Search dynamics in consumer choice

Silvio Ravaioli

C&D Lab meeting, March 2, 2018

General motivation

- Search Dynamics in Consumer Choice under Time Pressure: An Eye-Tracking Study (Reutskaja, Nagel, Camerer, and Rangel) AER 2011.

- Consumers in the supermarket face decision problems under choice overload and time pressure.
  1. What are the computational processes during the search and decision processes? Are they compatible with standard economic search models?
  2. How do the processes, and their performance, change with the number of options?
  3. Do the computational processes exhibit systematic biases?

- Other natural questions
  1. How do the processes, and their performance, change with the degree of time pressure?
  2. How does the consumer's perception of own decisions change with the amount of time/products?

Reutskaja et al., 2011

- Experimental version of the consumer's supermarket problem.
- Hungry subjects are presented with sets of 4, 9, or 16 familiar snack items and are asked to make a choice within three seconds.
- Behavioral and eye-tracking data
- Compare the performance of three competing models:
  1. Optimal dynamic search with zero search costs
  2. Satisficing model
  3. Hybrid model in which subjects search for a random amount of time, which depends on the value of the encountered items, and then choose the best-seen item.

Experimental design

- Participants: 41 hungry Caltech undergraduate students
- Stimuli: 70 popular snacks
- Incentivized task: \$ 35 + snack from random trial

1. Liking-rating task (once per snack, scale: -5 to +5)
2. Choice task (75 choice sets = 25×3)

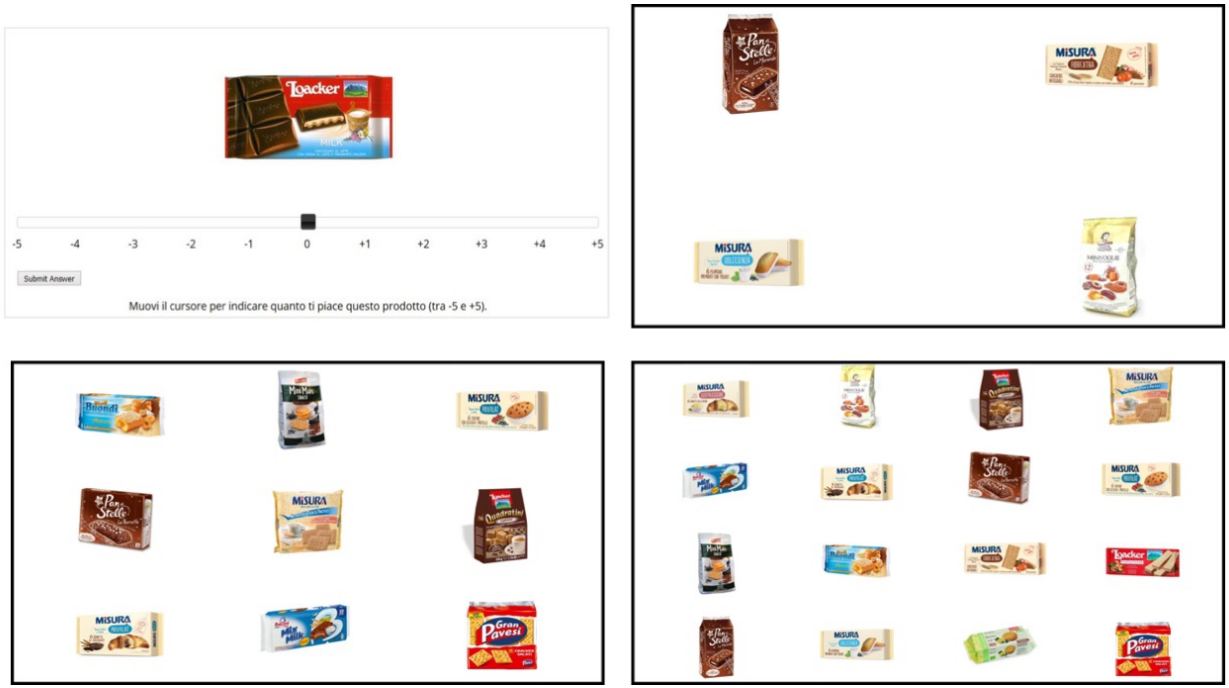
Set size 4

Set size 9

Set size 16

Modified experimental design

1. Liking-rating task (unchanged, Top-left figure)
2. Choice task (60 choice sets $= 10 \times 3$ size $\times 2$ time conditions)



- 2 time conditions: 3 vs 5 seconds (red/blue FP and frame color)
- Immediately after each choice: "How confident do you feel about the choice you made?" (scale: 1 to 5)

Modified experimental design

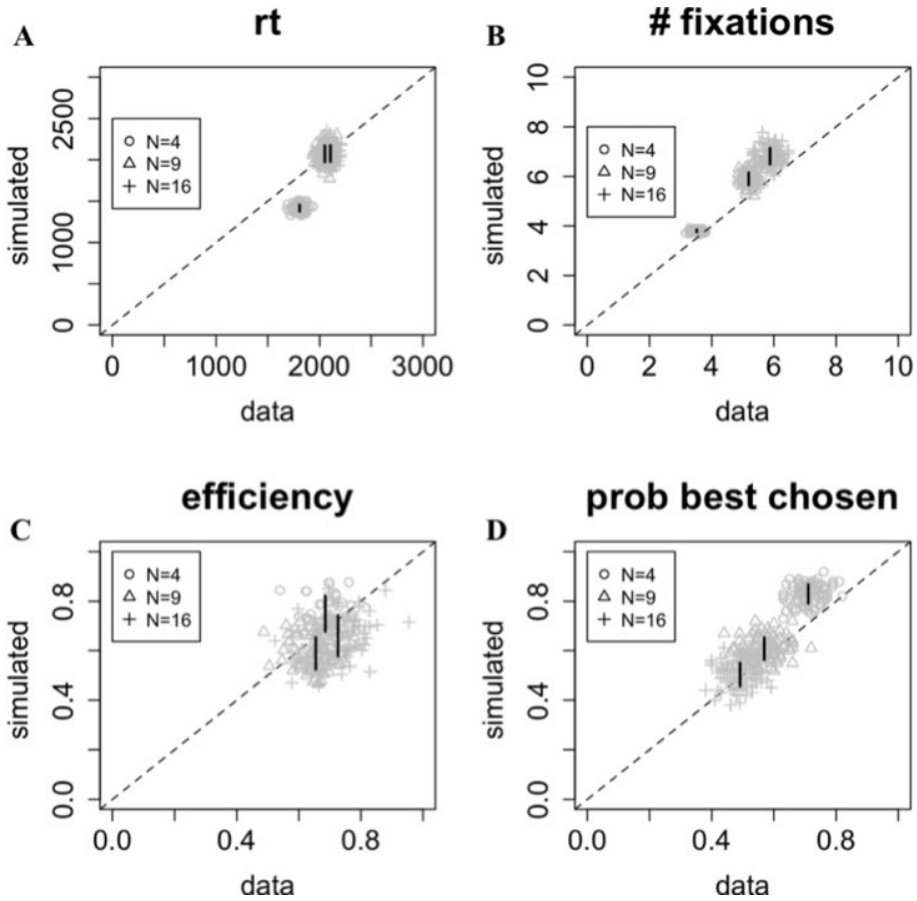
- Stimuli: 70 popular snacks
- Non-incentivized task (sadly)
- Other differences: frame color (instead of beep) indicates one second left, time is fixed (instead of upper bound), no use of keyboard
- Participants: 58 hungry Pisa University students
- 45 participants performed the task once (daytime)
- 13 participants performed the task four times: 2 evening + 1 morning (sleep deprived = SD) + 1 morning (NSD), randomized order
- 20 min task, part of a 60 min session (second out of three tasks, fixed order)

Reutskaja et al.: Main results

- Results support the hybrid model over the other two. A calibration of the hybrid model fits well time and choice quality properties of the observed data.
- Additional products shorten the duration of fixations by 60 ms and increase searching time by 250 ms (higher number of options that are sampled before making a choice). Small positive impact on the quality of the choices.
- Systematic bias to look first and more often at items that are placed in certain regions of the display, which they also end up choosing more often. In the case of $N = 9$ an item in the center of the display is 60 percent more likely to be selected.

Reutskaja et al.: Main results

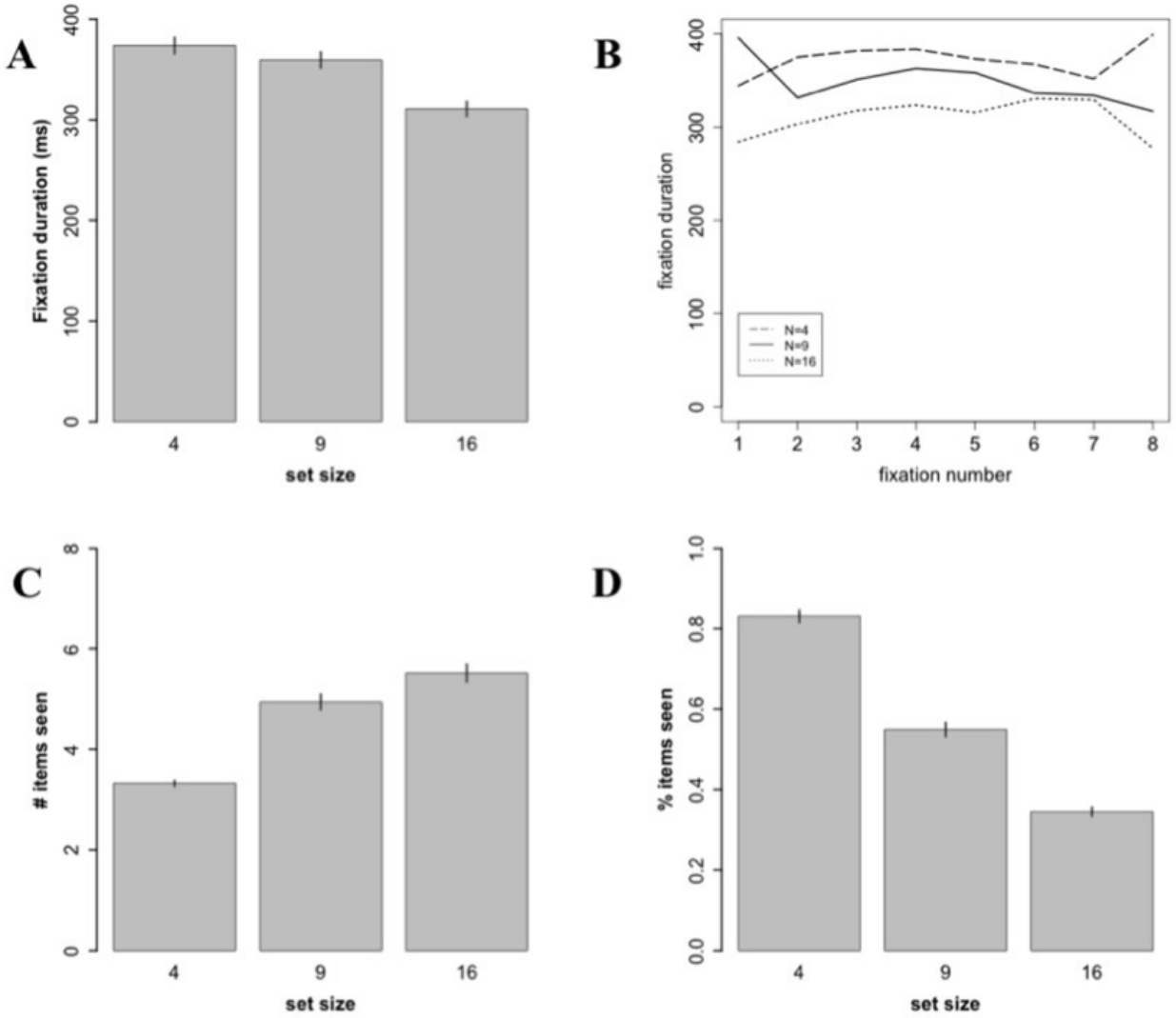
Quantitative fits of the calibrated model.



Simulated vs. actual reaction times, number of fixations per-trial, choice efficiency probability of best observed item is chosen.

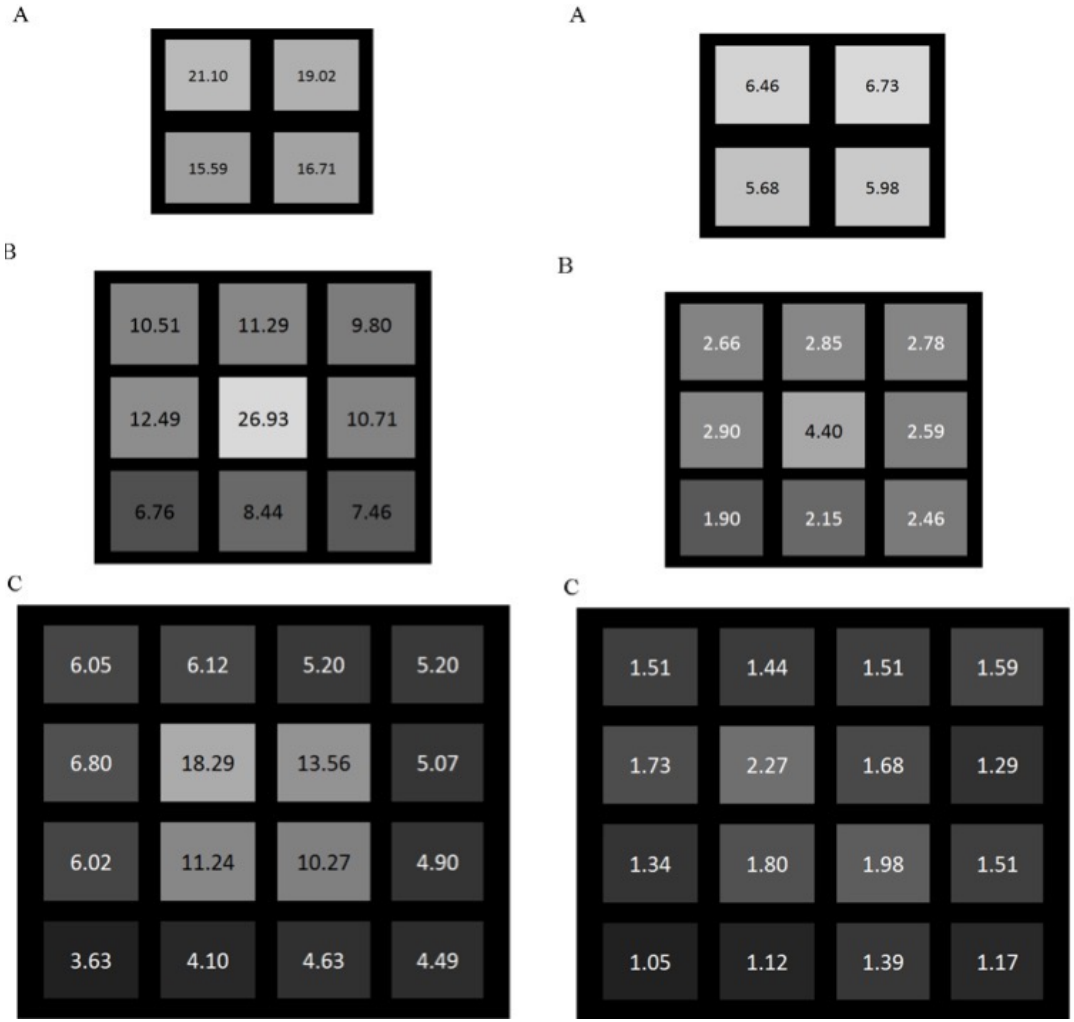
Reutskaja et al.: Main results

Effect of the set size on search and choice



Reutskaja et al.: Main results

Fixations (left) and Choice (right), average number per cell.



Replication of results

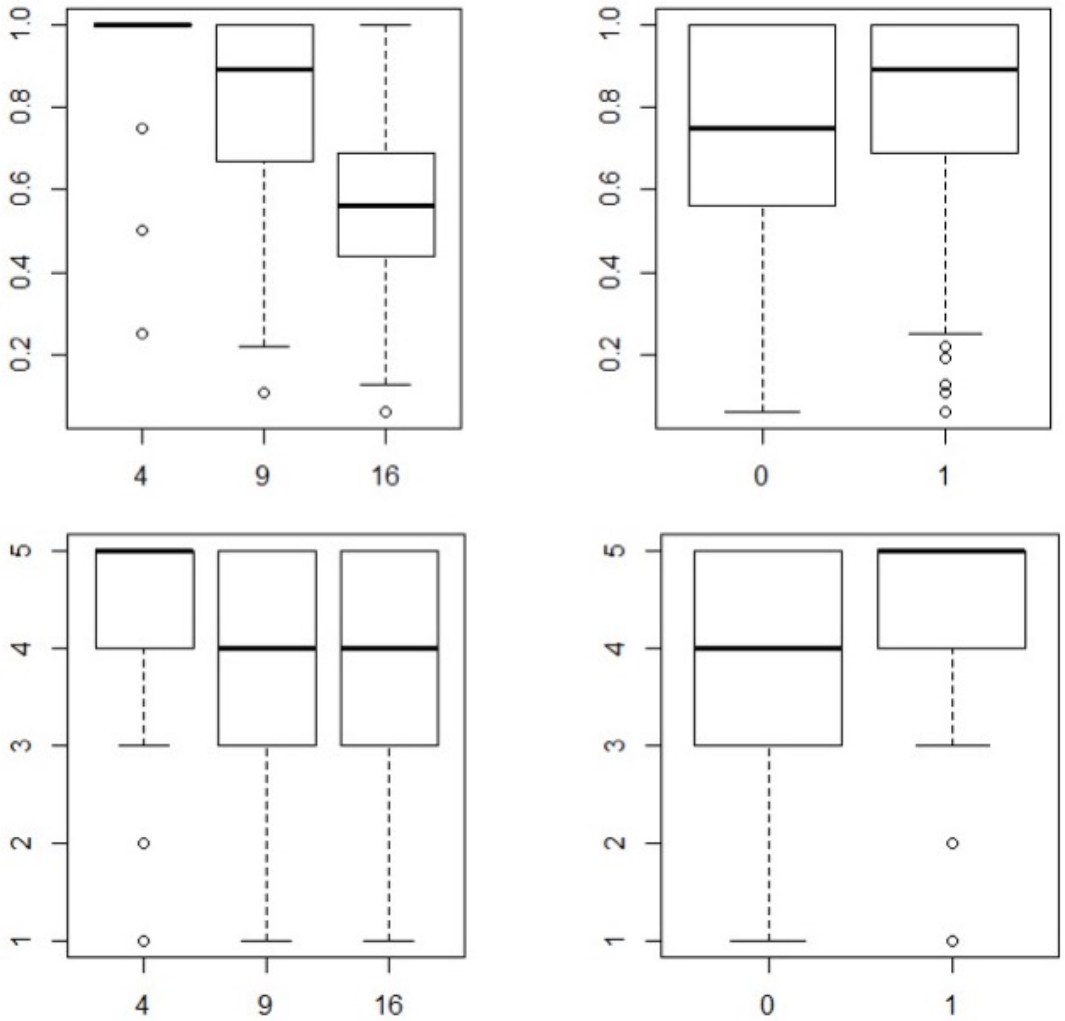
Percentage of trials in which the subject observes (left) or chooses (right) one among the best choices available. Results displayed by duration of the trial (short = 3 sec, long = 5 sec) and number of displayed options (4, 9, or 16 items).

Observe	**Short**	**Long**
4	69.00	72.00
9	58.25	59.00
16	40.25	46.50

Choose	**Short**	**Long**
4	70.00	70.75
9	61.25	62.25
16	51.00	54.00

Replication of results

Fraction of observed items (top panel) and average confidence score (bottom panel), grouped by number of items (left) and duration (right).



Replication of results

Percentage of choices conditional on position (not controlled by average score).

Roadmap for the new dataset?

- Replicate the analysis of the original paper
- Potential issue: no endogenous reaction time (use "reasonable" assumption about final fixation?)
- Complete simple analysis for time duration and confidence level
- Fitting of calibrated hybrid model with two time conditions
- Add alternative models for comparison