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# Irrational Maximisers: Are behavioural maximisers more prone to biased judgements than their satisficing counterparts?

Shashwat Pande, Nadia Papamichail & Peter Kawalek

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# Simon's Psychological Realism

- "...in an information-rich world, the wealth of information means a dearth of something else: a scarcity of whatever it is that information consumes. What information consumes is rather obvious: it consumes the attention of its recipients. Hence a wealth of information creates a poverty of attention and a need to allocate that attention efficiently among the overabundance of information sources that might consume it (Simon 1971, pp. 40–41)."

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# The Paradox of Choice

- Simon's (1944, 55, 56)."satisficing" as a critique of the expected utility maximization theorem as a descriptive model.
- In many ways foundational to modern behavioural sciences.
- Formally similar- accommodates a 'search cost'.

- **Maximisers**- want the "best"
- **Satisficers**- set thresholds for "good enough"


CURRY PASTE
TABASCO
SOUP PASTE

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# The Paradox of Choice

- Schwartz et al. (2002) operationalize Simon's initial distinction between satisficing and maximising as a behavioral scale.
- A plethora of studies suggest that maximisers want the best but suffer worse affective outcomes (Iyengar et al., 2006; Sparks et al., 2012; Roets et al., 2012; etc.).
- At the same time they make an a-priori assumption about maximizers being more rational and deliberative.

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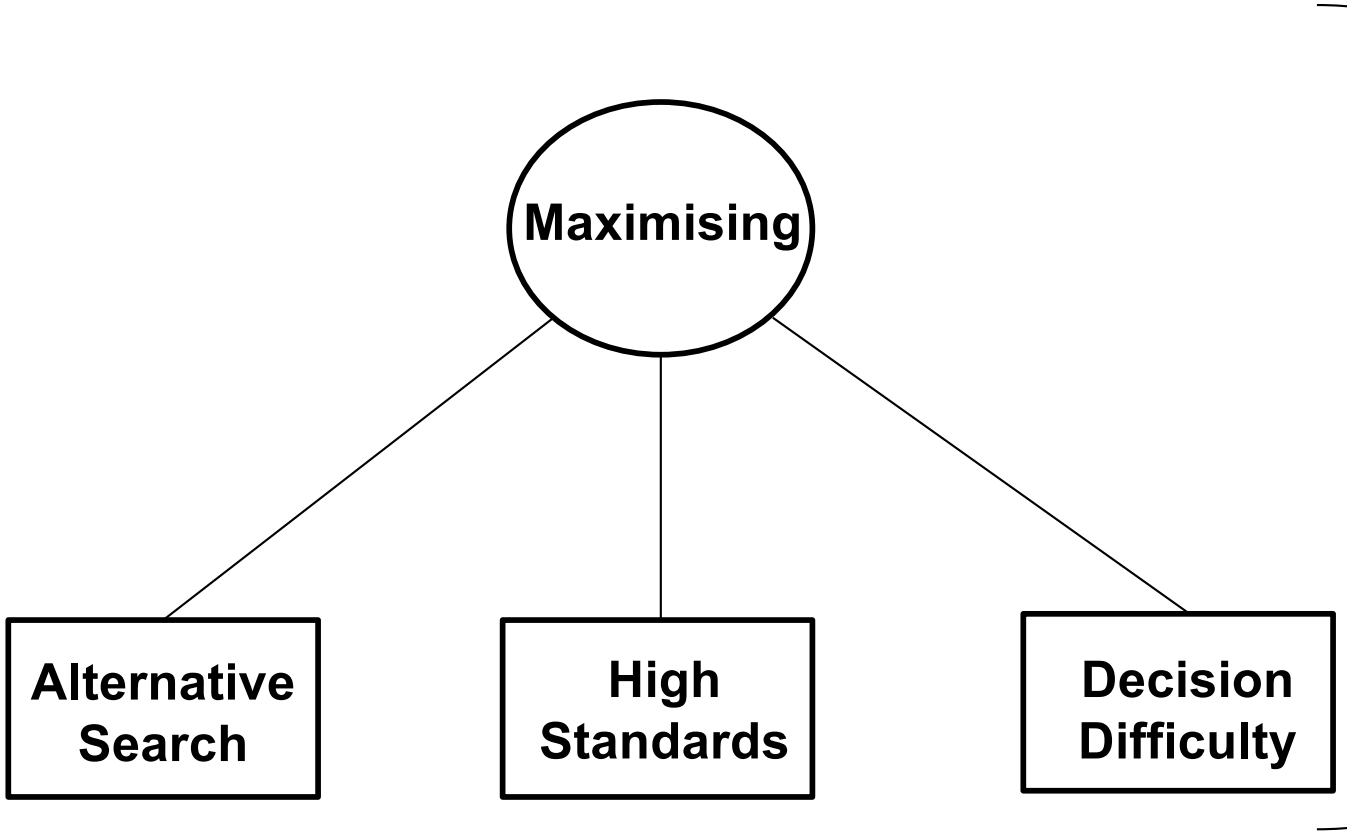
# The Paradox of Choice




- Arbitrary Variety Seeking.
- Availability of Easily Comparable Attributes.
- Representative choice sets.

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# The Paradox of Choice

- If Simon's initial intuition about the practical rationality of satisficing is accurate– behavioural maximising is inconsistent with this expectation.
- Shouldn't an emphasis on searching for extensive information, seeking more variety and representative choices negatively affect individuals' ability to make better judgements and engage in deliberative information processing in light of information abundance?

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# Irrational Maximisers

- On balance, the latter view seems to be more consistent with a bounded-rational view of decision processes.
- A denial of bounded-rationality is a central aspect of a maximising decision making orientation.
- RQ: Are maximisers poorer decision makers than their satisficing counterparts?

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# Method

- Three experiments (N = 1143):
- **Study 1:** N = 346 participants
  - Do maximisers express a lower preference for analytical information processing?
- **Study 2:** N = 538 participants
  - Are maximisers more prone to biased judgements than their satisficing counterparts?
- **Study 3:** N = 259 participants
  - Do maximisers' adherence to biased judgments persist in situations where a biased choice is dominated by a normatively superior alternative?

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# Measures

- **Maximising** tendency (Schwartz et al., 2002)
  - E.g. “When I watch TV, I channel surf, often scanning through the available options even while attempting to watch one program.”
- Preference for information processing (REI, Pacini and Epstein, 1999)
  - **Analytical**: E.g. “I usually have clear explainable reasons for my decisions.”
  - **Intuitive**: E.g. “I often go by my instincts when deciding on a course of action.”

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# Measures

- Ratio Bias (**easier access to irrelevant attribute**); Pseudo-diversification (**arbitrary variety seeking**); Gambler's Fallacy, Hot-hand Effect (**representativeness**).

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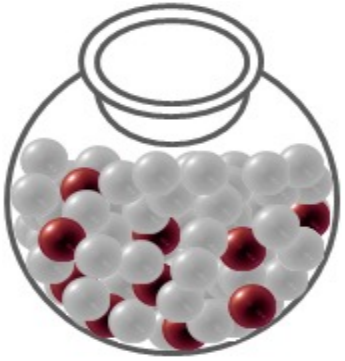
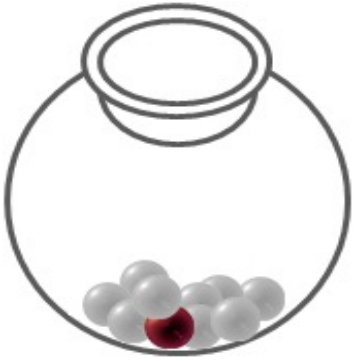
# Easier access to irrelevant attribute – ‘The Ratio Bias (Denes-Raj & Epstein, 1994)’

**Urn A** **(Indifference)** **Urn B**



contains 1000 marbles, 99 of which are red



contains 10 marbles, 1 of which is red

If a red marble is drawn, you win a cash prize.
Which of the urns do you choose?

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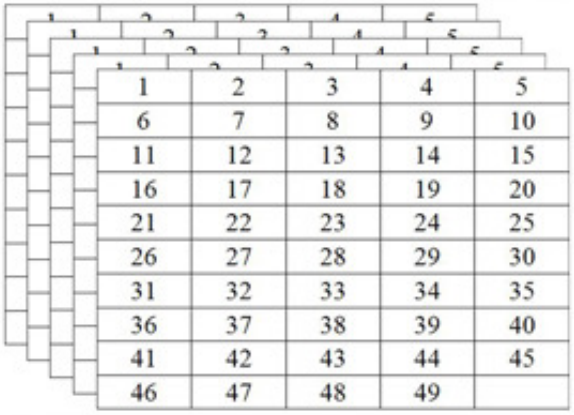
# Arbitrary Variety Seeking – 'Pseudo Diversification (Ayal & Zakay, 2009)'

**Method A** **(Indifference)** **Method B**



| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| 6 | 7 | 8 | 9 | 10 |
| 11 | 12 | 13 | 14 | 15 |
| 16 | 17 | 18 | 19 | 20 |
| 21 | 22 | 23 | 24 | 25 |
| 26 | 27 | 28 | 29 | 30 |
| 31 | 32 | 33 | 34 | 35 |
| 36 | 37 | 38 | 39 | 40 |
| 41 | 42 | 43 | 44 | 45 |
| 46 | 47 | 48 | 49 | |

Pick 5 numbers on 4 tickets

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| 6 | 7 | 8 | 9 | 10 |
| 11 | 12 | 13 | 14 | 15 |
| 16 | 17 | 18 | 19 | 20 |
| 21 | 22 | 23 | 24 | 25 |
| 26 | 27 | 28 | 29 | 30 |
| 31 | 32 | 33 | 34 | 35 |
| 36 | 37 | 38 | 39 | 40 |
| 41 | 42 | 43 | 44 | 45 |
| 46 | 47 | 48 | 49 | |

Pick 6 numbers on 1 ticket

A computer will randomly select five different numbers between 1-49. If you mark at least one of your tickets **with all five numbers** that the computer picks, you win. Which method do you choose?

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# Representativeness – 'Gambler's fallacy (Kahneman & Tversky, 1972)'


A fair coin has equal probabilities of 50% for a Heads or Tails outcome. Imagine that you have just observed three tosses of a fair coin and the outcome was Tails all three times (i.e. T-T-T). Given your observations, how likely do you think that the next outcome will be:

Heads (0-100) % ⟶ *Negative recency*
Tails (0-100) %

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# Representativeness – 'Hot hand effect (Gilovich, Tversky & Vallone, 1972)'


In tennis, an ace is a point winning legal serve that is untouched by the receiver. Maria is well known for her excellent serves and on a regular day, she hits an ace 45% of the time. Imagine that in the game that she is currently playing, she just hit two aces in a row. How likely do you think her next serve will be an ace?

Ace (0–100) % ⟶ *Positive recency*

Not Ace (0–100) %

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# Method

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# Study 1

- Do maximisers express a lower preference for analytical information processing?

**Table 1.** Multiple regression results for study 1 estimating the relationship between analytical information processing preference and maximising tendency

| | Estimate for maximising tendency | Collinearity statistics | |
|---|---|---|---|
| | *B* (SE) | VIF | Tolerance |
| Information processing preference | | | |
| Analytical | –.18 (.07)** | 1.06 | .94 |
| Intuitive | -.03 (.07) | 1.09 | .91 |
| Demographic controls | | | |
| Age | –.27 (.05)*** | 1.05 | .95 |
| Education | .19 (.06)*** | 1.04 | .96 |
| Gender (male=0, female=1) | .00 (.12) | 1.06 | .95 |
| Constant | 5.48 (.48)*** | | |
| $R^2$ | .15 | | |

***p < .001, * p < .05

*B* = unstandardized regression coefficient, SE = standard error, VIF = variance inflation factor, Tolerance = 1/VIF.

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# Study 2

Are maximisers more prone to biased judgements than their satisficing counterparts?

Across all tasks…

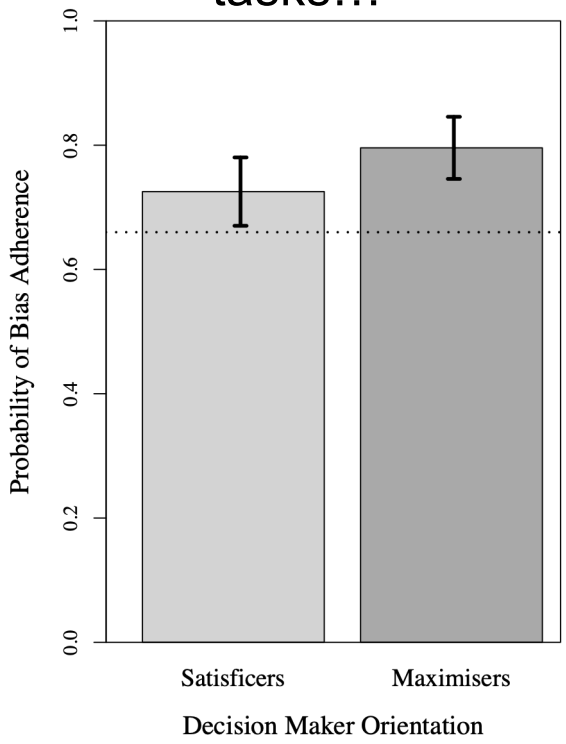


**Table 2.** Binomial logistic regression results from study 2a predicting bias adherence across all tasks

| | Estimates for rate of overall bias adherence | | | Collinearity statistics | |
|---|---|---|---|---|---|
| | *B* (SE) | OR | 95% CI | VIF | Tolerance |
| Key predictor | | | | | |
| Maximising | .19 (.05)*** | 1.21 | 1.08, 1.33 | 1.15 | .87 |
| Information processing preference | | | | | |
| Analytical | –.18 (.06)** | .84 | .74, .95 | 1.09 | .92 |
| Intuitive | .15 (.06) ** | 1.16 | 1.04, 1.30 | 1.09 | .92 |
| Demographic controls | | | | | |
| Age | .05 (.05) | 1.05 | .95, 1.16 | 1.12 | .90 |
| Education | –.01 (.05) | .98 | .89, 1.08 | 1.03 | .97 |
| Gender (male=0, female=1) | .01 (.05) | 1.01 | .82, 1.25 | 1.03 | .97 |
| Constant | .49 (.49) | | | | |
| *Model fit* | | | | | |
| Model $\chi^2(df)$ | 29.27 (6), p < .001 | | | | |
| H-L $\chi^2(df)$ | 10.02(7), p = .187, ns | | | | |
| $R^2$ (McFadden) | .03 | | | | |
| $R^2$ (Nagelkerke) | .08 | | | | |

***p < .001, * p < .05

*B* = unstandardized regression coefficient, SE = standard error, OR = odds ratio, 95% CI = confidence interval for OR, VIF = variance inflation factor, Tolerance = 1/VIF, Model $\chi^2$ = Likelihood-ratio test, H-L $\chi^2$ = Hosmer-Lemeshow test, $R^2$ (McFadden) = McFadden pseudo-$R^2$, $R^2$ (Nagelkerke) = Nagelkerke pseudo-$R^2$.

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# Study 2

**Table 4.** Multinomial logistic regression results from study 2b. Models (a)-(d) predict odds of picking the normatively expected choice or exhibiting a bias in the opposite direction compared to the reference category.

| | (a) Ratio Bias | | | | (b) Pseudo Diversification | | | | (c) Gambler's Fallacy | | | | (d) Hot Hand Effect | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Reference category: | Larger numerator (n = 339) | | | | Diversified choice (n = 309) | | | | Negative recency (n = 171) | | | | Positive recency (n = 290) | | | |
| | Normative choice (n = 83) | | Smaller numerator (n = 116) | | Normative choice (n = 63) | | Non-diversified choice (n = 166) | | Normative choice (n = 293) | | Positive recency (n = 74) | | Normative choice (n = 84) | | Negative recency (n = 164) | |
| | B (SE) | OR | B (SE) | OR | B (SE) | OR | B (SE) | OR | B (SE) | OR | B (SE) | OR | B (SE) | OR | B (SE) | OR |
| *Focal Predictor* | | | | | | | | | | | | | | | | |
| Maximising | −.37** (.13) | .68 | −.19 (.12) | .83 | −.63*** (.15) | .53 | −.75*** (.11) | .47 | −.26** (.10) | .77 | −.41** (.14) | .66 | −.34** (.13) | .71 | −.22* (.10) | .80 |
| *Information processing preference* | | | | | | | | | | | | | | | | |
| Analytical | .47** (.16) | 1.61 | −.10 (.13) | .90 | .02 (.16) | .98 | −.19 (.12) | .82 | .29* (.12) | 1.33 | −.39* (.17) | .68 | .29 (.16) | 1.34 | .39** (.12) | 1.48 |
| Intuitive | −.38* (.14) | .68 | .08 (.13) | 1.09 | −.24 (.16) | .79 | −.21 (.12) | .81 | −.11 (.12) | 1.11 | .20 (.17) | 1.22 | −.19 (.15) | .83 | −.10 (.11) | .91 |
| *Demographic controls* | | | | | | | | | | | | | | | | |
| Age | .09 (.12) | 1.10 | .09 (.11) | .87 | .05 (.13) | 1.05 | −.13 (.10) | .88 | −.14 (.10) | .87 | −.06 (.14) | .95 | −.29* (.13) | .75 | .07 (.10) | 1.07 |
| Education | −.03 (.11) | .97 | −.10 (.10) | .90 | −.09 (.13) | 1.09 | −.15 (.10) | .61 | .05 (.09) | 1.05 | .04 (.13) | 1.09 | −.25* (.12) | .78 | −.25** (.09) | .78 |
| Gender | −.10 (.26) | .91 | −.56* (.22) | .57 | −.02 (.29) | 1.02 | −.49* (.21) | .86 | −.06 (.20) | .94 | .08 (.29) | 1.04 | −.36 (.26) | .70 | −.36 (.21) | 1.03 |
| Constant | −.34 (1.20) | | .87 (1.02) | | 2.06 (1.42) | | 5.78*** (1.04) | | .10 (.95) | | 1.85 (1.31) | | 1.57 (1.18) | | −.19 (.96) | |

*B* = unstandardized regression coefficient, SE = standard error, OR = odds ratio.

***p < .001, **p < .01, *p < .05

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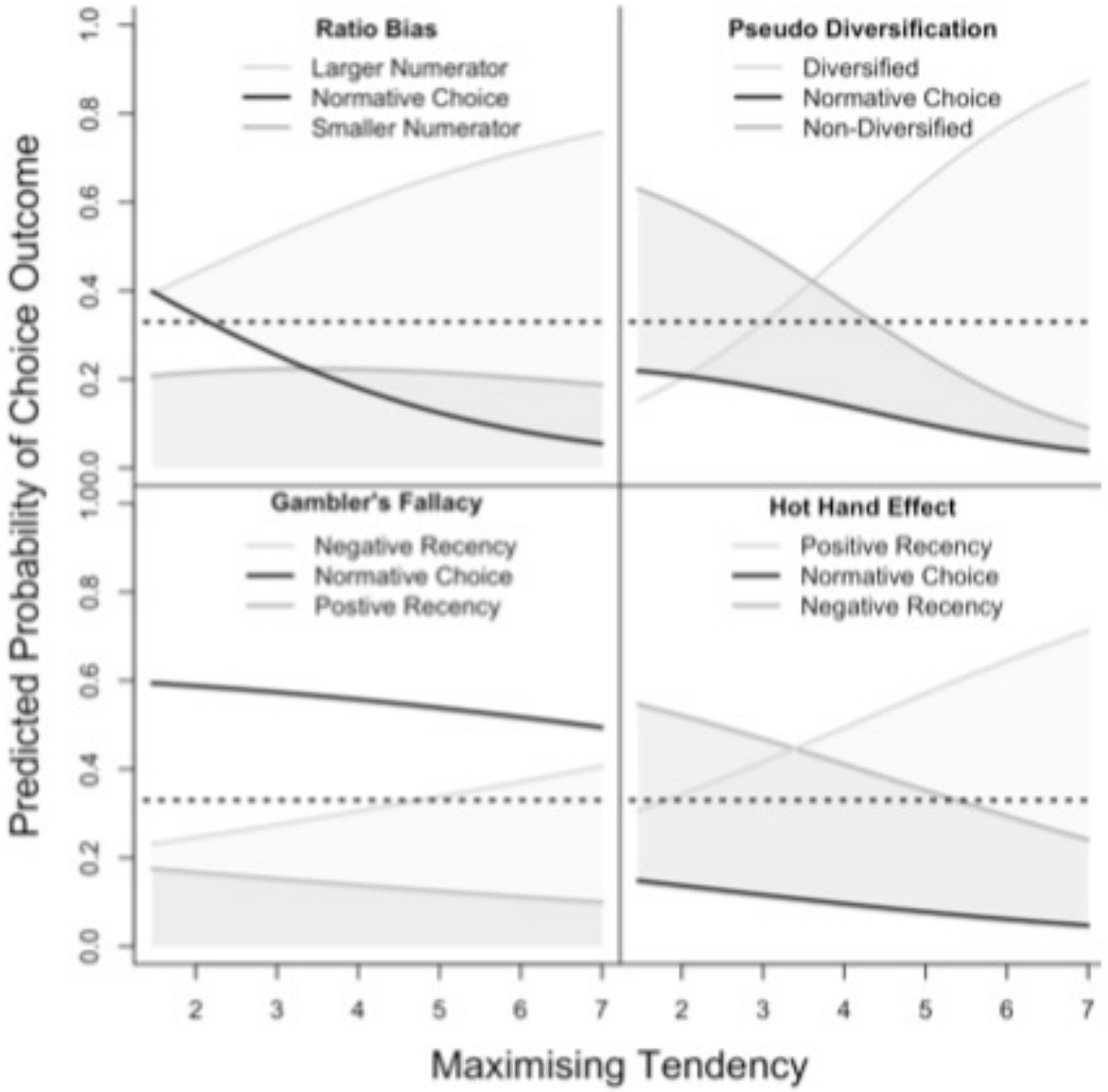
# Study 2

Pattern of results for individual tasks…



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# Study 3

Do maximisers' adherence to biased judgments persist in situations where a biased choice is dominated by a normatively superior alternative?

**Table 5.** Logistic regressions predicting overall and individual bias adherence for study 3.

| | Overall Bias Adherence | | (a) Ratio Bias | | (b) Pseudo Diversification | | (c) Gambler's Fallacy | | (d) Hot Hand Effect | |
|---|---|---|---|---|---|---|---|---|---|---|
| | B (SE) | OR [95% CI] | B (SE) | OR [95% CI] | B (SE) | OR [95% CI] | B (SE) | OR [95% CI] | B (SE) | OR [95% CI] |
| Key predictor | | | | | | | | | | |
| Maximising | .53*** (.07) | **1.69 [1.47, 1.95]** | .44*** (.14) | **1.56 [1.18, 2.06]** | .63*** (.15) | **1.89 [1.40, 2.55]** | .74*** (.15) | **2.09 [1.55, 2.83]** | .39** (.14) | **1.48 [1.13, 1.95]** |
| Information processing preference | | | | | | | | | | |
| Analytical | −.40*** (.08) | **.67 [.57, .79]** | −.44** (.17) | **.64 [.47, .89]** | −.82*** (.19) | **.44 [.30, .64]** | .03 (.16) | 1.03 [.75, 1.40] | −.48** (.16) | **.62 [.45, .85]** |
| Intuitive | .20** (.07) | **1.22 [1.06, 1.41]** | .40** (.15) | **1.49 [1.11, 2.01]** | .42** (.16) | **1.53 [1.11, 2.10]** | −.07 (.14) | .94 [.71, 1.24] | .13 (.14) | 1.13 [.86, 1.50] |
| Demographic controls | | | | | | | | | | |
| Age | .06 (.06) | 1.06 [.94, 1.19] | .29** (.12) | **1.34 [1.06, 1.69]** | −.14 (.12) | .87 [.68, 1.11] | .02 (.12) | 1.02 [.81, 1.28] | .04 (.12) | 1.04 [.83, 1.31] |
| Education | .09 (.06) | 1.09 [.96, 1.23] | .25* (.13) | 1.29 [1.00, 1.66] | .19 (.13) | 1.21 [.93, 1.57] | .04 (.13) | 1.04 [.81, 1.34] | −.12 (.13) | .89 [.69, 1.14] |
| Gender (male=0, female=1) | .05 (.14) | 1.06 [.81, 1.38] | .17* (.13) | 1.18 [.69, 2.01] | −.13 (.29) | .88 [.50, 1.55] | .16 (.28) | 1.17 [.68, 2.02] | .01 (.27) | 1.01 [.69, 1.14] |
| Constant | -1.48* (.64) | | −3.37* (1.32) | | −.66 (1.35) | | −2.89* (1.35) | | .74 (1.26) | |
| Model fit | | | | | | | | | | |
| Model $\chi^2(df)$ | 100.67 (6), p < .001 | | 30.47 (6), p < .001 | | 54.77 (6), p < .001 | | 30.01 (6), p < .001 | | 20.87 (6), p = .002 | |
| H-L $\chi^2(df)$ | 10.16 (7), p = .180, ns | | 10.25 (7), p = .175, ns | | 6.17 (7), p = .520, ns | | 5.15 (7), p = .642, ns | | 7.99 (7), = .334, ns | |
| $R^2$ (McFadden) | .07 | | .08 | | .15 | | .09 | | .06 | |
| $R^2$ (Nagelkerke) | .12 | | .15 | | .26 | | .15 | | .10 | |

*B* = unstandardized regression coefficient, SE = standard error, OR = odds ratio, 95% CI = 95% confidence interval for OR. Model $\chi^2$ = Likelihood-ratio test, H-L $\chi^2$ = Hosmer-Lemeshow test, $R^2$ (McFadden) = McFadden pseudo-$R^2$, $R^2$ (Nagelkerke) = Nagelkerke pseudo-$R^2$.
*Note*. Significant odds-ratios are in bold. VIFs ranged from 1.04-1.19 and indicated no issues with multicollinearity.
***p < .001, **p < .01, *p < .05

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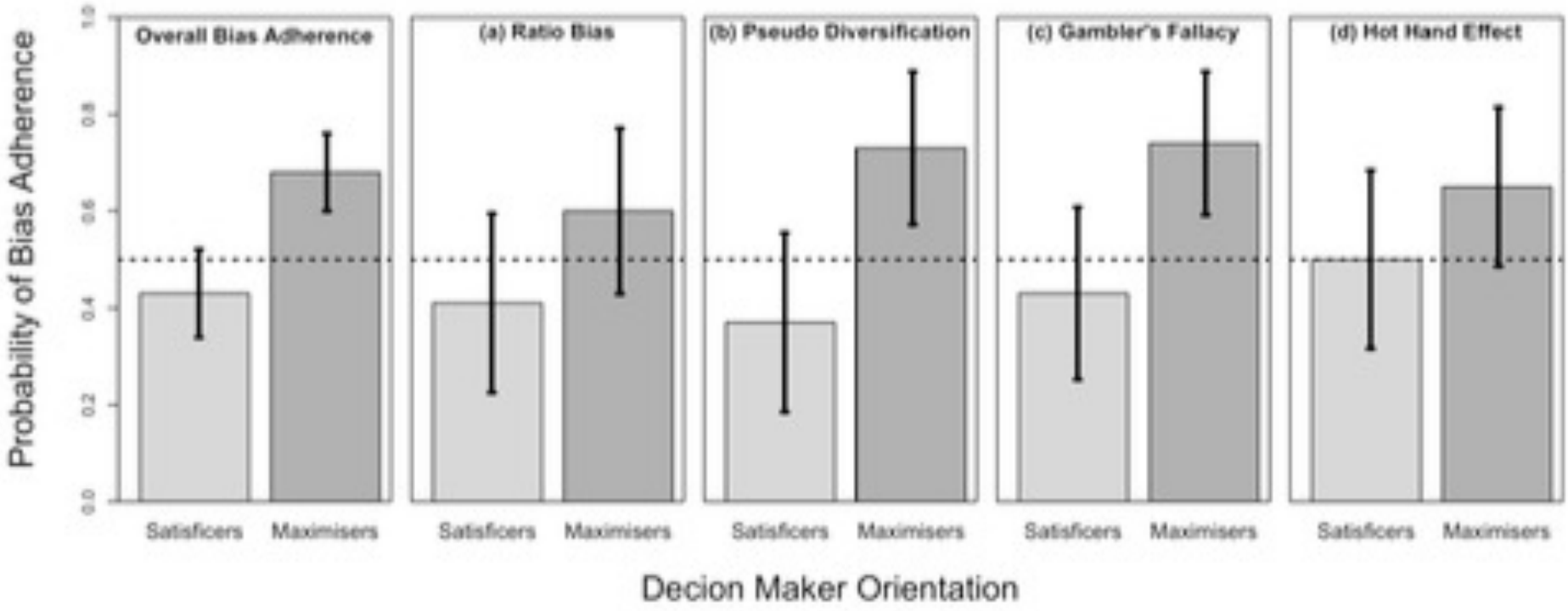
# Study 3

Do maximisers' adherence to biased judgments persist in situations where a biased choice is dominated by a normatively superior alternative?



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# Summary Findings

- Maximisers denial of their limited cognitive resources results in poorer judgements in the cases considered.
- Implication is that behavioural maximisers need to rely on simplifying heuristics to compensate (sic) for their reliance on alternative search *more so* than satisficers.
- Maximising has qualitative implications for choice that go beyond the negative affective outcomes reported in the psychological literature.

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# Theoretical Implications

- Satisficers actually come closer to the normative solution more frequently than their maximising counterparts!
  - What are maximisers doing if they are *not* maximising utility?
  - What does the scale actually measure?
  - Economic or behavioural rationality?

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# Concluding Remarks

- “decision makers can satisfice either by finding optimum solutions for a simplified world, or by finding satisfactory solutions for a more realistic world (Simon, 1978).”

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# Thank you for your Attention!