Journal of Risk and Uncertainty, 19:1–3; 171–197 (1999)
© 1999 Kluwer Academic Publishers. Manufactured in The Netherlands.

Choice Bracketing

DANIEL READ dr@lubs.leeds.ac.uk.
Leeds University Business School, Leeds, UK LS2 9JT

GEORGE LOEWENSTEIN
Department of Social and Decision Sciences, Carnegie Mellon University

MATTHEW RABIN
Department of Economics, University of California—Berkeley

Abstract

When making many choices, a person can *broadly bracket* them by assessing the consequences of all of them taken together, or *narrowly bracket* them by making each choice in isolation. We integrate research conducted in a wide range of decision contexts which shows that choice bracketing is an important determinant of behavior. Because broad bracketing allows people to take into account all the consequences of their actions, it generally leads to choices that yield higher utility. The evidence that we review, however, shows that people often fail to bracket broadly when it would be feasible for them to do so. In addition to documenting the diverse effects of bracketing, we also discuss factors that determine whether people bracket narrowly or broadly. We conclude with a discussion of normative aspects of bracketing and argue that there are some situations in which narrower bracketing results in superior decision making.

Key words: Decision framing, simultaneous and sequential choice addiction, procrastination, risk attitude

> If we do not accustom ourselves to look upon war, and the single campaigns in a war, as a chain which is all composed of battles strung together, one of which always brings on another; if we adopt the idea that the taking of a certain geographical point, the occupation of an undefended province, is in itself anything; then we are very likely to regard it as an acquisition which we may retain; and if we look at it so, and not as a term in the whole series of events, we do not ask ourselves whether this possession may not lead to greater disadvantages hereafter.
>
> Clausewitz, *On War*

1. Introduction

The consequences of choices can rarely be fully appreciated in isolation. Even seemingly trivial decisions, such as whether or not to indulge in desert, save small amounts of money, or purchase lottery tickets, can have profound cumulative

effects on our physical and material well-being. When we make choices without considering these effects, we can do to ourselves what the bad general can do to his army—make a series of local choices that each appear to be advantageous but which collectively lead to a bad global outcome.

In this paper we introduce the concept of *choice bracketing*, a term which designates the grouping of individual choices together into sets. A set of choices are *bracketed together* when they are made by taking into account the effect of each choice on all other choices in the set, but not on choices outside of the set. When the sets are small, containing one or very few choices, we say that bracketing is *narrow*, while when the sets are large, we say that it is *broad*. Broad bracketing allows people to consider all the hedonic consequences of their actions, and hence promotes utility maximization. Narrow bracketing, on the other hand, is like fighting a war one battle at a time with no overall guiding strategy, and it can have similar consequences.

To illustrate the effects of choice bracketing, consider the decision to smoke or abstain. If choices are made one cigarette at a time, the expected pleasure from each cigarette can easily seem to outweigh its trivial health consequences, so lighting up may appear to be the best choice. But if 7,300 single-cigarette choices (one year's worth, for a pack-a-day smoker) are combined, the health consequences may appear less trivial, and might well outweigh the pleasure. The individual who makes 7,300 individually inconsequential decisions to smoke, therefore, makes an aggregate choice that might have been rejected had all the decisions been bracketed together. Whether someone who likes cigarettes ends up as a lifetime smoker may thus depend in part on how she brackets her choices.

In recent years, the distinction between narrow and broad bracketing, under the guise of different more-or-less synonymous labels, has been a frequent object of research. Simonson (1990) used *sequential* and *simultaneous* choice; Kahneman and Lovallo (1993) used *narrow* and *broad decision frames*; Herrnstein and Prelec (1992a, 1992b) used *isolated* and *distributed* choice; Rachlin (1995) used decision making based on *acts* and *patterns*; and Heyman (1996) used *local* and *overall* value functions. Thaler (in press) argues that many choice errors are the result of *myopic loss aversion* which he contrasts to more global forms of utility maximization. All of these researchers have used these terms in the way that we use choice bracketing—to distinguish between choices made with an eye to the local consequences of one or a few choices (narrow bracketing), or with an eye to the global consequences of many choices (broad bracketing).

We argue that bracketing effects are central to understanding a great deal of human choice. Moreover, the distinction between broad and narrow bracketing is one that is often overlooked, even by economists. Economic theory assumes that people bracket broadly by maximizing well-defined global utility functions. Yet, specific economic analyses often rationalize puzzling behavior by showing how it is rational within narrow brackets. For instance, most formal models of risk attitudes assume that they are defined over aggregate wealth levels, and hence that consumers judge each risky choice according to the impact it will have on aggregate long-term risk. Yet specific economic analyses of activities that involve risk, such as

insurance purchases, treat consumers' individual decisions as if they were the only decisions that they make.

An example is Cicchetti and Dubin's (1994) analysis of consumer's purchases of insurance to protect themselves against the possibility of malfunctions in their home telephone wiring. The authors explain the frequency of purchases of wiring insurance, which is actuarially extremely unfair, using a standard account of risk aversion as the desire to avoid variation in wealth. In their data set, people pay 45 cents each month to insure against an expected loss of 26 cents a month, reflecting a $1/200$ chance of losing \$55. Looked at from the narrow month-by-month frame, by either the consumers themselves or the readers of the article, such risk aversion may seem reasonable. But from the perspective of risk to lifetime consumption power, the magnitude of the risk these people are facing is miniscule. Risk aversion over such small stakes makes sense *only* if we think of each choice in isolation, which is precisely how such examples are presented by authors. Consumers seem to bracket the decision narrowly, which is why they purchase the insurance. But economists also adopt narrow brackets when analyzing those choices, without recognizing that they are violating a bedrock assumption of economics.

In what follows, we provide a broad review of bracketing phenomena. In Section 2, we elaborate on the concept of choice bracketing, by placing it in the context of two other varieties of *choice partitioning*: outcome editing and joint versus separate evaluation of alternatives. In Section 3, we provide a rough classification of bracketing effects, and document these with many examples, both from related existing literature and some new research of our own. Section 4 offers some hypotheses concerning why and when people bracket narrowly rather than broadly. Section 5 examines the normative question of when narrow or broad bracketing lead to superior decisions. We show that, although broad bracketing should and perhaps typically does produce better decisions, there are some situations in which narrow bracketing is better. We conclude in Section 6.

2. Choice bracketing in context

Choice bracketing can be distinguished from two closely-related forms of choice partitioning. *Outcome editing* refers to whether the outcomes associated with a particular alternative are aggregated or segregated. *Joint versus separate evaluation* refers to whether the alternatives of a particular choice are evaluated one-at-a-time or comparatively. After defining choice bracketing, we elaborate on each of these other types of partitioning effects.

2.1 Choice bracketing

Consider the choices: $\{x_1, y_1\}$ and $\{x_2, y_2\}$. Under narrow bracketing, each choice is made separately. Under broad bracketing, a choice is made between the four possible alternative-pairs of the two choices—i.e., from the set $\{x_1x_2, x_1y_2,$

$y_1x_2, y_1y_2\}$. A bracketing effect occurs whenever the outcomes chosen under narrow bracketing differ from those chosen under broad bracketing. For instance, if x is chosen over y for both narrowly bracketed choices, then bracketing matters if anything other than x_1x_2 is chosen under broad bracketing. The special, but common, case of *temporal bracketing* applies when the sequencing of choices is important. In narrow temporal bracketing, the individual first chooses between x_1 and y_1 (subscripts now designate time) without consideration of the subsequent choice between x_2 and y_2, and then chooses between x_2 and y_2. Again, bracketing effects occur when narrow bracketing leads to a different final outcome than broad bracketing. In practice, choices are usually made sequentially, and therefore most bracketing effects are probably cases of temporal bracketing.

Choice bracketing is illustrated by responses to the following classic problem, due to Tversky and Kahneman (1981):

> Imagine that you face the following pair of concurrent decisions. First examine both decisions, then indicate the options you prefer:
>
> Choice (I) Choose between:
> A. a sure gain of \$240.
> B. 25% chance to gain \$1000 and 75% chance to gain nothing.
>
> Choice (II) Choose between:
> C. a sure loss of \$750.
> D. 75% chance to lose \$1000 and 25% chance to lose nothing.

When the two choices were presented in this way, a large majority of subjects chose A and D. This is because people are loss-averse—a loss of x is far more aversive than a gain of x is pleasurable—and because they give disproportionate weight to outcomes that are certain relative to those that are uncertain (Kahneman and Tversky, 1979). Consequently, subjects were risk averse when making Choice I (they chose the sure gain), and risk seeking when making Choice II (they chose the uncertain loss). When B and C are combined, however (giving a 25% chance to gain \$250 and a 75% chance to lose \$750), they dominate outcomes A and D (a 25% chance to gain \$240 and a 75% to lose \$760). Tversky and Kahneman's subjects apparently bracketed the two choices separately and treated each choice as if it had no connection to the other. That they would want something different if they had bracketed broadly was demonstrated when the outcomes from each choice pair were explicitly combined: nobody chose the dominated AD pair.

2.2 Outcome editing

Outcome editing (Kahneman and Tversky, 1979; Thaler, 1985) refers to how outcomes (or attributes) are integrated or segregated when their utility is evaluated. If an alternative has multiple outcomes, such as a compensation package that

includes both a long-term raise in salary and a bonus, then decision makers can either evaluate each outcome separately, then compute the value of the alternative as the sum of these separate values, or they can first combine the outcomes and then compute the value of the composite outcome. Imagine an alternative x with two attributes, r and s. In a simple case, integrated outcomes are first combined and then valued, as in $v(r + s)$, whereas segregated outcomes are first valued and then added, $v(r) + v(s)$. The hedonic consequences of the set of outcomes can vary depending on which editing procedure is used.

The distinction between choice bracketing and outcome editing can be illustrated using the example from Tversky and Kahneman described above. Decision makers can either treat each choice in isolation (narrow bracketing) or combine them (broad bracketing). Broad bracketing confronts the decision maker with four alternatives: AC, AD, BC and BD. Within these alternatives, the individual outcomes can be segregated or integrated. Thus, under broad bracketing the alternative AD could be expressed in a segregated form:

> a sure gain of \$240; combined with a 25% chance to lose \$1000 and 75% chance to lose nothing,

or in an integrated form:

> a 75% chance to lose \$760 and a 75% chance to gain \$240.

Choice bracketing and outcome editing are close relatives and in many cases, such as the example just presented, the distinction depends on the point at which editing occurs. If the effect reported by Tversky and Kahneman is due to a failure to transform the problem into the four-alternative representation, then it is a bracketing effect. If people do achieve that representation, but then fail to integrate the outcomes, then it is an illustration of outcome editing. Many problems, such as this one, may turn out to be ambiguous concerning when the editing occurs. We suggest, however, that for the problem described above and for the great majority of other situations revealing a failure to integrate outcomes across choices, the problem is not that decision makers combine the choices into a composite choice and then fail to integrate the outcomes (i.e., broad bracketing followed by outcome segregation), but that the decision maker views each choice as a separate choice to be evaluated on its own merits (narrow bracketing). As will be seen in many of the examples cited below, when experimenters turn separate choices into single choice, subjects readily integrate the outcomes.

2.3 Joint versus separate evaluation of alternatives

A third type of partitioning effect, which Hsee et al. (in press) refer to as *joint* versus *separate* evaluation, occurs between the alternatives offered within a single choice rather than between choices. Separate evaluation occurs when each alternative in a choice is first evaluated without reference to its neighbors, and then one

of the alternatives is chosen based on the outcome of these evaluations. In joint evaluation, people choose between alternatives by making explicit comparisons between them. Numerous studies show that whether people evaluate alternatives jointly or separately can have a major impact on choice (e.g., Kahneman and Ritov, 1994; Nowlis and Simonson, in press). In one study (Hsee, 1996), for example, participants were asked to assume that as the owner of a consulting firm they were looking for a computer programmer who could write in a special computer language—KY language. The two candidates, who were both new graduates, differed on two attributes: experience with the KY language and undergraduate GPA (on a 5-point scale):

	Experience	GPA
Candidate J:	70 KY programs in last 2 years	3.0
Candidate S:	10 KY programs in last 2 years	4.9

In the joint evaluation condition, participants were presented with the information on the two candidates as listed above. In the separate evaluation condition, participants were presented with the information on only one of the candidates. In all conditions, respondents were asked what salary they would be willing to pay the candidate(s). The result revealed a significant preference reversal between the two modes of evaluation: the salary offered to candidate J was higher (Ms = \$33.2k for J and \$31.2k for S) in joint evaluation; but lower in separate evaluation (Ms = \$32.7k for S and \$26.8k for J). Since the evaluation scale was identical in both conditions, the reversal could only have resulted from the difference in evaluation mode.

3. A review of bracketing effects

Bracketing effects occur because broad bracketing facilitates the consideration of choice factors that are either not perceived or given relatively less weight in narrow bracketing. These include:

Emergent properties. Alternatives can combine into options that have features that are not part of the alternatives taken by themselves. Sets of options that give rise to such gestalts are more likely to be recognized in broad bracketing.

Adding-up effects. Alternatives that are chosen repeatedly have trivial or even non-noticeable costs or benefits when considered individually. When choices are bracketed together, however, the aggregated costs or benefits can exceed a threshold so that they play a greater role in choice.

Taste change. What we choose now can change our tastes, and thus influence what we will want in the future. When choices are bracketed together, we are more likely to recognize how a choice of one alternative will influence our desire for future alternatives. Taste change effects are specific to temporal bracketing.

Trade-offs. When making many choices between multidimensional alternatives, it may be possible to find 'integrative solutions' in which the good parts of some alternatives compensate for the bad parts of others. Again, these trade-offs are easier to see when choices are bracketed together.

These factors embrace what we believe to be the majority of bracketing effects. They are not, however, mutually exclusive, and even in the examples we discuss below there is scope for controversy about where they fit into the framework. The first two factors are the most general, and describe the 'essential' differences between broad and narrow bracketing. Broad bracketing reveals global patterns and magnifies local consequences that can be missed or ignored under narrow bracketing. Taste change can be viewed either as a special kind of emergent property that unfolds over time, or as an adding-up effect involving endogenous changes. Trade-offs are also emergent properties, but these are unique to situations in which choices involve allocating limited resources to alternatives. In the remainder of this section we elaborate on these four factors, and give examples of their operation.

3.1 Emergent properties

When combined, alternatives can have set-level or emergent features that do not exist as features of any single alternative. An illustrative emergent feature is representativeness. A representative sample (the result of a sequence of sampling decisions) has properties that reflect those of its population, yet no single element in the sample can be said to be representative; nor can the representativeness of the sample be inferred from one element. Analogously, in some situations the outcome of many choices must be combined for emergent features to be recognized, and this can only be accomplished through broad bracketing.

We consider three ways in which broad bracketing can highlight properties of alternatives that might otherwise not be apparent. First, people often prefer sets of goods (e.g., clothes, books, movies) that are diverse rather than homogeneous. They are more likely to pay attention to this diversity when they bracket multiple choices together (e.g., by purchasing several books in one trip to the bookstore) than when they bracket them separately (e.g., in a series of single-book purchases). Second, people like to have their pleasures and pains distributed over time in specific ways: they like to spread them out rather than getting them all at once, and they like things to improve over time rather than to get worse. They can only know which choices will achieve these goals when they schedule many experiences simultaneously. Finally, people like to avoid risk—especially the risk of loss—and one way to reduce risk is to combine many risky choices. Consequently, the attractiveness of a portfolio of gambles, when perceived with the benefit of broad bracketing, may be greater than the sum of the attractiveness of its constituents

Diversity. When making many separate choices between goods, people tend to choose more diversity when the choices are bracketed broadly than when they are bracketed narrowly. This was first demonstrated by Simonson (1990), who gave students their choice of one of six snacks during each of three successive weekly class meetings. Some students chose all three snacks in the first week (broad bracketing; Simonson called this simultaneous choice), although they didn't receive their chosen snack until the appointed time. Other students chose each snack on the day that they were to receive it (narrow bracketing; sequential choice). Under broad bracketing, fully 64% chose a different snack for each week, as opposed to only 9% under narrow bracketing. In a follow-up study using supermarket scanner data, Simonson and Winer (1992) showed that consumers displayed an analogous pattern; they chose proportionally more rare flavors when they bought several containers of yogurt than when they bought only one or two. In other words, those who bought one or two containers at a time restricted themselves to their favorites (e.g., strawberry and blueberry), but if they chose several at once they 'spread their wings' a bit and chose more novel items like piña colada and vanilla.

Read and Loewenstein (1995) replicated Simonson's diversification effect (they called it the *diversification bias*) for snacks in several experiments. In one study conducted at two adjacent houses on Halloween they presented trick-or-treaters with two piles of candy bars. Children in the broad-bracketing condition were told to 'take two candies—whichever two you like.' Those in the narrow-bracketing condition were told to take one candy, then were given the same choice when they came to the second house. The broad-bracketing children always chose two different candies, while more than half of the narrow-bracketing children chose the same candy at both houses. Other studies (Read, Loewenstein and Kalyanaraman, in press; Read et al., 1999) have demonstrated the diversification bias for choices of lottery tickets and audio tracks.

Scheduling future experiences: the desire for improvement and spreading. When experiences are distributed over time, the utility of each experience is influenced by what has gone before and what is to come. Improving sequences are experienced as a series of gains, while declining sequences are experienced as a series of losses. Like diversity, improvement is a gestalt property of experiences that is not apparent under narrow bracketing. Indeed, when people schedule experiences one at a time, they typically choose to have the best experiences as soon as possible, and to delay the worst ones, thus ending up with a declining sequence. Loewenstein and Prelec (1993), for example, asked one group to choose between having dinner at a fine French restaurant on a Friday in one or two months. Most chose to have the French dinner in one month. Another group was asked whether they preferred to eat at home on Friday in one month and at the French restaurant on Friday in two months or to consume the two meals in reverse order with the French dinner first. The majority now wanted the French dinner in *two* months. For both groups, dinner at home was the most likely alternative to the French

dinner, but it was only when the two dinners were expressed as a sequence that the desire for improvement became a basis for decision.

Loewenstein and Prelec (1993) also described a second common preference for sequences: a desire for spreading multiple desirable or undesirable experiences out over time. For example, most people do not want to consume two fine meals on successive evenings, or to receive two pieces of bad news on the same day. Linville and Fischer (1991) attribute this to a limited capacity for coping with bad experiences or appreciating good ones. As with the desire for improvement, the desire for spreading only applies when scheduling more than one activity.

We investigated the role of bracketing in the scheduling of pleasant and unpleasant experiences. Subjects were asked to schedule four activities over two weekends, one unpleasant and one pleasant gardening task, and one unpleasant and one pleasant reading task. In the narrow bracketing condition, they scheduled the reading and gardening tasks separately, while in the broad bracketing condition the two decisions were combined. The task was described in the following way:

> Imagine that on the next two Saturdays you must plan when to do some reading and some gardening. On one Saturday you will spend two tedious hours reading the Pennsylvania driver's manual in preparation for your licensing exam. On the other Saturday you will spend two pleasant hours reading a new novel by your favorite author.
>
> In addition to reading, on one Saturday you will spend two boring hours weeding dandelions from your garden. On the other Saturday you will spend two enjoyable hours planting flower bulbs.

As expected, a majority of narrow bracketing subjects chose an improving sequence for both activities. They thus ended up weeding and reading the driver's manual on the first Saturday, and then planting flowers and reading a novel on the second Saturday. Broad bracketing subjects, however, who were exposed to both scheduling decisions before they made any choices, spread out the good and bad by taking one pleasant and one unpleasant task for each Saturday. Spreading, which was a feature that could emerge only from the combination of two alternatives, was only seen as an option under narrow bracketing.

Risk aggregation. When several positively valued but risky gambles are combined, the perceived risk from the super-gamble can be less than the risk from any individual gamble. Consequently, a decision maker who refuses a single gamble may nonetheless accept two or more identical ones. This is especially true when the risks from the different gambles are uncorrelated or (even better) negatively correlated, but even when risks are positively (but imperfectly) correlated, a portfolio of individually unacceptable gambles can be quite attractive. Thus, decision makers may accept several gambles when they are bracketed broadly, but reject them if they are bracketed narrowly.

Risk aggregation, in this context, was first discussed by Samuelson (1963), who asked a colleague if he would accept equal odds to win $200 or lose $100. The colleague refused but stated that he would accept 100 such bets.[1] This pattern of preference is driven by a combination of *loss aversion* (people's extreme distaste for losses) and narrow bracketing. Imagine that Samuelson's colleague had a loss-averse piecewise-linear value function with a slope of 1 in the domain of gains, but a slope of 2.5 in the domain of losses. Although he would refuse a single bet—since $.5 \times 2.5 \times -(100) + .5 \times 200 = -25$—he would have willingly played a portfolio of two bets—since their value would be $.25 \times 2.5 \times (-200) + .5 \times 100 + .25 \times 400 = 25$. Bracketing many choices together can, therefore, transform undesirable prospects into desirable ones.

Thaler (in press) adapted Samuelson's question for a course on decision making that he taught to 25 executives from a single firm, including its CEO. When Thaler asked the non-CEO executives whether they would accept a project for their division that offered an even chance of losing $1 million or gaining $2 million, only three stated that they would. However, when the CEO was asked whether he would like his subordinates to undertake the project, he enthusiastically nodded. The CEO, unlike his subordinates, was in a position to bracket all of the 'gambles' together. He realized that if they were all accepted, the profits would most likely be stupendous, and there was almost no chance of any loss at all. While this difference in preference may be due to factors other than loss aversion, such as the reluctance of the subordinates to make a decision that would prematurely end their careers, it is consistent with a large body of similar evidence in contexts where such considerations are absent (see Kahneman and Lovallo, 1993).

In another application of the same idea, Benartzi and Thaler (1995) attributed the equity premium puzzle—the low rate of return for bonds relative to stocks—to *myopic loss aversion*, which is their term for a combination of narrow bracketing and loss aversion shown by investors who invest in fixed income securities in preference to equities despite the much higher historical rate of return to equities.[2] Benartzi and Thaler argue that investors dislike stocks because they look at their portfolios frequently—perhaps once a month—even though the average investor is saving for a distant retirement. Over brief periods, stock prices are almost as likely to fall as to rise. For loss averse investors, the falls will be extremely painful and the rises only mildly enjoyable, so the overall experience might not be worth undertaking. By this logic, if people could resist looking at their portfolios for longer periods—i.e., bracket their investment choices more broadly—the likelihood that they would see such losses would diminish, and the clear benefits of stocks would emerge. While we can never be sure that U.S. investors during this period had correct expectations about the scale of risk, Gneezy and Potters (1997) and Thaler et al. (1997) have conducted experiments that support Benartzi and Thaler's interpretation. In Thaler et al.'s (1997) study, for example, subjects made investment decisions between stocks and bonds at frequencies that simulated either 8 times a year, once a year, or once every five years. Subjects in the two

long-term conditions invested the large majority of their funds in stocks, while those in the frequent evaluation condition invested the majority in bonds.

3.2 Adding-up effects

Bracketing effects due to adding-up occur when the perceived costs of alternatives accumulate at a different rate than their benefits. The costs or benefits from a single act may be so low as to fall below a threshold of consideration, while the cumulative costs or benefits of many such acts can be momentous. Consider, for example, the health consequences of one cigarette, the girth added by one slice of cake, or the effects on one's grades of a single decision to 'skip class.' In each of these examples, the anticipated cumulative benefit from indulging on multiple occasions seems to increase much more slowly than the cumulative costs. We suspect, for example, that the magnitude of the anticipated pleasure from 100 desserts does not even approach 100 times the pleasure from a single dessert, whereas the anticipated growth in your waistline is (if anything) greater than that from a single dessert. The same is true for cigarettes and skipping class. If people bracket narrowly and consider the costs and benefits of a single action, then the balance of costs and benefits will likely favor the benefits, while if they bracket broadly the balance can be reversed.

The failure to take tiny but cumulative effects into account has been implicated in many apparently suboptimal patterns of choice. Sabini and Silver (1982), for example, attribute procrastination to a combination of narrow bracketing and the apparently trivial amount of work that can be accomplished on a project in a short period:

> Imagine you have two days to write a paper. You believe it will take about six hours. To avoid being rushed, you decide to get to work. ... Now suppose you had to decide what to do for the next five minutes—either work on the paper or play one game of pinball ... In the short run, five minutes of pinball is far more pleasurable than five minutes of paper writing, and after all, how much of a paper can you do in five minutes? Pinball is the obvious choice. The game is over so you must decide about the next five minutes. The situation is only trivially changed, so you will reach the same result. Once you've fragmented your night into five minute intervals, you may be doomed to play until you run out of money, the machine breaks, or someone meaner than you wants to play.... One of the ways of being irrational and procrastinating is to act on rational calculations for intervals that are irrationally short.... A model that would capture rational action must not only show how means are fit to goals, but also how appropriate intervals for calculation are picked (Sabini and Silver, 1982, p. 133).

Sabini and Silver's discussion highlights another context in which bracketing effects have received considerable attention—that of self-control (see, for example, Ainslie, 1992; Heyman, 1996; Rachlin, 1995). Heyman's view is typical in that he suggests that self-control (in this case, avoiding or recovering from addiction) can be accomplished by putting preference 'under the control of global value functions.' The problem of addiction is considered in the next section. For now, we note only that those global value functions are equivalent to the 'appropriate intervals' for utility calculation described by Sabini and Silver: only when those intervals are large is self-control possible.[3]

Another consequence of narrow bracketing is the *peanuts effect*, in which repeated and seemingly inconsequential transactions can add up to significant total expenditures. Markowitz (1952) argued that the value function for money, both in the domain of gains and losses, is s-shaped. The initial flat segment reflects the observation that small amounts of money are treated as peanuts—i.e., underweighted or ignored. Because people view $1.00 as peanuts, a large fraction would prefer, for example, a 0.1 chance of $10 over $1 for sure, but would also prefer $100 for sure over a 0.1 chance of $1,000. A consequence of this underweighting of small money amounts is that people may spend disproportionate amounts on trivial items. Two dollars may not seem like much for the daily cappuccino, nor five dollars for a hot lunch, but the pleasure/cost calculus can look different if these expenditures are aggregated over time, and especially if we consider alternative uses for the money. Personal financial advisors often advise clients to keep track of expenses over some period (e.g., a week or month). They report that many clients are surprised at what a large fraction of the total results from very small expenditures. Rent-to-own companies capitalize on this effect by offering people durable goods, such as computers or stereos, for 'only' $25 per week over a period of three years or more (Swagler and Wheeler, 1989; Walden, 1990).

The 'pennies a day' technique for eliciting charitable donations also plays on the peanuts effect (Gourville, 1998).[4] Many organizations, such as public radio stations, plead for contributions by reminding potential donors that it will only cost them a small amount per day, perhaps 'no more than a cup of coffee.' When many days are aggregated, however, the opportunity cost of a large amount of money may seem greater than the benefit from the good in question; imagine the response to the plea that your donation will cost 'only $350 dollars per year, no more than the cost of a small refrigerator.'

3.3 Taste change

Taste change occurs when choosing an option at one time affects that option's future utility, and hence the likelihood of choosing it again. Bracketing is important because if individuals bracket narrowly, taking each choice separately, they will not take into account these *internalities* (Herrnstein et al., 1993)—i.e., impacts of earlier choices on the utilities associated with later choices. Herrnstein (1982;

Herrnstein and Prelec, 1992a) argues that the tendency to ignore internalities, which he calls *melioration*, can account for a wide range of suboptimal patterns in repeated choice. The most important taste change effects are *habit formation* and *satiation*.

Habit formation. If choosing an option increases its utility in future encounters, then a habit is being formed. Many acquired tastes are unpleasant when they are first encountered, but become more attractive than their alternatives once they have been tried a few times. For many, caviar, opera and exercise fit this description. To recognize that the early displeasure will be repaid by later pleasure, one has to bracket early experiences together with later ones. If we bracket narrowly, therefore, we will never acquire these tastes.[5]

Just as narrow bracketing can prevent people from forming good habits, it might also lead them to form bad habits and become addicted (e.g., Heyman, 1996; Herrnstein and Prelec, 1992b). If we define x as taking a drug and y as abstaining, then harmful addiction occurs when the individual repeatedly takes a drug $(x, x, x, \ldots)$ but would be better off not taking it $(y, y, y, \ldots)$. Although taking the addictive drug in the first period decreases the utility obtained from both taking it (due to habituation) and not taking it (due to withdrawal) in the second period, it actually increases the value of taking the drug relative to that of not taking it. That is, in the second period neither x nor y is as good as they were, but x is preferred more strongly to y than it was in the first period. Addiction can result from narrow bracketing when the effects of taking a drug on one's future preferences and well-being are ignored. According to Heyman (1996, p. 571),

> When preference is under the control of the overall value functions [broad bracketing]... just the right amount of drug will be consumed, which may be moderate amounts or none.... However, when preference is under the control of local value functions [narrow bracketing], drug use will increase.... Thus, a switch from overall to local value functions, in someone with a history of heavy drug use, will trigger a relapse or an increase in drug consumption beyond that which was intended.

Although it is difficult to demonstrate that real-world cases of harmful addiction result from narrow bracketing, experiments in stylized addiction-like settings have shown that the choice behavior of both humans and animals more closely approaches the optimum when choices are bracketed broadly. In a prototypical study, subjects make sequential choices between pairs of alternatives whose payoffs depend on which alternatives were chosen before. Just as with real addiction, the payoff to both alternatives x and y are negatively related to the number of times x has been chosen in the past, yet, regardless of the choice history, on every trial the payoff is greater for x than for y. If y is chosen every time, however, the subject gets the highest overall payoff, while if x is chosen every time, the subject gets the lowest payoff. Alternative x is like a drug which is always better than anything else

but which gets less enjoyable with repeated consumption and simultaneously worsens the quality of every other aspect of life. To recognize the 'trap,' the experimental subject (and the addict) has to recognize the interdependence between the choice of x and the returns to both x and y (cf., Ainslie, 1975, 1992). Manipulations that increase awareness of the internality (e.g., Herrnstein et al., 1993) reduce the frequency of x choices. The experiments most directly pertinent to choice bracketing have been conducted by Kudadjie-Gyamfi and Rachlin (1996). Their subjects made choices like those just described, except that one group made the choices in clusters of three, while control groups made non-clustered choices. Kudadjie-Gyamfi and Rachlin anticipated that the clustered choice group would treat each choice in a cluster as part of a single set (i.e., they would bracket broadly) while the non-clustered groups would treat each choice in isolation. As predicted, when the choices were clustered, subjects were more likely to choose the y alternative, and they obtained a significantly higher payoff.

3.4 Tradeoffs across choices

When two parties negotiate over many issues simultaneously they can look for integrative agreements, which are settlements in which one party concedes on a dimension that it values less than the other in exchange for a reciprocal concession on a dimension that it values more. A union, for instance, may be willing to concede on wage increases (which management values more) in exchange for job security (which the union values more). In this way both sides end up with an agreement which they prefer to the one which would have come from making separate concessions on wages and job security. Integrative agreements are possible only when more than one issue is negotiated simultaneously. Analogously, individual decision makers can reach integrative agreements with themselves if they take into account the possibility of trade-offs across the many choices that they face. Just as with union and management, such an intrapersonal integrative solution can only be reached if the decision maker brackets more than one choice together.

In this section we examine cases that illustrate the impact of bracketing on the exploitation of opportunities for intrapersonal tradeoffs. First, we look at how people trade off the amount of the time they spend working across days that offer different wage rates; then we examine how people trade off across categories of consumption; and finally we consider people's notions of a just division of resources, and how they allocate resources between different people who value those resources differently.

Trade-off between labor and leisure. Many workers, such as salespeople, fishermen, academics and artists daily choose how much time to spend working, and how much time relaxing. Moreover, the return to each hour of work varies from day-to-day. On some days there are many fish, while on other days there are few.

Likewise, artists and academics have days when the muse is resident, and days when she is painfully absent. In such situations, the most efficient way for workers to organize their time is to work long hours when the return to time spent is high, and take leisure when the return is low. This commonsensical integrative solution to the work hour problem is the prediction of basic economic theory.[6]

Camerer et al. (1995) tested this prediction in a study of the daily work-hour decisions of New York City cab drivers. Cab drivers can decide when to quit work each day, and also face wage rates that are relatively stable during the span of a day but which fluctuate, and are largely uncorrelated, across days. The authors found that, contrary to economic theory, drivers quit early on good days, and worked late on bad days. The drivers seemed to have adopted the strategy of working each day until they made a fixed amount of money (perhaps enough to pay for cab rental and living expenses plus a 'little extra') and then quitting. This pattern suggests that the cab drivers are making their labor supply decision 'one day at a time' which is almost the worst possible earning strategy. The authors calculated that if the cabbies had worked the same total number of hours, but allocated equal hours to each day, they would have increased their net take-home pay by about 10%, and that if they had optimized by working longer hours on good days and shorter hours on bad days, they would have earned about 20% more.[6]

Trade-offs across purchase categories. Another area in which there is a well-documented tendency to think narrowly, and thus fail to make optimal trade-offs across choices, is household and mental budgeting. Budgeting involves earmarking money for specific categories of expense. A household, for instance, might allocate fixed portions of its income to utilities, transportation, food and clothing. The money so earmarked is spent on that category of expense, and on nothing else. Budgeting can be a useful shortcut for ensuring that vital expenses are met, but if budget boundaries are too restrictive—that is, if there is a reluctance to transfer money from one account to another—they can prevent the decision making unit, whether household or individual, from making beneficial trade-offs.

A budget contains three elements: a category of expense, an amount budgeted, and a fiscal period. Accounting conventions dictate that money in the account be spent only on that category and within that fiscal period. A series of experiments by Heath and Soll (1985) demonstrate that people are quite strict about their budgets. Money saved in one category will be recycled into that category: money saved on free theater tickets, for example, is used to buy more entertainment, such as CDs or sports tickets. The specificity of such budgets can be striking: subjects in a study conducted by O'Curry (1995) reported that they would use a category-wide reduction in beer prices to buy better quality beer. As Heath and Soll (1995) observe, because budget decisions are made relative to categories, they can lead to simultaneous feelings of wealth ('I didn't spend all my clothing allowance, so now I can buy that gaudy hat ...') and poverty ('but I've spent enough on books this week').

Research into household budgeting has focused on how people use categories, and no one has investigated how choices are influenced by changing the scope of

the mental account. We might expect, for example, that if people could be induced to keep an "entertainment and clothing" account, then shoes and theater tickets would become substitutes. We investigated this prediction by manipulating another aspect of the budget—the fiscal period. The fiscal period demarcates the interval during which a particular budget allocation is to be used. Two groups of Carnegie Mellon students responded to the following question:

> Imagine that you are a poor student, and you set aside $25 per week [$100 per month] for entertainment. It is the last day of the week [7th of the month] and you have already spent $25 on entertainment. Tonight there is a concert that you would like to attend, but the tickets cost $15. Will you go?

In terms of the consequences to the student, the fiscal period is just window-dressing. The student attending the concert has spent more than planned, but will have enjoyed a concert. Changing the fiscal period, however, had the expected effect. Students were more likely to attend the concert if their fiscal period was one month rather than one week (39% vs. 8%; $\chi^2(1) = 7.7, p < .005$). At least in this case, budgeting decisions were altered by changing the domain of choices bracketed within a budget.

Fair divisions. Bracketing also seems important in understanding what people think is a fair allocation of resources. In particular, narrow bracketing of resource-allocation decisions—i.e., allocation on a case-by-case basis—is likely to lead to more equal, but less efficient, splits of resources than broad bracketing. Suppose that $10 worth of money or other goods must be split between two people. How would the average person, acting as a third party, decide to split the surplus between the two? One possible allocation rule is to give it all to the poorer person, or (for non-money goods) to the one who values the goods more. But research shows that, rather than maximizing the total welfare gain of the two individuals, disinterested people often prefer an allocation that equalizes welfare gains (Yaari and Bar-Hillel, 1984). Because people who value a resource less require more of it to increase their utility by a given amount, equalizing welfare gains typically implies that more of any given resource should be allocated to those who value it less.

While we have no comment on the moral soundness of this Rawlsian maximin criterion as an ultimate principle of justice, its implications can be strikingly different depending on whether the allocation decisions are bracketed narrowly or broadly. Imagine, for example, that the same two people are the subject of repeated allocation decisions, and that our goal is to maximize the minimum welfare gain that will result from these decisions. Imagine further that the goods being allocated are just as often more valued by one party as the other party. If we bracket very few decisions together, it is most likely that for each allocation the best (maximin) decision will be to maximize the sum of the two parties' benefits.

For example, suppose that we have to make two allocation decisions for two people, Johnny and Keanu. The first is to distribute 12 grapefruits and the second

is to distribute 12 avocados. Johnny values grapefruits twice as much as Keanu, and Keanu values avocados twice as much as Johnny. If we bracket narrowly, the maximin criterion would lead us to first give 4 grapefruits to Johnny and 8 to Keanu, and then to give 8 avocados to Johnny and 4 to Keanu—equating their benefits in each separate distribution. If we bracket broadly, however, we would give all the grapefruits to Johnny and all the avocados to Keanu. Both ways of allocating gives equal welfare gains to both, but those gains are 50% greater under broad bracketing. If one imagines larger numbers of individual allocation decisions, it becomes clear that maximizing the addition to total welfare on each choice is likely to be the best policy even if one wants to pursue the maximin criterion in the aggregate.[7]

4. Determinants of bracketing

In the previous section, we summarized the results of numerous studies that document the important consequences of bracketing choices narrowly or broadly. We did not directly address what causes people to bracket the way they do, in part because very few studies have addressed this question. Undoubtedly, many bracketing choices result from a wide range of subtle and unconscious factors that influence the way we categorize the world. For example, putting on one's shoes could be construed as: putting on each of two shoes; putting on a pair of shoes; part of getting dressed; part of preparing to leave the house; or, perhaps somewhat far-fetched, part of furthering one's career. Our lack of insight into the factors that influence bracketing even in mundane choices suggests that developing a theory of how people bracket is a crucial direction for future research. Despite our comparative ignorance on this issue, we provide a preliminary analysis of four factors that we suspect are important.

Cognitive capacity limitations. Cognitive limitations—in perception (Miller, 1956), attention (Kahneman, 1973), memory (Baddeley, 1986), and analytical processing (Simon, 1957), etc.—are one important determinant of bracketing. Such limitations sharply constrain our ability to simultaneously consider multiple decisions. As the number of choices—or the number of alternatives per choice—increases, the cognitive cost of broad bracketing will undergo a combinatorial explosion. To take an abstract example, narrowly bracketing two choices $\{x_1, y_1\}$ and $\{x_2, y_2\}$ involves two binary comparisons; broadly bracketing the choice so that it is made between the composite alternatives $\{x_1x_2, x_1y_2, y_1x_2, y_1y_2\}$ involves at least three and as many as six binary comparisons. If there are three choices, the composite choice can involve up to 28 binary comparisons. This does not take into account the resources needed to evaluate what will rapidly become exceedingly complex alternatives.

Cognitive inertia. Cognitive limitations are probably very important in the real world, and even in some experimental demonstrations of bracketing. In Kahneman and Tversky's (1981) twin-gamble dominance violation illustration, described ear-

lier, subjects might not integrate the gambles (despite being advised that the decisions are concurrent) because doing so would be cognitively taxing. But not all bracketing effects can be explained in this way. Many are due simply to the fact that people usually deal with problems in the way that they are presented to them. If choices come to them one at a time, they will bracket them narrowly, and if choices come to them collectively, they will bracket more broadly.

This was elegantly illustrated by Redelmeier and Tversky (1992) in the domain of gambles. Given a choice, people will usually prefer a larger number of gambles (assuming they have a positive expected value and are independent) to a smaller number (e.g., Keren and Wagenaar, 1987). Their study involved two groups, each of whom chose between five or six gambles. Most of the first group, who made a direct choice, took six gambles. A second group made two choices. First they chose between zero gambles or five. Most chose the five. Then they were offered one more gamble, which amounted to a choice between the original five gambles or six gambles. Most refused the sixth gamble. Indeed, the proportion taking the sixth gamble was identical to that taking a single gamble when the choice was between one or zero. The second group had bracketed narrowly, by treating the single gamble choice as separate from the earlier choice of five gambles. Only when the choices were explicitly bracketed together, as they were in the first group, did subjects recognize that the five gambles influenced the desirability of the sixth.

In a modification of Redelmeier and Tversky's study, we asked 143 Carnegie Mellon students to

> Imagine that on each of 5 days you will be allowed to choose between the following:
> A): 50-50 chance of losing $25 or winning $40;
> B): Do not gamble.

The students then made separate choices for each day. In the narrow bracketing condition, subjects chose for only the first day, while in the broad bracketing condition subjects made the decision for all 5 days. All subjects knew that they would be making five choices, so the only difference between groups was that single-day subjects would have more flexibility in their choices since they weren't precommitted to a pattern of gambles. They did not, however, take this view. While 50% of the broad-bracketing subjects gambled on the first day, only 32% of the narrow-bracketing subjects did ($\chi^2(1) = 4.57$, $p < .05$). Note that cognitive limitations cannot account for results such as these. Rather, the difference between broad and narrow bracketing apparently involves a shift-in-viewpoint, and not more processing power.

Narrow bracketing attributable to cognitive inertia may also contribute to the embedding effect (Kahneman and Knetsch, 1992)—the tendency for respondents in contingent valuation studies to report approximately equal willingness to pay to correct problems that differ dramatically in scope. Respondents, for example, might agree to pay as much to clean the pollution from one lake in Ontario as to clean all of the lakes in Canada. In a verbal protocol study, Schkade and Payne

(1994) found that when people estimate their willingness to pay to correct a particular environmental problem, they spend almost no time thinking about other uses for the money. Rather, they take the problem as it comes and think about how much they can afford to pay in general, and do not think about things like what proportion of their scarce resources they can spend on this cause as opposed to other causes. When respondents in Schkade and Payne's study were reminded that there were other causes as well, many indicated that their earlier statements of willingness to pay were too high.

Pre-existing heuristics. Bracketing decisions can also be determined by socially acquired heuristics and decision rules. For example, in our work-oriented society, it is common to divide the week into two intervals of unequal length—the work-week, and the weekend; periods of eating are labeled "meals," and food intake occurring between these designated times is referred to as "snacking"; and so on. All of these conventions, many or most of which exist for good reasons, influence the way that people bracket decisions.

In a study that illustrates both the arbitrariness and consequentiality of such divisions, we asked visitors to the Pittsburgh International Airport to state how much fattening bread pudding they would want during a week-long conference in Ohio:

> You are attending a conference at a hotel in Ohio for a week (Monday morning through Monday morning). You eat all your meals at the conference hotel. The specialty of the hotel dining room is New Orleans Bread Pudding, which is delicious, but heavy on the fat and calories. However, you can have the bread pudding with dinner at no extra cost.

Broad bracketing respondents were induced to make the entire week's choices together by being asked "On which day(s), if any, would you like to eat a bread pudding?" They then checked off their decision for each day. The remaining respondents were induced to bracket more narrowly. Again, they made separate decisions for each day, but this time the week was divided into two subperiods: weekdays and weekend. Subjects chose to eat many more puddings when they were broken down into weekdays and weekend days (.57 per day) then when the days of the week were expressed as one block (.35 per day; $t(44) = 4.00$, $p < .05$).

Motivated bracketing. People sometimes adopt a particular bracket to accomplish some goal—most typically to overcome problems of self-control. Much of social guidance regarding bracketing is clearly motivated to counteract otherwise-tempting misbehavior. For example, abstinent alcoholics are instructed to take it "one day at a time," presumably because taking it one year at a time makes their task seem overly daunting.[8] Narrow bracketing may also facilitate self-control when people are budgeting time, money, or calories. Eating only 14,000 calories per week is a rule that is much easier to fudge on than 2,000 calories per day, even if, or perhaps precisely because, the former allows for more flexible and thus efficient scheduling. Those who get the urge to binge, for example, might be able to

persuade themselves that today is the beginning of a new week. Similarly, spending is much easier to restrict on an entertainment budget of $10 per day rather than $70 per week, and spending two hours with one's child per day is more difficult to shirk on than spending at least 14 hours per week.[9] This might be one reason why the taxi drivers in Camerer et al.'s (1997) study employed a daily earnings target; if they had, for example, picked a weekly target they might have been tempted to quit early on any given day while assuring themselves that they could make up the deficiency later in the week.

Because narrow bracketing can make goals seem easier to attain, it can also increase motivation. This may be an additional reason for a lot of seemingly short-sighted behavior, such as that shown by the cab drivers. By setting a goal of earning a fixed amount per day, they had something realistic to work toward. Indeed, such a feasible performance-based goal may have enabled them to get more work done in less time than an alternative strategy such as 'work 8 hours per day.' Anthony Trollope (1883/1980, p. 119) attributed his remarkable productivity to a work schedule that explicitly recruited severe narrow-bracketing in the service of long-term goals:

> When I have commenced a new book, I have always prepared a diary, divided into weeks, and carried on for the period which I have allowed myself for the completion of the work. In this I have entered, day by day, the number of pages I have written, so that if at any time I have slipped into idleness for a day or two, the record of that idleness has been there, staring me in the face, and demanding of me increased labour, so that the deficiency might be supplied.... In the bargains I have made with publishers I have ... undertaken always to supply them with so many words, and I have never put a book out of hand short of the number by a single word.

Trollope's strategy was exactly the same as the one used by the cab drivers. On days when he was very productive he was able to quit early, and on days when the writing was slow he worked longer hours—or else, as indicated in the text, paid a price. Trollope produced at least three major novels a year, many of which are still widely read, while successfully holding a responsible position in the English postal service. It is difficult to fault him for bracketing too narrowly.

Broad bracketing can also serve motivational purposes. Both Rachlin's (1995) and Heyman's (1996) accounts of self-control and addiction are based on the premise that broad bracketing leads to superior choices and that people have some control over the type of brackets they adopt. Ainslie and Haslam (1992, p. 188) likewise posit that people may use broad bracketing of choices as a self-control device:

> Imagine a person on a weight-reducing diet who has been offered a piece of candy. The person knows that the calories in one piece of candy will not make any noticeable difference in weight, and yet he is apt to feel that he should not

> eat the candy. What would it cost him? Common experience tells us: his expectation of sticking to the diet. He will face many chances to eat forbidden foods, and if he sees himself eating this one, it will not seem likely to him that he will refuse the others

By bracketing dieting choices together, and by viewing rejection or acceptance of the single piece of candy as a larger choice between diet versus no diet, this person increases the chance of adherence to his diet. Although the evidence is not clear concerning whether bracketing as a framing strategy is a successful means of self-control, the widespread existence of rigid rules of conduct and the explicit claims that these rules are self-control devices suggest that it has some beneficial effect.

5. Is Broad Bracketing Always Better Than Narrow Bracketing?

The underlying premise of this article is that broad bracketing usually leads to better outcomes than narrow bracketing. By "better" we mean that people will usually gain more happiness from making the choices dictated by the broader bracketing than the narrow one. An examination of the studies cited above should make this clear: people who buy stocks will be wealthier than those who buy bonds; dieters who bracket their dining decisions broadly will eat fewer desserts than those who consider each day separately; and consumers who bracket all their purchases together without setting up inviolable budgets will be able to make efficient trade-offs across purchase categories. The general principle is that broad bracketing allows people to pursue maximization of their global well-being. However, broad bracketing is not an unalloyed good, and there may be cases where it is actually better to bracket narrowly. We see at least four caveats to the broader-is-better view of bracketing.

First, as is no doubt clear from many of our examples, choices made under broad bracketing often involve putting up with small discomforts or annoyances in order to achieve long-term gains. For example, people who invest all of their retirement funds in stocks, as they might do if they bracket broadly, may be wealthier when they retire, but at the cost of ongoing anxiety during the intervening period. A priori, it is impossible to determine whether the expected gain is adequate compensation for the anxiety. Likewise, for cab drivers to attempt to bracket more broadly—e.g., by attempting to maximize their weekly earnings while minimizing hours driven—might require more self-control and more careful record-keeping, burdens which could offset the benefits derived from greater efficiency. In order to be able to determine whether broadly or narrowly bracketed choices are better in a particular situation, we need some way of comparing the overall or total utility (Kahneman, Wakker and Sarin's (1997) term) of a lifetime of small annoyances against the big gains from broad bracketing. Ironically, it may turn out that narrow bracketing is sometimes better because it enables us to take little annoyances into

account (such as the pain of record keeping) that have a significant effect on total utility but which can be ignored when one takes the long view.

The second caveat is that, because broad bracketing facilitates the consideration of factors that are given little weight during narrow bracketing, it can exacerbate errors people make in anticipating the role these factors play in their experienced well-being. A possible case in point is the diversification bias, already discussed. Although people like diversity when they choose sets of goods, it is by no means certain that they are always more satisfied with diverse experiences. That is, diversity may influence their choices, but not the pleasure they get from what they choose. In one study, Read and Loewenstein (1995) found that people who chose a diverse set of snacks under broad bracketing often wanted to change their minds if given a chance—and usually changed their minds in the direction of less diversity. In another study, Read et al. (1999) found that people who chose more variety, whether under broad or narrow bracketing, retrospectively evaluated their choices as being less enjoyable than did those who chose less variety, suggesting that the tendency to diversify under broad bracketing may lead people to make poor choices. We suggest that the larger principle is that broad bracketing can lead to superior choices only when there are genuine and important preference interactions between alternatives. Broad bracketing will be worse than narrow bracketing when it leads people to either exaggerate trivial preference interactions or to imagine nonexistent ones.

The third caveat to the superiority of broad bracketing has already been discussed under the heading of 'motivated bracketing.' When people have self-control problems, broad bracketing might undermine the motivation to embark on a long chain of difficult choices. Broad bracketing, in this situation, can make the task seem overwhelming. In such cases, treating each choice in isolation may be the best strategy. In negotiation, this is known as a "salami tactic" (Fisher, 1969), in which a big problem is sliced up like a salami and dealt with one slice at a time. Salami tactics are one way that a planner can convince a doer (to use Shefrin and Thaler's (1981) terminology) to undertake a long series of connected choices that would seem unpalatable if they had to make them all at once. Many self-control programs, such as Alcoholics Anonymous, emphasize the importance of taking small steps towards the goal of recovery. While it may be feasible to desist from drinking for a single day, the prospect of not drinking for the rest of one's life might be so alarming that it becomes a reason to drink rather than to abstain. Of course, these examples are not straightforward cases of the superiority of narrow bracketing. The decision to undertake the task in the first place, and then to bracket each choice separately, is made by an 'executive' decision maker who presumably brackets broadly to begin with but then uses the salami strategy to get its untrustworthy self to accomplish the task.

The fourth and final problem with broad bracketing is that it is not free. As we have already observed, there are cognitive costs involved with attempting to integrate many choices together, and these costs have to be balanced against the benefits of broad bracketing. For trivial everyday decisions, and perhaps for

not-so-trivial but complicated ones, it may be that the costs exceed the benefits or that broad bracketing simply exceeds the individual's cognitive capacities. When narrow bracketing is inevitable, whether due to cognitive constraints or other reasons, a natural follow-up question is whether people employ decision rules that are "constrained optimal"—i.e., optimal given their narrow bracketing of choices. In the domain of risky choice, for example, if people do bracket narrowly then it will be optimal for them to be virtually risk neutral over moderate-stake gambles; a very simple heuristic—to always maximize expected return except on huge gambles—would make people better off than the (more complicated) procedures they actually do use on their narrowly-bracketed choices. Similarly, NYC cab drivers could be better off driving a fixed number of hours each day rather than aiming for a fixed level of take-home pay.

6. Concluding Comments

Bracketing is different from other familiar sources of decision suboptimalities in that it seems to play an interactive or enabling role. Many established causes of decision errors only exert an influence under narrow bracketing. Loss aversion, for example, would have little impact on decision making if people aggregated multiple decisions together. This is because loss aversion only matters for decisions that can lead to either gains or losses. But in many domains, the likelihood that any individual decision will shift the decision maker from one side of the divide to the other is exceedingly small. Hence, it is often not loss aversion alone, but the combination of loss aversion and narrow bracketing, that causes problems. This is illustrated by the case of Samuelson's colleague. If he played 100 gambles, the marginal effect of any single gamble on the overall payoff would be negligible, and the likelihood that by itself it would make a winning portfolio into a losing one is essentially zero.

Narrow bracketing generally shifts people's attention from the macro level to the micro level—a level at which many of the most pernicious patterns of decision making seem to occur. Many researchers claim that dieters and drug addicts are defeated by small, but frequent, indulgences (Herrnstein and Prelec, 1992a, 1992b). Others have argued that lapses of morality rarely happen all-at-once, but more typically involve a series of cascading misbehaviors (e.g., Lifton, 1990). Narrow bracketing exacerbates problems like these by shifting attention from the big picture to localized, isolated, decisions—from the campaign that is our life to the skirmish that is today.

Acknowledgments

We are grateful to Colin Camerer, Erik Eyster, Drazen Prelec, Shane Frederick and Richard Thaler for useful comments on an earlier draft, and to Baruch

Fischhoff, Chuck Manski, and two anonymous referees for very thorough comments. The paper was completed while Read was visiting the Rotterdam Institute for Business Economic Studies, and Loewenstein and Rabin were visiting the Center for Advanced Study in the Behavioral Sciences. We acknowledge support from NSF grants # SBR-960123 (to the Center), support for Loewenstein from the Center for Integrated Study of the Human Dimensions of Global Change at Carnegie Mellon University, and support for Rabin from the Sloan, MacArthur, and Russell Sage Foundations.

Notes

1. Samuelson's (1963) paper has stimulated a lively ongoing debate, as well as empirical research. See, e.g., Lopes (1981, 1996); Tversky and Bar-Hillel (1983); Redelmeier and Tversky (1990); Wedell and Bockenholt (1990, 1994); Keren and Wagenaar (1987); and Keren (1991).
2. Since 1925, equities have consistently outperformed bonds by a wide margin: stocks have had an average annual real return of 7%, while bonds have averaged less that 1%.
3. We should be cautious about implicating narrow bracketing in all failures of self-control. Smoking, overeating, and procrastination have all been explained by researchers as resulting from hyperbolic time-discounting (Ainslie, 1992; Laibson, 1997; Loewenstein and Prelec, 1992; O'Donoghue and Rabin, 1997, in press-a; Read and Van Leeuwen, 1998). In these models, the pursuit of immediate gratification does not arise because people fail to recognize the global consequences of their actions, but rather because they have different preferences at different times: right now they care equally about (say) next Monday and next Tuesday, but come next Monday they care much more about Monday than Tuesday. Because hyperbolic discounting has been so firmly established by behavioral evidence (e.g., Kirby, 1997), determining whether bracketing is also implicated in these phenomena is difficult. Hence, hyperbolic discounting tells us that broad bracketing itself is not always sufficient to induce good long-run behavior: even when people do bracket broadly, often cannot control themselves sufficiently and behave as if they are bracketing narrowly. All dieters, for instance, know that small lapses add up (one dieter's expression is 'a moment on the lips, a lifetime on the hips'), yet they face a constant and often losing battle to prevent lapses from occurring.
4. Gourville does not, in fact, attribute the pennies-a-day phenomenon to peanuts effects, but rather to mental accounting conventions that cause pennies-a-day expenditures to be classified into mental accounts containing small items.
5. A second situation in which melioration can lead to suboptimal choices is when the choice of an option decreases its utility in the future. Ideally, in such circumstances, people should ration—i.e., reduce their consumption of—that option to take account of its marginal cost on future choices. However, consistent with melioration with narrow bracketing, Herrnstein and Prelec (1992a) argue that people tend to ignore or underweight negative internalities. As a consequence, they will tend to overconsume highly attractive, but rapidly satiating rewards.
6. The basic economic theory of labor supply predicts that the supply response to a change in wage depends on the relative strength of the income effect and the substitution effect. The income effect captures the intuition that, as people become wealthier, they tend to work less because they have less need to earn money (their marginal utility of consumption is lower). The substitution effect captures the intuition that when wages are high there is an incentive to work longer hours because the return (in terms of consumption) per hour worked is high. If a particular worker gets a permanent wage increase, according to this theory, whether he will supply more or less labor depends on the relative strength of the income and substitution effects. When wages fluctuate from day to day, however, as is true in a small number of occupations, the theory makes a strong prediction: people should work longer hours on high wage days and quit early on low wage days.

This is because any one day's wage has a negligible effect on wealth, so there should be no wealth effect and the substitution effect should dominate. The worker who behaves in this way can maximize earnings while minimizing total hours worked.

7. Observe that treating an individual allocation decision in isolation is something of a fiction; every choice of allocation to two people is surely concatenating some additional resources to resources they already have, so that a maximin criterion should designate that we give all the resources to the person most in need—and be virtually impervious to any additional efficiency or distributional arguments.
8. By contrast, not-yet-addicted drug users are urged to take a broader view of their drug use—lest each day of drug use appear to have inconsequential costs.
9. Thaler and Shefrin's (1981) emphasis on the relationship between mental accounting and the self-control problems in their planner-doer model reflects this insight. See Laibson (1994) for a simple principal-agent model along these lines that is also suggestive of budgeting as a self-control mechanism.

References

Ainslie, G. (1975). "Specious Reward: A Behavioral Theory of Impulsiveness and Impulse Control," *Psychological Bulletin* 82, 463–496.

Ainslie, G. (1992). *Picoeconomics*: *The Strategic Interaction of Successive Motivational States within the Person*. New York: Cambridge University Press.

Ainslie, G. and Haslam, N. (1992). "Self-Control." In G. F. Loewenstein and J. Elster (eds.), *Choice Over Time*. New York: Russell Sage Foundation.

Baddeley, A. D. (1986). *Working Memory*. Oxford: Oxford University Press.

Benartzi, S. and R. H. Thaler. (1995). "Myopic Loss Aversion and the Equity Premium Puzzle," *The Quarterly Journal of Economics* 73–92.

Camerer, C., L. Babcock, G. Loewenstein, and R. Thaler. (1997). "Labor Supply of New York City Cab Drivers: One Day at a Time," *The Quarterly Journal of Economics* 112, 407–441.

Cicchetti, C. and J. Dubin. (1994). "A Microeconometric Analysis of Risk Aversion and the Decision to Self-Insure," *Journal of Political Economy* 102, 169–186.

Clausewitz, C. von (1832/1982). *On War*. Harmandsworth, UK: Penguin Books.

Fisher, R. (1969). *Basic Negotiating Strategy*: *International Conflict for Beginners*. London: Allen Lane.

Gneezy, U. and J. Potters. (1997). "An Experiment on Risk Taking and Evaluation Periods," *Quarterly Journal of Economics* 112, 631–645.

Gourville, J. T. (1998). "Pennies-a-Day: The Effect of Temporal Re-Framing on Transaction Evaluation," *Journal of Consumer Research* 24, 395–408.

Heath, C. and J. Soll. (1996). "Mental Budgeting and Consumer Decisions," *Journal of Consumer Research* 23, 40–52.

Herrnstein, R. J. (1982). "Stimuli and the Texture of Experience," *Neuroscience and Biobehavioral Reviews* 6, 105–117.

Herrnstein, R. J., G. F. Loewenstein, D. Prelec, and W. Vaughan, Jr. (1993). "Utility Maximization and Melioration: Internalities in Individual Choices," *Journal of Behavioral Decision Making* 6, 149–185.

Herrnstein, R. J., and D. Prelec. (1992a). "Melioration." In G. F. Loewenstein and J. Elster (eds.), *Choice Over Time*. New York: Russell Sage Foundation.

Herrnstein, R. J. and D. Prelec. (1992b). "A Theory of Addiction." In G. F. Loewenstein and J. Elster (eds.), *Choice Over Time*. New York: Russell Sage Foundation.

Heyman, G. M. (1996). "Resolving the Contradictions of Addiction," *Behavioral and Brain Sciences* 19, 561–610.

Hsee, C. K. (1996). "The Evaluability Hypothesis: An Explanation of Preference Reversals between Joint and Separate Evaluations of Alternatives," *Organizational Behavior and Human Decision Processes* 46, 247–257.

Hsee, C. K., G. Loewenstein, S. Blount, and M. Bazerman. (in press). "Preference Reversals between Joint and Separate Evaluations of Options: A Theoretical Analysis," *Psychological Bulletin*.

Kahneman, D. (1973). *Attention and Effort*. Englewood Cliffs, NJ: Prentice Hall.

Kahneman, D. and J. Knetsch. (1992). "Valuing Public Goods: The Purchase of Moral Satisfaction," *Journal of Environmental Economics and Management* 22, 57–70.

Kahneman, D. and D. Lovallo. (1993). "Timid Choices and Bold Forecasts: A Cognitive Perspective on Risk Taking," *Management Science* 39, 17–31.

Kahneman, D. and I. Ritov. (1994). "Determinants of Stated Willingness to Pay for Public Goods: A Study in the Headline Method," *Journal of Risk and Uncertainty* 9, 5–38.

Kahneman, D. and A. Tversky. (1979). "Prospect Theory: An Analysis of Decisions under Risk," *Econometrica*, 47, 263–291.

Kahneman, D., P. Wakker, and R. Sarin. (1997). "Back to Bentham? Explorations of Experienced Utility," *The Quarterly Journal of Economics* 112, 375–406.

Keren, G. (1991). "Calibration and Probability Judgments: Conceptualization and Methodological Issues," *Acta Psychologica* 77, 217–273.

Keren, G. and W. A. Wagenaar. (1987) "Violation of Utility Theory in Unique and Repeated Gambles," *Journal of Experimental Psychology*: *Learning*, *Memory and Cognition* 13, 387–391.

Kirby, K. N. (1997). "Bidding on the Future: Evidence against Normative Discounting of Delayed Rewards," *Journal of Experimental Psychology*: *General* 126, 54–70.

Kudadjie-Gyambi, E. and H. Rachlin. (1996). "Temporal Patterning Choice among Delayed Outcomes," *Organizational Behavior and Human Decision Processes* 65, 61–67.

Laibson, D. (1994). "Hyperbolic Discounting and Consumption," Dissertation, MIT.

Laibson, D. (1997). "Golden Eggs and Hyperbolic Discounting," *Quarterly Journal of Economics*, 112(2), 443–477.

Lifton, R. J. (1990). *The Nazi Doctors*: *Medical Killings and the Psychology of Genocide*. New York: Basic Books.

Linville, P. and G. W. Fischer. (1991). "Preferences for Separating or Combining Events," *Journal of Personality and Social Psychology* 60, 5–23.

Loewenstein, G. and D. Prelec. (1992). "Anomalies of Intertemporal Choice," *Quarterly Journal of Economics* 107(2), 573–597.

Loewenstein, G., and D. Prelec. (1993). "Preferences for Sequences of Outcomes," *Psychological Review* 100, 91–108.

Lopes, L. (1981). "Decision Making in the Short Run," *Journal of Experimental Psychology*: *Human Learning and Memory* 7, 377–385.

Lopes, L. (1996). "When Time Is of the Essence: Averaging, Aspiration and the Short Run," *Organizational Behavior and Human Decision Processes* 65, 179–189.

Markowitz, H. (1952). "The Utility of Wealth," *Journal of Political Economy* 60, 151–158.

Miller, G. A. (1956). "The Magical Number Seven Plus or Minus Two: Some Limits on Our Capacity for Processing Information," *Psychological Review* 63, 81–97.

Nowlis, S. M. and I. Simonson. (in press). "Attribute-Task Compatibility as a Determinant of Consumer Preference Reversals," *Journal of Marketing Research*.

O'Curry, S. (1995). "Income Source Effects," Working Paper, Department of Marketing, DePaul University, Chicago IL.

O'Donoghue, E. and M. Rabin. (1997) "Incentives for Procrastinators," Working Paper, Department of Economics. University of California, Berkeley.

O'Donoghue, E. and M. Rabin. (in press-a). "Doing It Now or Later," *American Economic Review*.

O'Donoghue, E. and M. Rabin. (in press-b). "The Economics of Immediate Gratification," *Journal of Behavioral Decision Making*.

Rabin, M. (1997). "Risk Aversion, Diminishing Marginal Utility, and Expected Utility: A Calibration Theorem," Working Paper, Department of Economics. University of California, Berkeley.

Rachlin, H. (1995). "Self-Control: Beyond Commitment," *Behavioral and Brain Sciences* 18, 109–59.

Ratner, R., B. Kahn, and D. Kahneman. (1998). "Choosing Less-Preferred Experiences for the Sake of Variety," Working Paper.
Read, D. and B. van Leeuwen. (1998). "Predicting Hunger: The Effects of Appetite and Delay on Choice," *Organizational Behavior and Human Decision Processes* 76, 189–205.
Read, D., and G. Loewenstein. (1995). "Diversification Bias: Explaining the Discrepancy in Variety Seeking between Combined and Separated Choices," *Journal of Experimental Psychology*: *Applied* 1, 1, 34–49.
Read, D., G. Loewenstein, and S. Kalyanaraman. (in press). "Mixing Virtue and Vice: The Combined Effects of Hyperbolic Discounting and Diversification," *Journal of Behavioral Decision Making*.
Read, D., L. Van den Ouden, H. Trienekens, and G. Antonides. (1999). "Diversification Bias in Choice for Consecutive Consumption," Working Paper, Leeds University Business School.
Redelmeier, D. A. and A. Tversky. (1992). "On the Framing of Multiple Prospects," *Psychological Science* 3, 191–193.
Sabini, J. and M. Silver. (1982). *Moralities of Everyday Life*. Oxford: Oxford University Press.
Samuelson, P. (1963). "Risk and Uncertainty: A Fallacy of Large Numbers," *Scientia* 98, 108–113.
Schkade, D. A. and J. W. Payne. (1994). "How People Respond to Contingent Valuation Questions—A Verbal Protocol Analysis of Willingness-to-Pay for an Environmental-Regulation," *Journal of Environmental Economics and Management* 26, 88–109.
Simon, H. A. (1957). *Models of Man*: *Social and Rational*. New York: Wiley.
Simonson, I. (1990). "The Effect of Purchase Quantity and Timing on Variety Seeking Behaviour," *Journal of Marketing Research* 32, 150–162.
Simonson, I. and R. S. Winer. (1992). "The Influence of Purchase Quantity and Display Format on Consumer Preference for Variety," *Journal of Consumer Research* 19, 133–138.
Slovic, P., B. Fischhoff, and S. Lichtenstein. (1978). "Accident Probabilities and Seat Belt Usage: A Psychological Perspective," *Accident Analysis and Prevention* 10, 281–285.
Swagler, R. M. and P. Wheeler. (1989). "Rental-Purchase Agreements: A Preliminary Investigation of Consumer Attitudes and Behaviors," *Journal of Consumer Affairs* 23, 145–160.
Thaler, R. H. (1985). "Mental Accounting and Consumer Choice," *Marketing Science* 4, 199–214.
Thaler, R. H. (in press). "Mental Accounting Matters." In D. Kahneman and A. Tversky (eds.), *Choices, Values and Frames*. Cambridge, UK: Cambridge University Press.
Thaler, R. and H. Shefrin. (1981). "An Economic Theory of Self-Control," *Journal of Political Economy* 89, 392–410.
Thaler, R., A. Tversky, D. Kahneman, and A. Schwartz. (1997). "The Effect of Myopia and Loss Aversion on Risk Taking: An Experimental Test," *Quarterly Journal of Economics* 112, 647–661.
Trollope, A. (1883/1980). *An Autobiography*. Oxford: Oxford University Press.
Tversky, A. and M. Bar-Hillel. (1983). "Risk: The Long and the Short," *Journal of Experimental Psychology*: *Learning, Memory and Cognition* 9, 713–717.
Tversky, A. and D. Kahneman. (1981). "The Framing of Decisions and the Psychology of Choice," *Science* 211, 453–458.
Walden, M. L. (1990). "The Economics of Rent-to-Own Contracts," *The Journal of Consumer Affairs* 24, 326–337.
Wedell, D. H. and U. Bockenholt. (1994). "Contemplating Single Versus Multiple Encounters of a Risky Prospect," *American Journal of Psychology* 107, 499–518.
Wedell, D. H. and U. Bockenholt. (1990). "Moderation of Preference Reversals in the Long Run," *Journal of Experimental Psychology*: *Human Perception and Performance* 16, 429–438.
Yaari, M. and M. Bar-Hillel. (1984). "On Dividing Justly," *Social Choice and Welfare* 1, 1–24.