

# Decoy Effects in a Massive Real-World Retail Dataset

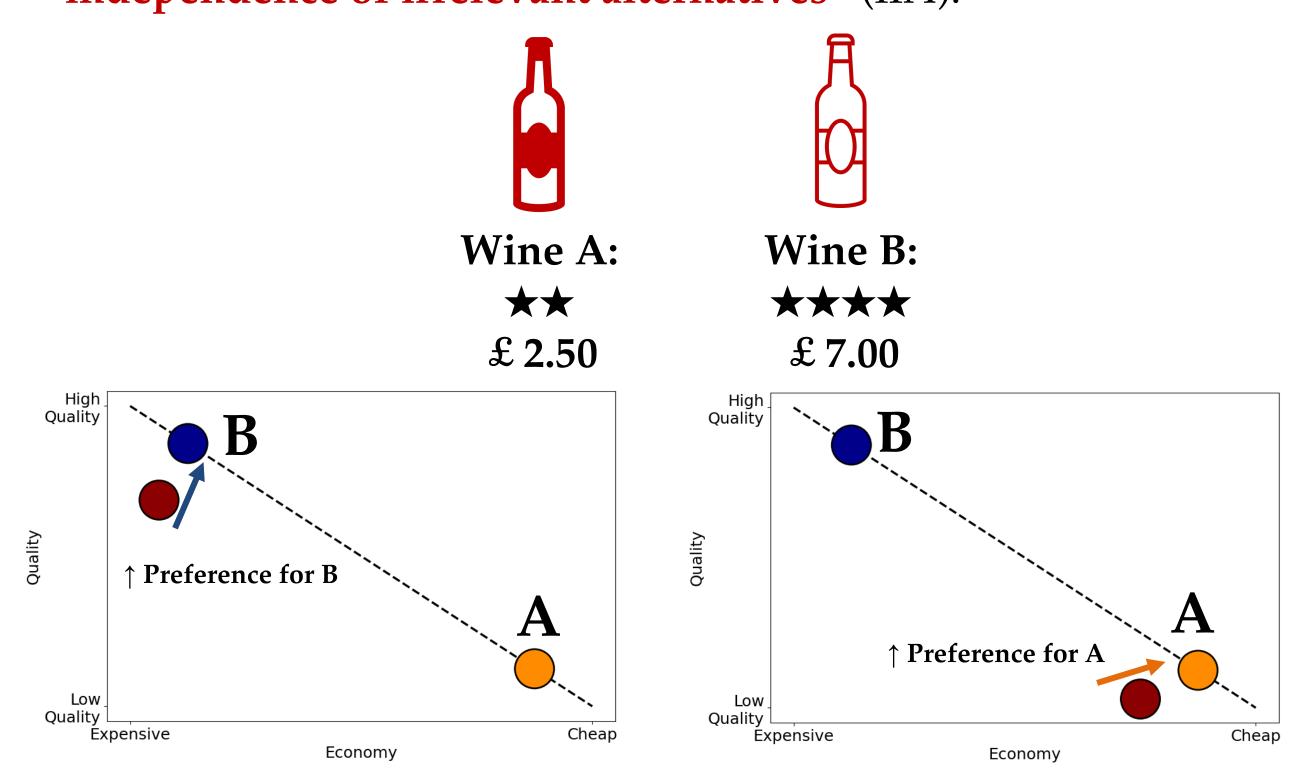
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## Background

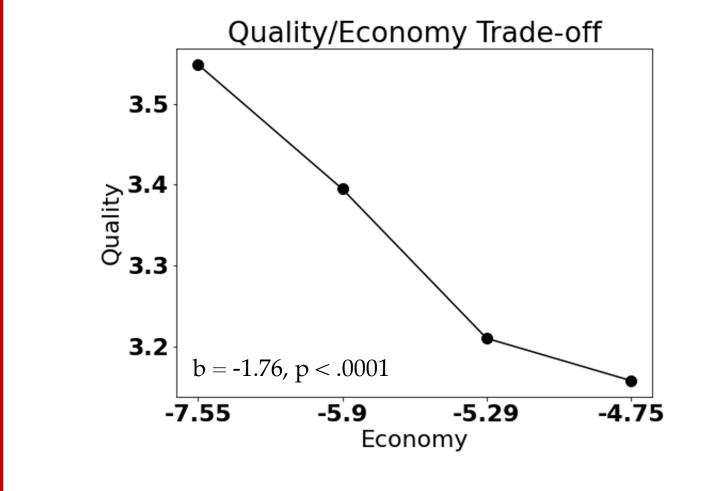
- The *attraction effect* describes a scenario where choice between **two** equally valued options is biased by the addition of a third, irrelevant, alternative—a decoy—that is similar to one of the target items.
- Challenges classical theories of rational choice that assume "independence of irrelevant alternatives" (IIA).

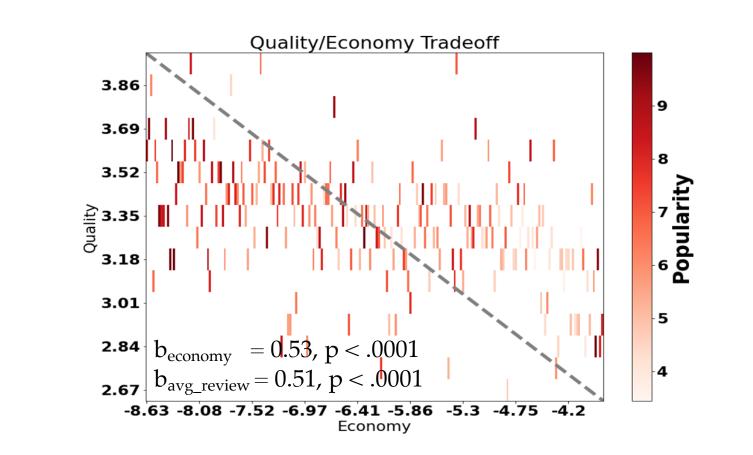


 Despite evidence for attraction effects in tightly constrained lab samples [1,2], demonstrations in real-world consumer choice, where choice sets are large and varied and choices are non-hypothetical [3], remain sparse [e.g., 4].

# Method (cont.)

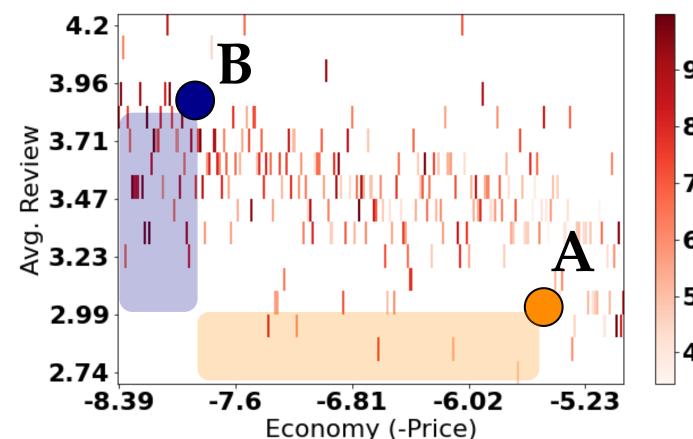
#### Are <u>cheaper</u> wines <u>worse quality</u>?

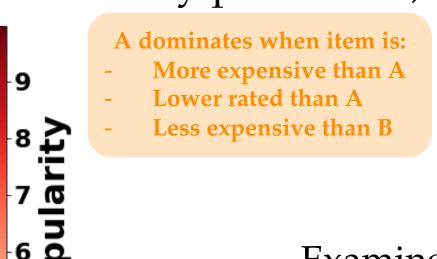




#### How are <u>decoy effects</u> defined in <u>constructed choice sets</u>?

• For popular wines (top 20 most commonly purchased):





More expensive than B Lower rated than B Higher rated than A

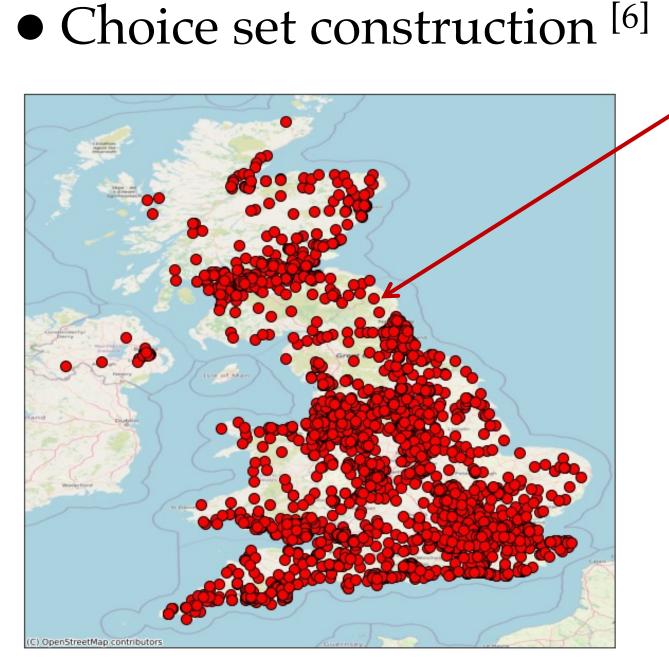
B dominates when item is:

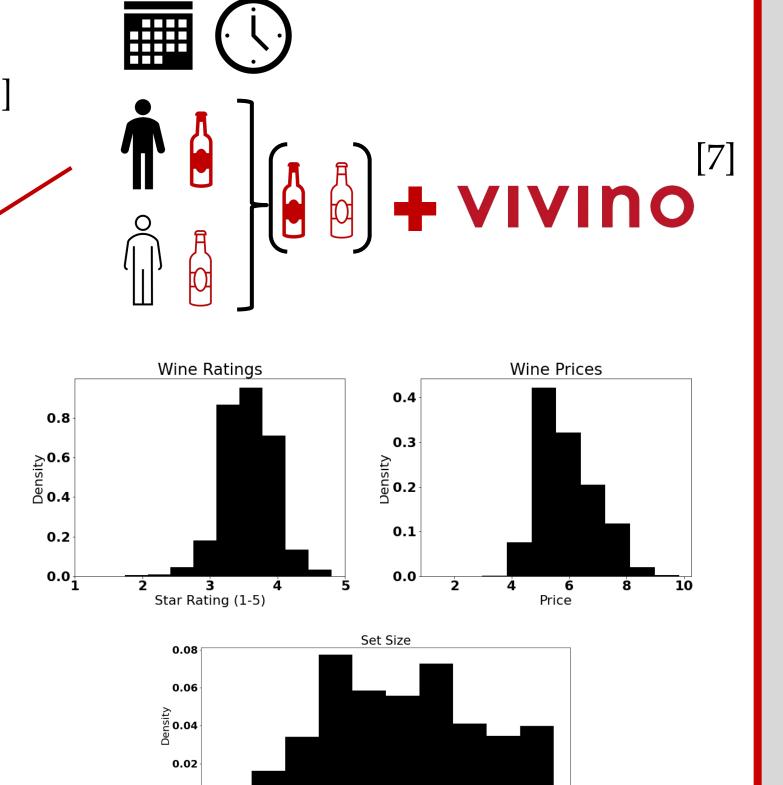
Examine sets where: A and B are both **present**  $(P(A \lor B) = 0)$ A and B are both, on average, popular A and B are equally preferred  $(P(A) \cong P(B))$ 

Does preference for A over B change in the presence and value of decoys in a set?

### Method

- Grocery Store Shopping Dataset [5] - 10M purchases from 1.2M customers across 2 673 stores.
- 3, 649, 027 wine purchases from 464 stores between 2019-08-01 and 2019-10-31



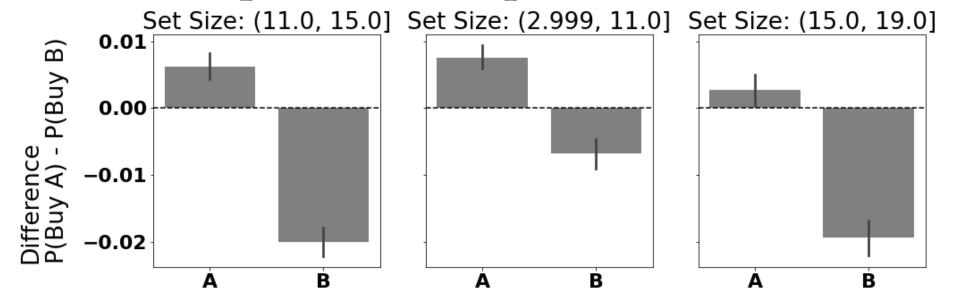


### Results

#### Do people <u>prefer target wines</u> when they <u>dominate distractors</u>?

Example Choice Set Dominated by A			_	Pairs in top 20		
Description	Price (£)	Rating (stars)	0.005	_	$b_{dom\_by} = 0.$	03, p < .0001
Lindeman's The Discoverer Chardonnay	6.38	3.7	B			
Australian Lime Tree Shiraz	4.93	3.3	- P(Buy			
The Discoverer Shiraz	5.34	3.2				
Fairtrade Irresistible Sauvignon Blanc	5.23	3.4	Diffe P(Buy A)			
Barefoot Chardonnay	5.12	2.9	-0.015			
Turano Sauvignon	5.05	3.1			B	None
			_	Distractors are Dominated by		

### Does this preference depend on the <u>size of the set</u>?



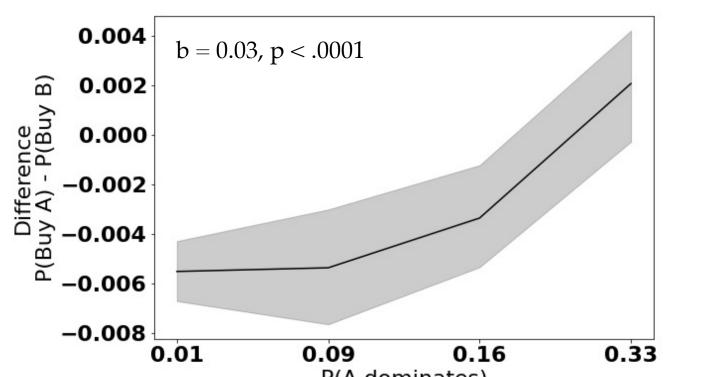
Distractors are Dominated by

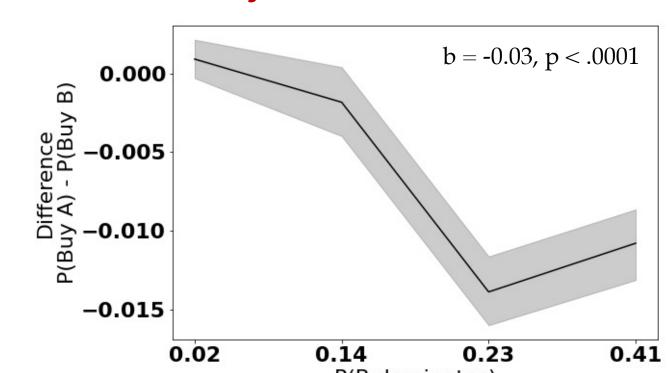
In line with classical demonstrations of the attraction effect<sup>[8]</sup>, when distractors are dominated by a target, the likelihood of choosing that target over the other increases.

## Results (cont.)

• Leveraging, the heterogeneity of choice sets in our sample, we examined whether the density of distractors (the number of dominated items) predicted the strength of the attraction effect [cf. 9]

#### Do decoy effects depend on the density of distractors?





Choice sets comprised of many similar, but poorer, options predicted stronger preference for the target item than sets of relatively few such distractors.

### Discussion

- The attraction effect is one of the most documented biases in the study of human choice, yet evidence for its impact on large-scale, real-world, consumer choice is scant.
- Using a massive real-world retail dataset of wine purchases from the UK, we find evidence for the attraction effect across constructed choice sets<sup>[6]</sup> that vary in size and composition.
- Leveraging the unique features of our dataset, we find that sets with more similar, but dominated, options evinced a stronger attraction effect.
- Future directions:
  - Decoy "distance effects"[9]
  - Formal psychological model [2]
  - Situational variability (e.g., days of week, time of day)

### Relevant Literature

- . Milberg et al. (2014). Synthesis of attraction effect research: Practical market implications. European J. of Mark. 2. Dumbalska et al. (2020). A map of decoy influence in human multialternative choice. *PNAS*.
- 3. Lichters et al. (2017). What really matters in attraction effect research: when choices have economic
- consequences. *Marketing Letters*. . Doyle et al. (1999). The robustness of the asymmetrically dominated effect: Buying frames, phantom
- alternatives, and in-store purchases. *Psych. & Mark.* 5. Dolan, E et al. (2022). Using Shopping Data to Improve the Diagnosis of Ovarian Cancer: Survey Study. *JMIR*
- 6. Otto, A.R. et al. (2022). Context-dependent choice and evaluation in real-world consumer behavior. Sci. Rep.
- 7. Kotonya et al. (2018). Of Wines and Reviews: Measuring and Modeling the Vivino Wine Social Network.
- 8. Trueblood et al. (2013). Not Just for Consumers: Context Effects Are Fundamental to Decision Making. Psy. Sci. . Soltani et al. (2012). A Range-Normalization Model of Context-Dependent Choice: A New Model and Evidence. PLoS Comp. Bio.



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