Fundamental Inconsistency Problem of Multi-dimensional Experiment: how Attention and Salience Distort Experimental Effects

- **Which candidate would you prefer to see as President?**

	Candidate A	Candidate B
Martial Status	married	single
Tax policy	raise 65 % for middle class	raise 9 % for middle class
Military	served	not served
	○	○

Q1: When making the decision, have you considered other attributes like ideology?
Q2: When making the decision, have you paid more weight to Tax policy?

Abstract:

Survey experiment is one of the most popular tools to identify and estimate attribute effects on individual preference. Several recent studies have examined the potential problem of aggregated estimators.

In this study, we show that any experiment under multiple-dimensional decision suffers from a more fundamental inconsistency problem: the experimental individual treatment effect (ITE) is inconsistent with the real-world effect, due to the attention and salience effect.

We formally show that ITE can be amplified, diminished, and even sign reversal in multiple-dimensional experiments. Moreover, the attribute importance can be also reversed. Finally, we provide experimental evidence to illustrate our theoretical results.

Contribution:

reveal and provide a simple mechanism to explain why ITE can be inconsistent under multi-dimensional decision settings.

Framework:

- **Let $u_j(X_j)$ be the utility from attribute $X_j \in X^R = \{X_1, ..., X_N\}$.**
- **Each attribute j is associated with salience $\alpha_j \geq 0$, $\sum_{j=1}^{N} \alpha_j = 1$.**
- **Individual preference is represented by: $V = \sum_{j=1}^{N} \alpha_j u_j(X_j)$.**

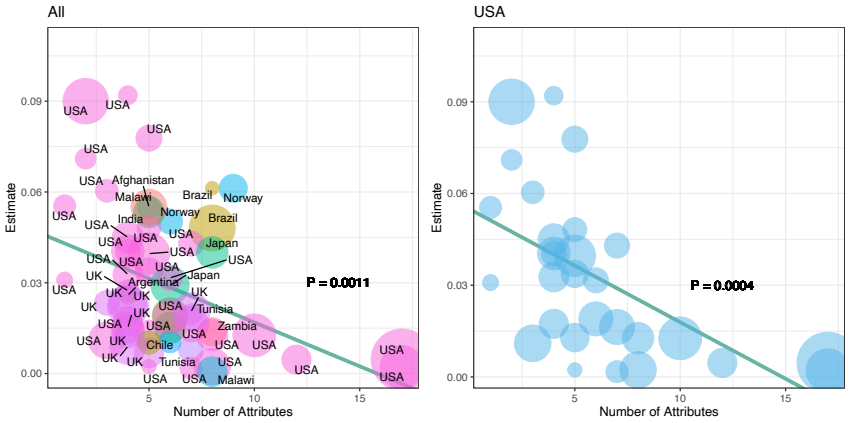
Assumption 1 (Limited Attention).

Consideration set in the experiment $X^e \subset X^R$.

Proposition 1.

Under assumption 1, the ITE (or ATE) for attribute X_j in the experiment compared to the real-world effect, is amplified by $\Delta > 1$.

See Figure below. Data from Schwarz et al. (2022)

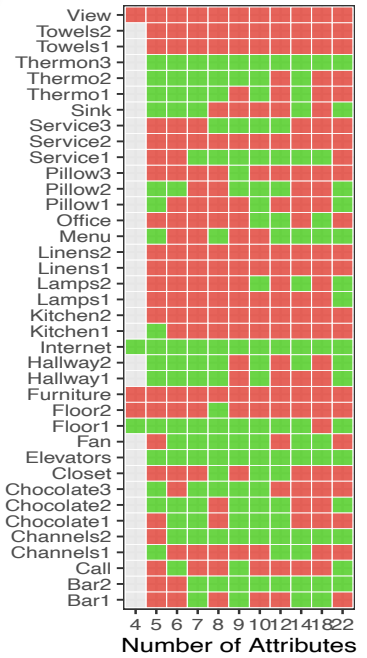


- **Regarding the salience effect, we adapt the psychologically founded framework from Bordalo et al. (2012).**
- **Salience for each attribute X_j is determined by its value x_j and reference point R_j: $\sigma(x_j, R)$.**
- **Original salience α_j will be increased or decreased according to the salience function. For example, if $\sigma(x_j, R_j) > \sigma(x_k, R_k)$, then**

$$V = \frac{\alpha_j}{\alpha_j + \delta\alpha_k} u_j(x_j) + \frac{\delta\alpha_k}{\alpha_j + \delta\alpha_k} u_k(x_k)$$

where $\delta \in (0, 1]$ denotes the severity of salient thinking.

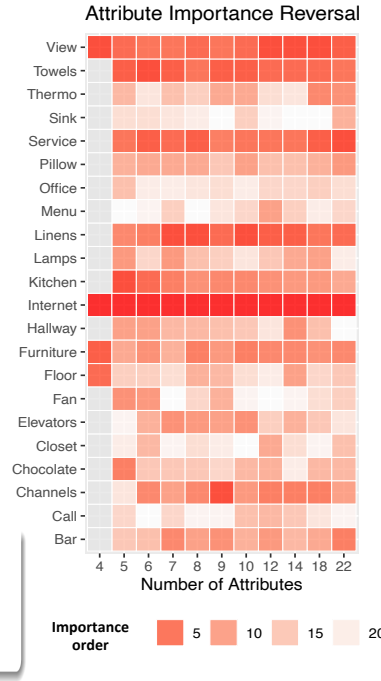
Effect Reversal



Proposition 2. If δ<1, then experimental ITE and real-world ITE can have different signs.

See Figure left. Data from Kansak et al. (2021).

Attribute Importance Reversal



Proposition 3. If δ<1, then experimental attribute Importance can be inconsistent with the real-world importance.

Take-aways:

- **If ITE is inconsistent, then ATE or AMCE is much more unreliable.**
- **When interpreting experimental effects, we need to realize the estimated effect highly depends on the included attributes; the experimental effect may not be informative to the real-world effect!**

References: Bansak, K., Hainmueller, J., Hopkins, D. J., & Yamamoto, T. (2021). Beyond the breaking point? Survey satisficing in conjoint experiments. *PSRM*, *9*(1), 53-71. Bordalo, P., Gennaioli, N., & Shleifer, A. (2012). Salience theory of choice under risk. *qje*, *127*(3), 1243-1285. Schwarz, S., & Coppock, A. (2022). What have we learned about gender from candidate choice experiments? A meta-analysis of sixty-seven factorial survey experiments. *JOP*, *84*(2), 655-668.

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