Missing Information and Discounting: Exploration and Extension

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Abstract

Missing information (MI), if detected, often leads to alternative discounting. However, inferences reduce uncertainty of MI and thus reduce discounting. This paper suggests that discounting results not only from uncertainty of MI, but from consumer's overall "confidence in evaluating" (CE). Confidently held inferences help resolve MI uncertainty, improve CE and attenuate discounting. This mediating role of CE suggests discounting/evaluation effects could also be observed in 'non-MI' contexts involving other types of uncertainty detection and resolution. An experiment demonstrates the role of CE, and a model proposes interactive effects of sources of uncertainty, and uncertainty detection and resolution on overall CE and discounting. The model extends the long observed discounting effect of MI to broader situations and highlights roles of ambiguity detection/resolution in evaluation effects.

Introduction and Conceptual Development

A choice situation involves MI when values for one or more of the attributes considered relevant for the decision task are not immediately available for one or more alternatives in the choice set (Burke 1996). Most studies agree that uncertainty associated with MI results in evaluation differentials between full and partially described alternatives (Edenbach and Moore 2000, Huber and McCann 1982; Jaccard and Wood 1988, Johnson and Levin 1985, Kardes, Posavac and Cronley 2004; Levin, Chapman and Johnson 1988). Discounting or the "penalty effect" refers to the common finding that alternatives with a missing value are evaluated less favourably than alternatives with at least an average value for the attribute. While a number of different processes may cause discounting of MI alternatives (Kardes, Posavac and Cronley 2004), it is generally agreed to be driven by a penalty for uncertainty associated with the MI coupled with risk aversion (Kahneman and Tversky 1979).

Some studies, however, have shown that MI can lead to equally or even more favourable evaluations than fully described alternatives in certain conditions (Jaccard and Wood 1988; Levin, Johnson and Faroane 1984; Levin, Chapman and Johnson 1988). These conflicting findings have been reconciled by considering the effects of MI detection and the use of inferences to fill in MI. Studies show that consumers may 1) reduce the uncertainty and discounting associated with MI by filling in the MI (Dick, Chakravarti and Biehal 1990; Ford and Smith 1987; Huber and McCann 1982; Levin, Chapman and Johnson 1988), or 2) fail to detect the MI at all resulting in no effect of the MI uncertainty. Sanbonmatsu, Kardes and Herr (1992) found that subjects did not always recognize the absence of information and that failure to do so lead to failure to moderate judgments and confidence in those judgments. Finally, studies have also considered the impact of the level of confidence in inferences about MI on evaluations. Levin, Chapman and Johnson (1988) found that rather than having lower levels of confidence in MI tasks, confidence was in fact higher when subjects were asked to infer missing values. The overconfidence may be the result of accepting one's own inferences as information without considering possible error. Lim and Kim (1992) found that discounting was attenuated when inferences were used to fill-in missing attributes as well. However, they also found that the effect was moderated by consumers' confidence in the

inferences. Specifically, while the formation of inferences did indeed reduce discounting, the impact occurred only when coupled with high confidence in the inferences. This suggests the effect is primarily a function of resolution of the uncertainty associated with the MI itself. Taken together the findings pose a number of questions. Consumers discount alternatives that are associated with uncertainty due to MI, yet form inferences to reduce the uncertainty of the MI and thus discounting. In what other contexts might they follow similar uncertainty detection/resolution/discounting evaluation behaviour? What other forms of alternative uncertainty might be associated with discounting behaviour? Are there other (non-MI) evaluation contexts that might be uncertainty affected resulting in similar uncertainty resolution and discounting influences. If so, considering such effects in non-MI situations may aid in the overall understanding of evaluation and processing in many consumer behaviour contexts.

Current Study Purposes

This study proposes discounting of alternatives can occur in many contexts. Whenever uncertainty is associated with an alternative, "confidence in evaluating" (CE) may be impacted. If the uncertainty is detected, it should lead to decreased CE and increased discounting of the alternative. However, if the decision maker is able to resolve the uncertainty, CE should be restored and discounting attenuated. Uncertainty/discounting may vary in 'full information' situations due to many things. Variables such as attribute inconsistency or ambiguity, attribute type (concrete versus abstract), brand equity, information source, and attribute value variance may affect uncertainty. In addition, consumer's likelihood to detect MI or other uncertainty is a function of contextual variables such as consumer's choice goal, personal characteristics and environment. Finally, consumer's ability to resolve uncertainty with mechanisms such as inference formations varies as a function of detection, context and type of uncertainty.

Thus, the present study has two purposes. First, it examines whether reductions in MI discounting when confidently held inferences are formed is a function solely of increased confidence in the MI (Lim and Kim 1992), or also of overall increased CE. The distinction has important implications. If the impact on discounting is solely a function of improved confidence in MI, then the findings are relevant only to situations of MI. However, if the effect is a function of improved CE (a more encompassing construct), the findings are relevant to many other evaluation contexts. Second, it proposes a model suggesting interactive effects of sources of uncertainty, consumer's uncertainty detection, and uncertainty resolution on overall CE and subsequent discounting. The model implications are substantial in that it extends the long observed discounting/evaluation effects of MI to far broader situations involving other sources of uncertainty and ambiguity resolution.

Methodology

An experiment was conducted to assess whether CE plays a moderating role in the uncertainty/discounting effect in a MI context where the effect has most commonly been observed. Based on the above discussion, it's suggested that H1) higher levels of confidence in inferences about MI will better resolve uncertainty and restore CE, and H2) increases in CE and confidence in inferences will BOTH result in reductions in discounting.

Furthermore, the study considers three context variables that are likely to affect CE: product familiarity, perceived correlation between given and missing attributes and the importance of

the choice. Sanbonmatsu, Kardes and Herr (1992) suggest that highly knowledgeable consumers are more likely to detect MI and form inferences. Further, they may be confident enough in their inference formations, and thus CE to mask expected set-size effects. Perceived correlations between given and missing attribute values may also impact consumers' ability to form inferences to resolve uncertainty and thus CE. Studies suggest that consumers often form "probabilistic consistency" inferences about MI based on perceived associations between missing and given information (Ford and Smith 1987, Huber and McCann 1982; Kardes, Prosavac and Cronley 2004). Thus, the likelihood of using inferences to resolve uncertainty may vary when perceived correlations between missing and given attributes vary. Finally, task importance may also impact CE in that high task importance may make accuracy of the decision more salient. Thus, inferences that are formed to resolve uncertainty in may be associated with more elaborative problem solving, and subsequently, more confidence in the inferences (Collins, Warnock, Aiello and Miller 1975). Therefore, it is also suggested that H3) higher levels of familiarity, involvement and perceived attribute correlations will be associated with higher levels of confidence in inferences and CE.

Study Design

A full-factorial 2x2x2 between subjects design was used. Three variables (product familiarity, attribute correlations, and task importance) were manipulated. A sample of undergraduate and graduate students (n = 125) were randomly assigned to treatment groups. While it's recognized that student samples may not generalise perfectly to other populations, the practise is common in MI studies and thus allows results comparability. Subjects received questionnaires that consisted of a cover story, instructions, a product description, and a battery of evaluation and confidence measurements. Each subject performed the evaluation task for a single product representing one treatment cell of the experiment. The product description named the product category and provided a list of four non-price attributes and a value for three of the four listed attributes. In each case, one of four attribute values was left as "N/A".

Product familiarity was manipulated by using two product categories representing high or low levels of familiarity (PC's and steam carpet cleaners) chosen based on pretests from the same population (Burke 1996; Simmons and Lynch 1991). Attribute correlations were manipulated such that in high/low correlation cases an attribute perceived to be highly/not correlated with the provided attributes (based on pretest results) was left missing. Finally, decision importance was manipulated by instructing half of the subjects that "there are only a few participants in this part of the survey, so your responses are especially important. If you do not feel able or willing to carefully consider your answers, please let the administrator know."

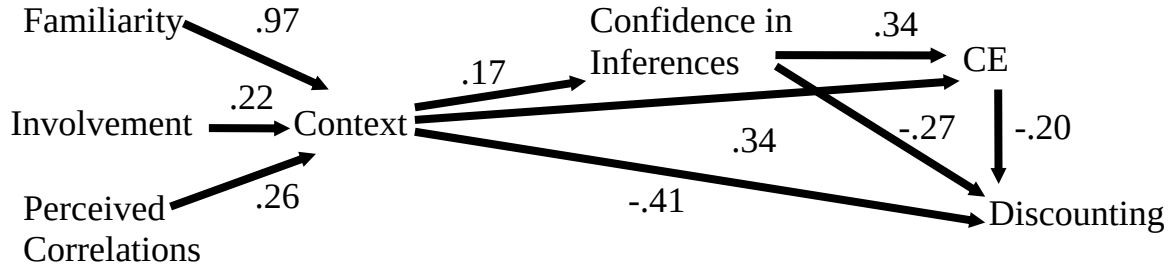
Immediately following exposure to the cover story, product descriptions were presented and measures taken on evaluations of the described product, CE and confidence in inference formations if formed. Evaluations were measured using three 5-point semantic differential scale items such as Like-Dislike, Would Buy-Would Not Buy. CE was measured using four Likert scale items such as "I strongly disagree/agree that: my evaluation is correct, I feel good about my evaluation." Confidence in inferences was measured using four Likert scale items similar to the CE measures. Manipulation checks were conducted in which subjects indicated the degree to which they were familiar with the product categories, perceived the given and missing attributes to be related, and felt involved or interested in the task. Finally, subjects provided evaluations of the "full-information" product descriptions in the product category NOT used in their experimental condition (either PC's or carpet cleaners, but not the category they evaluated in the experimental task). These measures were used as the full

information evaluation comparison measures in the calculation of the MI discounting variables. ANOVA's were performed to assess the effectiveness of the manipulations. Each of the three manipulations produced significant or marginally significant differences in the associated treatment variables across conditions.

Findings

PLS structural equation modelling was used to examine the relationships between context, inference use, confidence in inferences, CE and evaluations. The results of this analysis are shown in Figure 1. Various models were tested. The model that was most parsimonious with the highest predictive value (Multiple R-Squared) for the CE and discounting variables (MRS=.23 and .40, respectively), while maintaining theoretical validity, is reported. All factor loadings for items measuring the latent variables converged and were greater than the widely used rule of thumb of .60 (Bagozzi and Yi 1988). Specifically, loadings for the four measures of confidence in inferences ranged from .94 to .97, for the four measures of CE from .85 to .91, and for the three measures of discounting of MI alternatives from .82 to .89. Figure 1 shows that confidence in inferences had a significant positive direct effect on CE (coefficient = .34, $p<.05$). It also had significant negative direct AND indirect effects (through CE) on discounting of MI alternatives (coefficients = -.27 and -.07, $p<.05$, respectively). Significance of all PLS path coefficients was determined using the Jackknifing program provided in the PLS software. These findings provide support for H1-2 in that higher levels of confidence in inferences were positively associated with CE suggesting better resolution of uncertainty and restoration of CE. Furthermore, increases in BOTH confidence in inferences (replicating Lim and Kim 1992) AND CE (supporting a moderating role of CE in the uncertainty/discounting effect) lead to reductions in discounting.

Figure 1



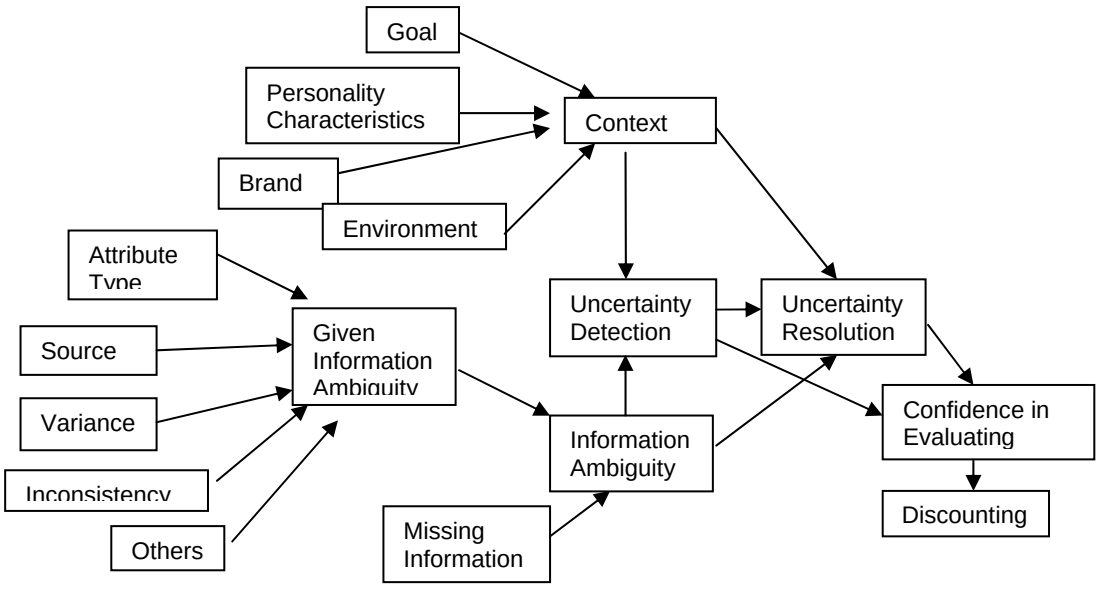
As shown in Figure 1, the model also provides support for H3. "Context" is modelled as a formative variable in PLS that's viewed as an index produced by the observed indicators of familiarity, attribute correlations and task importance (Fornell and Bookstein 1982). All three context indicators have significant ($p<.05$), positive coefficients contributing to the linear combination "context" variable (task importance was .22, perceived attribute correlations .26, and category familiarity .97). "Context" had a significant positive effect on confidence in inferences (coefficient = .17, $p<.05$) and a direct positive effect on CE (coefficient = .34, $p<.05$). Taken together these findings show that increases in the context variables result in increases in consumers' confidence in their inference formations and CE.

Discussion and Future Research

The experiment showed that the reduction in discounting of MI alternatives when confidently held inferences are formed is NOT solely a function of increased confidence in the MI (Lim and Kim 1992), but is also a function of overall increased CE. Thus, it is suggested that variations in confidence in "given information" may have similar discounting effects as those found in MI studies. If consumers do not view all given information as equally accurate, unbiased and unambiguous, their confidence in GIVEN information may vary, affecting their CE. As CE was shown to play a moderating role in terms of evaluation, ANY situation involving low CE could result in discounting. Studies suggest consumers may perceive differences in the accuracy, credibility and/or ambiguity (clarity) of provided information. Source credibility has been shown to impact advertising effects, and brand credibility as a function of brand consistency has been shown to affect brand consideration and choice (Erdem and Swait 2004). Studies have also shown information incongruity and inconsistency affect confidence and judgments (Luce, Jia and Fischer 2003; Sengupta and Johar 2002). Thus, if GIVEN information is viewed with varying levels of confidence, further questions arise. First, do resulting variations in CE impact non-MI evaluations? Second, what factors might impact consumers' confidence in GIVEN information and CE? Finally, what factors might affect consumers' ability to detect and resolve uncertainty in non-MI contexts?

To further investigate these issues, a model is proposed that identifies interactive effects of sources of uncertainty, consumers' uncertainty detection, and uncertainty resolution on CE and subsequent discounting (Fig. 2). The model extends the long observed discounting and evaluation effects of MI to broader situations involving other sources of uncertainty and ambiguity resolution. Uncertainty/discounting can vary in 'full information' situations due to many variables such as attribute inconsistency/ambiguity, attribute type (concrete or abstract), brand equity, information source, and attribute value variance. In addition, consumers' likelihood to detect uncertainty (MI or in 'given information') could be a function of contextual variables such as their choice goal, time constraints, personal characteristics and environment. Finally, when faced with missing information, consumers often fill in values to help resolve the uncertainty of the MI and improve CE. If, similarly, consumers engage in coping behaviour to reduce the ambiguity of given information, the variables affecting that behaviour and the ultimate effects on uncertainty and CE should be investigated.

Figure 2: Uncertainty Detection/Resolution Model



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