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Asymmetric dominance and the stability of constructed preferences

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Abstract

In this research, we explore how experience with an "attraction set" of options, designed to elicit an asymmetric-dominance (attraction) effect, affects choice making in a second "compromise set" designed to elicit a compromise effect. In Experiment 1, when a compromise set was presented, subjects who had chosen an asymmetrically dominating option from an attraction set were less likely to surrender to the compromise heuristic than their counterparts who had chosen the equivalent option from a binary set. Lower susceptibility to the compromise heuristic suggests that asymmetric dominance might have facilitated the learning of attribute preferences. In Experiment 2, subjects were asked to make six choices in the personal computer category. Subjects who had chosen any number of asymmetrically dominating options from the attraction condition were less susceptible to the compromise heuristic in a subsequent choice task than their counterparts who had chosen the same number of equivalent options from the binary condition. It was unlikely that the effect was caused by better memory of asymmetrically dominating options subjects had previously chosen. Results from the two experiments corroborated the reasoning that asymmetric dominance affects the learning of attribute weights and this effect persists in a subsequent choice task.

Keywords: choice set, attribute preference, asymmetric dominance, compromise heuristic, preference learning, preference stability.

1 Introduction

Consumer choices are significantly influenced by how the choice set is structured (Bettman, Luce & Payne, 1998). Consider a choice set with two options, a target option A and a competitor option B, defined in terms of two attributes so that neither option outperforms the other option on both attributes. In this paper, we refer to the choice set [A, B] with two non-dominated options as a binary set. Now, add a third option to the binary set to form a choice set with three options: the target option A, the competitor option B, and a decoy option A' which is dominated by option A but not by option B. In this paper, we refer to the choice set [A, A', B] as an attraction set. The addition of the asymmetrically dominated decoy option A' will significantly increase the choice share of option A at the cost of option B, a phenomenon known as the attraction effect (Huber, Payne & Puto, 1982; Huber & Puto, 1983; Ratneshwar, Shocker & Stewart, 1987). The attraction effect is referred to as a type of context effect because the biased choice-set structures can induce predictable changes in choice shares among options in the choice set, providing strong evidence that consumer preference formation is influenced by the choice context (e.g., Bettman et al., 1998; Simonson & Tversky, 1992; Slovic, 1995).

In this research, we discuss context effects from a different perspective. Our questions are: if preference for an asymmetrically dominating option is contextually constructed, should this preference carry over to a subsequent biased choice set of a different type (i.e., compromise) and, if so, how? Specifically, are subjects who prefer the asymmetrically dominating option A from an attraction set [A, A', B] more likely or less likely to surrender to the compromise heuristic when, subsequently, facing a compromise set [A, C, B] or [B, C, A]?

There are theoretical and practical reasons why these questions need to be raised. Theoretically, conflicting predictions may be justified based on extant literature (more discussion in the Conceptual Background section). For example, one can come forward with two mutually exclusive predictions:

P1: Subjects who prefer the asymmetrically dominating option A from an attraction set [A, A', B] should be more likely to prefer the compromise option C. This is so because the preference for A in the earlier choice, induced by the context (i.e., asymmetric dominance) in which the choice heuristic discourages attribute tradeoff and learning, will result in higher uncertainty about attribute preferences. Subjects who are more uncertain about their attribute preferences will be more likely to surrender to the compromise heuristic.

P2: Subjects who prefer the asymmetrically dominating option A from an attraction set [A, A', B] should be less likely to prefer the compromise option C. This is so be-

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cause the preference for A in the earlier choice, induced by the context (i.e., asymmetric dominance) in which choice is reached through tradeoff contrast of attributes, will result in higher certainty about attribute preferences. Subjects who are more certain about their attribute preferences will be less likely to surrender to the compromise heuristic.

Practically, moving from one choice context to another choice context is a highly realistic scenario of preference construction for comparison shoppers, especially when shopping online. For example, a consumer who visits a company's website to buy a laptop computer may use its filtering tools to specify clear attribute preferences (e.g., screen size, hard drive capacity) and receive a preliminary list of laptop options that satisfy these preferences. The consumer can then focus on figuring out the less clear attribute preferences (e.g., RAM memory, CPU processor) by selecting options to form a choice set for side-by-side comparison. Obviously, choice contexts have a role to play in this individual consumer's preference formation.

In the rest of the paper, we first review the literature on attraction effect to provide a conceptual background for the conflicting predictions presented above. We then present two experiments designed to test the conflicting hypotheses and report results we obtained. Finally, we draw conclusions and discuss the ramifications of our research findings.

1.1 Conceptual background for the conflicting hypotheses

While it may be assumed that context effects should exist only in their respective context (as implied by the modifier "context"), researchers have recently demonstrated interest in exploring whether context effects have the ability to go beyond their original context and exert influence on a subsequent choice task (e.g., Bettman, Luce & Payne, 2008; Simonson, 2008). Research has returned mixed results, with contradictory reports of constructed preference enduring up to years (Sharot, Fleming, Yu, Koster & Dolan, 2012) or quickly receding within minutes (Simon, Krawczyk, Bleicher & Holyoak, 2008). Research has also explored whether and how context cues (e.g., asymmetric dominance) should play a role in constructing relatively context-free preferences (Amir & Levav, 2008; Drolet, Luce & Simonson, 2009; Yoon & Simonson, 2008). The question of whether preferences constructed in a context should transfer to future choices in a different context is theoretically intriguing because its answer may deepen our understanding of constructed preferences (e.g., Bettman et al., 2008; Simonson, 2008), may contribute to defining the conditions under which previously constructed preferences may be more persistent and less context dependent in future choices (Hoeffler & Ariely, 1999; Muthukrishnan & Kardes, 2001; Muthukrishnan & Wathieu, 2007; West, 1996), and may have ramifications for marketing practices (e.g., online decision aids, personalized recommendations) increasingly geared toward revealing and satisfying the individual preferences of customers (Häubl & Murray, 2003; Kramer, 2007; Shen & Ball, 2011; Simonson, 2005, 2008).

1.2 The attraction effect: what consumers learn from asymmetric dominance

Different perspectives have been documented in previous research to account for the well-established asymmetric dominance effect (i.e., the attraction effect) in terms of its underlying decision processes (Huber et al., 1982; Prelec, Wernerfelt & Zettelmeyer, 1997; Ratneshwar et al., 1987; Simonson & Tversky, 1992; Wedell, 1991). For a brief summary of this diverse literature, see Bettman et al. (1998, pp. 206–207) or Wedell (1991). We briefly look at two perspectives — dominance heuristic and tradeoff contrast — and their different implications for preference construction and learning.

The dominance-heuristic perspective (Huber & Puto, 1983; Ratneshwar et al., 1987; Wedell, 1991) suggests that the decision maker does not process all the information in the choice set; instead, he or she identifies the asymmetrical dominance and uses it as a cognitive shortcut to arrive at the judgment of the overall attractiveness of the dominating option. Once found, the dominance relationship can be used as a heuristic to justify the choice of the dominating option — the decision maker does not completely process the information available from the attraction set. In the attraction set [A, A', B], the perceived superiority of A to A' will suffice for decision makers to prefer A, without triggering any real tradeoff between A and B on the desirability of objective attribute values.

The dominance-heuristic perspective implies that the attraction effect may be largely perceptual and context-dependent. Since they expend minimal cognitive effort to compare or make tradeoffs between the attributes of options A and B, decision makers may be unable to learn their own subjective attribute weights (e.g., preference for higher processer speed to higher RAM memory capacity). This perspective is supported by recent research (Amir and Levav 2008) in which subjects learn the asymmetric dominance only as a context cue and, as a result, are more uncertain about their attribute preferences. When a compromise set is presented, the preference for the dominating option A in an earlier choice should result in higher likelihood to surrender to the compromise option C, lending support to **P1**.

The tradeoff-contrast perspective proposes that an asymmetrically dominated decoy may increase the relative weight of the attribute on which the dominating option outperforms (Tversky, Sattath & Slovic, 1988; Wedell, 1991). This perspective maintains that the tendency to prefer an option will be enhanced if pairwise tradeoffs of attributes within the consideration set are favorable to that option

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(Dhar & Simonson, 2003; Simonson, 1989; Simonson & Tversky, 1992). In the attraction set, there are three pairwise comparisons: A/A', B/A' and A/B. Pairwise comparisons with the decoy option (A/A' and B/A') establish a kind of benchmark exchange rate for the A/B comparison so that the decision maker will be less willing to trade off the dominating attribute of A because the implied cost (loss in the dominating attribute) for the benefit (gain in the non-dominating attribute) is greater than those implied in A/A' and B/A' comparisons. Since higher importance is assigned to the dominating attribute of A, the preferred option is A.

The tradeoff-contrast perspective implies that decision makers cognitively process the attribute information and make tradeoffs between the two attributes to formulate their preference for the dominating option A. Decision makers should learn their subjective weights for attributes from their choice of A, as higher importance is being assigned to the attribute on which the dominating option A outperforms the competitor option B. When a compromise set is presented subsequently, the attribute weights learned in a previous choice of A under the attraction effect may transfer to the different context (i.e., compromise) to increase the preference for A and decrease the likelihood to surrender to the compromise option C, lending support to **P2**.

To sum up, the two theoretical perspectives have different implications for preference construction and learning. The dominance-heuristic perspective suggest that, by choosing the asymmetrically dominating option from an attraction set, the attraction effect should be a hindrance to decision makers in learning attribute preferences. On the other hand, the tradeoff-contrast perspective maintains that, by choosing the asymmetrically dominating option from an attraction set, the attraction effect should facilitate decision makers in learning attribute preferences. The difference in learning outcomes has implications for preference stability across choice contexts, leading to different predictions (**P1** or **P2**).

2 Experiment 1

In the above section, we reviewed the literature on the attraction effect and compared the two theoretical perspectives (dominance heuristic and tradeoff contrast) to explore their different predictions on whether preferences constructed under the influence of asymmetric dominance are more or less susceptible to the compromise heuristic. Next, we report Experiment 1, designed to test the two different predictions.

2.1 Method

Subjects were 118 undergraduate students taking business courses who participated for extra credits. Subjects were randomly assigned to two conditions, the binary condition (n=51) and the attraction condition (n=49). We also put 18 randomly selected subjects into a "control" group against which the learning effects in the binary and attraction conditions could be compared.

Subjects went through two experimental sessions (Session 1 and Session 2), separated by an unrelated distractor task.

In Session 1 (the preference learning stage), subjects were asked to choose from a binary set (the binary condition) or an attraction set (the attraction condition) in six product categories (see Table 1). In each product category, a binary set consisted of two non-dominated options [A, B]; an asymmetrically dominated decoy was added to the binary set to form the attraction set [A, A', B] or [A, B', B]. Refer to Table 1 for choice sets in the conditions.

Subjects in the binary condition and attraction condition received the following instructions at the beginning of Session 1: "In this session, you will be asked to make choices. There are no 'right' or 'wrong' answers; we are only interested in your own preferences." Specific information was then provided as each choice task was presented. For example, for the maple syrup choice task, information to subjects was: "Imagine that you are in a grocery store buying maple syrup. The brands that you are considering are Vermont-produced Grade-A products, but they differ in price and taste popularity rating (1=least popular, 5=most popular). Please indicate the maple syrup you choose."

Subjects in the control group completed a filler task irrelevant to this research.

After Session 1, subjects spent approximately 5 minutes completing a questionnaire on a topic unrelated to the current research (special possessions). This filler task was designed to distract subjects and to separate Session 1 from Session 2.

In Session 2 (the preference stability testing stage), subjects in all three conditions were asked to choose from a compromise set in each of the six categories, formed by adding a middle option C to the binary set in each category: [A, C, B]. Subjects received instructions and information in a similar manner as in Session 1.

When presenting the actual choice tasks, only product configurations were shown. Option markers such as A, B, C, A', or B' never appeared in the experiment. The order of presenting the product categories was randomized (in the same order for everyone) in Session 1 and Session 2.

2.2 Results

The number and percentage of middle option choices across the conditions are reported in Table 2. Susceptibility to the compromise heuristics — an indication of attribute preference uncertainty — was the highest in the control (49%). The proportion of middle option choices was similar between the binary condition (47%) and the control (49%) — a Chi-square test showed that this difference was not statisti-

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Table 1: Choice Set Configurations Used in Experiment 1.

Product category	Session 1		Session 2
	Binary: [A, B]	**Attraction: [A, A', B] or [A,B', B]**	**Target choice: [A, C, B]**
Maple syrup	Popularity rating: 3.1; price: $19.97.	Popularity rating: 3.1; price: $19.97.	Popularity rating: 3.1; price: $19.97.
	Popularity rating: 4.7; price: $28.97.	Popularity rating: 4.2; price: $27.97.	Popularity rating: 3.9; price: $24.47.
		Popularity rating: 4.7; price: $28.97.	Popularity rating: 4.7; price: $28.97.
Toothpaste	Fresh breath effectiveness: 45%; tooth-whitening effectiveness: 75%.	Fresh breath effectiveness: 45%; tooth-whitening effectiveness: 75%.	Fresh breath effectiveness: 45%; tooth-whitening effectiveness: 75%.
	Fresh breath effectiveness: 75%; tooth-whitening effectiveness: 45%.	Fresh breath effectiveness: 45%; tooth-whitening effectiveness: 70%.	Fresh breath effectiveness: 60%; tooth-whitening effectiveness: 60%.
		Fresh breath effectiveness: 75%; tooth-whitening effectiveness: 45%.	Fresh breath effectiveness: 75%; tooth-whitening effectiveness: 45%.
Laptop	CPU speed: 1.30 GHz; RAM memory size: 2.00 GB.	CPU speed: 1.30 GHz; RAM memory size: 2.00 GB.	CPU speed: 1.30 GHz; RAM memory size: 2.00 GB.
	CPU speed: 2.10 GHz; RAM memory size: 1.00 GB.	CPU speed: 1.30 GHz; RAM memory size: 1.70 GB.	CPU speed: 1.70 GHz; RAM memory size: 1.50 GB.
		CPU speed: 2.10 GHz; RAM memory size: 1.00 GB.	CPU speed: 2.10 GHz; RAM memory size: 1.00 GB.
Crystal	Crystal grade: 18% PbO; price: $29.99.	Crystal grade: 18% PbO; price: $29.99.	Crystal grade: 18% PbO; price: $29.99.
	Crystal grade: 24% PbO; price: $49.99.	Crystal grade: 18% PbO; price: $31.49.	Crystal grade: 21% PbO; price: $39.99.
		Crystal grade: 24% PbO; price: $49.99.	Crystal grade: 24% PbO; price: $49.99.
MP3 player	Storage capacity: 2.00 GB; battery life: 9 hours.	Storage capacity: 2.00 GB; battery life: 9 hours.	Storage capacity: 2.00 GB; battery life: 9 hours.
	Storage capacity: 4.00 GB; battery life: 6 hours.	Storage capacity: 3.50 GB; battery life: 6 hours.	Storage capacity: 3.00 GB; battery life: 7.5 hours.
		Storage capacity: 4.00 GB; battery life: 6 hours.	Storage capacity: 4.00 GB; battery life: 6 hours.
Drink	Taste rating: 81; price per serving: $3.99.	Taste rating: 81; price per serving: $3.99.	Taste rating: 81; price per serving: $3.99.
	Taste rating: 89; price per serving: $5.99.	Taste rating: 87; price per serving: $5.97.	Taste rating: 85; price per serving: $4.99.
		Taste rating: 89; price per serving: $5.99.	Taste rating: 89; price per serving: $5.99.

cally significant (p=0.72). Susceptibility to the compromise heuristics was significantly lower in the attraction condition than in the control (31% vs. 49%, p<0.001), suggesting a significant learning effect among subjects in the attraction conditions compared with the control. Susceptibility to the compromise heuristics was significantly lower in the attraction condition than in the binary condition (31% vs. 47%, p<0.001).

To test how asymmetric dominance in the attraction set affects preference construction in Session 1 and, subse-

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Table 2: Numbers (%) of Compromise Choices in Session 2

Conditions	Maple	Toothpaste	Laptop	Crystal	MP3 Player	Drink	Total Average
Control (n=18)	9 (50%)	12 (67%)	9 (50%)	7 (39%)	10 (56%)	6 (33%)	53/108 (49%)
Binary (n=51)	16 (31%)	28 (55%)	38 (75%)	21 (41%)	23 (45%)	18 (35%)	144/306 (47%)
Attraction (n=49)	15 (31%)	15 (31%)	21 (43%)	16 (33%)	16 (33%)	9 (18%)	92/294 (31%)

Table 3: Numbers (%) of Compromise Choices by Subjects' Choice in Session 1

Choice in Session 1		Maple	Toothpaste	Laptop	Crystal	MP3 Player	Drink	Total Average
Binary (n=51)	Counterpart option[1]	6/19 (32%)	16/26 (62%)	11/17 (65%)	11/28 (39%)	9/27 (33%)	8/34 (24%)	61/151 (40%)
Attraction (n=49)	Dominating option[2]	2/18 (11%)	8/25 (32%)	9/19 (47%)	11/26 (42%)	8/31 (36%)	3/30 (10%)	41/149 (28%)

1. Subjects who chose an asymmetrically dominating option's counterpart from a binary set in Session 1.
2. Subjects who chose an asymmetrically dominating option from an attraction set in Session 1.

quently, in Session 2, we examined the choice results of those who chose the asymmetrically dominating options in the attraction condition because, presumably, they represent the bread and butter of asymmetric dominance influence. We reason that, should asymmetric dominance have disrupted the learning of subjective attribute preference, as argued in the dominance heuristic perspective, subjects who had chosen the asymmetrically dominating option from an attraction set would be more uncertain about their attribute preferences and would have a higher likelihood to surrender to the compromise heuristic in the target choice set in Session 2 than their counterparts who had chosen the equivalent option from an binary set, lending support to **P1**. On the other hand, should asymmetric dominance have facilitated the learning of subjective attribute preference, as argued in the tradeoff contrast perspective, subjects who had chosen the asymmetrically dominating option from an attraction set would be less uncertain about their attribute preferences and would have a lower likelihood to surrender to the compromise heuristic in the target choice set in Session 3 than their counterparts in the binary condition, lending support to **P2**.

As can be seen in Table 3, subjects in the attraction condition who chose the dominating options were less likely to yield to the compromise cue than their counterparts in the binary condition: the proportion of compromise option choices was 28% in the attraction condition and 40% in the binary condition, respectively ($p<0.05$). These results are consistent with the prediction in **P2**.

2.3 Discussion

In this experiment, consistent with the prediction of **P2**, subjects who chose the asymmetrically dominating option from an attraction set were less likely to surrender to the compromise heuristic than their counterparts who chose the equivalent option from a binary set, suggesting that asymmetric dominance may have facilitated the learning of subjective attribute preference, as argued in the tradeoff-contrast perspective.

An alternative explanation for our experimental results might be that subjects in the attraction condition who chose the dominating option in Session 1 remembered the location of their choice in the trinary set and, as a result, could apply that location when asked to choose from the compromise set (which is also a trinary set) in Session 2. This is unlikely to be true in our experiment. First, the order of presenting the six product categories was randomized. Second, the location of the dominating option was balanced with three product categories (toothpaste, laptop, and crystal) structured as [A, A', B] and three product categories (maple syrup, MP3 player, and drink) structured as [A, B', B]. Besides, option markers such as A, B, C, A', or B' were never disclosed to subjects in our experiments. As such, subjects were unlikely to remember the location of a dominating option they chose from an attraction set in Session 1.

However, an alternative explanation that cannot be excluded is that, instead of learning attribute preferences, subjects who chose the dominating options in Session 1 might have gained better memory of the asymmetrically dominating options, so that the recall of them might increase preference persistence and decrease the likelihood of surrendering to the compromise heuristic in Session 2, as reported in previous research (e.g., Yoon & Simonson, 2008). Recall that, in Experiment 1, subjects were asked to make choices in six different product categories. Choosing only one time in each product category makes it easier for subjects to re-

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member the attribute configuration of their preferred option in that product category. This alternative explanation will be addressed in Experiment 2.

3 Experiment 2

The results obtained in Experiment 1 provided initial support for **P2** as predicted by the tradeoff contrast perspective, which maintains that asymmetric dominance may facilitate the learning of subjective attribute preference. However, the design of Experiment 1 was not able to exclude the alternative explanation that subjects demonstrated higher resistance to the compromise heuristic because they remembered their preferred options, rather than traded off and learned their attribute preferences. Simply put, Experiment 1 shows that the attraction set leads to the construction of something that persists. The question is what is learned: Is it preference for specific options or attribute weights?

In Experiment 2, subjects were asked to make six choices in the personal computer category in Session 1. There are three considerations for this design: 1) making repeated choices in one product category may direct subjects' attention to attribute tradeoffs when constructing and learning their own preferences; 2) making repeated choices in one product category makes it meaningless to remember one particular preferred option; and 3) making repeated choices in one product category allows the researcher to infer a subject's attribute preference from repeated choices. The finding obtained in Experiment 1, if supported in Experiment 2, cannot be attributed to better memory of the asymmetrically dominating option.

3.1 Method

One hundred and eighty-one undergraduate students taking business courses participated for extra credits. Subjects were randomly assigned to two conditions: the binary condition (n = 88) and the attraction condition (n = 93).

Subjects went through two experimental sessions (Session 1 and Session 2), separated by an unrelated distractor task.

In Session 1 (the preference learning stage), subjects were asked to choose from six binary sets (the binary conditions) or six attraction sets (the attraction conditions) of laptop computer configurations similar to those used in previous research. The binary sets consisted of two non-dominated options [A, B]. An asymmetrically dominated decoy was added to each binary set to form an attraction set [A, A', B]. The instructions and information were presented to subjects in a similar manner as in Experiment 1. See Table 4 for the choice set configurations used in this experiment.

To distract subjects from Session 1, a 5-minute filler task irrelevant to the research (to guess words from scrambled letters) was assigned to all subjects before moving to Session 2.

In Session 2 (the preference stability testing stage), subjects in both condition were asked to choose from a compromise set [A, C, B], formed by adding a middle option to a binary set similar but not identical to the last binary choice set in Session 1. Specifically, option B of Session 2 was slightly modified to avoid an exact match of the choice set with Sessions 1. It should also be noted that the design of options in Sessions 1 and 2 work together to further discourage option preference. In the attraction condition, while the attribute lure remained consistent (i.e., CPU speed) across the six choice sets in Session 1, option A of Session 2 appeared as a dominating option and a dominated option in Session 1 (see Choice sets 5 and 6). The inconsistency of dominance should make it more difficult to choose option A of Session 3 in terms of better memory of a dominating option in Session 1.

The instructions and information were presented in a similar manner as in Session 1. When presenting the actual choice tasks, only product configurations were shown. Option markers such as A, B, A' and C never appeared in the experiment. We also randomized the order of A and B options.

3.2 Results

The choice results from Experiment 2 are reported in Table 5.

To test the effect of asymmetric dominance on the learning of subjective attribute preferences, we compared subjects who had chosen the dominating options in the attraction condition and their counterparts who had chosen the equivalent options in the binary condition.

We used a logistic regression model to assess the differences. We inferred a subject's attribute preference construction and learning during Session 1 by counting the number of asymmetrically dominating options chosen in the attraction condition or the number of the equivalent option chosen in the binary condition. Our reasoning is that the number of times a subject chose the asymmetrically dominating option A in the attraction condition (or the equivalent option A in the binary condition) is a more reliable indicator of the subject's preference for the CPU speed attribute over the RAM memory attribute than solely depending on any one of the six repeated choices in Session 1. More importantly, we will be able to compare the two conditions on susceptibility to the compromise heuristic in Session 2, controlling the same number of asymmetrically dominating options chosen in the attraction condition or the number of the equivalent option chosen in the binary condition.

The observed outcome, categorized as the selection or non-selection of the compromised option, was used as the response variable in fitting a multiple logistic regression

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Table 4: Choice Set Configurations Used in Experiment 2 (adapted from Amir and Levav, 2008).

Choice set	The Binary Condition	The Attraction Conditions
Session 1:		
Choice set 1	CPU speed 2.0 GHz, RAM memory size 768 MB	CPU speed 2.0 GHz, RAM memory size 768 MB
	CPU speed 2.6 GHz, RAM memory size 512 MB	CPU speed 1.8 GHz, RAM memory size 768 MB
		CPU speed 2.6 GHz, RAM memory size 512 MB
Choice set 2	CPU speed 2.2 GHz, RAM memory size 640 MB	CPU speed 2.2 GHz, RAM memory size 640 MB
	CPU speed 2.6 GHz, RAM memory size 512 MB	CPU speed 1.9 GHz, RAM memory size 640 MB
		CPU speed 2.6 GHz, RAM memory size 512 MB
Choice set 3	CPU speed 2.2 GHz, RAM memory size 512 MB	CPU speed 2.2 GHz, RAM memory size 512 MB
	CPU speed 2.8 GHz, RAM memory size 384 MB	CPU speed 1.9 GHz, RAM memory size 512 MB
		CPU speed 2.8 GHz, RAM memory size 384 MB
Choice set 4	CPU speed 2.0 GHz, RAM memory size 768 MB	CPU speed 2.0 GHz, RAM memory size 768 MB
	CPU speed 2.8 GHz, RAM memory size 512 MB	CPU speed 1.7 GHz, RAM memory size 768 MB
		CPU speed 2.8 GHz, RAM memory size 512 MB
Choice set 5	CPU speed 1.9 GHz, RAM memory size 1.0 GB	CPU speed 1.9 GHz, RAM memory size 1.0 GB
	CPU speed 3.0 GHz, RAM memory size 512 MB	CPU speed 1.7 GHz, RAM memory size 1.0 GB
		CPU speed 3.0 GHz, RAM memory size 512 MB
Choice set 6	CPU speed 1.7 GHz, RAM memory size 1.0 GB	CPU speed 1.7 GHz, RAM memory size 1.0 GB
	CPU speed 3.2 GHz, RAM memory size 512 MB	CPU speed 1.5 GHz, RAM memory size 1.0 GB
		CPU speed 3.2 GHz, RAM memory size 512 MB
Session 2: Target choice set		
	CPU speed 1.7 GHz, RAM memory size 1.0 GB	
	CPU speed 2.2 GHz, RAM memory size 768 MB	
	CPU speed 3.0 GHz, RAM memory size 512 MB	

model. The model was built using generalized linear model in R (R Core Team 2015). The explanatory variables are 1) the number of asymmetrically dominating options (or equivalent options) and 2) the experimental conditions (the binary condition or the attraction condition). Selection of the compromised option is coded as 1 and non-selection 0. Similarly, the experimental conditions were coded as 0 (the attraction condition) and 1 (the binary condition). The other predictor, the number of asymmetrically dominating options, has values ranging from 0 to 6, where 0 represents the case that none of the asymmetrically dominating options (or equivalent options) were chosen; and 6 represents the asymmetrically dominating option (or equivalent options) was chosen in each of the six repeated choices.

Preference for the CPU attribute over RAM memory attribute was inferred from the number of asymmetrically dominating options chosen in the attraction condition or the number of the equivalent option chosen in the binary condition in Session 1. Susceptibility to the compromise heuristic was operationalized as the probability odds ratio of choosing vs. not choosing the compromise option C in Session 2.

Our reasoning is as follows. Should the asymmetric dominance cues in attraction sets have disrupted the learning of attribute preferences in Session 1, subjects who chose more asymmetrically dominating options in the attraction condition should have higher uncertainty about their attribute preference when the target choice was presented to them in Session 2 and, consequently, should display a higher likelihood to surrender to the compromise heuristic than their counterparts who chose more equivalent options in the binary condition in Session 1, thus lending support to **P1** and the dominance-heuristic perspective. On the other hand, should asymmetric dominance have facilitated the learning of subjective attribute preferences, subjects who had chosen more asymmetrically dominating option in the attraction

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Table 5: Choice Results of Experiment 2.

Choice Set	Binary	Attraction
Session 1		
Choice set 1	A: 26 (30%)	A: 59 (63%)
	B: 62 (70%)	B: 26 (28%)
		A': 8 (9%)
Choice set 2	A: 30 (34%)	A: 64 (69%)
	B: 58 (66%)	B: 25 (27%)
		A': 4 (4%)
Choice set 3	A: 57 (65%)	A: 66 (71%)
	B: 31 (35%)	B: 23 (25%)
		A': 4 (4%)
Choice set 4	A: 22 (25%)	A: 59 (63%)
	B: 66 (75%)	B: 33 (35%)
		A': 1 (2%)
Choice set 5	A: 14 (16%)	A: 45 (48%)
	B: 74 (84%)	B: 45 (48%)
		A': 3 (4%)
Choice set 6	A: 12 (14%)	A: 36 (39%)
	B: 76 (86%)	B: 57 (61%)
		A': 0 (0%)
Session 2: Target choice set		
	A: 5 (6%)	A: 17 (18%)
	B: 43 (49%)	B: 35 (38%)
	C: 40 (45%)	C: 41 (44%)

Table 6: Choice Results of Experiment 2.

Call: glm(formula = TC $\sim$ A + Condition, family = binomial, data = subset(all, Test == "Compromise"))

Deviance Residuals:

Min	1Q	Median	3Q	Max
–1.8911	–0.9610	–0.5493	1.0440	1.7946

Coefficients:

	Estimate	Std. Error	z-value	Pr($>\|z\|$)
(Intercept)	–0.9606	0.2799	–3.432	0.0006
# of A choices	0.4276	0.0934	4.578	4.68e–06
ConditonAC	–0.8543	0.3762	–2.271	0.0232

Null deviance: 248.92 on 180 degrees of freedom
Residual deviance: 223.99 on 178 degrees of freedom
AIC: 229.99

Note: experimental condition AC is coded as 1, BC as 0.

condition would be less uncertain about their attribute preferences and would have a lower likelihood to surrender to the compromise heuristic than their counterparts in the binary condition, thus lending support to **P2** and the tradeoff-contrast perspective.

We regressed whether or not the compromise option was chosen against 1) the number of asymmetrically dominating options (or equivalent options) and 2) the experimental conditions. The results of the logistic regression model are reported in Table 6.

As can be seen in Table 6, pooling the two conditions together, the number of asymmetrically dominating options (or equivalent options) has a significant effect on the likelihood of choosing the compromise option (coefficient = 0.43, $p<0.001$, odds ratio 1.53). More interestingly, holding constant the number of asymmetrically dominating options (or equivalent options), the binary condition had a higher likelihood of choosing the compromise option than the attraction condition (coefficient = 0.85, $p<0.025$, odds ratio 2.35). That is, subjects who had chosen a number of asymmetrically dominating options in the attraction condition were 0.85 less likely in log odds of choosing the compromise option than their counterparts who had chosen the same number of equivalent options in the binary condition. This test result provided support for the predictions of **P2**.

3.3 Discussion

In this experiment, we found that, when asked to make repeated choices, subjects who had chosen more asymmetrically dominating options from attraction sets were actually less susceptible to the compromise heuristic in a subsequent choice task than their counterparts who had chosen the same number of equivalent options from binary sets. This finding was consistent with the predictions of **P2**. In fact, the effect of condition was exerted everywhere for subjects who had chosen ANY number of asymmetrically dominating options, not just in subjects who chose a lot of A responses. The finding in this experiment, combined with the finding of Experiment 1, provided strong support for the tradeoff contrast perspective that asymmetric dominance may facilitate the subjective weight of attributes. Given the repeated choices design, the consistency of attribute lure, and the inconsistency of dominance in options, it is unlikely that the positive effect of asymmetric dominance can be attributed to better memory of the asymmetrically dominating option chosen in Session 1.

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4 General discussion

A question of interest is whether asymmetric dominance in an attraction set should disrupt or facilitate the learning of subjective attribute values and demonstrate lower or higher preference stability in subsequent choice tasks (e.g., Amir & Levav, 2008; Drolet et al., 2009; Yoon & Simonson, 2008). In this research, we discuss how asymmetric dominance affects preference learning and subsequent choice from a biased choice set of a different type (i.e., compromise). In Experiment 1, when a compromise set was presented, subjects who had chosen an asymmetrically dominating option from an attraction set were less likely to surrender to the compromise heuristic than their counterparts who had chosen the equivalent option from a binary set. Lower susceptibility to the compromise heuristic provided initial evidence that asymmetric dominance might have facilitated the learning of attribute preferences. In Experiment 2, when asked to make repeated choices in the same product category, subjects who had chosen any number of asymmetrically dominating options from attraction sets were less susceptible to the compromise heuristic in a subsequent choice task than their counterparts who had chosen the same number of equivalent options from binary sets. Results from the two experiments corroborated the facilitating effect of asymmetric dominance on the learning of attribute preferences, as argued in **P2** from the tradeoff-contrast perspective. These results, however, did not lend support to the disrupting effect of asymmetric dominance on the learning of attribute preferences (Amir & Levav, 2008), as argued in **P1** from the dominance heuristic perspective (Huber & Puto, 1983; Ratneshwar et al., 1987; Wedell, 1991). It was unlikely that these results could be explained by preferences for the options themselves (Yoon & Simonson, 2008), as distinct from changes in subjective weight of attributes.

Our results inform us about the effect of choice set configuration on the stability of constructed preferences by addressing one issue of theoretical relevance: what do decision makers learn when choosing under asymmetric dominance and how this learning may affect their subsequent choice in a different type of biased context? We discussed the dominance-heuristic and the tradeoff-contrast perspectives and made mutually exclusive predictions based on the two perspectives. Our results supported the tradeoff-contrast perspective: choosing under asymmetric dominance may facilitate the learning of attribute preferences.

Our results may be situated in the broader research on processes of preference construction. For example, following a connectionist approach to constraint satisfaction, the theoretical framework of "coherence-based reasoning" (e.g., Holyoak & Simon, 1999; Simon, Krawczyk & Holyoak, 2004) maintains that preferences are constructed in a bidirectional process in which units in support of an emerging decision get activated, rival units get inhibited, and coherence with the emerging decision increases. Our research results seem to be generally consistent with this theoretical framework which predicts that the dominating option should be chosen more frequently because its comparison with the dominated option alter the decision makers' preferences for attributes by giving them new weights, and that the shift of attribute preferences to be coherent with the decision should carry over to subsequent choices. Unlike previous research (e.g., Sharot et al., 2012; Simon et al., 2008), we did not ask subjects to report their attribute preferences before, during, and after the decision process as collecting such data might exert a subtle influence on choices under asymmetric dominance. As such, our research results did not provide direct evidence for coherence-based reasoning in choices under asymmetric dominance.

Our results may have implications for marketers targeting individual customers. While it is possible to observe and learn what an individual customer prefer in product categories, it may also be important to consider the context of consumer choices in individual marketing because customers often do not have clear preferences for attributes; instead, they construct their attribute preferences. The finding that choices made in one context can transfer to future choices may seem antithetical to the argument of "context effects" but it really is not. Our results indicate that, for subjects who get stuck when choosing between to nondominated options in a binary set, asymmetric dominance may facilitate attribute preference tradeoff and, as such, may serve as a tiebreaker in solving the otherwise difficult choice from the binary set at a later point of time.

Our research has limitations that must be addressed in future research. First, while we acknowledge that multiple choice processes might be involved when choosing under the influence of asymmetric dominance, we limited our theorization to just two mutually exclusive processes: the choice heuristic process and the tradeoff contrast process. Although the tradeoff contrast process seemed to be supported in our research, we did not explore whether the choice-heuristic process might be operating at least among some subjects. It would be interesting for future research to test whether the countervailing process exist among certain subjects (e.g., Baron, 2010). This research direction may help us explore the conditions under which certain choice processes prevail and how different choice processes affect learning from asymmetric dominance. Second, we did not directly manipulate choice processes, nor did we collect data on choice processes using process tracing (Simonson, 1989; Yoon & Simonson, 2008) or preference reports (Sharot et al., 2012; Simon et al., 2008). In this regard, our experimentation provided only indirect support for the tradeoff contrast perspective. Future research may manipulate or track the actual choice processes underlying specific choices being influenced by asymmetric dominance.

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