

The effect of incomplete information on the compromise effect

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Abstract

Most research on the compromise effect focuses on how consumers make their decisions in a complete information scenario; however, consumers generally lack sufficient information when they make purchase decisions. This research aims to explore the compromise effect with incomplete information. Three studies were conducted to examine the research hypotheses. The main findings was that consumers are more likely to choose the middle option when they have incomplete information than when they have complete information. Further, the compromise effect decreases when consumers can choose to defer their decision in an incomplete information scenario. Finally, the compromise effect decreases when consumers are asked to infer missing attribute values from the incomplete information.

Keywords: compromise effect, incomplete information, uncertainty, inference, no-choice.

1 Introduction

Consumer options are generally understood as having a utility or subjective value, as consumers are expected to select the option with the highest value or utility. This idea of “value maximization” provides a link between classical economic theory and consumer choice, and has been widely applied in both theories and practices, especially in the marketing field. The main connotation of value maximization is that preferences among alternatives are independent of the context, being defined by the set of alternatives under consideration. Hence, if a consumer prefers brand *x* to brand *y* in one context (for example, when only *x* and *y* are available), then *y* is the least likely to be preferred to *x* in another context (for example, when a third brand *z* is added to the choice set) (Simonson & Tversky, 1992). The compromise effect, proposed by Simonson (1989), posits that a brand will gain greater market share when it becomes the middle option in a choice set. The compromise effect has proved robust in numerous studies, such as those involving business-to-business decisions (Kivetz, Netzer, and Srinivasan, 2004; Dhar, Menon, and Maach, 2004), technology markets (Kivetz et al., 2004), group decision-making (Kivetz et al., 2004; Dhar et al., 2004), cultural differences (Briley, Morris, and Simonson, 2000), and consumer behavior (Chuang et al, 2007) in the marketing context.

Most research on the compromise effect has focused on the complete information scenarios, with few studies examining this effect with incomplete information. This

constitutes a significant gap in the literature. Generally, prior to making a purchase decision, most consumers search for product attribute information on the Internet, make reference to commercials, or consult their friends for information. In other words, consumers usually lack complete information when they make a decision; therefore, they may infer missing attribute values in the incomplete information scenario. Do consumers make different choices in such contexts? An examination of the compromise effects in an incomplete information scenario helps simulate the routine decision-making context. Therefore, this research aims to explore the relationship between the compromise effect and incomplete information, with discussions of value inference and no-choice option.

Experiments were designed and conducted to examine four research hypotheses: 1) A greater compromise effect occurs when consumers are asked to make a decision with incomplete information than with complete information; 2) choice uncertainty is the main reason that consumers choose the compromise option when they have incomplete information; 3) if a no-choice option is added to the choice set, then the compromise effect will become weaker in an incomplete information scenario than in a complete information scenario, as consumers tend to prefer the no-choice to the compromise option; and 4) the compromise effect becomes weaker when consumers infer missing attribute values than when they do not.

2 Compromise effect and incomplete information

2.1 Compromise effect

The compromise effect—proposed by Simonson (1989), with additional work carried out by Dhar et al. (2000),

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Drolet (2002), Nowlis and Simonson (2000), Lin et al. (2006), and Chuang and Yen (2007)—posits that a brand's market share will be greater when it is the middle option in a choice set and will be smaller when it is the extreme option (Simonson & Tversky, 1992). Consider a choice set consisting of brand A and brand C, with each brand having both advantageous and disadvantageous attributes. When a third option (i.e., B) is added to the choice set, then the attribute values of option B fall between those of the two extreme options (A and C), and B thus becomes the compromise option and gains greater market share than when it is alone. For example, assume that initially there are two cakes in a choice set, a six-inch cake selling for \$10 and an eight-inch cake selling for \$15. When a ten-inch cake selling for \$20 is added to this choice set, the eight-inch cake becomes the compromise option (the middle option), and the six- and ten-inch cakes become the extreme options.

A compromise choice, which contains two attributes, reduces conflict by encouraging decision-makers to give up one attribute in order to obtain a better one. Consumers tend to prefer the safer choice, as it decreases the likelihood of their decision being criticized (Dhar & Simonson, 2003; Simonson, 1989). Most purchase decisions are made under uncertainty; that is, consumers are not sure which option offers the best value (Sheng, Parker, & Nakamoto, 2005). Insufficient information and a lack of knowledge concerning attribute differences make it difficult for consumers to calculate the true value of their options (Duncan, 1972). A better understanding of how consumers make decisions under uncertainty—and of the role played by the compromise effect as an underlying mechanism—broadens the horizon of current decision-making literature.

The extremeness aversion hypothesis posits that the disadvantages of potential choices loom larger than their advantages (Simonson, 1989). Consumers tend to maximize gains and minimize losses while making decisions under uncertainty (Sheng et al., 2005). If they take the middle of three options as their reference point, then the corresponding attributes of the remaining options will be considered as losses (Kahneman and Tversky, 1979). Sheng et al. (2005) propose that the expected loss attributable to choose the middle option will be smaller than choose one of the extreme options. In short, consumers choose the safest compromise options due to their need to cope with uncertainty and their aversion to extremeness. It is acknowledged that incomplete information is a source of uncertainty (Meyer, 1981), implying that incomplete information can moderate the compromise effect. The following section discusses decision-making in the incomplete information scenario.

2.2 Choices with incomplete information

It is common that only incomplete information is available when consumers make purchase decisions. Prior research suggests that a lack of complete information increases choice uncertainty and explains why a particular option is not selected (Kivetz & Simonson, 2000). Few studies have examined consumer choice in the incomplete information scenario; however, several have further investigated how consumers treat missing attribute values, as well as whether and how they make inferences about those missing attribute values (Huber & McCann, 1982; Johnson & Levin, 1985; Sanbonmatsu, Kardes, & Sansone, 1991; Simmons & Lynch Jr., 1991; Ross & Creyer, 1992). For example, Meyer (1981) argues that the omission of information about an option will decrease its attractiveness to consumers. Simmons and Lynch (1991) indicate that consumers rarely speculate on missing attribute values. In addition, when all of the options in a choice set have missing attribute values, then consumers are likely to perceive a high degree of uncertainty and difficulties to make the decision (Corbin 1980; Greenleaf & Lehmann, 1995).

Most current research on compromise effect assumes that all decision-makers have complete information; however, this assumption is inconsistent with the routine decision-making contexts. In reality, individuals rarely have sufficient information while making decisions. In other words, in most routine decision-making situations, consumers have to make decisions based on incomplete information (Lynch & Srull, 1982). Therefore, this research aims to further understand consumers' decision-making mechanisms by investigating whether they choose the compromise option (the middle option) when no sufficient information is available.

Duncan (1972) defines uncertainty in the shopping environment as a psychological state resulting from insufficient information or a lack of knowledge on which to base shopping decisions. Before purchasing a specific product, consumers have some degree of uncertainty about its performance and failure rate. When some alternatives are available, consumers may experience uncertainty concerning which option offers the best value. Uncertainty also influences consumer decisions through perceived risk, such as performance or financial risk. Vlek and Stallen (1980) have categorized risks as the following types: (a) the probability of loss, (b) the size of the loss, (c) the expected loss (d) the variance in the probability distribution, (e) the semivariance of the utility, (f) the linear function of the expected value, and (g) the variance in the distribution of consequences.

The different types of risk may occur anytime or anywhere, depending on the decision-making contexts. Behavioral decision researchers describe risk as “con-

sumers' perceptions of the uncertainty and adverse consequences of buying a product (or service)" (Dowling & Staelin, 1994, p. 119). Therefore, uncertainty plays an important role in the conceptualization of risk. Sheng et al. (2005) argue that the greater a consumer's decision uncertainty, the more likely it is that he/she will choose the compromise option in the choice set. In addition, Kivetz and Simonson (2000) indicate that incomplete information increases choice uncertainty. Hence, this research aims to demonstrate that, when consumers make a decision with incomplete information, they tend to choose the compromise option due to the mediating effects of uncertainty. The two following hypotheses guide the first study.

H1: The compromise effect is stronger when consumers make a decision with incomplete information than with complete information.

H2: The effect of incomplete information on the compromise effect is mediated by perceived uncertainty.

3 Study 1

Study 1 aims to demonstrate that consumers are more likely to choose the middle option while they make a decision with incomplete information than with complete information (H_1), as well as to examine the mediating role of perceived uncertainty in the impact of incomplete information on the compromise effect (H_2).

3.1 Method

Participants. Two hundred and fifty-two undergraduate and graduate students (66% female and 34% male) participated in Study 1. Their ages ranged between 20 and 26 (average age = 22.49). Participants were asked to imagine a situation in which they needed to make a purchase decision based only on information provided in the questionnaire. Study 1 was designed to examine H1, which assumed the compromise effect is greater when consumers make a decision with incomplete information than with complete information. Participants were randomly assigned to either an incomplete or a complete information group.

Experimental design. Two factors were manipulated in a 2 (complete or incomplete information) \times 2 (two or three options in the choice set) between-subjects design. Both the choice set and procedure for Study 1 were adapted from Simonson (1989). There was a binary or trinary choice set for each product category, resulting in four situations: choosing one of two options based on either complete information or incomplete information, and choosing one of three options based on either complete information or incomplete information.

Coupey, Irwin, and Payne (1998) argue that consumers are more likely to use a simplifying heuristic, which involves a compensatory, equivalent weighting of the product attributes, to assess unfamiliar product categories than those familiar ones. Thus, this research employed stimulus materials that were unfamiliar to the participants in the following experiments, and these stimulus materials were similar to those used in previous research on compromise effect (e.g., Sheng et al., 2005; Simonson, 1989; Tversky & Simonson, 1993). 66 undergraduates joined a pilot study to determine two least familiar products from a list of twenty products. The results indicated that vacuum cleaners and waxing machines are the least familiar products. Therefore, vacuum cleaners and waxing machines were selected as the stimulus materials in Study 1. Eight attributes were listed for vacuum cleaners and waxing machines respectively. To simulate the routine decision-making context, in the incomplete information scenario, each option in the choice set was designed to leave a different attribute blank for implying a missing attribute value (see Appendix 1). In the complete information scenario, in contrast, all product attribute values for each option were provided (see Appendix 2). In addition, the attribute values of options A and C were designed to keep the same distance from the middle option to reduce preexisting bias (Simonson and Tversky, 1992). To better understand participants' choice uncertainty during their decision-making process, they were asked to respond to a decision-uncertainty instrument after making their decision. This decision-uncertainty instrument, developed by Sheng et al. (2005), uses a seven-point scale ranging from 1 for "strongly disagree" to 7 for "strongly agree" for each item. Eight items were averaged to form the respondents' decision uncertainty (Cronbach's $\alpha = 0.86$) (see Appendix 3).

3.2 Results for H1

The first study was conducted to examine the compromise effect between the complete and the incomplete information scenarios. A third option (option C) was added to a choice set containing two options (options A and B) to determine whether this addition increased the market share of option B. Participants were asked to choose from two or three options based on either complete or incomplete information. H1 assumed that the compromise effect is greater when consumers make a decision with incomplete information than with complete information. In H1, the compromise effect was measured by comparing the market share of option B to that of option A in the binary and trinary sets (Chernev, 2004; Simonson & Tversky, 1992). H1 would be supported if there was a significant difference in the compromise effect between the complete information and incomplete information.

Table 1: Compromise effect in complete/incomplete information scenarios.

	Complete information			Incomplete information		
	Binary (N=60)	Trinary (N=66)	ΔP_{BC} (%)	Binary (N=60)	Trinary (N=66)	ΔP_{BI} (%)
	$P(B; A)$	$P_C(B; A)$		$P(B; A)$	$P_C(B; A)$	
Vacuum cleaner	50%	67%	17%	47%	83%	36%
Waxing machine	47%	66%	19%	44%	81%	37%

Notes: P(B;A) denotes the probability of choosing B in a binary choice set.
 $P_C(B; A)$ denotes the probability of choosing B in a trinary choice set.
 ΔP_{BI} denotes the difference in the probability of choosing B between a binary and a trinary choice set in the condition of incomplete information.
 ΔP_{BC} denotes the difference in the probability of choosing B between a binary and a trinary choice set in the condition of complete information.

Table 1 indicated a significant difference in the compromise effect between the complete and incomplete information scenarios, either for vacuum cleaners or waxing machines. For the vacuum cleaners, the relative share gained by the compromise (middle) option increased from 47% in the binary choice set to 83% in the trinary choice set ($\Delta P = 36\%$) in the incomplete information scenario ($\chi^2(1) = 29.89, p < .001$) and from 50% in the binary choice set to 67% in the trinary choice set ($\Delta P = 17\%$) in the complete information scenario ($\chi^2(1) = 5.28, p < 0.05$). The gap between these two scenarios was 19% ($\chi^2(1) = 5.32, p < .05$). Similarly, for the waxing machines, the share of option B increased from 44% in the binary choice set to 81% in the trinary choice set ($\Delta P = 37\%$) in the incomplete information scenario ($\chi^2(1) = 30.01, p < .001$) but increased from 47% in the binary choice set to 66% in the trinary choice set ($\chi^2(1) = 5.68, p < 0.05$) in the complete information scenario. The gap between the two scenarios was 18% (that is, $(81\% - 44\%) - (66\% - 47\%)$) in Table 1; $\chi^2(1) = 5.01, p < .05$). Hence, H1 is supported.

Mediation analysis. The research procedure was adapted from Baron and Kenny (1986) to examine the mediating effect of perceived uncertainty. Baron and Kenny (1986) indicate that three regression equations are usually applied to examine a mediating effect. In addition, the following conditions must be satisfied:

1. The effect of regressing the mediator on the independent variable must be significant.
2. The effect of regressing the dependent variable on the independent variable must be significant.
3. When the dependent variable is regressed on both the independent variable and the mediator, the effect of the independent variable must be weaker than that in the second regression equation. Moreover, when the effect

Table 2: Mediating effects of uncertainty.

Predictors and R^2	Model 1	Model 2	Model 3
Vacuum cleaner			
Complete/incomplete		0.31**	0.21
Uncertainty	0.41**		0.41**
Nagelkerke ^a R^2	0.42	0.022	0.42
Waxing machine			
Complete/incomplete		0.33**	0.17
Uncertainty	0.24**		0.24**
Nagelkerke ^a R^2	0.38	0.011	0.39

Note: * $p < .05$, ** $p < .01$.

^a The Nagelkerke R^2 provides a logistic analogy to R^2 in OLS regression. It varies from 0 to 1, as does R^2 in OLS, reflecting the explanatory power of predictors in the regression.

of independent variable in the third condition is zero, it is referred as a complete mediating effect; otherwise, it is referred as a partial mediation (Sheng et al., 2005).

A series of logistic regressions were performed. In the trinary choice set, the respondent's decision as the dependent variable was encoded as 1 if he/she chose the option B (the compromise option), otherwise encoded as 0. As the dependent variable was binary, logistic regressions were applied to test the hypotheses. For the vacuum cleaners, the significant effect of incomplete/complete information on choice uncertainty was reported in Model 1. In addition, the results in Model 2 indicated that incomplete/complete information significantly affected the dependent variable (choice of the compromise option).

Finally, the dependent variable was regressed on both incomplete/complete information and choice uncertainty, with the coefficient of incomplete/complete information dropping from 0.31 ($p < 0.05$) in Model 2 to 0.21 ($p > 0.1$) in Model 3. The results demonstrated that choice uncertainty mediated the impact of incomplete/complete information on the compromise effect. Table 2 showed a similar pattern for the results of waxing machines. Therefore, H2 is supported.

3.3 Discussion

The results of Study 1 demonstrate that a greater compromise effect occurs when consumers make a decision with incomplete information than with complete information, which supports H1. The compromise effect is statistically significant in the incomplete information scenario. The results of Study 1 also provide evidence to show that perceived uncertainty mediates the compromise effect when consumers make a decision with incomplete information, which supports H2. As mentioned above, incomplete information is more likely to result in a higher degree of uncertainty than complete information. Therefore, it is predicted that when consumers perceive some degree of uncertainty, the compromise effect will increase in the incomplete information scenario and decrease in the complete information scenario.

4 Study 2

Most prior studies on consumer preferences and incomplete information have assumed that consumers are forced to choose from the available alternatives; however, consumers are likely to defer their choices (Dhar, 1997; Dhar & Simonson, 2003). The no-choice option can be viewed as a good solution for those who perceive a high degree of uncertainty (Corbin 1980; Dhar & Simonson, 2003; Greenleaf & Lehmann, 1995). When consumers make a decision with incomplete information, they tend to choose the middle option as it appears to involve the least loss (Sheng et al., 2005). However, compared to the middle option, the no-choice option is associated with fewer losses (even zero). In addition, the no-choice option is a good alternative for those who are indecisive, who wish to defer their choices, and those who have no preferences for all available options in the choice set (Greenleaf and Lehmann, 1995). Thus, when the no-choice option is added to a choice set, it is likely that consumers will opt for it.

Dhar and Simonson (2001) investigate how the addition of a no-choice (choice deferral) option in a complete information scenario affects the preferences for all options in a choice set, in contrast to a forced choice. Dhar

and Simonson (2001) argue that when the product attributes are manipulated to present in a vaguer fashion, the degree of perceived uncertainty will become higher, leading to the higher rate of choice deferral (no-choice option). Furthermore, Dhar and Simonson (2003) contend that the addition of a no-choice option reduces the shares of the compromise option. As compared with complete information, missing information can result in a greater degree of perceived uncertainty and make consumers unable to choose from the available alternatives. Study 2 was designed to include the addition of a no-choice option to a choice set containing missing attribute values. H3 predicts that the decision-makers prefer the no-choice option to the compromise option.

H3: The addition of a no-choice option to a choice set containing incomplete information weakens the compromise effect.

4.1 Methods

Participants. Four hundred undergraduate and graduate students (average age 22, female 61% and male 39%) participated in Study 2. The experiment stimulus material in Study 2 was identical to that in Study 1 to maintain the internal consistency. Participants were asked to imagine a situation in which they needed to make a purchase decision based only on the information provided in the questionnaire.

Experimental design. Participants were randomly assigned to one of eight cells in a 2 (two or three options in the choice set) \times 2 (incomplete or complete information) \times 2 (forced choice or free choice) between-subjects design. The manipulations of the number of options in the choice set (two vs. three) and information type (complete vs. incomplete) were identical to those in Study 1. Similarly to the study of Kunter et al. (2009), the free choice was manipulated by introducing a no-choice option to allow participants to choose none of the available options in the choice set; in contrast, no-choice option was absent in the forced choice condition.

4.2 Results

Results indicated that the impact of incomplete information on the compromise effect ($\chi^2(1) = 5.111, p < 0.05$ for the vacuum cleaners; $\chi^2(1) = 6.99, p < 0.01$ for the waxing machines) between the free and forced choice conditions was statistically significant. In the forced choice condition for the vacuum cleaners, the proportion of subjects choosing the compromise option increased by 16% in the complete information scenario ($\chi^2(1) = 3.72, p < .05$) and increased by 39% in the incomplete information scenario ($\chi^2(1) = 27.83, p < .001$). Overall, the compromise effect was significantly greater when partic-

Table 3: Compromise effect in forced choice/free-choice conditions.

	Complete information			Incomplete information		
	Binary (N=100)	Trinary (N=100)	ΔP_{BC} (%)	Binary (N=100)	Trinary (N=100)	ΔP_{BI} (%)
	$P(B; A)$	$P_C(B; A)$		$P(B; A)$	$P_C(B; A)$	
Vacuum cleaner						
Free choice (added No-Choice option)	56%	29%	-27%	55%	34%	-21%
Forced Choice (NOT added No-Choice option)	49%	65%	16%	46%	85%	39%
Waxing Machine						
Free Choice (added No-Choice option)	53%	37%	-16%	51%	37%	-14%
Forced Choice (NOT added No-Choice option)	52%	72%	20%	48%	89%	41%

Notes: $P(B;A)$ denotes the probability of choosing B in a binary choice set.

$P_C(B; A)$ denotes the probability of choosing B in a trinary choice set.

ΔP_{BI} denotes the difference in the probability of choosing B between a binary and a trinary choice set in the condition of incomplete information.

ΔP_{BC} denotes the difference in the probability of choosing B between a binary and a trinary choice set in the condition of complete information.

ipants were forced to make a decision in the incomplete information scenario than in the complete information scenario ($\chi^2(1) = 5.212, p < .05$). In the forced choice condition for the waxing machines, the proportion of subjects choosing the compromise option increased by 41% in the incomplete information scenario ($\chi^2(1) = 29.3, p < .001$), whereas it increased by only 20% in the complete information scenario ($\chi^2(1) = 4.56, p < .001$). The difference in the compromise effect between the incomplete and the complete information scenarios was 21% ((89%–48%)–(72%–52%)), Table 3; $\chi^2(1) = 4.89; p < .05$. These results were consistent with H1.

In the free choice (no-choice) condition for the vacuum cleaners, the proportion of subjects choosing the compromise option decreased by 21% in the incomplete information scenario ($\chi^2(1) = 3.82, p < .05$) and decreased by 27% in the complete information scenario ($\chi^2(1) = 6.4, p < .001$). Therefore, there was no significant difference in the compromise effect between the complete and the incomplete information scenarios in the free choice condition ($\chi^2(1) = 0.18, p > 0.1$). In the free choice condition for the waxing machines, while the proportion of subjects choosing the compromise option in the incomplete information scenario decreased by 14% ($\chi^2(1) = 3.55, p < .1$), the proportion of subjects choosing the compromise option in the complete information scenario decreased by 16% ($\chi^2(1) = 3.82, p < .1$). No significant difference in the compromise effect between these two scenarios was observed ($\chi^2(1) = 0.011, p > 0.1$) (see Table 3), suggesting that the addition of a no-choice option to a choice set

in the incomplete information scenario weakens the compromise effect. Thus H3 is supported.

4.3 Discussion

The results of Study 2 indicate that, when consumers have to make a decision, they tend to choose the compromise or middle option. Research has shown that, when a no-choice option is available, consumers are likely to choose it if they consider the decision-making very difficult or wish to defer their decision (Greenleaf & Lehmann, 1995). This research demonstrates that, when consumers are indecisive or intend to minimize the potential risks, the no-choice option is a good alternative to choose from all available options. Specifically, choosing the no-choice option can reduce the share of the compromise option; that is, the compromise effect will decrease when a no-choice option is added to the current choice set.

5 Study 3

When consumers have to make a decision with incomplete information, they may employ a variety of methods to infer those missing attribute values (see Kardes, Posavac, & Cronley, 2004, for a comprehensive review of research in this area; see also Lynch & Srull, 1982). The way consumers infer those missing attribute values depends on the corresponding values of other product at-

tributes in the choice set (Gunasti & Ross, 2009; Lee & Olshavsky, 1997; Ross & Creyer, 1992). Though the impact of missing information on choices or persuasion has been explored in previous studies, the effects of inferences on choices have received little attention yet (Gunasti and Ross Jr., 2009; see Dick et al., 1990, for an exception).

Consumers use inferred attribute values to replace unknown attribute values when they make decisions. During the process, they have a new choice set consisting of “complete” information, in which the missing attribute values are inferred. These inferred attribute values can override the currently available or passively obtained information (Kardes et al., 2004; Lee & Olshavsky, 1995), and further reduce choice uncertainty and decision difficulty (Gunasti & Ross, 2009). Study 3 was designed to examine the proposition that those inferred values help reduce choice uncertainty in a choice set consisting of incomplete information, and weaken the compromise effect. Therefore, H4 is proposed as follows.

H4: The compromise effect is weaker in the incomplete information condition when consumers infer missing attribute values than when they do not.

5.1 Methods

Participants. Three hundred and thirty-six EMBA students (average age 30, 66% female, 44% male) participated in Study 3. The experiment stimulus materials in Study 3 were identical to those in Study 1.

Experimental design. Participants were randomly assigned to one of four cells in a 2 (options in the choice set: binary vs. trinary) \times 2 (inferences about missing attribute values: absent vs. present) between-participants design. The manipulation of the number of options in the choice set was identical to that in Study 1 and Study 2. The manipulation of inferences about missing attribute values was adapted from Kunter et al. (2009). In the non-inference condition, participants were asked to make their choices directly based on incomplete information; in contrast, in the inference condition, they were asked to infer the missing attribute values first and then make a choice from three options.

To understand whether subjects in the incomplete information scenario were more likely to infer missing attribute values when they were asked to do so than they were not, this research asked subjects to indicate whether they had made inferences about the missing attribute values on a seven-point scale anchored by 1 = extremely disagree and 7 = extremely agree. In addition, to understand whether those who made inferences about the missing attribute values in incomplete information scenario were able to obtain more information to reduce choice uncertainty and accordingly weakened the com-

promise effect than those who did not make inferences, this research asked subjects to respond to the seven-point decision-uncertainty scale as in Study 1 after they make their decision.

5.2 Results

Results revealed that in the incomplete information scenario, the proportion of subjects being asked to make inferences who made inferences (99%) was significantly higher than the proportion of subjects not being asked to make inferences who made inferences (67%) ($Z=8.4, p<.001$) ($M_{\text{infer}}=6.05$ vs. $M_{\text{non-infer}}=5.27, t=6.01, p<0.001$), implying that the manipulation for inferences about the missing attribute values was successful. Furthermore, the results of inferences manipulation were consistent with Jaccard and Wood (1988), who argue that subjects under incomplete information may or may not make inferences about the missing attribute values. The results of decision-uncertainty further indicated that, in the incomplete information scenario, lower choice uncertainty was aroused when subjects were asked to make inferences ($M=4.19$) than when they were not asked to do so ($M=4.92$) ($t=8.23, p<0.001$), implying that the inferences about the missing attribute values significantly reduced choice uncertainty.

The measurement of the compromise effect was identical to that in Study 1. Table 4 indicated that the difference in the compromise effect between the inference and non-inference conditions was significant. For the vacuum cleaners, the middle option's share increased by 39% ($\chi^2(1)=21.45, p<.001$) in the non-inference condition and increased by only 15% ($\chi^2(1)=2.97, p<.1$) in the inference condition. The gap between the two conditions was thus 24% ($\chi^2(1)=4.62, p<.05$). Similarly, for the waxing machines, the middle option's share increased by 43% ($\chi^2(1)=26.72, p<.001$) in the non-inference condition, but increased by only 16% ($\chi^2(1)=3.67, p<.05$) in the inference condition. The gap between those two conditions was 27% ((83%–40%)–(66%–50%)), Table 4; $\chi^2(1)=5.73; p<.01$). Thus, H4 is supported.

5.3 Discussion

The results of Study 3 suggest that, when individuals infer missing values during their decision-making process, they tend to apply those inferred values to fill in the missing values to reduce their decision uncertainty (Gunasti & Ross, 2009) and make their decisions as they were in the complete information scenario (Kardes et al., 2004; Lee & Olshavsky, 1995). The results of Study 3 are consistent with Sheng et al. (2005), who argue that when consumers perceive some degree of decision uncertainty, they are likely to choose the middle option in a choice set.

Table 4: Compromise effect in interference/non-interference conditions.

	Complete information			Incomplete information		
	Binary (N=84)	Trinary (N=84)	ΔP_{BC}	Binary (N=84)	Trinary (N=84)	ΔP_{BI}
	$P(B; A)$	$P_C(B; A)$	(%)	$P(B; A)$	$P_C(B; A)$	(%)
Vacuum cleaner	49%	64%	15%	45%	84%	39%
Waxing machine	50%	66%	16%	40%	83%	43%

Notes: $P(B; A)$ denotes the probability of choosing B in a binary choice set.

$P_C(B; A)$ denotes the probability of choosing B in a trinary choice set.

ΔP_{BI} denotes the difference in the probability of choosing B between a binary and a trinary choice set in the condition of incomplete information.

ΔP_{BC} denotes the difference in the probability of choosing B between a binary and a trinary choice set in the condition of complete information.

6 General discussion

Most of the previous studies on the compromise effect have assumed that consumers make their choices in a complete information scenario (Dhar et al., 2000; Drolet, 2002; Nowlis & Simonson, 2000; Lin et al., 2006); however, this assumption is inconsistent within the routine decision-making contexts. Therefore, this research aims to fill the academic gap in the literature by investigating the relationship between the incomplete information and the compromise effect in different choice scenarios.

Three studies were conducted to achieve this goal. Study 1 focuses on examining whether consumers are more likely to choose the middle option in a choice set when they are asked to make a decision with incomplete information than with complete information. These results are consistent with our prediction; that is, participants are more likely to choose the middle option in the incomplete information scenario than in the complete information scenario. To better understand the effect of complete/incomplete information on the compromise effect, a further investigation was conducted to explore whether decision uncertainty mediated the compromise effect. Consistent with our prediction, the research findings indicate that incomplete information results in a higher degree of uncertainty and leads to a greater compromise effect than complete information.

Many studies on consumer preferences and incomplete information have assumed that consumers make their decisions in a forced choice condition; however, some research has suggested that consumers usually have the no-choice option in their routine decision-making and even that the rate of choice deferral is pretty high (Dhar, 1997). Thus, in Study 2, a no-choice option was added to the choice set in Study 1. It is predicted that, in the incom-

plete information scenario, the compromise effect becomes weaker when the choice set contains a no-choice option than when it does not. It is assumed that the no-choice option can help consumers reduce their perceived uncertainty, which leads to weaken the compromise effect. Consistent with our prediction, the results of Study 2 indicate that, in the incomplete information scenario, the compromise effect between the free and forced choice conditions is differentially significant. Specifically, when the no-choice option is not available, the compromise effect in the incomplete information scenario is significantly greater than in the complete information scenario; in contrast, when the no-choice option is available, the difference in the compromise effect between those two information scenarios is not differentially significant. Clearly, the compromise effect is weaker in the free choice condition than in the forced choice condition.

Finally, Study 3 was designed to explore whether the compromise effect decreased when participants were asked to infer missing attribute values on the basis of incomplete information. Results revealed that the compromise effect in the inference condition was significantly weaker than in the non-inference condition. This finding implies that consumers may apply those inferred values to fill in the missing attribute values and to make decisions as if they were in the complete information scenario (Kardes et al., 2004; Lee & Olshavsky, 1995).

6.1 Theoretical implications

This research aims to explore the effect of incomplete information on the compromise effect, which has received little attention in previous research. To simulate the routine decision-making context, the compromise effect was investigated in both the free choice/forced choice and

inference/non-inference conditions. In addition, the mediating role of uncertainty was examined. This research contributes to extend the academic theory to the practical perspective. Moreover, this research broadens the horizon of the compromise effect by examining the compromise effect in the incomplete information scenario, which is close to the routine decision-making context. Subsequently, the application of the incomplete information opens an avenue for future research in the fields of marketing, advertising, and consumer behavior.

6.2 Practical implications

Marketers are advised to apply those findings in this research to manipulate their advertising message strategy for better control of consumer preferences. In the routine decision-making contexts, consumers usually make a choice with incomplete information. However, consumers can either infer these missing attribute values or defer their choices. The findings of this research provide a number of marketing implications. For example, consumers tend to choose the middle (compromise) option when they are forced to make a choice among options. Thus, marketers are advised to build a trinary choice set, in which consumers are likely to choose the middle option. In contrast, when there is only a binary choice set with each option containing complete information of product attributes, consumers are less likely to choose that option as a compromise. In addition, in-store displays are good means for marketers to prompt consumers to infer the missing attribute values and accordingly give up the middle option.

6.3 Limitations and future research

There are several limitations in this research. First, the respondent's income is not taken into account in these experiments, as income may moderate purchase preferences and choice decisions. Second, the purchase scenarios are invented, and thus both participants' level of involvement and the quality of their answers are open for questions. Third, the external validity requires further examination due to the students sample and the product categories.

Finally, future researchers are advised to include more product categories to simulate the routine decision-making contexts. Consumers are usually under the conditions of incomplete information, free choice, and inferred attribute values simultaneously in their daily purchase activities. Therefore, this research opens an avenue for future researchers to examine whether consumers make different choices when the no-choice option and the inferences about missing attribute values are simultaneously introduced into the choice set in the incomplete information scenario.

References

- Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, 51, 1173–1182.
- Briley, D. A., Morris, M. W., & Simonson, I. (2000). Reasons as carriers of culture: Dynamic versus dispositional models of cultural influence on decision making. *Journal of Consumer Research*, 27, 157–178.
- Chernev, A. (2004). Extremeness aversion and attribute-balance effects in choice. *Journal of Consumer Research*, 31, 249–263.
- Chuang, S., & Yen, H. (2007). The impact of a product's country-of-origin on compromise and attraction effects. *Marketing Letters*, 18, 279–291.
- Chuang, S. C., Kao, D. T., Wu, P. H., & Tsai, C. C. (2007). Aspiration and the compromise effect. *Psychological Reports*, 101, 1179–1188.
- Corbin, R. M. (1980). Decisions that might not get made. In T. S. Wallsten, Ed., *Cognitive processes in choice and decision behavior*. Hillsdale, NJ: Erlbaum.
- Coupey, E., Irwin, J., & Payne, J. (1998). Product category familiarity and preference construction. *Journal of Consumer Research*, 24, 459–468.
- Dhar, R. (1997). Consumer preference for a no-choice option. *Journal of Consumer Research*, 24, 215–231.
- Dhar, R., & Simonson, I. (2003). The effect of forced choice on choice. *Journal of Marketing Research*, 40, 146–160.
- Dhar, R., Menon, A., & Maach, B. (2004). Toward extending the compromise effect to complex buying contexts. *Journal of Marketing Research*, 41, 258–261.
- Dhar, R., Nowlis, M. S., & Sherman, J. S. (2000). An analysis of context effects in choice. *Journal of Consumer Psychology*, 9, 189–200.
- Dick, A., Chakravarti, D., & Biehal, G. (1990). Memory-based inferences during choice. *Journal of Consumer Research*, 17, 82–93.
- Dowling, G. R., & Staelin, R. (1994). A model of perceived risk and intended risk-handling activity. *Journal of Consumer Research*, 21, 119–134.
- Drolet, A. (2002). Inherent rule variability in consumer choice: Changing rules for change's sake. *Journal of Consumer Research*, 29, 293–305.
- Duncan, R. B. (1972). Characteristics of organizational environments and perceived environmental uncertainty. *Administrative Science Quarterly*, 17, 313–327.
- Greenleaf, E., & Lehmann, D. (1995). Reasons for substantial delay in consumer decision making. *Journal of Consumer Research*, 22, 186–199.

Gunasti, K., & Ross, Jr., W. T. (2009). How inferences about missing attributes decrease the tendency to defer choice and increase purchase probability. *Journal of Consumer Research*, 35, 823–837.

Huber, J., & McCann, J. (1982). The impact of inferential beliefs on product evaluations. *Journal of Marketing Research*, 19, 324–333.

Jaccard, J., & Wood, G. (1988). The effects of incomplete information on the formation of attitudes toward behavioral alternatives. *Journal of Personality and Social Psychology*, 54, 580–591.

Johnson, R. D., & Levin, I. P. (1985). More than meets the eye: The effects of missing information on purchase evaluations. *Journal of Consumer Research*, 12, 169–177.

Kahneman, D., & Tversky, A. (1979). Prospect theory: An analysis of decision under uncertainty. *Econometrica*, 47, 263–291.

Kardes, F. R., Posavac, S. S., & Cronley, M. L. (2004). Consumer inference: A review of processes, bases, and judgment contexts. *Journal of Consumer Psychology*, 14, 230–56.

Kivetz, R., & Simonson, I. (2000). The effects of incomplete information on consumer choice. *Journal of Marketing Research*, 37, 427–448.

Kivetz, R., Netzer, O., & Srinivasan, V. (2004). Extending compromise effect models to complex buying situations and other context effects. *Journal of Marketing Research*, 41, 262–268.

Lee, D., & Olshavsky, R. W. (1995). Conditions and consequences of spontaneous inference generation: A concurrent protocol approach. *Organizational Behavior and Human Decision Making Processes*, 61, 171–189.

Lee, D., & Olshavsky, R. W. (1997). Consumers' use of alternative information sources in Inference generation: A replication study. *Journal of Business Research*, 39, 257–269.

Lin, C. H., Yen, H., & Chuang, S. C. (2006). The effects of mood and need for cognition on consumer choice involving risk. *Marketing Letters*, 17, 47–60.

Lynch Jr., J. R., & Srull, T. K. (1982). Memory and attentional factors in consumer choice: Concepts and research methods. *Journal of Consumer Research*, 9, 18–37.

Meyer, R. J. (1981). A model of multiattribute judgments under attribute uncertainty and informational constraints. *Journal of Marketing Research*, 18, 428–441.

Nowlis, S., & Simonson, I. (2000). Sales promotions and choice context as competing influences on consumer decision making. *Journal of Consumer Psychology*, 9, 1–17.

Ross Jr., W. T., & Creyer, E. H. (1992). Making inferences about missing information: The effects of existing information. *Journal of Consumer Research*, 19, 14–25.

Sanbonmatsu, K., Kardes, F. R., & Sansone, C. (1991). Remembering less and inferring more: The effects of the timing of judgment on inferences about unknown attributes. *Journal of Personality and Social Psychology*, 61, 546–554.

Sheng, S., Parker, A., & Nakamoto, K. (2005). Understanding the mechanism and determinants of compromise effects. *Psychology & Marketing*, 22, 591–609.

Simmons, C. J., & Lynch Jr., J. G. (1991). Inference effects without inference making? Effects of missing information on discounting and use of presented information. *Journal of Consumer Research*, 17, 477–491.

Simonson, I. (1989). Choosing based on reason: The case of attraction and compromise effects. *Journal of Consumer Research*, 16, 158–174.

Simonson, I., & Tversky, A. (1992). Choice in context: Tradeoff contrast and extremeness aversion. *Journal of Marketing Research*, 29, 281–295.

Tversky, A., & Simonson, I. (1993). Context-dependent preferences. *Management Science*, 39, 1179–1189.

Vlek, C., & Stallen, P. (1980). Rational and personal aspects of risk. *Acta Psychologica*, 45, 273–300.

Appendix 1. Product categories and incomplete attribute values

Vacuum cleaner	A	B	C
Price	\$60	\$90	\$120
Appearance	Average	Good	Very good
Nozzle number		3	5
Sound dB	80		60
Capacity	2 liter	2.5 liter	
Power consumption	800W		400W
Weight		3.5kg	2.5kg
Maximum suction	350W	450W	
Waxing machine	A	B	C
Price	\$100	\$125	\$150
Amplitude	5mm	3 mm	1 mm
RPM		10000 rpm	12000 rpm
Power consumption	510W		390W
Length of wire	5m	7m	
Weight	1.7 kg		0.7 kg
Speed change		4 kinds	6 kinds
Size of sponge	4-inch	6-inch	

Appendix 2. Product categories and complete attribute values

Vacuum cleaner	A	B	C
Price	\$60	\$90	\$120
Appearance	Average	Good	Very good
Nozzle number	1	3	5
Sound dB	80	70	60
Capacity	2 liter	2.5 liter	3 liter
Power consumption	800W	600W	400W
Weight	4.5kg	3.5kg	2.5kg
Maximum suction	350W	450W	550W
Waxing machine	A	B	C
Price	\$100	\$125	\$150
Amplitude	5 mm	3 mm	1 mm
RPM	8000 rpm	10000 rpm	12000 rpm
Power consumption	510W	450W	390W
Length of Wire	5m	7m	9pm
Weight	1.7 kg	1.2kg	0.7 kg
Speed change	2 kinds	4 kinds	6 kinds
Size of sponge	4-inch	6-inch	8-inch

Appendix 3. Decision-uncertainty instrument

- I wish that I had more information when making my decision.
- I feel confident that I have all the information necessary for my decision (R).
- I'm sure that one brand is more desirable to me than the other two alternatives (R).
- I'm certain about the performance of each alternative brand (R).
- I'm sure that I won't be disappointed in my choice (R).
- I'm not sure that my current evaluations of the brands will be the same after I make my choice.
- I'm pretty sure that I won't change my mind (R).
- My choice is easy to justify (R).