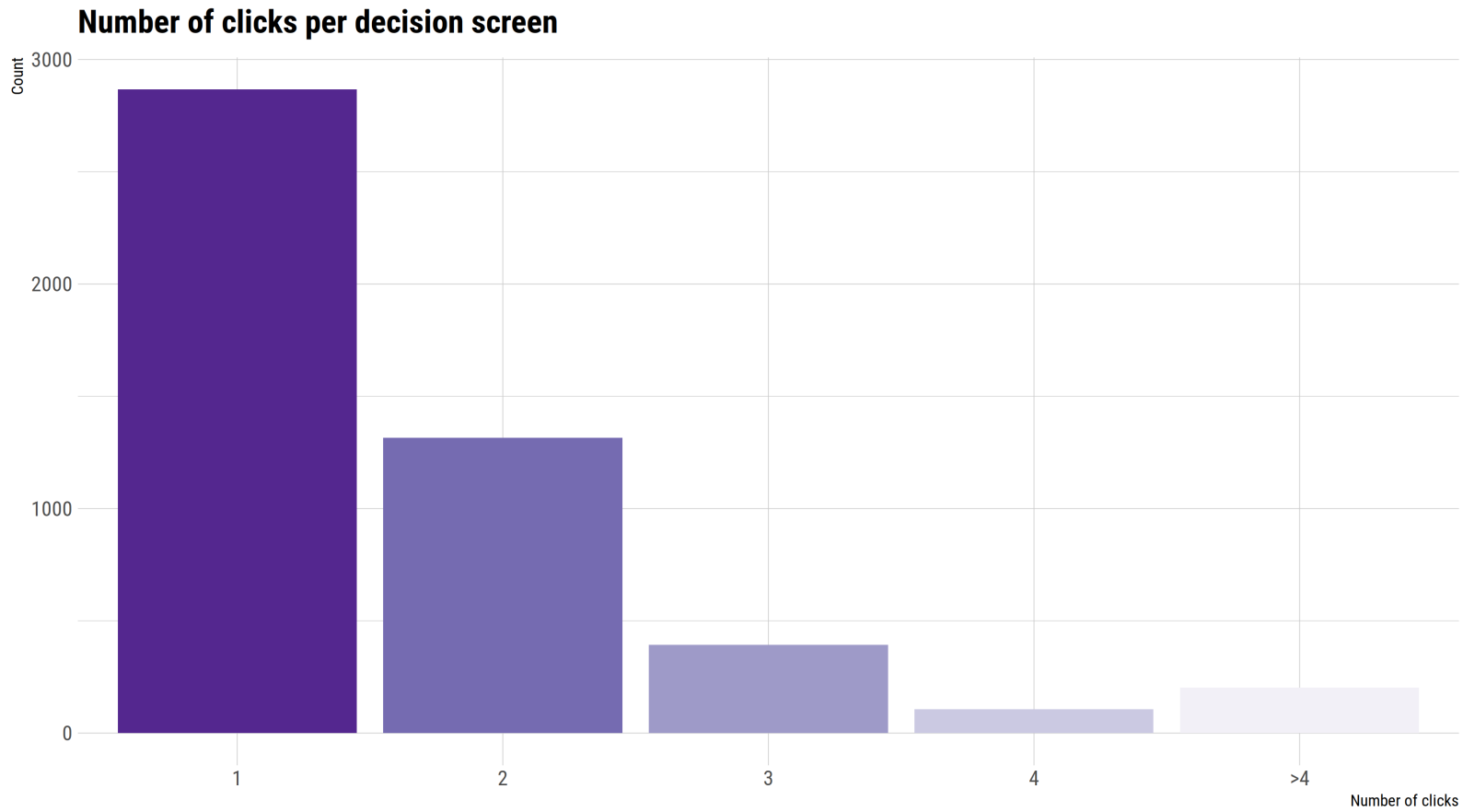
Heuristic only spot dominance, go for it, never revise

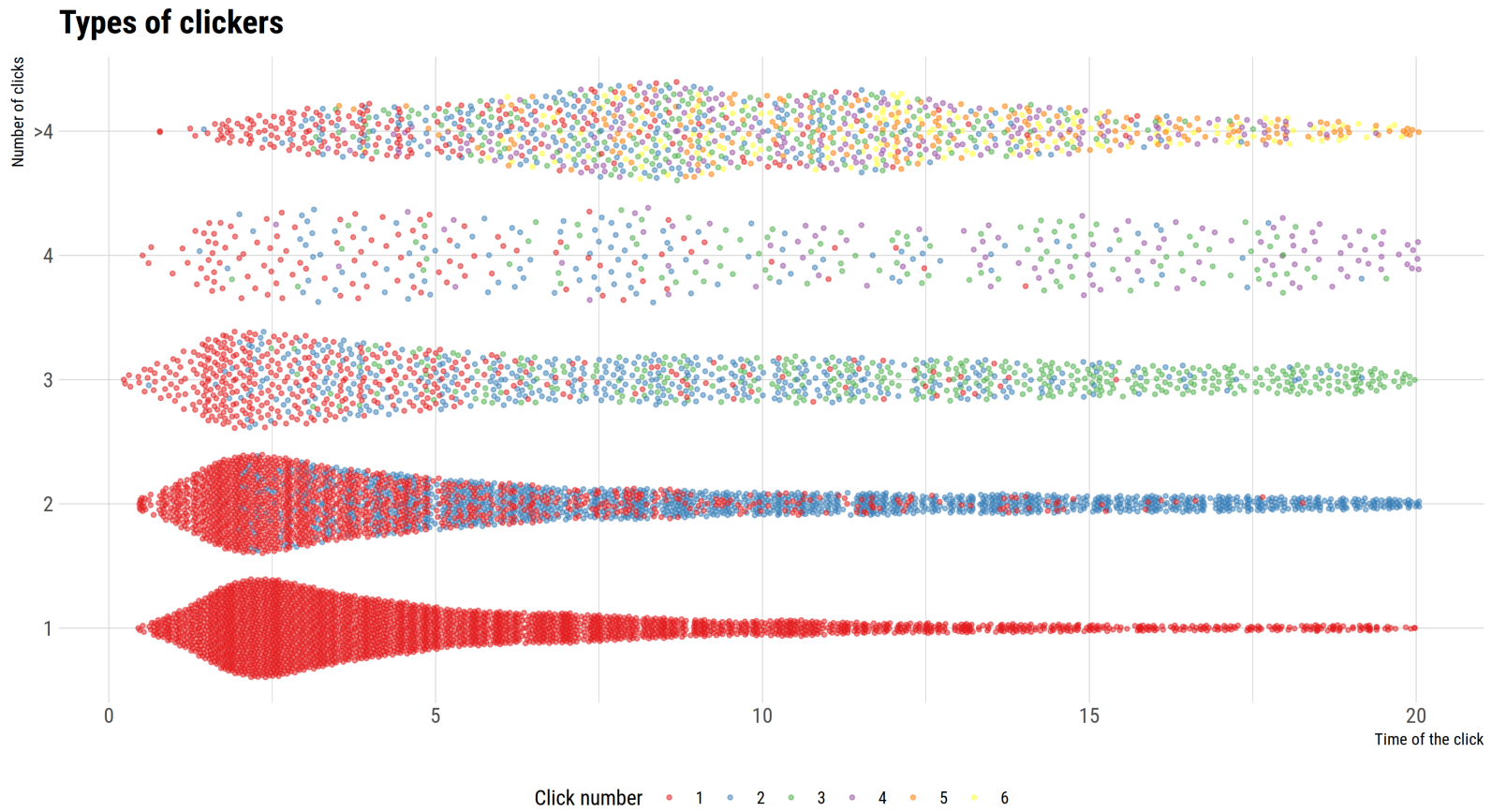
Maximisers do not use dominance, estimate value of each offer, choose best estimate

Fast *then* Slow (**HM**): first H, then M

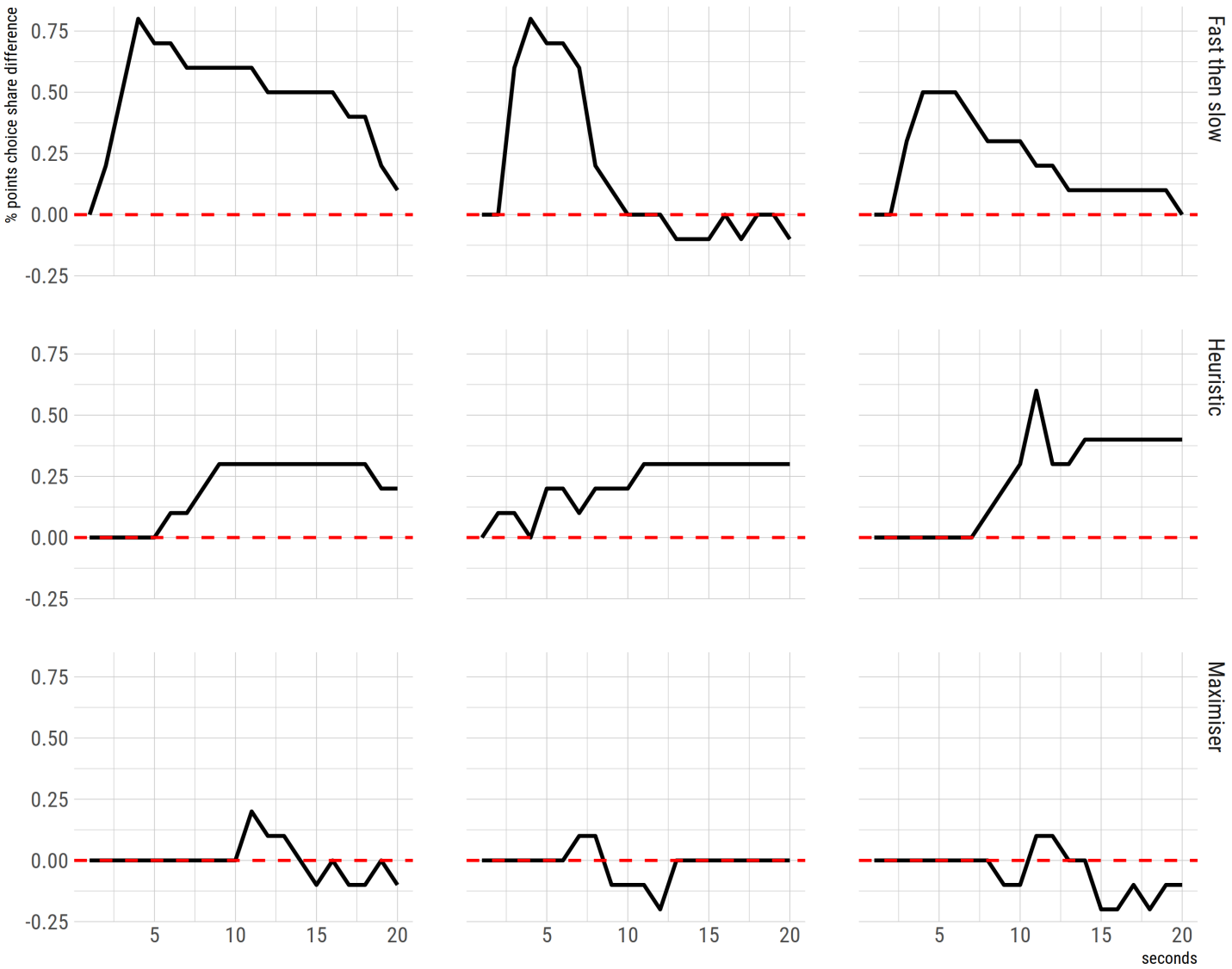
Results, 2: there are 3 decision types



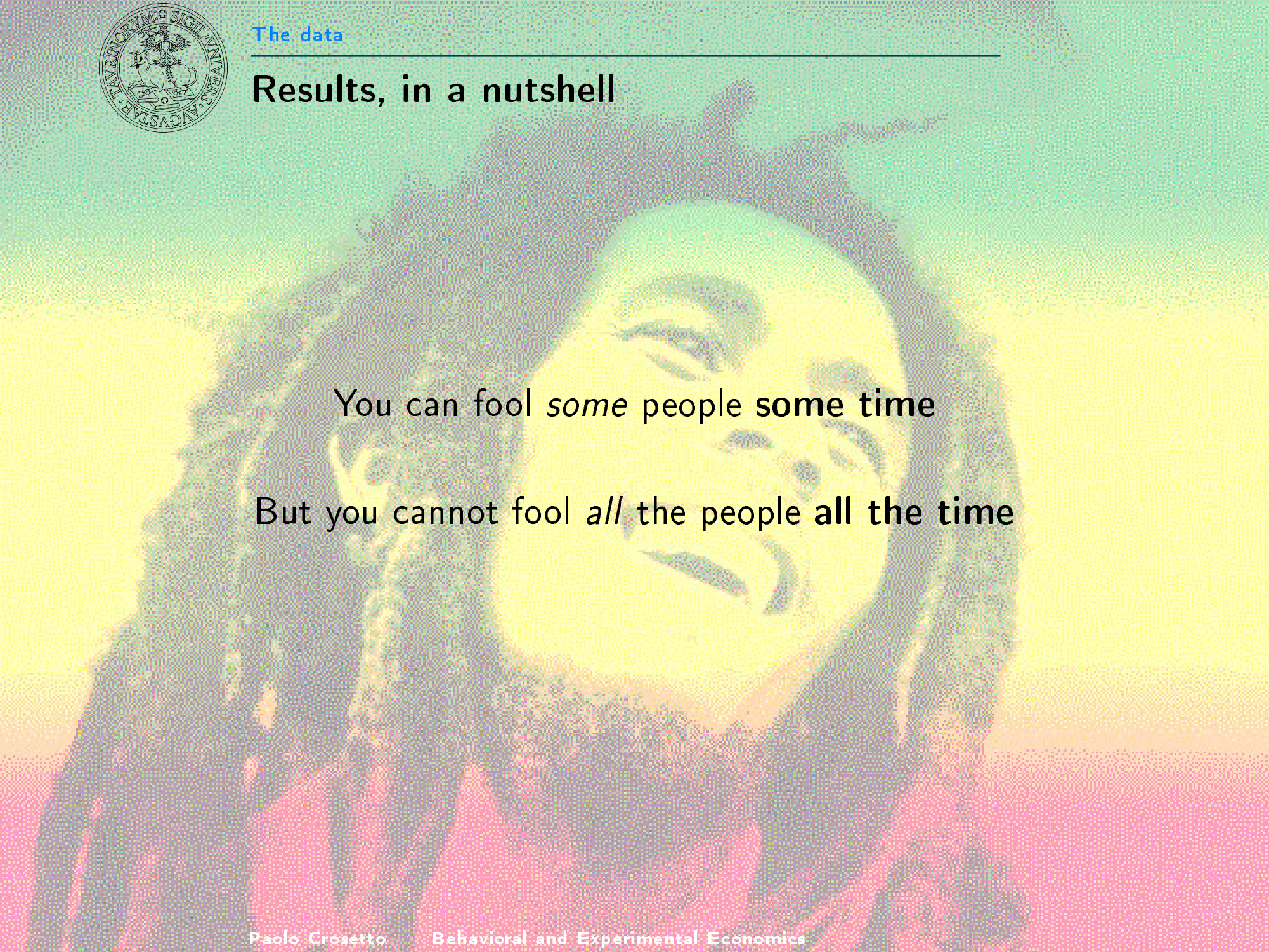

Number of clicks per decision screen
Count
3000
2000
1000
0
1
2
3
4
>4
Number of clicks


Types of clickers
Number of clicks
>4
4
3
2
1
0
5
10
15
20
Time of the click
Click number
1
2
3
4
5
6

ADE dynamics by type



Results, in a nutshell



You can fool *some* people **some time**

But you cannot fool *all* the people **all the time**