

# How Subjective Grouping of Options Influences Choice and Allocation: Diversification Bias and the Phenomenon of Partition Dependence

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The authors argue that people's tendency to diversify their allocations of money and consumption choices over alternatives gives rise to decisions that vary systematically with the subjective grouping of available options. These subjective groupings are influenced by subtle variations in the presentation of options or elicitation of preferences. Studies 1–4 demonstrate such "partition dependence" in allocations of money to beneficiaries, consumption experiences to future time periods, and choices to a menu of consumption options. Study 5 documents weaker partition dependence among individuals with greater relevant experience discriminating among options, and Study 6 shows that the effect is attenuated among participants with stronger or more accessible intrinsic preferences.

*Keywords:* partition dependence, variety seeking, choice, allocation, diversification

People are frequently called on to make multiple selections from an array of available options. For example, members of an admissions committee must decide which students to admit from a pool of applicants, and patrons at a restaurant buffet must select dishes to consume from a range of available appetizers and entrees. Likewise, people are often called on to allocate continuous resources, such as time or money, among a set of alternatives. For instance, a philanthropist must decide how to allocate time or charitable contributions among different organizations or individuals; many retirement benefit plans require employees to choose how to allocate savings among different investment instruments. Most behavioral studies of decision making have been concerned with a single choice made in isolation, for instance, how people choose among a set of chance lotteries or multiattribute consumer products; much less attention has been devoted to understanding how people make multiple simultaneous choices from a menu of possibilities.

Perhaps the most robust empirical pattern to emerge from past studies of simultaneous choice and allocation is that in many

settings people tend toward even allocation over the available options. For instance, employees tend to allocate their retirement savings in 401(k) plans relatively evenly over the instruments (e.g., stock and bond funds) that happen to be offered (Benartzi & Thaler, 2001; see also Langer & Fox, 2005), and a commonly invoked heuristic of distributive justice is to allocate benefits and burdens equally among individuals or groups (Harris & Joyce, 1980; Messick, 1993; Roch, Lane, Samuelson, Allison, & Dent, 2000). Consumers who are asked to choose several snacks to consume in the future tend to select a greater variety of items (i.e., they spread choices more evenly over available options) than when they are asked to make selections one at a time for immediate consumption (e.g., Simonson, 1990); even when making choices for immediate consumption, people sometimes sacrifice enjoyment to obtain greater variety (Ratner, Kahn, & Kahneman, 1999). Such tendencies have been referred to by some researchers as "diversification bias" (Read & Loewenstein, 1995).

Studies of diversification biases have usually sought to identify the causes of variety-seeking behavior. Early studies focused on explanations that could be construed as rational: concerns about satiation (e.g., McAlister, 1982), a desire for novelty and change (e.g., Venkatesan, 1973), or risk aversion resulting from uncertainty about one's future preferences (Kahn & Lehmann, 1991; Simonson, 1990; for an early review, see McAlister & Pessemer, 1982). Read and Loewenstein (1995) argued against utility-maximizing accounts and instead attributed diversification bias to *choice bracketing*, that is, the tendency to rely on a decision heuristic to diversify when a set of choices are viewed as a portfolio but to maximize utility when they are viewed individually (see also Read, Antonides, van den Ouden, & Trienekens, 2001; Read, Loewenstein, & Rabin, 1999). This diversification heuristic may be guided in part by a social norm that sanctions such behavior, as people diversify more in public settings than they do in private settings and tend to diversify less after receiving a cue

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that it is appropriate to focus on a single favored item (Ratner & Kahn, 2002). Moreover, recent cross-cultural work has suggested that, to assert their uniqueness, people from an individualistic culture choose more variety than do those from a collectivist culture (Kim & Drolet, 2003).

In the present article, we are not as concerned with the causes of diversification bias as we are with an unreported implication of such behavior. If one wishes to assemble a diversified portfolio of choices, one must identify categories across which to diversify (i.e., one must answer the question “diversification with respect to what?”). For example, in assembling a diverse committee, one must decide whether to seek variety in terms of ethnicity, religious creed, sexual preference, disciplinary training, or some combination of these dimensions.

If a decision maker subjectively partitions the option set in different ways on different occasions, then choices and allocations will vary systematically with these partitions. We refer to this phenomenon as *partition dependence*. To illustrate, suppose that a philanthropist intent on donating to an array of children’s charities is presented with a set of organizations that are grouped by whether they are domestic or international. She may decide to diversify fully across these two categories by allocating half of her donation to domestic charities and half to international charities. However, suppose instead that she is presented with the same set of organizations, grouped into local charities, national charities, and international charities. In this case, the philanthropist may allocate two thirds to domestic charities (one third to local, one third to national) and one third to international charities. Note that partition dependence differs from diversification heuristics such as the “ $1/n$  rule,” documented by Benartzi and Thaler (2001), in which people spread their retirement savings evenly across the  $n$  investment instruments that were offered (e.g., stock fund, bond fund). The  $1/n$  rule refers to the tendency to spread savings evenly among investment options with little regard to the particular investments that are offered; partition dependence refers to the tendency to make different allocations among the same set of options as a function of the way those options are subjectively grouped.

The notion that categorization of options affects diversification was anticipated by Read, Loewenstein, and Kalyanaraman (1999), who conjectured that people are more likely to diversify their consumption between “virtues” and “vices” in simultaneous choice than in sequential choice, and this effect is more pronounced in choice sets for which the distinction between these two categories is more salient (their Hypothesis 5; see also Loewenstein, 2001, p. 502). In one study, participants chose between lottery tickets with relatively low expected value that could be resolved instantly (vices) and lottery tickets with relatively high expected value that would be resolved several days later (i.e., virtues, relatively speaking). Participants were more likely to choose one of each type of lottery ticket when making two selections simultaneously than when they made selections sequentially, a finding that is consistent with earlier studies of variety-seeking behavior (Simonson, 1990). However, in another study, participants chose 3 movies from a list of 24 that varied on several dimensions, including the extent to which they might be considered “lowbrow” (i.e., vices) versus “highbrow” (i.e., virtues). In this case, participants tended to choose mostly lowbrow movies, regardless of whether they made choices simultaneously or se-

quentially. The authors attributed the difference in results of these two studies to the notion that the virtue–vice dimension was more salient in the first study than in the second study.

In the present article, we propose that when people are presented with a set of options over which they must allocate resources or choices, their allocations represent a compromise between (i.e., combination of) intrinsic preferences over options and a tendency to allocate evenly over the set of possibilities.<sup>1</sup> We propose further that, to the extent that a person relies on a diversification heuristic, allocations will vary systematically with the way in which that individual subjectively partitions the set of available options, and the relative accessibility of alternative partitions can be manipulated experimentally. Moreover, people who are better able to distinguish among options because of more developed, stronger, or more accessible intrinsic preferences should rely less on diversification heuristics and therefore be less susceptible to partition dependence. Thus, our purpose in the present article is to provide evidence of partition dependence across a range of allocation and choice settings and to show that this phenomenon is attenuated as intrinsic preferences become more pronounced or more salient.

We begin by providing evidence of partition dependence in three distinct allocation tasks. In Studies 1 and 2, we examine situations in which individuals are asked to make monetary allocations across a set of riskless alternatives (how much financial aid money to allocate to admitted college students or how much money to donate to each of several charities). We hypothesized that participants will exhibit partition dependence by spreading allocations over the intervals or categories into which the options happen to be grouped. In Study 3, we seek evidence of partition dependence in allocation of consumption over future time periods. We hypothesized that the well documented tendency to consume sooner rather than later will be tempered by a tendency to spread consumption over the time periods into which the future happens to be partitioned. Finally, in Studies 4–6 we consider situations in which participants make multiple choices of consumption items from a menu of alternatives. We hypothesized that the well documented tendency to seek variety will lead to different portfolios of choices, depending on how choice alternatives happen to be grouped (e.g., by physical arrangements, shared attribute levels, or ad hoc categories). Study 5 tests the hypothesis that participants who have greater expertise concerning items to be consumed will be less susceptible to partition dependence. Study 6 tests the hypothesis that people will be less susceptible to partition dependence if their preferences are stronger or more accessible.

### Study 1: Allocation of Money to Categories (Financial Aid)

Previous studies have found that when people allocate money to a small number of investments, they tend to allocate relatively evenly over the options provided (Benartzi & Thaler, 2001). Langer and Fox (2005) showed that allocations among investments

<sup>1</sup> In a related vein, there is some evidence that people’s allocations of organs in hypothetical surveys (Ubel, De Kay, Baron, & Asch, 1996; Ubel & Loewenstein, 1996) reflect a compromise between equity concerns (spread organs evenly over ethnic groups or blood types) and efficiency concerns (allocate organs to those who have the best prognosis of surviving).

and risky prospects exhibit partition dependence, varying systematically with the groups into which investments or gambles are organized. Presumably, the tendency to diversify in such settings is driven at least in part by investors' desire to hedge against risk or by folk wisdom that diversification is appropriate when investing. When invoking such considerations, people are apparently not sensitive to the particular grouping of options with which they have been presented.

In Studies 1 and 2, we examine whether partition dependence will emerge when people allocate money among a set of riskless alternatives where the desire to hedge or diversify one's investment portfolio is not a relevant consideration. We began by asking participants to allocate financial aid money over a continuous variable (income levels of applicants). To make such tasks tractable, it is usually necessary to define a finite number of intervals (e.g., less than \$50,000 per year, \$50,001–\$100,000 per year, more than \$100,000 per year) over which allocations are to be made. When allocating resources over groups of people, respondents may rely on a number of different fairness norms, including need and equality (Deutsch, 1975). In Study 1, we designed a financial aid allocation task that we expected to strongly suggest a need-based norm (i.e., to give the most money to applicants whose families have the lowest income). However, to the extent that participants also invoke an equality norm (Messick, 1993), either consciously or by default, responses will be biased toward an even allocation across the intervals into which income happens to be partitioned.

### Method

We recruited 208 graduate students from Duke University who were camping out for a chance to obtain basketball tickets. Students earned a respite from their campout in exchange for their participation in several unrelated studies.

Participants were informed that the financial aid office at Duke University would spend \$42.6 million to cover need-based scholarships during the academic year. They were reminded that the funds were limited and "must be distributed in an equitable manner."<sup>2</sup> Next, they were asked to consider the following hypothetical scenario:

Suppose that you were to advise the financial aid office on how they should distribute next year's budget among entering freshmen who apply for financial aid. Specifically, you are asked to indicate what *percentage* of the budget you would allocate to aid applicants whose family household incomes fall in various ranges. Beside each of the income ranges listed below, please indicate the percentage of the budget that you would recommend be allocated to that group of students.

We then included an instruction designed to minimize any demand effects of our partitioning manipulation: "Feel free to indicate 0% or 100% for any of the categories below, as these income categories were chosen arbitrarily." Finally, participants were reminded that their percentages should sum to 100.

In the first condition, which we refer to as the *low-income partition*, incomes were broken into the following ranges: \$15,000 per year or less, \$15,001–\$30,000 per year, \$30,001–\$45,000 per year, \$45,001–\$60,000 per year, \$60,001–\$75,000 per year, and more than \$75,000 per year. In the second condition, which we refer to as the *high-income partition*, incomes were broken into the following ranges: \$75,000 per year or less, \$75,001–\$85,000 per year, \$85,001–\$100,000 per year, \$100,001–\$120,000 per year, \$120,001–\$145,000 per year, and more than \$145,000 per year. We predicted that the tendency to allocate more money to needier families

would be tempered by a tendency to spread allocations over the income ranges that happen to be identified, thereby giving rise to partition dependence in which more money is allocated to poorer families in the low-income-partition condition than the high-income partition condition.

### Results and Discussion

Three responses were dropped from the analysis because the percentages listed did not sum to 100%. The results, summarized in Table 1, accord with our predictions. First, participants in both experimental conditions exhibited a consistent preference to give more money to lower income families: The mean percentages are largest for the lowest income category and decrease monotonically as income level increases. Second, participants seemed to spread their allocations over the categories they were given, despite the fact that the instructions explicitly stated that the categories were arbitrary and that respondents could allocate 0% or 100% to any group. In particular, the mean proportion of financial aid allocated to families with incomes less than or equal to \$75,000 was 95.9% (32.5% + 23% + 19% + 13.1% + 8.4%) in the low-income partition condition but only 47.7% in the high-income partition condition,<sup>3</sup>  $t(118) = 25.35$ ,  $p < .0001$ . Apparently, respondents' perception of what constitutes an equitable allocation of resources depended critically on the way in which beneficiaries happened to be grouped. Moreover, these respondents acted as if they were relying in part on an equality norm (applied at the group level), even though another, arguably more appropriate allocation criterion was available (i.e., one based on financial need).

#### Study 2: Hierarchical Allocation of Money (United Way Charities)

Study 1 provides evidence of partition dependence in allocation of money to beneficiaries, where partitions were suggested by the income intervals that happened to be defined for participants. In Study 2, we held the definition of options constant and explored the impact of different elicitation procedures on such allocations. In many choice and allocation settings, individuals are confronted with a discrete set of options that can be organized hierarchically by superordinate categories. In such settings, allocations can be made either in a single-stage manner (directly among each of the options) or in a multistage manner (to categories and then within categories). We hypothesized that if preferences are elicited in a single-stage manner, participants are more likely to diversify at the level of the individual options. However, if preferences are elicited in a two-stage (hierarchical) manner, many participants will diversify first at the level of the superordinate categories, which can give rise to a different pattern of allocations.

To illustrate, consider the case of charitable donations. The United Way charities include a general fund that benefits international projects; the organization also has numerous specialized funds within various local communities. Suppose a person is considering a donation to the international fund and four special-

<sup>2</sup> We expected participants to interpret *equitable* to mean "just, impartial, and fair," following the lay definition of equity (Houghton-Mifflin American Heritage Dictionary) rather than the academic definition that relates outputs to inputs.

<sup>3</sup> Totals vary slightly from sums as a result of rounding error.

Table 1  
*Mean Percentage of Financial Aid Allocated to Each Income Range as a Function of Whether Income Is Partitioned Into Lower Versus Higher Ranges (Study 1)*

Income range ( $\times$ \$1,000)	Mean % allocation
Low-income partition	
$\leq 15$	32.5
15–30	23.0
30–45	19.0
45–60	13.1
60–75	8.4
<b>&gt;75</b>	<b>4.1</b>
High-income partition	
$\geq 75$	47.7
<b>75–80</b>	<b>20.9</b>
<b>80–95</b>	<b>14.4</b>
<b>95–120</b>	<b>8.2</b>
<b>120–145</b>	<b>5.3</b>
<b>&gt;145</b>	<b>3.5</b>

*Note.* Percentages for the low-income partition do not sum to 100% because of rounding error. Boldface type indicates financial aid allocated to students with family incomes above \$75,000. Precise income ranges used in Study 1 are reported in the text.

ized local funds. In this case, a completely diversified allocation will imply a 20% donation to the international fund and a 20% donation to each of the four local funds. However, if this person first considers how to allocate the money between international and local funds (the superordinate categories), and next allocates money among the four local funds (the subordinate category), then two-stage diversification implies a 50% donation to the international fund and a 12.5% donation to each of the four local funds. Of course, individuals may have some intrinsic preferences among particular charities within this set. The present account therefore predicts that donation to the international fund will be biased toward 20% in nonhierarchical (single-stage) elicitation and toward 50% in hierarchical (two-stage) elicitation (i.e., respondents will allocate less money to the international fund in the nonhierarchical condition than in the hierarchical condition).

### Method

We recruited 31 participants at the student union of Duke University to participate in a short research study that also included some unrelated items; each participant was paid \$5. Participants were told that, in addition to the other compensation they were receiving, the researchers would donate \$2 for each respondent to United Way charities. They were told that the researchers would select one response at random from the pool of surveys returned and would allocate funds exactly as specified by that participant. Next, all participants were told the following:

In particular, you can allocate the United Way donation into international funds (which the United Way would then allocate to more specific funds abroad) and/or Durham County funds (including programs benefiting seniors, programs nurturing our young children, programs promoting health and wellness, and programs strengthening our families).<sup>4</sup>

Participants in the *nonhierarchical* partition condition ( $n = 15$ ) were then asked to indicate their proposed allocation to international funds and each of four Durham County funds, with the order identical to that listed in the preceding paragraph. Respondents were asked to indicate percentages and were reminded to make sure that their allocation summed to 100%.

Participants in the *hierarchical* partition condition ( $n = 16$ ) were told, “Below we will ask you to first allocate geographically, then to more specific funds.” Next they were asked to indicate how much of the money they would donate to (superordinate categories of) international funds versus Durham County funds and were reminded to make sure that their allocation summed to 100%. Finally, these participants were asked to indicate how they would allocate their Durham County donation among each of the four possibilities.

### Results and Discussion

The results, displayed in Table 2, reveal pronounced partition dependence: The mean donation to the international fund was 55% in the hierarchical condition ( $n = 16$ ) but only 21% in the nonhierarchical condition ( $n = 15$ ),  $t(29) = 3.73$ ,  $p = .0004$ , one-tailed. In fact, median donations were 50% in the hierarchical condition and 20% in the nonhierarchical condition—the precise proportions one would expect if participants applied pure partition-dependent diversification without adjustment.

#### Study 3: Allocation of Consumption to Time Periods (Free Lunches)

In Studies 1 and 2, we found strong evidence of partition dependence in situations where participants were asked to allocate money to beneficiaries. In Study 3, we investigated whether partition dependence extends to a very different setting in which people are asked to allocate experiences (free lunches) to future time periods (parts of the upcoming academic year). One of the most robust findings in the literature on intertemporal choice is impatience: People generally prefer to receive rewards (even those that are nonfungible) sooner rather than later (Mischel, 1974; for an overview of this topic, see, e.g., Loewenstein & Elster, 1992). However, previous researchers have also found that people generally prefer to spread their consumption of pleasurable experiences over time (Loewenstein & Prelec, 1993). The present account suggests that although impatience may lead people to prefer to consume lunches sooner rather than later, they will be biased to spread their consumption across each time period into which the upcoming year happens to be divided.

### Method

First-year daytime MBA students at Duke University ( $N = 191$ ) took part in a voluntary, hour-long “faculty research session” toward the end of their orientation at the start of the academic year. The following item was included in a packet with a number of unrelated items.

Participants were told that two respondents would be selected at random to receive three free lunches at the dining room of the campus executive conference center, which provides a lavish buffet that most MBA students regard as a rare indulgence. Participants were asked to commit to when they would like to consume these lunches should they be selected to

<sup>4</sup> The particular Durham County causes were a subset of actual options listed at the time on the home page of the local United Way Web site.

**Table 2**  
*Mean Donation to Charities as a Function of Whether Money Was Allocated Using a Single-Stage (Nonhierarchical) Versus Two-Stage (Hierarchical) Procedure (Study 2)*

Fund category	Nonhierarchical	Hierarchical
International	21.20	54.75
Durham County	78.80	45.25

receive them. The academic calendar for the daytime MBA program at Duke is divided into semesters (Fall and Spring), and each semester is further divided into two 6-week terms (Terms I and II comprise Fall semester; Terms III and IV comprise Spring semester).

Participants were randomly assigned to one of the three experimental conditions. In the first condition (I-II-Spring), participants were asked to indicate how many meals they would like to receive in Term I, Term II, and the Spring semester by circling a number ranging from 0 to 3 for each time period. In the second condition (Fall-III-IV), participants were asked to indicate how many meals (0–3) they would like to consume in the Fall semester, Term III, and Term IV. The third condition (Fall–Spring) served as a control in which participants were asked to indicate how many meals (0–3) they would like to consume in the Fall and the Spring semesters.

**Results and Discussion**

We dropped the responses of four participants who did not properly follow instructions. The results confirm our predictions. Mean number of meals to be consumed in the Fall and Spring semesters is listed in Table 3. First, participants in all conditions preferred to consume meals sooner rather than later ( $M_s = 2.27$  in the Fall vs. 0.73 in the Spring). Second, we observed a strong effect of our partitioning manipulation. Respondents in the Fall-III-IV condition chose significantly more meals in the Spring (i.e., by selecting from either Term III or Term IV) than did respondents in the I-II-Spring condition,  $t(123) = 3.24, p = .001$ , one-tailed. Also as predicted, participants in the control (Fall–Spring) condition chose an intermediate number of meals in the Spring, a greater number than did participants in the I-II-Spring condition,  $t(122) = 3.06, p = .001$ , and fewer than did participants in the Fall-III-IV condition,  $t(123) = 0.30, ns$ .

An even more dramatic pattern is evident when we examine the number of participants who elected to consume most of their meals in the Spring (see Table 4). Participants in the Fall-III-IV condition

**Table 3**  
*Mean Number of Meals Consumed in Fall Versus Spring Semesters by Participants in Each Temporal Partition Condition (Study 3)*

Semester	Temporal partition condition		
	I-II-Spring ( <i>n</i> = 62)	Fall-Spring ( <i>n</i> = 62)	Fall-III-IV ( <i>n</i> = 63)
Fall	2.58	2.15	2.10
Spring	0.42	0.85	0.90

*Note.* I-II-Spring indicates a partition into {Term I, Term II, Spring semester}, Fall-Spring indicates a partition into {Fall semester, Spring semester}, and Fall-III-IV indicates a partition into {Fall semester, Term III, Term IV}.

**Table 4**  
*Percentage of Participants in Each Temporal Partition Condition Allocating a Majority of Meals to the Fall Versus Spring Semesters (Study 3)*

Semester	Temporal partition condition		
	I-II-Spring ( <i>n</i> = 62)	Fall-Spring ( <i>n</i> = 62)	Fall-III-IV ( <i>n</i> = 63)
Fall	92	81	65
Spring	8	19	35

*Note.* I-II-Spring indicates a partition into {Term I, Term II, Spring semester}, Fall-Spring indicates a partition into {Fall semester, Spring semester}, and Fall-III-IV indicates a partition into {Fall semester, Term III, Term IV}.

were nearly four times as likely to choose most of their meals in the Spring than were participants in the I-II-Spring condition (35% vs. 8%),  $p = .0002$ , by one-tailed Fisher’s exact test. The control condition again fell between these extremes, with 19% of the participants choosing to consume a majority of their meals in the Spring semester. The difference between the control condition and the Fall-III-IV condition is significant ( $p = .04$ ), and the difference between the control condition and the I-II-Spring condition approaches significance ( $p = .06$ ).

**Study 4: Allocation of Choices to Options (Candy-Filled Bowls)**

In Studies 1–3, we observed partition dependence in allocation of money to beneficiaries and future consumption to time periods. In Study 4, we examined whether partition dependence extends to situations in which people make multiple selections from a menu of consumption options that are grouped in various ways. In particular, we hypothesized that participants tend to seek variety over the subsets of options that happen to be suggested through the physical grouping of options, in this case, by placing different kinds of candy in various bowls. We proposed that the tendency to seek variety in simultaneous choice reflects a desire to distribute one’s choices not only across each of the items offered (Simonson, 1990) but also across salient groups into which the items have been (even arbitrarily) arranged. If so, such choices should be partition dependent, varying systematically with the grouping of candy varieties in different bowls.

**Method**

We recruited 74 undergraduate students enrolled in an introductory marketing course at the University of North Carolina; students received course credit in exchange for their participation in an experiment. The present 5-min study was embedded within an hour-long set of unrelated tasks.

Participants were asked to select five pieces of candy to put into a small paper bag to take home with them. Each participant was then asked by the experimenter, one at a time, to walk to the side of the room, to a small kitchenette where piles of candy were displayed in three large plastic bowls. Four types of candy were arranged in the bowls, in piles of approximately equal size: Smarties, Bazooka Bubble Gum, Tootsie Rolls, and Starlight Mints. For all participants, one bowl contained two flavors (arranged in two distinct piles), and the other two bowls each contained a

single flavor (each arranged in a single pile). We counterbalanced the assignment of candy types to bowls such that each candy appeared an equal number of times in the single-candy bowls as in the two-candy bowl. Also, we placed mostly full bags of candy behind each bowl so that participants could see that none was in short supply. Each participant was provided a small paper bag into which he or she could place the five pieces of candy. While completing this task, participants had their backs to the other students such that neither the other participants nor the experimenter could see which candies were selected.

After participants made their candy selections, they were asked to record how many pieces of each type of candy they had taken (0–5 pieces), how much they liked each type of candy (1 = *do not like it at all*, 7 = *like it very much*), and how much they thought other participants in the study (on average) liked each type of candy (1 = *do not like it at all*, 7 = *like it very much*).

### Results and Discussion

*Choices.* Note that if respondents' choices are based on their candy preferences and are completely unaffected by candy placement into different bowls, then participants should choose approximately one half of their candies (i.e., an average of 2.5) from the two bowls that each contain a single type of candy ("one-candy" bowls) and one half (i.e., 2.5) from the bowl that contains piles of two kinds of candy ("two-candy" bowl). However, if individuals spread their choices evenly across the three bowls, then roughly two thirds of their selections (i.e., an average of 3.33) should come from the two one-candy bowls, and one third (i.e., 1.67) should come from the two-candy bowl. The present account predicts that the distribution of choices will lie between these extremes, with more candies selected from the one-candy bowls than from the two-candy bowl. Results confirmed this prediction: Participants selected more pieces of candy from the two one-candy bowls ( $M = 3.01$ ) than from the two-candy bowl ( $M = 1.99$ ),  $t(73) = 2.79$ ,  $p = .003$ , one-tailed.

*Ratings of the flavors.* To rule out an alternative explanation that participants surmised that the most popular candies were placed into separate bowls, we examined whether participants' assessments of the popularity of the flavors varied as a function of bowl placement. As predicted, participants did not seem to think others liked candies more if they were placed in one-candy bowls ( $M = 4.83$ ) rather than in two-candy bowls ( $M = 4.73$ ),  $t(73) = .79$ , *ns*. There also were no significant effects of partitions on ratings of own liking for any of the four candy types (Tootsie Rolls, Starlight Mints, Smarties, or Bazooka).

### Study 5: The Impact of Expertise on Partition Dependence (Wines)

Our first four studies demonstrate the robustness of partition dependence in allocations of money among beneficiaries, experiences among time periods, and selections among consumption options. We now examine moderators of partition dependence. We have hypothesized that allocations of money and choices reflect a compromise between the decision maker's innate preferences among options and diversification across salient categories into which the options are subjectively partitioned. Indeed, the foregoing results suggest that, in some cases, the tendency toward diversification was tempered by participants' preferences among options (e.g., a preference to allocate more financial aid to needier

students in Study 1 or to consume lunches sooner in Study 3). If people's choices reflect a compromise between the tendency to treat options alike by diversifying and the tendency to distinguish among items by choosing according to innate preferences, then people should rely less on diversification (and exhibit less partition dependence) if they are better able to distinguish among items. Indeed, previous research has indicated that people make more consistent choices across different descriptions of options if they are highly familiar with the target choice domain (Coupey, Irwin, & Payne, 1998). Study 5 was designed to test whether partition dependence would be attenuated among individuals with greater relevant expertise. In this case, we attempted to manipulate the relative accessibility of alternative partitions by selectively calling attention to alternative attributes of the alternatives. Previous work has shown that individuals are more likely to base decisions on a particular attribute when choice alternatives are sorted by levels of that attribute (Russo, 1977). Here, we examined whether novices are more likely than experts to seek variety over levels of an attribute that has been made salient through such grouping.

### Method

We recruited 149 graduate students camping out for tickets to basketball games at Duke University; students participated in exchange for a respite from the campout. They completed the following item, which was included in a packet of mostly unrelated items.

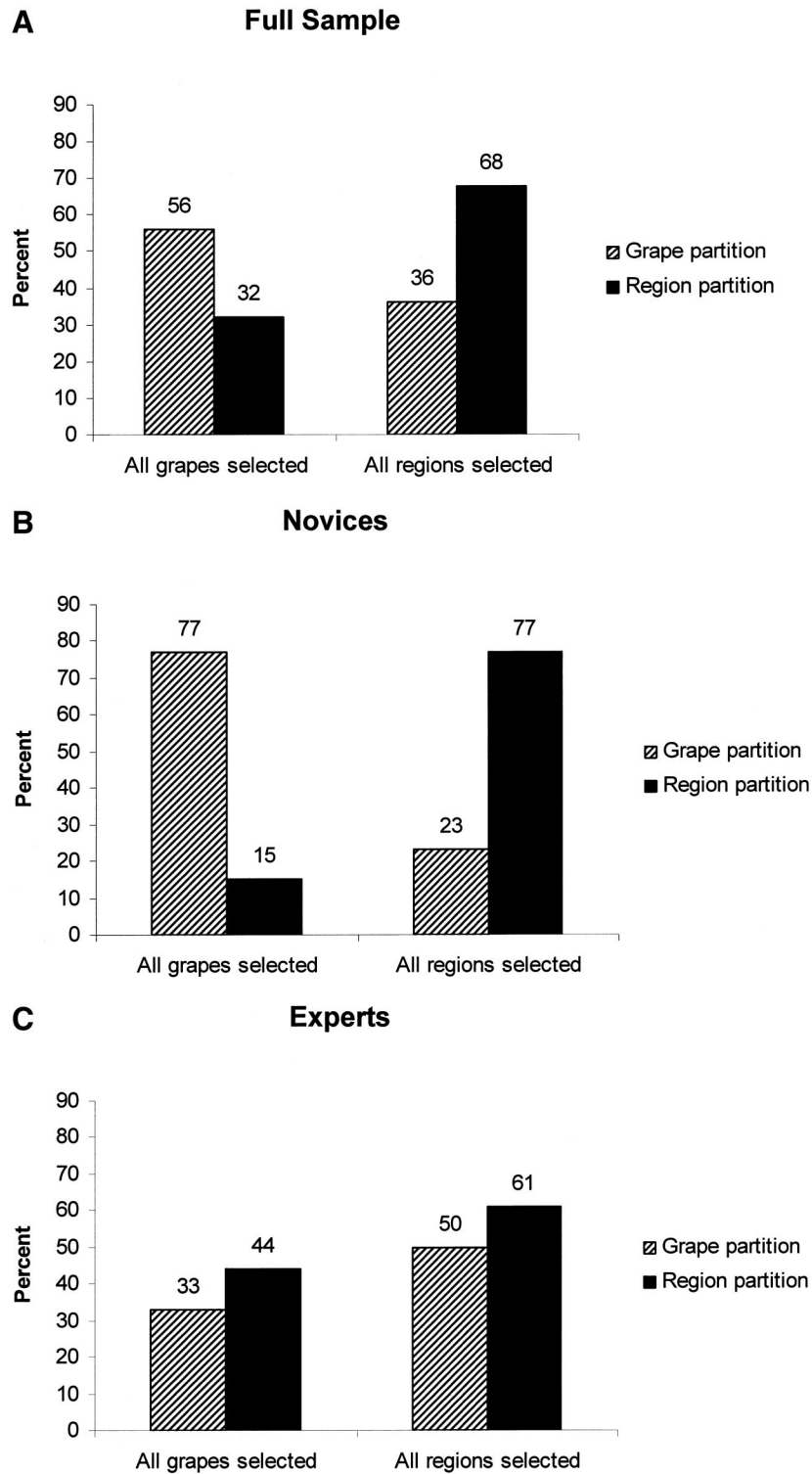
Participants were presented with a list of six white wines and were asked which they would select if they could choose three from the list. They were told that all wines received the same score (87 out of 100) from *Wine Spectator* magazine and that all wines were in the same price range (\$15–18). Brief descriptions from *Wine Spectator* were provided, as well as information on the type of grape, vintage, and region of origin. The list included a Chardonnay from Italy, a Chardonnay from Australia, a Pinot Grigio from Italy, a Pinot Grigio from California, a Sauvignon Blanc from Australia, and a Sauvignon Blanc from California.

One group of participants received wine lists that were organized by grape (two Chardonnays, two Pinot Grigios, and two Sauvignon Blancs), and a second group received the same list, organized by region (two from Australia, two from California, and two from Italy), with the order of wines reversed for half the participants. Participants were first asked to choose three of these six wines. On the page following these choices, participants were asked to report how many bottles of white wine they had purchased in the previous year. The main text of the survey for one ordering of the "grape partition" condition is included in the Appendix.

### Results and Discussion

Note that the design of this study allowed participants to select either two or three different types of grape and either two or three different regions of origin. Figure 1A shows the proportion of participants in each experimental condition who selected three different kinds of grape and three different regions of origin (note that these are not mutually exclusive categories). As predicted, participants were more likely to choose three different kinds of grape when wines were grouped by grape, and they were more likely to choose wines from three different regions when they were grouped by region.

To provide a statistical test of partition dependence, we first noted that the number of levels selected of these two attributes are



*Figure 1.* A: Impact of partition manipulation on percentage of participants choosing one wine of each grape or one wine from each region (Study 5). B: Impact of partition manipulation on percentage of wine novices (who had purchased no bottles of white wine in the previous year) choosing one wine of each grape or one wine from each region (Study 5). C: Impact of partition manipulation on percentage of wine experts (who had purchased at least 10 bottles of white wine in the previous year) choosing one wine of each grape or one wine from each region (Study 5).

not statistically independent,<sup>5</sup> and we therefore categorized participants according to whether they had selected from two regions and two types of grape, two regions and three types of grape, three regions and two types of grape, or three regions and three types of grape (see Table 5). The present analysis suggests that respondents should be no more likely to choose a set including two types of grape and two regions in either experimental condition; likewise, the present analysis suggests that respondents should be no more likely to choose a set including three types of grape and three regions in either experimental condition. Thus, we would expect that the frequencies listed in the outer two columns of Table 5 should not differ significantly by experimental condition; indeed, we found this to be the case ( $p = 1.0$  by two-tailed Fisher's exact test). In contrast, we hypothesized that participants would be more likely to choose two types of grape and three regions in the region partition condition and that they would be more likely to choose three types of grape and two regions in the grape type partition condition. Indeed, we found such a pattern, and the frequencies listed in the inner two columns of Table 5 differ significantly by experimental condition ( $p < .0001$  by one-tailed Fisher's exact test).

To test whether expertise moderates the impact of the partitioning manipulation, we conducted a logistic regression with the choice of two grapes and three regions versus three grapes and two regions as the dependent variable. Independent variables included our expertise measure (number of bottles of white wine purchased in the past year), the partition manipulation, and an Expertise  $\times$  Partition interaction term. In doing so, we found that the partition (grape vs. region) significantly predicted whether people chose two grapes and three regions versus three grapes and two regions, Wald  $\chi^2 = 23.57$ ,  $p < .0001$ . Expertise was not a significant predictor of the choice of two grapes and three regions versus three grapes and two regions, Wald  $\chi^2 = .67$ ,  $p = .41$ ; however, the predicted Expertise  $\times$  Partition interaction was significant, Wald  $\chi^2 = 7.62$ ,  $p = .006$ . To help convey this interaction visually, we divided respondents into groups of relative novices versus experts on the basis of a quartile split of the number of bottles of white wine purchased in the previous year. Respondents reported purchasing a median of 4 bottles of white wine in the previous year, with the lowest quartile ("novices") purchasing 0 bottles and the highest quartile ("experts") purchasing 10 or more bottles. Partition dependence was extremely pronounced among the novices (see Figure 1B) and much weaker among the experts (see Figure 1C).

Table 5  
Number of Participants Selecting Each Combination of Number of Regions and Type of Grapes (Study 5)

Partition	2, 2	2, 3	3, 2	3, 3
Grape	11	40	17	6
Region	14	13	41	7

Note. The first number in each column heading indicates the number of regions selected; the second number in each column heading indicates the number of grapes selected.

### Study 6: The Impact of Strength and Accessibility of Intrinsic Preferences on Partition Dependence (Snacks)

The results of Study 5 suggest that expertise moderates partition dependence. Our interpretation is that more experienced wine drinkers have better defined preferences over wine varieties and are therefore better able to distinguish among wines. That is, we expected that the experts' intrinsic preferences would be stronger than those of novices and that the evaluations of the different wine types would be more accessible for experts than for novices. We hypothesized that when preferences are stronger or more accessible, people will rely less on diversification heuristics and allocations will therefore exhibit less partition dependence. Study 6 tests this interpretation more directly by explicitly manipulating the accessibility of intrinsic preferences. We asked participants to rate the attractiveness of familiar snacks (e.g., carrot sticks, an apple, a chocolate chip cookie) either before or after choosing which items to consume. These snacks were grouped into three ad hoc categories that varied by experimental condition ("fruits & vegetables," "cookies," and "crackers" in one condition; "fruits," "vegetables," and "cookies & crackers" in another condition). According to the present account, participants should exhibit partition dependence, spreading out their choices over the ad hoc categories into which options have been grouped. We predicted that asking participants to focus on anticipated enjoyment before making selections would cause intrinsic preferences to be more accessible, which we expected to attenuate partition dependence. Furthermore, we expected that people who express stronger preferences among items in the option set would exhibit less partition dependence.

### Method

We recruited 216 University of North Carolina MBA students to participate in a study as part of their 1st-year orientation program. We donated \$5 to a charity for each respondent who completed a 30-min questionnaire packet that included unrelated items. The study used a 2 (ratings order: ratings before choices vs. ratings after choices)  $\times$  2 (partition: "fruits & vegetables," "cookies," and "crackers" vs. "fruits," "vegetables," and "cookies & crackers")  $\times$  2 (item order: celery first vs. chocolate chip cookie first) between-participants design.

Participants were presented with a list of eight familiar snacks, most of which could be purchased from their business school cafeteria: a small bag of celery sticks, a small bag of carrot sticks, a banana, a red apple, a small bag of mini peanut butter sandwich crackers, a small package of cheese and crackers, a large oatmeal raisin cookie, and a large chocolate chip cookie. That is, they were presented with a list containing two types of vegetables, fruits, cookies, and crackers. Approximately half of the participants were presented with the items in the order listed in the preceding sentence, and the remaining participants saw the items listed in the opposite order.

Participants were asked to suppose they were in the cafeteria and could purchase any three of the eight items for \$1.50 total because of a special reduced price. For this selection task, participants in the "cookies &

<sup>5</sup> There are 20 different ways to choose three wines at random from our list of six, 6 of which (30%) entail two types of grape and two regions, 6 of which (30%) entail two types of grape and three regions, 6 of which (30%) entail three types of grape and two regions, and 2 of which (10%) entail three types of grape and three regions. Thus, the number of levels of the two attributes represented in a choice bundle should be negatively correlated, and test statistics should be computed for the aggregate pattern of choices.



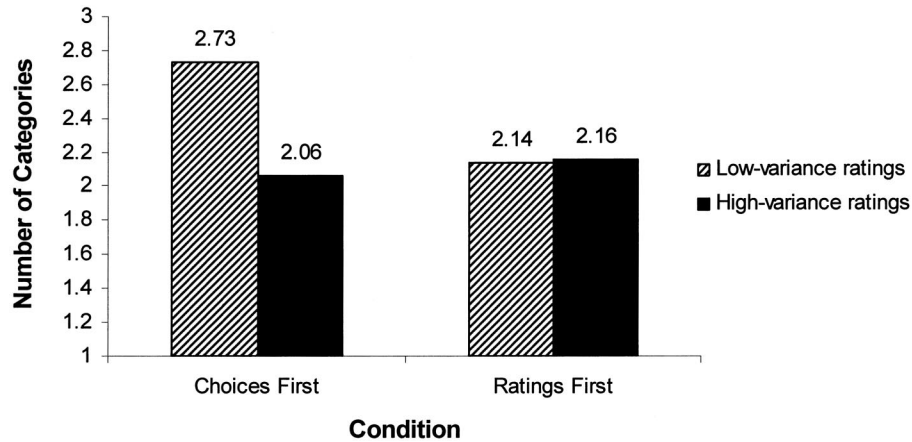


Figure 2. Effect of variance in ratings and timing of making ratings on the mean number of categories from which snacks were selected (Study 6).

crackers” condition saw a menu divided into the following three categories: “fruits,” “vegetables,” and “cookies & crackers.” Participants in the “fruits & vegetables” condition saw a menu divided into the following three categories: “fruits & vegetables,” “cookies,” and “crackers.” Respondents were also asked, either before or after selecting three items, to rate how appealing they found the prospect of eating each of these items (1 = *not at all appealing*, 7 = *extremely appealing*).

The dependent variable in this study was the number of ad hoc categories from which participants made their selections. We predicted that participants would tend to spread their snack choices over the three categories that we happened to make salient but that this tendency would be less pronounced among participants who provide attractiveness ratings immediately prior to making their choices (so that these innate preferences are more accessible) or who express stronger preferences among items in the choice set.

It can easily be shown that participants who select snacks at random can be expected to choose from an average of 2.25 categories.<sup>6</sup> Note that participants who make consistent choices that are not influenced by the grouping manipulation should select from a minimum average of 1.50 categories (e.g., banana, apple, and carrot sticks all come from the “fruits & vegetables” category for participants in the “fruits & vegetables” condition; it would come from the “fruits” and “vegetables” categories for participants in the “cookies & crackers” condition) and a maximum average of 2.50 categories (e.g., banana, carrot sticks, and chocolate chip cookie would come from the “fruits & vegetables” and “cookies” categories for participants in the “fruits & vegetables” condition and from the “fruits,” “vegetables,” and “cookies & crackers” categories for participants in the “cookies & crackers” condition). The more that participants spread their choices over ad hoc categories, the larger the number of categories from which we would expect them to select. Thus, selection of three items from an average of more than 2.50 categories would provide the strongest possible evidence of partition dependence.

### Results and Discussion

To quantify individuals’ strength of preference among the options, we calculated for each respondent the variance in ratings of how appealing they found each of the eight items, with higher variance suggesting stronger preferences. Next, we conducted a regression analysis in which ratings order (i.e., before vs. after choices), variance in ratings of the eight snacks, and the Ratings Order  $\times$  Variance interaction were tested as predictors of the total

number of categories from which participants selected snacks. The effect of ratings order emerged as significant,  $\beta = .41$ ,  $t = 2.72$ ,  $p = .007$ . Variance did not emerge as a significant predictor of the number of categories,  $\beta = .28$ ,  $t = 1.14$ ,  $p = .26$ . However, as predicted, the Ratings Order  $\times$  Variance interaction,  $\beta = -.58$ ,  $t = -2.09$ ,  $p = .04$ , emerged as significant. Apparently, the order manipulation trumped the variance measure such that strength of preference mattered more when ratings came after choices. We observed no significant effects of the specific partition on the number of partition categories selected when this factor was included in the model (i.e., participants responded similarly to the two partition conditions).

To visually depict the nature of the Ratings Order  $\times$  Variance interaction, we present in Figure 2 the mean number of ad hoc categories from which participants selected snacks (out of a possible total of three categories), separately for participants in both ratings order conditions and for those in the top and bottom quartiles of the variance measure (i.e., the people with the highest and lowest variance in their ratings of snacks). The pattern indicates that prompting participants to consider how appealing they found each item before making their choices attenuated partition dependence, and participants who made choices before rating each snack were less susceptible to partition dependence if they expressed stronger intrinsic preferences among the snacks. These results support our interpretation of Study 5 that more experienced wine drinkers tend to resist partition dependence because they have stronger and better articulated preferences among wines. Finally, it is worth noting that participants who chose first and had weaker preferences chose from a mean 2.73 categories, somewhat more than the maximum 2.50 categories that could possibly represent consistent choices across conditions and much more than the 2.25 categories that would be expected under random choice.

<sup>6</sup> There are 48 combinations of three unique snacks that can be selected from a menu of 8 items. With one category of four items and two categories of two items, 4 of these combinations entail a selection from a single category, 28 entail selection from two categories, and 16 entail selection from all three categories. Thus,  $(4 \times 1 + 28 \times 2 + 16 \times 3)/48 = 2.25$ .

## General Discussion

In the present article, we have provided evidence that the tendency to diversify can lead to allocations of money and choices that vary systematically with the relative accessibility of alternative groupings of the option set. In Studies 1 and 2, we demonstrated partition dependence in which people make different allocations of money depending on the way in which the set of beneficiaries is grouped. In Study 1, monetary allocations to aid recipients depended on the intervals into which income ranges were divided: Participants were more likely to allocate financial aid to higher-income families when higher income ranges were broken into subintervals. In Study 2, monetary allocations to charities were influenced by whether participants first made allocations at the level of a superordinate category: Participants donated much more money to an international United Way fund if they were first asked to allocate money between it and a group of four local funds, compared with if they were asked to allocate among the five funds in a single step. In Study 3, we demonstrated partition dependence in an intertemporal choice context. Students were more likely to defer consumption if the far future was partitioned into finer intervals than if the near future was partitioned into finer intervals. In Studies 4–6 we demonstrated partition dependence in situations where people make multiple selections from a menu of discrete options that are grouped in various ways. In Study 4, participants made different choices depending on how the available options were physically grouped. Participants tended to spread their candy selections relatively evenly over the bowls in which candies were placed such that they were more likely to choose a given type of candy if it was placed in a bowl by itself than if it was placed in a bowl with another type of candy. In Studies 5 and 6, we replicated partition dependence of variety-seeking behavior, grouping options by levels of different attributes and into ad hoc categories, respectively. Taken together, our results suggest that the previously documented tendency to diversify choices over the set of available options leads to different selections, depending on how people subjectively partition the set of options available to them, and the relative accessibility of alternative partitions can be manipulated through subtle variations in the description of options or elicitation of choices.

We also have provided evidence that partition dependence is moderated by the decision maker's ability to distinguish the relative attractiveness of options. In Study 5, graduate students who had purchased more bottles of white wine in the previous year exhibited less partition dependence when selecting from a set of white wines than did those who had purchased fewer bottles. In Study 6, partition dependence was less pronounced among participants who either rated the attractiveness of snacks before they made their choices or expressed stronger preferences in their ratings of alternative snacks, compared with those who made choices before ratings and exhibited weaker preferences in their ratings. This latter result suggests a promising method of minimizing partition dependence in practice: By inducing people to reflect on their intrinsic preferences before making choices or allocations, they may be less biased by salient partitions.

We close with a discussion of the role of information conveyed by partitions, additional moderators of this partition dependence, the extension of partition dependence to new domains, and related phenomena.

## *Do Partitions Convey Information?*

We have argued that partition dependence violates rational choice theory because it gives rise to allocations that differ across strategically equivalent elicitation modes. However, one might be concerned that the method of eliciting allocations or describing possibilities could in fact communicate information to participants in the studies described. For instance, in Study 1, some participants might have inferred that each of the income ranges presented applies to a relatively equal number of students; in Study 4, some participants might have inferred that the placement of candies in bowls reflects their relative popularity. This argument suggests that partition dependence is a demand effect whereby a participant considers the assessment as an implicit conversation with the experimenter, in which the experimenter is expected to adhere to accepted conversational norms, including the notion that any contribution, such as the grouping of options presented, should be relevant to the aims of the conversation (Grice, 1975; Orne, 1962).

Although we acknowledge that in some instances conversational norms might contribute to partition dependence, we assert that they do not provide an adequate explanation of this phenomenon for several reasons. First, in some cases we explicitly tried to minimize information effects through details in the design of our studies. In Study 1, participants were told explicitly that the categories into which the space is partitioned were arbitrary and that they should feel free to allocate 0% or 100% to any of the categories identified. In Study 4, we explicitly attempted to minimize the perception that items placed in bowls by themselves were more or less popular by placing full bags of candy behind the bowls, and our manipulation check confirmed that participants did not make such inferences. Second, several of the studies presented here demonstrate the robustness of partition dependence even in the presence of a real-world (incentive-compatible) consequence. In Study 2, participants knew that their allocations to charities might be honored for real money. In Study 3, participants knew that they might receive real lunches. In Study 4, all participants actually kept the candy they selected. Although Study 5 entailed a hypothetical choice of wines, we found an identical pattern of partition dependence in an unreported replication involving choices of movie rentals that some randomly selected participants were to receive for real. Third, in Study 6, we used ad hoc categories that were unlikely to convey information to participants concerning their own preferences for snacks. Finally, to the extent that some respondents did surmise that there was information conveyed by the particular partition with which they were presented, we assert that people may draw such erroneous conclusions not only in the laboratory but also in more naturalistic settings in which the partition is determined by arbitrary factors.

## *Additional Moderators of Partition Dependence*

We have argued that allocations of money and discrete choices among a set of options reflect a compromise between intrinsic preferences and a tendency to diversify. In Studies 5 and 6, we showed that partition dependence is moderated by the strength and accessibility of intrinsic preferences among options. Alternatively, future research might explore whether partition dependence is also moderated by the strength and accessibility of the motivation to diversify. For example, previous research has indicated that people

tend to diversify more when making choices in the presence of others (Ratner & Kahn, 2002; see also Ariely & Levav, 2000); we suspect that partition dependence might likewise be exacerbated when decisions are made in public.<sup>7</sup> Although social norms to diversify appear strong within individualistic cultures such as that in the United States, recent research has suggested that diversification—driven by a desire to appear unique—is less common in collectivistic cultures such as that in Korea (Kim & Drolet, 2003). Thus, it may also be worthwhile to explore cross-cultural differences in partition dependence.

### *Extensions*

We expect that partition dependence in allocation will extend to resources other than money, such as the amount of time devoted to different activities or the number of people assigned to a project. For example, a young couple's allocation of leisure time may be influenced by whether the couple perceives the options as time spent by themselves versus with others or whether the couple perceives the options as being time spent by themselves versus with friends versus with family.

In more general terms, our results suggest that diversification bias has important implications for decisions that people make concerning social allocations. For instance, in Study 1 (financial aid), we found that the way in which the sets of individuals were defined (by income range) influenced allocations even though there was a strong need-based fairness norm. Likewise, we have found in an unreported study that people tended to allocate money from an estate differently depending on whether they were prompted to allocate directly to six grandchildren or to allocate first to the deceased's two sons (one having two children and the other having four children) and then to each grandchild. In particular, the grandchildren were more likely to receive equal shares in the one-stage than in the two-stage elicitation and the sons' families were more likely to receive equal shares in the two-stage elicitation than in the one-stage elicitation. It would be interesting to explore situations in which the dependent measure is perceived fairness rather than the allocation itself. We suspect that people would judge others' allocations to be more fair when they appear more even relative to the partition that happens to be made salient.

In more institutional decision-making contexts, our results have implications for selection committees that explicitly seek to hire or admit a diverse set of people, because the way in which candidates are grouped is likely to impact the types of diversity obtained. For instance, a leader may select more White members for a committee if she perceives the set of candidate members as being White versus non-White than if she sees the set of candidate members as White, African American, Asian, and Hispanic.

Although we have observed that partition dependence results from application of diversification heuristics to sets of options that are subjectively grouped in different ways, we propose that partition dependence may also be observed in situations where people apply antidiversification heuristics to sets of options that are grouped in different ways. For instance, suppose that a generous aunt shops for holiday gifts for her four nephews and wishes to give them all the same kind of gift to avoid the appearance of favoritism or the possibility of envy among the children. She shops at a small toy store that is divided into four sections: books, stuffed animals, crafts, and board games. In this case, she might select

books for all four nephews. Suppose instead that the same store is divided into two sections: educational gifts (books and crafts) versus noneducational gifts (stuffed animals and games). In this case, the aunt may stick to educational gifts but select some books and some crafts. Likewise, if the store is divided into a section containing interactive toys (crafts and games) versus toys for individual play (books and stuffed animals), then she may favor interactive toys and purchase some crafts and some games. Thus, even in a situation where the aunt invokes a decision rule to specialize, the way in which she partitions the option set will influence her allocation of choices.

People are often overwhelmed when offered a large variety of options from which to make a single selection (Chernev, 2003; Iyengar & Lepper, 2000). The present studies suggest that if people are provided an opportunity to make multiple selections from a large variety of options that have been partitioned into a manageable number of categories, they will tend to spread their choices across those categories. We speculate that organizing large sets of options (e.g., investment opportunities) into a more reasonable number of groups (e.g., investment classes) may in some cases diminish individuals' perceptions of choice overload and therefore facilitate choice.

### *Partition Dependence in Other Contexts*

The present studies demonstrate the robustness of partition dependence across a wide array of situations in which people are called on to allocate resources or choices among a set of options with known consequences. A similar pattern has been documented in allocation of money to chance gambles and investments (Langer & Fox, 2005); in such cases, the application of diversification heuristics may be motivated by a desire to hedge against uncertainty.

Partition dependence has also been observed in judgment under uncertainty, where people must allocate degrees of belief among possible events that might occur. When assigning probability estimates to unfamiliar events, people seem intuitively to invoke the "principle of insufficient reason" (e.g., Laplace, 1814/1995), treating all possible events as equally likely. Thus, when alternative partitions of the event space are made salient, people may assign probabilities in different ways (Fox & Clemen, 2005; Fox & Levav, 2004; Fox & Rottenstreich, 2003; See, Fox, & Rottenstreich, 2005). For instance, when business students in a decision models class were asked to judge the probability that the Jakarta Stock Index would close in each of four intervals on the last trading day of the year, participants responded with a median 25% for each of the four ranges, regardless of what those ranges were. Further studies obtained a significant but less pronounced bias toward equal probabilities in situations where participants were more knowledgeable, and demonstrated that the phenomenon is much more general than the well known "pruning bias" in assessment of fault trees (Fox & Clemen, 2005; cf. Fischhoff, Slovic, & Lichtenstein, 1978).

The tendency toward even allocation seems to extend to the use of response scales (e.g., Likert scales) in subjective judgment

<sup>7</sup> However, we note that individuals may be less influenced by suggested partitions if they are consciously aware that someone is trying to manipulate their choices.

tasks. Studies of range-frequency theory (Parducci, 1995) have found that when one holds the range of stimuli constant, respondents are biased toward using each identified response category with equal frequency (e.g., Parducci & Wedell, 1986). Thus, one would predict that the ratings of stimuli will shift as the set of possible responses is partitioned into different response categories. For instance, suppose participants view a set of squares of varying sizes and then are asked to rate the size of each square. Participants might be expected to describe fewer squares as “large” if asked to use the categories small, medium, and large than if asked to use the categories not large and large.

Taken together, these data suggest a more general cognitive phenomenon. When people allocate a limited resource (e.g., choices, money, probability, stimuli) over a fixed set of possibilities (e.g., consumption options, time periods, beneficiaries, investments, events, subjective ratings), they first subjectively partition the set of possibilities into exclusive and exhaustive groups of options (subsets). Final allocations represent a compromise between even distribution over groups and a consideration of how groups differ from one another (for a preliminary review of this literature, see Fox, Bardolet, & Lieb, 2005). A key contribution of the present research is to document these effects for the first time in several riskless allocation and choice contexts.

### Related Phenomena

Partition dependence should be distinguished from a number of related phenomena. First, Kahn and Wansink (2004) reported that the organization of items within a stimulus set (e.g., whether similar items are grouped together) influences perceived variety and the selections that individuals make. Specifically, participants in those studies chose a larger number of items (but not a larger variety of items) when different flavors of candies were organized by type rather than jumbled together. Like the present work, these researchers found that the perceived structure of the choice set influences individuals’ choices. Unlike the present work, these researchers highlighted the number of items selected rather than the nature of items selected.

Second, partition dependence is superficially similar to the aforementioned choice-bracketing effects (Read, Loewenstein, & Rabin, 1999). People often make different decisions when they assess the consequences of many decisions taken together (under “broad bracketing”) than when they make each choice in isolation (under “narrow bracketing”). For example, in a cleverly designed field study, Read and Loewenstein (1995) found that young trick-or-treaters were more likely to seek variety when choosing two Halloween candies from one house than when facing the same options from two houses that they visited consecutively. In the present work, however, we contrasted the implications of broad brackets that are subbracketed (i.e., partitioned) in different ways.

Finally, the notion that people are biased toward allocating choices evenly over groups into which options are clustered may contribute to the finding of Brenner, Rottenstreich, and Sood (1999) that options are more popular when presented as a singleton against a group of alternatives than when they are grouped with other alternatives. These authors argued that singleton items would be favored because, unlike grouped items, they do not suffer from negative comparisons to neighboring options. We speculate that this phenomenon might also be driven in part by a tendency to seek

variety (i.e., randomize) over two sets of options that are grouped in different ways (i.e., presented singly or with other options) so that respondents are biased to choose each set roughly half the time.

### Conclusion

Our experiments suggest that individuals allocating money or multiple discrete choices over a set of options tend to diversify their choices across the groups into which options are subjectively partitioned. Whereas previous researchers have established that individuals tend to spread allocations and choices across available options (e.g., Benartzi & Thaler, 2001; Simonson, 1990), we build on this literature by showing that the way in which people subjectively partition the set of options greatly influences the implications of such diversification. The relative accessibility of alternative partitions can be cued by varying the definition of intervals over which resources or choices are allocated, by varying whether allocations are elicited in a single stage or multistage manner, or by varying the association of options (by attribute, ad hoc categories, or physical proximity). Indeed, even when people had intrinsic preferences concerning how their choices should be allocated (e.g., giving more financial aid to poorer students), they exhibited sensitivity to the partitions that we invoked. These results suggest that marketers, managers, policymakers, and others who seek to influence the choices and allocations of target individuals can greatly influence decisions through subtle variations in the presentation of options or elicitation of preferences. On the other hand, decision makers who wish to avoid falling prey to partition dependence may protect themselves by taking pains to distinguish among options (e.g., spending time gaining relevant information and experience and reflecting on their intrinsic preferences) and by actively questioning whether diversification is desirable and whether the salient categories over which they might diversify are relevant.

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## Appendix

Instructions to Participants, Study 5  
(Grape Partition, Order 1)

Suppose that you could receive any *THREE* of the following white wines (one bottle each) to take home with you today for free. All wines below received scores of "87" (out of 100) from *Wine Spectator* magazine and are in the \$15–\$18 price range. Which three would you choose? Please place a check mark next to any three wines below.

## CHARDONNAYS

- \_\_\_ Winery: **Marchesi di Grésy**  
 Wine: 2000 Chardonnay Langhe  
 Region: Italy  
 Description: A crisp and clean Chardonnay, with subtle apple, straw and mineral character. Medium-bodied, with fresh acidity and a long, refreshing finish.
- \_\_\_ Winery: **Stonehaven**  
 Wine: 2000 Chardonnay Limestone Coast  
 Region: Australia  
 Description: Bright and tangy, with citrus and melon flavors in the forefront and a peppery note on the finish.

## PINOT GRIGIOS

- \_\_\_ Winery: **Bollini**  
 Wine: 1999 Pinot Grigio Grave del Friuli Reserve Selection  
 Region: Italy  
 Description: Aromas of freshly sliced apples and pears, with hints of spice. Medium- to full-bodied, with good fruit and a medium, fruity finish.
- \_\_\_ Winery: **Luna**  
 Wine: 1999 Pinot Grigio Napa Valley  
 Region: California  
 Description: Ripe, with good depth to butter, citrus, apple and anise flavors. Concentration carries through the complex finish.

## SAUVIGNON BLANCS

- \_\_\_ Winery: **Fox Creek**  
 Wine: 2001 Sauvignon Blanc South Australia  
 Region: Australia  
 Description: Bright in flavor, refreshing for its lime peel and apple fruit, which echoes on the open-textured finish.
- \_\_\_ Winery: **Groth**  
 Wine: 2001 Sauvignon Blanc Napa Valley  
 Region: California  
 Description: Tangy and intense, with lime rind, green apple, grapefruit and ripe melon tones that weave into a tart, slightly grassy finish.

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