Attraction Effect in Risky Choices

Yi-tsen Liao[1]

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Correspondence concerning this article should be addressed to Yi-tsen Liao, The Hong Kong University of Science and Technology, Hong Kong. E-mail: yliaoav@connect.ust.hk

Abstract

This study investigates the attraction effect—a well-documented context-dependent preference reversal—in the domain of risky choices. While prior research has established the robustness of the attraction effect in consumer decisions, its role in decision-making under risk and uncertainty remains underexplored. This paper contributes to this literature by examining whether introducing an asymmetrically dominated decoy option can systematically shift preferences between lotteries. Using an incentivized within-subject experimental design (N = 602), we manipulate the similarity and dominance of decoy lotteries to test their influence on the selection of a focal risky or safe option. The focal and non-focal lotteries are identical in expected value but differ in their risk profiles, enabling us to isolate context effects from baseline risk preferences. Our findings suggest an asymmetric attraction effect: while decoys dominated by the risky option significantly increased its selection likelihood (by 5.6 percentage points, $p < .001$), decoys dominated by the safe option had no positive effect and even slightly decreased its attractiveness. This asymmetry in our experimental evidences suggest that the attraction effect on risky choices is better explained by attribute-based rather than value-based accounts, challenging prior results from perceptual and consumer choice studies. These results deepen our understanding of context-dependent preferences in risk settings and highlight the role of attribute salience in shaping economic decision-making under uncertainty.

Keywords: Attraction effect, Risky choice, Context effects, Preference reversal

Word count: 3234

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Introduction

Imagine you are shopping for a new laptop and are torn between two options. One is a stylish, lightweight model that you can easily carry to work, but it has only mediocre battery life. The other is a bulkier model with excellent battery life that can last for days without charging, but carrying it in your backpack might cause discomfort or even back pain. Both options fall within your budget, so the decision ultimately comes down to a trade-off between portability and battery life. As you deliberate, you notice a third model displayed next to the lightweight one. This alternative is just as portable, but its battery life is even shorter. Suddenly, the original lightweight model appears significantly more attractive. You might find yourself thinking, "Although its battery life isn't ideal, it's the best I can get among laptops of similar weight." This shift in preference illustrates how our evaluations can be shaped not only by objective attributes but also by the context in which choices are presented—specifically, the other options available in the choice set when a decision is made (González-Vallejo, 2002; Trueblood et al., 2014). Most of the decisions we make involve options with multiple attributes, such as price, quality, and aesthetics. After eliminating obviously undesirable options, we usually end up choosing between two options—one that has advantages over the other in some attributes but disadvantages in others. Such decisions are especially difficult since they involve trade-offs across various attributes—how much of an increase in battery life justifies the inconvenience caused by the heavier laptop? Traditional economic theory posits that although people may value each attribute differently, their preference between two options should be fixed and independent of the addition of irrelevant alternatives (Von Neumann & Morgenstern, 1947). Violations of this independence axiom are often demonstrated in the form of preference reversals (Busemeyer & Townsend, 1993; Camerer, 1989; Tsetsos et al., 2010). In theory, such inconsistencies could make decision-makers vulnerable to a "money pump"—being exploited by repeatedly switching preferences as the choice set is manipulated. However, the independence axiom is also highly controversial and has been frequently rejected in both experimental data and anecdotal observations (Tversky, 1972; Tversky & Kahneman, 1981). The shift in preferences triggered by introducing a third option has been widely studied in psychology and behavioral economics and is commonly used as a marketing strategy (Huber et al., 1982; Mishra et al., 1993). Among the different forms of contextual effects, the attraction effect, as demonstrated in the example, refers to the tendency to choose one option (the focal option) over another (the competitor) when a third, similar but inferior option (the decoy) is introduced. Without the decoy, the decision-maker might have chosen differently. This paper investigates the attraction effect in the context of risky choices. Specifically, we examine whether introducing a dominated prospect leads people to choose a dominant prospect they might not have otherwise preferred. We also seek to understand the mechanism by which the dominated prospect makes the focal prospect more "attractive." The remainder of the introduction is structured as follows: we begin by defining what constitutes a decoy and the necessary components for an option to be considered one. We then discuss three broad theoretical accounts that explain the mechanism behind the attraction effect and highlight how they generate different predictions in certain cases. Finally, we explain how the attraction effect applies in the context of risky choice and outline our contributions to the literature on decision-making under risk and uncertainty. A decoy that induces the attraction effect is typically defined as an option that is similar to, but inferior to, the focal option. Suppose there are two laptops, Model A and Model B, whose desirability is determined by two attributes—portability and battery life. Model A is more portable but has poorer battery life. In contrast, Model B offers better battery life but is less portable. A decoy for Model A should be similarly portable but worse than Model A in at least one attribute. That is, the decoy should either be slightly heavier or have even worse battery life. In short, a decoy consists of two components: similarity and inferiority. The literature on the attraction effect has somewhat ambiguous definitions of similarity. Practically, the decoy should be similar enough to the focal option to invite comparison, but not so similar that differences become imperceptible. Inferiority, on the other hand, requires the decoy to be worse in some attributes and strictly worse in at least one. For instance, a decoy model could be worse than Model A in battery life (Model A's disadvantage), in portability (its advantage), or in both. Trueblood et al. (2013) categorized these variations as range decoys (inferior in the disadvantaged attribute), frequency decoys (inferior in the advantaged attribute), and mixed decoys (inferior in both). Despite its wide application, the underlying mechanism of the attraction effect remains unclear. Numerous theoretical proposals and experimental studies attempt to explain how the decoy enhances the appeal of the focal option (Trueblood, 2012; Tsetsos et al., 2010). We summarize three main accounts—reason-based, attribute-based, and value-based—each of which emphasizes different elements of decision-making. Reason-based accounts suggest that the decoy provides a justification for choosing the focal option when the relative importance of attributes is unclear (Shafir, 1993). When both options have strengths and weaknesses, the decoy makes one option (usually the focal one) appear more reasonable, reducing the psychological discomfort associated with making trade- offs (Simonson, 1989). According to this view, the decoy doesn't increase the desirability of the focal option but makes the choice feel more justifiable and comfortable. Attribute-based accounts, in contrast, suggest that decoys influence how much weight decision- makers place on specific attributes (Roe et al., 2001). Tversky's (1972) Elimination-by-Aspects (EBA) model treats choices as collections of attributes. In each step, one attribute is selected, and options lacking it are eliminated. The order in which attributes are selected depends on their importance. In this framework, a decoy draws attention to the focal option's advantaged attribute, increasing its influence on the decision. However, this account best explains frequency decoys. It struggles to explain why range decoys—which highlight the focal option's disadvantages—often produce stronger attraction effects, as shown in perceptual tasks

(Trueblood et al., 2013). Value-based accounts take yet another approach, focusing on how individuals perceive attribute values through comparisons (Hsee et al., 1999). Instead of evaluating options in isolation, people assess them relative to a reference point—such as the decoy (Kőszegi & Rabin, 2007). According to Prospect Theory (Kahneman & Tversky, 1979), people encode gains and losses asymmetrically, being more sensitive to losses. In this context, Model A appears as a clear upgrade over the decoy, while Model B entails both a gain (battery life) and a loss (portability). Given people's aversion to losses, Model A may feel more attractive. This account avoids assumptions about advantaged or disadvantaged attributes and accommodates various types of decoys. It also implies that the size of the decoy's inferiority matters—the greater the gap between the focal option and the decoy, the stronger the attraction effect. Building on these theoretical perspectives, this paper examines how the attraction effect influences decisions under risk. Specifically, we test whether the presence of a dominated prospect increases the likelihood of the dominant prospect being chosen. We also investigate whether the attribute- based or value-based account better explains the observed behavior—that is, whether the decoy works by redirecting attention to a specific attribute or by altering perceived value through comparison. This research offers a new perspective on how people evaluate risky choices. Rather than treating probability and payoff solely in terms of risk, we view them as distinct, comparable attributes. Risk-seeking or risk-averse behavior may simply reflect trade-offs between these attributes. Our study contributes to the growing literature on contextual influences in decision- making (e.g., complexity, salience, emotion) and the psychological mechanisms (e.g., attention, justification, reference-dependence) through which they shape behavior.

Experiments

Study 1

This experiment is designed to study the attraction effect in risky choice settings. Specifically, we test whether introducing a third, dominated "decoy" option increases the likelihood that individuals choose a particular "focal" lottery—one they might not have selected based solely on their risk preferences in the absence of the decoy.

Definition of Decoy

In the literature on the attraction effect, a decoy is typically defined as a third option that is asymmetrically dominated — that is, it is clearly inferior to the focal option across relevant attributes but bears sufficient similarity to invite comparison (Huber et al., 1982). The presence of such a decoy makes the focal option appear more attractive relative to the non-focal alternative. Two elements are essential in defining a decoy. The first is similarity, which ensures that the decoy invites direct comparison with the focal option. Typically, individuals face a trade-off between two lotteries that differ in multiple attributes—e.g., payoff versus probability—such that neither option dominates the other. A decoy that closely resembles the focal option in most attributes prompts a comparison between the two and shifts attention toward the focal lottery. The second element is dominance: the decoy must be observably worse than the focal option. Importantly, the dominance need not be rational in an objective sense (Ariely & Wallsten, 1995); it must only be perceived by the decision maker as such. In our experiment, a decoy is defined as a lottery that shares the same probability distribution as the focal lottery but has lower payoffs (and a payoff that is strictly lower in at least one state). While decoys can also be constructed by varying probabilities instead of payoffs, we restrict our design to decoys that match the focal lottery in probability but are dominated in payoff. This decision is grounded in prior research suggesting that individuals process differences in payoffs more readily than differences in probabilities, and that these two types of decoys may trigger different cognitive mechanisms (Kahneman & Miller, 1986; Lee et al., 2024; Slovic et al., 1977; Tversky & Kahneman, 1981).

Choice under Risk

In each decision round, participants are presented with three lotteries: the focal lottery, the non-focal lottery, and a decoy. They are asked to choose the lottery they would prefer to play. All choices are incentivized. Two of the decision rounds will be randomly drawn in the conclusion of the experiment. Participant's choice of lottery in that round will actually be played out and be used to determine their bonus payout. To minimize complexity and isolate risk preference, we use simple two-state lotteries with a pure gain in one state and nothing in the other. The focal and non-focal lotteries are symmetrical in structure—for example, one lottery offers an x% chance of winning y cents, and the other offers a y% chance of winning x cents. That is, two lotteries yield the same expected value. Under this construction, traditional expected utility theory (EU) will predict that any decision between the two lotteries to be the result of individual's risk preference. The symmetrical structure also has its strength in communicating the level of risk involved in a straightforward manner — One lottery is always risker, yielding a higher payoff at the cost of lowering the chance of winning; the other lottery is always safer, increasing the chance of winning by compromising some of the gain. This design reduces variance due to math sophistication and ensures that differences in choice behavior reflect risk preferences rather than mathematical ability. Decoys are constructed by retaining the focal lottery's probability structure while reducing the payoff in the gain state. In the first study, we include several types of decoys to test the necessary component of decoy. Each set of lotteries includes either a treatment decoy that shares the same probability distribution as the focal lottery but has a lower payoff in the gain state or a control decoy that does not resemble the focal option in either payoff or probability. To control for treatment size, the payoff in the decoy lottery is always set to half of the payoff in the focal lottery. This design is informed by findings in psychology literature, which suggest that people tend to perceive proportional differences rather than absolute differences (Kahneman & Tversky, 1979; Weber, 1834). For simplicity, the control decoy in our experiment is always a 50-50 lottery. Noted that both the treatment and the control decoys similarly result in a lower expected value, and we only manipulate their similarity to the focal lottery. Based on past experimental findings, control decoys will not increase the likelihood of choosing focal lottery since its lack of similarity prevents people from initiating the comparison with the focal lottery. The actual set of lotteries used in the experiment can be found in the appendix.

Experiemntal design

Procedure

All participants first go through a comprehension check that tests their understanding of the instruction. Participants will not be able to move on to the main task until they pass the comprehension check. Participants complete 10 lottery choices, where each round presents a different set of three lotteries: a focal lottery, a non-focal lottery, and a decoy. We design five unique pairs of focal and non-focal Fig 1. Example of experiment interface. The left shows a set which includes a control decoy while the right shows a set which includes a treatment decoy. lotteries, each appearing with either a treatment or a control decoy. To avoid identical pairs from showing up back to back due to the randomization, ten choices are divided into two separate sections. In the first section, three of five unique pairs of lotteries are presented along with their treatment decoy while the other two pairs are presented with their control decoy. The second section presents the same five pairs with their treatment-control counterparts. The experiment flow is described in Table 1. The within-section randomization achieves two goals — it prevents the spillover in the within-subject design where the treatment-control are displayed in sequence; it also reduces the pattern-seeking behavior resulted from incessantly observing either treatment or control. Similar research has found the order effect to be a seriously confounder — people followed the pattern observed in the first few trails and fixated on a single attribute in the rest of the experiment (Castillo, 2020). Participants are randomly assigned to one of two conditions: a risk-seeking condition, in which decoys are designed to promote the riskier lottery, or a risk-averse condition, in which decoys are designed to promote the safer lottery. This design allows us to test both the within-subject effect of decoy characteristics and the between-subject effect of decoy directionality (toward risk-seeking or risk-averse options). All lotteries are presented in both text description and pie charts to enhance people's understand of probability.

Incentivization scheme

In each part, one of the five sets will be randomly drawn to determine participants' bonus payoff. The computer will actually play the lotteries of their choice and the participants will receive the sum of the rewards. This design attempts to encourage deliberate decision by reminding participants the bonus in every five decisions, avoiding random choices on the last few decisions.

Sample

We will recruit 600 participants through Prolific, selecting a gender-balanced sample. Participants who select decoys more than five times across ten rounds of choices will be excluded, as this behavior suggests inattention. Additionally, we will conduct a robustness check by analyzing the full sample, including all participants.

Open science statement

All studies will be preregistered on AsPredicted. We will report all sample sizes, data exclusions, manipulations, and measures. Screen captures of the experimental materials will be made available in the Supplemental Information. The complete data and code to reproduce all statistical analyses and figures in the manuscript will be made available via OSF.

Result

Aggregrate result

Table 1 indicates a strong overall tendency toward risk aversion — participants were more likely to choose the safer lottery regardless of decoy presence. At the aggregate level, the decoy had no statistically significant effect on the likelihood of choosing the focal lottery. In the baseline condition, without any treatment, participants exhibited a strong preference for the safe lottery, with an estimated choice probability of 75.5%. Against our expectation, when a decoy dominated by the safe lottery was introduced, this probability decreased slightly to 73.4% (−2.1 percentage points, $p < .05$), contrary to what the attraction effect would predict. In contrast, introducing a decoy dominated by the risky lottery boosted the choice probability for the risky option from 13.6% to 19.2%, resulting in a significant increase of 5.6 percentage points ($p < .001$).

Table 1
Likelihood of choosing focal lottery.

	Focal Lottery
Treatment Decoy	−0.115*
	(0.058)
Condition Risk-seeking	−2.975***
	(0.160)
Decoy x Risk-seeking	0.406***
	(0.098)
Constant	1.130***
	(0.107)
Num.Obs.	6020

Note. Parentheses show standard errors clustered at the participant level.
+p < 0.10, *p < 0.05, **p < 0.01, ***p < 0.001

Asymetrical effect

Table 2 presents the results by risk condition, demonstrating this asymmetrical effect more clearly. The findings suggest that the decoy's influence depends on the direction of risk: it successfully nudged participants toward riskier choices but had a slight adverse effect when promoting safer ones. Fig 1 illustrates this asymmetry by presenting changes in the proportion of focal lottery choices across treatments and conditions.

Table 2
Likelihood of choosing focal lottery, separated by the risk condition.

	Risky Lottery	Safe Lottery
Treatment Decoy	0.292***	−0.115*
	(0.079)	(0.058)
Constant	−1.845***	1.130***
	(0.119)	(0.107)
Num.Obs.	2990	3030

Note. Parentheses show standard errors clustered at the participant level.
+p < 0.10, *p < 0.05, **p < 0.01, ***p < 0.001

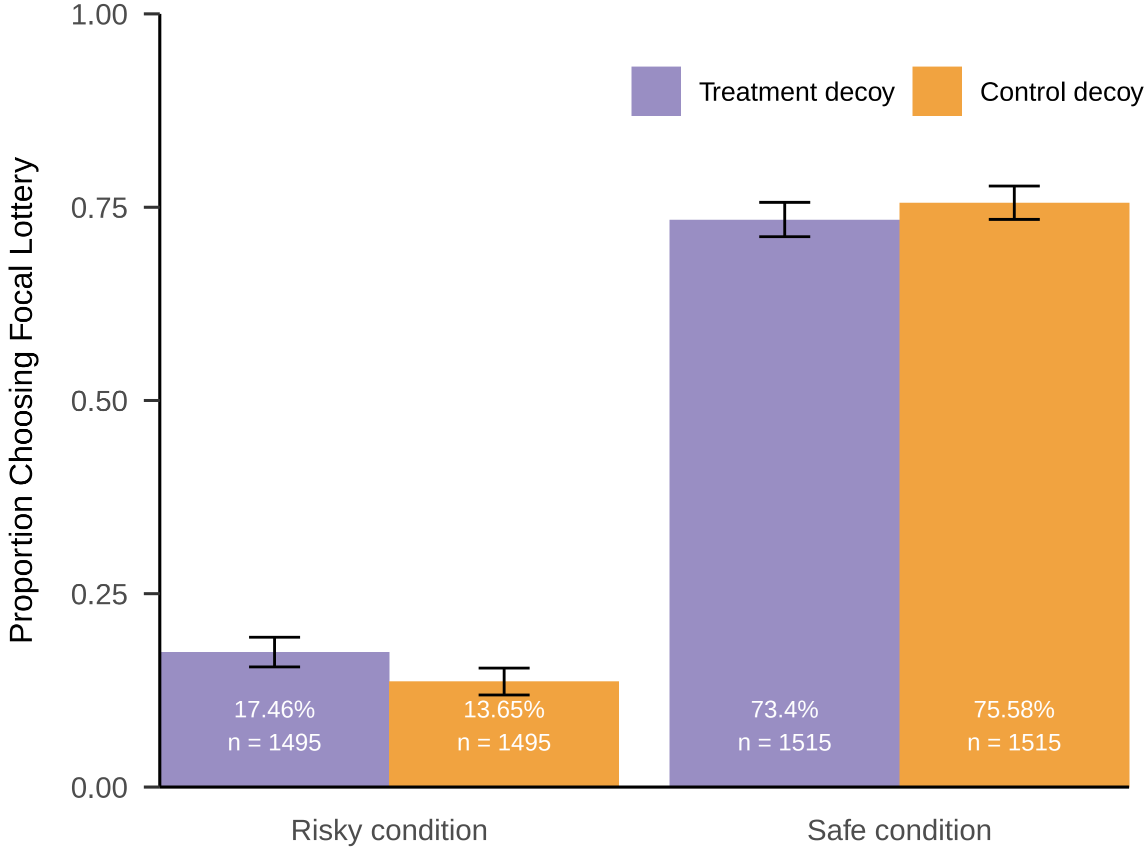
Individual heterogeneity

To account for potential individual differences in baseline risk preferences and susceptibility to the decoy effect, we extended the model to include random intercepts and slopes. Table 3 presents the results of this more extensive analysis. In the risky condition, where only a random intercept was included due to limited within-subject treatment variation, the decoy effect increased in magnitude after accounting for individual differences in risk preference.

In the safe condition, however, adding a random slope for treatment (in addition to a random intercept) led to a larger standard error, turning the previously significant negative decoy effect non-significant. This implies considerable heterogeneity in participants' responses — some may have responded strongly to the decoy, others not at

Figure 1

Propotion of choosing focal lottery in Study1. There was no significant difference in the propotion of choosing the safe lottery when a decoy doominated by it was introduced. In contrast, The presense of a decoy dominated by the risky lottery slightly increased the propotion of it being chosen



all, and some even in the opposite direction.

Discussion

These findings suggest that the attraction effect in risky choices operates asymmetrically depending on the direction of risk. Participants were more likely to choose the risky lottery when a decoy dominated the risky option, but the effect was weaker when the decoy targeted the safe lottery. If we consider the payoff as the risky lottery's advantage and probability as its disadvantage, our findings suggest that a decoy enhancing one's advantage generates a stronger attraction effect than a decoy enhancing one's disadvantage. This asymmetry contradicts prior research showing that range decoys — emphasizing the

Table 3
Likelihood of choosing focal lottery, separated by the risk condition. A random intercept is introduced to both conditions while a random slope is only added to the safe condition due to data limitation

	Risky Lottery	Safe Lottery
Treatment Decoy	0.481***	0.368
	(0.131)	(0.309)
Constant	−3.642***	2.763***
	(0.277)	(0.299)
Num.Obs.	2990	3030

+p < 0.10, *p < 0.05, **p < 0.01, ***p < 0.001

focal option's disadvantages — often produce stronger attraction effects than frequency decoys, which highlight the focal option's advantages (Trueblood et al., 2013).

The underlying mechanism of the attraction effect we observed here is better explained by attribute-based accounts, which suggest that decoys influence the weight decision-makers assign to specific attributes. This contrasts with value-based accounts, which focus on how decision-makers perceive values in each attribute through direct comparisons. Additionally, the effect does not vary across different pair characteristics. The difference in the certainty equivalent of each pair of lotteries had no impact on how easily participants were nudged from one option to the other. This further supports attribute-based accounts, as value-based accounts would predict that the size of the decoy's inferiority should matter.

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