

A Service of



Leibniz-Informationszentrum Wirtschaft Leibniz Information Centre for Economics

Herweg, Fabian; Müller, Daniel; Özgümüs, Asri; Römeis, Fabio

Working Paper Context-Dependent Risk Preferences and Decoy Effects

CESifo Working Paper, No. 11611

Provided in Cooperation with: Ifo Institute – Leibniz Institute for Economic Research at the University of Munich

Suggested Citation: Herweg, Fabian; Müller, Daniel; Özgümüs, Asri; Römeis, Fabio (2025) : Context-Dependent Risk Preferences and Decoy Effects, CESifo Working Paper, No. 11611, CESifo GmbH, Munich

This Version is available at: https://hdl.handle.net/10419/314650

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.



WWW.ECONSTOR.EU



Context-Dependent Risk Preferences and Decoy Effects

Fabian Herweg, Daniel Müller, Asri Özgümüs, Fabio Römeis



Impressum:

CESifo Working Papers ISSN 2364-1428 (electronic version) Publisher and distributor: Munich Society for the Promotion of Economic Research - CESifo GmbH The international platform of Ludwigs-Maximilians University's Center for Economic Studies and the ifo Institute Poschingerstr. 5, 81679 Munich, Germany Telephone +49 (0)89 2180-2740, Telefax +49 (0)89 2180-17845, email office@cesifo.de Editor: Clemens Fuest https://www.cesifo.org/en/wp An electronic version of the paper may be downloaded • from the SSRN website: www.SSRN.com

- from the RePEc website: <u>www.RePEc.org</u>
- from the CESifo website: <u>https://www.cesifo.org/en/wp</u>

Context-Dependent Risk Preferences and Decoy Effects

Abstract

We present a theory of context-dependent risk preferences under which within-state payoff comparisons and regret aversion shape decisions. Defining the attraction and compromise effect in reference to a state-space-based description of the choice problem, we show that our theory can account for both these prominent decoy effects. We test our theoretical predictions with an online experiment, including comparative statics results. We find strong evidence for the attraction and the compromise effect. Furthermore, we find some supportive evidence for our comparative static predictions and weakly diminishing sensitivity regarding ex-post regret.

JEL-Codes: C910, D010.D810, D910, M310.

Keywords: asymmetric dominance effect, attraction effect, compromise effect, context-dependent preferences, correlation-sensitive preferences, decoy effect, regret theory.

Fabian Herweg Faculty of Law, Business and Economics University of Bayreuth / Germany fabian.herweg@uni-bayreuth.de

Asri Özgümüs Chair for Contract Theory and Information asri.oezguemues@uni-wuerzburg.de

Daniel Müller Chair for Contract, Theory and Information Economics, University of Würzburg / Germany daniel.mueller2@uni-wuerzburg.de

Fabio Römeis Chair for Contract Theory and Information Economics, University of Würzburg / Germany Economics, University of Würzburg / Germany fabio.roemeis@uni-wuerzburg.de

January 3, 2025

We would like to thank Geoffrey Castillo, Andreas Grunewald, Henrik Guhling, Victor Klockmann, Moritz Loewenfeld, Brian Monroe, Alicia von Schenk, Hannah Schildberg-Hörisch, Erik Wengström, Ro'i Zultan as well as participants at ESA World Meeting (2023, Lyon), Nordic Conference on Behavioral and Experimental Economics (2023, Lund), ESA Africa Meeting (2023, Cape Town), and DFG Meeting (2024, Frankfurt) for helpful comments and suggestions. Financial support by the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation), grants HE 7106/4-1 and MU 4439/2-1 (GEPRIS project number 440656074), is gratefully acknowledged.

1. Introduction

For riskless multi-attribute consumption decisions, there is tremendous evidence in psychology and marketing that changes to a choice set can affect the preference ranking among options available before and after the change.



Figure 1: Illustration of the attraction and compromise effect

Consider the upper left situation in Figure 1. Imagine you want to buy yourself a coffee and can choose between a large and a small one. You do not need a big coffee, and thus, you opt for the cheaper small one. Now imagine the situation in the lower left part of Figure 1, where you can choose between a large, medium, and small coffee. The large one is on sale and sold at the price of the medium one. Again, you do not need a big coffee, but the small one now appears very small. You choose the large cup because the large one does not cost more than the medium one. In this scenario, adding the irrelevant medium-size coffee changed your preferences between small and large cups of coffee. This is the so-called *attraction effect* or *asymmetric dominance effect* (Huber et al., 1982). A similar situation is depicted in the right part of Figure 1. Now, adding the extreme option of a large and expensive coffee may make you choose a medium-sized coffee instead of a small one. The medium size now appears to be a good compromise in quantity and price. This is an instance of the so-called *compromise effect* (Simonson, 1989).¹

Next to these observations for riskless multi-attribute consumption decisions, there is also evidence regarding the effects of decoy options on decisions taken under risk (Herne, 1999; Soltani et al., 2012; Mohr et al., 2017; Sürücü et al., 2017; Castillo,

¹Such choice set effects for consumer products are documented, among others, by Huber et al. (1982), Heath and Chatterjee (1995), Hsu and Liu (2011), Milberg et al. (2014), Lichters et al. (2017) and Wu and Cosguner (2020).

2020). These studies focus on simple gambles of the form "obtain x with probability $p \in (0, 1)$ and 0 otherwise" and, thus, posit that the attributes entering a risky choice option's evaluation are the prize x to be won and the winning probability p. Consequently, the decoys considered here are also defined in terms of the two attribute dimensions, prize and winning probability. We, in contrast, posit that the attributes are the different states of nature. This not only allows us to consider decoy effects for arbitrarily complex gambles (i.e., for gambles with more than just one strictly positive winning prize) but also is closer to risky decisions in practice, where, e.g., insurance plans are often presented similarly to describing gambles in terms of payments in different states of nature. For instance, the plans described in the left part of Figure 2 distinguish between the 'states' that you need a preventative service (e.g., cleaning), a basic service (e.g., a filling), and a major service (e.g., an inlay).²

								Why D	enali D	e <mark>ntal fo</mark>	Dental	Implan	ts?
		1.1	1.1	1.1	A			-	DENALI DENTAL	Spirit		🙊 Cigna.	UnitedHealthOn
	△ DELTA DENTAL [®]	blue 🔮	blue 🕖	blue 🔮	BlueCross	C DELTA DENTAL	(it) COVERED	Guaranteed Acceptance?	~	~	\checkmark	~	1
	нмо	нмо	РРО	РРО	РРО	РРО	РРО	Choice of PPO or Indemnity Plans?	~	~	×	×	×
Premium	\$8/mo (annual plan)	\$24/mo	\$65/mo	\$71/mo	\$60 _{/mo}	\$64.mo	\$42+/mo (evailable only with	Child Only Plans Available?	~	×	×	~	×
Benefits	DeltaCare® USA - CAA54 Individual/Family	Dental HMO	Enhanced Dental PPO 50/2000	Enhanced Dental PPO 50/2000 Lifetime Ortho 1500	Essential Choice PPO Platinum	Delta Dental PPO" - Premium Plan	purchase of Medical Plan) Various	Adult and Child Orthodontics Covered?	~	×	×	\checkmark	×
Deductible	None	None	\$50/per person	\$50/per person	\$50/per person	\$50/per person	\$50/per person	3 Cleanings Per Year?	~	\checkmark	×	×	×
Annual Max	۲	8	\$2,000	\$2,000	\$2,000	\$1,500	\$1,500	Cover Major Services? (Crowns, Root Canals, Extractions)	~	~	~	~	~
Preventative Exams, cleanings, x-	No Charge	No Charge	No Charge	No Charge	No Charge	No Charge	No Charge	Takeover Credit From Previous Plan?	~	×	~	~	 Image: A start of the start of
rays, sealants Basic Services	\$25 -\$425 Copay	\$25 -\$425 Copay	20% (6 Months Waiting Period)	20% (6 Months	20% (3 Months Waiting Period)	20% (6 Months Waiting Period)	20% (3 Months Waiting Period)	Choose Any Dentist?	\checkmark	\checkmark	×	×	×
Major Services	\$300- \$650 Copay	\$300- \$650 Copay	50% (12 Months	50% (12 Months	50% (6 Months	50% (6 Months	50% (6 Months Weiting Resid	Covers Dental Implants?	\checkmark	\checkmark	×	×	×
Crowns, Root canal, inlays, onlays, cast res	0	0	(Taning Pendo)	(manual Prenod)	(Penca)	(rating Period)	(manual 1 = 100)	No Walting Period?	~	~	×	×	×
Orthodontics	\odot	\odot	(8)	\odot	\odot	\odot	\otimes	No Missing Tooth Clause?	×	×	×	×	×
								Up to \$3,500 Annual Max Available?	1	1	×	x	×

Figure 2: Dental insurance plans

Based on this state-space-based description of the choice situation, we first provide a rigorous theoretical account of the attraction and the compromise effect under risk. A context-dependent theory of choice is needed as a building block to account for decoy effects. A prominent context-dependent theory for choice under risk is regret theory (Loomes and Sugden, 1982, 1987a), where a decision-maker is assumed to engage in comparing the outcomes of different choice options across the different potential states of the world and to suffer from regret when ex-post she receives a worse outcome than she would have received if she had chosen differently. This theory, however, is mainly developed and explored for pairwise choice. Therefore, following ideas informally outlined by Loomes and Sugden (1982), we augment regret

²The insurance plans depicted in Figure 2 are taken from https://insurancecenterhelpline. com/dental and https://www.dentalinsuranceshop.com/buyers-guide/ specific-dental-services/dental-implants/denali-dental-learn-more-implants.

theory to allow for choice from arbitrary large choice sets and derive conditions under which the occurrence of the attraction effect or the compromise effect is predicted. Moreover, we use these theoretical predictions to outline testable comparative statics results.³

Furthermore, we run an online experiment to test the predictions of our regret theoretic model for choices among gambles with two and three states of nature. We find strong evidence for the attraction and compromise effects as defined and predicted by our theory. While the attraction effect is highly significant even if we split our sample by the number of states, the compromise effect is significant only for choices among gambles with two but not for choices among gambles with three states. Beyond predicting the mere occurrence of the attraction effect, our theory also predicts that certain decoy specifications are more effective in triggering the attraction effect than others. This comparative static prediction is statistically confirmed for some of our decoy specifications but not all. Regarding the compromise effect, we use comparative static results to test whether subjects are particularly averse to large-stakes regrets, as it is often assumed in the literature (Loomes and Sugden, 1982). Contrary to this common assumption but in line with recent empirical evidence (Loewenfeld and Zheng, 2023), we cannot reject the hypothesis that marginal regret aversion is constant.

Our contribution thus is twofold. First, we develop a model of regret theory that can account for both the attraction and compromise effects with arbitrarily complex gambles. Second, we experimentally test this model's predictions and explore whether attraction and compromise effects also occur for more complicated gambles, complementing the existing experimental literature on decoy effects under risk.

The rest of the paper is structured as follows. After reviewing the related literature in more detail at the end of Section 1, we introduce the theoretical setup in Section 2. This model is analyzed in Section 3, and the resulting testable hypotheses are outlined in Section 4. We introduce our experimental design in Section 5, and report the associated experimental findings in Section 6. The findings and shortcomings of our analysis are discussed in Section 7. The proofs accompanying our theoretical analysis are deferred to Appendix A. Appendices B to D provide additional material related to the experiment.

³Sachley (2005) and Pak and Ferdowsian (2021) use notions of regret aversion to explain decoy effects among riskless consumption choices. These models, which consider choices among goods and not gambles, differ greatly from ours. The idea that a model of regret aversion can predict decoy effects among gambling decisions is shared by Walls et al. (2024). They fit a fully parameterized regret model to the aggregate data reported in Wedell (1991). They neither provide analytical results regarding how and when their model of regret theory explains decoy effects nor do they test their theory with an experiment.

Related Literature: First and foremost, we contribute to the strand of literature that experimentally investigates decoy effects in decisions under risk. The first pieces of systematic evidence for the attraction effect and the compromise effect in choices between gambles are provided by Wedell (1991) and Herne (1999). For instance, using a fully incentivized laboratory study where subjects choose one gamble out of a choice set containing three gambles, Herne (1999) provides strong within-subject evidence for the attraction effect. Her results also support the compromise effect, but the net effect of preference changes is weaker than for the attraction effect. Similar results are also obtained by the neuro-economic oriented studies by Soltani et al. (2012) and Mohr et al. (2017). Soltani et al. (2012) increase the scope for decoy effects to prevail by designing the target and competitor gamble so that an experimental subject is initially indifferent between the two if they are the only feasible choice options. Mohr et al. (2017) in addition, measure brain activity and find that a stronger attraction effect is positively correlated with brain activity in the medial orbitofrontal cortex and negatively with activity in the anterior insula. Focusing on the attraction effect, Castillo (2020) and Sürücü et al. (2017) further explore the nature of choice set effects. Castillo (2020) identifies a 'range effect', i.e., subjects attach greater weight to those attributes whose range is increased by adding a further choice option. Sürücü et al. (2017) report that the attraction effect is less likely to be observed for subjects who strongly prefer either the target gamble or the competitor gamble and that adding a second decoy does not change the size of the attraction effect. Notably, all the studies mentioned above focus on gambles of the simple (\$x, p) form, i.e., winning \$x with probability p and zero otherwise. The proposed theoretical explanations typically rely on a dimension-wise comparison of prizes and winning probabilities across choice options and, therefore, apply only to this class of gambles. Two exceptions that provide evidence for choice-set effects for gambles with two outcomes that both differ from zero are Engle-Warnick et al. (2009) and Bordalo (2010). However, the scope of these studies is restricted to 50/50"-gambles where each outcome is equiprobable to prevail. We, in contrast, consider gambles with more than two outcomes and allow for states of nature with different probabilities.⁴

Second, our paper is related to the literature investigating different notions of context-dependent preferences under risk. Quiggin (1994) makes an alternative proposal how to extend regret theory (Loomes and Sugden, 1982) beyond pairwise choice by introducing the axiom of *irrelevance of state-wise dominated alternatives*.

⁴Another study that allows for more complicated gambles is by Costa-Gomes and Gerasimou (2022). They, however, focus on the relative importance of the attraction effect compared to the status quo bias.

While appealing from a normative perspective, this approach, by assumption, can not capture the attraction effect, where adding a state-wise dominated choice option affects the preference ranking between the options in the initial choice set. Next to regret theory, salience theory (Bordalo et al., 2012) is also a context-dependent theory of choice under risk. While virtually identical for pairwise choice (Lanzani, 2022; Herweg and Müller, 2021), there are subtle differences between regret theory and salience theory for more than two choice options (see the discussion in Appendix A.2 of Herweg and Müller (2021)). Nevertheless, given the large overlap between these theories, we expect both salience theory and our regret-theoretic model to make similar predictions concerning decoy effects.

Finally, a growing body of literature proposes theories of context-dependent preferences (mainly) for consumption decisions involving trade-offs between quality and price (Suppes and Winet, 1955; Kőszegi and Szeidl, 2013; Bordalo et al., 2013; Tserenjigmid, 2015, 2019; Landry and Webb, 2021; Bushong et al., 2021). While we share with some of these theories that a decision maker's evaluation is formed through pairwise comparisons, none of those above analyze the attraction and compromise effects under risk.⁵

2. The Model

2.1. The Choice Situation

A decision-maker (she) chooses between two or more risky options. These choice options are acts in the sense of Savage (1954) and can be described based on the finite state space $S = \{1, \ldots, S\}$, where the occurrence probability of state $s \in S$ is $p_s \in (0, 1)$. The $S \ge 2$ different states of the world are mutually exclusive such that $\sum_{s=1}^{S} p_s = 1$. Letting $\mathcal{X} \subseteq \mathbb{R}$ denote the set of all conceivable monetary consequences (i.e., increments and decrements of the decision-maker's wealth), an act $X^i : S^S \to \mathcal{X}^S$ assigns to each state of the world $s \in S$ a monetary consequence $x_s^i \in \mathcal{X}$; i.e., $X^i = (x_1^i, \ldots, x_S^i) \in \mathcal{X}^S$. A choice set is a set of available acts from which the decision-maker can choose and denoted by $\mathcal{C} = \{X^1, \ldots, X^I\}$, with $I \ge 2$. As outlined below, the decision-maker's preferences are choice-set dependent. We denote by $\succeq_{\mathcal{C}}, \succ_{\mathcal{C}}$, and $\sim_{\mathcal{C}}$ her weak preference relation, strict preference relation, and indifference relation, respectively when selecting from the choice set \mathcal{C} .

⁵Landry and Webb (2021) compare various of these theories regarding their ability to explain well-documented choice anomalies, e.g., the attraction effect and the compromise effect for multi-attribute consumption decisions.

2.2. Regret Theory

According to regret theory, when receiving a given outcome because of the choice she has made, a decision-maker's hedonic experience is not exclusively determined by the outcome she receives but also by the comparison of this particular outcome to those outcomes that she would have received if she had chosen differently. Specifically, as elaborated in detail by Loomes and Sugden (1982), when receiving some outcome $x \in \mathcal{X}$ and missing out on a better outcome $y \in \mathcal{X}$ because of her choice, the decision-maker's hedonic experience might fall short of the hedonic experience from receiving x without having made any choice, because she experiences regret about her own decision.

We follow the approach suggested by Loomes and Sugden (1982), under which the decision-maker's evaluation of act X^i in the context of the binary choice set $\{X^i, X^k\}$ is given by

$$V(X^{i}|\{X^{i}, X^{k}\}) = \sum_{s=1}^{S} p_{s} \left[c(x_{s}^{i}) - R(c(x_{s}^{k}) - c(x_{s}^{i})) \right].$$
(1)

Here, the strictly increasing and unbounded function $c : \mathcal{X} \to \mathbb{R}$ denotes "choiceless utility"; i.e., c(x) captures the hedonic pleasure associated with obtaining the amount x when there is no scope for comparing x to alternative outcomes that potentially trigger feelings of regret. Thus, the choiceless utility function $c(\cdot)$ is similar to the Bernoulli utility function under expected utility theory (von Neumann and Morgenstern, 1947).

The regret function $R(\cdot)$ captures feelings of regret that arise from comparing the outcome that the decision-maker receives under the act she chose to the outcome that she would have received if she had chosen differently. Regarding the function $R(\cdot)$, we impose the following assumption of (pure) regret aversion.⁶

Assumption 1 (Regret aversion). The regret function $R : \mathbb{R} \to \mathbb{R}$ is continuous and satisfies $R'(\Delta) > 0$ for all $\Delta > 0$ and $R(\Delta) = 0$ for all $\Delta \leq 0$.

When choosing from a general choice set $\mathcal{C} = \{X^1, \ldots, X^I\}$ with $I \geq 2$, the evaluation of act X^i is given by the unweighted average of the evaluations resulting from the pairwise comparisons of act X^i with each other act contained in \mathcal{C} :

$$V(X^{i}|\mathcal{C}) = \sum_{k \in \{1,\dots,I\} \setminus \{i\}} \frac{1}{I-1} V(X^{i}|\{X^{i}, X^{k}\}).$$
(2)

⁶For pairwise choices, the assumption of pure regret is without loss of generality because regret and rejoicing enter the evaluation of the two lotteries in question symmetrically. Thus, as long as regret outweighs rejoicing, our function $R(\cdot)$ can be considered as the joint effect of regret and rejoicing in pairwise choice. With larger choice sets, the assumption of pure regret reduces the theory's degrees of freedom, which entails that all results obtained with pure regret can also be derived under a model specification with both regret and rejoicing.

3. Theoretical Analysis

We focus on choices from either a binary or a ternary choice set. The choice set always contains the acts $A = (a_1, \ldots, a_S)$ and $B = (b_1, \ldots, b_S)$, where $A \neq B$ and act A neither state-wise dominates nor is state-wise dominated by act B. In consequence, the decision-maker faces trade-offs when considering these two acts such that the following two sets are not empty:

$$\mathcal{S}^{A} = \{ s \in \mathcal{S} \mid a_{s} > b_{s} \} \quad \text{and} \quad \mathcal{S}^{B} = \{ s \in \mathcal{S} \mid b_{s} > a_{s} \}.$$
(3)

The set S^A contains all those states in which act A pays out a strictly higher amount than act B, and the set S^B contains all those states in which act B pays out a strictly higher amount than act A. All remaining states, if there are any, are "neutral" in the sense that the two acts A and B pay identical amounts; i.e., $a_s = b_s$ for all $s \in S^N := S \setminus (S^A \cup S^B)$.⁷ Next to the acts A and B, the choice set may contain an additional third act $D^X = (d_1^X, \ldots, d_S^X)$ with $X \in \{A, B\}$. This so-called "decoy act" is designed to shift the trade-offs that arise in the comparison of the acts Aand B in a way such that the decision-maker prefers the "target act" $X \in \{A, B\}$ over the "competitor act" $Y \in \{A, B\} \setminus \{X\}$ when choosing from the ternary choice set $\{A, B, D^X\}$. Formally, we define the occurrence of a decoy effect that favors act $X \in \{A, B\}$ as follows:

Definition 1 (Decoy Effect). For acts A and B the act D^X triggers a decoy effect favoring act $X \in \{A, B\}$ if, for $Y = \{A, B\} \setminus \{X\}$, the following holds:

$$X \sim_{\{A,B\}} Y \Longrightarrow X \succ_{\{A,B,D^X\}} Y.$$
(4)

According to Definition 1 a decoy effect occurs if the decision-maker is indifferent between A and B when choosing from the binary choice set containing the acts A and B, but strictly favors, say, act A over act B when choosing from the ternary choice set that, in addition to the acts A and B, also contains the decoy act D^A . This definition does not specify which act the decision-maker chooses when facing the ternary choice set. She may select the decoy act D^X . Requiring that the decoy act D^X is not selected from the ternary choice set may impose additional restrictions on the composition of D^X . In the following, we will spell out these restrictions whenever necessary.

Definition 1 defines the "classical" decoy effect as a violation of the *independence* of *irrelevant alternatives* axiom, i.e., as a change in preference between acts A

⁷Obviously, the sets S^A , S^B and S^N partition the state space S; i.e., S^A , S^B and S^N are mutually disjoint and $S^A \cup S^B \cup S^N = S$.

and B when moving from the binary choice set $\{A, B\}$ to the ternary choice set $\{A, B, D^X\}$ with $X \in \{A, B\}$.⁸ Experimental investigations, particularly when applying a within-subject design, often address the decoy effect as a violation of the weak axiom of revealed preferences (WARP), which relies on comparing the choices from two ternary choice sets. More precisely, a decoy effect as a violation of WARP occurs if act A is chosen from the choice set $\{A, B, D^A\}$, whereas act B is chosen from the choice set $\{A, B, D^A\}$, whereas act B is chosen from the choice set $\{A, B, D^A\}$. This choice pattern, however, is a direct implication of the classical decoy effect defined in Definition 1.⁹

Observation 1. If, for acts A and B with $A \sim_{\{A,B\}} B$, the acts D^A and D^B trigger a decoy effect favoring act A and act B, respectively, the following holds:

$$A \succ_{\{A,B,D^A\}} B \qquad and \qquad B \succ_{\{A,B,D^B\}} A. \tag{5}$$

Next, we introduce further notation and make some preliminary observations. We denote the expected choiceless utility under act $X \in \{A, B, D^A, D^B\}$ as $\bar{c}^X = \sum_{s \in S} p_s c(x_s)$. With this notation, when considering the choice from the binary choice set $\{A, B\}$, the regret-averse decision-maker's evaluation of act $X \in \{A, B\}$ is

$$V(X|\{A,B\}) = \bar{c}^X - \sum_{s \in S^Y} p_s R(c(y_s) - c(x_s)),$$
(6)

where $Y = (y_1, \ldots, y_S) \in \{A, B\} \setminus \{X\}$ is the act that the decision-maker misses out on because of choosing act X. Hence, when choosing from the binary choice set, the decision-maker is indifferent between act A and act B, i.e., $A \sim_{\{A,B\}} B$, if and only if

$$\bar{c}^{A} - \bar{c}^{B} = \sum_{s \in \mathcal{S}^{B}} p_{s} R(c(b_{s}) - c(a_{s})) - \sum_{s \in \mathcal{S}^{A}} p_{s} R(c(a_{s}) - c(b_{s})).$$
(7)

When choosing only between the acts A and B, the regret-averse decision-maker is indifferent if and only if the (dis-)advantage of act A regarding the expected choiceless utility equals the difference in expected post-decisional regrets between the two acts.

When choosing from the ternary choice set $\{A, B, D^Z\}$, with $Z \in \{A, B\}$, the regret-averse decision-maker's evaluation of act $X \in \{A, B\}$ is given by

$$V(X|\{A, B, D^Z\}) = \frac{1}{2}V(X|\{A, B\}) + \frac{1}{2}V(X|\{X, D^Z\}).$$
(8)

⁸Independence of irrelevant alternatives (IIA) is also called Chernoff's condition (Chernoff, 1954) or Sen's α (Sen, 1969). Formally, letting $f(\mathcal{C})$ denote a choice function, IIA is defined as follows: For $\mathcal{C}^1 \subseteq \mathcal{C}^2$ and $A, B \in \mathcal{C}^1$: $A \in f(\mathcal{C}^2) \Longrightarrow A \in f(\mathcal{C}^1)$. By contraposition, this definition is equivalent to $B \notin f(\mathcal{C}^1) \Longrightarrow B \notin f(\mathcal{C}^2)$.

⁹Formally, WARP is defined as follows: Let $f(\mathcal{C})$ be a choice function and $A, B \in \mathcal{C}^1 \cap \mathcal{C}^2$. Then, $f(\mathcal{C}^1) = \{A\} \Longrightarrow B \notin f(\mathcal{C}^2)$. As shown by Dasgupta and Pattanaik (2007), IIA implies WARP and, thus, a violation of WARP implies a violation of IIA.

With $A \sim_{\{A,B\}} B$ implying that $V(A|\{A,B\}) = V(B|\{A,B\})$, the following result then is readily obtained.

Lemma 1. If a regret-averse decision-maker is indifferent between act A and act B when choosing from the binary choice set $\{A, B\}$, then, for $X \in \{A, B\}$ and $Y = \{A, B\} \setminus \{X\}$, the act D^X triggers a decoy effect favoring act X if and only if

$$V(X|\{X, D^X\}) > V(Y|\{Y, D^X\}).$$
(9)

In words, a decoy effect that favors, say, act A occurs if and only if the targeted act A is evaluated more favorable in the pairwise comparison with the decoy act D^A than the competitor act B.¹⁰

As we alluded to above, the occurrence of a decoy effect that favors act $X \in \{A, B\}$ does not imply that the decision-maker ends up choosing act X from the ternary choice set because, without further restrictions on the composition of the decoy act, she may select the decoy. Her evaluation of the decoy act D^X in the context of the ternary choice set $\{A, B, D^X\}$ is

$$V(D^{X}|\{A, B, D^{X}) = \frac{1}{2}V(D^{X}|\{A, D^{X}\}) + \frac{1}{2}V(D^{X}|\{B, D^{X}\}).$$
(10)

Thus, for $X \in \{A, B\}$ and $Y = \{A, B\} \setminus \{X\}$, we have $X \succ_{\{A, B, D^X\}} D^X$ if and only if

$$V(X|\{A,B\}) + V(X|\{X,D^X\}) > V(D^X|\{X,D^X\}) + V(D^X|\{Y,D^X\}).$$
(11)

3.1. Regret Theory and the Attraction Effect

The attraction effect occurs if a decoy effect is triggered by a decoy act D^X that is state-wise dominated by the target act X (i.e., X pays a higher amount than D^X in each state of the world) and neither dominates nor is dominated by the competitor act Y (i.e., Y pays a higher amount than D^X in some states and a lower amount in other states).

Definition 2 (Attraction Effect). The X-attraction effect occurs if, for acts A and B, a decoy effect favoring act $X \in \{A, B\}$ is triggered by a decoy act D^X with the following properties (where $Y = \{A, B\} \setminus \{X\}$):

• $d_s^X \in (y_s, x_s]$ for all $s \in \mathcal{S}^X$;

¹⁰Lemma 1 does not only hold when moving from a binary to a ternary choice set but also when moving from a choice set C with $I \geq 2$ acts to the choice set $\hat{C} = C \cup \{D^X\}$ containing I + 1acts. The reason is that for all for $X, Y \in C$ with $X \neq Y$ the evaluations of act X in the choice context $\{X, Y\}$, i.e., $V(X|\{X, Y\})$, is unaffected if the choice set is augmented by $D^X \notin C$.

- $d_s^X \leq x_s \text{ for all } s \in \mathcal{S}^Y \cup \mathcal{S}^N;$
- $d_s^X < x_s$ for some $s \in \mathcal{S}^X \cup \mathcal{S}^Y$.

With this definition, we now can formally outline the conditions so that the attraction effect is predicted by regret theory as defined in Section 2.

Proposition 1 (Attraction Effect). Consider acts A, B and D^X with $X \in \{A, B\}$ satisfying the conditions in Definition 2. The X-attraction effect occurs if one of the following two conditions holds (where $Y = \{A, B\} \setminus \{X\}$):

- (i) $\bar{c}^X \geq \bar{c}^Y$;
- (ii) $\bar{c}^X < \bar{c}^Y$ and $d_s^X \ge z_s^{AE} \in [y_s, x_s]$ for all $s \in \mathcal{S}^X$ (with strict inequality for at least one $s \in \mathcal{S}^X$), where the threshold vector $\mathbf{z}^{\mathbf{AE}} = (z_s^{AE})_{s \in \mathcal{S}^X}$ is implicitly defined by

$$\sum_{s \in \mathcal{S}^X} p_s [R(c(x_s) - c(y_s)) - R(c(z_s^{AE}) - c(y_s))] = \sum_{s \in \mathcal{S}^Y} p_s R(c(y_s) - c(x_s)).$$
(12)

According to Proposition 1(i), regret theory predicts the attraction effect always to occur if the target act's expected choiceless utility is weakly higher than the competitor act's. Notably, under the standard assumption of a concave choiceless utility function $c(\cdot)$, this is the case if the target act second-order stochastically dominates the competitor act. According to Proposition 1(ii), if the expected choiceless utility of the target act is lower than that of the competitor act, the attraction effect is predicted if the decoy act is sufficiently attractive in those states where the target act dominates the competitor act. Intuitively, if the decoy act is sufficiently attractive in these states, then the expected ex post regret from choosing the competitor act instead of the decoy act is rather high.

Finally, note that state-wise dominance of the target act X over the decoy act D^X implies that the decision-maker strictly prefers the target act to the decoy act, i.e., $X \succ_{\{X,Y,D^X\}} D^X$. Hence, the asymmetrically dominated decoy act D^X is not selected by the decision-maker when choosing from the ternary choice set $\mathcal{C} = \{A, B, D^X\}$.

3.2. Regret Theory and the Compromise Effect

The compromise effect occurs if a decoy effect is triggered by a decoy act D^X that is more extreme than the target act X in the sense that the decoy act pays a higher amount than the target in those states where the target dominates the competitor and a lower amount than the target in those states where the competitor dominates the target. Thus, the addition of the decoy act D^X makes the target act X look like a "good" compromise between decoy act D^X and competitor act Y as X pays an intermediate amount in comparison to D^X and Y in all states of the world.

Definition 3 (Compromise Effect). The X-compromise effect occurs if, for acts A and B, a decoy effect favoring $X \in \{A, B\}$ is triggered by a decoy act D^X with the following properties (where $Y = \{A, B\} \setminus \{X\}$):

- $d_s^X \ge x_s$ for all $s \in \mathcal{S}^X$ and $d_s^X > x_s$ for some $s \in \mathcal{S}^X$;
- $d_s^X \leq x_s$ for all $s \in \mathcal{S}^Y \cup \mathcal{S}^N$ and $d_s^X < x_s$ for some $s \in \mathcal{S}^Y$.

Definition 3 allows us to state the conditions under which regret theory predicts the occurrence of the compromise effect.

Proposition 2 (Compromise Effect). Consider acts A, B and D^X with $X \in \{A, B\}$ satisfying the conditions in Definition 3. The X-compromise effect occurs if one of the following two conditions hold (where $Y = \{A, B\} \setminus \{X\}$):

- (i) $\bar{c}^X \geq \bar{c}^Y$;
- (ii) $\bar{c}^X < \bar{c}^Y$ and $R''(\Delta) > 0$ for all $\Delta > 0$.

According to Proposition 2(i), regret theory predicts the compromise effect to occur if the expected choiceless utility is at least as high under the target act than under the competitor act. According to Proposition 2(ii), if the expected choice-less utility is higher under the competitor act than under the target act, regret theory predicts the compromise effect to occur if enormous potential regrets obtain disproportional high weight, i.e., if the regret function $R(\cdot)$ is convex.

Finally, to complete the characterization of the compromise effect's occurrence, we specify the conditions under which the target act is preferred to the decoy act. Intuitively, this requires the decoy act to be not too attractive.

Lemma 2. The target act X is preferred to the decoy act D^X designed to trigger the compromise effect (i.e., $X \succ_{\{X,Y,D^X\}} D^X$) if and only if

$$2(\bar{c}^{X} - \bar{c}^{D^{X}}) > \sum_{s \in \mathcal{S}^{X}} p_{s}R(c(d_{s}^{X}) - c(x_{s})) - \sum_{s \in \mathcal{S}^{Y}} p_{s}[R(c(y_{s}) - c(d_{s}^{X})) - R(c(y_{s}) - c(x_{s})) + R(c(x_{s}) - c(d_{s}^{X}))] - 2\sum_{s \in \mathcal{S}^{N}} p_{s}R(c(x_{s}) - c(d_{s}^{X})).$$
(13)

Notably, the second and third lines of (13) are negative. Thus, a sufficient condition for $X \succ_{\{X,Y,D^X\}} D^X$ is that $\bar{c}^X > \bar{c}^{D^X}$ and that d_s^X is sufficiently close to x_s for all $s \in \mathcal{S}^X$. Moreover, inequality (13) is more likely to be satisfied the lower d_s^X for $s \in \mathcal{S}^Y \cup \mathcal{S}^N$.

4. Testable Implications

In this section, we first outline our empirical strategy, and thereafter, we derive testable hypotheses based on the analysis conducted in Section 3.

4.1. Empirical Strategy

In all decoy-effect-related questions in our experiment, subjects choose from a ternary choice set that contains the two baseline acts A and B as well as a decoy act D^X that either favors act A (i.e., X = A) or act B (i.e., X = B). Such a ternary choice set is depicted in Table 1. Concerning the states' occurrence probabilities, we impose $p \in (0, 1)$ and $q \in [0, 1)$ with q + p < 1; i.e., we focus on choice problems with at least two and at most three states. Furthermore, to derive testable hypotheses, we assume that $S^A = \{1\}$ and $S^B = \{2\}$ such that $a_1 > b_1 \ge 0$ and $b_2 > a_2 \ge 0$. Finally, $S^N = \{3\}$ with $0 \le d_3^X \le a_3 = b_3 = n$.

	s = 1	s = 2	s = 3
A	a_1	a_2	n
В	b_1	b_2	n
$D^X, X \in \{A, B\}$	d_1^X	d_2^X	d_3^X
p_s	p	1-p-q	q

Table 1: Ternary choice set in the experiment

To account for noise in observed behavior, we phrase our hypotheses in terms of how a variation in the composition of the decoy act should be expected to affect the relative attractiveness of the two baseline acts A and B. Specifically, we define

$$\sigma(X, Y | D^A, D^B) \quad \text{for } X, Y \in \{A, B\}$$

as the proportion of subjects that choose act X from ternary choice set $\{X, Y, D^A\}$ and act Y from ternary choice set $\{X, Y, D^B\}$. Following Herne (1999), our main test statistic is based on the difference between predicted and unpredicted choice switches, i.e.,

$$\chi(D^{A}, D^{B}) := \sigma(A, B | D^{A}, D^{B}) - \sigma(B, A | D^{A}, D^{B}).$$
(14)

If choices are not systematic but represent random mistakes, then $\chi(D^A, D^B) \approx 0$.

While we address decoy acts that favor act A and decoy acts that favor act B in the experiment, we restrict the following exposition to the A-attraction effect and the A-compromise effect. The corresponding hypotheses for the B-attraction effect and the B-compromise effect can be derived analogously.

4.2. Attraction Effect: Hypotheses

For given acts A and B, we construct the following two decoy acts:

$$D^{A+} = (a_1, a_2 - \delta_2, n - \delta_3)$$
 and $D^{A-} = \left(\frac{a_1 + b_1}{2}, a_2 - \delta_2, n - \delta_3\right)$, (15)

with $0 < \delta_2 < a_2$ and $0 \le \delta_3 \le n$. Notably, $d_1^{A*} \in (b_1, a_1]$, $d_2^{A*} < a_2 < b_2$ and $d_3^{A*} \in [0, n]$ for $* \in \{+, -\}$, such that both D^{A+} and D^{A-} are state-wise dominated by act A and neither D^{A+} nor D^{A-} state-wise dominates or is state-wise dominated by act B. Therefore, as stated in the following hypothesis, both D^{A+} and D^{A-} should (on average) be expected to trigger the A-attraction effect.

Hypothesis 1 (Attraction Effect). If the decoy act changes from $D^{A*} \in \{D^{A+}, D^{A-}\}$ to D^B , where $d_1^B < b_1$, $d_2^B \in (a_2, b_2]$ and $d_3^B \leq n$, the proportion of subjects that switches from A to B is higher than the proportion that switches from B to A:

$$\chi(D^{A*}, D^B) > 0.$$

Two remarks regarding Hypothesis 1 are in order. First, act D^B is state-wise dominated by act B, and neither state-wise dominates nor is state-wise dominated by act A. Hence, by its construction, act D^B is a decoy act that potentially triggers the B-attraction effect. Second, if Hypothesis 1 should turn out to be confirmed, then subjects behave *as if* regret averse, which would provide implicit support for our Assumption 1.

While both D^{A+} and D^{A-} may trigger the A-attraction effect, by design, the two decoy acts differ concerning their effectiveness. Precisely, according to Proposition 1, the attraction effect is always predicted for decoy D^{A+} , whereas for decoy D^{A-} the attraction effect is predicted only if a subject's individual preferences are such that either $\bar{c}^A \geq \bar{c}^B$ or $d_1^{A-} = (a_1 + b_1)/2 > z_1$. Thus, as stated in the following hypothesis, we should expect the decoy act D^{A+} to induce a more robust increase in the relative attractiveness of act A in comparison to act B than the decoy act D^{A-} .

Hypothesis 2 (AE – Comparative Static). Decoy act D^{A+} is more effective than decoy act D^{A-} in triggering the A-attraction effect:

$$\chi(D^{A+}, D^B) > \chi(D^{A-}, D^B)$$

4.3. Compromise Effect: Hypotheses

Again, for given acts A and B, we construct two decoy acts:

$$D^{A+} = \left(a_1 + 2\delta_1, \frac{a_2}{2}, n - \delta_3\right) \quad \text{and} \quad D^{A-} = \left(a_1 + \delta_1, \frac{a_2}{2}, n - \delta_3\right), \quad (16)$$

with $\delta_1 > 0$ and $0 \le \delta_3 \le n$. Here, $b_1 < a_1 < d_1^{A*}$ and $d_2^{A*} < a_2 < b_2$ for $* \in \{+, -\}$, such that the target act A looks like a "good compromise" in states 1 and 2 compared to the acts B and D^{A*} . Thus, with $d_3^{A*} \in [0, n]$ for $* \in \{+, -\}$, both D^{A+} and D^{A-} should (on average) be expected to trigger the A-compromise effect.

Hypothesis 3 (Compromise Effect). If the decoy act changes from $D^{A*} \in \{D^{A+}, D^{A-}\}$ to D^B , where $d_1^B < b_1$, $d_2^B > b_2$ and $d_3^B \le n$, the proportion of subjects that switches from A to B is higher than the proportion that switches from B to A:

$$\chi(D^{A*}, D^B) > 0.$$

Note that the decoy act D^B in Hypothesis 3 makes act B look like a (good) compromise in the choice set $\{A, B, D^B\}$, i.e., D^B can be expected to trigger the B-compromise effect.

Next, we use the difference in the composition of the two decoy acts D^{A+} and D^{A-} to derive a hypothesis regarding their effectiveness in triggering the A-compromise effect. According to (A.7) in the proof of Proposition 2, the compromise effect occurs if and only if

$$\bar{c}^A - \bar{c}^B > p \left[R(c(d_1^{A*}) - c(a_1)) - R(c(d_1^{A*}) - c(b_1)) \right].$$
(17)

As $d_1^{A*} > a_1 > b_1$, the right-hand side of (17) is negative. Furthermore, if $R''(\Delta) > 0$ for $\Delta > 0$, the right-hand side of (17) is decreasing in d_1^{A*} . Therefore, if $R(\cdot)$ is convex, we should expect the A-compromise effect to occur more often the higher d_1^{A*} is as (17) then is more likely to be satisfied. While the convexity of $R(\cdot)$ is in line with the assumptions typically imposed in the literature on regret aversion (Loomes and Sugden, 1982, 1987a), there also is recent evidence that the regret function $R(\cdot)$ embodies diminishing sensitivity (Loewenfeld and Zheng, 2023) and might be concave rather than convex.¹¹ In light of the above discussion, we formulate the following hypotheses.

Hypothesis 4 (CE – Comparative Static).

(a) $R(\cdot)$ is convex (aversion to large-stake regrets): Decoy act D^{A+} is more effective than decoy act D^{A-} in triggering the A-compromise effect:

$$\chi(D^{A+}, D^B) > \chi(D^{A-}, D^B).$$

(b) $R(\cdot)$ is concave or linear: Decoy act D^{A+} is not more effective than decoy act D^{A-} in triggering the A-compromise effect:

$$\chi(D^{A+}, D^B) \leq \chi(D^{A-}, D^B).$$

¹¹To be precise, Loewenfeld and Zheng (2023) document evidence that the net-advantage function $\Psi(\cdot, \cdot)$ from generalized regret theory (Loomes and Sugden, 1987a) exhibits decreasing sensitivity to payoff differences. This directly translates into $R(\cdot)$ being concave in our formalization.

5. Experimental Design and Procedural Details

5.1. Experimental Design

We implement a within-subject design to test the hypotheses derived in Section 4. Every subject is sequentially presented with 24 choices between two or three acts. Sixteen choices are designed to trigger the attraction and compromise effect, as hypothesized in Section 4. The remaining eight choices serve as distractor choices to dilute the purpose of the experiment.¹² At the end of the experiment, the computer randomly determines one of these 24 choice problems and the subject's decision in this choice problem becomes payoff relevant.

In our experiment, an act assigns a monetary amount between $\pounds 0$ and $\pounds 14$ to each integer number from 1 to 100. Suppose a given act is selected as payoff relevant at the end of the experiment. In that case, the computer randomly draws an integer number between 1 and 100, and the subject is paid the amount the act in question assigns to this number.

In each of the 16 main choices of the experiment, subjects are asked to choose their most preferred act from a ternary set of acts $C = \{A, B, D^X\}$. We formulate two constellations of ternary choice sets for the attraction effect and two constellations of ternary choice sets for the compromise effect. The two constellations for a given notion of the decoy effect mainly differ in the number of states involved: In Constellation 1, there are only two states of the world, whereas in Constellation 2 there are three states of the world.

In Figure 3, we summarize the 16 ternary choice sets that we use in the experiment, where each constellation for a given notion of the decoy effect comprises the ternary choice sets $\{A, B, D^{A+}\}$, $\{A, B, D^{A-}\}$, $\{A, B, D^{B+}\}$ and $\{A, B, D^{B-}\}$.¹³ That is, within a given constellation that relates to either the attraction effect or the compromise effect, we fix the parameterization of the baseline acts A and B and then vary the decoy act D^{X*} concerning which act $X \in \{A, B\}$ shall be targeted at what "degree of effectiveness" $* \in \{+, -\}$, respectively.

All choice sets in the experiment are presented to subjects in a matrix display to make the correlation of monetary outcomes across acts transparent and, thus, allow for context effects (i.e., regret) to play a role in shaping subjects' choices.¹⁴ As Figure 4 illustrates for one particular ternary choice set from the experiment,

¹²An overview of all gamble decisions can be found in Appendix B.1.

 $^{^{13}\}mathrm{In}$ total, we design 8 ternary choice sets for the attraction effect and 8 ternary choice sets for the compromise effect.

¹⁴This display format was used, for example, by Loomes (1988a,b, 1989), Loomes and Sugden (1987b), Loomes et al. (1989, 1991, 1992), Starmer (1992), Starmer and Sugden (1989, 1993, 1998), and Castillo (2020).

	1 40	41 100
A	£10	£3
В	£4	£7
D ^{A+}	£10	£2
D ^{A-}	£7	£2
D ^{B+}	£3	£7
D ^{B-}	£3	£5
	40%	60%

	1 50	51 80	81 100
А	£7	£4	£2
В	£3	£10	£2
D ^{A+}	£7	£3	£0
D ^{A-}	£5	£3	£0
D ^{B+}	£2	£10	£0
D ^{B-}	£2	£7	£0
	50%	30%	20%

(a) Constellation 1: Attraction effect

(b)	Constellation	2:	Attraction	effect
-----	---------------	----	------------	--------

	1 70	71 100		1
A	£7	£6	A	
В	£4	£12	В	
D ^{A+}	£9	£3	D ^{A+}	
D ^{A-}	£8	£3	D ^{A-}	
D ^{B+}	£2	£14	D ^{B+}	
D ^{B-}	£2	£13	D ^{B-}	
	70%	30%		

	1 30	31 80	81 100
A	£9	£4	£3
В	£2	£8	£3
D ^{A+}	£11	£2	£0
D ^{A-}	£10	£2	£0
D ^{B+}	£1	£10	£0
D ^{B-}	£1	£9	£0
	30%	50%	20%

(c) Constellation 1: Compromise effect

(d) Constellation 2: Compromise effect

Figure 3: Overview of main choices in the experiment.

under this matrix display, the feasible acts correspond to the rows of the matrix, and the numbers within these rows' cells denote amounts of money in GBP. For each act's potential monetary outcomes, the numbers along the top of the matrix indicate the range of numbers for which the respective monetary amount would be paid. The numbers along the bottom of the matrix show the probability with which the randomly generated number falls into the corresponding range indicated at the top of the matrix. The width of each column is proportional to the respective probability.

Choice problems are presented in random order to subjects.¹⁵ Before making any choices, subjects receive detailed information on understanding the matrix dis-

 $^{^{15}}$ However, to avoid that subjects can compare the ternary choice sets of a given constellation too easily, we ensure that consecutive choice problems faced by a subject never belong to the same constellation.

	1 50	51 80	81 100
0	£7	£4	£2
0	£3	£10	£2
0	£2	£7	£0
	50%	30%	20%

Figure 4: Matrix display of a ternary choice set in the experiment.

play of a choice situation and how their payoff would be determined at the end of the experiment. The detailed instructions and other experimental materials for replication are available at Open Science Framework (OSF) under the following direct link: https://osf.io/g8jh3/?view_only=6bf91229995a4ed9919e260afbcd5653. The pre-registration of this study is accessible at the same direct link. Institutional review board (IRB) approval was given by the German Association for Experimental Economic Research e.V. (GfeW) and is also available at the OSF repository.

5.2. Procedural Details

The experiment was programmed using the software o-Tree (Chen et al., 2016), and subjects were recruited online via Prolific. In total, 462 subjects were recruited in November 2023. Of these, 398 (198 female, 193 male, 7 non-binary) completed our experiment.¹⁶ Before making the 24 choices in the experiment, we asked subjects to answer comprehension questions to ensure that they understood the instructions. Moreover, we placed an attention check among the 24 choice problems. The 64 subjects excluded from our sample either failed a comprehension question twice or did not pass the attention check, which added to the 24 choice problems.¹⁷ The median completion time of the experiment was 15:22 minutes, and the average payoff amounted to £8.78 (including Prolific VAT), including a fixed participation fee of £2. After the main experiment, we elicited each subject's general risk attitude based on Dohmen et al. (2011) and the general degree of post-decisional regret aversion based on the measure provided in Appendix B.2. Furthermore, several socio-demographic (control) variables were collected using an ex-post questionnaire

¹⁶We pre-registered a sample size of at least 397 subjects based on previous power analyses (details are available in the pre-registration).

¹⁷These exclusion rules were defined in the pre-registration. Subjects who failed comprehension questions twice or did not pass the attention check were paid a fixed participation fee of £2 but were excluded from all additional payments in the experiment.

(gender, age, education, occupation, and maths ability).¹⁸

6. Results

In Sections 6.1 and 6.2, we present the observations of our experimental study regarding the attraction and the compromise effect, respectively. Following Herne (1999), our primary test statistic compares the mean frequencies (proportions) of predicted preference switches with those of unpredicted switches. We apply nonparametric tests to our aggregated data and to more granular data. In particular, we split our data by the number of states (Constellation 1 vs. Constellation 2). Regression analyses complement our non-parametric tests.

6.1. Results: Attraction Effect

We have 3184 observations when considering the fully aggregated data set.¹⁹ Among these observations, subjects made consistent choices in 65.58% of these cases (consistent choice of A and B in 36.72% and 28.86% of the cases, respectively). In only 1.98% of the cases, subjects chose at least one state-wise dominated decoy act. In the remaining 32.44% of the cases, subjects switched their preference between the two acts, A and B, depending on the decoy's target act.

	A	В	D^B
A	1169~(36.72%)	593~(18.62%)	14~(0.44%)
В	440 (13.82%)	919 (28.86%)	23~(0.72%)
D^A	13 (0.41%)	8 (0.25%)	5 (0.16%)

Table 2: Contingency table for the attraction effect with data pooled across constellations and decoy specifications.

We are interested in the preference relation between act A and B. As we do not observe this relation if a decoy act is chosen, we disregard these choice patterns in our empirical analysis, leaving us with 3121 observations. Among these patterns, as depicted in Figure 5, we observe a predicted preference switch in 19.00% of the cases

¹⁸Tables 10 and 11 in Appendix B.2 provide an overview of subjects' responses to the questions included in the ex-post questionnaire.

¹⁹Of the 24 choice sets in the experiment, eight were designed to test for the attraction effect: four choice sets in each of the two constellations, with two of the respective choice sets including a decoy targeting baseline act A, and two choice sets including a decoy targeting baseline act B. When comparing the decisions between choice problems involving a decoy that targets A and choice problems involving a decoy that targets B, we have to include in our analysis eight possible combinations of the choice problems (each of the two decoys D^{A*} with each of the two decoys D^{B*} times the number of constellations). Thus, we have $398 \times 2^2 \times 2 = 3184$ observations.

(593/3121) and an unpredicted preference switch in 14.10% of the cases (440/3121). This difference is statistically significant (p<0.01, McNemar test) and thus supports Hypothesis 1.



Figure 5: Attraction effect for data pooled across constellations.

To provide more nuanced insights, we split our data by the number of states involved (Constellation 1, two states; Constellation 2, three states). We have 1551 and



Figure 6: Attraction effect for data split by constellations.

1570 observations of interest in Constellation 1 and 2, respectively.²⁰ Figure 6 de-

 $^{^{20}{\}rm Table~13}$ in Appendix C.1 depicts the contingency tables for the attraction effect with data split by constellations.

picts the proportion of predicted preference and unpredicted preference switches by constellation. In Constellation 1 we have 316 (20.37%) predicted and 211 (13.60%) unpredicted preference switches. This difference is statistically significant (p<0.01, McNemar test). In Constellation 2 we observe 277 (17.64%) predicted and 229 (14.59%) unpredicted preference switches. This difference is less pronounced than in Constellation 2 but still statistically significant (0.01 , McNemar test) and thus supports Hypothesis 1.

Result 1. We observe a significant attraction effect for the aggregated data and the data split by constellation. That is, we observe an attraction effect irrespective of the number of states involved.

We complement the above non-parametric tests with regression analyses, whose results are presented in Table 3. Coefficients indicate the average marginal effects of probit models, and coefficients in parentheses indicate the marginal effects of linear probability models. In all regressions, the dependent variable is a dummy variable capturing the "attraction effect" and is 1 if, for the comparison of a ternary choice set including a decoy targeting baseline act A with a ternary choice set including a decoy targeting baseline act B, a subject shows a predicted preference switch and 0 if a subject shows an unpredicted preference switch.²¹

All regressions include the following explanatory dummy variables: a *Const.* 2 dummy variable, which is 1 if choice took place in Constellation 2 with three states and 0 if choice took place in Constellation 1 with only two states; a D^{X+} dummy variable, which, for $X \in \{A, B\}$, is 1 if a D^{X+} decoy is available in the ternary choice set and 0 if a D^{X-} decoy is available in the ternary choice set.²²

As can be seen from Table 3, with the coefficient of dummy *Const. 2* being negative in all regression specifications, increasing the number of states from two to three in tendency decreases the likelihood of observing the attraction effect. This effect, however, is never statistically significant, which is in line with the robust occurrence of the attraction effect in both Constellations 1 and 2 as documented in Result 1. Furthermore, Table 3 also allows to shed some first light on the comparative static conjecture in Hypothesis 2, according to which decoy D^{X+} should be more effective than decoy D^{X-} in triggering the attraction effect. Regarding decoys

²¹Thus, for each subject, four choice comparisons are made: $\{A, B, D^{A+}\}$ and $\{A, B, D^{B+}\}$, $\{A, B, D^{A+}\}$ and $\{A, B, D^{B-}\}$, $\{A, B, D^{A-}\}$ and $\{A, B, D^{B+}\}$, $\{A, B, D^{A-}\}$ and $\{A, B, D^{B-}\}$.

²²The variable *Controls* in regression specification (2) includes subjects' age, gender, educational status, occupational status, math skills, risk attitude (based on Dohmen et al. (2011)), and post-decisional regret attitude (based on the measure provided in Appendix B.2). We included binary variables for subjects' gender, educational status, and occupational status here and in further regression analyses to ease the interpretation of these variables and due to insufficient observations in some categories, respectively. See Appendix B.2 for details.

	Depende	ent variable: attraction effect
	(1)	(2)
Const. 2	-0.0510	-0.0472
	(-0.0509)	(-0.0477)
D^{A+}	0.0699^{**}	0.0681^{**}
	(0.0700^{**})	(0.0684^{**})
D^{B+}	0.0333	0.0307
	(0.0334)	(0.0307)
Controls	No	Yes
No. of obs.	N=1023	N=1023

Notes: Significance levels indicated as follows: 0.10 * 0.05 ** 0.01 *** 0. Standard errors are clustered at the subjects level.

Table 3: Regression results on the attraction effect.

targeting baseline act A, the dummy D^{A+} coefficient is positive and significantly different from zero in all regression specifications. Specifically, deploying decoy D^{A+} instead of D^{A-} increases the likelihood of observing the attraction effect on average by about 7.0% in probit regression (1) and 6.8% in probit regression (2).²³ Regarding decoys targeting baseline act B, on the other hand, we find that the likelihood of observing the attraction effect is not affected differently by whether decoy D^{B+} or D^{B-} is available in the choice set. While positive in all regression specifications, the dummy D^{B+} coefficient is never significantly different from zero.

Next, we refine the above mentioned observations regarding the comparative static conjecture in Hypothesis 2 with complementary regression analyses that directly assess the relative effectiveness of different decoy specifications to trigger the attraction effect. The results for decoy specifications targeting baseline act A are presented in Tables 4 and 5. As before, coefficients indicate the average marginal effects of probit models, and coefficients in parentheses indicate the average marginal effects of linear probability models. The dependent variable is a dummy variable capturing the attraction effect as before. We include as an explanatory variable a D^{A+} dummy, which is 1 if decoy act D^{A+} is included in the choice set and 0 if decoy act D^{A-} is included in the choice set (i.e., decoy act D^{A-} serves as the reference category). The decoy act targeting baseline act B is fixed to D^{B+} in regression model (1) and to D^{B-} in regression model (2).

The regression results reported in Table 4, where data is pooled across constellations, indicate that overall, the availability of a D^{A+} decoy relative to the availability

²³Throughout the paper, when interpreting coefficients in regression tables, we only refer to the coefficients obtained by probit models as linear probability models produce similar results in all regressions considered in this paper.

Dependent variable: attraction effect				
	(1) D^{B+}	(2) D^{B-}		
Pooled constellatio	ns			
D^{A+}	0.0701^{**}	0.0785^{**}		
	(0.0704^{**})	(0.0788^{**})		
D^{A-}	Ref.	Ref.		
	N=518	N=515		

Notes: Significance levels indicated as follows: 0.10 * 0.05 ** 0.01 *** 0. Standard errors are clustered at the subjects level.

Table 4: Regression results on the relative effectiveness of decoy D^{A+} when data is pooled by constellations.

	Dependent v	ariable: attraction effect
	(1) D^{B+}	(2) D^{B-}
Constellation 1		
D^{A+}	0.1237^{***}	0.1106***
	(0.1250^{***})	(0.1115^{***})
D^{A-}	Ref.	Ref.
	N=252	N=275
$\underline{Constellation 2}$		
D^{A+}	0.0194	0.0403
	(0.0194)	(0.0403)
D^{A-}	Ref.	Ref.
	N=266	N=240

Notes: Significance levels indicated as follows: 0.10 * 0.05 ** 0.01 *** 0. Standard errors are clustered at the subjects level.

Table 5: Regression results on the relative effectiveness of decoy D^{A+} when data is split by constellations.

of a D^{A-} decoy increases the probability of observing the attraction effect by approximately 7.0% when decoy act D^{B+} is fixed and by almost 7.9% when decoy act D^{B-} is fixed. As documented by the regression results in Table 5, this is driven by decoy D^{A+} being significantly more effective in triggering the attraction effect than decoy D^{A-} in Constellation 1. Specifically, in Constellation 1, the availability of a D^{A+} decoy act relative to the availability of a D^{A-} decoy act increases the probability of observing the attraction effect, on average, by more than 12.3% when decoy D^{B+} is present and by about 11.1% when decoy act D^{B-} is present. In Constellation 2, in contrast, we observe no such effect, irrespective of which decoy targeting baseline act *B* is fixed. In Constellation 2, the availability of a D^{A+} decoy act relative to the availability of a D^{A-} decoy act does not increase the probability of observing the attraction effect in a statistically significant manner.

Regarding decoys targeting baseline act B, as was already foreshadowed by the results in Table 5, decoy D^{B+} turns out to be not more effective in triggering the attraction effect than decoy D^{B-} .²⁴ Thus, we conclude the following regarding Hypothesis 2.

Result 2.

- (a) For the aggregated data, decoy act D^{A+} is more effective than decoy act D^{A-} in triggering the attraction effect, whereas decoy act D^{B+} is not more effective than decoy act D^{B-} in triggering the attraction effect.
- (b) For the data split by constellation, decoy act D^{A+} is more effective than decoy act D^{A-} in triggering the attraction effect only if the number of states is low (i.e., in Constellation 1 but not in Constellation 2).

Finally, we analyze the granular data set – split by constellations and decoy specifications – with non-parametric tests to obtain a nuanced view on the results.²⁵ Figure 7 depicts the proportions of subjects exhibiting a predicted preference switch and the proportions exhibiting an unpredicted preference switch for each choice pair separately. As net decoy effects are independent, we rely on (one-sided) two-proportion Z-tests for statistical inference.

For all four choice pairs in Constellation 1, we find that the proportion of subjects showing a predicted preference switch is strictly larger than that of subjects showing an unpredicted preference switch.²⁶ As depicted in Figure 7(a), the occurrence of the attraction effect is statistically significant only for the pairs of choice sets that involve the decoy specifications $\langle D^{A+}, D^{B+} \rangle$ (p < 0.01) or $\langle D^{A+}, D^{B-} \rangle$ (p < 0.01), i.e., only if decoy act D^{A+} is contained in one of the choice sets.

For Constellation 2, we find that the proportion of subjects showing a predicted preference switch is at least as large as that of subjects showing an unpredicted preference switch for all four (and strictly larger for three out of four) combinations of decoy specifications.²⁷ As depicted in Figure 7(b), the occurrence of the attraction

²⁴Regression results on the relative effectiveness of decoys D^{B+} and D^{B-} to trigger the attraction effect are provided in Appendix C.

²⁵Table 14 in Appendix C.1 depicts the contingency tables for the attraction effect with data split by constellations and by decoy specifications.

²⁶For Constellation 1, the precise differences of proportions of predicted and unpredicted preference reversals amount to $\chi(D^{A+}, D^{B+}) = 11.49\%$, $\chi(D^{A+}, D^{B-}) = 10.82\%$, $\chi(D^{A-}, D^{B+}) = 2.58\%$ and $\chi(D^{A-}, D^{B-}) = 2.30\%$.

²⁷Specifically, for Constellation 2, we have $\chi(D^{A+}, D^{B+}) = 5.90\%$, $\chi(D^{A+}, D^{B-}) = 2.56\%$, $\chi(D^{A-}, D^{B+}) = 3.81\%$ and $\chi(D^{A-}, D^{B-}) = 0.00\%$.











effect is statistically significant only for the pairs of choice sets that involve the decoy specifications $\langle D^{A+}, D^{B+} \rangle$ (0.01 \langle D^{A-}, D^{B+} \rangle (0.05 D^{B+} is included in one of the choice sets.

These observations suggest the following qualification of Result 1 above: The occurrence of the attraction effect in Constellation 1 seems to be driven primarily by decoy specification D^{A+} , whereas the occurrence of the attraction effect in Constellation 2 seems to be driven primarily by decoy specification D^{B+} . In this sense, both 'plus' decoys, the D^{A+} and the D^{B+} , are more effective in triggering the attraction effect than the respective alternative, supporting Hypothesis 2.

6.2. Results: Compromise Effect

The analysis of the compromise effect follows the structure of the analysis of the attraction effect. Therefore, to streamline the exposition, we refer to Subsection 6.1 for details on the non-parametric tests and regression specifications.

Among the 3184 observations of the fully aggregated data set, subjects consistently selected act A or act B in 55.37% of the cases. Specifically, subjects chose act A from both ternary sets in 39.98% of the cases and act B from both ternary choice

sets in 15.39% of the cases. In 19.12% of the cases, subjects selected at least one decoy act.²⁸ In the remaining 25.51% of the cases, subjects switched their preference between the two baseline acts, A and B, depending on the decoy's target act.

	A	В	D^B
A	1273~(39.98%)	459 (14.42%)	60~(1.88%)
В	353 (11.09%)	490 (15.39%)	93~(2.92%)
D^A	286 (8.98%)	131 (4.11%)	39~(1.23%)

Table 6: Contingency table for the compromise effect with data pooled across constellations and decoy specifications.

As we do not observe the preference relation between acts A and B if a decoy act is selected, we again disregard these choice patterns in our empirical analysis, leaving us with 2575 observations. Among those, as depicted in Figure 8, we observe a predicted preference switch in 17.83% of the cases (459/2575) and an unpredicted preference switch in 13.71% of the cases (353/2575). This difference is statistically significant and thus supports Hypothesis 3 (p<0.01, McNemar test).



Figure 8: Compromise effect for data pooled across constellations.

When splitting the data by constellations, we have 1133 relevant observations in Constellation 1 (with two states) and 1442 in Constellation 2 (with three states).²⁹

²⁸Notably, with the decoy act being an extreme option that is not dominated by either of the two baseline acts, selecting the decoy act can actually be a reasonable choice.

²⁹Table 17 in Appendix D.1 depicts the contingency tables for the compromise effect with data split by constellations.



Figure 9: Compromise effect for data split by constellations.

Figure 9 depicts the proportions of predicted and unpredicted preference switches in the two constellations. In Constellation 1, there are 216 (19.06%) predicted and 106 (9.36%) unpredicted preference switches, a difference that is highly significant (p<0.01, McNemar test). In Constellation 2, in contrast, we observe 243 (16.85%) predicted and 247 (17.13%) unpredicted preference switches. This difference has the opposite sign as predicted and is not statistically significant (p>0.10, McNemar test). We thus come to confirm Hypothesis 3, albeit with qualification.

Result 3. We observe a significant compromise effect for the aggregated data. For the data split by constellation, we observe a significant compromise effect only if the number of states is low (i.e., in Constellation 1, but not in Constellation 2).

We complement and extend the non-parametric test results with regression analyses, whose results are reported in Table 7.³⁰ Here, the coefficient of the dummy variable *Const.* 2 is negative and highly significant in all regression specifications. Specifically, adding a third state of nature reduces the likelihood of observing the compromise effect by 17.0% in probit regression (1) and by 16.5% in probit regression (2), which is in line with Result 3. Furthermore, in all regression specifications,

³⁰As before, coefficients (in parentheses) indicate the average marginal effects of probit (linear probability) models. The dependent variable in all regressions is a dummy variable capturing the compromise effect and is 1 if, for the comparison of a ternary choice set including a decoy targeting baseline act A with a ternary choice set including a decoy targeting baseline act B, a subject shows a predicted preference switch and 0 if a subject shows an unpredicted preference switch. Furthermore, each regression includes the dummy variables *Const.* 2 (which is 1 in Constellation 2 and 0 in Constellation 1) and D^{X+} with $X \in \{A, B\}$ (which is 1 if a decoy D^{X+} is available in the choice set and 0 if a decoy D^{X-} is available in the choice set). *Controls* include age, gender (binary), educational status (binary), occupational status (binary), math skills, risk attitude and regret attitude.

the coefficients of the dummy variables D^{A+} and D^{B+} are both negative though not significantly different from zero; i.e., for $X \in \{A, B\}$, decoy D^{X+} seems not more effective than decoy D^{X-} in triggering the compromise effect. As outlined in detail in Subsection 4.3, this observation speaks against a convex regret function (cf. Hypothesis 4(a)) but in favor of a linear or even concave regret function (cf. Hypothesis 4(b)).

	Dependent v	variable: compromise effect
	(1)	(2)
Const. 2	-0.1691^{***}	-0.1645^{***}
	(-0.1701^{***})	(-0.1658^{***})
D^{A+}	-0.0058	-0.0109
	(-0.0056)	(-0.0108)
D^{B+}	-0.0396	-0.0335
	(-0.0399)	(-0.0340)
Controls	No	Yes
No. of obs.	N=802	N=802

Notes: Significance levels indicated as follows: 0.10 * 0.05 ** 0.01 *** 0. Standard errors are clustered at the subject's level.

Table 7: Regression results on the compromise effect.

To further investigate Hypothesis 4, we conduct a set of complementary regression analyses that directly assess the effectiveness of different decoy specifications to trigger the compromise effect. The results regarding decoys targeting baseline act Aare presented in Tables 8 and 9, the (qualitatively identical) results regarding decoys targeting baseline act B are deferred to Appendix D.³¹ The regression results for the pooled data in Table 8 indicate that the availability of a D^{A+} decoy relative to the availability of a D^{A-} decoy does not affect the likelihood to observe the compromise effect. The coefficient is always negative but never statistically different from zero, irrespective of whether the decoy targeting baseline act B is fixed to D^{B+} or D^{B-} . As becomes apparent from Table 9, this observation is confirmed by the regression analysis where the data is split by constellation. Also, here, while negative in Constellation 1 (with two states) and positive in Constellation 2 (with three states), the coefficient is not significantly different from zero in any case. Thus, overall, we do not find evidence supporting the assumption of a convex regret

³¹Again, coefficients (in parentheses) indicate the average marginal effects of probit (linear probability) models. The dependent variable is 1 if, for the comparison of a ternary choice set including a decoy targeting baseline act A with a ternary choice set including a decoy targeting baseline act B, a subject shows a predicted preference switch and 0 if a subject shows an unpredicted preference switch. The decoy targeting baseline act B is fixed to D^{B+} in regression model (1) and to D^{B-} in regression model (2).

Dependent variable: compromise effect					
	(1) D^{B+} (2) D^{B-}				
Pooled constellati	ons				
D^{A+}	-0.0091	-0.0087			
	(-0.0091)	(-0.0087)			
D^{A-}	Ref.	Ref.			
	N = 408	N=404			

function; i.e., we cannot confirm Hypothesis 4(a). Our findings are supportive for Hypothesis 4(b).

Notes: Significance levels indicated as follows: 0.10 * 0.05 ** 0.01 *** 0. Standard errors are clustered at the subject's level.

Table 8: Regression results on the relative effectiveness of decoy D^{A+} when data is pooled by constellations.

	Dependent variable: compromise effect		
	(1) D^{B+}	(2) D^{B-}	
Constellation 1	-		
D^{A+}	-0.0299	-0.0273	
	(-0.0299)	(-0.0273)	
D^{A-}	Ref.	Ref.	
	N = 158	N=164	
Constellation 2	2		
D^{A+}	0.0039	0.0033	
	(0.0039)	(0.0033)	
D^{A-}	Ref.	Ref.	
	N=250	N=240	

Notes: Significance levels indicated as follows: 0.10 * 0.05 ** 0.01 *** 0. Standard errors are clustered at the subject's level.

Table 9: Regression results on the relative effectiveness of decoy D^{A+} when data is split by constellations.

Result 4.

- (a) For the aggregated data, decoy act D^{A+} (D^{B+}) is not more effective in triggering the compromise effect than decoy act D^{A-} (D^{B-}) .
- (b) The number of states involved (Constellation 1 vs. 2) does not affect the relative effectiveness of decoy act D^{X+} , with $X \in \{A, B\}$, in triggering the compromise effect.

Finally, concerning the granular data set, Figure 10 depicts the proportion of subjects with a predicted and an unpredicted preference reversal for each choice pair separately.³² For statistical inference, we rely on (one-sided) two-proportion Z-tests.All four choice pairs in Constellation 1 display a highly significant compromise effect (p<0.01, respectively). In Constellation 2, on the other hand, all four choice pairs show an insignificant compromise effect (p>0.10, respectively). The choice pairs that involve the decoy act D^{B+} exhibit more unpredicted than predicted preference reversals.³³ Thus, overall, the observations for the granular data set not only strongly support Result 3, but also lend support to Result 4 as the decoy D^{B+} seems highly ineffective in triggering the compromise effect.



(b) Constellation 2



 $^{^{32}}$ Table 18 in Appendix D.1 depicts the contingency tables for the compromise effect with data split by constellations and by decoy specifications.

³³The precise differences of proportions or predicted and unpredicted preference reversals amount to $\chi(D^{A+}, D^{B+}) = 9.24\%, \ \chi(D^{A+}, D^{B-}) = 9.73\%, \ \chi(D^{A-}, D^{B+}) = 9.65\%, \ \chi(D^{A-}, D^{B-}) = 10.09\%$ in Constellation 1 and to $\chi(D^{A+}, D^{B+}) = -2.00\%, \ \chi(D^{A+}, D^{B-}) = 1.65\%, \ \chi(D^{A-}, D^{B+}) = -2.52\%, \ \chi(D^{A-}, D^{B-}) = 1.62\%$ in Constellation 2.

7. Concluding Remarks

Positing that within-state payoff comparisons across choice options are important drivers for decisions under risk, we follow ideas first outlined in Loomes and Sugden (1982) and develop a regret-theoretic model for choices from arbitrarily large choice sets. This model predicts the compromise and attraction effect, the two most prominent notions of the decoy effect. The model also allows us to compare the effectiveness of different decoy gambles in triggering the attraction or compromise effect. We test the predictions of our theoretical model with an online experiment and find strong evidence for the attraction and the compromise effect. The compromise effect, however, is statistically significant only if the choice problems involve two states but not when they involve three states. Regarding the relative effectiveness of triggering the attraction effect, we find weak evidence for our theory's comparative static prediction. Regarding the compromise effect, we used different decoy specifications to test whether subjects are disproportionally averse towards large-stake regrets as assumed by Loomes and Sugden (1982, 1987a). We do not find support for this assumption but rather evidence pointing towards (weak) diminishing sensitivity in ex-post feelings of regret.

What we are missing at this point is an explanation for what drives the different magnitudes in the observed decoy effects. For example, why is the occurrence of the attraction effect more pronounced in Constellation 1 with only two payoff states than in Constellation 2 with three payoff states? Likewise, regarding Constellation 2 with three payoff states? Likewise, regarding Constellation 2 with three payoff states? Likewise, regarding Constellation 2 with three payoff states, why is the occurrence of the attraction effect statistically more robust than the occurrence of the compromise effect? One potential explanation might be differences in choice complexity. Specifically, the observations in Enke and Shubatt (2023) suggest that choice complexity might increase when an additional payoff state "is added" (as when comparing Constellation 1 and Constellation 2 regarding the attraction effect) and that choice complexity might increase even further when a dominated decoy gamble is replaced with an undominated decoy gamble (as when comparing the attraction and the compromise effect in Constellation 2). However, our experimental design does not allow for a clean comparative analysis along these lines.³⁴

An alternative explanation for parts of the observed differences in magnitudes may also be the perceived riskiness of the target and the competitor act. Recall, for instance, that we observed that the attraction effect is mainly driven by the presence of decoy act D^{A+} in Constellation 1 and the presence of decoy act D^{B+}

³⁴The complexity index in Enke and Shubatt (2023) is constructed for pairwise choices and, thus, cannot be directly applied to our choice problems with ternary choice sets.

in Constellation 2. Act B is arguably the safer option in Constellation 1 but the riskier option in Constellation 2. This suggests that pushing the riskier rather than the safer option with an appropriate decoy might be easier.³⁵

As mentioned in Section 1, almost all studies on decoy effects restrict attention to gambles of the form (\$x, p), where the prize \$x is received with probability p and zero is received otherwise (Wedell, 1991; Herne, 1999; Soltani et al., 2012; Sürücü et al., 2017; Castillo, 2020). These studies argue that a decision-maker engages in dimension-wise comparisons across such gambles by comparing gambles' prizes with each other and the gambles' winning probabilities with each other.³⁶ We refer to such theories as (x, p)-theories. As became apparent in Section 3, under regret theory, the decision process is also shaped by dimension-wise comparisons, but the dimensions are the different states of nature. A natural question of interest is which kind of dimension-wise comparison decision-makers engage in when choosing among gambles of the (\$x, p)-form. To see how this question might be addressed experimentally, consider the choice between the gambles $A = (\$a, p_a), B = (\$b, p_b)$, and $D = (\$d, p_d)$ with a > d > b and $p_b > p_a \ge p_d$. Suppose that A and B are positively correlated, i.e., gamble B pays the amount b in all states where gamble A pays the amount \$a. According to (x, p)-theories, the gamble D is a decoy that triggers the A-attraction effect. According to regret theory, the gamble D is a decoy triggering the A-attraction effect only if it is (maximally) positively correlated with the gambles A and B, but not when it is negatively correlated. Thus, the change in the juxtaposition of the outcomes can be used to differentiate (x, p)-theories and regret theory for choices among simple gambles, where both theories can be applied. While beyond the scope of our analysis, investigating this issue is a fascinating topic for future research.

 $^{^{35}}$ For recent theory and evidence of how choice sets may affect risk attitudes, see Chen et al. (2024).

³⁶This approach is used by Rubinstein (1988) to provide an alternative explanation for the (common ratio) Allais paradox based on similarity judgments.

References

- Bordalo, P., "Salience Theory and Choice-Set Effects," mimeo 2010. Harvard University.
- _, N. Gennaioli, and A. Shleifer, "Salience theory for choice under risk," Quarterly Journal of Economics, 2012, 127, 1243–1285.
- _ , _ , and _ , "Salience and consumer choice," Journal of Political Economy, 2013, 121, 803–843.
- Bushong, B., M. Rabin, and J. Schwarzstein, "A Model of Relative Thinking," *Review of Economic Studies*, 2021, 88, 162–191.
- Castillo, G., "The attraction effect and its explanations," *Games and Economic Behavior*, 2020, 119, 123–147.
- Chen, D. L., M. Schonger, and C. Wickens, "oTree An open-source platform for laboratory, online, and field experiments," *Journal of Behavioral and Experimental Finance*, 2016, 9, 88–97.
- Chen, Zhuo, Russell Golman, and Jason Somerville, "Menu-dependent risk attitudes: Theory and evidence," Journal of Risk and Uncertainty, 2024, 68 (1), 77–105.
- **Chernoff, H.**, "Rational selection of decision functions," *Econometrica*, 1954, pp. 422–443.
- **Costa-Gomes, M. and G. Gerasimou**, "Status quo bias and the decoy effect: A comparative analysis in choice under risk," 2022. University of St Andrews.
- **Dasgupta, I. and P. K. Pattanaik**, "Regular choice and the weak axiom of stochastic revealed preference," *Economic Theory*, 2007, *31*, 35–50.
- Dohmen, Thomas, Armin Falk, David Huffman, Uwe Sunde, Jürgen Schupp, and Gert G Wagner, "Individual risk attitudes: Measurement, determinants, and behavioral consequences," *Journal of the European Economic Association*, 2011, 9 (3), 522–550.
- Engle-Warnick, J., J. Escobal, and S. Laszlo, "How do additional alternatives affect individual choice under uncertainty?," *Canadian Journal of Economics/Revue canadienne d'économique*, 2009, 42 (1), 113–140.

- Enke, Benjamin and Cassidy Shubatt, "Quantifying Lottery Choice Complexity," Working Paper 31677, National Bureau of Economic Research September 2023.
- Heath, T. B. and S. Chatterjee, "Asymmetric decoy effects on lower-quality versus higher-quality brands: Meta-analytic and experimental evidence," *Journal of Consumer Research*, 1995, 22 (3), 268–284.
- Herne, K., "The effects of decoy gambles on individual choice," *Experimental Economics*, 1999, 2, 31–40.
- Herweg, F. and D. Müller, "A comparison of regret theory and salience theory for decisions under risk," *Journal of Economic Theory*, 2021, 193, 105226.
- Hsu, H.-C. and W.-L. Liu, "Using decoy effects to influence an online brand choice: The role of price-quality trade-offs," *Cyberpsychology, Behavior, and Social Networking*, 2011, 14 (4), 235–239.
- Huber, J., J. W. Payne, and C. Puto, "Adding asymmetrically dominated alternatives: Violations of regularity and the similarity hypothesis," *Journal of Consumer Research*, 1982, 9 (1), 90–98.
- Köszegi, B. and A. Szeidl, "A model of focusing in economic choice," *Quarterly Journal of Economics*, 2013, 128, 53–104.
- Landry, P. and R. Webb, "Pairwise normalization: A neuroeconomic theory of multi-attribute choice," *Journal of Economic Theory*, 2021, 193, 105221.
- Lanzani, G., "Correlation made simple: Applications to salience and regret theory," Quarterly Journal of Economics, 2022, 137, 959–987.
- Lichters, M., P. Bengart, M. Sarstedt, and B. Vogt, "What really matters in attraction effect research: when choices have economic consequences," *Marketing Letters*, 2017, 28, 127–138.
- Loewenfeld, M. and J. Zheng, "Uncovering correlation sensitivity in decision making under risk," mimeo 2023. Toulouse School of Economics.
- Loomes, G., "Further evidence of the impact of regret and disappointment in choice under uncertainty," *Economica*, 1988, 55, 47–62.
- _ , "When actions speak louder than prospects," *American Economic Review*, 1988, 78, 463–470.

- _____, "Predicted violations of the invariance principle in choice under uncertainty," Annals of Operations Research, 1989, 19, 103–113.
- _ and R. Sugden, "Regret theory: An alternative theory of rational choice under uncertainty," *Economic Journal*, 1982, *92*, 805–824.
- and _ , "Some implications of a more general form of regret theory," Journal of Economic Theory, 1987, 41, 270–287.
- and _ , "Testing for regret and disappointment in choice under uncertainty," Economic Journal, 1987, 97, 118–129.
- _, C. Starmer, and R. Sugden, "Preference reversal: Information processing effect or rational non-transitive choice," *Economic Journal*, 1989, 99, 140–151.
- _ , _ , and _ , "Observing violations of transitivity by experimental methods," Econometrica, 1991, 59, 425–439.
- _, _, and _, "Are preferences monotonic? Testing some predictions of regret theory," *Economica*, 1992, 59, 17–33.
- Milberg, S. J., M. Silva, P. Celedon, and F. Sinn, "Synthesis of attraction effect research: practical market implications?," *European Journal of Marketing*, 2014, 48 (7/8), 1413–1430.
- Mohr, P. N. C., H. R. Heekeren, and J. Rieskamp, "Attraction effect in risky choice can be explained by subjective distance between choice alternatives," *Scientific Reports*, 2017, 7 (1), 1–10.
- **Pak, R. and A. Ferdowsian**, "The decoy effect and risk aversion," mimeo 2021. NYU Stern School of Business.
- Quiggin, J., "Regret theory with general choice sets," Journal of Risk and Uncertainty, 1994, 8, 153–165.
- **Rubinstein, A.**, "Similarity and decision-making under risk (Is there a utility theory resolution to the Allais paradox?)," *Journal of Economic Theory*, 1988, 46 (1), 145–153.
- Sachley, D., "Minimized regret is sufficient to model the asymmetrically dominated decoy effect.," *Marketing Bulletin*, 2005, 16.
- Savage, L. J., The foundations of statistics, New York: Wiley, 1954.

- Sen, A., "Quasi-transitivity, rational choice and collective decisions," The Review of Economic Studies, 1969, 36 (3), 381–393.
- Simonson, I., "Choice based on reasons: The case of attraction and compromise effects," *Journal of Consumer Research*, 1989, 16, 158–174.
- Soltani, A., B. De Martino, and C. Camerer, "A range-normalization model of context-dependent choice: A new model and evidence," *PLOS Computational Biology*, 2012, 8, e1002607.
- Starmer, C., "Testing new theories of choice under uncertainty using the common consequence effect," *Review of Economic Studies*, 1992, 59, 813–830.
- and R. Sugden, "Probability and juxtaposition effects: An experimental investigation of the common ratio effect," *Journal of Risk and Uncertainty*, 1989, 2, 159–178.
- and _, "Testing for juxtaposition and event-splitting effects," Journal of Risk and Uncertainty, 1993, 6, 235–254.
- and _ , "Testing alternative explanations of cyclical choices," *Economica*, 1998, 65, 347–361.
- Suppes, P. and M. Winet, "An axiomatization of utility based on the notion of utility differences," *Management science*, 1955, 1 (3-4), 259–270.
- Sürücü, O., B. M. Djawadi, and S. Recker, "The asymmetric dominance effect: Reexamination and extension in risky choice — An experimental study," *Journal* of Economic Psychology, 2017, 73, 102–122.
- **Tserenjigmid, G.**, "Theory of decisions by intra-dimensional comparisons," *Journal* of Economic Theory, 2015, 159, 326–338.
- _, "Choosing with the worst in mind: A reference-dependent model," Journal of Economic Behavior & Organization, 2019, 157, 631–652.
- von Neumann, J. and O. Morgenstern, The theory of games and economic behavior, Princeton University Press, 1947. 2nd ed.
- Walls, L., A. Howes, and R. L. Lewis, "Regret Theory Predicts Decoy Effects in Risky and Multi-attribute Choice," in L. K. Samuelson, S. L. Frank, M. Toneva, A. Mackey, and E. Hazeltine, eds., *Proceedings of the Annual Meeting of the Cognitive Science Society*, Vol. 46 2024.

- Wedell, D. H., "Distinguishing among models of contextually induced preference reversals.," Journal of Experimental Psychology: Learning, Memory, and Cognition, 1991, 17 (4), 767.
- Wu, C. and K. Cosguner, "Profiting from the decoy effect: A case study of an online diamond retailer," *Marketing Science*, 2020, 39 (5), 974–995.

A. Mathematical Appendix: Proofs

Proof of Proposition 1. Let $X, Y \in \{A, B\}$ and $X \neq Y$ with act X being the target and act Y being the competitor. By Lemma 1, we have to show that $V(X|\{X, D^X\}) > V(Y|\{Y, D^X\})$. With D^X being state-wise dominated by act X and D^X paying out a larger amount than act Y only in states $s \in \mathcal{S}^X$, we have

$$V(X|\{X, D^X\}) = \bar{c}^X \tag{A.1}$$

and

$$V(Y|\{Y, D^X\}) = \bar{c}^Y - \sum_{s \in \mathcal{S}^X} p_s R(c(d_s^X) - c(y_s)).$$
(A.2)

Thus, the X-attraction effect occurs if and only if

$$\bar{c}^X - \bar{c}^Y > -\sum_{s \in \mathcal{S}^X} p_s R(c(d_s^X) - c(y_s)).$$
(A.3)

The right-hand side of (A.3) is strictly negative, and thus (A.3) is always satisfied for $\bar{c}^X - \bar{c}^Y \ge 0$. If, on the other hand, $\bar{c}^X - \bar{c}^Y < 0$, then the left-hand side of (A.3) also is strictly negative. If $d_s^X \to y_s$ for all $s \in \mathcal{S}^X$, the right-hand side of (A.3) approaches zero, and thus (A.3) is violated. In contrast, if $d_s^X \to x_s$ for all $s \in \mathcal{S}^X$, (A.3) is satisfied. To see this, we use (7) to rewrite (A.3) equivalently as

$$\sum_{s \in \mathcal{S}^Y} p_s R(c(y_s) - c(x_s)) > \sum_{s \in \mathcal{S}^X} p_s [R(c(x_s) - c(y_s)) - R(c(d_s^X) - c(y_s))]$$
(A.4)

and note that the left-hand side of (A.4) is strictly positive, whereas the right-hand side of (A.4) approaches zero if $d_s^X \to x_s$ for all $s \in \mathcal{S}^X$. Hence, by the intermediatevalue theorem, there exist threshold vectors $\mathbf{z}^{\mathbf{AE}} = (z_s^{AE})_{s \in \mathcal{S}^X}$ so that (A.4) holds if $d_s^X \ge z_s^{AE}$ for all $s \in \mathcal{S}^X$ with at least one strict inequality for some $s \in \mathcal{S}^X$. \Box

Proof of Proposition 2. Let $X, Y \in \{A, B\}$ and $X \neq Y$ with act X being the target and act Y being the competitor. By Lemma 1, we have to show that $V(X|\{X, D^X\}) > V(Y|\{Y, D^X\})$. With the decoy act D^X paying out a (weakly) higher amount than X and Y only in states $s \in \mathcal{S}^X$, we have

$$V(X|\{X, D^X\}) = \bar{c}^X - \sum_{s \in \mathcal{S}^X} p_s R(c(d_s^X) - c(x_s))$$
(A.5)

and

$$V(Y|\{Y, D^X\}) = \bar{c}^Y - \sum_{s \in S^X} p_s R(c(d_s^X) - c(y_s))$$
(A.6)

Thus, the compromise effect occurs if and only if

$$\bar{c}^X - \bar{c}^Y > \sum_{s \in \mathcal{S}^X} p_s [R(c(d_s^X) - c(x_s)) - R(c(d_s^X) - c(y_s))].$$
(A.7)

As $d_s^X \ge x_s > y_s$ for all $s \in \mathcal{S}^X$ and with $R(\cdot)$ being strictly increasing, the righthand side of (A.7) is strictly negative. Thus, (A.7) is always satisfied if $\bar{c}^X \ge \bar{c}^Y$.

If $\bar{c}^X < \bar{c}^Y$, on the other hand, (A.7) is satisfied if $R''(\Delta) > 0$ for all $\Delta > 0$. To see this, note that (7) allows to rewrite (A.7) equivalently as

$$\sum_{s \in \mathcal{S}^X} p_s [R(c(d_s^X) - c(y_s)) - R(c(d_s^X) - c(x_s)) - R(c(x_s) - c(y_s))] > -\sum_{s \in \mathcal{S}^Y} p_s [R(c(y_s) - c(x_s)). \quad (A.8)$$

With $x_s < y_s$ for all $s \in \mathcal{S}^Y$, the right-hand side of (A.8) is strictly negative. The left-hand side of (A.8), on the other hand, is strictly positive if the regret function $R(\cdot)$ is convex, i.e., if $R''(\Delta) > 0$ for $\Delta > 0$.

Proof of Lemma 2. The evaluation of the decoy act D^X in the context of the binary choice sets $\{X, D^X\}$ and $\{Y, D^X\}$ is given by

$$V(D^X|\{X, D^X\}) = \bar{c}^{D^X} - \sum_{s \in \mathcal{S}^Y} p_s R(c(x_s) - c(d_s^X)) - \sum_{s \in \mathcal{S}^N} p_s R(c(x_s) - c(d_s^X)) (A.9)$$

and

$$V(D^X|\{Y, D^X\}) = \bar{c}^{D^X} - \sum_{s \in \mathcal{S}^Y} p_s R(c(y_s) - c(d_s^X)) - \sum_{s \in \mathcal{S}^N} p_s R(c(y_s) - c(d_s^X)) (A.10)$$

respectively. Thus, $X \succ_{\{X,Y,D^X\}} D^X$ if and only if

$$2\bar{c}^{X} - \sum_{s \in \mathcal{S}^{Y}} p_{s}R((c(y_{s}) - c(x_{s})) - \sum_{s \in \mathcal{S}^{X}} p_{s}R(c(d_{s}^{X}) - c(x_{s}))$$

$$> 2\bar{c}^{D^{X}} - \sum_{s \in \mathcal{S}^{Y}} p_{s}[R(c(y_{s}) - c(d_{s}^{X})) + R(c(x_{s}) - c(d_{s}^{X}))]$$

$$- 2\sum_{s \in \mathcal{S}^{N}} p_{s}R(c(x_{s}) - c(d_{s}^{X})), \quad (A.11)$$

where we used that $x_s = y_s$ for $s \in \mathcal{S}^N$. Rearranging (A.11) yields (13).

B. Appendix: Details to the Experimental Procedures and Design

B.1. Gambles used in the Experiment

	s = 1	s = 2
Α	£10	£3
В	£4	£7
D^{A+}	£10	£2
Prob.	40%	60%

Problem 1 (AE, Const. 1, D^{A+}).

	s = 1	s = 2
A	£10	£3
В	£4	£7
D^{A-}	$\pounds7$	£2
Prob.	40%	60%

Problem 2 (AE, Const. 1, D^{A-}).

	s = 1	s = 2
A	£10	£3
В	£4	£7
D^{B+}	£3	£7
Prob.	40%	60%

Problem 3 (AE, Const. 1, D^{B+}).

	s = 1	s = 2
A	£10	£3
В	£4	£7
D^{B-}	£3	£5
Prob.	40%	60%

Problem 4 (AE, Const. 1, D^{B-}).

	s = 1	s = 2	s = 3
A	£7	£4	£2
В	$\pounds 3$	£10	$\pounds 2$
D^{A+}	£7	£3	$\pounds 0$
Prob.	50%	30%	20%

Problem 5 (AE, Const. 2, D^{A+}).

	s = 1	s = 2	s = 3
A	£7	£4	£2
В	$\pounds 3$	£10	$\pounds 2$
D^{A-}	$\pounds 5$	£3	$\pounds 0$
Prob.	50%	30%	20%

Problem 6 (AE, Const. 2, D^{A-}).

	s = 1	s = 2	s = 3
A	£7	£4	£2
B	£3	£10	$\pounds 2$
D^{B+}	£2	£10	$\pounds 0$
Prob.	50%	30%	20%

Problem 7 (AE, Const. 2, D^{B+}).

	s = 1	s = 2	s = 3
A	£7	£4	£2
В	£3	£10	£2
D^{B-}	£2	£7	$\pounds 0$
Prob.	50%	30%	20%

Problem 8 (AE, Const. 2, D^{B-}).

	s = 1	s = 2
A	£7	£6
B	£4	£12
D^{A+}	£9	£3
Prob.	70%	30%

Problem 9 (CE, Const. 1, D^{A+}).

	s = 1	s = 2
A	£7	£6
B	£4	£12
D^{A-}	£8	£3
Prob.	70%	30%

Problem 10 (CE, Const. 1, D^{A-}).

	s = 1	s = 2
A	£7	£6
B	£4	£12
D^{B+}	$\pounds 2$	£14
Prob.	70%	30%

Problem 11 (CE, Const. 1, D^{B+}).

	s = 1	s = 2
A	£7	£6
В	£4	£12
D^{B-}	£2	£13
Prob.	70%	30%

Problem 12 (CE, Const. 1, D^{B-}).

	s = 1	s = 2	s = 3
A	£9	£4	£3
B	$\pounds 2$	£8	$\pounds 3$
D^{A+}	£11	£2	$\pounds 0$
Prob.	30%	50%	20%

Problem 13 (CE, Const. 2, D^{A+}).

	s = 1	s=2	s = 3
A	£9	£4	£3
В	$\pounds 2$	£8	$\pounds 3$
D^{A-}	£10	$\pounds 2$	$\pounds 0$
Prob.	30%	50%	20%

Problem 14 (CE, Const. 2, D^{A-}).

	s = 1	s=2	s = 3
A	£9	£4	£3
В	£2	£8	£3
D^{B+}	£1	£10	$\pounds 0$
Prob.	30%	50%	20%

Problem 15 (CE, Const. 2, D^{B+}).

	s = 1	s = 2	s = 3
A	£9	£4	£3
В	$\pounds 2$	£8	$\pounds 3$
D^{B-}	£1	£9	$\pounds 0$
Prob.	30%	50%	20%

Problem 16 (CE, Const. 2, D^{B-}).

	s = 1	s = 2	s = 3
A	£10	£0	£0
В	£8	£8	$\pounds 0$
C	£9	$\pounds 0$	£0
Prob.	40%	20%	40%

Problem 17 (Distractor 1).

	s = 1	s = 2	s = 3
A	£10	£0	£0
B	£8	£8	$\pounds 0$
C	£0	$\pounds 0$	£9
Prob.	40%	20%	40%

Problem 18 (Distractor 2).

	s = 1	s = 2	s = 3
A	£9	£0	£0
B	$\pounds 5$	$\pounds 5$	£0
C	£7	$\pounds 0$	£0
Prob.	30%	40%	30%

Problem 19 (Distractor 3).

	s = 1	s = 2	s = 3
A	£9	$\pounds 0$	£0
В	$\pounds 5$	$\pounds 5$	$\pounds 0$
C	£0	$\pounds 0$	£7
Prob.	30%	40%	30%

Problem 20 (Distractor 4).

	s = 1	s = 2
A	£4	£4
В	£3	£6
C	£1	£8
Prob.	60%	40%

Problem 21 (Distractor 5).

	s = 1	s = 2
A	£3	£3
B	£8	$\pounds 2$
C	£10	£1
Prob.	20%	80%

Problem 22 (Distractor 6).

	s = 1	s=2	s = 3	s = 4
A	£2	£10	£4	£3
В	$\pounds 5$	£0	£6	£6
Prob.	30%	20%	20%	30%

Problem 23 (Distractor 7).

	s = 1	s=2	s = 3	s = 4
A	£3	£3	£0	£12
В	£0	£13	£3	$\pounds 0$
Prob.	20%	20%	40%	20%

Problem 24 (Distractor 8).

B.2. Ex-post Questionnaire

Tables 10 and 11 provide an overview of subjects' responses to the metric and categorical variables included in our ex-post questionnaire, respectively.

Variable	Min.	Median	Mean	Std. Dev.	Max.
Age	18.00	29.00	31.12	10.03	73.00
Math skills	1.00	2.00	2.47	0.78	5.00
General risk attitude	1.00	4.00	4.75	2.02	10.00
Post-decisional regret aversion	1.00	4.00	4.44	2.15	10.00

Table 10: Overview of metric variables included in the ex-post questionnaire.

Variable	Categories	# observations
Gender	Female	198
	Male	193
	Non-binary	7
		Total = 398
Education	University degree	226
	University of applied sciences entry qualification	17
	High-school diploma	87
	Foremen qualification	22
	Secondary school leaving certificate	30
	Secondary modern school leaving certificate	15
	None of the above	1
		Total = 398
Occupation	Craft worker	7
	Desk job	115
	Medical activity	23
	Education and research	47
	Pupil or student	94
	Civil servant and judiciary	11
	Pensioner	3
	Not employed	30
	None of the above	68
		Total = 398

Table 11: Overview of categorical variables included in the ex-post questionnaire.

For measuring subjects' math skills, we included the question "How do you rate your math skills?" in the questionnaire. The answers to this question were measured on an ordinal scale in the experiment (A=excellent, B=good, C=average, D=slightly below average, E=poor) and translated into a metric variable after the experiment (1=excellent, 2=good, 3=average, 4=slightly below average, 5=poor). Hence, lower numbers indicate higher math skills, as is the case in the German grading system.

Subjects' general risk attitudes are measured using a question that asks subjects to report their willingness to take risks "in general." This question is based on Dohmen et al. (2011). Subjects rate their willingness to take risks on a scale from 0 (=not at all willing) to 10 (=very willing). Thus, higher numbers indicate higher willingness to take risks.

In order to measure subjects' post-decisional regret aversion, we first let subjects put themselves in the following situation, where an undesirable result has occurred because of a decision that the subject has already made:

Imagine it's the last football game in the championship. Your team is awarded a penalty shortly before the final whistle. If the penalty is converted, your team wins the game and the championship. If the penalty is missed, the game ends in a draw and your team does not win the league title. You take the penalty and you decide to shoot in the left corner. Unfortunately, the goalkeeper also chose the left corner and is able to save your shot.

We then ask subjects to report on a scale from 1 (=no regrets) to 10 (=extreme regret) how much they regret having chosen the left corner for the penalty, where higher numbers indicate higher post-decisional regret aversion.

In the regression analyses, we included binary variables for subjects' gender, educational status, and occupational status to ease the interpretation of these variables and due to insufficient observations in some categories (see Table 11), respectively.³⁷ Table 12 provides an overview of the specific binary variables that we used in our regression analyses.

The binary "Gender" variable is 1 if a subject is a male and 0 if a subject is a female. Thus, the non-binary category is excluded from the analysis. The binary "Education" variable is 1 if a subject has a university degree and 0 if a subject is in one of the other categories of the "Education" variable listed in Table 11. The binary "Occupation" variable is 1 if a subject is a pupil or student and 0 if a subject is in one of the other categories of the "Occupation" variable listed in Table

³⁷None of the regression results presented in this paper are qualitatively changed by this approach as compared to when all categories are considered individually in the regression analyses. Regression tables including all individual categories are not reported in the paper, but are included in the analysis script that is part of the replication package on OSF (the link can be found in subsection 5.1).

Variable	Categories	# observations
Gender	Male	193
	Female	198
		Total = 391
Education	University degree	226
	No university degree	165
		Total = 391
Occupation	Currently pupil or student	94
	Currently non-pupil or non-student	297
		Total = 391

Table 12: Overview of binary categorical variables used in the regression analyses.

11. While the binary "Education" variable distinguishes between different forms of completed education (university degree vs. lower degree), the binary "Occupation" variable indicates if education is still ongoing, or if education is completed and a post-educational occupation was taken up already.

B.3. Instructions

Welcome to this Study!

You are taking part in an economic study. This study takes approximately 15 minutes and is financed by the University of Würzburg. Your participation is voluntary and you can quit the study at any time without providing any reasons. Ending the study before completion will result in exclusion from all payments, but will otherwise have no consequences for you.

For your participation in this study you will receive a lump sum of £2 (approximately $\in 2.30$). You can earn an additional, not insignificant amount of money, which depends on your own decisions and on chance. It is therefore important that you **read the following instructions carefully**. Your total earnings from this study will be credited to your Prolific account upon completion of the study.

Please find a neutral and quiet environment where you will not be distracted. Please also turn off mobile devices of all kinds (cell phones and smartwatches) and put them, and all other things that you do not need for the study, aside. Please only use the programs and functions on your computer that are required for the study.

No personal data is collected in this study. All decisions that you make and all data collected in this study are treated anonymous and are used exclusively for scientific research purposes. The data protection regulations below apply (at the bottom of this page).

Detailed instructions for this study will shortly be displayed on the screen. Please read these carefully. You will be asked questions to check your understanding of the instructions. In addition, you will occasionally be asked questions to check your attention during the study. In the attention questions you will be given a pre-specified option that you have to choose.

If you answer the same comprehension question incorrectly twice, or answer an attention question incorrectly once, you will still receive the lump sum of $\pounds 2$ credited to your Prolific account upon completion of the study, but you will automatically be excluded from any possible additional payouts.

General Instructions

This study is about gambling decisions. A gamble indicates the chances at which you can win certain amounts of money. In this study the possible amounts of money range from $\pounds 0$ to $\pounds 14$. The chances of you winning the respective amounts of money are between 1 percent and 100 percent.

Example for a gamble:

1 80	81 100
£7	£10
80%	20%

In this study, each gamble is described using a table. To play such a gamble, the computer randomly draws a number between 1 and 100. Each number has the same chance of being drawn.

A gamble assigns an amount of money to each number between 1 and 100. For this purpose, **number ranges** are summarized in the **top row** of the table shown. The **chance** that the randomly drawn number falls within a certain number range is shown in the **bottom row** of the table. The following applies: the higher the chance, the wider the corresponding column.

For example, if the computer draws the number 53 (i.e. a number between 1 and 80), the amount paid out in the shown gamble is $\pounds 7$. If the computer draws the number 97 (i.e. a number between 81 and 100), the amount $\pounds 10$ is paid out.

Payment

At the end of the study, the computer will randomly draw **ONE** gambling decision to be played for you. Depending on the outcome of this gamble, you can earn a significant amount of money in addition to the lump sum of £2. Each of your gambling decisions has the same chance of being drawn by the computer. The gambling decision randomly drawn by the computer will be shown to you at the end of this study.

Important: For the entire study, there are no right or wrong decisions. We are only interested in how you decide.

Comprehension Questions

Please answer the following comprehension questions.

- 1. Which statement regarding the probability that a decision will be payout relevant at the end of the experiment is correct?
 - The probability is the same for every decision.
 - The probabilities can be different, respectively.
- 2. How many decisions from this study will actually be paid out at the end of the study?
 - None of the decisions will be paid out.
 - Exactly one decision will be paid out.
 - All decisions will be paid out.
- 3. When will you find out which decision ultimately determines the amount of money you could earn in addition to the lump sum of £2 in this study?
 - At the beginning of the study.
 - At the end of the study.

Consider the following gamble:

1 60	61 75	76 100
£5	£12	£3
60%	15%	25%

- 4. What amount of money would you receive if the computer randomly drew the number 62?
 - £5
 - £12
 - £3
- 5. At what chance would you receive the amount of $\pounds 5$?
 - 15%
 - 25%
 - 60%

Specific Instructions

In this study, you will be shown 24 gambling decisions, one after the other. In each of these decisions you are offered **either two or three gambles to choose from**.

	1 50	51 80	81 100
0	£1	£4	£2
0	£3	£9	£2
0	£0	£4	£7
	50%	30%	20%

Example of a gambling decision with three gambles:

Decision

In each of the 24 gambling decisions, your task is to **choose the gamble** that you **<u>think is best</u>** from the gambles on offer. In each gambling decision you can only select **one** of the available gambles. You select your preferred gamble by clicking in the circle in front of the respective alternative.

Payment

At the end of the study, the computer randomly chooses ONE gambling decision. This decision determines your additional earnings from the experiment. The gamble that you chose in the randomly drawn gamble decision will be played.

<u>Example</u>: If you have chosen the middle gamble from the available gambles and the computer draws this gambling decision as relevant to the payout, then the middle gamble will be played for you at the end of the experiment.

As a reminder: A gamble is played by the computer drawing a number between 1 and 100. You receive the amount of money that the gamble you have chosen assigns to the number drawn between 1 and 100.

Comprehension Questions

Please answer the following comprehension questions.

- 1. What is your task in this study?
 - I have to choose the gamble that I think is the worst.
 - I have to choose the gamble that I think is the best.
 - I always have to choose the bottom gamble.

Consider the following gamble:

	1 80	81 100
	£10	£2
\bigcirc	£13	£0
0	£0	£7
	80%	20%

Imagine that you have selected the middle gamble as your preferred one and the computer has randomly drawn this decision as payout relevant.

- 2. Which gamble is being played?
 - The top gamble.
 - The middle gamble.
 - The bottom gamble.
- 3. Which statement is correct?
 - If the computer randomly draws the number 12, you will receive an additional £10 payout.
 - If the computer randomly draws the number 91, you will receive an additional £0 payout.

C. Appendix: Experimental Results on the Attraction Effect

$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$		A	В	D^B		A	В	D^B
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	A	359 (22.55%)	316 (19.85%)	$11 \ (0.69\%)$	A	810 (50.88%)	277 (17.40%)	3 (0.19%)
	В	211 (13.25%)	665 (41.77%)	$16\ (1.01\%)$	В	229 (14.38%)	254~(15.95%)	7 (0.44%)
$D^{A} \mid 4 (0.25\%) \mid 5 (0.31\%) \mid 5 (0.31\%) \qquad D^{A} \mid 9 (0.57\%) \mid 3 (0.19\%) \mid 0$	D^A	4 (0.25%)	5 (0.31%)	5 (0.31%)	D^A	9~(0.57%)	3~(0.19%)	0

C.1. Contingency Tables including Decoy Choices

(a) Constellation 1

(b) Constellation 2

Table 13: Contingency	r tables	for	the	attraction	effect	with	data	split	by	constella-
tions.										

$\langle D^{A+}, D^{B+}\rangle$	A	В	D^{B+}	$\langle D^{A+}, D^{B+}\rangle$	Α	В	D^{B+}
A	96 (24.12%)	88 (22.11%)	3 (0.75%)	A	192 (48.24%)	83 (20.85%)	1 (0.25%)
В	44 (11.06%)	155 (38.94%)	5 (1.26%)	В	60 (15.08%)	55 (13.82%)	2(0.50%)
D^{A+}	1 (0.25%)	4 (1.01%)	2(0.50%)	D^{A+}	3~(0.75%)	2(0.50%)	0 (0%)
	'						
$\langle D^{A+}, D^{B-}\rangle$	A	В	D^{B-}	$\langle D^{A+}, D^{B-} \rangle$	A	В	D^{B-}
A	92 (23.12%)	93 (23.37%)	2(0.50%)	A	208 (52.26%)	67 (16.83%)	1 (0.25%)
В	51 (12.81%)	152 (38.19%)	1 (0.25%)	В	57 (14.32%)	59 (14.82%)	1 (0.25%)
D^{A+}	3 (0.75%)	1 (0.25%)	3(0.75%)	D^{A+}	4 (1.00%)	1 (0.25%)	0 (0%)
$\langle D^{A-}, D^{B+}\rangle$	A	В	D^{B+}	$\langle D^{A-}, D^{B+} \rangle$	A	В	D^{B+}
A	86 (21.61%)	65 (16.33%)	5(1.26%)	A	200 (50.25%)	69 (17.34%)	0 (0%)
В	55 (13.81%)	182 (45.73%)	5(1.26%)	В	54 (13.57%)	71 (17.84%)	3(0.75%)
D^{A-}	0 (0%)	0 (0%)	0 (0%)	D^{A-}	1 (0.25%)	0 (0%)	0 (0%)
	'	,					
(DA - DB -)	1	I.	L		1	I	-
$\langle D , D \rangle$	A	В	D^{B-}	$\langle D^{A-}, D^{B-} \rangle$	A	B	D^{B-}
A	A 85 (21.36%)	B 70 (17.59%)	$\frac{D^{B-}}{1 \ (0.25\%)}$	$\frac{\langle D^{A-}, D^{B-} \rangle}{A}$	A 210 (52.76%)	B 58 (14.57%)	D^{B-} 1 (0.25%)
$\frac{A}{B}$	A 85 (21.36%) 61 (15.33%)	B 70 (17.59%) 176 (44.22%)	$ \begin{array}{c} D^{B-} \\ 1 (0.25\%) \\ 5 (1.26\%) \end{array} $	$\frac{\langle D^{A-}, D^{B-} \rangle}{\frac{A}{B}}$	A 210 (52.76%) 58 (14.57%)	B 58 (14.57%) 69 (17.34%)	$ \begin{array}{c} D^{B-} \\ 1 (0.25\%) \\ 1 (0.25\%) \end{array} $
	$\begin{array}{c} A \\ 85 (21.36\%) \\ 61 (15.33\%) \\ 0 (0\%) \end{array}$	B 70 (17.59%) 176 (44.22%) 0 (0%)	$ \begin{array}{c} D^{B-} \\ 1 (0.25\%) \\ 5 (1.26\%) \\ 0 (0\%) \end{array} $	$\begin{array}{c} \langle D^{A-}, D^{B-} \rangle \\ \hline \\ A \\ \hline \\ B \\ \hline \\ D^{A-} \end{array}$	A 210 (52.76%) 58 (14.57%) 1 (0.25%)	$\begin{array}{c} B \\ 58 (14.57\%) \\ 69 (17.34\%) \\ 0 (0\%) \end{array}$	$ \begin{array}{c} D^{B-} \\ \hline 1 (0.25\%) \\ \hline 1 (0.25\%) \\ \hline 0 (0\%) \end{array} $

Table 14: Contingency tables for the attraction effect with data split by constellations and by decoy specifications.

C.2. Comparative Statics

Regression Analyses (Decoy Act D^{B*})

Dependent variable: attraction effect					
	(1) D^{A+}	(2) D^{A-}			
Pooled constellation	ons				
D^{B+}	0.0248	0.0332			
	(0.0248)	(0.0332)			
D^{B-}	Ref.	Ref.			
	N=543	N=490			

Notes: Significance levels indicated as follows: 0.10 * 0.05 ** 0.01 *** 0. Standard errors are clustered at the subjects level. Binary dependent variable: 1 if, for the comparison of a ternary choice set including a decoy targeting baseline act B with a ternary choice set including a decoy targeting baseline act A, a subject shows a predicted preference switch and 0 if a subject shows an unpredicted preference switch. Explanatory variable is a D^{B+} dummy, which is 1 if decoy act D^{B+} is included in the choice set and 0 if decoy act D^{B-} is included in the choice set (i.e., decoy act D^{B-} serves as the reference category). Coefficients indicate average marginal effects of probit models. Coefficients in brackets indicate coefficients of linear probability models.

Table 15: Attraction effect regression results for the relative effectiveness of decoy D^{B+} when data is pooled by constellations.

	Dependent variable	e: attraction effect	
	(1) D^{A+}	(2) D^{A-}	
Constellation 1			
D^{B+}	0.0208	0.0073	
	(0.0208)	(0.0073)	
D^{B-}	Ref.	Ref.	
	N=276	N=251	
$\underline{\text{Constellation } 2}$			
D^{B+}	0.0400	0.0609	
	(0.0401)	(0.0610)	
D^{B-}	Ref.	Ref.	
	N=267	N=239	

Notes: Significance levels indicated as follows: 0.10 * 0.05 ** 0.01 *** 0. Standard errors are clustered at the subjects level. Binary dependent variable: 1 if, for the comparison of a ternary choice set including a decoy targeting baseline act B with a ternary choice set including a decoy targeting baseline act A, a subject shows a predicted preference switch and 0 if a subject shows an unpredicted preference switch. Explanatory variable is a D^{B+} dummy, which is 1 if decoy act D^{B+} is included in the choice set and 0 if decoy act D^{B-} is included in the choice set (i.e., decoy act D^{B-} serves as the reference category). Coefficients indicate average marginal effects of probit models. Coefficients in brackets indicate coefficients of linear probability models.

Table 16: Attraction effect regression results for the relative effectiveness of decoy D^{B+} when data is split by constellations.

Vertical-bar Graph of Frequency Distributions

Figures 11 and 12 depict differences in net attraction effects for different decoy specifications when data is pooled and split by constellations, respectively. Net attraction effects are determined as the difference in the proportion of predicted preference switches and the proportion of unpredicted preference switches.



Figure 11: Differences in net attraction effects for data pooled by constellations.





(b) Constellation 2

Figure 12: Differences in net attraction effects for data split by constellations.

D. Appendix: Experimental Results on the Compromise Effect

	A	В	D^B	_		A	В	D^B
A	663 (41.65%)	216~(13.57%)	27 (1.70%)		A	610 (38.32%)	243 (15.26%)	33 (2.07%)
В	106 (6.66%)	148 (9.30%)	44 (2.76%)		В	247 (15.52%)	342 (21.48%)	49 (3.08%)
D^A	253 (15.89%)	110 (6.91%)	25 (1.57%)	-	D^A	33~(2.07%)	21~(1.32%)	14 (0.88%)

D.1. Contingency Tables including Decoy Choices

(a) Constellation 1

(b) Constellation 2

Table 17: Contingency	tables for	the	$\operatorname{compromise}$	effect	with	data	split	by	constel-
lations.									

$\langle D^{A+}, D^{B+}\rangle$	Α	В	D^{B+}	$\langle D^{A+}, D^{B+} \rangle$	A	В	D^{B+}
A	139 (34.92%)	48 (12.06%)	9(2.26%)	Α	152 (38.19%)	55 (13.82%)	13 (3.27%)
В	26 (6.53%)	25~(6.28%)	17 (4.27%)	В	62 (15.58%)	81 (20.35%)	15(3.77%)
D^{A+}	87 (21.86%)	39 (9.80%)	8 (2.01%)	D^{A+}	13 (3.27%)	2(0.50%)	5 (1.26%)
$\langle D^{A+}, D^{B-}\rangle$	A	В	D^{B-}	$\langle D^{A+}, D^{B-}\rangle$	A	В	D^{B-}
A	143 (35.93%)	51 (12.81%)	2(0.50%)	A	155 (38.94%)	59 (14.82%)	6 (1.51%)
В	26 (6.53%)	37 (9.30%)	5(1.26%)	В	53 (13.32%)	97 (24.37%)	8 (2.01%)
D^{A+}	90 (22.61%)	37 (9.30%)	7 (1.76%)	D^{A+}	10 (2.51%)	9 (2.26%)	1 (0.25%)
			•		'		
$\langle D^{A-}, D^{B+} \rangle$	A	В	D^{B+}	$\langle D^{A-}, D^{B+} \rangle$	A	В	D^{B+}
$\frac{\langle D^{A-}, D^{B+} \rangle}{A}$	A 189 (47.49%)	B 57 (14.32%)	D^{B+} 11 (2.76%)	$\frac{\langle D^{A-}, D^{B+} \rangle}{A}$	A 149 (37.44%)	B 62 (15.58%)	D^{B+} 12 (3.02%)
$\frac{\langle D^{A-}, D^{B+} \rangle}{A}$	A 189 (47.49%) 27 (6.78%)	B 57 (14.32%) 38 (9.55%)	$\frac{D^{B+}}{11 (2.76\%)}$ 16 (4.02\%)	$\frac{\langle D^{A-}, D^{B+} \rangle}{A}$	A 149 (37.44%) 71 (17.84%)	B 62 (15.58%) 75 (18.84%)	$\frac{D^{B+}}{12 (3.02\%)}$ 15 (3.77\%)
$\begin{array}{c} \langle D^{A-}, D^{B+} \rangle \\ \hline \\ D^{A-} \end{array}$	A 189 (47.49%) 27 (6.78%) 36 (9.05%)	B 57 (14.32%) 38 (9.55%) 17 (4.27%)	$ D^{B+} 11 (2.76\%) 16 (4.02\%) 7 (1.76\%) $	$\begin{array}{c} \langle D^{A-}, D^{B+} \rangle \\ \hline \\ A \\ \hline \\ B \\ D^{A-} \end{array}$	A 149 (37.44%) 71 (17.84%) 7 (1.76%)	B 62 (15.58%) 75 (18.84%) 1 (0.25%)	$ \begin{array}{c} D^{B+} \\ 12 (3.02\%) \\ 15 (3.77\%) \\ 6 (1.51\%) \end{array} $
$ \begin{array}{c} \langle D^{A-}, D^{B+} \rangle \\ \hline \\ A \\ \hline \\ B \\ \hline \\ D^{A-} \end{array} $	A 189 (47.49%) 27 (6.78%) 36 (9.05%)	<i>B</i> 57 (14.32%) 38 (9.55%) 17 (4.27%)	$ D^{B+} 11 (2.76\%) 16 (4.02\%) 7 (1.76\%) $	$\begin{array}{c} \langle D^{A-}, D^{B+} \rangle \\ \hline \\ A \\ \hline \\ B \\ D^{A-} \end{array}$	<i>A</i> 149 (37.44%) 71 (17.84%) 7 (1.76%)	B 62 (15.58%) 75 (18.84%) 1 (0.25%)	$\begin{array}{c} D^{B+} \\ 12 \ (3.02\%) \\ 15 \ (3.77\%) \\ 6 \ (1.51\%) \end{array}$
$\begin{array}{c} \langle D^{A-}, D^{B+} \rangle \\ \hline \\ \hline \\ \\ \hline \\ \\ \hline \\ \\ \\ \hline \\ \\ \\ \\ \\$	$ \begin{array}{c} A \\ 189 (47.49\%) \\ 27 (6.78\%) \\ 36 (9.05\%) \\ \end{array} $	B 57 (14.32%) 38 (9.55%) 17 (4.27%) B		$\begin{array}{c} \langle D^{A-}, D^{B+} \rangle \\ \hline \\ A \\ \hline \\ B \\ \hline \\ D^{A-} \\ \langle D^{A-}, D^{B-} \rangle \end{array}$	A 149 (37.44%) 71 (17.84%) 7 (1.76%) A	B 62 (15.58%) 75 (18.84%) 1 (0.25%) B	$\begin{array}{c} D^{B+} \\ 12 \ (3.02\%) \\ 15 \ (3.77\%) \\ 6 \ (1.51\%) \\ \end{array}$
$\begin{array}{c} \langle D^{A-}, D^{B+} \rangle \\ \hline \\ A \\ \hline \\ B \\ \hline \\ D^{A-} \\ \hline \\ \hline \\ \langle D^{A-}, D^{B-} \rangle \\ \hline \\ A \end{array}$	$\begin{array}{c} A \\ 189 (47.49\%) \\ 27 (6.78\%) \\ 36 (9.05\%) \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$	B 57 (14.32%) 38 (9.55%) 17 (4.27%) B 60 (15.08%)	$\begin{array}{c} D^{B+} \\ \hline 11 (2.76\%) \\ \hline 16 (4.02\%) \\ \hline 7 (1.76\%) \\ \hline D^{B-} \\ \hline 5 (1.26\%) \end{array}$	$\begin{array}{c} \langle D^{A-}, D^{B+} \rangle \\ \hline \\ A \\ \hline \\ B \\ D^{A-} \\ \\ \langle D^{A-}, D^{B-} \rangle \\ \hline \\ A \end{array}$	A 149 (37.44%) 71 (17.84%) 7 (1.76%) A 154 (38.69%)	B 62 (15.58%) 75 (18.84%) 1 (0.25%) B 67 (16.83%)	$\begin{array}{c} D^{B+} \\ 12 \ (3.02\%) \\ 15 \ (3.77\%) \\ 6 \ (1.51\%) \\ \end{array}$ $\begin{array}{c} D^{B-} \\ 2 \ (0.50\%) \end{array}$
$ \begin{array}{c} \langle D^{A-}, D^{B+} \rangle \\ \hline \\ A \\ \hline \\ B \\ \hline \\ D^{A-} \\ \hline \\ \hline \\ (D^{A-}, D^{B-} \rangle \\ \hline \\ \hline \\ A \\ \hline \\ B \end{array} $	$\begin{array}{c} A \\ 189 (47.49\%) \\ 27 (6.78\%) \\ 36 (9.05\%) \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$	B 57 (14.32%) 38 (9.55%) 17 (4.27%) B 60 (15.08%) 48 (12.06%)	$\begin{array}{c} D^{B+} \\ \hline 11 (2.76\%) \\ \hline 16 (4.02\%) \\ \hline 7 (1.76\%) \\ \hline \\ D^{B-} \\ \hline 5 (1.26\%) \\ \hline 6 (1.51\%) \end{array}$	$\begin{array}{c} \langle D^{A-}, D^{B+} \rangle \\ \hline A \\ \hline B \\ \hline D^{A-} \\ \langle D^{A-}, D^{B-} \rangle \\ \hline A \\ \hline B \end{array}$	$\begin{array}{c} A \\ 149 (37.44\%) \\ 71 (17.84\%) \\ 7 (1.76\%) \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$	$\begin{array}{c} B \\ 62 (15.58\%) \\ 75 (18.84\%) \\ 1 (0.25\%) \\ \\ B \\ 67 (16.83\%) \\ 89 (22.36\%) \end{array}$	$\begin{array}{c} D^{B+} \\ 12 \ (3.02\%) \\ 15 \ (3.77\%) \\ 6 \ (1.51\%) \\ \end{array}$ $\begin{array}{c} D^{B-} \\ 2 \ (0.50\%) \\ 11 \ (2.76\%) \end{array}$
$\begin{array}{c} \langle D^{A-}, D^{B+} \rangle \\ \hline \\ \hline \\ \\ \hline \\ \\ \hline \\ \\ \\ \hline \\ \\ \\ \\ \hline \\$	$\begin{array}{c} A \\ \hline 189 \ (47.49\%) \\ \hline 27 \ (6.78\%) \\ \hline 36 \ (9.05\%) \\ \hline \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ $	B 57 (14.32%) 38 (9.55%) 17 (4.27%) B 60 (15.08%) 48 (12.06%) 17 (4.27%)	$\begin{array}{c} D^{B+} \\ \hline 11 \ (2.76\%) \\ \hline 16 \ (4.02\%) \\ \hline 7 \ (1.76\%) \\ \hline \\ D^{B-} \\ \hline 5 \ (1.26\%) \\ \hline 6 \ (1.51\%) \\ \hline 3 \ (0.75\%) \end{array}$	$\begin{array}{c} \langle D^{A-}, D^{B+} \rangle \\ \hline A \\ \hline B \\ D^{A-} \\ \langle D^{A-}, D^{B-} \rangle \\ \hline A \\ \hline B \\ D^{A-} \end{array}$	$\begin{array}{c} A \\ 149 \ (37.44\%) \\ 71 \ (17.84\%) \\ 7 \ (1.76\%) \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$	$\begin{array}{c} B \\ \hline 62 \ (15.58\%) \\ \hline 75 \ (18.84\%) \\ \hline 1 \ (0.25\%) \\ \hline \\ B \\ \hline 67 \ (16.83\%) \\ \hline 89 \ (22.36\%) \\ \hline 9 \ (2.26\%) \end{array}$	$\begin{array}{c} D^{B+} \\ 12 \ (3.02\%) \\ 15 \ (3.77\%) \\ 6 \ (1.51\%) \\ \end{array} \\ D^{B-} \\ 2 \ (0.50\%) \\ 11 \ (2.76\%) \\ 2 \ (0.50\%) \end{array}$

Table 18: Contingency tables for the compromise effect with data split by constellations and by decoy specifications.

D.2. Comparative Statics

Regression Analyses (Decoy Act D^{B*})

	Dependent variable:	compromise effect	
	(1) D^{A+}	(2) D^{A-}	
Pooled constellation	ons		
D^{B+}	-0.0427	-0.0423	
	(-0.0427)	(-0.0423)	
D^{B-}	Ref.	Ref.	
	N=380	N=432	

Notes: Significance levels indicated as follows: 0.10 * 0.05 ** 0.01 *** 0. Standard errors are clustered at the subjects level. Binary dependent variable: 1 if, for the comparison of a ternary choice set including a decoy targeting baseline act B with a ternary choice set including a decoy targeting baseline act A, a subject shows a predicted preference switch and 0 if a subject shows an unpredicted preference switch. Explanatory variable is a D^{B+} dummy, which is 1 if decoy act D^{B+} is included in the choice set and 0 if decoy act D^{B-} is included in the choice set (i.e., decoy act D^{B-} serves as the reference category). Coefficients indicate average marginal effects of probit models. Coefficients in brackets indicate coefficients of linear probability models.

Table 19: Compromise effect regression results for the relative effectiveness of decoy D^{B+} when data is pooled by constellations.

	Dependent variable:	compromise effect	
	(1) D^{A+}	(2) D^{A-}	
Constellation 1			
D^{B+}	-0.0137	-0.0111	
	(-0.0137)	(-0.0111)	
D^{B-}	Ref.	Ref.	
	N=151	N=171	
Constellation 2			
D^{B+}	-0.0566	-0.0572	
	(-0.0567)	(-0.0573)	
D^{B-}	Ref.	Ref.	
	N=229	N=261	

Notes: Significance levels indicated as follows: 0.10 * 0.05 ** 0.01 *** 0. Standard errors are clustered at the subjects level. Binary dependent variable: 1 if, for the comparison of a ternary choice set including a decoy targeting baseline act B with a ternary choice set including a decoy targeting baseline act A, a subject shows a predicted preference switch and 0 if a subject shows an unpredicted preference switch. Explanatory variable is a D^{B+} dummy, which is 1 if decoy act D^{B+} is included in the choice set and 0 if decoy act D^{B-} is included in the choice set (i.e., decoy act D^{B-} serves as the reference category). Coefficients indicate average marginal effects of probit models. Coefficients in brackets indicate coefficients of linear probability models.

Table 20: Compromise effect regression results for the relative effectiveness of decoy D^{B+} when data is split by constellations.

Vertical-bar Graph of Frequency Distributions

Figures 13 and 14 depict differences in net compromise effects for different decoy specifications when data is pooled and split by constellations, respectively. Net compromise effects are determined as the difference in the proportion of predicted preference switches and the proportion of unpredicted preference switches.



Figure 13: Differences in net compromise effects for data pooled by constellations.





Figure 14: Differences in net compromise effects for data split by constellations.