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**How Scarce Objects Attract People:
The Effects of Temporal and Social Contexts of the Scarcity on Object Value**

Atsunori Ariga

*Department of Psychology, Rissho University
4-2-16 Osaki, Shinagawa-ku, Tokyo 141-8602, Japan
Tel: +81-3-5487-3256
E-mail: atsu.ariga@gmail.com*

Atsuko Inoue

*Department of Economics, Seikei University
3-3-1 Kichijoji-kitamachi, Musashino-shi, Tokyo 180-8633, Japan
Tel: +81- 422-37-3703
E-mail: ainoue@econ.seikei.ac.jp*

Abstract

Factors that underlie the scarcity effect have not been investigated under controlled experiments thus far. We found that scarcity given by the decrease (not the fewness) of objects predominantly elicited the effect, manipulating the total number of objects of any color and the number of objects of a certain feature (color) independently (Experiments 1 and 2). However, in the presence of others, the scarcity effect was elicited even by the fewness of objects (Experiment 3). Consumer preference depends on the dynamic temporal context that has generated the scarcity and on the social context in which the current scarcity occurs.

Key words: Scarcity Effect; Attractiveness; Preference

In daily shopping at the store, we always evaluate products or services. Evaluating them, particularly with respect to attractiveness, directly affects our decision of what to purchase. Thus far, many psychologists have explored how people determine the attractiveness of an object under controlled conditions. Most psychological findings are founded on evidence that the attractiveness of an object is determined by the physical characteristics of the objects themselves (e.g. average face; Rhodes 2006), by individuals' experiences of them (e.g. mere exposure; Zajonc 1968), or by interpersonal communication about the objects between individuals (e.g. persuasion or conformity; Turner 1991). Yet, in economics, the attractiveness of objects, or object value, is discussed more in the context of supply. A famous anecdote in this field is the so-called water-diamond paradox: we purchase water, which is necessary for our survival, very cheaply, whereas we pay much more money for a diamond, even though it is not required for our lives at all (Smith 1776/1937). This paradox critically points out that object value is not merely determined by usefulness but also by availability.

One interesting relationship between availability and object value is the *scarcity principle*, which is the focus of this paper. The scarcity principle refers to a tendency to perceive rare opportunities as more valuable than plentiful opportunities (Baumeister and Bushman 2011). According to the commodity theory (Brock 1968), commodities, which are defined as anything that can be possessed and conveyed, are valued to the extent that they are unavailable. Here, unavailability is typically operationalized as limits in the supply or number of suppliers, cost in acquiring or providing a commodity, restrictions limiting the possession of a commodity, and delays in providing a commodity. That is, "scarcity" is defined as insufficiency of product supply or time of availability (Brock 1968; Lynn 1991, 1992).

For example, limited editions of cars, stamps, and coins continually appear on the market, and they cost more than regular, everyday products. In sales promotions, an advertisement stating that only a limited number of these products will be available (limited-number technique) or that an item or a price is only available for a limited time (fast-approaching-deadline technique) is ubiquitously used in order to drive consumer appetite for purchasing. In fact, products labeled with quantity limits (e.g. limit X per customer) dramatically increased sales of those products at a grocery store (Inman, Peter, and Raghuram 1997). Also, products sold better when they were advertised as being available only today than when they were available all year at a fast-food restaurant (Brannon and Brock 2001). In several studies in the marketing area, it has been reported that sales restriction has positive effects on consumers' behaviors and evaluations (Aggarwal and Vaidyanathan 2003; Verhallen and Robben 1994). The effect of such sales restriction, or exclusiveness, is interpreted in terms of the scarcity principle because it is strongly linked to consumers' perception of the availability (van Herpen, Pieters, and Zeelenberg 2009).

Prevailing Theories

There have been several theories as to why the scarcity principle works. One is that the scarcity is used as a heuristic cue in decision making (e.g. Kardes, Posovac, and Cronley 2004; Monroe and Petroschius 1981; Rao and Monroe 1989). Because people have (even evolutionally, Cialdini, 2001) experienced and learned that rare objects are good (or vital) in most cases, the scarcity serves as a cue for the objects that people should get. Another theory is that it ordinarily takes more effort to obtain rare objects than plentiful objects. Because people tend to link the accessibility of an object with its value, the cost they pay/paid for the scarce objects enhances its value (Seta and Seta 1982). A third theory focuses on the distinctiveness. Because rare, unique objects provide the holders with the same distinctiveness—i.e., that they are different from others—people are eager to possess scarce objects in order to appear more individualized (Lynn 1991; Snyder and Fromkin 1980). A fourth theory centers on the view that people, especially those from individualistic cultures, highly value their freedom (Brehm 1966; Brehm and Brehm 1981). As opportunities decrease and become scarce, we lose our freedom to obtain them. When our freedom is threatened or eliminated, we experience a negative emotional state and are motivated to recover the freedom, which is called psychological reactance; that is, the fewer opportunities (or freedom) we have, the less pleasant we feel. As a consequence, we highly value scarce objects in response to reactance.

The Scarcity Effect

The scarcity principle was first empirically demonstrated by Worchel, Lee, and Adewole (1975). They manipulated the scarcity of objects and investigated the effect of this manipulation on how people view the attractiveness of the objects. In their study, two experimenters ran experiments in which one experimenter gave instructions to participants while the other played the role of a visitor to manipulate the scarcity. Under a demand-change condition, the first experimenter presented a jar containing ten cookies to participants. The second experimenter then entered the room and exchanged the jar for a new jar containing two cookies, saying “The participants in the other room have eaten more cookies than I expected, so I need to get some additional cookies.” Under an accident-change condition, the manipulation was the same as in the demand-change condition, except that the second experimenter said to the first experimenter, “I have accidentally taken your cookies” when switching the jars. Under a consistent-scarce condition, a jar containing two cookies was continuously exposed to the participants, and under a consistent-abundant condition, a jar of ten cookies was continuously presented. Under these two consistent conditions, the second experimenter entered the room and said to the first experimenter, “I simply wanted to check your supply of cookies” and did not change the jar. After the

manipulations, participants tasted a cookie and then rated how attractive it was.

The attractiveness ratings given to the cookies under the consistent-scarce condition were higher than those under the consistent-abundant condition. Moreover, as compared to the consistent-scarce condition, the attractiveness was rated higher not only for the demand-change condition but also for the accident-change condition. These results suggest that the attractiveness of the cookies was enhanced when their supply was scarce and when it changed from abundant to scarce even without the demand that should generate the scarce situation (*scarcity effect*). Their findings were consistent with the suggestion that the perception of the scarcity is determined not simply by how much of an object exists at present but by how much of it exists in relation to what existed in the past (Gurr 1970).

Purpose of This Study

Worchel et al. (1975) reported a boost of the attractiveness of objects (or the scarcity effect) by manipulating the number of cookies. Apparently this enhanced attractiveness was caused additively by the decrease of and the fewness of the number of cookies. However, it was unclear whether the effect was predominantly affected by one or the other. Although this issue is controversial among researchers, it is currently obvious that various factors of evaluators, such as personality trait (e.g. Amaldoss and Jain 2005; Harris, Lynn, and Clair 1991; Lynn 1991) and familiarity with objects (Stock and Balachander 2005), interactively affect the occurrence of the effect. According to a recent study that simultaneously investigated multiple factors underlying the effect, perceived scarcity has significant influences on perceived value through several mediating variables, such as assumed expensiveness and perceived uniqueness (Wu and Wu 2009). That said, how perceived scarcity that is of the essence is driven is still unclear.

Our aims with this study are to clarify the mechanism(s) underlying the scarcity effect. More specifically, we examined which factor (decrease vs. fewness) is predominant for perceived scarcity to be driven by manipulating the total number of cookies of any color and the number of cookies of a certain feature (color) independently. This should provide us with a better understanding of the nature of the scarcity principle so that we can incorporate such knowledge into sales-promotion strategies in marketing practice.

EXPERIMENT 1

Which Factor Predominantly Elicits the Scarcity Effect, Decrease or Fewness?

Method

Participants. Sixty naïve volunteers (24 males and 36 females, 18–26 years old) participated in Experiment 1.

Stimuli. Plain white cookies and black chocolate cookies were used as stimuli that participants

were to evaluate. In a preliminary study ($N = 10$), we confirmed that the attractiveness ratings were not significantly different between the white and black cookies ($t(9) = 0.71, p > .10$).

Procedure. Under a white-decrease condition (Fig.1, top), jar A, which contained nine white cookies and one black cookie, was first exposed to participants. When the participants were about to reach for jar A, the experimenter exchanged it for a new jar, B, containing four white cookies and one black cookie, saying “Sorry, I put out the wrong jar, this is the correct jar,” the manipulation of which was analogous to the accident-change condition in Worchel et al.’s study (1975). That is, five white cookies accidentally decreased in front of participants under this condition. Under a black-decrease condition (Fig.1, middle), four white cookies and six black cookies (jar A) were initially presented to participants, and five black cookies then decreased (jar B) in the same fashion as under the white-decrease condition. Under a control condition (Fig.1, bottom), a jar B containing four white cookies and one black cookie was continuously exposed to participants without an exchange. After either manipulation, participants tasted the white cookies and black cookies, the order of which was counterbalanced across participants, and then rated how attractive they respectively were with a 9-point Likert scale (1 = extremely unattractive, 9 = extremely attractive). Participants were randomly assigned to one of the three conditions, each of which contained 20 participants.

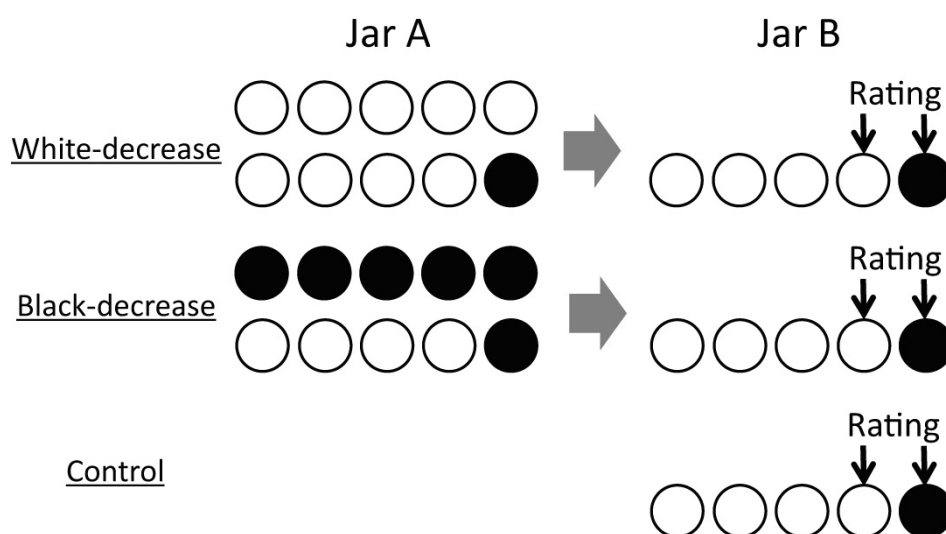


Figure 1 Schematic illustration of each condition in Experiment 1.

Results and Discussion

The attractiveness ratings given to white and black cookies were averaged across participants under each condition (Fig. 2). A 3 (condition: white-decrease, black-decrease, and control) \times 2 (color: white and black cookies) two-way analysis of variance (ANOVA) revealed no

significant main effects of condition ($F(2,57) = 1.16, p > .10$) and of color ($F(1,57) = 0.31, p > .10$), but a significant interaction between these factors ($F(2,57) = 4.47, p < .05$). Simple main effects of color were significant in the white-decrease and black-decrease conditions ($p < .05$), but it was not significant in the control condition ($p > .10$).

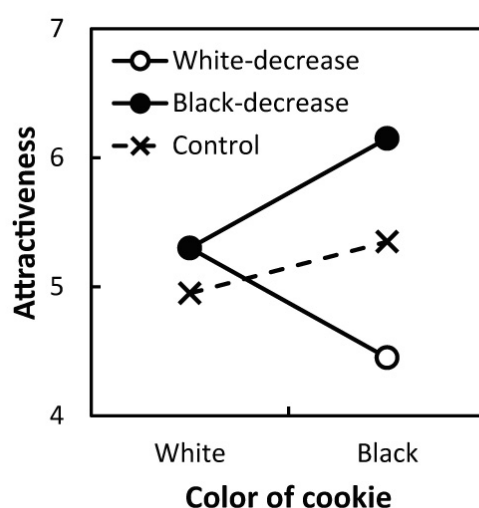


Figure 2 Mean attractiveness ratings for white and black cookies under each condition in Experiment 1.

Under the control condition, the attractiveness ratings did not significantly differ between the white and black cookies, even though there were fewer black cookies than white when the participants were evaluating (see Experiment 3 for discussion). Interestingly, under the white-decrease and black-decrease conditions, the attractiveness was rated significantly higher for a cookie whose color was the same as the decreased cookies compared with that of a different color, even though all participants tasted the same cookies between the conditions. Note that participants in the white-decrease condition preferred the white cookie to the black cookie even though the white cookies were more abundant than the black at the time of evaluating.

One may argue that if the scarcity effect had occurred, the attractiveness ratings given to the decreased cookies should have been higher under both the white-decrease and black-decrease conditions than under the control condition. Regarding this point, we assume that the decrease of objects would trigger the scarcity effect, and that a result of the decrease would modulate the degree of the effect. That is, under the black-decrease condition, the scarcity effect was elicited for the decreased cookie, and then its degree was enhanced by only one (or very rare) black cookie. Under the white-decrease condition, the effect was similarly elicited, but its degree was not enhanced because four white cookies still existed. Following these, the attractiveness for the

other (or non-decreased) cookies would be relatively formed. Therefore, we consider that the difference of the ratings between the white and black cookies would better reflect the scarcity effect in Experiment 1, rather than the difference among conditions.

Experiment 1 successfully differentiated the effects of the decrease and of the fewness on the scarcity effect in a single experiment by using two kinds of cookies. The results suggest that the scarcity effect (or perceived scarcity) depends predominantly on the decrease, not the fewness, of objects, and also that perceived scarcity is feature-based, not total-number-based, because object value was selectively enhanced by what had decreased under each condition.

EXPERIMENT 2

Is a “Decrease” Really Necessary for Eliciting the Scarcity Effect?

Experiment 1 demonstrated that the decrease of objects is the predominant factor for the scarcity effect to be elicited. However, it is still unknown if the effect occurs due to perceived scarcity given by the decrease of the cookies or by the newly generated scarcity given by a change in the number of the cookies.

In Experiment 2, one white cookie and one black cookie were initially exposed to participants. At this time, both the cookies were equal in terms of the scarcity. Eight black cookies were subsequently added to the original lineup, for a total of one white cookie and nine black cookies. At this time, the one white cookie became relatively scarce due to the ratio of cookies between the two colors (an increase condition). Under a control condition, one white cookie and nine black cookies were continuously presented throughout the experiment. Participants then evaluated how attractive the respective white and black cookies were. A significant point here is that under the increase condition, we newly generated the relative scarcity for the white cookie by “increasing” the number of black cookies during the experiment.

If the scarcity effect occurred for the white cookie under the increase condition—i.e., if the attractiveness of the white cookie was rated higher under the increase condition than under the control condition—it would mean that the effect occurs as long as the scarcity is newly generated, regardless of whether it is generated by the decrease of target cookies or by the increase of other cookies. These results also suggest that the scarcity effect cannot fit in with the psychological reactance theory (Brehm 1966; Brehm and Brehm 1981). This is because that theory explicitly posits the decrease (or elimination) of objects as the determinant factor for taking away participants’ freedom as the stimulus for the scarcity principle; nothing was decreased in this experiment. On the other hand, if the scarcity effect did not occur for the white cookie under the increase condition—i.e., if the attractiveness of the white cookie was equally rated under the increase and control conditions—it would mean that the effect is not triggered by the scarcity newly generated by the increase of non-target objects but only by the decrease-based

scarcity. Now, these results suggest that the scarcity effect can be well explained in line with the psychological reactance theory, rather than the other theories described above (e.g. Kardes et al. 2004; Lynn 1991; Monroe and Petrosius 1981; Rao and Monroe 1989; Seta and Seta 1982), because they do not anticipate the effect as decrease-specific. Although none of the theories proposed for the scarcity principle are mutually exclusive, it should be possible to weigh which theory is more responsible for the effect.

Method

Participants. Forty-eight naïve volunteers (20 males and 28 females, 18–23 years old) participated in Experiment 2.

Procedure. The stimuli and procedure were the same as in Experiment 1, differing only in the contents of the jars, as follows (Fig.3). Under the increase condition, jar A contained one white cookie and one black cookie, which were first exposed to participants. Jar B contained one white cookie and nine black cookies. Just as the participants reached out to jar A, the experimenter exchanged jar A for jar B. That is, under this condition, eight black cookies accidentally increased in front of the participants. Under the control condition, jar B was continuously presented throughout the experiment. Participants were randomly assigned to either of the two conditions, each of which contained 24 participants.

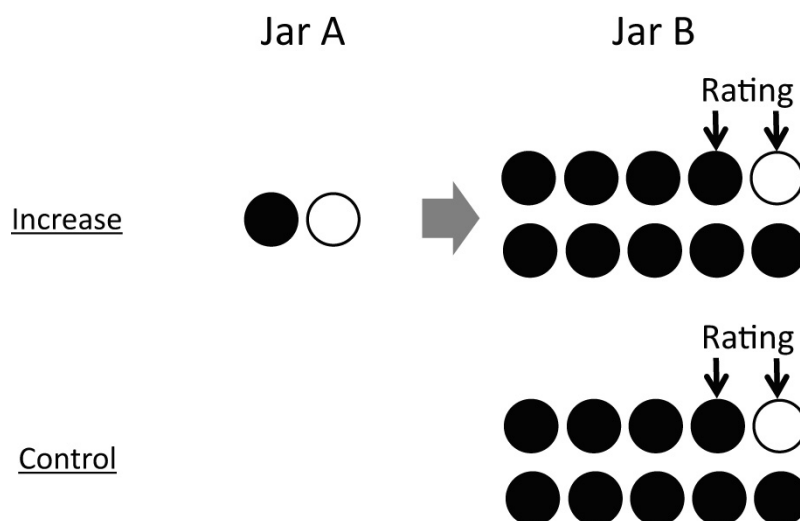


Figure 3 Schematic illustration of each condition in Experiment 2.

Results and Discussion

The attractiveness ratings given to white and black cookies were averaged across participants under each condition (Fig. 4). A 2 (condition: increase and control) \times 2 (color: white

and black cookies) two-way ANOVA revealed no significant main effects of condition ($F(1,46) = 0.13, p > .10$) or of color ($F(1,46) = 0.45, p > .10$) as well as no significant interaction between these factors ($F(1,46) = 0.03, p > .10$).

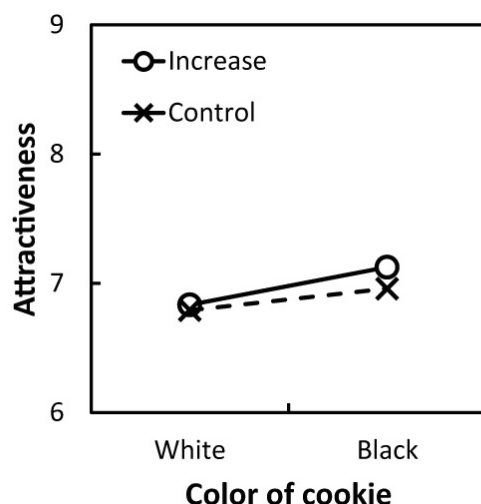


Figure 4 Mean attractiveness ratings for white and black cookies under each condition in Experiment 2.

First, there was no significant difference in the attractiveness ratings between the rare white and the plentiful black cookies under the control condition, which was in good agreement with Experiment 1. Second, comparing the increase and control conditions, we found no effect of the manipulation of the scarcity on the attractiveness ratings given to the cookies. This suggests that the relative scarcity generated for the white cookie as a result of increasing the black cookies did not create the scarcity effect; rather, the scarcity effect is triggered only by the decrease of the cookies. The results of Experiments 1 and 2 enable us to specify the psychological reactance theory as a predominant explanation for the scarcity effect because it explicitly considers the decrease (or elimination) of objects as the main factor underlying the scarcity principle (Brehm 1966; Brehm and Brehm 1981).

EXPERIMENT 3

Does a “Fewness” Elicit the Scarcity Effect Socially?

The results of Experiments 1 and 2 demonstrate that the decrease of objects is predominant for eliciting the scarcity effect (or perceived scarcity), which supports the psychological reactance theory more than it does other theories. However, we should note that the experimental design in Experiments 1 and 2 was unfair for the uniqueness theory (Lynn 1991),

which posits that people are eager to possess scarce objects in order to appear individualized in contrast to others. Because the uniqueness theory postulates that the scarcity is more pronounced when others are present, the fewness-based scarcity effect would have been absent when the participants evaluated the cookies alone in Experiments 1 and 2. In fact, others were referred to (as the participants in the other room) during the experimental manipulation in Worchel et al. (1975), which reported the fewness-based scarcity effect. Given the uniqueness theory, the scarcity effect is expected to be present based on the fewness of objects when participants are aware of others. Furthermore, it is recently suggested that perceived uniqueness is positioned as a mediating variable influencing the scarcity effect (Wu and Wu 2009). In Experiment 3, we examined whether the fewness triggers the scarcity effect under a social condition, or in the presence of others.

Method

Participants. Twenty-five naïve volunteers (10 males and 15 females, 18–21 years old) participated in Experiment 3.

Procedure. The stimuli and procedure was the same as in the control condition in Experiment 2, except that the confederate, who was introduced as another participant, was seated next to the actual participant during the experiment. They were together exposed to the jar, the contents of which were the same as those of jar B in Experiment 2 (see Fig.3, bottom). They were instructed in advance that the jar was to be shared by them and that the task was to individually taste the cookies from the jar and rate how attractive they were in turns. First, the participant was required to taste the white and black cookies and rate how attractive each respectively was, during which the confederate waited without verbal interaction. This manipulation was aimed at providing the actual participant with the uniqueness of getting only one white cookie. During the experiment, their faces were visible to each other, but their responses were hidden by boxes. After the actual participant had completed the task, a debriefing was given, which means that the confederate did not taste any cookie.

Results and Discussion

The attractiveness ratings given to white and black cookies were averaged across participants and shown with the ratings under the control condition in Experiment 2 (Fig.5). A 2 (condition: social and control) \times 2 (color: white and black cookies) two-way ANOVA revealed no significant main effect of condition ($F(1,47) = 0.74, p > .10$), a marginally significant main effect of color ($F(1,47) = 3.67, p < .10$), and a significant interaction between these factors ($F(1,47) = 6.42, p < .05$). A simple main effect of color was significant for the social condition in Experiment 2 ($p < .005$), and that of condition was marginally significant for white cookies (p

< .10).

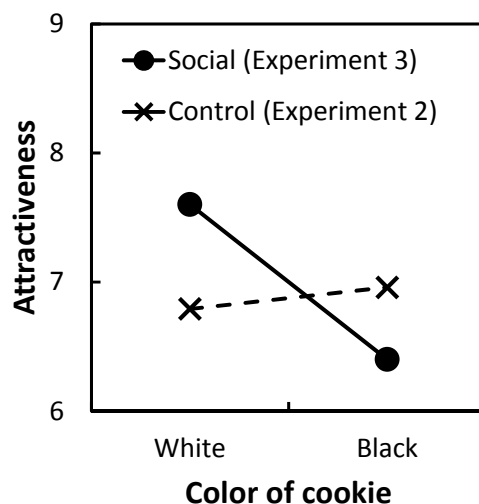


Figure 5 Mean attractiveness ratings for white and black cookies in Experiment 3 and under the control condition in Experiment 2.

As expected, the attractiveness was rated higher for the few white cookies than for the abundant black cookies. Furthermore, the attractiveness ratings given to the white cookies tended to be higher under the social condition in Experiment 3 compared to those under the control condition in Experiment 2. Thus, simply by introducing the confederate to the control condition in Experiment 2 without changing the task of the participants, the fewness of the cookies elicited the scarcity effect even though they never decreased. This is likely because the uniqueness was emphasized by the confederate, who had the same goal. These results are in favor with the uniqueness theory (Lynn 1991) and with the recent model that perceived uniqueness mediates the scarcity effect (Wu and Wu 2009). We can conclude that the current ratio matters to the scarcity effect when the participants are aware of others. The presence of others may facilitate the occurrence of the scarcity effect in general.

GENERAL DISCUSSION

The purpose of the present research was to understand the nature of the scarcity effect. In Experiment 1, we examined factors underlying the effect: Which factor predominantly elicits the effect, decrease or fewness? The answer is decrease. The attractiveness for a cookie was selectively enhanced by what had decreased. Furthermore, in Experiment 2, we examined what fundamentally causes the scarcity effect to arise: Is “decrease” really necessary to elicit it? The answer is yes. The scarcity effect for target objects was not observed when the relative scarcity

was newly generated by the increase of other objects. The decrease is the predominant factor for eliciting the scarcity effect to—or for boosting the attractiveness of—the scarce objects. We consider these results well in line with the psychological reactance theory (Brehm 1966; Brehm and Brehm 1981) because this theory explicitly considers the decrease (or elimination) of objects as the primary factor underlying the scarcity principle. On the other hand, the other views described in the introduction (e.g., Kardes et al. 2004; Lynn 1991; Monroe and Petroschius 1981; Rao and Monroe 1989; Seta and Seta 1982) are in less agreement with our findings because they do not anticipate the effect as decrease-specific; rather, they allow the effect to occur for the scarcity generated by any change in the number of objects, whereas we found that this was not the case. Although none of the theories are mutually exclusive, the results of Experiments 1 and 2 suggest that the psychological reactance theory is primarily responsible for the scarcity effect.

In Experiment 3, we examined the effect of ratio on the scarcity effect under a social situation that was favorable to the uniqueness theory (Lynn 1991): Does “fewness” elicit the scarcity effect socially? The answer is yes. If people are aware of others, the scarcity effect can be elicited based on the fewness of objects. This is likely because the uniqueness, which is driven by the perception of scarcity, is more emphasized by the presence of others than by their absence. Collectively, the decrease is fundamentally predominant for eliciting the scarcity effect (or perceived scarcity) in all cases, whereas the fewness (or ratio) can be effective depending on the social situation. The presence of others may facilitate perceived uniqueness and thus the occurrence of the scarcity effect in general. Thus, the scarcity effect is not a unitary phenomenon mediated by a single mechanism: rather, it seems to arise from multiple factors, both intrapersonal (the psychological reactance) and interpersonal (the uniqueness), working independently of one another. The current result strengthens the recent multiple-factor model suggested by Wu and Wu (2009).

Based on the current findings, we can propose two “low-cost” examples of sales-promotion strategies in the field of marketing. First, visualizing the decreasing, not increasing, process of products for consumers is important to boost the product attractiveness. Note that the feature-based decrease could easily provide products with a more novel value than ever before. In the context of shelf-based scarcity, it has been reported that the scarcity effect occurs when consumers only see traces of others’ behavior through emptied shelf space (Parker and Lehman 2011; van Herpen et al. 2009). Second, visualizing the presence of other consumers, for example, on an Internet shopping site, is likely to enhance the attractiveness of a few products even if they do not decrease.

An increasing amount of real-world advertising is now using scarcity claims (such as “limited quantities”; Howard, Shu, and Kerin 2007; Pratkanis, Shadel, Kleinman, Small, and Pak 2006). However, the scarcity claims used in advertising probably contribute to the activation of

persuasion knowledge in consumers. Persuasion knowledge is defined as an individual's knowledge about persuasion agents' motives and influence techniques (e.g. Campbell and Kirmani 2000; Friestad and Wright 1994). It is known that the activation of persuasion knowledge increases consumers' suspicion about a marketer's ulterior motives, skepticism towards advertising claims, and perception of firms as deceptive or manipulative (Brown and Krishna 2004; Darke and Ritchie 2007; Kirmani and Zhu 2007), which degrades consumer preference for products with default options. Under this circumstance, persuasion knowledge could significantly disrupt the effect of the scarcity. Given these, the present research proposes that an *implicit* appeal of the scarcity by only manipulating the number of products is a useful, low-risk strategy for stimulating consumers' purchase behavior, as compared to an *explicit* appeal via the scarcity claims. Although the scarcity effect can be complexly modulated by various external factors, such as discount price or the product information given, or by consumers' strategies in processing the scarcity information (e.g. Brannon and Brock 2001; Inman et al. 1997), the present research demonstrates the fundamental effects of the manipulation of product quantity on the attractiveness perceived by consumers.

CONCLUSION

In sum, object value can be altered simply by manipulating the number of objects. People's attraction to a target object increases based on its scarcity due to a decrease in its number, not by the increase of other objects. Particularly when people are aware of others, the scarcity due to an original low number of objects attracts people. Thus, the present research newly and experimentally specifies (1) the factor by which the scarcity effect is fundamentally elicited (individual, intrapersonal factor: *decrease of objects*), and (2) the factor that facilitates the occurrence of the scarcity effect in general (social, interpersonal factor: *awareness of others*).

The human cognitive system performs an elaborate, yet rather finical, discrimination of object features when deciding on the attractiveness of an object. Consumer preference is quite inflexible, depending strictly on the dynamic temporal context that has generated the scarcity and on the social context in which the current scarcity occurs. Happily, this is an easy-to-control preference for marketers.

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