

# Diversification Bias: Explaining the Discrepancy in Variety Seeking Between Combined and Separated Choices

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Recent research has revealed a pattern of choice characterized as a *diversification bias*: If people make combined choices of quantities of goods for future consumption, they choose more variety than if they make separate choices immediately preceding consumption. This phenomenon is explored in a series of experiments in which the researchers first eliminated several hypotheses that held that the discrepancy between combined and separate choice can be explained by traditional accounts of utility maximization. On the basis of results of further experiments, it was concluded that the diversification bias is largely attributable to 2 mechanisms: *time contraction*, which is the tendency to compress time intervals and treat long intervals as if they were short, and *choice bracketing*, which is the tendency to treat choices that are framed together differently from those that are framed apart. The researchers describe how the findings can be applied in the domains of marketing and consumer education.

Most normative models of choice imply that it is better to make choices in combination rather than separately. For example, at dinner tonight we should choose the wine with an eye to the entree, and before going out we should select a matching tie and jacket. Indeed, we may want to combine all four choices. The restaurant we select may influence the costume we choose and vice versa. The advantages of combined choice stem from complementarity and substitutability between goods. Only when choices are taken together can such interactions be accommodated optimally.

Although the view that combined choices are best is normatively appealing, there appears to be

at least one situation in which combined choices actually leave consumers worse off. This occurs when consumers select many goods of the same kind to meet future consumption needs. Recent research by Simonson (1990) has shown that if consumers combine their purchases in this way, they will choose more diverse bundles (or show more *variety seeking*) than if they choose them individually when the goods are to be consumed. In one experiment, Simonson's subjects chose three snacks for consumption on 3 specific days. Some scheduled the snacks in advance (*simultaneous choice*), while others chose one on each day (*sequential choice*).<sup>1</sup> Subjects showed much more variety seeking when making simultaneous choices (64% chose three different items), than when making sequential choices (9%). The same pattern was also observed in a subsequent study (Simonson & Winer, 1992) examining actual family purchases of yogurt. Within the same family, as purchase quantity increased so did the variety chosen; in-

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<sup>1</sup> We used the terms *simultaneous* and *sequential choice* to refer to choices made using experimental arrangements similar to Simonson's. When speaking in more general terms or when referring to different experimental arrangements, we use the terms *combined* and *separated choice*.

deed, large quantity purchases often contained unusual flavors that were never bought separately. It appears that consumers plan much more diversity for themselves than they will subsequently want. We refer to this as the *diversification bias*.

Our main goal is to explain the underlying cause of the discrepancy in variety seeking between simultaneous and sequential choice. We are particularly concerned with whether the discrepancy can be justified normatively or whether it is, as our title correctly implies that we conclude, a type of choice bias.

### Classical Model of Variety Seeking

To provide a context for our work, we begin with a discussion of the classical economic model of variety seeking, drawing attention to those elements of the model that we feature in our subsequent analysis. According to the classical model, variety seeking arises from object-specific satiation or the *diminishing rate of marginal return to consumption*. According to this view, the optimal bundle of goods contains variety because the benefit from an additional unit of a specific good (i.e., its marginal return) decreases as a function of the number of units of that good one already possesses.

Consider the case of a consumer choosing between oranges and candy bars. Figure 1 shows a

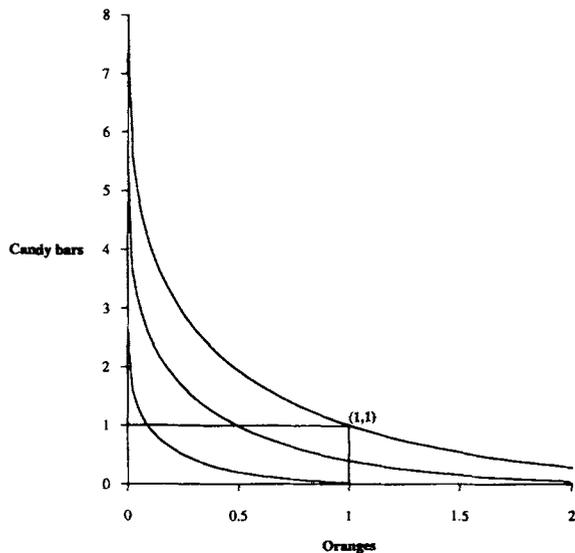


Figure 1. Indifference curves for two goods, oranges and candy bars, with oranges preferred to candy bars and choices to be made simultaneously.

family of indifference curves for such a consumer, depicting preferences for bundles of the two goods. Indifference curves are isoquants, depicting combinations of goods having identical utility to the consumer, with higher curves depicting greater utility. In most cases, indifference curves are convex toward the origin, indicating that as the relative amount of one good in a bundle increases, the amount of the other good needed to compensate for some loss of that good declines. If oranges are initially preferred to candy bars, as is the case for the consumer whose preferences are depicted in Figure 1, an orange will be the first item chosen. However, there will then be less benefit to her from a second orange than from the first candy bar; if she is at the point (1, 0), with one orange and no candy bars, then choosing a candy bar will put her on a higher indifference curve, point (1, 1), than selecting a second orange (2, 0).

Applied to the problem of variety seeking, the indifference curve analysis becomes somewhat more complicated because consumption typically occurs over time, and satiation for a particular good is likely to diminish as the interconsumption interval (the time interval between acts of consumption) increases. In our example, if you have just eaten an orange it might well make an immediate second orange less appealing, but it will probably have little effect on the pleasure of an orange eaten tomorrow. Indeed, if the interconsumption interval is sufficiently large, the same benefit will be obtained from consuming a second unit of an item as from the first. Such a case, in which consumption of one unit has no effect on the marginal benefit of a second, is represented by straight line indifference curves. Thus, as in Figure 2, the effect of the interconsumption interval can be described in terms of changes in the convexity of the indifference curve, with separation in time leading to reduced convexity.<sup>2</sup>

A common functional form for indifference curves is given by the constant elasticity of substitution (CES) formula:

$$k = (a_1q_1^r + a_2q_2^r)^{1/r}, \quad (1)$$

<sup>2</sup> We assume that tastes do not change over time and that temporal discounting is constant for both goods. Although taste change can complicate the issue, in this context its primary effect would be to add noise.

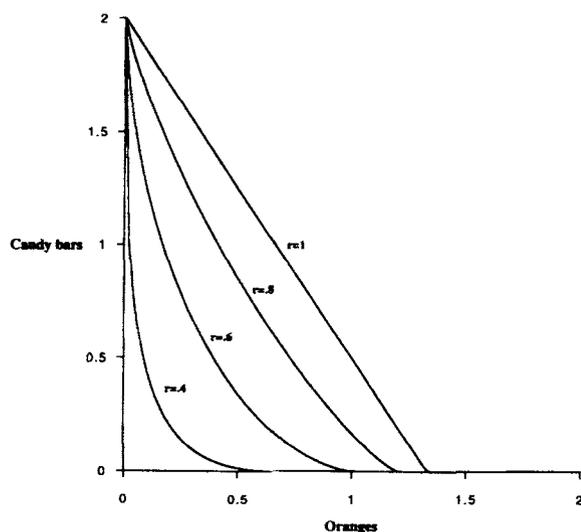


Figure 2. Indifference curves for oranges and candy bars with varying convexity. Note that convexity decreases as the interconsumption interval increases.

where  $k$  is the overall utility level of a particular indifference curve,  $r$  ( $0 < r < 1$ ) describes the convexity of the indifference curve (a measure of the degree of object-specific satiation),  $a_1$  and  $a_2$  are the initial relative preferences for the two items, and  $q_1$  and  $q_2$  are the quantities consumed of each good.

If convexity decreases exponentially with the interconsumption interval, as seems plausible, then we can express  $r$  as a function of time ( $t$ ) as follows:

$$r = r_0 e^{-\theta t}, \quad (2)$$

where  $r_0$  is the parameter applicable to simultaneous consumption, and  $\theta$  is an exponential decay parameter ( $\theta \geq 0$ ). Increasing the interconsumption interval will increase  $r$ , thereby flattening the indifference curve. When the interconsumption interval is long  $r$  approaches 1 and  $k$ , the utility of a bundle of two goods, approaches  $(a_1 q_1 + a_2 q_2)$ . The utility of the bundle is then maximized by choosing a bundle consisting exclusively of the good having the highest initial preference.

If the discrepancy in variety seeking between sequential and simultaneous choice reflects a misprediction of tastes, it might stem from a tendency to overpredict satiation: although eating three candy bars of the same kind may seem quite unappealing in prospect, it may not be bad at all if they are consumed on different days. In terms of

the indifference curve analysis, this suggests that simultaneous choices are based on a more convex indifference curve (i.e., one having a lower value of  $r$ ) than are sequential choices.

### Explanations for the Diversification Bias

Explanations for the discrepancy between choice modes in amount of variety seeking can be divided according to whether the underlying decision processes are thought to be unbiased or biased. *Unbiased* decision processes, enabling an individual to maximize net utility from consumption by choosing more variety during simultaneous than sequential choice, are compatible with traditional models of rationality or utility maximization. We discuss three hypotheses maintaining that the observed discrepancy in variety seeking between sequential and simultaneous choice are due to such unbiased processes. Alternatively, *biases* arise when the decision processes adopted lead to systematic deviations from optimality. We present two hypotheses holding that response format effects on diversification reflect biased decision processes.

### Hypotheses That Do Not Imply Bias

*Diversification.* Simonson (1990) and Kahn and Lehmann (1991) suggested that people seek variety because they are risk averse and uncertain about their preferences.<sup>3</sup> Choosing variety reduces the likelihood of repeatedly consuming something undesirable. With reference to the classical model, this implies that consumers are uncertain about

<sup>3</sup> Simonson (1990) mentioned an additional hypothesis to account for the discrepancy in variety seeking between simultaneous and sequential choice. According to the *time-and-effort* hypothesis, people choose more variety during simultaneous choice because it is both quicker and less effortful to choose several different items than to choose several items of the same kind. In two experiments we found that, contrary to this hypothesis, participants took less time to select a certain number of items when they were told that all had to be identical (four of the same type of candy bars) than when they were not so constrained (they could choose whichever four candy bars they liked). Given the lack of face plausibility or empirical support for the time-and-effort hypothesis, we conserve space by not presenting the details of these experiments.

the utility ( $k$ ) of each bundle of goods. Therefore, they choose a bundle that is unlikely to have the lowest utility, although at the cost of virtually eliminating the bundle that has the highest utility. Diversification is an unbiased decision rule because the expected utility of such low-risk assortments can be greater than that of riskier bundles containing only one kind of item (even if it is the one they expect to like best). On this view, diversification is a response to uncertainty about preferences for goods. Consequently, the diversification hypothesis predicts that variety seeking should decline if such uncertainty is reduced.

*Information seeking.* People may also seek variety because it provides information that can help to inform future choices. If we always consume the same kind of item, we may miss out on better alternatives. Information seeking may have a smaller influence on sequential choices because many people may find they like the first good they choose sufficiently to decide that it is not worth exchanging the certain pleasure from that good for a potentially less enjoyable good along with some extra information. The information-seeking account implies that consumers making simultaneous choices will choose less variety if they have already obtained, or believe that they will obtain, all the information that variety seeking could yield.

*Cognitive capacity limitations.* Both the diversification and information-seeking hypotheses suggest that people seek out variety in simultaneous choice for some normatively justifiable reason, but change their minds when they discover how much they like their first selection. An alternative account that does not imply bias is that people choose less variety in sequential choice because they are unable, due to cognitive capacity limitations, to implement their desire for variety. It is well known that our ability to cope with complex problems is sharply limited by our capacity for processing information (Baddeley, 1976; Kahneman, 1973; Miller, 1957). Indeed, capacity limitations may be one of the primary reasons why people adopt suboptimal decision rules or heuristics (Simon, 1957); these heuristics do the best job possible given people's capacity constraints. The limitations that are most relevant for variety seeking are those on memory: To carry out a planned sequence of consumption, one must be able to remember the plan.

Unlike the next two hypotheses, the cognitive capacity limitation hypothesis views the sequential choice condition as the source of the observed discrepancy between simultaneous and sequential choice. It posits that variety seeking in the sequential choice condition is attenuated by cognitive limitations and predicts that if these limitations are reduced, variety seeking during sequential choice will increase. Support for this hypothesis would not challenge the normative view that decisions are best made simultaneously. Instead it would imply that such simultaneous choices, although they may be optimal, are difficult to implement.

### *Hypotheses That Imply Bias*

*Time contraction.* This hypothesis proposes that people subjectively shrink the interconsumption interval when making simultaneous choices, thus exaggerating the impact of satiation on their preferences.

We know well that we can become satiated on even the most desirable foods, so that if we are to consume several dishes within a short interval we should choose a variety. Yet satiation is fleeting, and our preferences typically return to their preconsumption level within a short time. The time contraction hypothesis holds that we do not give sufficient weight to the interconsumption interval, treating even lengthy intervals as if they were very brief. An experiment reported by Kahneman and Snell (1992) may have demonstrated such a bias. At a specified time on each of 7 consecutive days, their subjects ate a bowl of yogurt while listening to the same piece of music. On the 1st day, they stated how much they liked both the yogurt and the music and then predicted how much they would like them on the 7th day. Although they predicted that they would like both the music and the yogurt much less, there was no consistent pattern of decline. In fact, they liked the yogurt more on the 7th day than on the 1st, and their drop in liking for the music was smaller than they had expected. Perhaps these subjects imagined a much smaller interconsumption interval than was specified and therefore overpredicted their degree of satiation. Other work by Kahneman and coauthors on retrospective evaluations of sequences of pleasure and pain has uncovered a systematic pattern of *duration neglect*, in which retrospective ratings of

the overall utility of sequences of pleasure and pain are insensitive to the durations of those sequences (Kahneman, Frederickson, Schreiber, & Redelmeier, 1993; Frederickson & Kahneman, 1993). Time contraction, if demonstrated, could be viewed as an analogous phenomenon associated with prospective judgments.

Since the time contraction hypothesis is based on the assumption that people do not consider how the size of the interconsumption interval will influence satiation, it predicts that the level of variety seeking will be reduced if a large interconsumption interval is made salient. This prediction is tested in several experiments reported below.

*Choice bracketing.* This hypothesis holds that the discrepancy in variety seeking occurs because simultaneous choices are presented together and are thus framed as a type of portfolio choice, whereas sequential choices are considered in isolation.

There is considerable evidence that subjects tend to frame problems according to how the problems are presented to them (Tversky & Kahneman, 1981). Simultaneous choices are presented to subjects in the form of a package, and perhaps the most straightforward choice heuristic applicable to such packages is diversification. In the sequential choice condition, in contrast, subjects are presented with the choices one at a time, and the natural choice heuristic applicable to a single choice is to choose the single most preferred alternative. A similar mechanism was alluded to by Simonson, who noted that "in addition to simplifying decisions, making multiple choices simultaneously enables consumers to implement, rather easily, global strategies for the different selections" (Simonson, 1990, p. 160).

## Experiments

Experiment 1 was designed primarily to determine whether the discrepancy in variety seeking between simultaneous and sequential choice could be attributed to unbiased decision processes. As will be shown, none of these hypotheses was supported. In subsequent studies, we investigated the validity of the time contraction and choice-bracketing hypotheses, concluding that these processes are major determinants of the diversification bias.

## Experiment 1

### Overview

Participants made sequential and simultaneous choices of three snacks, just as in Simonson's (1990) original study, with the addition of several manipulations. The experiment constitutes a replication of Simonson's original study, tests of several of the hypotheses described above, and an investigation of whether people are aware of the discrepancy between choice formats.

*Tests of the causes of variety seeking.* The diversification hypothesis suggests that variety seeking is analogous to holding a diverse investment portfolio and that it will be reduced if uncertainty about the goods is reduced. To reduce uncertainty about their preferences, we gave some simultaneous choice subjects a pretaste of all the snacks before they made their choices. If the diversification hypothesis is correct, less variety seeking should occur in this pretaste condition.

The information-seeking hypothesis holds that people seek variety to discover what the world has to offer and thereby to update their preferences. It implies that if information is made available through some extrachoice mechanism, there will be less motivation to seek variety during choice. To test this prediction, a group of participants (post-taste group) was given samples of all the snacks offered immediately after making simultaneous choices. Since subjects in this condition obtain at the outset all the information possible from variety seeking, the information-seeking hypothesis predicts that variety seeking will be reduced in this condition, as well as in the pretaste condition in which they receive samples before choosing.

The cognitive capacity limitation hypothesis holds that the choice conditions differ primarily in the ease of intertransactional thinking. That is, although sequential choice subjects would like to choose the same amount of variety as simultaneous choice subjects, they are unable to act on this desire because they can neither remember what they have already chosen nor anticipate what they will choose. To test this hypothesis, we included a sequential choice condition in which participants were told at the outset that they would be making three weekly choices and were also reminded at each session of their previous choices. If variety seeking is hindered by capacity limitations, then

this aware sequential choice group should show more variety seeking than an unaware group.

The time contraction hypothesis holds that people psychologically underestimate the length of interconsumption intervals. Concerns about satiation, which are a reasonable basis for variety seeking when interconsumption intervals are short, then justify high variety seeking. We hypothesized that the interconsumption interval is not very salient to consumers making simultaneous choices, but that if this salience were increased, variety seeking would decrease. To increase this salience, we included an additional sequential choice condition in which long-interval choices were contrasted with short-interval choices. Based on the time contraction hypothesis, we predicted that people would contrast the two interconsumption intervals, thereby becoming more aware of the low level of satiation that would remain after 1 week.

The time contraction hypothesis also makes a prediction about the order in which goods are chosen. McAlister (1982) and Pessemier and Handelsman (1984) argued that variety seeking during sequential choice is partly due to increasing satiation for familiar goods. Satiation is reflected in the rate at which people change from one good to another in a series. Even if one chooses only two different goods in a long series, satiation for those goods could be reflected in a pattern of alternating consumption (i.e., an *ABABAB* pattern), but not in two short series of uniform consumption (e.g., the pattern *AAABBB*). Although Pessemier and Handelsman were concerned with actual satiety, the time contraction hypothesis is based on imagined satiety. When people simultaneously schedule a series of consumption occasions, they imagine how they would feel at each time and, if they believe they will be satiated for their favorite good, choose an alternative. Imagine that someone's favorite good is *A* and second favorite is *B*. At Time 1 they will choose *A*. However, if they imagine that they will still be satiated for *A* at Time 2 they will make *B* their second choice. At Time 3, they will imagine less satiation for *A*, and so will be more likely to choose it again. Consequently, the time contraction hypothesis predicts that simultaneous choice subjects who choose two items of one kind and one of another will likely schedule them in the order *ABA*. In the sequential choice condition, this will not happen. Since there will be no actual satiation at Time 2 for goods eaten at Time 1, those who

choose two of one kind will have no preference for the order *ABA* over any other order. In short, amongst those subjects who choose two different items, the time contraction hypothesis predicts that simultaneous choice subjects will be more likely to schedule them in the order *ABA* than will sequential choice subjects.

*Do simultaneous choice subjects change their minds?* A central prediction of the view that consumers are better off making sequential choices is that those making simultaneous choices will later want to change their choices so as to have less variety than they had planned. We tested this prediction in the following way: During the second and third session, we asked the simultaneous choice subjects if they would want to change the snack planned for that day and, if so, what they preferred. The participants were not allowed to actually change what they received.

*Awareness.* Are simultaneous choice subjects aware that they would probably choose less variety if they chose sequentially? Simonson (1990) compared one group of subjects who predicted the choices that they would make during sequential choice (e.g., "What will you choose next week?") with a standard simultaneous choice group. He found that subjects predicted less variety seeking during sequential choice than actually occurred during simultaneous choice. This suggests that subjects were at least partially aware of the amount of variety they would want at the moment of consumption. Simonson did not compare his prediction group to a standard sequential choice condition, leaving some doubt about the degree of this awareness. To test for awareness, we included a sequential choice condition in which subjects during the first session predicted what they were going to choose in subsequent sessions.

### Method

*Participants.* Three hundred seventy-eight students in 16 undergraduate classes in economics and history participated in the experiment. To approximately equate the number of participants in each condition, two classes each were assigned to five experimental conditions and three each to the remaining conditions. Because the classes met weekly, the length of the interconsumption interval was 1 week.

**Materials.** To reproduce the conditions of Simonson's (1990) original study as closely as possible, we offered our participants similar choices: Snickers bars, Oreo cookies, milk chocolate with almonds, tortilla chips, peanuts, and cheese-peanut butter crackers. For the conditions requiring samples, we wrapped small portions of each item in a strip of foil.

**Conditions.** Depending on the group to which they were assigned, each participant selected three snacks in one of the following experimental conditions:

1. Standard sequential choice. Participants chose one item on each of the 3 weeks. They were not told that there would be more than one choice.

2. Sequential choice with awareness. Participants knew that they would be making three choices on 3 different weeks, and all the choices were made on the same form, so that they had reliable knowledge about previous choices.

3. Prediction. Participants made their first choice and then predicted what they would choose on subsequent weeks. They were informed that their predictions were nonbinding. The second and third sessions were conducted in the same way as the standard sequential choice condition. Specifically, they were not reminded of their predictions.

4. Standard simultaneous choice. In the first of the three classes, participants chose a snack for that day and for the two subsequent classes.

5. Simultaneous choice with pretaste. This condition was identical to standard simultaneous choice except that participants tasted a small sample of each snack before making their three choices.

6. Simultaneous choice with posttaste. Participants were informed that immediately after making their choices, they would receive a sample of all the snacks.

7. Simultaneous choice preceded by hypothetical immediate consumption. Participants were first instructed to imagine that they were receiving all three choices immediately. They made hypothetical choices under these conditions and were then informed that, in fact, their selections would be given to them during three classes spaced at least 1 week apart. They then made their actual choices in the same manner as the standard simultaneous choice conditions.

During the second and third classes in all the simultaneous choice conditions, we asked participants whether, if given the opportunity, they would

prefer a different snack than the one they had previously chosen and, if so, which one they wanted. We emphasized that they could not actually change from their initial choice and that they would receive the snack they had originally selected for consumption on that date.

**Procedure.** The experiment was conducted in the closing minutes of each class session. During the first session, the experimenter first placed one of each snack on the instructor's desk, allowing the students to see what they could get. Response sheets containing instructions were distributed, as well as foil-wrapped samples to those participants who were to receive a pretaste or a posttaste. All forms contained a list of available snacks, as well as instructions specific to each condition. Once participants had completed the forms, they returned them to the experimenter, who gave them the snack they had chosen for that day.

During the second and third classes, the experimenter distributed the forms and the participants responded and were given the snacks of their choice. The six snacks were not displayed again.

## Results

Table 1 reports the mean level of variety seeking in all conditions, along with the number of people choosing different numbers of items. The level of variety seeking was coded as 1 if the participant chose the same snack three times, 2 if the participant chose one snack twice and another a single time, and 3 if the participant chose three different snacks. All of the analyses we report include only

Table 1  
*Variety Seeking in All Conditions of Experiment 1*

Group	Number of different kinds chosen						M
	One		Two		Three		
	%	n	%	n	%	n	
Sequential choice	46	19	46	19	8	3	1.61
Sequential-aware	50	25	34	17	16	8	1.66
Prediction	38	18	31	15	31	15	1.94
Simultaneous choice	18	10	38	21	45	25	2.27
Simultaneous-pretaste	17	8	38	18	46	22	2.29
Simultaneous-post-taste	20	9	45	20	34	15	2.14
Simultaneous after immediate	17	9	31	16	52	27	2.35

participants for whom we were able to calculate the level of variety seeking—the simultaneous choice participants and the sequential choice participants who attended all three classes. An overall analysis of variance (ANOVA) comparing the level of variety seeking in all experimental conditions confirmed significant differences between some of them,  $F(6, 332) = 7.98, p < .0001$ , justifying the use of planned comparisons. Unless otherwise stated, analyses compare the mean level of variety seeking between conditions.

We strongly replicated Simonson's (1990) major finding: there was more variety seeking in the standard sequential choice condition than in the standard simultaneous choice condition,  $t(87) = 4.6, p < .001$ . We next turn to an examination of the specific hypotheses.

*Unbiased hypotheses.* As is evident in Table 1, the simultaneous choice conditions did not differ among themselves in level of variety seeking,  $F(3, 196) < 1$ . Two of the hypotheses proposing that the discrepancy between sequential and simultaneous choice was attributable to unbiased processes were dependent on such differences; therefore these hypotheses were unsupported. According to the diversification hypothesis, variety seeking should be lower in the pretaste condition, whereas the information seeking hypothesis predicts that it should be lower in both the pretaste and posttaste conditions. Note that although the mean variety seeking in the posttaste condition is nonsignificantly lower than the other three simultaneous choice conditions, this cannot be construed as support for the information seeking hypothesis, which, as already noted, also predicts less variety seeking following a pretaste.

The cognitive capacity limitation hypothesis predicted that informing people that they would receive one choice per week and reminding them of their previous choices would increase their variety seeking. This did not occur, as can be seen by comparing the standard and aware sequential choice conditions,  $t(89) < 1$ .

*Time contraction.* We made two predictions based on the time contraction hypothesis. The first, that variety seeking would be lower if simultaneous choice for delayed consumption followed choice for immediate consumption, was not supported. The second prediction, which was supported, was that subjects in simultaneous choice conditions who chose two items of one kind would

Table 2  
*Proportion of ABA Judgments Made by Those Choosing Two of the Same Kind in All Conditions of Experiment 1*

Group	Percentage choosing ABA	Number choosing two
Sequential choice	21	19
Sequential-aware	35	17
Prediction	47	15
Simultaneous choice	67	21
Simultaneous-pretaste	67	18
Simultaneous-posttaste	55	20
Simultaneous after immediate	75	16

commonly choose them in the order *ABA* rather than *AAB* or *BAA*. Table 2 gives the proportion of *ABA* choices in all conditions. As predicted by time contraction, the proportion of such choices is much higher in the combined simultaneous choice conditions (65.3%) than in the sequential choice condition (27.8%),  $\chi^2(1) = 13.8, p < .001$ .

In hindsight, we suspect that the design of the simultaneous choice preceded by hypothetical immediate choice condition was flawed because it introduced another well-established and robust effect that operated opposite to the predicted direction: anchoring and insufficient adjustment. Participants' responses to the hypothetical immediate consumption question revealed an extremely high rate of variety seeking ( $M = 2.6$ ).<sup>4</sup> If participants first anchored on their own initially high level of variety seeking and then failed to adjust sufficiently for the introduction of an interconsumption interval, the postadjustment level of variety seeking might be higher than that of the conventional simultaneous choice conditions. This might have occurred even if the immediate/week delay manipulation increased the salience of the inter-

<sup>4</sup> The fact that the hypothetical immediate consumption question elicited a significantly greater level of variety seeking than the other simultaneous choice conditions,  $t(51) = 4.6, p < .001$ , indicates that there was some limit to time contraction (i.e., that subjects in the simultaneous choice conditions did not completely ignore the interconsumption interval). If they had, the level of variety seeking in simultaneous choice would have been indistinguishable from the level of variety seeking associated with immediate consumption.

consumption interval and time contraction was operative. On the basis of the support implied by *ABA* patterns and our belated recognition of this confound, we conducted further tests of time contraction, which are reported below (see Experiments 2 and 3).

*Awareness.* Apparently participants were at least partially aware of their preference for more variety during simultaneous choice, because when asked to predict what they would do, they anticipated choosing significantly less variety than was actually chosen by simultaneous choice subjects,  $t(246) = 2.67, p < .01$ , and they also predicted that they would want more variety than was chosen by subjects in the sequential choice conditions,  $t(137) = 2.26, p < .05$ . Interestingly, for the prediction subjects, there was no difference between the degree of predicted and actual variety seeking (1.94 for actual choice, 1.90 for predicted choice),  $t(28) < 1$ , suggesting that their predictions served as a plan which they then carried out.

*Do simultaneous choice subjects change their minds?* Simultaneous choice subjects stated whether they wanted something different than they had originally chosen and, if so, what. For the 84 subjects providing us with complete data in this condition, we compared the amount of variety originally chosen with their preferences at the time they received the snacks. The mean variety of their revised choices (1.8) was significantly lower than that of their original choices (2.09),  $t(83) = 4.55, p < .001$ . Of the 37 people who changed their minds at least once, fully 31 (84%) of them changed in the direction of wanting less variety. Note that with six different types of candies, random changes in the snacks selected would be far more likely to move subjects in the direction of wanting more variety than toward wanting less. Thus, this is a conservative measure of their desire to change to less variety. It is also conservative because participants were not actually given the option of changing their minds, so they had little motive to acknowledge that their original choice was "wrong."

### Discussion

Simonson's finding that more variety is sought during simultaneous than sequential choice was replicated and proved quite robust. None of the many manipulations designed to remove factors

that might normatively justify this discrepancy had any effect. Moreover, two results suggested that simultaneous choices are actually biased. First, the simultaneous choices were made in the order *ABA* much more frequently than sequential choices. This suggests that subjects believed that they would experience greater satiation than actually occurred. Second, simultaneous choice subjects who indicated that they would want to change their original choices were likely to change in the direction of less variety rather than more. Again, this suggests that people believed that they would grow tired of their favorite item more rapidly than they actually did.

We have already speculated that one mechanism underlying this overprediction of satiation is time contraction, or the tendency to psychologically shrink interconsumption intervals. Time contraction could be due to the low salience of the interconsumption interval to subjects who attend only to the order in which they will consume goods or to subjects' use of a choice process in which they first anchor on what they would choose if they were going to consume immediately and then adjust insufficiently for the duration of the interconsumption interval. Both of these mechanisms imply that increasing the salience of the interconsumption interval will decrease the degree of variety seeking in simultaneous choice, which is what we tested in Experiments 2 and 3.

### Experiments 2 and 3: Time Contraction

The classical model of variety seeking, discussed above, holds that variety seeking is a function of diminishing marginal returns for additional goods of the same type. However, simultaneous choice is determined by imagined rates of marginal return. Time contraction can be interpreted as a factor that influences these imagined marginal rates of return, thereby altering desire for variety. Time contraction is the tendency for people to contract time psychologically when making choices about future activities and therefore to overpredict satiation. If people contract time, they will choose less variety when making single choices at the time of consumption than when choosing concurrently for the same consumption occasions.

In the equation for the CES indifference function, time contraction can be modeled by transforming the expression for  $r$  (Equation 2) into  $r_*$  by

incorporating an additional parameter,  $\lambda$ , that effectively shrinks the interconsumption interval:

$$r_{\psi} = r_0^{e^{-\lambda \psi}}. \quad (3)$$

Time contraction,  $\lambda$ , can vary between 0 and 1. For  $\lambda = 0$  (complete time contraction) the individual treats consumption as simultaneous regardless of the interconsumption interval. For  $\lambda = 1$  (no time contraction) the individual accurately responds to the impact of satiation, given a particular interconsumption interval. Time contraction might reflect an anchoring and insufficient adjustment process whereby people use the convexity factor for immediate consumption ( $r_0$ ) as the anchor, but insufficiently adjust for the effect of the interconsumption interval ( $\lambda < 1$ ).

### Overview

In these experiments, we tested the time contraction hypothesis with a method similar to that in Experiment 1, but with an attempt to reduce the influence of anchoring. We did this by having participants contrast choices made for sequential days with those made for sequential weeks. We assumed that the contrast between the two intervals would still highlight the length of the week interval, but that the extremity of the anchor would be reduced if the initial interconsumption interval was a day. Experiment 2 involved hypothetical choices and Experiment 3 involved real choices. In Experiment 2, participants either chose which of six snacks they would want on 3 consecutive days followed by the same choice for consecutive weeks (day  $\rightarrow$  week condition), or else chose for consecutive weeks followed by days (week  $\rightarrow$  day condition). We reasoned that subjects would treat the first question more or less identically in both conditions. Specifically, they would contract the 1-week interconsumption interval so that choices for both the 1-week and 1-day intervals would show similar levels of variety seeking when the interval was not made salient. For the second question, we expected that time would be salient and therefore that participants would consider how variations in the interconsumption interval might influence their preference. Week  $\rightarrow$  day subjects will have already contracted the interval when making week judgments and would therefore not ask for greater variety when making day

judgments. On the other hand, participants in the day  $\rightarrow$  week condition will, in effect, expand the interval when asked about weekly consumption. Experiment 3 was similar to Experiment 2, except that participants made real choices, and the week  $\rightarrow$  day condition was replaced with a week-only condition because the class in which data was collected met weekly, so it was not practical to give subjects snacks on sequential days. For both experiments, we predicted that variety seeking would be similar for all judgments except for the week judgments made in the day  $\rightarrow$  week condition, which would show less variety seeking.

### Method

*Participants.* Experiment 2 was conducted with 122 graduate students in two classes at Carnegie Mellon University, one in the Heinz School of Public Policy and Management and another in Social and Decision Sciences. They were each given a single chocolate bar as a reward for participation. Experiment 3 involved 61 undergraduate business students at Indiana University of Pennsylvania. This experiment involved actual choices, so all students received three snacks of their choice at the appointed times.

*Procedure.* Response sheets were distributed to participants just before the end of their classes. The first page of all two-page forms began with an exhortation to answer the questions one page at a time and not to change any answers once they had turned the page. Experiment 2 involved two hypothetical choice conditions. In the day  $\rightarrow$  week (week  $\rightarrow$  day) condition, participants were first told to “imagine that you are going to eat one snack per day (week) for the next 3 days (weeks)” and were then asked to choose which of the three snacks they wanted on each occasion. On the next page, they were told to “imagine that instead of eating one snack per day (week), you are going to be eating **one snack per week (day) for the next 3 weeks (days).**” (Boldface in the original.) Again, they chose the three items they wanted for the three occasions.

Experiment 3 was identical except that participants in the day  $\rightarrow$  week condition made hypothetical choices for an interconsumption interval of 1 day and then made real choices for a 1-week interval, while participants in the week-only condition chose only for the 1-week interval.

### Results

Table 3 depicts the results of both experiments. For the hypothetical choices of Experiment 2, variety seeking varied in the manner predicted by the time contraction hypothesis. We conducted a  $2 \times 2$  ANOVA with interconsumption interval (day or week) as a within-subjects factor and order (day  $\rightarrow$  week versus week  $\rightarrow$  day) as a between-subjects factor, and with level of variety seeking as the dependent measure. The main effects of both order,  $F(1, 23) = 4.34, p < .05$ , and time,  $F(1, 123) = 5.83, p < .05$ , were significant, as was the interaction between them,  $F(1, 123) = 18.00, p < .001$ . Inspection of the data suggests that the two main effects were the result of much lower variety seeking for week judgments in the day  $\rightarrow$  week condition, and this was confirmed by separate ANOVAs. Day and week judgments did not differ in the week  $\rightarrow$  day condition,  $F(1, 61) = 1.58$ , whereas there was significantly more variety seeking in the day judgments of the day  $\rightarrow$  week condition,  $F(1, 61) = 23.53, p < .001$ .

For Experiment 3, there was numerically more variety seeking for week judgments in the day  $\rightarrow$  week condition than in the week-only condition, but this result did not achieve conventional levels of significance,  $t(59) = 1.44, p < .15$ . However, the results of other analyses also support our hypothesis. There was no difference between variety seeking for day choices than for week-only choices,  $t(59) < 1$  (in fact, week-only judgments showed marginally more variety seeking), but there was a difference between day choices and week

choices within the subjects in the day  $\rightarrow$  week condition,  $t(29) = 3.25, p < .005$ .

The results of Experiments 2 and 3 along with the prominence of ABA choices in the simultaneous choice conditions of Experiment 1 suggest that time contraction is one cause for the high levels of variety seeking observed during simultaneous choice. At least under the circumstances tested by Simonson and ourselves, it appears that people underweight the interconsumption interval. Our participants gave little evidence of sensitivity to the difference between the two interconsumption intervals unless the long interval was made salient by explicitly contrasting it with the first, short interval.

### Discussion

Time contraction has implications that extend beyond the domain of variety seeking; it applies to any situation in which there is an interconsumption interval that affects choice in some way. To illustrate, we demonstrated the effects of time contraction on intertemporal choice, drawing on a study conducted by Loewenstein and Prelec (1993). Their subjects imagined that they had to take two weekend trips, one pleasant (a visit to friends) and the other unpleasant (a visit to a disliked aunt). Participants first specified in which order they would like to take the visits if the intervisit interval was 1 week and then what they would prefer if the interval was 6 months. They found that subjects preferred to get the aunt over with quickly when

Table 3  
Variety Seeking in All Conditions of Experiments 2 and 3: Tests of Time Contraction Hypothesis

Condition	Number of different kinds chosen by interconsumption interval													M
	Day						Week							
	One		Two		Three		One		Two		Three			
	%	n	%	n	%	n	%	n	%	n	%	n	M	
Experiment 2														
Day $\rightarrow$ week	13	8	42	26	45	28	2.32	35	22	39	24	26	16	1.90
Week $\rightarrow$ day	25	15	28	17	47	28	2.22	27	16	30	18	43	26	2.17
Experiment 3														
Day $\rightarrow$ week	20	6	33	10	47	14	2.27	33	10	33	10	33	10	2.00
Week only								16	5	38	12	45	14	2.29

the interval was 1 week, but were much less likely to do so when the interval was 6 months.

We suspected that the week → 6 months order of the two questions made the long interval very salient, but that if the questions had been asked in reverse order (6 months → week) the long interval would not have been so salient. Therefore, based on the time contraction hypothesis, we predicted that participants in the 6 months → week condition would contract the long interval and want to visit the aunt first. As predicted, we found that whereas only a minority (39%) of week → 6 month subjects wanted to visit the aunt first when the intervisit interval was 6 months, a sizable majority (75%) of the 6 month → week subjects made this choice. Moreover, there were no effects of question ordering on the number of people who wanted to visit the aunt first if the intervisit interval was only 1 week. These results parallel those of Experiments 2 and 3.

#### Experiment 4: Choice Bracketing

Choice bracketing refers to the impact on decision making of the way sets of choices are subjectively partitioned. We suggest that subdividing a set of integral choices can cause the separated choices to be treated independently. Likewise, presenting several normatively independent choices as a package can cause them to be treated in an artificially interdependent fashion. Insofar as variety seeking is concerned, the bracketing, or simultaneous presentation, of several similar choices is likely to evoke a diversification heuristic.

A crucial difference between simultaneous and sequential choices is the great discrepancy in time between choices—simultaneous choices are made all at once, whereas sequential choices are separated by several days. According to the choice-bracketing hypothesis, the interval between choices is only one of many ways that choices can be psychologically combined or separated. We argue that even if the interval between choices is held constant, choices that are bracketed separately will result in less variety seeking than will those that are bracketed together. Experiment 4 tests the choice-bracketing hypothesis by having participants choose a pair of items with the task framed as either two separate choices or as a combined choice of two items.

#### Overview

Experiment 4 was conducted with young trick-or-treaters visiting two neighboring homes on Halloween. Some children chose two candy bars at one house (combined choice), whereas others chose one candy bar at each of the two houses (separate choice). In both conditions, choices were made at virtually the same time: the houses were separated by a small distance, and the time separating choices was less than 1 min. Moreover, the children had no opportunity to consume one candy bar before receiving another, and we assumed that the time between receipt of a candy bar and its consumption would be randomly distributed across conditions. In both situations, the outcomes of the choices had the same material consequences: two candy bars in each child's bucket. If the children bracket their choices by the houses they are visiting, then we would predict less variety seeking when they get one candy bar at two houses than when they get two candy bars at one house.

#### Method

*Participants.* Thirty-eight young trick-or-treaters, with approximate ages ranging from 3 to 14 years, participated in the experiment. No formal record of ages was kept because the experiment was done unobtrusively. Because of an asymmetry in the procedure by which children were assigned to groups, 13 participated in the simultaneous choice condition and 25 in the sequential choice condition.

*Procedure.* The experiment was conducted on Halloween 1993 in two neighboring houses. The trick-or-treaters petitioning both houses were offered a choice between two snack-size candy bars placed in stacks on a tray. The two candy bars were similar in both appearance and content—Three Musketeers and Milky Way. Children in the combined choice condition were told they could “choose whichever two candy bars you like”—instructions designed to minimize potential demand effects to choose two different bars. We also placed very large stacks of candy on the tray (and there were few trick-or-treaters because of bad weather), so it is unlikely that the children chose different bars because they believed that by taking two bars of the best kind they would be depriving others. Children in the separate choice condition chose

one candy bar at each house. To coordinate data between houses, we recorded a brief description of each child and the time at which they arrived.

Initially, we assigned children to groups based on the direction in which they were moving down the street. In this way, there needed to be no communication between houses to decide to which group a child should be assigned. However, because few children were moving in the combined choice direction, we reversed directions after approximately 1 hr. However, the change did not come soon enough to equalize the number of participants in each group.

### *Results and Discussion*

All 13 children in the combined choice condition chose two different candy bars, compared with only 48% (12 of 25) in the separate choice condition,  $\chi^2(1) = 10.27, p < .001$ . Notice that in both cases, the children were selecting the same number of candy bars from the same assortment at virtually the same time for future consumption. However, in one case they invariably chose two different candy bars, while in another case they were more likely to choose the same candy bar.

Besides variety seeking, there are many situations for which people treat packages of choices differently from individual choices. For example, research on decision making under uncertainty has shown that people may choose to play a gamble if they can do so repeatedly, but not if they can play it only once (Lopes, 1981; Redelmeier & Tversky, 1992; Samuelson, 1963). Research on intertemporal choice shows that people prefer to experience outcomes starting with the worst and ending with the best when the outcomes are expressed as sequences, but that they often reveal the precise opposite order when presented with a series of separate decisions concerning when to receive each component of the series.

Another example of choice bracketing is found in the literature on self-control. Ainslie (1975) posits a difference between viewing an individual act of consumption in isolation and "bundling" it with other choices made over the long term. Indeed, Read, Loewenstein, and Camerer (1994) show that the rate at which people plan to indulge in a fairly "sinful" dessert is strongly related to the period over which they plan their consumption. Their subjects imagined that they were attending a conference for a week and had to decide before-

hand how many tasty but highly caloric bread puddings to order as desserts. In one condition, subjects checked off the days of the week from Monday through Sunday on which they would like to consume bread puddings. The other condition was equivalent, except that the week was divided into two intervals, weekdays and the weekend. Subjects in the latter condition ordered 73% more bread puddings (2.3 versus 4) than those in the former. It appears that people ration their indulgences by permitting themselves a certain number per period. Perhaps because of time contraction, they are insensitive to the length of those periods, and so bracketing a single interval into two can virtually double the number of indulgences (puddings, in our case) permitted.

### General Discussion

The preceding research confirms that, contrary to the traditional notion that combined choices are best, there are occasions when consumers are better off choosing separately. Indeed, what we have characterized as the diversification bias is aptly named: when people choose many goods in combination they commonly choose more variety than they end up wanting. Experiment 1 contained two demonstrations of this. The first demonstration was a test of the cognitive capacity limitation hypothesis. We contrasted the variety seeking of two groups of subjects. One group was informed that they would be choosing three snacks and reminded of their earlier choices, while another group was left uninformed and was not reminded. We reasoned that if subjects really wanted as much variety as they chose during simultaneous choice but were hindered by capacity limitations, then sequential choices would elicit more variety seeking if those limitations were reduced. However, there was no evidence that informed participants wanted more variety than uninformed ones. In a second demonstration that combined choices elicit an unwanted degree of variety seeking, participants who chose simultaneously were later asked if they wanted to change their minds on the days of consumption. These participants commonly stated that they wished to shift their choices in the direction of less variety. Subsequent experiments are consistent with the conclusion that surplus variety seeking during combined choices is attributable to time contraction and choice bracketing. In

two sequels to this article, we provide many more examples of choice bracketing (Read et al., 1994).

It should be noted that in the majority of cases, combined choices are superior to separate ones. Combining choices allows us to take into account complementarity (imagining choosing a tie without knowing what jacket to wear) and substitutability of goods (if you are having clam chowder as an appetizer, you probably don't want clam sauce on your pasta). Combining choices may also help us to choose what is best in the long run rather than falling prey to momentary desires. As Ainslie and Haslam (1992b) propose, people can increase their incentive to make optimal choices if they combine together, in imagination, all their choices of one kind or another. For example, one can more easily avoid taking a single cigarette by considering the choice as between a policy of smoking and one of not smoking.

### *Dynamic Consistency*

In addition to the question of whether people are better off making combined or separate choices, our research bears on another normative issue. Economic models generally demand that people be dynamically consistent. This means that so long as no economically relevant changes occur in the period intervening between planning choices and their execution, the choices themselves should not change (Machina, 1989). A failure of such consistency can lead (theoretically) to people being transformed into *money pumps* because a dynamically inconsistent person can be induced to pay to exchange *A* for *B* at one time and then later pay money to change back. Although in reality people do not appear to be money pumps, there is a growing catalogue of evidence suggesting that neither are they dynamically consistent. To illustrate, a well-established finding is that people show hyperbolic rather than exponential discounting, which results in changes in the ordering of preferences as objects approach in time (Ainslie & Haslam, 1992a; Rachlin & Raineri, 1992).

Our studies show a hitherto unrecognized source of dynamic inconsistency. People's preferences for snacks, for example, can change depending on how they bracket the choices they are making. If they plan a whole series of consumption occasions in advance they will choose more variety than they want when the time for consumption arises. In principle, as in all cases of dynamic inconsistency,

choice combination and separation can turn people into money pumps. Because trade-offs between complements and substitutes are made locally (in reference to a single bundle of choices), consumers can in theory be induced to pay to change back and forth between two bundles of goods by changing the set with which the bundle is combined.

This can be illustrated by considering the consumer depicted in Figure 1. Imagine offering her the choice between a combination of two oranges or candy bars. Recall that this consumer prefers oranges to candy bars but also prefers one of each (when they are bracketed together) to two oranges. Let us say that she first buys a combination of one orange and one candy bar. If we now induce her to consider the candy bar as a separate good, she will voluntarily pay us a small amount to exchange it for a more desirable orange. If we reframe the two items as a combined bundle of goods, she should then be willing to trade the two oranges for one of each good plus a premium paid to us.

Machina (1989) observed that there are practical reasons why people cannot be so readily transformed into money pumps. First, since consumers remember what their previous choices were, they will not be tricked into going back. Second, and specific to the bracketing problem as formulated, the endowment effect (Kahneman, Knetsch, & Thaler, 1991) may act as a countervailing force to prevent consumers from too easily parting with what they already possess, even if in a direct choice they would prefer the item they do not have to the one they have. These mechanisms prevent the consumer from experiencing fully the consequences of dynamic inconsistency.

### *The Pennies-a-Day Phenomenon*

Time contraction may make payment schedules with short interpayment intervals more attractive than those with long intervals. Rent-to-own companies are able to persuade people to pay remarkably high total prices through installment plans. One of their marketing strategies is to advertise weekly payment rates rather than traditional monthly ones, a technique based on what Gourville (1994) has referred to as the pennies-a-day phenomenon. These weekly rates are much more than one quarter of the monthly rates offered by more

legitimate companies (Swagler & Wheeler, 1989). We suggest that people's tendency to contract time increases the total amount they are willing to pay if the payment schedule is described in weekly rather than monthly terms. Note that if the interval between payments is contracted, the psychological interpayment interval for monthly payments will be much shorter than four times the interval for weekly payments. The time contraction hypothesis predicts that, within some normal limits, as the payment interval is increased, with the (objective) cost per unit time held constant, the likelihood that a payment schedule will be acceptable will decrease. Presumably, framing the purchase in terms of final cost will lead to the fewest takers—those people willing to make 78 weekly payments of \$15 for a 19-inch television (Swagler & Wheeler, 1989) may be disinclined to make those payments if they are informed that the final cost will be \$1,170. Thus, those who concern themselves with educating consumers to avoid the lure of poor economic decisions may wish to encourage them to recode all candidate payment schedules into a standard form such as final cost or cost per year.

#### *Applications to Marketing and Education*

The clearest applications of choice bracketing are to marketing. Based on our findings, we suspect that some products will benefit from marketing strategies that invoke the diversification bias, while other products could benefit from attempting to eliminate the bias. Products that already have the lion's share of the market will benefit from encouraging people to purchase the same good all the time. Our research suggests that this might be accomplished by emphasizing the time interval between consumption (thereby reducing the impact of time dilation), or by encouraging people to think about what they will want on separate consumption occasions before they make their purchases. For instance, an advertiser might point to the disappointment of the consumer who goes to his or her refrigerator and finds that a favorite soft drink is not there and all that remains is a less desirable brand. On the other hand, less popular brands can position themselves as changes of pace by emphasizing the possibility of satiation along with the pleasures of diversity. Indeed, this is precisely the strategy used by 7-Up, which emphasizes its "uncola" as an alternative to a typical cola soft drink. Because unusual brands are more likely

to be chosen by consumers buying in bulk (Simonson & Winer, 1992), those marketing unusual brands might wish to expend most advertising resources to promote sales where quantity purchases are made, such as in supermarkets rather than corner stores.

Consumers prefer greater diversity when their choices are bracketed together than when they are made separately. In the simple cases examined here, there probably was no good reason to choose diversity (i.e., people are not better off having eaten many different snacks rather than many of the same snack) and there is some reason for them not to (i.e., they will likely prefer the same snack every time at the specified times of consumption). However, on many occasions more diversity is to the advantage of the individual, and under these circumstances encouraging people to bracket choices together may well induce them to act in their own best interest. For example, nutritionists recommend a varied diet, and a proper exercise regime is composed of a good mix of aerobic and anaerobic activity. Practitioners who wish to facilitate such diversification may find that encouraging people to simultaneously plan many meals or exercise occasions may be an effective and unobtrusive way of inducing them to meet these goals. Of course, our research also suggests that the activities planned will likely deviate from what is wanted when the plan is to be executed, and therefore it remains an empirical question to what extent such long-term planning is beneficial.

#### *Variety Seeking for Others*

Recently, one of us attended a party where the host had thoughtfully provided a good quantity of several varieties of premium beer. Quite quickly, all the bottles of one brand were gone and what remained was a large quantity of several marginally less desirable beers. This illustrates that the diversification bias operates interpersonally as well as intrapersonally. Apparently, when the host purchased a quantity of beer for other people she used the same reasoning about their tastes as other people use when they buy quantities for themselves.<sup>5</sup> She inferred that other people prefer vari-

<sup>5</sup> Interestingly, the host's preferred beer was the one which went most quickly. She would have been better off purchasing her favorite beer only.

ety more than they actually do. Her guests did what individual consumers do after they have purchased a variety for themselves. They first consume the goods they prefer the most and then turn to the less desirable items that they had purchased when under the influence of a goal (diversification) that is no longer operative.

Clearly, whether we are deciding for ourselves or for others, we should select the item that each individual (or ourself at different points in time) will want to consume and not the bundle of items that appears most attractive from our own present perspective.

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