

# **The Effect of Having Too Much Choice**

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## **English Abstract**

This dissertation explores the so-called too-much-choice effect, according to which an overabundance of options eventually leads to negative consequences, such as a diminished motivation to choose any option or a decreased satisfaction with the finally chosen alternative. While strong instances of this effect have been found in a small number of studies in the past, its theoretical underpinnings are still somewhat unspecific. Because the effect challenges basic axioms of rational choice theory and it also has important implications for applied fields such as marketing and public policy making, it is important to get a better understanding of the mechanisms that lead to the effect. As a starting point to test these mechanisms, an experimental paradigm is needed in which the effect reliably occurs. Therefore, I first strived to replicate previous experiments that reported large effect sizes. Yet in a series of three replications in the field and in the lab with a total of 850 participants, I did not find an effect of too much choice, suggesting that the effect is less robust than previously thought and that it depends on certain boundary conditions instead. To find out why the effect occurs and which specific conditions are necessary to reliably elicit it, I subsequently examined several boundary conditions that figure in previous research on decision making in psychology and related fields and then tested the conditions empirically in a series of six laboratory experiments. Based on the results of these experiments with a total of 595 participants, most of the tested boundary conditions could be ruled out as explanations of why and when the effect of too much choice occurs. The results of a meta-analysis of published and unpublished data including my own suggest that the effect of too much choice is smaller than previously thought and that the differences between the studies that found the effect and those that did not cannot be explained by mere chance. As a consequence, a further search for moderator variables in future research seems justified.

## **Deutsches Abstrakt**

Die vorliegende Dissertation beschäftigt sich mit dem so genannten „Effekt zu großer Auswahl“. Der Effekt besagt, dass ein Überangebot von Auswahlalternativen negative Konsequenzen hat, in dem es beispielsweise die Motivation verringert, überhaupt eine Entscheidung zu treffen oder in dem es die subjektive Zufriedenheit mit der letztlich gewählten Alternative verringert. Der Effekt wurde von einigen wenigen experimentellen Studien in der Vergangenheit empirisch nachgewiesen. Seine theoretische Erklärung sowie die zugrunde liegenden Entscheidungsmechanismen sind jedoch bisher nur unzureichend präzisiert. Der Effekt steht im Widerspruch zu Axiomen der klassischen rationalen Entscheidungstheorie. Ein sicherer Nachweis des Effektes hätte daher Konsequenzen für die Theorienbildung in der Psychologie. Außerdem hätte der Effekt praktische Relevanz in angewandten Bereichen wie zum Beispiel im Konsumgütermarketing oder in der Politik. Daher ist es wichtig, ein genaueres Verständnis der Mechanismen zu erlangen, die zur Entstehung des Effektes führen. Um diese Mechanismen zu untersuchen wird zunächst ein experimentelles Paradigma benötigt, in dem der Effekt reliabel auftritt. Aus diesem Grund wird in der vorliegenden Arbeit der Versuch unternommen, bereits publizierte Studien zu replizieren, in denen große Effektstärken gefunden wurden. In einer Serie von insgesamt drei Replikationen (Zwei Feldexperimente und ein Laborexperiment) mit insgesamt 850 Versuchsteilnehmern konnte ich jedoch den Effekt zu großer Auswahl nicht replizieren. In der Konsequenz dieser Ergebnisse ist davon auszugehen, dass der Effekt weit weniger generalisierbar ist als bisher angenommen und dass sein Auftreten wesentlich von spezifischen Randbedingungen abhängt. Ausgehend von dieser Tatsache untersuche ich im Weiteren die Frage wann, wieso und unter welchen Randbedingungen ein Effekt zu großer Auswahl zu erwarten ist. Dabei arbeite ich basierend auf etablierten empirischen und theoretischen Erkenntnissen in der Psychologie und in verwandten Forschungsfeldern eine Reihe potenzieller Randbedingungen heraus und teste diese in sechs weiteren Experimenten mit insgesamt 595 Teilnehmern. Basierend auf den Ergebnissen dieser Experimente können die meisten der getesteten Randbedingungen als Erklärung für das Auftreten des Effektes ausgeschlossen werden. Die Ergebnisse einer sich daran anschließenden Meta-Analyse veröffentlichter und unveröffentlichter Daten zeigt jedoch, dass der Unterschied zwischen Studien die einen Effekt nachweisen und solchen, in denen kein Effekt auftritt, vermutlich nicht allein durch Zufallsprozesse erklärbar ist. Demnach ist eine Suche nach weiteren Randbedingungen in zukünftiger Forschung gerechtfertigt.

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## **Chapter I: The effect of too much choice**

In today's market democracies, people face an ever-increasing number of options to choose from. People may choose between careers, places to live, holiday destinations, or a seemingly infinite number of consumer products. As I will outline in more detail below, an increase in the number of choices has many advantages. But can there also be such a thing as too much choice? Does an increase in assortment sizes at some point lead to negative consequences? Lately, a growing number of scholars in psychology have suggested that when the number of choices increases beyond a certain point, people's motivation to choose and their satisfaction with the chosen alternative decreases. But how reliable and robust is this so-called too-much-choice effect? Can it be generalized to many situations or does it depend on certain boundary conditions instead? What are the theoretical underpinnings and explanations of the effect and what does it tell us about the underlying cognitive processes and mechanisms? What consequences follow for applied research in public policy making and marketing and what implications does the effect have on theories of decision making and human reasoning?

In this dissertation, I aim to answer these questions. In Chapter I, I will start by reviewing the main arguments—from several disciplines, including psychology, philosophy, economics, marketing, and biology—in favor of having many options. Building on this, I will give a more precise definition of the too-much-choice effect, discuss its theoretical underpinnings, and summarize the empirical evidence supporting its occurrence. I will further show that the theory behind the effect has some weaknesses. Based on a literature review and my own series of failed attempts at replicating the effect, in Chapter II, I will show that the effect is far less robust than previously thought and that it probably depends on certain boundary conditions instead. In Chapter III I will identify, discuss, and empirically test some potential boundary conditions, including individual differences and changes in environmental structure. To summarize and to provide a more coherent picture of the too-much-choice effect, in Chapter IV I will present a meta-analysis designed to estimate the mean effect size across all available studies, including my own, and to determine whether a further search for moderator variables is justified. In Chapter V I will discuss and critically evaluate alternative theoretical accounts of why and when a too-much-choice effect might occur that could be tested in future research. In the following, I will begin by providing some examples of the increasing number of choices in today's market democracies.

## **The proliferation of choice**

In modern and affluent societies such as many found in Europe or North America, the number of choices is ever increasing across many domains of daily life. Horovitz (2004) provides a number of examples that illustrate this “variety revolution” (Postrel, 2005): Dreyer’s, which offered 34 flavors of their ice cream in 1977, sold 250 in the year 2004. Arby’s sold one kind of roast beef sandwich when it was founded in 1964; in 2004 it sold 30 sandwiches. According to Horovitz, Starbucks has 19,000 ways it can serve a cup of coffee. He further reports that Tropicana, which had two kinds of orange juice a decade ago, now has 24. Frito-Lay started with two types of potato chips; now it offers 60. When Whole Foods opened in 1974, it sold two kinds of lettuce. Now according to Horovitz it sells 40 different kinds.

Even more extreme figures can be obtained from the Internet. The online music store iTunes currently offers more than 5 million songs for 99 cent apiece. By May 2007, the online DVD rental company Netflix offered 75,000 different DVDs. At the same time, the German bookseller amazon.de offered 2,257,828 German books while its U.S. counterpart amazon.com offered a staggering 5,980,889 English books and even, among other products, 858 different jams.

This wide proliferation of choices raises the question if having more options to choose from is an unambiguously good thing or if there can also be something like having too much choice. Below, I will summarize the literature on the effects of increasing assortment sizes, which can be roughly categorized into three categories: advantageous, harmful, or of little or no effect. As I will show, viewing an increase in choices as advantageous represents the traditional and somewhat established view of economics and psychology on human decision making. Considering many choices as harmful, and thus supporting the idea of too much choice, challenges this view. The third, no-effect category speaks in favor of humans as adaptive decision makers and provides yet another alternative account of human reasoning.

## **More is better: Advantages of large assortments**

In the following, I will summarize some of the benefits that come with the increasing proliferation of choice in modern societies.

### **Individual freedom**

Having options is commonly regarded as an important prerequisite of personal freedom as it allows an individual to live life according to his or her own agenda. Having options is what brings autonomy (Dowding, 1992). As pointed out by Postrel (2005), people are different in many ways and abundant choice accommodates this variation. On the other hand, in a world of few choices, whether of consumer goods, mates, or careers, individual differences may become a source of alienation and unhappiness. For example, imagine someone who loves opera but who lives in a rural

environment without an opera house nearby and without anyone to share the enjoyment.

### **Motivation**

In a study by Zuckerman, Porac, Lathin, Smith, and Deci (1978) in which students had to solve a puzzle, performance and motivation increased for students who could personally choose from among six different puzzles as compared to another group of students who got the same puzzles assigned to them by the experimenter. Along the same lines, Langer and Rodin (1976) found that inhabitants of a nursing home who could choose among seemingly trivial things like when to watch a movie or how to arrange their furniture enjoyed an increase in health and well-being. On the other hand, elimination of choice made people feel helpless and hopeless (see also Taylor, 1979).

### **Matching of preferences and search costs**

In a market context, a large variety increases the likelihood of satisfying diverse consumers and because it facilitates competition, it eventually drives price down and quality up. In view of this, the philosopher Gerald Dworkin (1982, p. 60) wrote:

One of the ways in which increased choice contributes to the welfare of individuals is by increasing the probability that they will satisfy their desires. People want various things—goods and services, status, affection, power, health, security—and their chances of getting these things are often enhanced if they have more options to choose among. My chances of finding a shirt I like is greater if I have ten different shirts to choose among than if I have only two.

There are also other reasons why people benefit from having many options. Choosing from a large assortment that is assembled at one place reduces the costs of search for more options and allows for more direct comparison between options. As a consequence, a large assortment makes it easier to get a sense of the overall quality distribution in the relevant domain, which leads to better-informed choice. It can also lead to more confidence because it is less likely that a potentially better alternative is missing.

### **Desire for variety**

As has been summarized by Kahn (1995), if people select more than one option at a time (e.g. for future use) or if they repeatedly choose from the same assortment, there are several other ways that large assortments can be beneficial to individuals: An increased variety, for instance, meets a desire for change and novelty, as a result of satiation with the usual or mere curiosity (Ariely & Levav, 2000). Being allowed to choose from a variety of options and to diversify one's portfolio also provides insurance against uncertainty or miscalculation of one's own future preferences (see also Simonson, 1990).

In some cases, the benefits of choosing from large assortments seem to go beyond the maximization of one's immediate enjoyment or satisfaction. For example, Ratner, Kahn, and Kahneman (1999) ran a series of experiments that involved repeated choice of music. Individuals sometimes chose songs that led to lower satisfaction for the time being. The authors conjectured that memories for sequences that vary in quality are more positive than memories for sequences that have a low variance, even if in the latter case the mean quality is higher. If so, people who sometimes chose a less-preferred option might aim for favorable memories of the overall series rather than to maximize immediate enjoyment. But as a pre-requisite, a certain amount of variety is necessary.

### **Advantages from a biological perspective**

As laid out in a review article by Hutchinson (2005), many aspects of choice are not unique to humans but can also be found among animals that choose a mate or forage for food. According to Hutchinson, there are several reasons why having more options to choose from may be beneficial for animals: For food choice, having many different alternatives buffers against potential harm from changes in the environment, such as seasonality or the presence of others competing for the same resources.

In mate choice, potential partners attract more attention and are easier to find in the first place if they group in clusters (so-called leks). For animals that actively search for a mate (females for most species), leks reduce the travel time between potential (male) mates and thereby reduce energy consumption and predator risk for those who search. As an additional advantage due to the reduced travel time, in larger leks more mates can be inspected and/or they can be inspected for a longer period of time, which leads to greater accuracy and eventually to an increased expected reward. There also seems to be some evidence that low-quality mates avoid large leks because they compete less effectively there. In addition, having shorter intervals between potential mates reduces memory load because past encounters do not have to be remembered for too long. Hutchinson further reviews several studies showing that various animals like crickets or eagle owls prefer to compare potential mates relative to each other, which is easier if they group in leks. A small lek on the other hand comes with the risk of currently containing no acceptable mates at all.

While the studies reviewed by Hutchinson are mainly concerned with animals, there are reasons to believe that these advantages also hold for humans. For example, in close resemblance to the forming of leks in animals, people also form clusters, as documented by a sound body of research in the social sciences on groups as diverse as antique dealers and prostitutes (Ashworth, White, & Winchester, 1988; Miller, 1996).

### **Increased sales**

For manufacturers, large assortments have the additional advantage of taking up more space on the supermarket shelf, which attracts more attention from the customer and thus increases choice probability. According to Koelemeijer and Oppewal (1999) it is

well known among marketers that making people enter a store increases the probability of making a sale. If a store that offers a large assortment attracts more people, it should also sell more than a store that offers a small assortment.

### **More is (subjectively) better: Preferences for large choice sets**

In line with these advantages, empirical evidence suggests that people as well as animals tend to prefer large assortments and large variety over smaller ones (Brown, Read, & Summers, 2003; Hutchinson, 2005) and that stores that offer a large variety have a competitive advantage over those that offer less (Anderson, 2006; Arnold, Oum, & Tigert, 1983; Craig, Gosh, & McLafferty, 1984; Mazursky & Jacoby, 1986).

#### **Preferences for niche products**

Especially on the Internet where distribution costs are low and a large number of potential consumers can easily be reached, retailers with large assortments are successful because they meet a demand for niche products and specialties. According to Anderson (2006), of the 16,000 albums that are offered on digital jukebox, a website that offers music downloads, 98% had at least one track purchased per quarter-year. Of the 1 million tracks that were offered by the online music store iTunes in 2005, every one sold at least once in a quarter.

These examples reflect the diversity inherent in the population and they suggest that there is considerable demand for niche products, but this demand is only revealed once people are offered a large number of choices. While there is little doubt about the existence of this demand, scholars have interpreted it in different ways. Some see it as “egocasting,” the narrow pursuit of one’s personal taste (Rosen, 2005). Others praise it as mass customization and are glad that the tyranny of the lowest-common-denominator fare and the times of poor supply-and-demand matching are coming to an end (Anderson, 2006).

#### **Inherited preference for choice**

The preference for large assortments over smaller ones has also been explained from an evolutionary perspective: Brown et al. (2003) conjectured that preference for choice may be a fundamental part of our natural endowment because it would be difficult to think of a natural environment in which there would be a zero, or even negative correlation between the amount of choice and the value of the outcome that is eventually chosen. The authors acknowledged, though, that this relationship might not hold for artificial environments that consumers typically face.

#### **Increased food consumption**

Human subjects who received a large quantity of three different flavors of yogurt consumed an average of 23% more yogurt compared to people who received the same quantity of yogurt of only one flavor (Rolls, Rowe, Rolls, Kingston, Megson, & Gunary, 1981). In a similar fashion, in a series of experiments, Kahn and Wansink (2004) showed that children as well as adults eat more candies if the number of

options increases. In their experiments, participants chose from assortments of jelly beans and M&Ms that consisted of either 6 or 24 different colors. What is remarkable about their results is that even though M&Ms differ in color, they all taste the same, which rules out the hypothesis of flavor-specific satiety as an explanation of the increased consumption. Instead, the authors suggested that consumption is controlled by the mere perception of variety. In line with this hypothesis, the authors found that participants' consumption quantity is correlated with their perceived variety and that it is perceived variety rather than actual variety that eventually matters.

As far as animal food consumption is concerned, animals that are not specialized in one particular food seem to consume more if diversity is large. This is probably because nutrients complement each other and, especially for folivores (herbivores that specialize in eating leaves), a varied diet helps the animal avoid over-ingesting toxins that are specific to particular plants (Hutchinson, 2005).

#### **Perceived attractiveness and satisfaction**

In an experiment in which participants had to rate the attractiveness of cut flower assortments with sizes ranging from 1 to 12 flowers, Oppewal and Koelemeijer (2005) found that, at least within the range they tested, people rate the assortment as more attractive the larger it gets.

Along the same lines, in a series of three studies in the laboratory and in the field involving choices among printed magazines and different types of coffee flavors, Mogliner, Rudnick, and Iyengar (2006) consistently found that satisfaction with the chosen option and also with the selection process itself increased with the amount of choice and variety people perceived. Interestingly, and in line with the results of Kahn and Wansink (2004), in their studies, the perceived variety did not depend on the objective number of options but rather on the number of categories into which the options were grouped, such that more categories led to an increase in the perceived variety.

### **Less is more: The effect of having too much choice**

Given the wide proliferation of choice in modern societies and the numerous advantages that come with it, having many options to choose from seems to be an unambiguously good thing. Yet recently some scholars have started to ask if there can also be something like having too much choice. In the following, I will lay out reasons and empirical findings for this latter proposition, which stipulates that at some point, a further increase in the number of choices leads to negative consequences. I will start by summarizing the economic argument on the benefits of having fewer options and by defining what, exactly, is meant by the effect of too much choice.

#### **Economic limits to the number of options**

In classical economic theory it is a basic principle that expanding the choice set cannot make a consumer worse off (Benartzi & Thaler, 2001). From this perspective, the only

reason why the full demand for variety on the side of the consumers will commonly not be supplied is because producers have to balance variety against the lower unit production costs of fewer variants (Lancaster, 1990). If production costs are the only factor that limits assortment size, the amount of variety should increase if production costs decrease. According to Anderson (2006), this is exactly what happens. As an example, he points to the fact that the number of options to choose from is commonly much higher on the Internet because there, the costs to produce and stock a variety of goods that appeal to consumers is commonly much lower than in regular stores.

### **Definition of the too-much-choice effect**

Recent empirical findings suggest that an overly large number of options can indeed lead to negative consequences such as dissatisfaction, regret, disappointment, decreased motivation to make a choice, or decreased consumption rates, all of which are manifestations of what has been termed the too-much-choice effect (Huberman, Iyengar, & Jiang, 2007; Iyengar & Lepper, 2000), choice overload (Chernev, 2003a, 2003b; Reutskaja & Hogarth, 2005), or hyperchoice (Mick, Broniarczyk, & Haidt, 2004). Thus, in the following, to refer to these negative consequences I will use the terms too much choice and choice overload interchangeably.

When talking about choice overload, it is also important to define what is actually meant by the term “choice.” According to Dowding (1992), choice has three meanings. It describes the ability to select an option (“a person is capable of choice”), the alternative that a person actually selects (“this is my choice”), and a set of options (“a store offers a lot of choice”). This distinction is important because an increase in choice can mean different things for different types of choice. For example, one’s ability to make choices commonly increases with power, yet this is not what is usually meant when talking about choice overload. In the literature on choice overload, most often “choice” refers to a set of options.

### **No definition of what constitutes “too much”**

Previous research has not provided an exact definition of what constitutes “too much” choice. Iyengar and Lepper (2000) described it as a “reasonably large, but not ecologically unusual, number of options” (p. 996). From this perspective, the size of an assortment can only be evaluated relative to the distribution of assortment sizes that would be expected within a certain environment.

With regard to choices of animals, Hutchinson (2005) argued that choice overload effects are seldom found in animals because they are adapted to assortment sizes that naturally occur in their environment. If this holds true for humans as well, in contradiction of Iyengar and Lepper’s notion, it might be that too much choice looms in cases in which the assortment exceeds ecologically usual sizes.

### Limited information capacity

Scholars (e.g. Mogilner et al., 2006), have conjectured that too much choice occurs for assortment sizes that exceed George A. Miller's magical number seven plus or minus two (Miller, 1956) because, so the argument goes, set sizes above that threshold are beyond humans' capacity for processing information. Yet a closer look at Miller's original publication renders this a rather ill-conceived definition. In Miller's work, the "magical number seven" applies to two distinct psychological concepts: (1) the span of absolute judgments on one single dimension such as the loudness or frequencies of tones, the taste intensities of salt solutions, or the intensity of a vibrator on the chest region; and (2) the span of immediate or short-term memory. In the following, I will lay out both concepts in more detail.

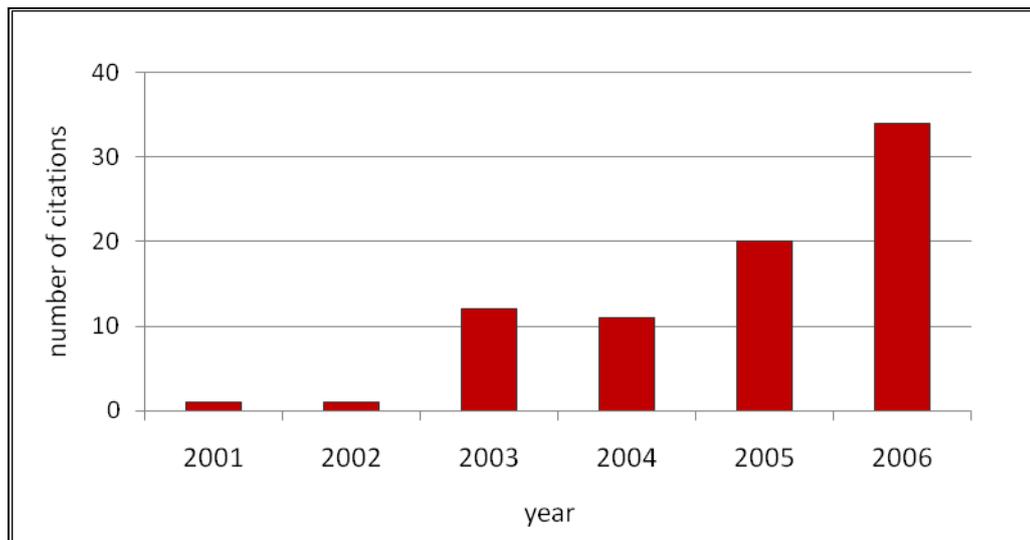
With regard to the first concept, Miller argued that even though judgments of one-dimensional stimuli are severely limited in the first place, this limitation only holds for absolute judgments and not for relative comparisons of stimuli. Also, most relevant stimuli in real-world environments are not one-dimensional but multi-dimensional, and every additional dimension increases the ability to discriminate. As an example, Miller presented data from experiments in which participants were asked to identify different frequencies of tones by assigning numerals to them. In such a task, apparently most humans can only judge about six different classes without error. Yet, when tones also differ on an additional dimension, such as loudness, the number of correct assignments increases. If tones differ on six independent dimensions, for example, duration or rate of interruption, Miller reported experimental data showing that participants could identify about 150 categories without error—the more dimensions added, the more categories that can be identified. As a consequence, Miller stated that "everyday experience teaches us that we can identify accurately any one of several hundred faces, any one of several thousand words, any one of several thousand objects, etc." (p.87), and for real-world situations, "the limit is probably in the thousands, if indeed there is a limit" (p.91). Thus, what initially looks like a severe limitation in fact provides little grounds to define choice overload.

For the second concept, the capacity of short-term memory, Miller also found the limit to be around seven initially. Here, Miller explicitly referred to a limit in the number of items, or chunks, as he called them. Yet drawing on the results of several experiments, Miller concluded that memory span seems to be almost independent of the amount of information per item, and that humans in their daily life constantly group and recode information and thus manage to break the informational bottleneck of memory span. As an example, Miller described the process of learning radiotelegraphic code: In the beginning one hears *dit* and *dah* as separate chunks, but as learning proceeds, these sounds will be organized into letters, and what used to be one-sound-per-chunk then becomes one-word-per-chunk. In Miller's terms, this recoding process shows how a person can increase the capacity of his or her short-term memory by increasing the amount of information per chunk, and Miller

conjectured that in one form or another we constantly engage in this kind of recoding in daily life. As a consequence, short-term memory hardly provides a guideline for defining choice overload.

### **Empirical findings of having too much choice**

In the year 2000, Iyengar and Lepper published a widely cited paper in which they argued that an overabundance of options decreases satisfaction and the motivation to choose. Their research attracted a lot of attention from inside and outside psychology. An analysis of the number of citations the paper has received since its publication suggests that interest in the topic is still growing (Figure 1).



*Figure 1: Number of citations for the Iyengar and Lepper (2000) paper according to the Web of Science Citation Report*

### ***Iyengar and Lepper, 2000***

In their paper, Iyengar and Lepper reported results from a series of three studies that they conducted in the field and in the laboratory. In the field study, data was collected on the sales floor of an upscale grocery store in Stanford, California. At the entrance to the store, the researchers set up a tasting booth with one brand of exotic jam (Wilkin & Sons) on two consecutive Saturdays. The booth displayed either a small assortment of 6 jams or a large assortment of 24 jams. The two different assortments were shifted on an hourly basis. While the large assortment contained all but the most common jam flavors of that brand, the jams in the small assortment consisted of the most, least, and medium attractive flavors. The attractiveness was determined by a pretest in which students rated the attractiveness of the flavors based on their names. On the days of the experiment, every consumer who approached the booth received a coupon to get 1 dollar off any jam of that brand. The coupons looked slightly different for the two experimental conditions. Therefore, by counting the number of redeemed

coupons at the cashiers' registers the researchers knew the percentage of customers who purchased a jam within each condition.

In line with the idea that people are attracted by large assortments, the authors found that more consumers approached the tasting booth when it showed the large assortment as compared to the small assortment. Yet, when it came to actual purchase, 30% of all consumers who saw the small assortment of 6 jams at the tasting display actually bought one of the jams (with a coupon), while in the comparison group that could taste from a large assortment of 24 jams, only 3% of the people redeemed a coupon for a jam. The authors interpreted this finding as an effect of too much choice such that too many options decreased the motivation to make a choice.

In the lab study, Iyengar and Lepper let two groups of participants choose one piece of chocolate to taste from an array of exotic Godiva chocolates (a Belgian chocolate brand). One group chose from 30 different Godiva chocolates (large assortment size), the other group from 6 different chocolates (small assortment size). As in the jam study, the 6 chocolate flavors in the small assortment were a subset of those in the large set. In extension to the jam study, the chocolate flavors from the large set were split into five small sets of 6 pieces each. These small sets were rotated between subjects so that at some point during the experiment each chocolate from the large set was also present in the small set.

In this study, participants who chose from the large assortment reported higher enjoyment of the decision than the participants who chose from the small assortment (6 vs. 4.7 on a 7-point Likert scale ranging from 1 [not at all] to 7 [extreme]). But at the same time, participants who chose from the large assortment reported higher difficulties (4.5 vs. 3.3) and more frustration (3.1 vs. 2.2) in making the decision and less satisfaction with the chocolate they finally chose (5.5 vs. 6.3). At the end of the experiment they were also less likely to accept a box of Godiva chocolate instead of money as compensation for their participation (12% vs. 48%, Cohen's  $d=0.88$ ). Iyengar and Lepper also found an effect of choice overload in a third study in which the quality of written essays decreased if the number of topics to choose from increased.

### ***Chernev, 2003b***

When people choose from different types of chocolate, Chernev (2003b) found that they are less confident with their decision when choosing from a large set of 16 chocolates as compared to a small set of 4 chocolates. In a series of two experiments, participants first had to choose a piece of chocolate and then were asked if they would like to switch to another piece that was recommended to them by the experimenter. Participants who chose from the set of 16 chocolates were more likely to switch compared to participants who chose from the set of 4 chocolates (82% vs. 74% in the first study; 75% vs. 69% in the second study; Cohen's  $d=0.23$  and  $0.22$ , respectively).

Insofar as switching indicates preference strength, these results can be interpreted as weaker preferences for options chosen from large assortments.

***Huberman, Iyengar, and Jiang, 2007***

Huberman et al. (2007) found that the more retirement plans people have to choose from, the lower their probability of investing their money in any one of them. In their study, they analyzed archival data from 647 companies that offered their employees (a total of 793,794) the opportunity to invest part of their income in defined pension plans, so-called 401(k) plans. A 401(k) plan consists of a finite number of investment options, and participation requires choosing among them. In Huberman et al.'s data set, the number of investment options within each company ranged from 2 to 59 and the median number per plan was 13. The percentage of employees participating in the pension plan with 5 options to choose from was 72%, whereas for 35 options, participation dropped to 67.5%.

It should be noted, however, that these are cross-sectional data that do not allow for any causal interpretation. While the authors statistically controlled for influences of gender, age, tenure, neighborhood wealth, and annual compensation, there are still other factors that might explain these differences. For example, the reasons why companies offer varying number of options remain unknown and so do the reasons people have for (not) participating in the plan.

***Reutskaja and Hogarth, 2005***

In another study on choice overload, Reutskaja and Hogarth (2005) looked at how much people's satisfaction with a hypothetical choice between gift boxes depends on the number of boxes being offered to them. In their experiments, participants saw either 5, 10, 15, or 30 gift boxes sketched on a computer screen in a between-subjects design. The boxes differed in shape and color. Participants were asked to examine the boxes and to state which one they would hypothetically buy to package a present for a friend. Next, participants were asked to rate their satisfaction with the choice process, the hypothetically chosen box, and the difficulty they experienced when making their decision. The items were similar to those used in Iyengar and Lepper's (2000) chocolate experiment outlined above. To explore potential differences between Western and Eastern Europe, participants were recruited in Spain, Ukraine, and Belarus. What Reutskaja and Hogarth found was that satisfaction with the chosen box followed an inverted U-shape: Satisfaction was highest for the 10- (Spanish sample) and the 15-option (Eastern European sample) sets. For smaller and, more importantly, also for larger set sizes, mean satisfaction ratings decreased. In both samples, the gradients for the satisfaction with the decision-making process followed a similar inverted U-shape form while the difficulty of making the choice monotonically increased with the size of the assortment.

***Shah and Wolford, 2007***

In the most recent study on the effect of too much choice, Shah and Wolford (2007) also found a curvilinear relationship between assortment size and the motivation to purchase. In their experiment, they offered participants the opportunity to purchase a black pen for a reduced price. The number of different pens to choose among was varied from 2 to 20 in increments of 2 pens. What they found was that for the lowest three assortment sizes of 2 to 6 pens, 46% of the participants purchased a pen. For the largest three sets between 16 and 20 pens, 33% purchased, while for the middle-sized assortments of 8–14 pens, the percentage of participants who purchased peaked at 70%.

**Tendency to avoid large assortments**

Along the same lines, a study by Lenton, Fasolo, and Todd (2005) suggests that in mate search, decision makers avoid overly large assortments and by this might protect themselves from having too much choice. In their study, decision makers were asked to imagine that they were presented with a list of potential mates to choose from, as in online dating. They were further asked to rate which of 10 different lists that ranged in size between one and 5,000 options they preferred. Most of the participants expressed a preference for lists that offered between 20 and 50 options. The lists that exceeded this size became increasingly unattractive, apparently because of higher expected choice difficulties.

**Too much choice in animals**

In his review, Hutchinson (2005) concluded that there is almost no evidence for choice overload in animals, which seems partly due to the fact that biologists have not explored this hypothesis so far. However, Hutchinson pointed out that according to Bernays (1999), some insects produce fewer eggs when presented with three different host plants as compared to only one. As a potential explanation, Bernays conjectured that in the presence of three plants, the animal was stimulated to move too often.

**A brief history of choice overload**

Even though it is rarely addressed in current publications, the idea of too much choice can be traced back to Aristotle, who asked how a dog faced with the choice of two equally tempting meals could rationally choose between them. In the 14<sup>th</sup> century, the French philosopher Jean Buridan took up this question and concluded that in such a situation a rational decision maker would delay the choice to further assess the possible outcomes. His idea is often exemplified as an ass between two hay stacks that starves to death because it cannot decide which one to approach (Zupko, 2003).

**Appetence conflicts**

In psychology, it was Kurt Lewin (1951) who argued that so-called *appetence–appetence* conflicts between equally attractive options may lead to procrastination and decision avoidance. Choosing between several options has also been seen as difficult

because most options then have to be forgone, which induces conflicting cognitions (Festinger, 1957). Building on this back in the early 1970s, the psychiatrist Zbigniew Lipowski (1970) extended the idea of choice conflict to more than two options. In what he called “the theory of attractive stimulus overload” he argued that the “massive output and variety of available material objects promoted by aggressive advertising” (p. 276) constitutes a situation in which decision makers are overwhelmed with attractive options. Lipowski argued that this situation would be specific to affluent industrial societies where individuals are confronted with a multitude of possible choices of career opportunities, living environments, styles of life, and modes of leisure. He further proposed that withdrawal from choice can be seen as a way to cope with the conflict arising from an overabundance of attractive alternatives and that this withdrawal can eventually lead to “passive pleasures of drug-induced altered states of consciousness” (p. 277).

### **Cognitive dissonance**

In the 1960s, Anderson, Taylor, and Holloway (1966) showed experimentally that when the number of options increases from two to five, decision makers consider fewer attributes per item and are more likely to choose an alternative that others have chosen before, even if it does not suit them very well. In a second experiment, Anderson et al. provided empirical evidence that post-decisional dissonance increases with the number of available options. Here, dissonance refers to the perceived incompatibility of two or more attitudes or behaviors. In this second study, dissonance was operationalized as an increase in the desirability rating for the selected product after the choice had been made—an effect also known as postdecisional spreading of alternatives. Dissonance was especially high in cases in which all four options were initially rated as about equally desirable. Anderson et al. further argued that dissonance can be taken as a proxy for increased discomfort and displeasure.

### **Early notions of too much choice**

Interestingly, in their 1966 article, Anderson et al. pointed to even earlier evidence for the attractiveness of large assortments. Alderson and Sessions (1957, cited in Anderson et al., 1966) found that “women shoppers are attracted to stores carrying a wide assortment of merchandise” (Anderson et al., p. 62). And as an early example of having too much choice, Anderson et al. also mentioned the department store Macy’s in Manhattan, which in those days offered 129 styles of men’s white dress shirts while Korvette, a competing chain, only offered 35<sup>1</sup>.

It is interesting to note that according to Anderson (2006), back in 1897 the Sears mail-order catalog listed 200,000 items including 67 different types of tea and 29 different types of cocoa. Thus, even though assortment sizes in many domains are

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<sup>1</sup> Perhaps tellingly, in 2007 Macy’s is still prospering while Korvette went out of business in 1980.

with no doubt bigger today than they were in the past, the phenomenon of large assortment sizes itself is hardly a new one.

### **Theoretical explanations of the too-much-choice effect**

Despite the growing body of empirical evidence in favor of the too-much-choice effect, its theoretical explanation is still sparse and thus far, promoters of the effect have put little effort into developing a coherent framework that explains when and why an increase in the number of options leads to negative consequences. This lack of theory is in sharp contrast to the numerous explanations for the opposite effect—in which decision makers benefit from an increase in assortment size—outlined above.

#### **Preference uncertainty**

According to Huberman et al. (2007), an increased number of options exacerbates a chooser's preference uncertainty. Yet unfortunately the authors did not elaborate on this statement. And as they did not explain what they meant by preference uncertainty, their explanation cannot be scrutinized or tested. Consequently, it cannot be ruled out that the concept of preference uncertainty is a mere redescription of the too-much-choice effect.

#### **Anticipated regret**

Besides decreased satisfaction and a decreased motivation to choose, the experience of regret, as well as the negative emotions that go along with it, is commonly seen as one indicator of having too much choice. The concepts of satisfaction and regret are akin. Regret and the closely related concept of counterfactual thinking (thoughts of what might have been) influence people's satisfaction with an outcome. For example, despite their objectively better outcome, Olympic athletes who win a silver medal seem to be less happy than athletes who win a bronze medal (Medvec, Madey, & Gilovich, 1995). Medvec et al. reckoned that this is due to the ease with which counterfactual alternatives can be generated such that silver medalists are more likely to compare their outcome to the missed gold medal whereas bronze medalists are more likely to engage in downward comparison.

According to regret theory (Bell, 1982), disappointment theory (Loomes & Sugden, 1982), and also dissonance theory (Festinger, 1957), decisions will often be made so as to minimize the anticipated feeling of post-choice regret and disappointment (Zeelenberg, van Dijk, Manstead, & van der Pligt, 2000). Building on this, scholars have argued that the decreased motivation to choose due to choice overload can be explained by anticipated feelings of regret for the expected decision outcome (Botti & Iyengar, 2006; Schwartz, 2004). The line of argumentation goes as follows:

When choosing from an assortment, the number of options that will not be chosen increases with the size of the assortment. Furthermore, the more options that will be forgone, the higher the probability of missing a better option, which is likely to

increase anticipated regret (cf. Festinger, 1957). Empirical evidence suggest that the subjective feeling of loss increases when the number of forgone options increases from one to two (Carmon, Wertebroch, & Zeelenberg, 2003). Ayton (2000) envisioned one possible manifestation of this phenomenon: people with cable TV who spend all evening channel hopping because they are afraid they might be missing something.

As Schwartz (2004) has pointed out, one way to prevent regret is by choosing the best possible option. Yet this goal becomes harder with an increase in assortment size, because the more options there are, the more search will be necessary to find the best option. Another way to prevent anticipated regret and disappointment in a given decision situation might be to avoid making the decision at all (Beattie, Baron, Hershey, & Spranca, 1994; Inman & Zeelenberg, 2002).

However, as with preference uncertainty, the explanation of too much choice based on regret contains the danger of being circular: If satisfaction and regret are two sides of the same coin and satisfaction is the measure with which the effect of choice overload is diagnosed, little insight is gained by explaining overload with regret.

#### **Prevention of preference matching**

Another explanation of the too-much-choice effect is that an increased number of options hinders choosers' ability to identify the option that matches their preferences (Huberman et al., 2007). However, this explanation assumes that the decision maker already has preferences prior to choice. As will be outlined in more detail in the following section, this explanation contradicts a basic assumption of most research on choice overload, including the work of Iyengar and Lepper (2000), which is that in order to elicit the effect of too much choice, one needs a situation in which decision makers do not have well-defined prior preferences.

#### **Lack of prior preferences as a necessary precondition**

All the studies outlined above were based on situations and options that participants were not familiar with. In line with this, an important precondition of the too-much-choice effect seems to be the lack of clear goals or preferences prior to choice.

#### ***Empirical evidence for the importance of prior preferences***

Roy O. Disney, cofounder of The Walt Disney Company, once said that "it's not hard to make decisions when you know what your values are." Likewise, previous research has shown that having prior preferences and predefined goals makes it easier and more satisfactory to choose from complex environments, provided that people's preferences can be matched. And the probability that these prior preferences can indeed be matched rises with the number of available options (Kahn, 1995).

Chernev (2003a) showed in a series of experiments that for people with preferences prior to choice (or "ideal points" as he terms them), the probability of choosing and satisfaction with the choice increase with assortment size. The author

suggested that when people have a certain idea of what they want, they benefit from a large assortment because it makes it more likely they will find what they have in mind. For people without prior preferences, he found the opposite effect. In his experiments, prior to choice all participants were informed about the assortment structure and the relevant attributes. Prior preferences were experimentally induced by instructing some of the participants to think about and articulate which combination of attributes they liked best.

Likewise, in an experiment by Huffman and Kahn (1998) participants saw descriptions of either hotels or sofas that were described on many attributes. While people in one condition were instructed to familiarize themselves with the attributes and the different attribute levels, people in the other condition were instructed to think about their preferred level within each attribute. In a subsequent (hypothetical) choice, people in the latter group were more satisfied with the outcome of their decisions.

Similar results were also obtained by Mogilner et al. (2006, Experiment 2). In their study, participants chose from an assortment of 144 different magazines. Half of the participants were instructed to choose a magazine they regularly read, which corresponds to the case of predefined goals in Huffman and Kahn's study. The other half were instructed to choose a magazine that they did not regularly read, to prevent prior preferences. When asked about their satisfaction with the choice, the latter group without prior preferences was less satisfied. However, this result is not that surprising because it seems reasonable to assume that people regularly read those magazines that they like most.

### ***Critical evaluation of prior preferences as an explanation for choice overload***

Despite the shortcomings of some of the empirical studies outlined above, from a conceptual perspective, it seems reasonable that without clear goals on hand, individual preferences first have to be constructed by relying on information offered by the choice context. Also, in this case options need to be compared relative to each other, whereas decision makers with a clearly defined preference already have a reference point at hand that they could use. With regard to the search strategy, Payne, Bettman, and Johnson (1992) conjectured that prior preferences lead to a very selective search in which people look for an option that matches their needs, terminate the search as soon as the desired option is found, and neglect the remaining assortment.

Taken together, there are convincing arguments that prior preferences can prevent choice overload. Also, it seems reasonable that choosing without any prior preferences requires additional effort because decision makers first might want to learn about the distribution of a given assortment and construct their preferences before they make a choice (Fischhoff, 1991). As the choice process becomes more difficult, uncertainty might increase, which in turn might decrease satisfaction and/or the motivation to choose.

However, even if satisfaction decreases due to a lack of prior preferences, this does not necessarily imply that it decreases even further with a growing assortment size. As a consequence, even though the lack of prior preferences is a necessary condition for the too-much-choice effect, this is not sufficient to explain the effect. Maybe learning about a distribution or the construction of preferences becomes harder or less accurate with more options to learn about. If this drives the effect, it would imply that individuals will not be able to shield themselves from additional information about options, and some scholars argue that individuals indeed cannot elide additional options (Schwartz, 2004).

Even though explaining choice overload through the lack of prior preferences requires several auxiliary assumptions, compared to studies that merely look at the effect of assortment size, the research on ideal points and prior preferences is a conceptual advancement because it explicitly addresses individual differences as well as aspects of the underlying search and decision strategies. According to Brunswik (1955) and Simon (1955), a mere focus on the environment only provides an insufficient picture of most if not all psychological phenomena, while looking at the interaction between environment on the one hand and the individual that acts within that environment on the other is a much more fruitful approach. I will elaborate on the interaction between environment and decision strategies in more detail in the General Discussion in Chapter V.

### **Conflict and trade-off aversion**

Another attempt to find a theoretical explanation for the effect of too much choice is to link it to the well-established finding showing that decision makers tend to avoid decisions that involve trade-offs due to conflicting attributes between options.

#### ***Empirical evidence of trade-off aversion***

In a seminal paper on the effect of conflict on choice, Tversky and Shafir (1992) found that when deciding between two options people were more likely to defer choice when trade-offs had to be made as compared to a situation where one option dominated the other (such that one option was superior in every aspect). In their experiment, one group of participants were offered a hypothetical choice between buying a low-quality Sony CD player for \$99 and buying nothing. A second group of participants were given a choice between the same low-quality Sony CD player for \$99, a high-quality Aiwa CD player for \$159, and nothing. They found that 34% of the participants chose nothing in the first group whereas in the second group, 46% of the participants chose nothing. The only difference between the two groups was the presence of an additional option (the Aiwa CD player), which presumably led to a conflict situation such that participants in the second group had to trade off quality against price; as a consequence, the motivation to choose any of the options was diminished. As an alternative explanation, it could be that the second option informed the participants that there was a wider range to choose from and that further search would be worthwhile.

This latter explanation does not really fit with the results of a second study by Tversky and Shafir. Participants in this study received \$1.50 as compensation for their participation in a previous, unrelated study. Subsequently, one group of participants got an offer to exchange the money for a metal pen; the other group got an offer to exchange the money for the same metal pen or for a plastic pen that was similar in quality. Similar to the results of the first study, participants in the latter group were more likely to keep their money (53%) compared to participants in the first group, where only 25% kept their money.

Tversky and Shafir's findings of trade-off aversion were successfully replicated in other choice situations including medical decision making (Redelmeier & Shafir, 1995), consumer decisions for such things as light bulbs, CD changers, or cordless phones (Hsee & Leclerc, 1998), as well as choices among lotteries (Roe, Busemeyer, & Townsend, 2001).

In a series of experiments, Dhar (1997) found that the number of pre-choice thoughts people reported in a think-aloud protocol was much larger when two options were conflicting as compared to a situation in which one option dominated the other. Also, in his experiments there was no increase in deferral when participants could avoid the trade-off by choosing both options rather than only one.

From the perspective of the coping literature, these examples of omission and deferral outlined above could also be understood as a defensive-avoidant coping strategy to escape difficult situations (Janis & Mann, 1977; Lazarus, 1966). In line with this interpretation, the tendency to defer choice is pronounced in cases in which sacred or highly consequential outcomes have to be traded off against each other, such as the desire for environmental friendliness and safety when purchasing a car (Luce, Bettman, & Payne, 1999).

### ***Trade-offs and choice overload***

Taken together, these results suggest that an increase in conflict or trade-offs can increase the tendency to avoid making a choice. While the studies on trade-off aversion are commonly based on choices between two options, supporters of the too-much-choice hypothesis have also argued that, similar to the notion of regret, when the number of options within a choice set increases, so do the number of trade-offs within that set (Shanteau & Thomas, 2000), and as I will outline below, numerous experimental results indicate that the tendency to avoid choice can increase with the addition of alternatives due to trade-offs. But before I outline the nature of this relationship in more detail, I will elaborate on what is commonly meant by the term trade-offs and the closely related concept of conflict.

### ***The concepts of trade-off and conflict***

Conflict does not have a standard formal definition (Tversky & Shafir, 1992; Dhar, 1997). Yet it is generally assumed that a conflict between two options arises if

choosing between them implies that some advantageous aspects will eventually be forsaken. This would be the case if one option is better or more desirable on one attribute (e.g. price) while the other option is better on another attribute (e.g. quality) or if both of them hold unique and attractive features. Conflict implies that when making a choice in such a situation, trade-offs between attributes or attribute values are an unavoidable necessity, which is why the terms trade-off and conflict are often used interchangeably in the literature.

***Conflict and negative correlation***

One way to formally express conflict is by calculating correlation coefficients between two attributes across all options within an assortment (e.g. Bettman, Johnson, Luce, & Payne, 1993). Yet correlations are just an approximate measure of conflict and the coefficients are difficult to interpret. If the correlation is negative, at least some options must conflict. Still, as long as the correlation is not  $r=-1.0$  (i.e. perfect negative correlation), there can be some options that dominate others such that they are better on both attributes. In theory, even if the overall correlation is negative, one option could still dominate all the others, rendering the decision easy (Figure 2A). Also, at least with regard to Pearson's correlation coefficients, it can be the case that there are no dominant options even though the correlation is not "perfect" ( $|r| \neq 1$ ; Figure 2B). Similarly, if the correlation is positive, at least some dominated options must exist. Yet, as long as the positive correlation is not perfect (if it does not equal 1.0), it can still be the case that there is no option that dominates all others (Figure 2C).

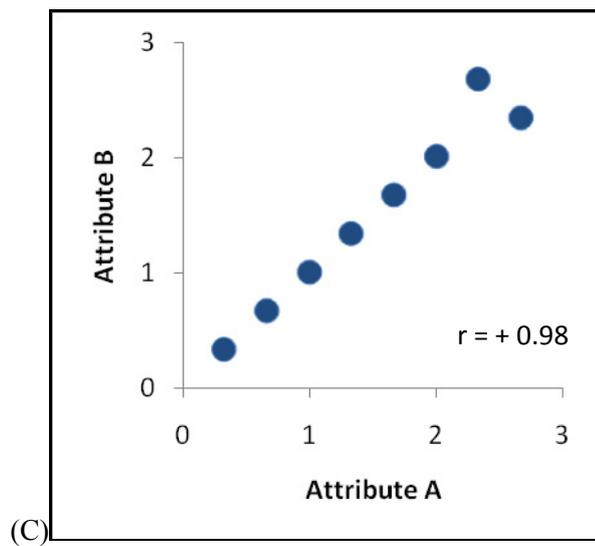
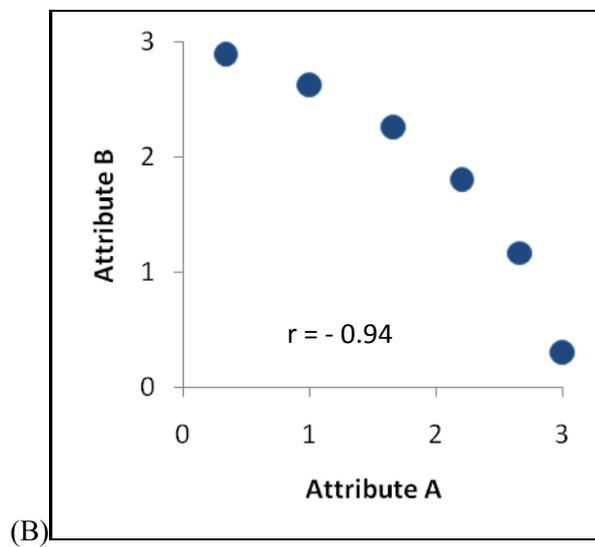
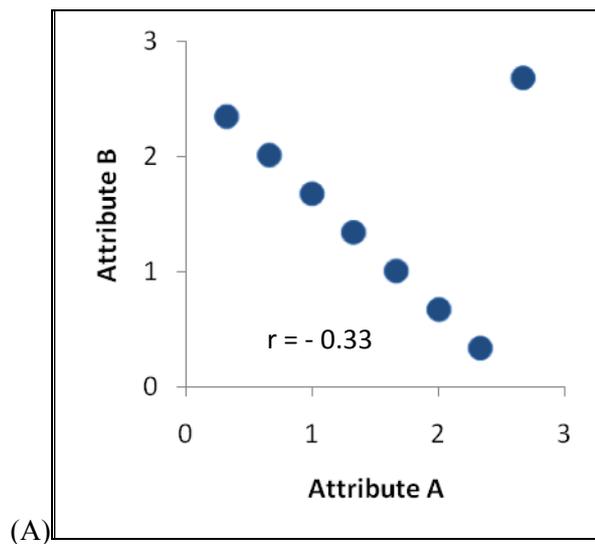


Figure 2: Relationships between options on two attributes.

***Alternative ways to measure conflict***

To overcome these measurement problems, one could calculate Goodman and Kruskal's gamma between pairs of options (Goodman & Kruskal, 1954). To calculate gamma, all possible pairs of attributes on which the options conflict are summed up and designated as  $D$ . Likewise, the number of pairs that are in concordance are summed up and designated as  $C$ . A pair of attributes is said to conflict if each option is better than the other on one attribute. Concordances occur if one option is better on both attributes and thus locally dominates the other. The total number of pairs can be calculated as

$$\frac{a \cdot (a - 1)}{2} \tag{1-1}$$

where  $a$  is the number of different attributes. The difference between the two measures is then divided by the sum of both measures:

$$\gamma = \frac{(C - D)}{(C + D)} \tag{1-2}$$

Thus, cases in which two options have similar attribute values are not taken into account. This measure can be interpreted as the degree to which one option dominates the other. For perfect dominance, gamma would equal 1, and the higher the conflict, the lower the gamma coefficient.

For attributes that are nominal rather than ordinal, van Herpen and Pieters (2002) calculated lambda coefficients between two attributes (Goodman & Kruskal, 1954). The lambda coefficient denotes the proportion by which the error in predicting one attribute is reduced when the other attribute is known, compared to a situation where the other attribute is unknown. A lambda of zero indicates that there is no relationship between two attributes whereas a lambda of one indicates a perfect association.

Yet another way to measure conflict is to calculate the fraction of options that are nondominated. For an option to be nondominated, no other option can be found that is superior on every aspect or attribute (Fasolo, McClelland, & Todd, 2007). For example, in Figure 2A, only one option is nondominated, which indicates zero conflict, whereas in Figure 2B, all of the options are nondominated, indicating high conflict.

***Critical evaluation of trade-off aversion as an explanation for choice overload***

Taken together, it seems plausible that conflict and trade-offs between options are a necessary precondition for the too-much-choice effect. Yet this is not to say that the number of trade-offs necessarily increases with the number of options. For example, if dominated options are added that are worse than at least one other option in every attribute, the number of trade-offs will not change because the dominated alternative need not be considered anyhow. Likewise, if a dominant option is added that is better

than all the other options in every attribute, no trade-offs have to be made when choosing the dominant option. Furthermore, even if conflict leads to deferral and avoidance of choice, it does not follow that more conflict leads to more deferral and avoidance of choice, yet this would be necessary for the too-much-choice effect to occur.

To test if the number of conflicts matters, Dhar (1997) conducted two experiments in which he manipulated the number of conflicting attributes between two consumer products. What he found was that choice deferral did not increase with the number of trade-offs and that having to make a single attribute trade-off is already sufficient to decrease the motivation to choose. While these results question the idea that an increase in the number of trade-offs can account for the too-much-choice effect, one study might not be enough to draw a firm conclusion. Also, it is likely that it is not the number of trade-offs per se that matters but also the magnitude of the difference and the importance of the conflicting attributes, making it difficult to draw any final conclusions.

#### **Difficulty discriminating between options**

Another explanation of the too-much-choice effect by Iyengar and Jiang (2004) is based on the notion that options get more similar with an increase in assortment size, which makes it harder to distinguish between them. Because of this, the authors argue that the “fear of not being able to choose optimally” (p. 4) will increase. While not explicitly stated, this explanation seems to imply that decision makers seek to identify the optimal option according to some predefined standard. As I will outline in more detail below, the idea that people strive to find the optimum is at odds with several psychological concepts that are empirically and theoretically well established, including Simon’s (1955) notion of “satisficing”, the concept of adaptive decision making (Payne et al., 1992), and the framework of fast and frugal heuristics (Gigerenzer, Todd, & the ABC Research Group, 1999). In short, all three concepts suggest that decision makers adapt to changes in the environment by making use of fast and frugal heuristics. As a consequence, they are expected to remain fully capable of acting under a wide range of different situations, including an increase in the number of options to choose from.

#### **Failure to adapt the decision strategy**

Botti and Iyengar argued that in contrast to the idea that decision strategies are adapted to the environment in which they are applied, simple heuristics “may incorrectly eliminate valuable options,” which in turn would lead to “suboptimal decisions and subsequent dissatisfying outcomes” (2006, p. 13). If so, the effect of too much choice would result from a specific interaction between the decision strategy on one side and the environmental structure, including the number of options to choose from, on the other. As mentioned above, there is a considerable body of literature that explicitly addresses this relationship.

Hence, in order to evaluate Botti and Iyengar's claim, I will review the literature on adaptive decision making with a special emphasis on the number of options. As I will outline in more detail below, I found little empirical or conceptual evidence to support Botti and Iyengar's claim.

## **Too much choice and the notion of adaptive decision heuristics**

According to the notion of humans as adaptive decision makers, people in daily life are well adapted to proliferating choices. For example, Postrel (2005) suggested that abundant choice does not force us to look for the absolute best of everything but allows us to find the extremes in those things we really care about. As an example, she pointed out that even 20 years after phone deregulation, 60% of all U.S. consumers were with AT&T, the former monopolist. This inertia to change the service despite a multitude of different options could be due to the fact that most people are simply satisfied with their status quo, an instance of Herbert Simon's idea of satisficing.

### **Satisficing**

The notion of satisficing (Simon, 1955, 1956) suggests that in most cases, assortment size will hardly have any effect on either satisfaction or motivation and thus no choice overload should occur because "an organism may make its choice within a set of alternatives more limited than the whole range objectively available to it" (Simon, 1955, p. 102). Satisficing, in contrast to optimizing, assumes that humans only possess limited information and limited computational facilities. Because of these constraints, optimizing is unfeasible and the rational thing to do is to find solutions that are satisfactory in that they exceed a certain aspiration level. (Simon, 1955). The aspiration level is formed based on experience of how good a solution one might reasonably achieve (Simon, 1990). Simon (1956) hypothesized that decision-making agents find these solutions by making use of cues, or "clues" as Simon (1956) called them, and other structural characteristics of the environment in which they operate. Satisficing further assumes that options are evaluated sequentially and that the first option that exceeds the aspiration threshold will be chosen. As a consequence, usually only a few options are considered before a choice is made and no trade-offs between advantages and disadvantages are made. Simon (1990) stated that "picking the first satisfactory alternative solves the problem of making a choice whenever an enormous, or even potentially infinite, number of alternatives are to be compared" (p. 9).

On the other hand, a decision maker who aims to optimize would consider as many options as possible before making a final decision. Satisficing also implies that each option is evaluated relative to some aspiration level while optimizing would require a relative comparison between the options.

According to Janis and Mann (1977), the notion of satisficing can also describe the situation in which a decision maker considers only a few, albeit important attributes. In contrast, an optimizing strategy would typically be based on a weighted

additive model in which the magnitude and importance of each dimension is taken into account and possible trade-offs need to be considered.

In line with the notion of satisficing, research on consumer behavior has found that people in shops often buy products “on impulse”: A consumer notices something she finds attractive and if its price is within a reasonable range she immediately decides to buy it (Rook, 1987). Taken together, if Simon is correct in that his theory is descriptive of human decision making, people would usually follow a satisficing strategy that should shield them from being overloaded.

### **Adaptive decision making**

The research on adaptive decision making (Gigerenzer et al., 1999; Payne et al., 1992) also suggests that people are capable of reasonable choices even if the number of options and the amount of information gets large. As an example, one would expect that decision makers become pickier when the assortment is large and lower their expectations when choices are few. Consequently, the probability of making a choice would remain constant and no too-much-choice effect would be found with respect to choice.

From this perspective, the empirical findings of choice overload could be interpreted as a failure to adapt the decision strategy to the current situation. If people do not have a strategy to handle the situation they face, deferring the choice might be more likely. In extension to this, if human decision makers have (evolved or learned) heuristics available that protect them from experiencing choice overload for common everyday assortment sizes, it might be a necessary precondition for the too-much-choice effect that, unlike the definition of Iyengar and Lepper (2000), the assortment exceeds ecologically usual sizes so that people face situations in which they cannot make use of their evolved simple heuristics. Such an interpretation would also be in line with Simon, who conjectured that “conflict of choice may often be equivalent to an absence of a choice mechanism in the given situation” (1956, p. 137) but that the organism seldom encounters such situations in its natural environment (see also Gigerenzer et al., 1999).

It should be noted here that this latter explanation of too much choice is essentially different from Botti and Iyengar’s hypothesis above. While according to Botti and Iyengar the effect occurs due to the utilization of a simple heuristic, from the perspective of humans as adaptive decision makers, the effect would occur due to a lack thereof.

### **Further empirical evidence on the too-much-choice effect**

In line with the notion of humans as adaptive decision makers, there are a few studies that did not find any effect of the number of options on either satisfaction or the motivation to make a choice. Given that finding no effect on the number of options is

commonly not regarded as a very surprising result, the data outlined below is often hidden behind other findings and main effects.

**Lenton, Fasolo, and Todd, 2005**

Lenton et al. (2005) did not find any difference between choosing from a small assortment and choosing from a large assortment with regard to the difficulty of choosing, the satisfaction with the chosen option, and the experience of post-choice regret. In their experiment, students were asked to browse through a mock dating website that consisted of either 4 or 20 profiles in a between-subjects design. After looking at all the profiles, participants were asked to select the mate they preferred most. Their results are in line with the idea that participants had a strategy available that shielded them from being overloaded with too many options. However, in their study the authors did not explicitly test the use of strategies.

**Mogilner, Rudnick, and Iyengar, 2006**

Likewise, for people choosing among different numbers of printed magazines in a supermarket, Mogilner et al. (2006, Study 1) did not find any effect of actual (vs. perceived) assortment size on satisfaction with the shopping experience. In their study, they administered questionnaires to regular customers at different branches of a high-end supermarket chain that offered various numbers of magazines. At each store, consumers rated how satisfied they were while shopping for a magazine and they also rated the amount of choice they subjectively perceived. What they found was that the perceived amount of choice was a good predictor of choice satisfaction, such that more perceived choice led to more satisfaction while the actual number of magazines offered by the store did not affect consumers' satisfaction. It should be noted, however, that the number of magazines was not experimentally controlled but pre-determined by the store management. While this makes it more ecologically valid, the study follows a correlational design that does not allow for any causal interpretations.

In a more controlled experimental design (Mogilner et al., 2006, Study 3), the researchers still did not find an effect of the number of options on satisfaction with the chosen options. Participants in this experiment chose a cup of coffee from one of two menus in a between-subjects design. One menu listed 5 different coffee flavors while the other listed 50 different flavors. After their choice, participants received a cup of coffee and subsequently rated the taste of the coffee and their satisfaction with their choice. In this experiment, people were deceived into believing that they received the flavor of their choice, whereas in fact everyone got the same type of coffee. Besides the fact that the authors do not disclose if they informed participants about the deception at the end of the experiment, scholars have argued that deception might actually impair internal and external experimental validity (Ortmann & Hertwig, 2002).

Despite these methodological concerns and the lack of a main effect, Mogilner et al. (2006) did find an effect of too much choice in parts of their sample data: For

people who described themselves as having relatively little knowledge about coffee, the satisfaction with a choice from the small assortment was slightly higher compared to a choice from the large assortment. On the other hand, people who were relatively knowledgeable and usually drank a lot of coffee were largely unaffected by the number of options. This finding is in line with the findings outlined above saying that a lack of prior preferences is a necessary precondition for the effect to occur. Notwithstanding the results, it seems surprising that alleged coffee experts did not recognize that they got served a different coffee than the one they chose. Yet, the study outlined next indicates that even for a task that people usually do not face every day and for which they might not have specific expertise, the effect of too much choice is not always found.

#### **Haynes and Olson, 2007**

Participants in a study by Haynes and Olson (2007, Study 1) were asked to imagine that they won a lottery and that they could choose among different prizes. The number of prizes to choose from was subject to experimental manipulation. What they found was that participants who chose from 10 options found the task more enjoyable but also more difficult and more frustrating than participants who chose from 3 options. There was also a small effect of assortment size on satisfaction with the finally chosen hypothetical option (Cohen's  $d = 0.44$ ). However, in a follow-up study with a small assortment of 5 options and a large assortment of 20 options (Haynes & Olson, 2007, Study 2), the effect of assortment size on satisfaction disappeared (Cohen's  $d = -0.2$ ). While it is not clear what caused these differences in the results, it can at least be concluded that even though participants faced a decision that was rather exotic, the effect was not always found.

### **Theoretical implications of the too-much-choice effect**

From a theoretical point of view, a possible effect of choice overload is important for our understanding of human rationality and the concept of liberty as the freedom of choice.

#### **Violation of regularity**

The too-much-choice effect challenges the assumptions of rational choice theory (Savage, 1954) in that it violates regularity. The regularity axiom does not claim that large assortments are necessarily better than small ones but dictates that increasing variety should never lead to less choice. More precisely, it states that the preference for (and hence potential choice share of) a given product cannot be increased by including an alternative product in the choice set. Expressed formally, let  $p(z | \{z,x\})$  be the probability of choosing option  $z$  from the set  $\{z,x\}$  and let  $p(z | \{z,x,y\})$  be the probability of choosing option  $z$  from the set  $\{z,y,x\}$ . According to regularity,  $p(z | \{z,x,y\})$  cannot exceed  $p(z | \{z,x\})$ . The violation becomes obvious if  $z$  represents "choose nothing" and  $y$  represents a large number of alternative options: The probability of choosing nothing if presented with many options,  $p(z | \{z,x,y\})$ , cannot,

according to regularity, be greater than the probability of choosing nothing rather than  $x$  alone,  $p(z | \{z,x\})$ —and yet the too-much-choice effect says sometimes it is.

### **Cognitive models of choice**

The effect of too much choice challenges many cognitive models of preferential choice for at least two reasons: First, most of the models assume that one option will eventually be chosen. For these models, predicting “no-choice” would require specifying the no-choice option as one explicit alternative among many. For example, to incorporate no-choice into a weighted additive model, one would need to know precise attribute values for the no-choice option, which in most cases seems unfeasible. Process models of preferential choice, such as the elimination-by-aspects model (Tversky, 1972), that, similar to the notion of satisficing outlined above, assume a step-wise information search in which options are sequentially screened and subsequently eliminated if they do not exceed certain thresholds can predict no-choice for cases in which none of the options meets the necessary criteria. Yet for the latter class of models, the probability that all necessary criteria are met will usually increase with the number of options. I will come back to the relationship between choice models and too much choice in further detail in the General Discussion in Chapter V.

### **Violation of Pareto efficiency**

By adding options, for instance, by widening the range of consumer products within a certain category, it can be expected that some people will eventually be better off because their preferences can be satisfied to a higher degree. If at the same time, no one is worse off, Schwartz (2007) laid out that a larger assortment of options is Pareto efficient. The too-much-choice effect challenges the Pareto efficiency of large assortments because it predicts a decrease in the motivation to choose and thus makes some people worse off when the number of options increases.

Finally, insofar as individual freedom is defined as the ability to choose unconstrained by external or internal forces, adding options should remove constraints and thus increase freedom. But because it leads to decreased choice motivation and satisfaction, the too-much-choice effect suggests an antagonism between amount of choice and its constraining influences that reaches into philosophical debates on the understanding of freedom.

### **Too much choice and freedom of choice**

It is commonly agreed that humans have a desire for personal control and self-determination. At least in the United States, “free choice” ranks among the highest values (Rokeach & Ball-Rokeach, 1989; Schwartz, Markus, & Snibbe, 2006). In order for a choice to be free, it is a necessary condition that a person could have done otherwise. As a consequence, having more than one alternative is required for a free choice. This is not to say that having more alternatives would further increase individual freedom. Yet this latter proposition could be deduced from the writings of

the philosopher Isaiah Berlin (1969), according to whom freedom derives from the wish to be self-directed, such that decisions depend on oneself rather than on external forces of whatever kind. From this perspective, having many options to choose from could be seen as an increase in individual freedom because the more options there are, the fewer external forces one has to deal with. Accordingly, some philosophers explicitly conflate the number of options to choose from on one hand and individual freedom on the other (Steiner, 1975, cited in Dowding, 1992). Yet according to the effect of too much choice, having too many options decreases the motivation to choose and thus eventually constrains people's ability to make a decision. From this perspective, a further increase in the number of options would decrease individual freedom, calling into question the concept of individual freedom outlined above.

The coalescence of freedom and choice has been questioned by other philosophers who argue that the range of physical possibilities from which a person can choose at a given moment has no direct relevance to freedom (Hayek, 1960). As an example, Hayek described a rock climber who sees only one way out to save his life and thus is unquestionably free even though he has hardly any choice. Likewise, Milton Friedman (1990) described a situation in which an armed robber offers a victim the choice between money and life as an example of a situation in which people are not free despite multiple options to choose from. Dowding concluded that it is not the number of options per se that increases a person's freedom. Rather, it is getting what one wants. From this perspective, a mere increase in the number of options does not increase freedom in the first place, and as a consequence, any opposition between freedom and choice overload would be dissolved.

#### ***Alternative views on the concept of freedom***

Schwartz (2000) conceptualized freedom of choice as a two-edged sword with liberation on one side and chaos on the other. In Schwartz's terms, freedom is chaos when it is unconstrained, resulting in tyranny and anxiety.

Building on this dichotomy, Schwartz et al., (2006) reported evidence that especially students from working-class families associated the word "choice" with the concepts of "fear," "doubt," and "difficulty," while students whose parents had a college degree were more likely to associate "choice" with "freedom," "action," and "control." In another series of studies, Schwartz et al. (2006) reported evidence that middle-class Americans were more satisfied with a pen or a music CD if they chose it themselves than if someone else chose it for them. For working-class Americans, satisfaction was independent of who made the choice. Schwartz et al. argued that these data reflect divergent conceptions of freedom, such that for the middle-class Americans, freedom was the *freedom to* make a free choice, whereas for the working-class Americans, it was the *freedom from* having to make a choice. From this perspective, not to make a choice when facing many options would be a liberating act itself, as it frees a person from making a decision. In the long run, it is questionable, though, how much freedom from choosing will be appreciated. At least it is hard to

imagine that a person who is patronized such that all choices are made on his behalf would actually feel free.

## **Practical and applied implications**

In addition to examining its theoretical implications, exploring the extent of the too-much-choice effect is important because of its practical implications for public policy making and related fields. Free choice is one of the hallmarks of free market economies. For example, since the 1990s, the World Bank (1994) has advocated a libertarian policy in which government-provided age pensions are supplemented by private retirement savings to face the challenges of an aging population. In countries that changed their retirement system accordingly, including Germany, Australia, and Sweden, to name only a few, people can choose from a plenitude of financial products (Gallery & Gallery, 2005; Hedesström, Svedsäter, & Gärling, 2007). Likewise, as governments turn to privatization and liberalism, a similar development holds true for health insurance and utilities such as electricity and gas. While the rationale of these measures is to increase competition and participation, the effect of too much choice suggests that an overabundance of alternatives will lead to the opposite effect.

As mentioned above, the results of Huberman et al. (2007) suggest that too many investment options to choose from in a 401(k) plan might decrease participation in these programs, which in turn would lead to a decrease in the quality of life after retirement. Also, many important decisions are made in interaction with an expert who controls the number of options being offered. In these situations, a better understanding of the too-much-choice effect will help the expert—be it a doctor presenting different medical treatments or a used-car dealer who wants to increase sales—guide people to making better decisions.

The question of whether limiting choice can increase social welfare was also raised by Hanoch and Rice (2006). They hypothesized that especially for elderly citizens in the United States, where health insurance is somewhat discretionary, an increase in the number of health plans leads to a lower participation rate and/or insufficient coverage. Hanoch and Rice further conjectured that the recent attempts of public policy makers to increase participation of the elderly in prescription drug discount plans (an insurance that partly covers the costs of prescribed drugs) mainly failed because the number of available plans might have been too high and therefore too confusing. To overcome these problems the authors suggested following the advice of Sunstein and Thaler (2003), who raised the possibility of “libertarian paternalism.” Often seen as an oxymoron, libertarian paternalists, according to Sunstein and Thaler, should attempt to steer people’s choice in welfare-promoting directions while also respecting their freedom of choice. Among other measures, they suggest that one way to do this would be to restrict the choice being offered. Yet as pointed out by Berg and Gigerenzer (2007), links between psychological theories and arguments concerning paternalism (including libertarian paternalism) rest on a

selective account of the psychological literature and rely on a definition of rationality that most likely is too narrow.

In extension to the debate on public policy making, other social scientists recently connected the increase in choices within modern market democracies directly to a decrease in well being. In his book on the loss of happiness in market democracies (which is dedicated to all unhappy people, wherever they may be), the political scientist Robert Lane (2000) regards the overabundance of options in consumer markets as one reason for the decline in mean happiness in the United States. According to Lane, “choices proliferate beyond our pleasure in choosing and our capacity to handle the choices” (p. 181). It should be noted, however, that this reasoning is somewhat reminiscent of the line of argumentation by Lipowski (1970), outlined above, and from the perspective of choice proponents such as Anderson (2006) or Postrel (2005), it might be interpreted as a post-hoc rationalization of a general scepticism toward societal trends of modernization and diversification.

## **General Discussion**

The effect of too much choice challenges many theoretical models of choice and has important practical and theoretical implications. At the same time, there is an apparent lack of compelling theory and no model that explains when and why the effect will occur. Therefore, in the following chapter, I will argue that a more precise theoretical model is needed that predicts when and why the effect of too much choice will occur. Furthermore, the mixed empirical evidence for and against the too-much-choice effect means that a replication of the effect is required as a basis for theory building.

## **Chapter II:**

# **Testing the generalizability of the choice overload hypothesis**

As outlined in the previous chapter, the effect of too much choice has important practical and theoretical implications, yet its theoretical underpinnings are debated. Likewise, even though its empirical foundation is growing, there are also a number of divergent findings. These conceptual shortcomings are in contrast with the increasing amount of attention the effect has received from both inside and outside psychology (Botti & Iyengar, 2006; Kuksov & Villas-Boas, 2005; Lane, 2000; Mick et al., 2004; Schwartz, 2004).

### **Need for a model**

Clearly, a precise and testable model of the underlying psychological processes and mechanisms would be highly desirable. Yet, before starting to build such a model, it is important to ensure that the effect of too much choice is robust and replicable. This is especially important given that, as mentioned in Chapter I, there is a considerable body of empirical evidence backed by sound theoretical arguments that speak in favor of large assortments.

### **Need for replication**

According to the statistician Ronald Fisher, “no isolated experiment, however significant in itself, can suffice for the experimental demonstration of any natural phenomenon” (Fisher, 1971, p. 13). Along the same lines, Levin (1998) proposed that “instead of measuring the quality of research by the level of significance, it would be better judged by its consistency of results in repeated experiments” (p. 92). Similarly, other scholars argue that scientific findings rest upon replication and they recommend skepticism about nonreplicated results (Evanschitzky, Baumgarth, Hubbard, & Armstrong, 2007). Following these calls, I will subsequently describe a series of three studies that were intended to empirically test the replicability of the effect of too much choice across different contexts and choice situations in the lab and in the field.

## **Jam study**

### **Introduction**

To test the generalizability of the too-much-choice effect across different contexts, I first sought a situation in which the a priori probability of finding the effect would be high. In the jam study reported by Iyengar and Lepper (2000), 3% of people exposed to the large assortment made a purchase versus 30% of those exposed to the small assortment. The corresponding effect size is  $d=0.77$ , which Cohen (1977) operationally defines as a large effect. Therefore, I strived to replicate that study as closely as possible.

## Method

### *Experimental setup*

My experimental setup closely followed the one described by Iyengar and Lepper (2000, Study 1). The study took place on two consecutive Saturdays on the sales floor of an upscale grocery store in Berlin that is famous for its extraordinary assortment size. At the entrance to the store a table was placed on which a variable number of jams in jars were displayed. To reduce the chances of participants having strong prior preferences, I chose a brand of high-quality jam (*Lafayette Confiture*) that offers many different exotic flavors and that was only sold at that particular store. The jars were lined up in random order. The name of the flavor was written on the jar and on a paper tag in front of it. A sign above the table invited customers to stop and taste the jams. Each customer who stopped at the table received a coupon, valid for one week, to purchase any Lafayette Confiture for a reduced price. Jams for purchase were found on a shelf elsewhere in the store. On each Saturday, the table was operated by two female assistants recruited from a local university. The assistants were paid a regular hourly wage. Although they knew that the data would be used for scientific purposes, they were unaware of the specific hypotheses of the study. Every customer who approached the tasting table received a coupon from one of the assistants and was counted as a participant in the study, even if he or she decided not to taste any jam.

### *Dependent and independent variables*

The numbers of jams displayed as well as the value of the coupon were both subject to experimental manipulation and thus depict the two main independent variables. The value of the coupon used was fixed to 1.0 euro on the first Saturday and 0.50 euro on the second Saturday. The regular price of Lafayette Confiture was 3.90 euros for all flavors. The number of jams on the table was either 6 (small assortment) or 24 (large assortment). The two assortment sizes were switched on an hourly basis. On each of the two Saturdays the study was run for 8 hours, so each assortment size was on display for 4 hours. The number of redeemed coupons represents the main dependent variable and was taken as a measure of purchase motivation. By using a small differentiating mark on the coupons handed out, the number of redeemed coupons could be counted separately for each condition and for each gender.

### *Large assortment*

As the total number of different flavors of Lafayette Confiture is 24, the large assortment consisted of all available flavors of the brand. In contrast to Iyengar and Lepper, I deemed it unnecessary to take out the most common flavors because all the flavors of Lafayette Confiture are very exotic. In fact, the brand was tailor-made for the store to complement their regular jam assortment with flavors that are not offered by any other manufacturer. During the whole time of the study, all 24 flavors of Lafayette Confiture were constantly available on the jam shelves in the store.

### ***Small assortment***

The jams that made up the small assortment were chosen based on a pretest similar to the one used by Iyengar and Lepper: In the pretest, 42 students from a local university were given a list with the names of all 24 flavors of Lafayette Confiture. Out of that list, each student had to indicate the four “best-sounding” flavors, four “good- but not excellent-sounding” flavors, and four “worst-sounding” flavors. In exchange for their participation, students received a chocolate bar. Based on the aggregated data, the two most attractive, two least attractive and two medium attractive flavors were selected for the first small set (ss1). This procedure was chosen to exactly replicate Iyengar and Lepper’s study, but, it proved rather imprecise due to overlap in the classification of jams (e.g. some flavors ranked equally high in attractiveness and unattractiveness). To counteract this imprecision, a second, alternative set of six jams was randomly selected (ss2). Within the 4 hours that the small assortment was on display each day, sets ss1 and ss2 were displayed for 2 hours each.

### ***Additional measures***

In extension to the experimental setup used by Iyengar and Lepper, I numbered all coupons consecutively. Because the numbering was hidden within a pseudo barcode printed on each coupon, it could hardly be noticed by the consumers. Based on the numbering, the assistants at the table discreetly recorded the jam flavor(s) that each consumer tasted. The cashiers at the store’s exit noted the flavor of each purchased jam on the back of the coupon that was used for this purchase. While the vast majority of participants did not take notice of these recordings, the few that did were told what type of data was recorded and that it would be used for the purpose of market research.

## **Results**

### ***Participants***

In total, 504 customers (297 female, 207 male) were included in the study: 193 on the first Saturday and 311 on the second Saturday. Across both Saturdays, 239 participants saw the large assortment, 128 saw the small assortment ss1 and 137 saw the ss2 assortment. Across all conditions, 33% of all participants redeemed their coupon and 60 participants (12%) did not taste any jam. Those who did tasted 1.7 jams on average and 74% of all participants tasted between one and two jams.

There were almost no differences between the two small assortments ss1 and ss2 in terms of gender of tasters, number of jams tasted, and percentage of redeemed coupons. Therefore, the data of the two sets was collapsed for subsequent analyses into one “small assortment.”

### ***Effect of coupon value***

There was a main effect of coupon value: 46% of all participants redeemed a coupon that was worth 1.0 euro while this percentage dropped to 24% when the coupon value

was 0.50,  $t(504)=5.07$ ;  $p<.001$ . However, as the coupon value is confounded with the day of the study (first vs. second Saturday), the effect can also be due to the higher number of participants on the second Saturday. On the second Saturday, participants tasted less jam (an average of 1.3 jams compared to 1.9 during the first Saturday),  $t(502)=6.75$ ;  $p<.001$ , which could be due to the lower coupon value but also to the higher number of people at the tasting table, which might have prompted people to give others a chance to taste. Nonetheless, no effect of assortment size was seen in the second session either (Figure 3).

### ***Effect of assortment size***

Across both Saturdays, participants who saw the large assortment tasted slightly more jams than participants who saw the small assortment (1.6 vs. 1.4 jams),  $t(502)=2.37$ ;  $p=.018$ . However, there was no effect of assortment size on the number of redeemed coupons (32% in the large condition vs. 33% in the small condition),  $t(504)=0.19$ ;  $p=.853$ ; Cohen's  $d=0.03$ . There was no interaction effect between the number of redeemed coupons and coupon value or taster's gender. Independent of assortment size there was a small positive relationship between the number of jams tasted and the probability of redeeming a coupon ( $r=.26$ ).

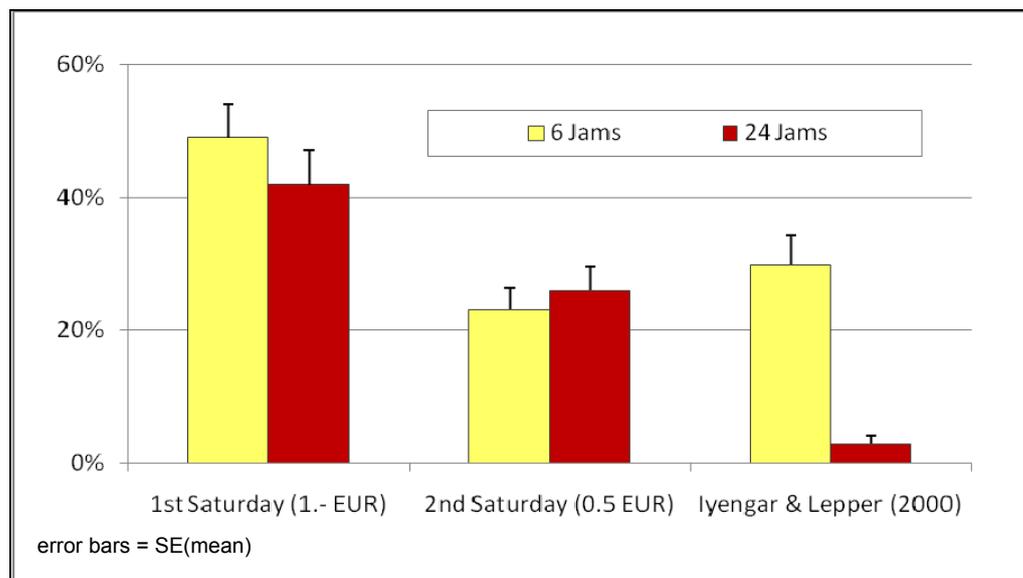


Figure 3: Effect of assortment size and coupon value on the percentage of redeemed coupons compared to the findings of Iyengar and Lepper (2000)

### ***Match between the flavors tasted and flavors purchased***

In the large condition with all 24 jams on display, 77 participants redeemed coupons. Of these, 26 participants (34%) purchased a jam that they had actually tasted at the booth and the other 66% of the participants purchased a jam they had not tasted but

which was displayed at the table. Of the 80 participants who redeemed a coupon in the small conditions, 31 (39%) bought a jam that they had tasted and 34 (43%) bought a jam that was displayed at the booth but that they did not taste. The remaining 15 participants (19%) bought a jam that was not on display at the booth but only on the shelf of the store.

### **Discussion**

Despite the fact that the study closely followed the setup used by Iyengar and Lepper, I did not find a relationship between assortment size and motivation to purchase. The relationship between purchases and coupon value suggests that the experimental manipulation was successful, yet the effect size of the set-size manipulation (Cohen's  $d=0.03$ ) is in sharp contrast to the strong effect reported by Iyengar and Lepper (30% vs. 3%,  $d=0.77$ ). Under the assumption that Iyengar and Lepper's findings depict the actual population effect size, and assuming an alpha of 0.05 (one-sided), the power ( $1-\beta$ ) of my experiment would be greater than 0.995. In other words, in my study the probability of finding an effect of Iyengar and Lepper's magnitude and by this correctly rejecting a false null hypothesis was very high. In fact, even under the assumption of a small effect of  $d=0.3$ , the power of my experiment would have been about 0.95, which is still far higher than the convention of 0.8 proposed by Cohen (1977).

This prior analysis of statistical power shows that the different findings are probably not due to random variation in the data or mere chance, which leads to the question of what might have been the reason for the divergent results.

#### ***Different types of jam***

It could be that the very type of jam made a difference. Whereas Iyengar and Lepper used Wilkin and Sons jam, I used Lafayette Confiture. While both brands are of high quality and almost equal in price, Lafayette Confiture comprises more exotic flavors than Wilkin and Sons. But given that unfamiliarity with the available options is seen as a prerequisite of the too-much-choice effect because it circumvents preference matching, this should have boosted rather than diminished the effect in my study.

#### ***Differences in the small assortment***

One important factor that may contribute to the presence or absence of the too-much-choice effect is the composition of the small choice set determined by the name-rating pretest. The rationale behind that pretest was to create a small assortment that had a wide range with regard to perceived attractiveness of flavors. Whereas the pretest relied solely on names, the participants in the store could see (and maybe also smell) the jams. This could have changed the perception of attractiveness and it brings the validity of the pretest into question. With the data on hand, attractiveness can be operationalized in different ways, for instance, based on the number of times a jam on the table was tasted (visual attractiveness) or based on the number of times a jam was purchased (purchase attractiveness). Across all jams, visual attractiveness and

purchase attractiveness are positively correlated with  $r=.66$  but the attractiveness ratings of the pretest do not match up with these in-store attractiveness measures. The two jams rated as least attractive in the pretest were in the top quartile of jams that were tasted and bought most often in the store. Of the six jams in the small set, the most attractive jam according to the pretest turned out to be the jam tasted least often at the booth. Nevertheless, in the present study both small sets of jam (ss1 and ss2) still turned out to be widely varied in terms of both purchase and visual attractiveness, but this is largely due to lucky chance given the low validity of the pretest ratings.

These findings have a straightforward implication: If Iyengar and Lepper's pretest was as invalid as mine, it could have been that by mere chance, they ended up with a small set that consisted of the most attractive jams (in terms of visual—or purchase—attractiveness) in the assortment. In this case, the probability of purchase from the small set could have been artificially increased in their study, which would then be interpreted as a too-much-choice effect. As the pretest data from Iyengar and Lepper is not available, I tested the influence of the attractiveness of the small set in two separate experiments by using restaurants and charity organizations as options to choose from. Both experiments will be outlined in Chapter III below.

#### ***Presentation of the jams on the table***

In the present study, the jam jars on the tasting table were lined up in an orderly fashion. This setup made it easy for customers to get an overview of the assortment even in the large choice condition. In contrast, in the study by Iyengar and Lepper, the jam jars were displayed in a rather disordered and messy way (Iyengar, personal communication). These differences may have led to two different effects that potentially reduced the choice overload in my study.

First, it can be argued that it is not the objective assortment size that matters but how it is perceived by the decision maker. As mentioned in Chapter I, Kahn and Wansink (2004) showed experimentally that an unstructured display can increase the perception of variety. Thus, the unordered setup used by Iyengar and Lepper might have induced the participants to perceive the choice set as even larger than it was. However, although this difference might explain a quantitative difference in the effect sizes between the studies, it is not sufficient to explain why I did not find any effect at all.

Second, as already mentioned by Iyengar and Lepper, “the display of 24 jams may have aroused the curiosity of otherwise uninterested passers-by” (p. 998). Because at my tasting booth the presentation was in a rather orderly fashion, even the large assortment condition could hardly be mistaken for anything other than a tasting table of jam. Thus, Iyengar and Lepper might be right in their conjecture that the effect in their study was not unique to the number of options but rather occurred because customers were attracted to the tasting booth for very different reasons in the

small condition as compared to the large condition, and that consumers who approached the large assortment never intended to make a purchase.

### ***Different expectations of the participants***

Both studies were conducted on the sales floor of upscale grocery stores that were comparable in their assortment structure. Draeger's, the store used by Iyengar and Lepper, at the time offered about 314 different jams while at the Berlin site, 280 jams were available. However, the store I used was located in the very center of Berlin, where, especially on a Saturday, it is visited by a lot of tourists. Draeger's, on the other hand, is probably more frequented by local people doing their weekly shopping. As a consequence, the participants in the present study might have been much more interested in having a lot of choice and also might have perceived the assortment as exciting and motivating. The participants in Iyengar and Lepper's study might have had a different motivation, that is, to get through their shopping list and proceed to the exit as soon as possible. It could be that in the latter case, a large assortment would be demotivating, because it takes relatively longer to browse through all the options. I addressed this hypothesis in a follow-up study on the sales floor of a regular day-to-day grocery store in a residential neighborhood that will be outlined in full detail next.

## **Wine study**

### **Introduction**

Even though I tried to replicate the original Iyengar and Lepper jam study as closely as possible, there are still a number of differences that could explain why I did not find a too-much-choice effect as they did. To account for the possibility that this was because of special features of my experimental site (e.g. tourists as customers), I conducted a follow-up experiment at an organic grocery store in a residential area where people did their daily grocery shopping. Instead of jams, I used wine because even in small shops, wine assortments can be very large, which makes wine an appropriate stimulus for this type of study. Like jam, wine is also a common product, so to reduce the chance that people had strong prior preferences among the experimental assortment, I used exotic varieties, namely, organically grown Spanish red wines.

### **Method**

#### ***Small and large assortments***

The large assortment consisted of all 12 organically grown Spanish red wines available at the store. The wines were from different regions in Spain and all were within a price range of 4 to 7 euros (approx. \$4.80 to \$8.40). The wines were in dark-colored bottles that only slightly differed in shape, but each had a different label. Eleven of the bottles had a volume of 0.75 liters and one bottle contained one liter of wine.

Three wines were selected for the small assortment based on a pretest conducted at my institute. There, the 12 bottles of the large assortment were placed on a table next to the entrance of the institute's canteen. Just as in the main study to come, the name of the vineyard as well as the price for one bottle was printed on a small tag and put in front of each bottle. The first 50 people who passed by the table (mostly researchers and administrative staff) were asked which wine looked most appealing to them. Based on the resulting attractiveness ranking, the most attractive, the least attractive, and one medium-attractive wine were chosen for the small assortment.

### ***Experimental setting***

The setup of the main wine study closely followed the setup of the previous jam study. The study was conducted on the sales floor of a large organic grocery store on two consecutive weekends (Friday and Saturday) from 4 pm to 8 pm (a total of 16 hours). A tasting table with the wine was set up just inside the entrance to the store. A sign in front of the table informed customers that there would be a wine tasting on that day. On all 4 days, the tasting was run by a female assistant who was aware of my hypothesis. The assistant handed out the wine in small disposable plastic cups in servings of about 20 milliliters. People were invited to taste as many wines as they wanted and everyone who tasted was asked if he or she wanted to taste another sample of wine. On each of the 4 days, the large and small assortments of wines were rotated on an hourly basis (with the small assortment displayed at 5–6 pm and 7–8 pm).

Everyone who stopped at the tasting table received a coupon to get 1.0 euro off any organically grown Spanish red wine. Each coupon had a unique number and was valid for 1 week. As in the jam study, consumers who decided to purchase a wine had to pick it up from a regular wine shelf at the very end of the store. To make it easier for the customers to remember what they had tasted, the name of the tasted wine(s) was marked on the back of the coupon. The number of redeemed coupons within each condition was taken as a measurement of purchase motivation.

The assistant at the tasting booth recorded which wines were tasted by each participant. For each redeemed coupon, the shop cashier recorded the name of the wine that was bought with that coupon.

## **Results**

In total, during the four afternoons of the study, 280 customers stopped at the tasting table and received a coupon (141 for the large assortment and 139 for the small assortment). Everyone who stopped and received a coupon was counted as a participant in my study. Of the participants, 168 were women. Six participants shopped with a partner; the others were on their own. Out of the 280 participants across both conditions, 172 (61%) tasted a wine and 102 (36%) purchased a bottle. Of the participants who saw the large assortment, 83 (59%) tasted at least one wine and so did 89 (64%) of those participants who saw the small assortment. Among those

who tasted, the mean number of tasted wines was 2.1 and in total, 93% of all participants who stopped tasted between one and three different wines. The average number of wines tasted in the large assortment was 2.4 as compared to 1.9 in the small assortment,  $t(170)=3.4$ ;  $p=.001$ ; Cohen's  $d=0.4$ .

With regard to the main dependent variable, the number of redeemed coupons, there was hardly any difference between the small and the large assortment. In the large assortment, 54 participants (38%) redeemed a coupon while in the small assortment, 48 (35%) did so,  $t(278)=0.55$ ;  $p=.579$ ;  $d=-0.10$ .

### Discussion

As in the previous study, no too-much-choice effect could be found. With the sample size on hand and alpha set at 0.05 (one-sided), the statistical power of finding an effect of  $d=0.77$  (the magnitude in Iyengar and Lepper's jam study) is  $>.995$ . For a small effect size of  $d=0.3$ , the statistical power would still be about 0.8. This relatively high power makes it unlikely that the null hypothesis was accepted by mistake.

The diverging results occurred despite the fact that the experimental site was a busy store where people did their daily grocery shopping and presumably did not enter for the sake of experiencing a large assortment. This questions possible explanations for the lack of effect in my first study that relate to special consumer expectations and the shop environment. However, with a total of 12 bottles, the large assortment might have been yet too small. Also, even though I used an exotic wine, people might still have had prior preferences that enabled them to engage in preference matching. To rule out these explanations, it would be advantageous to assess the degree of prior preferences independently from the choice. Also, as already mentioned, it might be the perception of variety that eventually matters rather than the absolute number of options. To collect this kind of data, a more controlled experiment would be necessary.

Both the wine study and the jam study were set up such that customers always had to go to the shelf elsewhere in the store if they wanted to make a purchase. Thus, even the participants in the small condition were eventually confronted with a large assortment. This raises the question of why customers should be affected by the large assortment at the tasting booth but not at the shelf (i.e. why customers making a choice at the small-assortment tasting would not be scared off from selecting their purchase when they had to get it from the usual large-assortment store shelf). To maintain the logic of the experiment, it has to be assumed that the participants decided whether to purchase while at the tasting table and that those who decided to purchase would not reconsider that decision at the shelf.

Yet in the wine study, of the 48 participants in the small assortment who bought a wine, 30 (60%) bought one that was not displayed on the tasting table. In the jam study, this percentage was 19%. This indicates that in both experiments a fair

number of participants must have made the final decision in front of the shelf. It can be conjectured that similar data would have been found in Iyengar and Lepper's jam study, yet as they did not collect data on the exact jams being purchased, it could not be measured.

## **Jelly bean study**

### **Introduction**

A field experiment like the one outlined above does not allow for strict variable control. To make sure the failed replication was not due to some third variable and to explicitly control for prior preferences and differences in the subjective perception of variety, I switched to laboratory experiments. As outlined in Chapter I, Iyengar and Lepper (2000) also found the effect of too much choice in a well-controlled experiment based on choices for exotic chocolates. In that study, people were less satisfied when choosing from a large assortment as compared to a small one. Also, people who chose from a large assortment were less likely to accept chocolate rather than money as compensation. For both of these dependent variables the effect sizes were high; therefore I next aimed to replicate that study. My experimental setup resembled the study conducted by Iyengar and Lepper. The main difference between their experiment and mine was that I used Jelly Belly® jelly beans instead of chocolate.

### **Method**

Similar to the original experiment, the task in my study was to choose, eat, and rate one jelly bean out of an assortment of 6 or 30 different flavored jelly beans (between participants). The beans were presented on a tray that was divided into small sections of equal size. Each section contained one bean and a label with the name of the flavor. For the large assortment, a large tray was used (5 rows of 6 beans in 60 × 60 centimeters) while the small assortment was presented on a small tray (1 row of 6 beans in 60 × 12 centimeters). Five small assortments were used, and each was a subset of the large assortment such that each bean in the large assortment was equally often presented (across participants) in the small assortments. This setup closely resembles that of Iyengar and Lepper.

The task of the participants was to select one of the jelly beans, eat it, and rate it. To explicitly control for prior preferences, before the actual choice participants were asked if they had ever heard of jelly beans and how often they had eaten them before. As mentioned in the Introduction, what eventually matters might be the perception of variety rather than the number of options per se (Kahn & Wansink, 2004). Therefore, as a manipulation check to test if the two assortments were perceived as different in size, participants also rated the assortment size they saw on a Likert scale ranging from 1 (too few jelly beans) to 9 (too many jelly beans).

In between choosing and tasting, participants were asked to rate the difficulty, frustration, and enjoyment of the choice process and to anticipate their satisfaction with the taste of the selected jelly bean. After tasting, participants rated the satisfaction with their choice and the degree of regret they experienced. They were also asked to rate how likely it was that there was an even better jelly bean on the table that they did not taste and how good the whole assortment of jelly beans that they saw would taste overall. All ratings were made on a Likert scale ranging from 1 (not at all) to 9 (very much). As an additional measure of attractiveness beyond the satisfaction rating of the taste, participants were asked what they would be willing to pay for “a box of 50 jelly beans like the ones you just saw on the table” (in euros).

After completion of the study, each participant received a coupon that could be exchanged for a small box of jelly beans at a secretary’s office that was three floors up and in another wing of the building. Making the effort to redeem the coupon was taken as a proxy to measure motivation. The study was conducted by a skilled experimenter who was unaware of my too-much-choice hypothesis. The experiment took place subsequent to another, unrelated study and participants were paid for the whole time they spent in the lab.

## Results

### *Participants*

In total, 66 people participated in the study (33 in each condition; 34 women, 32 men evenly split over conditions). Most were students at a local university, and no one was on a diet. The average age of participants in both conditions was 25 years ( $SD=3.6$  years). Of the 66 participants, 23 had never heard of jelly beans prior to the study and of the remaining 43 participants, 24 had never eaten one before. None of the participants ate jelly beans on a regular basis; 19 ate them occasionally. None of the subsequent analyses yielded considerable or statistically significant differences between participants who had eaten jelly beans before and those who had not.

### *Manipulation check*

When asked to rate the perceived size of the assortment in front of them, participants in the large choice condition on average perceived the assortment as larger than those in the small choice condition (5.6 in the large condition vs. 4.2 in the small condition,  $t(64)=3.14$ ;  $p=.003$ ). However, given that a 5 denotes the middle of the scale, neither assortment was perceived as being extreme. In comparison to the similar manipulation check in the chocolate study by Iyengar and Lepper based on a 7-point Likert scale ranging from “too few” (1) to “too many” (7), the mean value in the large condition was 4.9 as compared to 3.6 in the small condition. While an average of 4.9 on a 7-point scale is also not very extreme, a comparison with my data based on standardized  $z$ -values ( $SD=1$  and  $mean=0$ ) shows that the large assortment in Iyengar and Lepper’s study was perceived as slightly larger than in my study ( $z=.7$  vs.  $z=.3$ ).

***Choice process***

Choosing from the large set of jelly beans was perceived as more difficult (6.3 in the large set vs. 3.5 in the small set),  $t(64)=5.32$ ;  $p<.001$ ; more frustrating (2.7 vs. 1.5),  $t(64)=3.45$ ;  $p=.001$ ; but also as more enjoyable (6.3 vs. 4.8),  $t(64)=2.78$ ;  $p=.007$ , which matches the results reported by Iyengar and Lepper for choices between chocolates outlined in Chapter I.

***Enjoyment, Satisfaction, and Regret***

Participants who chose from a large assortment anticipated a slightly higher satisfaction with their chosen bean than participants who chose from the small set. With an alpha set at 0.05, the difference is not statistically significant, though (6.6 in the large set vs. 6.0 in the small set),  $t(64)=1.27$ ;  $p=.210$ . If anything, the slightly higher expectations in the case of the large assortment should make it more likely to find a too-much-choice effect because it increases the chances that the actual experience will fall short of these expectations. However, my data does not show this. Contrary to the predictions of choice overload and in difference to the findings reported by Iyengar and Lepper, participants in the large choice condition did not differ significantly in their actual satisfaction with their chosen jelly bean. If anything, they were slightly more satisfied than participants in the small choice condition (6.7 vs. 6.2),  $t(64)=0.91$ ;  $p=.366$  (see Figure 4). Participants in the large condition also experienced less regret (1.9 vs. 2.3 in the small condition),  $t(64)=.897$ ;  $p=.37$ . This is despite the fact that participants in the large choice condition held a stronger belief that there were better options available that they did not choose (5.3 vs. 4.1),  $t(64)=1.94$ ;  $p=.056$ . Also, in the large choice condition, participants evaluated the whole assortment as better tasting overall (5.6 vs. 4.6),  $t(64)=2.09$   $p=.04$ .

***Motivation to redeem a coupon and willingness to pay***

Participants were willing to pay almost the same amount for a small box of jelly beans in the two conditions (1.70 euros in the large set vs. 1.60 euros in the small set),  $t(64)=1.2$ ;  $p=.65$ . The same holds for the number of redeemed coupons. In the small choice condition, 21 coupons were redeemed while in the large choice condition 26 participants redeemed their coupon in the secretary's office.  $t(64)=-1.1$ ;  $p=0.28$ ; Cohen's  $d=-0.27$ ). Figure 4 gives an overview of the main results.

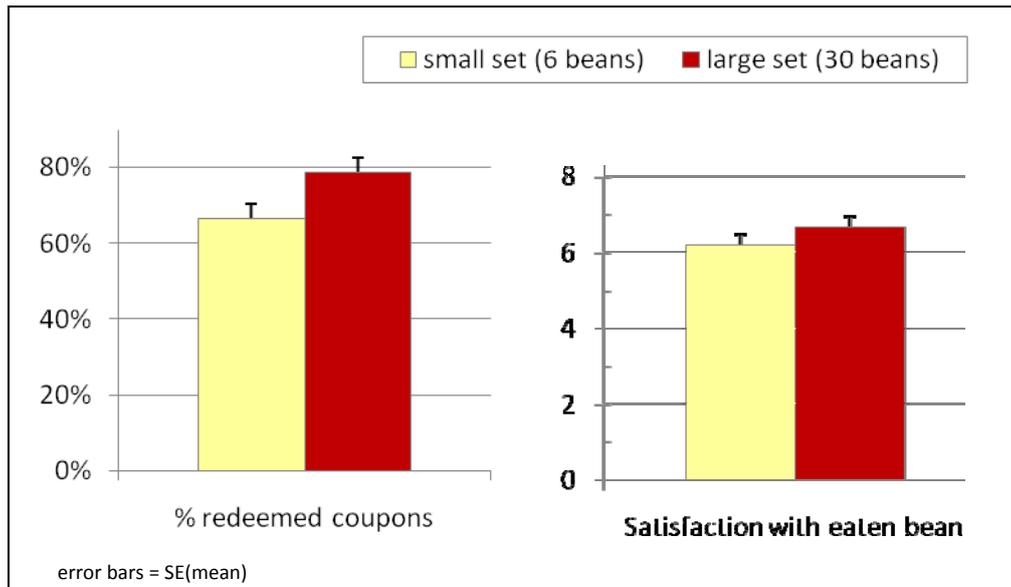


Figure 4: Effect of assortment size on satisfaction and percentage of redeemed coupons

### Discussion

Despite the fact that my controlled laboratory experiment closely resembles Iyengar and Lepper's study, participants in the large choice condition were as motivated to redeem a coupon and as satisfied with their chosen option as the participants in the small choice condition.

Iyengar and Lepper's main dependent variables, satisfaction with the choice and probability of taking a box of candy as compensation, had an effect size of  $d=1.0$  and  $d=0.88$ , respectively. With these effect sizes, the power to reject a false null hypothesis in the present experiment ( $N=66$ ,  $\alpha[\text{one-sided}]=0.05$ ) was 0.82 and 0.95, respectively, which implies that the probability of obtaining a significant result was high. The fact that nevertheless I did not find the effect suggests that either the actual effect size is much smaller or that there were other variables that either diminished the effect in my study or boosted it in Iyengar and Lepper's experiment.

Insofar as trade-off aversion drives the effect of too much choice, Dhar (1997) argued that for trivial and repeated decisions, an increase in choice omission due to too many options might rarely be found because individuals might simply choose more than one option or they may choose something else at the next occasion. Thus, maybe more than a jelly bean needs to be at stake in order for choice overload to loom. On the other hand, choosing a chocolate praline is hardly consequential and therefore this explanation does not resolve the difference between the two studies.

***Prior preferences***

Given that there were no considerable differences between participants who had eaten jelly beans before and those who had not, it seems unlikely that prior preferences can explain why I did not find an effect of too much choice. As I laid out in Chapter I, the existence of prior preferences might explain why one would not find a too-much-choice effect but it is not obvious why the *lack* thereof should lead to the effect.

***Distinction between subjective and behavioral measures***

While the results of the jelly bean study do not support the idea of a too-much-choice effect, they point out the importance of having a clear distinction between subjective and behavioral measurements. Based on subjectively perceived difficulty and frustration, one could argue for a too-much-choice effect. However, these emotions did not translate into manifest behavior. The fact that an increasing number of options simultaneously led to more frustration *and* to more joy makes it difficult to interpret these self-reports on emotional states as dependent measures.

**General discussion**

In their original experiments, which I strove to replicate, Iyengar and Lepper (2000) found strong effects of assortment size on the motivation to redeem a coupon and also on the satisfaction with the chosen option. In the face of moderate procedural variation within the three studies that I conducted, the effect did not prove robust. On a general theoretical level, there are at two different explanations for the differences between the results: First, it could be that the effect of too much choice was actually much smaller than the effects found in previous studies outlined in chapter I and that the different results in my studies as compared to those that found the effect are solely due to unsystematic sampling or random error. Second, it could be that there are systematic differences between the studies that are responsible for the diverging results. In the first case, a meta-analytic integration of the studies would yield a more reliable estimate of the real magnitude of the effect. In the latter case, there should be a systematic and theory-driven search for potential boundary conditions and systematic differences between the studies that have been overlooked so far.

**Random variation or moderator variables?**

To find out which of the two interpretations is more plausible, one needs to know how likely it is that the differences between the effect sizes are due to mere sampling error. If the differences between the studies are simply due to random variation around a true population effect size, there is nothing left for moderator variables to explain (Hunter & Schmidt, 1990). To statistically test the homogeneity of the effect sizes, one needs to relate the variance between the studies to the error variance within the studies in a *Q*-test (Cochran, 1954). The *Q*-test can be calculated as

$$Q = \sum_{i=1}^m (w_i \cdot d_i)^2 - \frac{\sum_{i=1}^m (w_i \cdot d_i)^2}{\sum_{i=1}^m (w_i)} \quad (2-1)$$

with  $d_i$  being the effect size of study  $i$ ,  $m$  being the total number of studies, and  $w_i$  being a weight that is calculated as the inverse of the standard error of  $d$  (Shadish & Haddock, 1994):

$$w = \left( \frac{n_1 + n_2}{n_1 \cdot n_2} + \frac{d}{2 \cdot (n_1 + n_2)} \right)^{-1} \quad (2-2)$$

with  $n_1$  being the sample size of the group that chose from the small assortment and  $n_2$  being the sample size of the group that chose from the large assortment.

For the data on hand, the  $Q$ -value obtained from Equation 2-1 is 38. The  $Q$ -value follows a chi-square distribution with  $m-1$  degrees of freedom. With  $m=5$  and an alpha-value set at 0.05, the critical  $Q$ -value is 9.5. As this is smaller than the obtained  $Q$ -value of 38, it can be concluded that the distribution of effect sizes is not homogenous and thus the differences between the studies cannot be explained by mere sampling error or random variance. As a consequence, according to Hedges and Olkin (1985), the further exploration of potential moderator variables seems worthwhile. In the next chapter, I will lay out a series of experiments in which I strived to systematically identify some of the most promising moderator variables.

## **Chapter III:**

### **Testing potential moderators and mediators**

As outlined in the Discussion of Chapter II, the diverging results could not be attributed to random error across the experiments. Therefore, one needs to look for systematical sources of variance. Proceeding from a mere estimation of the effect size to a more detailed analysis of explanatory third variables will also lead to a deeper understanding of the psychological mechanisms underlying the effect of too much choice and it will provide a necessary basis for establishing a process model that will allow us to predict when and why the effect will occur. As a first step toward this goal I will start by introducing a conceptual differentiation of third variables into moderator and mediator variables.

#### **Difference between moderators and mediators**

According to Baron and Kenny (1986), a moderator is a third variable that affects the direction and/or strength of the relation between an independent and a dependent variable. With regard to the effect of too much choice, a moderator would be a variable that specifies the appropriate conditions or boundaries in which the number of options within an assortment (=independent variable) affects the motivation to choose and/or satisfaction with the chosen option (=dependent variable). As such, there need not be a direct influence of the moderator on the dependent variable; only the effect of the interaction between the independent variable and the moderator matters. Besides this, no assumptions about the underlying processes or mechanisms are made. This is conceptually different from the notion of a mediator variable, which tabs directly into the intervening entities or processes. In the latter case, the independent variable is assumed to cause the dependent variable through the mediator and therefore the mediator needs to be related to both the independent and the dependent variable.

Searching for mediators explicitly aims to flesh out underlying psychological processes. Therefore, the approach seems to be generally more appropriate for the goal of testing and developing theories. Yet, as pointed out by Baron and Kenny, search for mediation is best done in the case of a strong relation between the independent and the dependent variable. If this relationship is weak or inconsistent, a search for moderators is recommended. Once moderators are identified that help to establish a consistent relationship between independent and dependent variables, the ground is prepared for testing intervening mediators.

#### **Outline of the subsequent studies**

In the remainder of this chapter, I will systematically identify potential moderator and mediator variables that might help to explain why some studies, including my own, did not find any effect of too much choice while others reported strong effect sizes. I will then strive to test some of the most promising of these moderators and mediators in a series of controlled choice experiments. In these experiments, I will specifically

focus on the influence of option complexity, the number of options in the large choice condition, the average attractiveness of the small assortment, cultural differences, and individual differences in personality, expertise, and search behavior, all of which will be outlined in more detail below.

## **Restaurant study**

### **Introduction**

This study was designed to test the influence of three variables, namely, the moderating effect of option complexity, the moderating effect of option attractiveness, and the perceived variety as a mediator.

#### ***Option complexity***

As mentioned above, scholars have argued that choice overload might not occur for trivial decisions among very simple options (Dhar, 1997). With regard to the difference between Iyengar and Lepper's (2000) chocolate study and the jelly bean study, I argued that a choice between a piece of chocolate and a jelly bean is of equal (un)importance. However, one could conjecture that the stimuli at least differed slightly in complexity. Jelly beans only differ in color and taste, whereas Godiva chocolates also differ in texture, shape, and filling. The higher option complexity of the chocolates is also reflected in their names. While the chocolates had rather long names (e.g. "Grand Marnier Truffle"), the jelly beans could sufficiently be described with one or two words (e.g. "Strawberry").

To test the possibility that option complexity is indeed a moderator of too much choice, the present study explored the possibility that the options have to exceed a certain level of complexity and that they have to vary on several possibly conflicting attributes in order to elicit choice overload. A potential moderating role of option and assortment complexity would link choice overload to previous research on the related concept of information overload. I will come back to this relationship in more detail in the general discussion in Chapter V.

#### ***Option attractiveness***

In the present study I also tested the hypothesis that a too-much-choice effect is more likely to be found if the average attractiveness of the large set is lower than the average attractiveness of the small set, which can happen if the small set only consists of very attractive options. I raised this possibility earlier in Chapter II when discussing the composition of the small assortment in the jam study. There, I conjectured that Iyengar and Lepper might have found the effect because by chance they ended up with a sub-sample of very attractive jams in the small assortment.

#### ***Perceived variety***

In an extension to the work of Kahn and Wansink (2004), who found that it is the perception of variety rather than the mere number of options, Broniarczyk, Hoyer, and

McAllister (1998) found that the perception of variety mainly depends on how much physical space an assortment takes up on the shelf of a store and not so much on the actual number of different options. As a consequence, in a series of studies in the lab and in the field, the removal of up to 25% of the options (they used microwave popcorn as stimuli) did go unnoticed as long as shelf space was held constant and the most popular brand was available. Broniarczyk et al.'s results again show that the perception of variety does not solely depend on the mere number of different options but also on other, maybe less obvious characteristic of the environment as well as the expectations and prior experiences of the individual decision maker. As such, the results stress the need to control for perceived assortment size as a potential mediator of choice overload.

In line with this, Huffman and Kahn (1998) argued that perceptions of high variety do not necessarily depend on the structure of assortment but can also be determined by how selective people are in their perceptions. As an example, one might think of an expert who, within his or her field of expertise, can process more options than a layperson (Chase & Simon, 1973).

### **Method**

To test for the influence of option complexity, in the experiment on hand, participants had to choose among options that were described on several attributes and thus constituted a more multifaceted selection than, for example, jelly beans or jams. Furthermore, in the experimental design on hand subjective perception of variety was controlled for and, as I will outline in more detail below, the setup also allowed me to test if the effect depends on the attractiveness of the small choice set.

#### ***The decision task***

Participants were asked to browse through a list of restaurant descriptions. For each restaurant, participants were asked if they knew the place and if they had eaten there before. Next, participants were entered into a lottery with a 1 in 40 chance to win. They were instructed that they had to choose whether they would want to receive 30 euros in cash (\$36 at that time) or a restaurant coupon worth 40 euros (\$48) if they won. Participants were further told that those who chose the coupon had to pick one restaurant from the list, for which the coupon would be issued. The percentage of participants choosing the restaurant coupon over the cash was used as a measure of motivation.

#### ***Stimuli***

The main independent variable was the number of restaurants presented to the participants. In the large choice condition, 30 restaurants were presented, spread equally over the following five cuisines: Italian, Asian, German, French, and International. The small choice set consisted of 5 restaurants, one of each cuisine type.

The restaurant descriptions were taken from a recent restaurant guide for the city of Berlin (*Marcellino's Restaurant Report 2005*). Only restaurants in the district *Berlin Mitte*, which marks the center of Berlin, were selected. The average price for a dish in all restaurants ranged between 10 and 20 euros (\$12–24). As Marcellino's Restaurant Report often lists more than five restaurants per cuisine type for this district, restaurants were chosen to ensure an equal distribution of food prices among the different cuisines.

To ensure a certain complexity of the options, each restaurant was described on a small sheet of paper using a short narrative description and a numerical rating for the quality of food, drinks, service, and atmosphere, all taken from the restaurant guide. The participants were also told the name, address, and type of cuisine for each restaurant. The descriptions were assembled in booklets in two different random orders, together with a cover sheet reading "Restaurant Descriptions."

To test whether choice overload is more likely if the small set consists of very attractive options, I ran the large choice condition first to find out which restaurants were chosen most often (and thus were most attractive). The small choice set was then constructed from the most attractive restaurant for each cuisine. Thus, it had a total of five presumably attractive restaurants to choose from. Given that in my previous studies I did not find any too-much-choice effect, I hoped that these manipulations would increase my chances of finding the effect.

#### ***Additional measures***

To control for perceived variety, participants were asked to judge the assortment size of the offered restaurants on a Likert scale ranging from 1 ("very little choice") to 7 ("a lot of choice"). The middle of the scale was described as "average number of choices." Participants who preferred a restaurant coupon over a cash coupon were also asked how difficult it was to choose their one restaurant on a scale of 1 ("very easy") to 7 ("very difficult").

To control for the factor that the attractiveness of the restaurant coupon might decrease the further people lived from the center of Berlin, participants were asked in which part of the city they lived and in which part they worked or studied.

## **Results**

#### ***Participants***

In total, 80 people participated in the restaurant study, 40 in each choice-set-size condition; most of them were students from a local university. The mean age was 25 years, ranging from 19 to 33 years with no significant differences between the two experimental conditions. Within both conditions, half of the participants were male and half were female.

***Manipulation check***

The size of the large assortment was perceived as rather high (4.9 on a scale from 1 to 7;  $SD=1.4$ ) and larger than the size of the small assortment (4.9 vs. 3.1),  $t(78)=5.61$ ;  $p<0.01$ . Thus, the experimental manipulation was successful in terms of perceived set size. Participants who chose from the large assortment also reported slightly more difficulty in making that choice (3.5 vs. 2.4 in the small assortment),  $t(78)=1.9$ ;  $p=.066$ .

***Familiarity with the choice sets***

Because I used descriptions from real restaurants, I wanted to know how familiar participants were with my stimuli: In the large choice condition, the participants had never heard of 80% of the restaurants on average (24 out of 30;  $SD = 4.2$ ) and had never eaten at 95% of the restaurants (28.5 out of 30;  $SD = 2.9$ ). In the small choice condition, on average participants had never heard of 75% of the restaurants (3.7 out of 5;  $SD = 1.2$ ) and had never eaten at 86% of the restaurants (4.3 out of 5;  $SD = 0.8$ ).

However, the number of recognized restaurants (the familiarity with the choice set) was not related to the probability of choosing a restaurant coupon, nor correlated with the difficulty of choice or the perceived assortment size. And so the familiarity with the choice set did not seem to have an influence on the dependent variable.

***Effect of assortment size***

For the main dependent variable, the number of people who preferred a restaurant coupon over a cash coupon, there was hardly any difference between the large and the small choice set: From the large set, 14 out of 40 participants (35%) chose a restaurant coupon while from the small set 12 out of 40 (30%) chose a restaurant coupon. Thus, if anything, people were more likely to choose a coupon from the large assortment. According to Cohen (1977), the difference between these proportions corresponds to an effect size of  $d=.14$ .

Across both set sizes, participants who chose a cash coupon did not perceive the assortment of restaurants as larger compared to those who chose a restaurant coupon (3.9 vs. 4.3),  $t(78)=1.02$ ;  $p=0.31$ . This indicates that the subjective perception of variety also did not seem to influence people's propensity to make a choice.

**Discussion**

As in the experiments reported in Chapter II, I did not find any effect of too much choice on the likelihood of making a choice. The result is especially surprising as this time the setting was well controlled, the set-size manipulation was successful, the options were complex, the decision was not trivial, and the small set was highly attractive—all measures that should have increased the chances of finding the effect. Again, the question arises as to what distinguishes my experiment from those where an effect was found.

The data on hand indicates that the restaurants I used in my experiments were mostly unknown and the familiarity with the choice set did not influence the effect. Nevertheless, choosing a restaurant is not that uncommon in daily life and therefore participants might still have had specific prior preferences on what types of restaurants or cuisines they like in general. As mentioned above, it could be that these prior preferences enabled them to engage in a decision process in which they simply matched their preferences. Also, it could be that the lottery at the end introduced an additional source of error due to individual differences in risk-taking behavior. Finally, as mentioned above, thus far there is no definition of what constitutes too much choice and as a consequence it could be that 5 different options in the small set were already sufficient to induce choice overload or that 30 different restaurants are not enough. To rule out these explanations, I conducted a series of experiments that involved concrete choices among a wider range of options that are less common in everyday life, namely, public charity organizations.

## **Charity study I**

### **Introduction**

The present study marks the first in a series of three experiments that aimed to rigorously test the effect of varying assortment sizes on the motivation to make a choice. All experiments involved real choices in which participants could either donate a certain amount of money to a charity organization or keep the money for themselves. In contrast to the selection of a restaurant, choices among different charity organizations are much less common. To further control for the moderating effect of clear preferences or evaluation standards prior to choice, the awareness level of the charity organizations within the choice set was subject to experimental manipulation.

### **Method**

#### ***Stimuli***

To make the choice real, participants who had come to our lab to participate in other experiments received a 1-euro coin and a sheet with charity organizations listed in alphabetical order. Participants could choose if they wanted to donate the money to one of the organizations on the list or keep the money themselves. If they decided to make a donation they had to check the name of the organization that the money should go to. To make the choice reasonable and to ensure a certain degree of complexity, each organization on the list was described by its name and a list of keywords indicating its mission. The charities were sampled from the population of all 180 German organizations that complied with the standards of the *German charity seal (Deutsches Spendensiegel)*, an association that certifies trustworthy charities. From this set, I created the large-assortment list from the 30 leading (and presumably most well known) charities according to the amount of money they collected in 2004. To ensure that the small-assortment list would be small enough to prevent overload, it consisted of just the 2 biggest charity organizations. To further control for prior

preferences and to alternate the set sizes, I created an additional large list that consisted of the 40 smallest (and presumably least known) charity organizations and a corresponding small list consisting of the 5 smallest organizations.

### ***Choice task***

To rule out demand effects, participants made their decision anonymously. Anonymity was ensured by putting the instructions and the list of charities into an envelope. Participants in the experiment were asked to open the envelope and to follow the instructions in a separate booth that was set up in a corner of the lab. After completion (including indicating their sex and student status), they were instructed to put the list, and if they had made a donation also the euro coin, back into the envelope, seal it, and throw it into a “ballot box” within the booth. The envelopes with the different lists were mixed and indistinguishable from the outside so that the experimenter who gave out the envelopes was blind toward the experimental condition. At the end of the study, I transferred the money donated by the participants to the charities that they had indicated.

## **Results**

In total, 120 people participated in the study, 30 in each of the four conditions (with three sheets not filled out completely). There were 68 women and 49 men and a total of 90 participants (78%) were enrolled as students.

In the conditions based on the lists of leading charities, 28 out of 30 participants who saw the large-assortment list (30 charities) chose to donate (93%). Out of the 30 participants who saw the small-assortment list (2 charities), 25 chose to donate (83%). With an alpha level set at 0.05, the comparison of the two proportions revealed no statistically significant difference,  $t(58)=-1.2$ ;  $p=.235$ ; Cohen's  $d=-0.53$ .

In the conditions based on the least known charities, 20 out of 28 participants who saw the large assortment list of 40 charities chose to donate (68%). Out of the 29 participants who saw the small assortment list of 5 charities, 19 chose to donate (66%). As in the previous conditions, the comparison of the two proportions revealed no statistically significant difference,  $t(55)=-0.18$ ;  $p=.855$ ; Cohen's  $d=-0.17$ . If anything, in both sets of charities, participants were more likely to donate when facing the large assortment. There was an effect of the type of charity such that well-known charities received more money (88%, vs. 68% for the low-profile charities),  $t(115)=2.7$ ;  $p=0.08$ . Figure 5 gives an overview of the main results.

To test if participants simply ignored the charity organizations at the end of the list, thus effectively shielding themselves from having too much choice, I correlated the position of the organization on the list with the number of donations it received. A positive correlation would indicate that charities on the top of the list would have a higher probability of receiving money. Yet for both the long list with

well-known charities and the long list with least-known charities, the correlation was virtually zero.

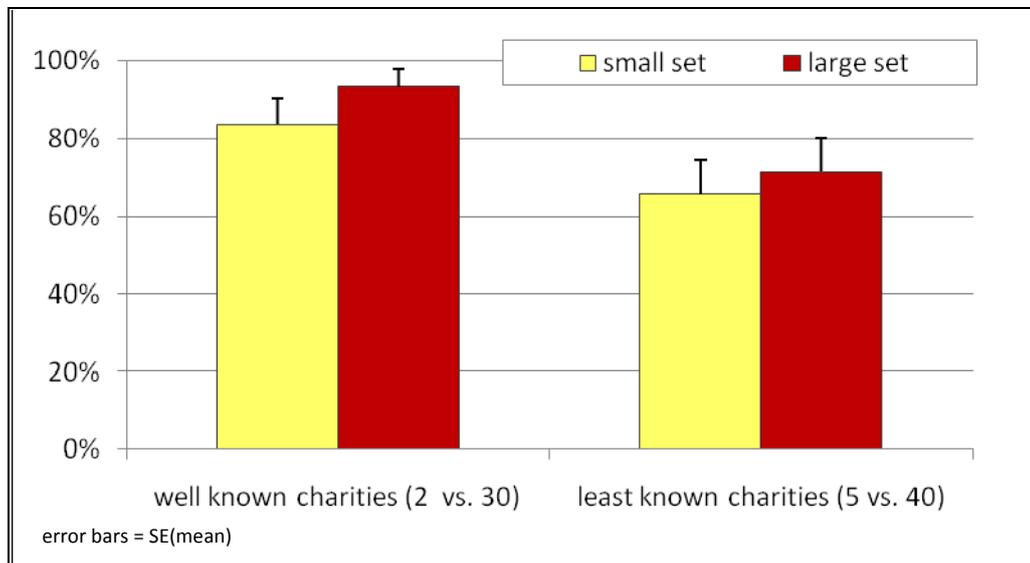


Figure 5: Proportion of participants who gave to charity depending on assortment size

### Discussion

The experimental design on hand ruled out demand effects and it involved real choices among authentic and fairly complex options. Also, it was not an everyday choice, the number of options varied widely, and at least for the condition with least-known charities it was unlikely that participants had prior preferences. Despite all these measures, again I did not find any effect of assortment size on choice motivation. That there was an effect of the type of charity such that more people decided to give to leading charities suggests that people did not choose randomly and that the decision task was reasonable. Given the vague definition of what constitutes too much choice, it could still be the case that when it comes to choices between charities 40 options are not sufficient to elicit the effect. To test for the possibility that the number of options needs to be increased even further, I conducted another charity study in which I doubled the number of options in the large assortment.

## Charity study II (Bloomington, Indiana)

### Introduction

The purpose of the study on hand was twofold. First, following up on the discussion of the charity study above, there is a necessity to explore even larger assortment sizes. This is because, as mentioned in Chapter I, there is no clear definition of what constitutes extensive choice and how many options are needed to elicit the effect.

Because of this, the second charity study circumvents this problem by exploring a wider range of assortment sizes. Second, I aimed to test if the effect of too much choice depends on cultural differences between Germany and the United States. As I will outline in more detail below, there are a number of differences between the two countries with regard to choice and the perception of assortments that might mediate the effect.

### ***Number of options***

As mentioned in Chapter I, Iyengar and Lepper (2000) defined extensive-choice conditions as “reasonably large, but not ecologically unusual” (p. 996). These terms are difficult to pin down: How does one define “ecologically usual” for cases that are seldom encountered in everyday life? The same difficulty holds true for the vague term “reasonably large.” In any case, it can be assumed that the usual sizes widely differ depending on the context.

### ***Cultural differences as a moderator***

Almost all studies that report an effect of too much choice were conducted in the United States, whereas all my studies reported so far were conducted in Germany. Both countries are highly developed market democracies, but there are also a number of differences between them that might explain the diverging results.

The only scholars who found an effect of too much choice outside the United States were Reutskaja and Hogarth (2005). As outlined in Chapter I, they studied hypothetical choices among different numbers of gift boxes that were displayed on a computer screen. What is noticeable about their study is that they collected data in Spain but also in two countries in Eastern Europe, namely, Belarus and Ukraine. Due to the difficult economical situations, consumer choice in these countries is noticeably smaller than in Western Europe and in the decades prior to 1990, choices were even more scarce. What Reutskaja and Hogarth found was that on average, more options were needed to elicit choice overload in the Eastern European sample as compared to the Western European sample. This suggests that in environments in which choice is scarce, people might be more excited to have large assortments, while in environments in which variety is extensive, people might become less and less attracted, saturated, and maybe even irritated by large assortments.

On the other hand, a recent study on how people evaluate variety (Rozin, Fischler, Shields, & Masson, 2006) suggests that at least in the comparison between the United States and Germany it might be the other way around. In that study, a representative sample of 1,450 participants in the United States and 851 participants in Germany were asked whether they would prefer an ice cream parlor with 10 different flavors or 50. The results showed that 56% of the Americans would rather go to the parlor with 50 ice creams, as compared to only 33% of the German sample. When asked about their expectations of the selection of dishes at a top-class restaurant, 36% of the Americans answered that they would expect a large choice with numerous

different dishes rather than a small number of suggestions from the chef. Among the Germans, the percentage of people expecting a large choice was only 22%. Based on their results, Rozin and colleagues conjectured that at least in the food domain, there is a preference for quantity over quality in the United States, while in Germany it might be the other way around.

Again, it is not obvious how these findings translate into different motivations with regard to too much choice. On the surface, one would rather expect that Americans, who seem to value large assortments, would be more likely to make a choice from a large assortment.

To further explore the potential moderating effect of cultural differences on the effect of too much choice, I also ran an experiment in the United States. To allow for a straight comparison to the results in Germany, the U.S. experimental setting closely resembled that of the charity study conducted in Berlin.

### **Method**

As in Germany, the U.S. study was administered following other, unrelated psychological experiments ranging in duration from 15 minutes to 1 hour. Similar to the German study, participants received an envelope containing instructions, a list of charities, and a 1-dollar bill. Participants could either donate the dollar to one of the charities on the list or keep the money for themselves. The decision was made in private, and after completion participants dropped the envelope into a sealed box. The list of charities contained either 5, 40, or 79<sup>2</sup> different organizations.

### ***Stimuli***

The organizations on the list were sampled from the U.S. website [charitynavigator.com](http://charitynavigator.com), a nonprofit organization similar to the German Charity Seal that lists and evaluates U.S.-based charities that have operated for at least 4 years, that have been granted tax-exempt status, and that make their accounting information publicly available. At the time I conducted the study, [charitynavigator.com](http://charitynavigator.com) listed a total of 204 organizations that had a national scope of work related to either animal, educational, or environmental issues. From this sub-set, I drew a stratified sample of 80 organizations (27 environmental, 27 educational, and 26 animal charities). From this large sample I then drew random sub-samples for the 5- and the 40-option condition such that the proportions of environment, educational, and animal charities were equal. As in the German study, the charities were listed alphabetically. Besides their name, they were also described by one sentence about their mission.

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<sup>2</sup> Initially, I planned to have 80 organizations in the large set but due to a mistake in the layout, the name of one educational charity did not appear on the large-set questionnaire.

## Results

A total of 112 envelopes were administered, 36 in the 5-option condition, 37 in the 40-option condition, and 39 in the 79-option condition. Of the participants, 58 were male, 51 were female, and 3 did not indicate their gender. Participants' mean age was 20 years, ranging from 18 to 28 years. From the total number of 112 participants, 95 (85%) decided to give to charity. Of those who made a donation, 14 (15%) indicated that they had heard the name of the organization of their choice before, which suggests that the vast majority of participants were indeed unfamiliar with the choice set and thus could not engage in preference matching.

In the 5-option condition, 29 participants (81%) gave to charity, in the 40-option condition, 32 participants (87%) donated, and in the 79-option condition, 34 (87%) gave to charity. Thus, if anything, an increase in the assortment led to more choice. For the comparison between 5 and 40 charities, the effect size is Cohen's  $d=-0.16$ . For the comparison between 5 and 79 charities, the effect size is Cohen's  $d=-0.18$ .

The probability of choosing a certain charity did not depend on the position of the charity in the list. The correlation between the number of donations a charity received and its position on the list was virtually zero for the lists of 40 and 79 options.

## Discussion

The results closely resemble those found for the first charity study that was conducted in Germany. Again no effect of assortment size on choice motivation was found, and if anything, the propensity to choose increased with assortment size. Also, charities that were at the beginning of the list were not more likely to receive a donation than charities at the end. This suggests that participants indeed looked through the whole list and deliberately selected an option. These data provide some preliminary evidence against the idea that participants sequentially went down the list and chose the first satisfactory option that they came across, as a satisficing decision strategy would suggest. As outlined in Chapter I, applying a fast and frugal heuristic such as satisficing should shield people from being overloaded with choice. If anything, not using such a satisficing heuristic should increase the vulnerability to choice overload. Perhaps if the list had been even longer, such a search strategy might eventually have been observed.

Participants in the present study were undergraduate students at a U.S. university and thus presumably similar to the participants in most of the previous studies outlined in Chapter I that successfully found an effect of too much choice. Given that I did not find an effect in such a sample, the role of culture or population differences as a moderator is called into question.

## Charity study III (Berlin)

### Introduction

Based on the charity paradigm outlined above, the present study was designed to further increase the power of finding the effect by asking people to justify their choice. Furthermore, to allow for a direct comparison to the U.S. data, the experiment on hand also includes an extended set size of 80 charities.

### *Justification of the choice as a mediator*

From a social perspective, active choices are often more difficult to justify than omissions (Ritov & Barron, 1990). As a consequence, decisions may at times be avoided due to an anticipation of blame. It seems likely that an increasing number of alternatives also increases the difficulty of justification because the decision made has to be defended against more alternatives. Furthermore, Fasolo, Huber, Hertwig, and Ludwig (2007), examining real-world assortments in actual stores, showed that options get more similar to each other as the assortment size increases. It is possible that any justification of choosing a single option would become even more difficult because it is more likely to apply to more than one alternative and thus will not be sufficient to single out one solitary option. At the same time, the difficulty to justify no choice or the choice of a default option remains the same.

For example, in a choice between a red and a green apple, red color would serve as a distinctive reason to choose one apple over the other. As the number of apple types increases there will eventually be two red apple varieties and one would need a more sophisticated reason to justify the choice. On the other hand, the justification of no choice would be unaffected by an increase in assortment size (e.g. one could always argue that one prefers oranges, irrespective of the number of apples). Taken together, people might be more likely to resign from the choice if they know that they will be asked to justify their choice, which should increase the chances of finding the too-much-choice effect.

### Method

The experimental design closely resembled that of the former charity studies. As before, participants received an envelope with a list of charity organizations in alphabetical order and were asked if they wanted to donate 1 euro to one of the organizations on the list. Again, charities were sampled from the German charity-seal-approved set. Participants were randomly assigned to one of three different conditions with either 5, 40, or 80 of the smallest-sized and presumably least-known charity organizations listed by Deutsches Spendensiegel.

To include a justification of choice, participants who gave to charity were asked to write down a short statement explaining the reason why they chose this organization in particular and not another one. To make the choice even more real, the study was attached to an unrelated experiment on Bayesian reasoning for which

participants received 26, euros as compensation. After receiving the money, the envelope that contained the instructions and the charity list was handed to them. If participants decided to give 1 euro to charity, they had to take it from what they earned in the previous experiment. Likewise, making no donation maintained the status-quo of keeping the money and can be reasonably interpreted as no choice.

### Results

A total of 119 people participated in the study, 67 male, 47 female, and 5 who did not indicate their gender. In total, 72% of all participants were students. Of the 42 participants who saw the 5-option assortment, 37 (88%) gave 1 euro to charity. In the 40-option condition, 28 of 39 participants (72%) donated, and in the 80-option condition, 28 out of 38 participants (74%) donated. The difference in proportions between the small assortment of 5 and the large assortment of 40 options is 16% (88%-72%). Between the small assortment of 5 and the large assortment of 80 the difference is 14% (88%-74%). Under the null-hypothesis that no too-much-choice effect exists, the probability of finding differences of this magnitude or higher is  $p=.033$  ( $z=1.8$ ; Cohen's  $d=0.4$ ) for the comparison with the 40-option condition and  $p=.05$  ( $z=1.7$ ; Cohen's  $d=0.37$ ) for the comparison with the 80-option condition. Thus, for both comparisons there seems to be a small yet statistically significant ( $p<.05$ ) effect of too much choice. As in the previous studies, the correlation between the number of donations a charity received and its position on the questionnaire was virtually zero in both large choice conditions.

### Discussion

The fact that an effect of too much choice occurred if participants had to give a reason for their choice supports the hypothesis outlined above that justification becomes more difficult when options become more similar and/or harder to distinguish from each other. In line with this interpretation, for those participants who gave a justification, the numbers of characters used to justify the decision were larger in the 40- and 80-option conditions as compared to the 5-option condition.

Of the 37 participants in the 5-option condition who gave to charity, 33 wrote down a reason for why they chose that particular organization. The mean number of characters used in these 33 justifications was 74 ( $SD=45$ ). In the 40-option condition, 25 of the 28 participants wrote down a reason. Of these justifications, the mean length was 100 characters ( $SD=45$ ). In the 80-option condition 24 of the 28 participants who donated wrote down a reason. Here, the mean length of all statements was 96 characters ( $SD=51$ ). An analysis of variance with alpha set at 0.05 indicated that overall the differences are not statistically significant,  $F(79,2)=2.6$ ;  $p=0.08$ , yet a post-hoc comparison of the small set with the two large sets indicates a statistically significant difference,  $t(80)=2.3$ ;  $p=0.03$ .

Of course, the number of characters only provides a proximate measure of the difficulty of justification. Besides, even if the need for justification led to an effect of

too much choice here, it is not obvious how this would explain the results of the studies by other researchers that did find the effect. In any case, none of these previous experiments asked participants for a reason or justification for their choice.

With regard to the moderate effect size of the main effect on choice probability, the positive result of the present study should be interpreted with caution. Given that I did not find an effect in any of the previous studies, the actual size of the too-much-choice effect in general—if it exists at all—might well be low. If so, the effect found in the present study might simply be due to random variation and the result would suggest a mediator that is in fact nonexistent. Figure 6 provides an overview of the results obtained in the Bloomington and the second Berlin study.

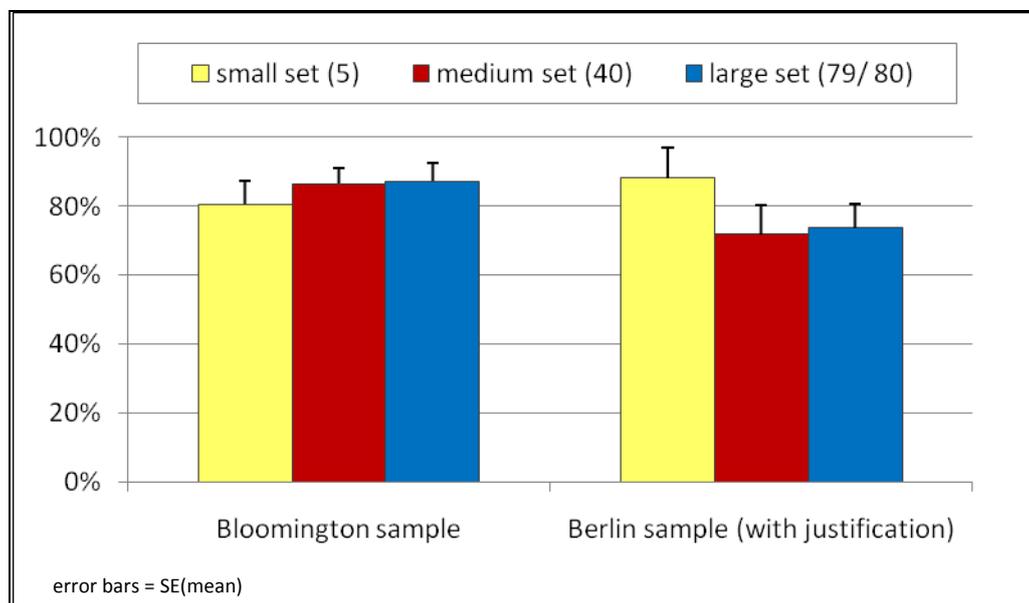


Figure 6: Proportion of participants who gave to charity depending on assortment size in Bloomington and Berlin

Taken together, the series of charity studies allowed for high experimental control and provided a realistic choice scenario, yet the data only reveal limited insight into the psychological processes underlying the choice. Apart from their age, we know little about participants' personality traits, attitudes, and motives and it remains unknown how participants perceived the assortment, and how they derived their decision. As I will outline in more detail below, there is good reason to believe that these individual differences play an important role with regard to the effect of too much choice. To get a more detailed picture of the process and the decision makers themselves, I conducted another study that aimed to flesh out these variables.

## Music study

### Introduction

The current study arose from the need for an experimental design that allowed for a more precise test of potential moderator and mediator variables on the effect of too much choice. Analogous to the previous studies, the main dependent variables in the study on hand were the degree of post-choice satisfaction, post-choice regret, and the motivation to choose.

Foreshadowing the difficulty of replicating the effect of too much choice, scholars in the past argued that the effect of choice overload is moderated by inter-individual differences in how people perceive a situation and how they go about making the choice. Among the most prominent of these personality constructs are the concepts of maximizing versus satisficing (Schwartz et al., 2002), and the need for cognition (Cacioppo, Petty, & Kao, 1984), both of which I will outline in more detail below.

#### *Need for cognition as a moderator*

The importance of individual differences with regard to the too-much-choice effect received empirical support in a recent study by Lin and Wu (2006), who found that participants with a low need for cognition (Cacioppo et al., 1984) were less confident about their decision when choosing from a large set of 16 options as compared to a small set of 6 options. In close resemblance to the study by Chernev (2003b) outlined above, in Lin and Wu's between-subjects experiment, participants got to choose between different types of chocolate. Confidence, or preference strength as Chernev called it, was measured by participants' propensity to switch their choice to another option that was recommended by the experimenters at the end of the study. Interestingly, people with a high need for cognition were less confident when choosing from the small set as compared to a large set. As a consequence, besides the interaction of need for cognition and assortment size, there was no main effect of assortment size on confidence. This suggests that in total across all participants, Lin and Wu did not find an effect of too much choice.

Lin and Wu explained the interaction effect between need for cognition and choice overload with differences in the way people adapt their decision strategy to the choice environment. They argued that people with a high need for cognition examine the options more thoroughly while people with a low need for cognition only do this if the assortment is small. For large assortments they expected the latter group to switch to a heuristic decision strategy such that less information is processed per option. They further argued that the heuristic leads to more uncertainty and hence a lower confidence.

However, this theory cannot fully account for their data as it does not explain why people with a high need for cognition were less confident when choosing from

the small set as compared to a large set. A closely related but slightly more elaborate construct that has been connected to the effect of too much choice is the tendency to maximize or satisfice.

### *Maximizing as a moderator*

As mentioned in Chapter I, and in contrast to the hypothesis of Lin and Wu (2006), no effect of too much choice would be expected when people apply a fast and frugal satisficing heuristic (Simon, 1955) because in these cases, people would simply search for something that is good enough and the search would stop once an option is found that exceeds their level of aspiration. On the other hand, optimizing, the aim to find the best option, gets more difficult and involves more effort as the number of options increases. At the same time, the second-best, not-chosen option will be more similar to the chosen option, which implies relatively higher opportunity costs. The concept of opportunity costs originated from economic theory and describes the benefits that could have been received from choosing the most valuable forgone alternative. According to Schwartz (2000, 2004; Schwartz et al., 2002), an increase in opportunity costs will lead to increased feelings of regret as well as a decrease in satisfaction and the motivation to choose.

Schwartz proposed that decision strategies can be described on a continuum ranging from satisficing to optimizing (or “maximizing” as Schwartz calls it). He further assumed that decision makers differ in the degree to which they engage in one of the strategies and that this propensity is moderately stable across situations.

### *The maximization scale*

To measure people’s propensity to maximize, Schwartz et al. developed a 13-item scale that includes statements such as “I never settle for second best,” “When shopping, I have a hard time finding clothes that I really like,” or “Renting videos is really difficult. I’m always struggling to pick the best one.” All the statements have to be rated on a scale from 1 (strongly disagree) to 9 (strongly agree). Based on a total sample of  $N=1,747$  that included diverse sub-samples of first year psychology students, nurses, and a convenience sample at a train station, Schwartz et al. reported scale reliabilities of Cronbach’s  $\alpha = 0.71$  for the maximization scale, ranging from 0.60 to 0.73 across different sub-samples. In a validation study, Schwartz et al. found that maximizers, defined as having a mean score above the middle of the scale, are more likely to engage in social comparisons than satisficers. They further found positive correlations between maximization, regret, and depression and they hypothesized that this relationship would be mediated by the presence of an overwhelming array of options. In a consumer context maximizers self-reported less positive feelings toward purchases and said they considered more products compared to satisficers.

*Empirical evidence for maximization as a moderator*

Supporting the idea that the propensity to maximize moderates the effect of too much choice, Haynes and Olson (2007, Study 1) found that maximizers experienced more difficulties and more frustration with the decision process when the choice set increased from 3 to 10, whereas for satisficers they did not find a difference. Likewise, maximizers experienced more dissatisfaction and regret when choosing from the large assortment of ten options as compared to the small assortment of three. For satisficers it was the other way around. Satisficers were less satisfied with the option chosen from the small assortment as compared to the choice from the large assortment. In the Haynes and Olson study, maximization was measured based on Schwartz's maximization scale. Maximizers and satisficers were defined relative to the sample mean. Everyone above one standard deviation from the mean was denoted a maximizer and likewise a satisficer for scores below one standard deviation from the mean. The differences in satisfaction and regret for maximizers confirm Schwartz's prediction. Yet the finding that satisficers were less satisfied when choosing from the small set runs somewhat counter to the prediction according to which satisficers should not be affected by the number of options. Also, with a Cronbach's  $\alpha$  of 0.54 the reliability of the maximization scale was rather poor.

In a recent study on job search, Iyengar, Wells, and Schwartz (2006) found that senior college students who described themselves as maximizers on a questionnaire made a greater effort to search for job offers and were able to get better paid jobs after graduation, but at the same time they were less satisfied with their choices as compared to satisficers. While in their study the reliability of the maximization scale was also rather low (Cronbach's  $\alpha = 0.6$ ), the results suggest that even though on an objective scale maximizers might make better choices, they are subjectively less satisfied with them. As an explanation, the authors suggested that decision makers determine their satisfaction by trading-off the "cost" of search against the benefits of the job they found and that for maximizers this trade-off is less advantageous. What speaks against this interpretation is that once a job is found, search costs are fixed, whereas the benefits of the job continue for the time it lasts. Thus, as long as a decision maker does not quit, the benefits should eventually outweigh the costs. On the other hand, at the time Iyengar et al. measured people's satisfaction, they had just stated their new jobs and might not have had many benefits yet. I will discuss the relationship between search costs and the effect of too much choice in more detail in the General Discussion in Chapter V.

*An alternative process interpretation*

An alternative explanation for Iyengar et al.'s results would be that maximizers set their aspiration level much higher than satisficers do. If so, maximizers would search longer because they also satisfice but while trying to match a higher aspiration. The better job would then simply be a consequence of the extended search and the relatively lower satisfaction could be explained by the fact that maximizers were still

less likely to match their aspiration. This interpretation would also be closer to Simon's (1956) original conception of satisficing as a search and decision rule by which an individual looks up information and chooses according to a predetermined aspiration level.

It should be noted here that this latter interpretation of maximizing as the propensity for high aspirations would not necessarily predict a too-much-choice effect. It would predict that maximizers will search longer, but as a consequence of the prolonged search they should be relatively more satisfied when choosing from a large assortment as compared to a small assortment. This is because the large assortment provides a higher chance to achieve (or at least get closer to) their aspiration.

#### *Context dependencies*

Personality traits that relate to decision making, such as the tendency to avoid decisions or to seek risks, have been shown to be highly context dependent (Beattie et al., 1994; Hanoch, Johnson, & Wilke, 2006). Thus, the individual tendency to maximize might also depend on the situation. As an example, one might think of a person who tries to maximize outcomes within a job-related context but less so in private matters. Therefore, a test of the impact of maximizing on the too-much-choice effect should also incorporate a context-specific way to measure that trait.

#### *Consideration set size and search process*

Further building upon Simon's (1956) and Schwartz's (2004) notions of satisficing, it seems to be a necessary precondition of the too-much-choice effect that decision makers actually take the additional options in the large assortment into account. One reason why I did not find an effect in previous studies could be that people simply ignored the excess and by this shielded themselves from being overloaded with choice, a strategy that resembles the concept of a satisficing.

However, given that in the series of charity studies, organizations at the end of the list had the same probability of being selected as organizations at the top of the list, the selection process might have looked somewhat different. A concept that would be in accordance with the data from the charity studies and that relates to the notion of satisficing is the idea that decision makers use a two-stage process such that they first screen options to form a consideration set (sometimes referred to as an evoked or relevant set) from which they then choose (Hauser & Wernerfelt, 1990; Reilly, 1985). From this perspective, what eventually matters is not the total number of options available but rather the number of options that are seriously considered for the final decision. If so, it can be conjectured that the effect of too much choice is mediated by the size of that sub-set, and assessing the size of that sub-set could help to explain the previously divergent findings.

***Cultural differences***

Testing for cultural differences between Germany and the United States as a moderator ideally builds upon a study design that can be used in the same manner in both countries. While the charity paradigm outlined above was a first step in this direction, its results cannot be compared directly because in each country different charity organizations had to be used. To obtain a more precise comparison between Germany and the United States, a study design in which the exact same stimuli could be used in both countries would be preferable.

**Method**

To empirically test the effect of too much choice and the influence of the moderators and mediators outlined above, I implemented a computer experiment in which participants repeatedly listened to samples of classical music that they had chosen from different assortments beforehand. Because classical music is equally enjoyed across many cultures, the exact same choice sets could be used in Germany and in the United States with the only difference being the translation of the instructions. In Germany, the experiment was conducted at the Max Planck Institute for Human Development in Berlin, and in the United States participants were recruited at Indiana University in Bloomington.

***Within-subject design to increase statistical power***

So far, all experiments on too much choice, including my own, have adopted a between-subjects design such that the group of people facing the small assortment was different from the group facing the large assortment. Yet the results of my previous studies suggest that if anything, the size of the too-much-choice effect is probably much smaller than previously thought. To be able to even detect such small effects, a within-subject design in which each individual faces both a small and a large assortment is preferable because it comes with a larger power due to a decreased measurement error (Hunter & Schmidt, 1990). As laid out by Hunter and Schmidt, a classical between-subjects design assumes that the independent variable (the number of options in the present case) affects all participants equally such that there is no interaction between the independent variable and the individual. Yet, it could be that half the participants would show a too-much-choice effect while the other half would show the reverse effect. In a between-subjects design, these differences would go unnoticed and the conclusion would be that there is no effect—a conclusion that would be completely invalid. To circumvent these problems, the study on hand employs a within-subject design in which the same participant consecutively chooses from both a small and a large assortment.

***Choice set***

To allow for choices among identical options in both countries, participants in the experiments got to choose among recently released CDs of classical music from the record label *Deutsche Grammophon*, an internationally renowned label that specializes in high-quality recordings of classical music. For the purpose of the study, I compiled

two large sets of 30 CDs each from the most recent releases of Deutsche Grammophon: one set with vocal music and one set with orchestra music. From each of these two large sets, I then randomly selected one sub-sample with 6 CDs. Thus, there were four different sets of CDs that can be described based on the two orthogonal factors music style (orchestra vs. vocal) and assortment size (small vs. large).

The CD assortments were displayed on a 17-inch computer screen as a collection of thumbnails (36×36 pixels each) that showed the miniaturized pictures of the CD covers in a random order. The last name of the composer and the abbreviated CD title was displayed underneath each thumbnail. A detailed description of each CD could be retrieved by clicking on the thumbnails with the left mouse button. The detailed description consisted of a full-size picture of the cover, the full CD title, and the full names of the composer, the conductor, the orchestra, and the choir (for vocal music only).

Participants could browse through one of the assortments at a time and they could look up as many details about the available CDs as they wished. Finally they were asked to choose one single CD from each of the assortments. From this CD they got to hear a sound sample on their headphones that lasted for 2 minutes. The samples actually were the first two minutes of the first track of each CD that I had downloaded from iTunes and embedded into the experimental software prior to the actual experiment. To control for differences in the volume of the recordings, the volume of each track was normalized and participants got a slider on the screen to control the volume according to their own preferences.

### ***Experimental design***

Participants in front of the computer screen consecutively chose from one small and one large assortment. To control for potential order effects such that the experience of choosing from the first set influences the choice in the second set, participants saw the assortments in one of two different sequences. Half the participants first chose from a small assortment followed by a large assortment; the other half first chose from a large assortment followed by a small assortment. To motivate a repeated choice, one of the assortments consisted of classical orchestra music and one assortment consisted of classical vocal music. The order in which participants saw the type of music was counterbalanced with the order of the assortment size which resulted in four different experimental groups A-D (Table 1).

Participants in group A first chose from a small assortment of orchestra music followed by a choice from a large assortment of vocal music. Participants in group B first chose from a small assortment of vocal music followed by a large assortment of orchestra music. Group C first chose from a large assortment of orchestra music followed by a small assortment of vocal music and group D first chose from a large assortment of vocal music followed by a small assortment of orchestra music. To get

familiar with the experimental setting, all participants first chose a CD from a “training set” of 14 CDs with Deutsche Grammophon piano recordings. The piano CDs were compiled and displayed in the same way as the orchestra and the vocal CDs.

Table 1: Experimental Design

Experimental groups	Sequence of choice sets		
	1st set	2nd set	3rd set
A	piano (14)	vocal (30)	orchestra (6)
B	piano (14)	orchestra (30)	vocal (6)
C	piano (14)	vocal (6)	orchestra (30)
D	piano (14)	orchestra (6)	vocal (30)

### ***Dependent variables***

In line with previous studies on choice overload, the main dependent variables of the study on hand were the degree of post-choice satisfaction and post-choice regret with the chosen piece of music as well as the motivation to make a choice in the first place.

### ***Post-choice satisfaction and regret***

The dependent variables post-choice satisfaction and post-choice regret were assessed immediately after listening to each of the three sound samples. To decrease measurement error and to assess construct reliability, post-choice satisfaction and regret were both measured based on multiple items. All items called for answers on a 9-point Likert scale ranging from -4 (lowest rating) to +4 (highest rating) with textual anchors on both sides of the scale.

Post-choice satisfaction was measured based on six items: Participants were asked to rate their satisfaction with the chosen piece of music in comparison to the other pieces on the screen, in comparison to other pieces of the Deutsche Grammophon label, and in comparison to other pieces of classical music in general. They were further asked to rate how much they liked the chosen piece of music, how much they enjoyed listening to it, and how satisfied they were with their choice.

Post-choice regret was assessed based on three items asking participants to rate how likely they would be to choose the same piece again, if they thought another piece would be better, and how much they regretted their choice. As an additional measure, participants were also asked to state exactly how many of the options they did not choose they now thought were better than the one they actually chose.

### *Choice motivation*

In this experiment preference strength and choice motivation were assessed indirectly through people's willingness to pay for the option of their choice. At the end of the experiment, participants were asked to state how much they were willing to pay for the orchestra and the vocal CD that they had previously selected. To make this task meaningful, they were informed that the three participants willing to pay the most would be allowed to buy the respective CD at the price they stated, a procedure commonly referred to as a sealed-bid first-price auction or discriminatory auction. To give people a sense of the actual market values, they were told that the CDs on display on average cost about 20, euros or 20 dollars, respectively. To make sure that participants remembered their selections, they were presented with the covers of their previously chosen orchestral and vocal CDs.

The difference in how much participants were willing to pay for an option chosen from a small set and an option chosen from a large set indicates how much one option is preferred over the other. As the willingness to pay more increases the probability of an actual purchase, the measure can also be seen as a proxy for the motivation to choose.

### ***Mediators and moderators***

#### *Perception of the assortment*

As mentioned in Chapter I, another potential mediator of the effect might be the perception of a large assortment as less attractive or overly complex or the experience of choice from a large assortment as being more difficult or less enjoyable. As for the main dependent variables, all items on mediators and moderators were assessed at the end of each sound sample and if not stated otherwise, items called for answers on a 9-point Likert scale ranging from -4 (lowest rating) to +4 (highest rating).

Perceived choice difficulty was assessed based on four items: Participants rated how hard/easy it was for them to make a choice (very easy/very hard), how exhausting it was to choose a piece of music (very exhausting/not at all exhausting), how much they deliberated about their choice (very little/very much), and to what extent they experienced the choice process as frustrating (very frustrating/not at all frustrating). To get a more complete picture of the process, participants also rated how much they enjoyed making a choice between the pieces of music and how much they were trying to select the best piece of music.

#### *Consideration set size and search process*

The current study set out to measure the size of the consideration set and the degree to which decision makers ignore the excess choices based on self-reports and based on behavioral measures of the amount of search and the number of options inspected prior to choice. Consideration set size was measured by asking participants to state the exact number of options they short-listed ("Wie viele CD's kamen für Sie in die

engere Wahl?“/“How many options did you short-list?“). As a behavioral measure of the individual search process, the number of CDs that were looked up in detail and the decision time was measured by tracking each mouse click on the screen. As this tracking was achieved in the background through the experimental software, it did not interfere with the decision task and it could not be noticed by the participants.

### *Maximizing*

After the choice task on the computer screen, participants filled out a paper-and-pencil questionnaire that consisted of the personality scales for maximizing and satisficing. To validate the maximizing scale, participants also filled out Schwartz et al.'s (2002) regret scale, which is supposed to moderately correlate with the maximizing scale. Maximizing and regret were measured based on the scales published by Schwartz et al. (2002) and their validated German versions, respectively (Greifeneder & Betsch, 2006).

As a domain-specific measure of maximizing, participants also rated how much they were trying to select the best piece of music. As mentioned above, this item was asked after each sound sample alongside the other items.

### *Expertise*

At the end of the experiment, prior preferences and domain-specific expertise were assessed. Participants were asked to indicate on a Likert scale how often they listen to classical orchestra music (never–daily), how often they listen to classical vocal music, how knowledgeable they consider themselves with regard to these two styles of music (don't know anything–know a whole lot) and how much they like these two styles (don't like it at all–like it very much).

As further control variables, participants also rated how motivated they were to participate in the study (not motivated at all–very motivated) and how carefully they answered the questions (very carefully–not at all carefully). As compensation for their participation, participants in Berlin received 8. euros and participants in Bloomington received course credit.

## **Results**

### ***Participants***

In Berlin, 80 students from local universities participated in the study (20 in each condition). Of the participants, 49% were female; the average age was 26 years ( $SD=2.9$  years). In Bloomington, 87 undergraduate students from Indiana University participated (22 in conditions A, B, and C and 21 in condition D). Of the participants in Bloomington, 69% were female and the average age was 20 years ( $SD=1.6$  years).

### ***Counterbalancing***

There was no statistically significant ( $\alpha=0.05$ ) difference between the four experimental groups (A-D) in either country on any of the three main dependent

variables: post-choice satisfaction, post-choice regret, and willingness to pay. Therefore, to test for main effects of assortment size within subjects, the data was collapsed across the order of music style (orchestra first/vocal first) and the order of assortment size (small set first/large set first), separately within each country.

To allow for a more concise report of results in the following paragraphs, data from the Berlin sample will be stated first, followed by data from the Bloomington sample, separated by a slash.

### ***Manipulation check***

Participants in both countries were motivated to participate in the study and all reported that they carefully answered the questions.

### ***Perception of the assortment***

On a scale from -4 (not at all attractive) to +4 (very attractive), participants in both countries on average perceived the large set as more attractive than the small set, which is in line with previous findings on too much choice. The average attractiveness rating was -0.3/0.3 ( $SD=2.0/2.2$ ) for the small set and 0.8/0.7 ( $SD=2.0/2.1$ ) for the large set. When compared within subjects, 55%/45% of the participants rated the large set as more attractive compared to 21%/31% who rated the small set as more attractive. In absolute terms, the attractiveness ratings vary around the center of the rating scale, which indicates middling attractiveness.

The complexity of the small assortments was rated as -1.6/-0.7 ( $SD=1.8/2.1$ ) and the complexity of the large assortments as 1.5/0.7 ( $SD=1.9/2.1$ ). Thus, in both countries the two assortments clearly differed with regard to their perceived complexity. Yet in absolute terms, especially in the U.S. sample, the large assortment was not rated as very complex. In line with this, choosing from the small set was perceived as easier (-1.5/-2.1;  $SD=1.4/1.7$ ) as compared to the choice from the large set (-1.0/-1.8;  $SD=1.6/1.9$ ). Of all participants, 65%/47% rated the choice from the small set as easier and 37%/32% rated the choice from the large set as easier. In absolute terms, the negative mean scores indicate that both choices were perceived as rather easy.

### ***Consideration set size and search process***

On average, participants looked up 5/5 different CDs ( $SD=1.6/1.4$ ) or 89%/84%<sup>3</sup> in the small assortments while in the large assortments they looked up 16/14 different CDs ( $SD=11.2/11.3$ ) or 52%/47%. In total, 74%/68% of the participants looked up more options in the large set as compared to the small set and 20%/16% looked up more options in the small set. Thus, a higher absolute number of options was looked

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<sup>3</sup> The differences between absolute numbers and percentages are due to rounding to full numbers

up in the large condition as compared to the small condition while at the same time the relative number of explored options was notably smaller in the large assortment.

On average, participants' reported consideration set size was 3/3 ( $SD=1.0/2.1$ ) in the small assortment and 5/8 ( $SD=4/8.1$ ) in the large assortment. Of all participants, 80%/71% formed higher consideration sets for the large assortment as compared to the small assortment, and 9%/19% formed higher consideration sets for the small assortment.

In the small assortment, it took an average<sup>4</sup> of 29/24 seconds from the moment the assortment was displayed on the screen until the final choice of one particular piece of music ( $SD=18/17$  seconds). In the large set, this search and exploration phase took an average of 64/44 seconds per person ( $SD=54/36$  seconds). Of all participants, 79%/77% took longer to choose from the large set as compared to the small set. When choosing from the small assortment, on average, participants spent 5.4/4.7 seconds to examine the details of one single option before they went on to the next or terminated their search ( $SD=2.7/3.0$  seconds). In the large assortment, the time it took to examine one single option was 5.1/4.0 seconds ( $SD=3.1/3.3$  seconds).

#### ***Effect of assortment size on the main dependent variables***

In the following, I will report the effect of assortment size on the main dependent variables post-choice satisfaction, post-choice regret and willingness to pay.

#### ***Post-choice satisfaction***

Prior to testing the effect of assortment size on post-choice satisfaction the reliability of this main dependent measure needs to be assured. Cronbach's alpha for the six-item post-choice satisfaction scale is 0.98/0.98 for both the small and the large assortment, which indicates a good reliability in both countries (Bortz & Döring, 2002).

On a scale from -4 (very unsatisfied) to +4 (very satisfied), the mean satisfaction with options chosen from the large set is 1.1/1.0 ( $SD=2.4/2.2$ ) and from the small set it is 0.5/0.9 ( $SD=2.4/2.2$ ). Of the 80/87 participants, 35/39 were more satisfied with the chosen option from the small set, 41/43 were more satisfied with the chosen option from the large set, and the remaining 5 were equally satisfied in both conditions. When subtracting the post-choice satisfaction score in the large set from the post-choice satisfaction score in the small set within each participant, the mean difference across participants is -0.5/-0.1 ( $SD=3.9/2.9$ ), where a negative value indicates a higher satisfaction for options chosen from the large assortment (Figure 7). According to Cohen (1977) this translates into an effect size of  $d=-0.17/-0.05$ . By means of a *t*-test for paired samples, and an alpha level of 0.05, the null hypothesis of

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<sup>4</sup> Following the recommendation of Wilcox (1998), mean statistics on decision times are 20% trimmed to control for outliers, which means that 10% of the largest as well as 10% of the smallest observations are discarded

a zero difference can be rejected neither in Berlin,  $t(79,1)=-1.3$ ;  $p=0.21$ , nor in Bloomington,  $t(86,1)=-0.3$ ;  $p=0.74$ .

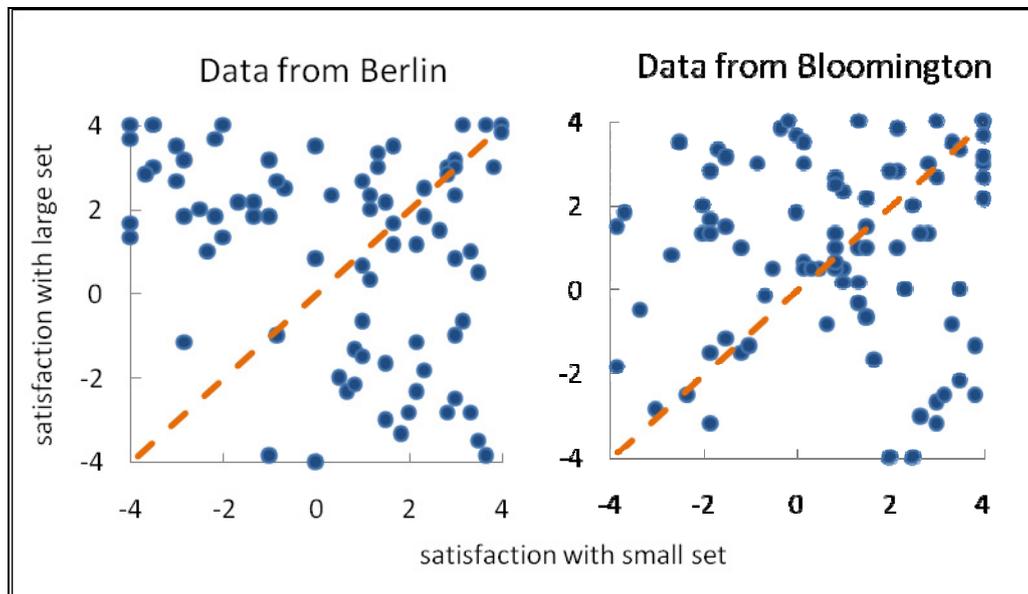


Figure 7: Individual satisfaction with the chosen option depending on assortment size. Data points below the diagonal indicate higher satisfaction when choosing from the small set as compared to the large set (=too-much-choice effect).

#### Post-choice regret

For the three-item post-choice regret scale, Cronbach's  $\alpha=0.79/0.80$  for the small assortment and  $0.86/0.83$  for the large assortment. Analogous to the post-choice satisfaction measure, this indicates a satisfactory reliability.

The mean post-choice regret with options chosen from the large set is  $0/0.3$  ( $SD=2.3/2.4$ ) and from the small set it is  $0/-0.2$  ( $SD=2.5/2.3$ ). Of all participants, 35/40 experienced more post-choice regret when choosing from the small assortment as compared to the large assortment, 39/42 experienced more regret in the large assortment, and 6/5 equally regretted their choice in both conditions. A  $t$ -test analog to the one applied for post-choice satisfaction did not reveal a significant difference in Berlin,  $t(79,1)=-0.04$ ;  $p=.97$ ; Cohen's  $d=-0.01$ , or in Bloomington,  $t(86,1)=0.17$ ;  $p=.87$ ; Cohen's  $d=0.04$ .

#### Willingness to pay

The mean amount participants were willing to pay is 6.3 euros/6.9 dollars ( $SD=€5.5/\$4.9$ ) for a CD chosen from the small assortment and 6.7 euros/7.6 dollars ( $SD=€4.5/\$5.2$ ) for a CD chosen from the large assortment. The corresponding effect size (Cohen's  $d$ ) is  $-0.08/-0.13$ . Of all participants, 40/40 stated a willingness to pay

more in the large-choice condition and 29/28 stated a willingness to pay more in the small-choice condition. These data indicates that if anything, people were willing to pay more for an option chosen from the large assortment (Figure 8).

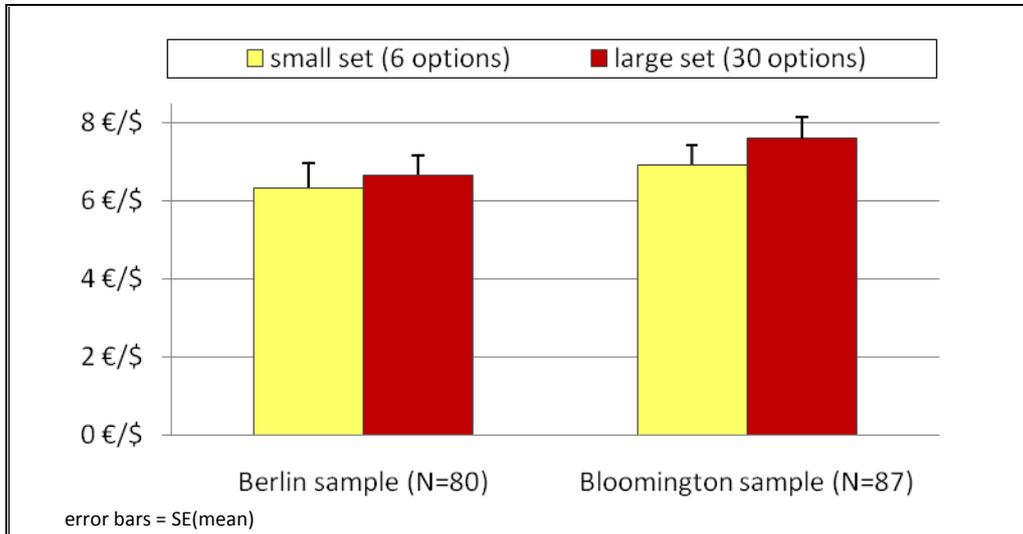


Figure 8: Amount willing to pay for the selected CD depending on assortment size.

#### *Inter-individual differences*

In summary, when averaging across all participants within each country, no effect of assortment size on the three main dependent variables, post-choice satisfaction, post-choice regret, and willingness to pay, was found. Yet, as the data indicate considerable inter-individual differences in these dependent variables, it can be conjectured that an effect of too much choice might have occurred at least for some participants. In line with this, the three main dependent variables are highly correlated with each other. The Pearson correlation between the difference in post-choice regret and the difference in post choice satisfaction is  $r = -.90/- .85$ . For the difference in post-choice regret and the willingness to pay, the correlation is  $r = -.61/- .60$ ; and for post-choice satisfaction and the willingness to pay, the difference is  $r = .68/.63$ .

Together, these correlations indicate that a person who is dissatisfied regrets the choice and is willing to pay less—and vice versa. Merging these three measures assumes that they reflect the same underlying construct. With regard to their intercorrelation, this assumption seems justified as Cronbach's alpha is 0.87/0.83. Even though preliminary, this provides some convergent evidence for the existence of the effect for some of the participants. The question that arises is if these individual differences can be explained by one of the moderator or mediator variables outlined above. If so, this would lead to an important insight into when and why the effect of too much choice occurs.

### *Test of potential moderators and mediators*

I set out to test the potential moderators and mediators outlined above, namely, the personality traits maximizing and regret, as well as behavioral differences in the amount of search, the perception of complexity, the size of the consideration set, the perceived attractiveness of the assortment, the perceived difficulty of making a choice, the number of options participants thought would be better than the one they chose, and the expertise in the domain on hand.

To test if these factors matter, I split the sample into two separate groups for each country. The “overloaded group” consisted of participants who showed signs of choice overload on all three dependent variables such that they experienced the choice from the small set as more satisfactory and less regrettable and were willing to pay more for a CD chosen from the small assortment. The “scarcity group” consisted of those participants who showed the reverse pattern on all three dependent variables. There were 26/20 participants in the overloaded group and 28/30 participants in the scarcity group.

As an alternative way to split the participants into two groups, I could have used the continuous compound score on the three measures of choice overload as variable within a random effects model. While in the latter case the statistical power would have been higher, due to the more complex statistic, the presentation of the results would have been less comprehensible. As the results are similar for both statistical methods, I will report the results based on the comparison between the overloaded and the scarcity group.

#### *Propensity to maximize and to regret*

In Berlin, participants in the overloaded group had slightly higher scores on Schwartz et al.’s (2002) maximizing scale (4.3 [ $SD=1.0$ ] vs. 3.8 [ $SD=1.0$ ] on a scale from 1 to 9) and the regret scale (4.5 [ $SD=1.4$ ] vs. 3.9 [ $SD=1.6$ ]). Yet the magnitude of these differences was rather small (Cohen’s  $d=0.5$  for maximizing and  $d=0.4$  for regret) and on an alpha level of 0.05 the corresponding  $F$ -tests were not significant,  $F(52,1)=3.0$ ;  $p=.09$  for maximizing and  $F(52,1)=2.2$ ;  $p=.14$  for regret. In Bloomington, participants in both groups have similar mean scores and variance on the maximization scale (5.2,  $SD=1.1$ ) and with respect to regret, the overloaded group in Bloomington had a slightly lower average score (4.7 [ $SD=1.0$ ] vs. 5.3 [ $SD=1.0$ ]). Thus, there was no consistent difference between the two groups with regard to their general propensity to maximize or to regret their choices.

In Berlin, only 16 (20%) of the participants scored above the middle of the maximization scale and thus according to Schwartz et al. (2002) would classify as maximizers, while the majority of participants should be classified as satisficers. In the Bloomington sample, 51 (59%) of the participants had a maximization score above 5. To rule out that the high proliferation of satisficers in Berlin diminished the effect in the sample, I directly compared maximizers to satisficers. Yet with regard to the three

main dependent variables, there is virtually no difference between the two groups in Berlin. Consequently, only 6 of the 16 maximizers were found in the overloaded group, which is about what would be expected by chance.

One reason for why the assessed personality traits can only partly count as explanation for the effect might be that their reliability is rather low. Cronbach's alpha for the maximization scale is 0.62/0.70 and for the regret scale it is 0.76/0.62. While these low reliabilities make it difficult to interpret the personality construct underlying these scales, it should be noted here that these values are slightly higher than the scale reliabilities reported by Iyengar et al. (2006) and those reported by Haynes and Olson (2007, Study I).

As outlined above, the tendency to maximize might be domain specific, which is why I asked participants after each choice to specify to what extent they were trying to select the best piece of music. Yet for this domain-specific measure there is also no notable difference between the overloaded group and the scarcity group. There is also practically no correlation between the domain-specific tendency to maximize and the maximization scale, which further questions the validity of the maximization construct in the context on hand.

#### *Domain-specific expertise*

In both countries, the six items assessing prior preferences and expertise were highly intercorrelated, with Cronbach's  $\alpha=0.89$  for the Bloomington data and  $\alpha=0.81$  for the Berlin data. Thus, I collapsed the items into an aggregated score for each participant for subsequent analyses.

Despite the good reliability of the measure, the degree of domain-specific expertise was virtually the same between the overloaded and the scarcity groups, which suggests that in the current study this factor did not directly influence the effect of too much choice. This is in contrast to the findings of Mogilner et al., (2006, Study 3) who found an effect of too much choice for people with little knowledge and experience but not for experienced participants.

#### *Search, perception of assortment, and expertise as potential moderators*

Also, in Berlin and in Bloomington there were virtually no differences between the two groups with regard to the number of options that were looked up prior to choice, the perception of complexity, the amount of time spent searching (in seconds) and the amount of self-reported deliberation. In the Berlin sample, people in the overloaded group experienced the choice from the small assortment as easier (-1.8 vs. -0.9),  $F(52,1)=5.2$ ;  $p=.03$ , and the choice from the large assortment as slightly more difficult (-0.7 vs. -1.5),  $F(52,1)=3.5$ ;  $p=0.07$ , than the scarcity group. However, I found no such differences in the Bloomington sample.

In Berlin, but not in Bloomington, the overloaded group formed considerably larger consideration sets when choosing from the large assortment as compared to the scarcity group (six vs. four options) while for the small assortment there was no such difference. This might indicate that for some people in Berlin the effect of too much choice was moderated through an appetite conflict as a result of having too many attractive options. Narrowing down these options might have been perceived as difficult and frustrating, which in turn would affect the satisfaction with the finally chosen option. However, the fact that no such relationship exists in the U.S. sample suggests that this interpretation should be considered preliminary.

In both countries, compared to the scarcity group people in the overloaded group thought that the number of better options in the rest of the large set was higher (8/9 vs. 2/5),  $F(52,1)=18.4$ ;  $p<.001$  and  $F(48,1)=4.8$ ;  $p=.03$ . In Bloomington, but not in Berlin, people in the overloaded group also rated the large assortment as less attractive as compared to the scarcity group (0.2 vs. 1.1),  $F(48,1)=5.3$ ;  $p=.03$ . Yet the relationship between these latter two variables and the dependent variables might be due to the close resemblance of their theoretical underpinnings: The number of better yet forgone options clearly is an aspect of regret while the attractiveness of the assortment might be influenced by the attractiveness of the chosen option. Thus, while these differences reconfirm the dependent variables, they add little to their explanation.

### **Discussion**

As in my previous experiments, I did not find any effect of assortment size on either satisfaction, regret, or willingness to pay. This was despite the use of a within-subject design and a well-controlled experimental setup through which even small effects would have been detected. The strong correlation between three main dependent variables and the inter-individual variance with regard to these variables suggest that something like a too-much-choice effect might have occurred for about a quarter of the participants. However, this intraindividual variance could not be explained by any of the theoretically well-grounded moderators and mediators that I assessed. There are several possible explanations for these findings.

#### ***Random error variance***

The reason that most suggests itself is that the differences in the dependent variables are simply due to random variation. Independent of assortment size, there certainly is variance in how much participants liked the option that they chose due to influences such as individual preferences for certain types of sounds, the quality of the recording, or different expectations, to name only a few. As I did not control or measure these influences they count as error variance. This error variance causes variation in people's satisfaction, regret, and their willingness to pay. In addition, as in any experiment, these three main dependent variables themselves are measured with an error. Yet, as indicated by the high reliability of the multi-item measures for satisfaction and regret, this latter error is probably negligible.

Thus, under the null hypothesis that there is no effect of assortment size, participants would be classified in an overloaded group and a scarcity group just by chance, and as a consequence, there would be no variance left to be explained by potential moderators and mediators.

### ***Satisficing***

An alternative explanation for the lack of findings might be that overall the attractiveness of the assortment was rated as mediocre and that even though the choice was real, it did not have important consequences. This might have increased the chances that people did not care much about the outcome and that they satisficed rather than optimized. In line with this, the data on hand indicate that participants found it rather easy to make a decision and that they did not perceive the assortment as very complex. What speaks against this interpretation is the fact that the perception of the assortment and the self-reported decision strategy (i.e. how much subjects said they were maximizing vs. satisficing) did not have an influence on the main dependent variables. However, the data also indicate that the validity of the maximizing vs. satisficing personality measure was poor, which makes it difficult to interpret these results. Moreover, there is some evidence that people have little insight into their own decision strategies (Nisbett & Wilson, 1977) and thus asking them might not be an adequate measure in principle. I will discuss the relationship between decision strategies and assortment size in more detail in the General Discussion in Chapter V.

### ***Higher-order interactions***

It can be speculated that the effect of too much choice depends on several necessary preconditions such that in order for it to occur, decision makers need to have a low expertise in a complex and unfamiliar domain and at the same time seek an optimal outcome. Yet, due to its highly explorative nature and the decrease in statistical power, I refrained from testing multiple causation models and higher-order interactions of that kind. Besides, the more preconditions that have to be met in order to elicit the effect of too much choice, the lower its generalizability and ultimately also its importance.

## **General Discussion**

In a total of six experiments across various domains and contexts with a total of 595 participants in Germany and the U.S., I found no effect in five studies and only a medium effect of too much choice in one study. Summarizing my results, the effect does not seem to depend on cultural differences between Germany and the United States, nor on a further increase in the number of options in the large set (i.e. from 40 to 80 in the charity study), an increase in the average attractiveness of the small assortment, people's tendency to maximize their outcome or their perception of complexity, the number of options people explore, or their domain-specific expertise.

Across all my experiments, the only case in which a small effect of choice overload occurred was when participants were asked to justify their choices. In this

case, the effect could be due to the fact that it is more difficult to justify a choice from a large assortment as compared to a small assortment because in the small assortment the options are less similar. While the data on the number of characters used to justify the choice provided some weak support for this idea, the finding needs to be replicated before any firm conclusion can be drawn. Also, as mentioned before, it does not explain most of the reported occurrences of the effect.

In summary, the question remains of when and why the effect of too much choice occurs. As outlined in Chapter I, other researchers have found the effect in different contexts. With regard to the results of my own research it can be concluded that the effect is far less robust than suggested by its proponents.

As before, there are two possible approaches to joining these divergent findings into a coherent theoretical frame. First, it could be that choice overload is indeed widespread but that the effect is much smaller than previously thought. In this case, the question arises of how probable these divergent results are. Second, it could be that moderator or mediator variables that explain the diverging results actually do exist and remain to be discovered. In the latter case, the core question is what these variables are. These approaches will be followed up in Chapters IV and V, respectively.

## **Chapter IV: Meta-analysis**

In a series of nine studies in the field and in the laboratory involving choices among exotic jams, wine, jelly beans, restaurants, charity organizations, and classical music with a total of 1,445 participants, there was only one case in which I found an effect of the number of options on choice motivation. This is despite the fact that in each study, options were used that the decision makers were largely not familiar with, to rule out the influence of strong preferences prior to choice. The only case in which I found an effect was under the condition that participants had to give a justification for their decision. Even if future research confirms this “justification effect,” it can still be concluded that the effect of too much choice is far less robust than previously thought. Averaged over all 1,278 participants across the eight studies that I conducted in which there was an option not to choose, 49% of all participants make a choice from the large set and 48% make a choice from the small set.

In the two music studies in which participants in the United States and in Berlin were forced to make a choice and the main dependent variables were self-reported satisfaction, regret, and the willingness to pay, the results look similar. If anything, the 167 participants in both countries were more satisfied, less regretful, and willing to pay more when choosing from a large set as compared to a small set.

As has been pointed out by the statistician R. A. Fisher, replicability of empirical evidence is the foundation of science and the path to cumulative knowledge (Fisher, 1971). Along the same lines, Schmidt (1996) argued that any single empirical study usually reveals only little information and by itself can rarely resolve a controversial issue. As a consequence, the results from many studies need to be integrated to obtain reliable measures and to promote scientific progress. As a means to this end, in this chapter, I will strive to meta-analytically integrate the divergent findings into a more coherent framework.

### **Introduction**

To get a broader picture of the true nature of the too-much-choice effect, it is advisable to incorporate as much data as possible in a meta-analysis. Toward this goal, in the following I will also include the results of the experiments on choice overload that I reviewed in Chapter I. Including my own, this makes a total of 26 experiments. Together, these studies represent all the published and unpublished experimental data on the effect of varying assortment sizes that I could get ahold of by June 2007.

## **Overview of the studies**

The studies can be classified into two categories based on the experimental setup they used: In 14 of these experiments, including 8 of my own, participants had the option not to make a choice for the time being, to choose a default option, or to change their choice later on. In the other 12 studies, including 2 of my own, people were forced to make a choice. In the first case, with few exceptions (Chernev, 2003a, 2003b) the dependent variable is the percentage of people who made a choice (Table 2). In the latter case, the dependent variable is usually the satisfaction with the chosen option, but sometimes also the amount of consumption or the propensity to change the decision at a later point in time (Table 3). Figure 9 provides a forest plot of all effect sizes and their respective standard errors alongside each other.

Table 2: Summary of experiments with choice proportions as dependent variable. The asterisks (\*) mark my own experiments

Study name	N total	Assortment size		Choice in %			Effect size ( <i>d</i> )	SE ( <i>d</i> )
		small set	large set	small set	large set	difference		
Iyengar & Lepper (2000), Jam study	249	6	24	29.8%	2.8%	27.0%	0.77	0.13
Iyengar & Lepper (2000), Chocolate study	67	6	30	48.0%	12.0%	36.0%	0.88	0.26
Shah & Wolford (2007)	60	2-10	12-20	60.0%	44.0%	16.0%	0.32	0.20
Chernev (2003a)	58	4	16	16.0%	84.0%	-68.0%	-1.44	0.24
Chernev (2003b), Study 1	88	4	16	82.0%	74.0%	8.0%	0.23	0.22
Chernev (2003b), Study 2	75	4	16	75.0%	69.0%	6.0%	0.22	0.23
Jam study Berlin*	504	6	24	33.3%	32.0%	1.3%	0.03	0.09
Jelly bean study*	66	6	30	63.6%	78.8%	-3.0%	-0.27	0.24
Wine study*	280	3	12	34.5%	38.3%	-3.8%	-0.10	0.12
Restaurant study*	80	5	30	30.0%	35.0%	-5.0%	-0.14	0.22
Charity study I – well known charities*	60	2	30	83.3%	93.3%	-10.0%	-0.53	0.26
Charity study I – least known charities*	57	5	40	65.5%	71.4%	-5.9%	-0.17	0.26
Charity study II (Bloomington)*	112	5	40 & 79	80.6%	87.0%	-6.5%	-0.26	0.20
Charity study III*	119	5	40 & 80	88.1%	72.7%	15.4%	0.57	0.20

Table 3: Summary of experiments with satisfaction ratings <sup>(a)</sup>, amount of consumption <sup>(b)</sup>, or propensity to change the decision <sup>(c)</sup> as dependent variable. The asterisks (\*) mark my own experiments

Study name	N total	Assortment size		Mean value			Effect size ( <i>d</i> )	SE ( <i>d</i> )
		small set	large set	small set	large set	difference		
Haynes & Olson (2007), Study 1 <sup>a</sup>	69	3	10	7.85	7.20	0.65	0.44	0.25
Haynes & Olson (2007), Study 2 <sup>a</sup>	72	5	20	7.17	7.28	-0.11	-0.20	0.23
Lenton, Fasolo, & Todd (2005) <sup>a</sup>	96	4	20	5.19	5.36	-0.17	-0.08	0.20
Reutskaja & Hogarth (2005), Study 1 <sup>a</sup>	60	10	30	8.50	7.10	1.40	0.68	0.27
Reutskaja & Hogarth (2005), Study 2 <sup>a</sup>	60	10	30	7.30	7.70	-0.40	-0.33	0.25
Kahn & Wansink (2004), Study 1 <sup>b</sup>	36	6	24	16.60	22.70	-6.10	-0.37	0.33
Kahn & Wansink (2004), Study 2 <sup>b</sup>	91	6	24	34.90	50.90	-16.00	-0.46	0.20
Kahn & Wansink (2004), Study 5 <sup>b</sup>	138	6	24	43.70	60.90	-17.20	-0.39	0.17
Lin & Wu (2006) <sup>c</sup>	82	6	16	2.76	2.83	-0.07	-0.08	0.22
Mogilner, Rudnick, & Iyengar (2007), Study 3a	121	5	50	4.36	3.89	0.47	0.25	0.18
Music study (Berlin) <sup>*,a</sup>	80	6	30	0.51	1.06	-0.55	-0.17	0.16
Music study (Bloomington) <sup>*,a</sup>	87	6	30	1.90	2.00	-0.10	-0.05	0.15

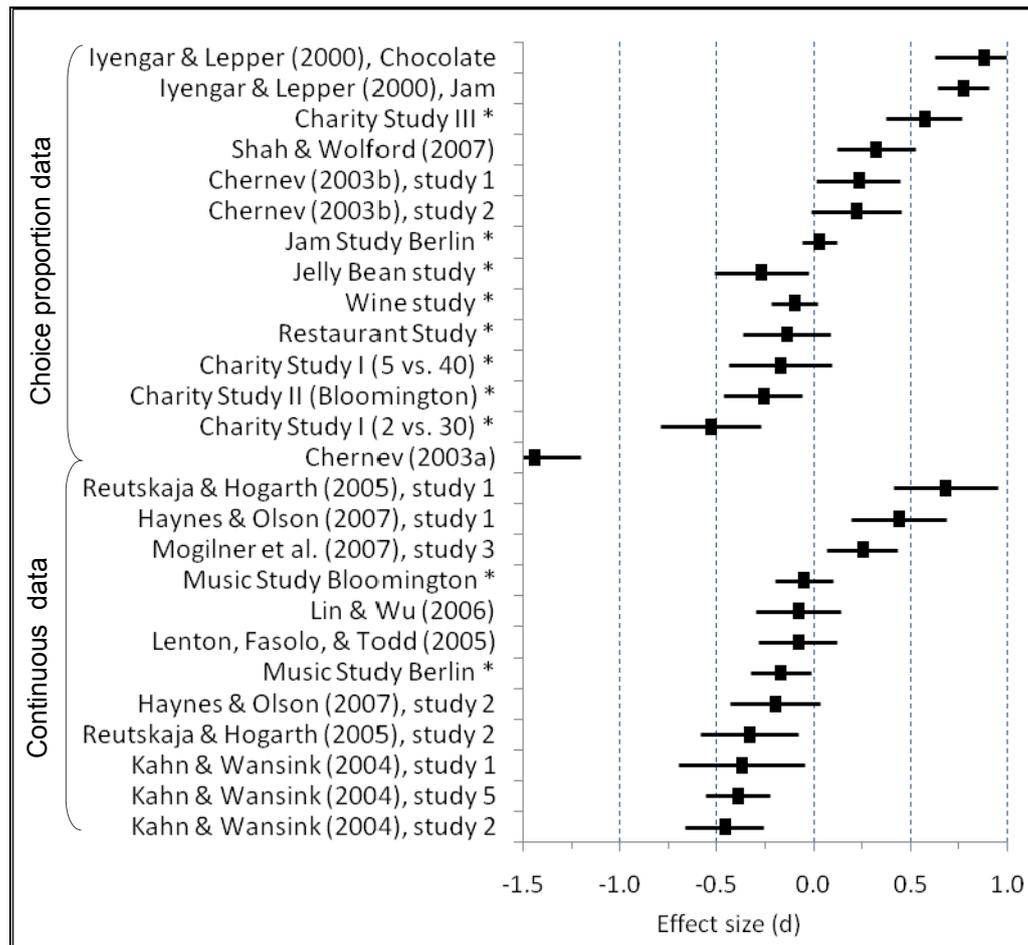


Figure 9: Forest plot of all effect sizes. The bars indicate standard errors; the asterisks (\*) denote my own studies

## Method

One way to meta-analytically integrate these results would be simply to count the number of studies that did not find a (statistically significant) effect of assortment size. If this number exceeds the number of studies that found an effect, one would conclude that no relationship exists. As pointed out by Schmidt (1996), this so-called traditional voting method leads to wrong conclusions because it dismisses the fact that the significance of a study depends on the sample size and that studies might appear to be inconsistent with each other due to mere random error.

To obtain a more precise method of meta-analytic integration, Hunter and Schmidt (1990) suggest relying on effect sizes and their respective sampling error rather than on statistical significance. According to Hunter and Schmidt, the results of several studies are integrated by calculating a weighted average of all single effect sizes across studies ( $D$ ):

$$D = \frac{\sum_{i=1}^m (w_i \cdot d_i)}{\sum_{i=1}^m w_i} \quad (4-1)$$

where  $w$  is the weight of each single effect size as calculated in Equation 2-2<sup>5</sup>,  $d_i$  is the effect size of a study  $i$ , and  $m$  is the total number of studies. The 95% confidence interval around  $D$  is calculated as

$$D \pm 1.96 \cdot se_D \quad (4-2)$$

where  $SE_D$  is the standard error of  $D$ , calculated as

$$SE_D = \sqrt{\frac{1}{\sum_{i=1}^m w_i}} \quad (4-3)$$

To find out how much of the variance in  $D$  is due to mere sampling error and how much is due to meaningful differences between the studies, one needs to calculate a homogeneity analysis based on the  $Q$ -statistic as laid out in Formula 2-1. In the homogeneity analysis in Chapter II, the variance between studies could not be fully accounted for by error variance and as a consequence, searching for moderators and mediators seemed justified. However, with the empirical data of 21 additional studies on hand, the results of this analysis may look different.

#### Selection of studies

The meta-analysis on hand is only concerned with the main effect of too much choice in controlled experimental settings. Interaction effects, such as the effect of need for cognition (Lin & Wu, 2006), or the effect of entropy (Kahn & Wansink, 2004) are not considered because there is not enough data to separately estimate the effect of those interactions in a meta-analysis.

In general, the meta-analytical integration of results requires that the studies be comparable in their design and their hypotheses. The experimental designs of the studies that used choice proportions as the dependent variable are rather similar and so a meta-analytical integration seems justified. However, in one of Chernev's (2003b) studies, the proportion of people who changed their decision was measured, and in another (Chernev, 2003a), it was the proportion of people who choose from the large assortment rather than the small. While both dependent variables are somewhat

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<sup>5</sup>  $w = \left( \frac{n_1 + n_2}{n_1 \cdot n_2} + \frac{d}{2 \cdot (n_1 + n_2)} \right)^{-1}$

different from those in the other studies that looked at the proportions of people who did (not) choose any of the options, in each case the authors argued that on a conceptual level their measure reflects people's motivation to make a choice. Thus, the integration of studies seems justified.

The studies that used a continuous dependent variable are not directly comparable to those that measured choice proportions because for the continuous measures, participants were forced to make a selection from a given set. These latter studies are also somewhat more heterogeneous in their design. The majority of the studies used satisfaction with the chosen option (Haynes & Olson, 2007; Mogilner et al., 2007, Experiment 3; Reutskaja & Hogarth, 2005; my own music studies), measured with a Likert scale. In contrast, Lin and Wu (2006) asked participants about their propensity to change their decision later on, which seems at least similar to satisfaction. The experiments by Kahn and Wansink (2004) were based on consumption, which according to the authors themselves is conceptually different from choice or subjective satisfaction. However, as these studies generally tested the effect of assortment size, I included them in the meta-analysis initially and then checked in a second step if the results change when this set of studies is excluded.

#### **Coding of studies**

To integrate the studies, effect sizes have to be calculated. Effect size measures such as Cohen's  $d$  express the magnitude of an effect in units of standard deviations. For studies with proportion of choice, the calculation of standard deviations is straightforward because they are a function of the sample size and the proportion, both of which are commonly provided by the authors. For studies with a continuous measure, such as satisfaction or amount of consumption, a calculation of effect sizes requires that standard deviations be explicitly reported in the original study. Unfortunately, this is often not the case. In some studies (Haynes & Olson, 2007, Study 1; Lenton et al., 2005; Lin & Wu, 2006; Mogilner et al., 2007, Experiment 3), this problem can be solved by reverse-engineering standard deviations from test statistics such as  $F$ - or  $t$ -values. In one case (Kahn & Wansink, 2004), however, this is not possible because the main effect of assortment size on the dependent variable, the amount of consumption, was not tested statistically. As I also could not obtain the necessary statistics from the authors, strictly speaking the data cannot be integrated into a meta-analysis. Yet because Kahn and Wansink's studies provide important insight, for the present purpose I decided to integrate them regardless by estimating the standard deviations, knowing that the resulting effect size is error prone. To reduce the error, I estimated that the standard deviation would be equal to the mean consumption value. As this is most probably an overestimation, the effect sizes will be smaller and thus the weight of the studies in the meta-analysis will be reduced.

In some experiments (Reutskaja & Hogarth, 2005; Shah & Wolford, 2007), the number of options varied across a wide range. To integrate the results of the study by Reutskaja & Hogarth, I selected those assortment sizes for which the effect was

greatest (10 vs. 30 options). In the study by Shah & Wolford, assortment sizes varied between 2 and 20 with increments of 2. To test for the main effect of too much choice, I grouped the assortment sizes 2 to 10 into a small assortment and compared it to the mean choice proportions for assortment sizes of 12 to 20 options.

## Results

### Studies with choice as dependent variable

Integrating all 14 studies listed in Table 2 with choice proportions as dependent variable, the mean effect size according to equation 4-1 is  $D=0.07$  ( $SE_D=0.05$ ) and the 95% confidence interval ranges from -0.02 to 0.17. As the confidence interval includes zero, the mean effect size is not statistically different from zero. The  $Q$ -value obtained from Equation 2-1 is 100.2. As this is larger than the critical chi-square value of 22.4 ( $\alpha=0.05$ ;  $df=13$ ), the variability across effect sizes exceeds what would be expected based on sampling error. Thus, according to Hedges and Olkin (1985), it can be concluded that the different results between the studies are due to the influence of moderator variables.

If the data from Chernev (2003a) with its extreme effect size of  $d=-1.44$  and the data from Chernev (2003b) that used a slightly different dependent variable are excluded, the mean effect size  $D$  is 0.13 with a 95% confidence interval ranging from 0.05 to 0.22. The corresponding  $Q$ -value is 57.7, which is still higher than the critical chi-square value of 18.3 ( $df=10$ ).

### Studies with satisfaction as dependent variable

For all eight studies with satisfaction as dependent measure, excluding the studies by Kahn and Wansink (2004) and Lin and Wu (2006), the mean effect size  $D$  is 0.02 ( $SE_D=0.07$ ) with a 95% confidence interval ranging from -0.12 to 0.16. Thus, the data on hand is similar to the results obtained for the data on choice as dependent variable such that the mean effect is not statistically significantly different from zero. The  $Q$ -value for the studies with satisfaction as dependent variable is 15.2, which is larger than the critical value of 14.1 ( $\alpha=0.05$ ;  $df=7$ ), which again suggests a further search for moderators.

For all studies with a continuous dependent variable, including the studies by Kahn and Wansink and by Lin and Wu, the mean effect size is  $D=-0.09$  ( $SE_D=0.06$ ) with a 95% confidence interval ranging from -0.2 to 0.02. The homogeneity statistic  $Q=24.9$ , which is larger than the critical chi-square value of 19.7 ( $\alpha=0.05$ ;  $df=11$ ).

### Publication bias and differences in assortment sizes

To see whether the mean effect size is driven by a few studies with extreme effect sizes and/or extreme weights, I drew a so-called funnel plot in which the weight of each study is plotted against its effect size (Figure 10). By looking at Figure 10, it can be seen that the effect sizes are distributed relatively equally. There are only two

outliers. One is the jam study conducted in Berlin, which has an extreme weight. Yet, due to its small effect size, it does not have a large leverage on the mean effect size. The other outlier is the study by Chernev (2003a), which has already been dealt with in the analysis above. The funnel plot can also be used as to detect potential publication or selection biases by checking if the distribution of effect sizes follows the shape of a symmetrical inverted funnel. This is because the results of studies with a smaller sample size (and thus a larger standard error) should have a higher variability. If the plot is asymmetrical, for example, it could be that studies with a small sample size that did not find an effect are missing. Yet with the exception of Chernev's study, the studies are somewhat symmetrically distributed, which suggests a fairly representative selection of studies.

To see whether the difference between the small and the large assortment influences the effect sizes, I correlated the difference in the assortment sizes (coded as large set–small set) with the effect size across studies. The resulting Pearson correlation coefficient is  $r=.10$ . However, this correlation is mainly due to the study by Chernev (2003a) because if this study is excluded, the correlation drops to  $r=.01$ . Thus, it can be concluded that an increase in the difference between small and large set does not increase the effect size (Figure 11).

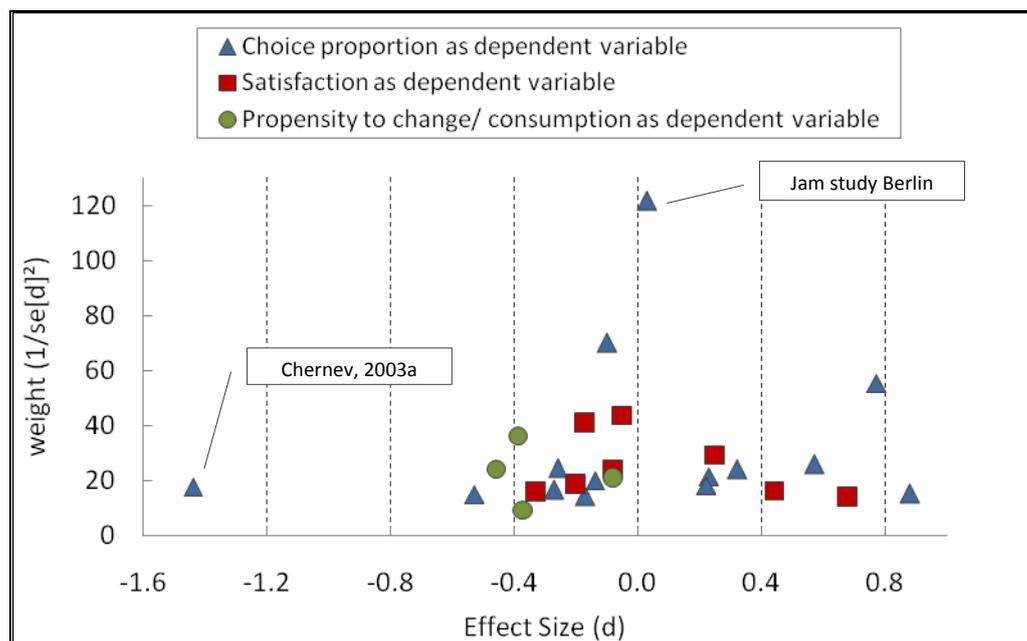


Figure 10: Funnel Plot: Distribution of effect sizes relative to study weight  
 $w=1/SE(d)^2$

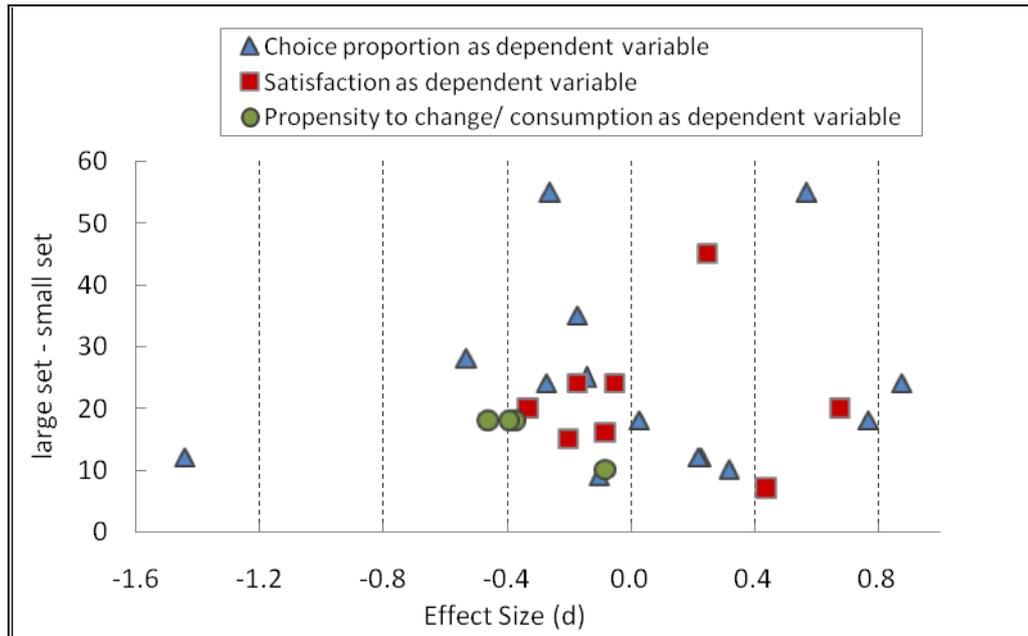


Figure 11: Scatter plot of the correlation between effect size and difference in assortment sizes

## Discussion

When summarizing the empirical evidence on the effect of too much choice based on the published effect sizes, two things can be concluded: First, the effect is far less generalizable than previously thought. Second, the strong effect sizes in some studies that found the effect cannot be explained by random variation, which indicates the presence of moderator and mediator variables.

With regard to the first conclusion, Kelly (2006) noted that unsuccessful replications leave no clear basis for deciding between the original and the replicate study. Based on an analysis of literature databases, he found that unsuccessful replications are cited less often than the original work, which suggests that contradictory evidence is at times ignored. Also, if studies that find a strong effect have a higher probability of being published than studies that find a small effect or no effect, the estimation of the true effect size will be biased.

There is some evidence that studies that are not published in scientific journals have smaller effect sizes than studies that appear in journals. In a study by Rosenthal and Rubin (1978), the average effect size of 32 dissertations that did not appear in journals, expressed in fractions of standard deviations, was 0.35, whereas the average effect size of 313 published journal papers on the same topic was 0.56. With regard to the effect of choice overload, this suggests that the true effect might also be lower.

With regard to the second conclusion, exploring the boundary conditions of the too-much-choice effect clearly is an important and necessary step toward the understanding of its underlying psychological mechanisms. In the preceding chapters, I discussed, evaluated, and eventually tested a number of potential mediators and moderators. There the conclusion was that with one exception, none of the variables that I considered seemed to facilitate the effect of too much choice. Extending this earlier analysis, in the following chapter, I will lay out and critically evaluate additional theoretical explanations as well as potential moderators and mediators that may help provide a more clear-cut picture of the seemingly inconsistent effect of too much choice. Doing so will help to identify the most promising variables to be tested in future experiments.

## **Chapter V: General Discussion and Conclusion**

One explanation of why the effect of too much choice does not reliably occur might be that in the experiments where the effect could not be found, the number of options or the difference in number between the conditions was still not large enough. Due to the vague definition of what constitutes too much choice, it can never be ruled out that an effect would eventually be found with an even higher number of options. Yet this explanation is challenged by the fact that other scholars have found the effect with the number of options I used and that a doubling in assortment size from 40 to 80 in the charity study did not have any effect on the motivation to choose. Also, according to the results of the meta-analysis, there is no relationship between the difference in assortment sizes and the effect size.

As a consequence, it seems worthwhile to discuss other potential explanations and, perhaps most importantly, some theoretical perspectives that might help clarify the too much choice effect. Toward this goal, in the following I will aim to link the too-much-choice effect to previous research on decision making. As I will show, the effect can be placed within the broader frameworks of information overload, decision avoidance, and adaptive decision making, for each of which there is a considerable amount of research.

According to Simon (1990), behavior is shaped by the interaction between the human information-processing system on one side and the properties of the environment on the other. Starting from this general notion, in the following I will identify potential boundary conditions on the side of the decision maker, on the side of the environmental structure (incorporating the choice set or assortment), and on the interaction between the two. Along the way, I propose a number of hypotheses and boundary conditions that can be explored in future research.

### **Complementary features as a moderator**

In Chapter I, I discussed the notion of trade-offs and negative attribute correlation as an important environmental structure to elicit a better understanding of choice overload. In extension to this, scholars in the past have argued that the content of the attributes on which options differ also plays an important role in the amount of decisional conflict people perceive and also for the emergence of choice overload.

#### **Feature complementarity**

Based on a series of experiments involving hypothetical choices among different consumer products, Chernev (2005) found that when options differed along what he called “complementary” features, an increase in assortment size from two to five led

to higher choice deferral. On the other hand, when features were “noncomplementary,” choice deferral decreased with an increase of the assortment size. In Chernev’s terms, features complement each other if a combination of them increases the attractiveness of the option. For example, in his experiment, participants chose among holiday resorts. In the noncomplementary condition, the resorts differed by their location (e.g. Bermuda, Bahamas, Antigua, etc.). In the complementary condition, they differed by what they offered to their guests (e.g. fantastic beaches, convenient transportation, exceptional service, etc.). In the latter case, an ideal resort would offer all features and thus choosing any one of the available options implies that certain attractive features have to be forgone. On the other hand, if options differ along noncomplementary features, an increase in assortment size increases the probability that decision makers will find something that matches their preferences.

Chernev further conjectured that the more resorts there are that have unique and complementary features, the further the deficits of the other options are highlighted and the less attractive it becomes to choose any of the options. To test this hypothesis, similar to my charity study, Chernev asked participants in his study to give a reason for their choice. What he found was that in the condition with complementary features, participants were more likely to mention that they missed a certain feature, and this tendency was even stronger when choosing among five options as compared to choosing between two options.

#### **Attribute “alignability”**

Chernev’s (2005) results match up with the findings of Zhang and Fitzsimons (1999) who found that people were more satisfied with the process of a choice when options differed on noncomplementary features (Zhang and Fitzsimons called them “alignable differences”) as compared to choices between options that had different complementary features (referred to as “nonalignable differences”).

In Zhang and Fitzsimon’s series of four experiments, participants made hypothetical choices among three different types of fictitious microwave popcorn. One group of participants chose among popcorns described on complementary features such as “not likely to burn,” “easy to swallow,” or “few kernels left unpopped.” The other group chose among popcorns described on noncomplementary features such as the origin of the corn (Southwest, Midwest, Northwest) or the size of the kernels (small, medium, large). Participants who chose from the complementary set were subsequently less satisfied with the choice process, such that they were more frustrated and said they would be less likely to make a choice. Zhang and Fitzsimons argued that this is because it is more difficult to compare the unique, complementary features due to the lack of a comparison standard.

The findings of Zhang and Fitzsimons were subsequently confirmed in an experiment that also involved choices among varying numbers of microwave ovens (Gourville & Soman, 2005). In this study, participants were given a choice between

one single oven of brand A and a varying number of ovens of brand B in a between-subjects design. The number of B ovens was subject to experimental manipulation and differed between 1 and 5. In one condition, the B ovens differed along the alignable or noncomplementary attributes such as capacity and price, and in the other condition, the B ovens differed with regard to nonalignable or complementary features (e.g. one oven had a moisture sensor, the other had programmable menus, etc.). The description of the oven from brand A was the same across conditions. Gourville and Soman found that when the B ovens were described on complementary features, the choice share of oven A increased with the number of B ovens. When B ovens were described on noncomplementary features, the choice share of oven A decreased with the number of B ovens being offered.

#### **Critical evaluation of complementary features as moderators**

Taken together, the results of all these studies suggest that trade-offs due to differences along nonalignable or complementary attributes are a necessary precondition for the effect of too much choice. Yet, in their experiments, Chernev as well as Gourville and Soman explored small assortments ranging between two and five options. While these researchers claim that their findings can be generalized to larger assortment sizes as well, so far there is no direct empirical evidence that supports this hypothesis.

In Iyengar and Lepper's jam and chocolate studies, an effect was found despite the fact that options mainly differed on noncomplementary features such as flavor or type of chocolate. Besides, there is no reason to believe that the differences in features were of a different quality in the studies that did not find an effect. Also, if the presence of complementary features is a sufficient precondition, the too much choice effect should be widespread, because many choice sets in the real world are characterized by options that have unique advantages.

#### **Too much choice effect as a special case of information overload**

In earlier chapters I repeatedly pointed out that the research on choice overload is remarkably similar to the research on information overload. In the following, I will discuss to what extent choice overload is just a special case of information overload and how much insight can be gained by looking into that literature.

As outlined in Chapter I, Miller (1956) found that decision makers have finite limits to the amount of information they can assimilate and process during any given moment. The information overload paradigm states that if these limits are exceeded, decision makers become confused and make poorer decisions.

#### **Limited channel capacity**

In a series of experiments, Milinski (1990) found that limitations in the amount of information that is processed within a certain time are not unique to humans but can

also be found among other animals. In his experiments, Milinski found that when given a choice between a large swarm of 40 waterfleas and a small one with 2 waterfleas, hungry sticklebacks preferred the large swarm, whereas less-hungry sticklebacks preferred the small swarm. Milinski argued that hunting in the large swarm requires more attention and concentration because of the difficulties of tracking one of the many similar-looking targets. Because of this, a stickleback that hunts in the large swarm probably cannot pay sufficient attention to a suddenly approaching predator of its own. Earlier, Milinski (1984) found that frightened sticklebacks (hungry or not) preferred the small swarm and sticklebacks that hunted the large swarm were less likely to detect an approaching predator. In this experiment, the predator was a model of a king-fisher bird that was flown over the fish tank. In an analogous experiment on humans, Milinski (1990) gave participants sheets of papers with different numbers of white dots. Their task was to punch 20 white dots with a needle as fast as possible. The time participants needed to punch 20 dots increased with the density of dots on the sheet and this increase was pronounced when participants were visually distracted with occasional flashes from a light bulb. Building on the notion of limited channel capacity to process information, previous research on information overload (Jacoby, Speller, & Kohn, 1974a) looked at the potential influence of assortment size and assortment structure on confusion, satisfaction, and dysfunctional behavior on the part of the decision maker.

#### **Previous research on information overload**

In an early study on information overload, Jacoby et al. (1974a) and also Jacoby, Speller, and Kohn Berning (1974b) compared choices among up to 12 different bogus consumer products that were described on a varying number of attributes. Participants were instructed to examine and evaluate all available information. Information load was operationalized as the number of products multiplied by the number of attributes. What they found was that there was an inverted U-shaped relation between information load and the “accuracy” of the decision. Accuracy was defined by measuring the difference between the chosen option and the option that would have been chosen based on the weighted additive combination of all attribute values. In their approach, the weights were taken from individual importance ratings that were assessed for each attribute prior to the actual choice. Based on this definition, too little, but more importantly, also too much information led people to make less accurate decisions.

The findings on information overload by Jacoby and his colleagues (1974a, 1974b) were subsequently heavily criticized on theoretical as well as methodological grounds. The main criticisms were that the original study did not control for chance factors and that the number of products was not sufficiently high (Malhotra, 1984; Malhotra, Jain, & Lagakos, 1982). Other critics argued that a weighted additive model may not have been an appropriate measure for choice accuracy in the first place (Meyer & Johnson, 1989). Because of the difficulty in defining a good decision when it comes to

preferential choice, Meyer and Johnson instead called for consistency-based measures such as the probability of picking a dominant option. In a reanalysis of Jacoby et al.'s (1974a) data, Malhotra et al. (1982) completely dismissed Jacoby et al.'s evidence of information overload because the original authors did not control for the fact that the mere chance of randomly choosing a single "best" option decreases with the number of options to choose from. However, in a methodologically more sound study, Malhotra (1982) nevertheless confirmed the hypothesis of Jacoby et al. In this study, Malhotra increased the maximum number of both options and attributes to 25, statistically controlled for chance factors, and also included a self-reported measure on subjective choice overload. He nevertheless maintained a weighted additive model as normative yardstick to measure choice accuracy. He found that on average, dissatisfaction with the act of choosing, confusion, the subjective feeling of being overloaded, and the inaccuracy of the choice all increased with more than 15 attributes or more than 10 options. Malhotra (1982) also found that number of options and the number of attributes both contribute independently to information overload.

#### **Critical evaluation of information overload as a moderator**

With regard to the too-much-choice effect, the decrease in accuracy of finding the presumably best option due to too much information might be reflected in a decreased satisfaction with the chosen option. Also, if decision makers are able to anticipate this lack of accuracy, it could be that they try to avoid a poor decision in high-information situations by not making any choice at all.

However, in my studies, the amount of information with which the options were described did not seem to make a difference. For instance, in the restaurant study, each restaurant was described on many different attributes, and in the charity study, a considerable amount of information about each organization was provided, and neither yielded a too-much-choice effect. Also, the data obtained from my experiments indicate that independent of the assortment size, the more options (e.g. jam, wine, or music) a participant sampled from an assortment, the higher his or her individual likelihood to choose. For example, in the jam study, participants who tasted more jam and by this gathered more information were more likely to purchase, which indicates that an increase in information led to a higher probability of choosing. Furthermore, Iyengar and Lepper (2000) found the effect based on choices among rather simple options such as jam or chocolate, suggesting that the mere amount of information is not sufficient to explain the occurrence of the effect.

#### **Extensions of the information overload paradigm**

While the early research on information overload focused on the actual number of options and attributes, what ultimately matters is how an assortment is perceived by a decision maker. Beyond the number of options and attributes, recent studies have shown that the perception of information content also depends on many other

structural factors such as the (dis)organization of the assortment and the number and distribution of attribute levels, which can be expressed as the entropy of an assortment (Hoch, Bradlow, & Wansink, 1999; Kahn & Lehmann, 1991; Kahn & Wansink, 2004; Lurie, 2002, 2004).

### Entropy

In a study by van Herpen and Pieters (2002), the mere number of options was a poor predictor of participants' subjective variety perceptions, while measures that tapped into structural details of the assortment were good predictors. Each of the 62 participants in their experiment rated a variety of 12 different assortments of bogus products that were characterized by three categorical attributes. The assortments differed in size (ranging from 4 to 16), in entropy, and in the degree of association between attributes. Entropy is a concept borrowed from information theory (Shannon & Weaver, 1949) that in its original usage indicates the number of bits necessary to code a given environment. The entropy  $I$  within a categorical attribute  $A$  can be calculated as

$$I(A) = -\sum_{j=1}^m p_j \cdot \log_2(p_j) \quad (5-1)$$

where  $p_j$  equals the proportion of options with attribute level  $j$ ,  $m$  is the total number of attribute levels, and  $\log_2$  is the logarithm to the base 2. When only a single attribute level is present (e.g. all jelly beans are red),  $p_j$  equals one and the entropy is zero. Entropy increases with the number of attribute levels and it is highest if all attribute levels occur in equal proportions (e.g. an equal number of red, green, and yellow jelly beans). For assortments with more than one attribute, the entropy measure is commonly added across all attributes (Fasolo, Hertwig, Huber, & Ludwig, 2006),

$$I(\text{assortment}) = \sum_k^l I(A_k) \quad (5-2)$$

where  $A_k$  is the entropy of the  $k$ th attribute and  $l$  is the total number of attributes within the assortment.

As already mentioned in Chapter I, besides entropy, van Herpen and Pieters also measured the degree of conflicting attributes within the assortment by calculating lambda coefficients (Goodman & Kruskal, 1954). What they found was that in a linear regression on the perception of variance, the attribute dispersion (entropy) and the conflict between attributes (lambda) together accounted for 62.5% of the variance in people's perception of variety while the mere number of options only accounted for an additional 3.4% of the variance.

### Assortment structure in the real world

For real-world assortments within grocery stores, Fasolo et al. (2006) found that the number of attribute levels strongly correlates with the number of products within an assortment, which suggests that each product tends to add a new attribute level. As a

consequence, Fasolo et al. also found a strong correlation between the number of options and the entropy within the assortment. The largest share of the entropy measure across product categories was due to the attributes' brand and price. Yet for a continuous attribute such as price, it is questionable if entropy, which was initially used for categorical data, is an appropriate measure. This is because if every option has a different value, the entropy is simply a function of the number of options within the assortment and the high correlation between entropy and assortment size comes as little surprise. For continuous variables, dispersion measures such as variance or quartile ranges might be more appropriate.

### **Entropy affects choice quality**

With regard to choices, Lurie (2004, Experiment 1) found that low entropy was a good predictor of choice quality. In his experiment, participants made a hypothetical choice from an assortment of pocket calculators that differed with regard to the number of options and with regard to the entropy as measured in equation 5-2. Choice quality was operationalized as the probability of choosing a dominant option from a set of pocket calculators. Lurie found a main effect of assortment size on the probability of choosing a dominant option but this effect diminished if entropy was taken into account. These results suggest that information structure, not the number of alternatives, is the crucial factor in determining overload.

In line with this, Lee and Lee (2004) found that the quality of decisions (also defined as the probability of choosing a dominant option) depends on entropy and on the number of attributes rather than the mere number of options. In their experiment, participants chose among different sets of CD players that differed in the number of options (18 vs. 27), the number of attributes on which the CD players were described (9 vs. 18), and the distribution of the attribute values, measured in terms of entropy (high vs. low entropy). Based on a between-subjects design, they found that an increase in the number of attributes and also an increase in entropy both decreased choice quality, whereas the number of options did not have any effect. Likewise, the number of options did not affect participants' satisfaction with the choice, but satisfaction decreased with the number of attributes. In contrast to the previous findings, though, entropy did not affect satisfaction.

To increase the internal validity and to make it easier for participants to pay attention to all attributes, the inter-attribute correlations in the experiments by Lurie (2004) as well as by Lee and Lee (2004) were set around zero. Thus, a high value of an option on one attribute did not reveal anything about the value of that option on another attribute. Such a choice environment might not be what people are used to, though. In their study on real-world consumer environments, Fasolo et al. (2006) found that in grocery stores many attributes are typically negatively correlated such that a high value on one attribute implies a low value on another attribute. Thus the

generalizability of Lee and Lee's findings to real-world assortments might be impaired.

### **Critical evaluation of entropy as a moderator**

An equal increase in the number of options makes it more difficult to find the best option (and potentially less motivating and less satisfactory) in the high-entropy case as compared to the low-entropy case. Also, if the entropy in an assortment is high, the perception of variety might increase faster with an increase in the number of options as compared to a situation in which the entropy is low. As a consequence, entropy could potentially moderate the effect of too much choice.

In my experiments, I did not control for the entropy within the assortment, but I did control for the perception of variety that is affected by entropy and thus could be taken as a proxy. While the perceived variety differed among the experimental conditions, in absolute terms the variety was commonly not perceived as extremely high. This also holds true for other studies that found the effect (e.g. Iyengar & Lepper's chocolate study, 2000). Still, maybe for choice overload to occur reliably, assortments have to be perceived as extraordinarily large and complex; a situation that might only occur if a large number of options is paired with high entropy.

### **Expedient ordering of the options as a moderator**

From yet another perspective on the influence of assortment structure on choice overload, previous research found that the motivation to choose also increases if a clear description of the differences between the options is given, seemingly because the relevant information for comparisons can be perceived more easily and the effort to make a choice is low, and possibly also because it could make justification easier.

The availability of reasonable categories along which options can be ordered and compared becomes more important the more options there are (Anderson, 2006). As an example, one can think of online retailers that invest great efforts to offer alternative ways to search their assortments along several attributes (e.g. price, ratings, or specific features). On the other hand, for a randomized assortment, search clearly gets more difficult as the number of options increases.

Following up on the notion of adaptive decision making, Payne et al. (1992) showed that more information changes the direction of search from alternative-wise (looking for all of the attribute values for one option before going on to the next alternative) to more attribute-wise (comparing all options on a single attribute before going on to the next attribute). Following up on that finding, Huffman and Kahn (1998) found that the satisfaction with the decision process and the finally chosen option did not depend on the amount of information per se but on how this information was structured. In their experiments, satisfaction with hypothetical sofas and hotels increased if assortments were ordered along their attribute values, presumably because this layout made it easier for the consumer to process the

information. Likewise, in a study on patient decision making, Carrigan, Gardner, Conner, and Maule (2004) found that people's decisions were closer to the predictions of a weighted additive model if information was ordered such that it could be accessed selectively according to individual preferences as compared to a condition in which all information was presented in a predetermined order.

In an early study by Russo (1977), shoppers in a grocery store on average saved 2% of their spending through purchasing cheaper products when all brands within a category were sorted on one list according to their price, as compared to a regular grocery store with separate price tags on each item. Russo argued that providing the price information in a convenient way would make it easier for shoppers to use this information when making a choice.

### **Critical evaluation of the ordering as a moderator**

Considering these findings together, if the assortment structure matches with people's preferred search and decision strategy, the choice becomes easier and more satisfying. This relationship might be especially pronounced for large assortments. For small assortments, decision makers might be less affected by the order because it is easier to get an overview. Thus, a mismatch between the assortment structure and the decision strategy might be a necessary precondition for the too much choice effect.

However, in my experiments, the options were not ordered in any sensible way, which should have increased the likelihood of finding the effect. For example, in the jelly bean and the music study, the options were randomly distributed. In the charity study, the options were ordered lexicographically, but the first letter was completely uninformative about the mission of the organization.

### **Interaction between environment and decision strategies**

In my discussion on information overload and its related concepts I mainly focused on structural aspects of assortments that go beyond the mere number of options. These aspects included various types of conflict between attributes and options, the number of attributes, and the distribution of attribute values (entropy) and how the options are ordered. Yet following Simon's (1990) allegory of a pair of scissors, the structure of the environment is only one of the two blades that need to be considered in order to understand human decision making. The other blade represents the decision strategies used within a given environment and how these strategies might change depending on the situation. According to Simon, both aspects are equally important to understanding, explaining, and predicting decision making.

In Chapter I, I mentioned the notion of adaptive decision heuristics such as satisficing and how the use of these heuristics can shield people from being overloaded with choice. In the following, I will further elaborate on the interaction between decision strategies and the effect of too much choice, showing that the

understanding of decision strategies is a key to understanding when and why choice overload occurs.

### **Weighted additive model as normative standard**

The information overload and entropy literature are not completely mute about decision strategies, because as outlined above, being “overloaded” is commonly defined as a deviation from an allegedly normative standard of a weighted additive decision model. For example, in a study on information overload, Keller and Staelin (1987) defined decision effectiveness as the degree to which individuals obey a weighted additive rule. As stated earlier, such a rule requires that all information be weighted by its importance and then integrated in an additive way to obtain an overall preference or quality value for each option. Following this procedure, the option with the highest value should eventually be selected. Based on this definition, Keller and Staelin found that decision effectiveness decreases once the amount of information surpasses a certain threshold.

A weighted additive rule is a prime example of a so-called compensatory decision rule, because it implies that one or more positive values on one attribute can outweigh one or more bad values on another attribute, and vice versa. As a psychological process model of choice, weighting and adding requires a considerable amount of time to gather and assess all the relevant attributes and attitudes, and computation to combine all this information into an overall judgment of each choice alternative.

### **Simple heuristics as more appropriate models of choice**

Because of these somewhat unrealistic demands that weighted additive rules make on human cognitive abilities, previous research on judgment and decision making has seriously questioned them as reasonable models of human decision making in many common circumstances (Dawes, 1979; Einhorn & Hogarth, 1975). Instead, the research tradition of so-called simple heuristics (Gigerenzer et al., 1999) proposes decision mechanisms that overcome the problems of weighted additive models and other complex decision rules. First, the simple heuristics framework suggests that people are often frugal in terms of the information they assess for a choice and second, it proposes that instead of aggregating many pieces of information by weighting and adding, people make their choices based on a much simpler yet still effective decision rule. The key assumptions of this heuristics approach are that decision makers have limited time and computational resources (exhibiting what Simon called “bounded rationality”), and that rather than trying to determine “the best” option, they search for something that is “good enough” (Schwartz, 2004; Simon, 1955). There is considerable evidence that people’s decision-making processes can indeed often be characterized as rules of thumb that work reasonably well in many situations (Bröder,

2000, 2003; Gigerenzer & Goldstein, 1996; Payne et al., 1992; Scheibehenne & Bröder, 2007; Scheibehenne, Miesler, & Todd, 2007; Svenson 1979; Wright, 1975).

### **Adaptive decision making**

For frugal strategies to be effective, the research tradition on simple heuristics further assumes that the decision strategies people use are adapted to the environment. As already mentioned in chapter I, adaptive shifts of strategy that depend on environmental characteristics are a well established finding for which a large body of empirical evidence exists (see Ford, Schmitt, Schechtman, Hults, & Doherty, 1989 for a review).

Despite these findings, it is still a widespread idea that the accuracy of a decision can be judged by comparing it to a weighted additive model. For example, Bettman, Luce, and Payne (1998) argued that a weighted additive model best reflects people's preferences and therefore defines a normative yardstick against which the quality of a decision can be compared.

Yet, if we think of decision makers as “adaptive” (Payne et al., 1992), then deviating from a weighted additive model need not necessarily lead to a decrease in decision quality; such decision makers are simply applying a different (arguably more adaptive) heuristic. If a weighted additive model is regarded as one possible strategy among many, it seems peculiar to define its outcome as the normative standard against which the outcomes of other strategies are evaluated. In fact, the research tradition of simple heuristics (Gigerenzer et al., 1999) provides a number of good reasons why a weighted additive model should not be taken as a prime standard for human decision making. If the perspective on human decision making is broadened, for example, by taking into account search costs, computational limitations, psychological feasibility, social constraints, or robustness toward external changes, the normative claim of weighted additive strategies quickly loses ground (Gigerenzer et al.). From this perspective, whether a strategy is normative or rational should not solely depend on “internal” criteria—such as consistency or whether it obeys the rules of formal logic—but rather also on its success within the environment in which it operates.

### **Simple heuristics shield from information overload**

Acknowledging the importance of adaptive changes in decision strategy to accommodate changes in the environment, Malhotra (1982) conjectured that “a major variable influencing the outcome of overload may be the nature of the decision-making process” (p. 428) as well as individual cognitive abilities. He goes on to acknowledge that individuals adaptively switched their decision strategy to heuristic processing when large amounts of information were presented.

Along the same lines, Jacoby (1984), the founding father of the information overload paradigm, concluded that for most real decisions, decision makers will stop far short of overloading themselves by accessing only a limited amount of the available information and by applying a simple heuristic such as satisficing or elimination-by-aspects. Likewise, Grether, Schwartz, and Wilde (1986) pointed out that the notion of information overload, saying that the amount of information impairs people's ability to make a sound choice, conflicts with Simon's idea of satisficing and also with the notion of adaptive decision making.

The notion of an adaptive use of decision strategies to cope with information overload finds empirical support in an early experiment conducted by Hendrick, Mills, and Kiesler (1968), who found a nonlinear relationship between the amount of available information and the decision time. Their experiment followed a 2×2 between-subjects design in which undergraduates were given an actual choice between two or four ties that were described on either 1 or 15 attributes. From the perspective of information overload, the four conditions differed with regard to their information content. The time it took participants to decide between the ties was shortest in the condition with two ties described on 1 attribute and it peaked for the two conditions in which two ties were described on 15 attributes and in which four ties were described on 1 attribute. For the high-information condition of four ties described on 15 conditions, decision time decreased again. Hendrick and his colleagues interpreted this result as meaning that if information load exceeds a certain threshold, people "give up trying to compare the alternatives" and "the choice may be made impulsively" (p. 314). With regard to the recent literature on adaptive decision making one could also regard these results as early empirical evidence for the use of simple heuristics—what the researchers labeled impulsive in fact reflected an adaptive shift toward a fast and frugal choice strategy.

In a more recent study, Lurie (2004, Experiment 2) found that an increase in entropy (measured as in equation 5-2) led to a more selective search. In his experiment, participants chose among assortments of 16 pocket calculators that were all described on eight attributes but that differed in the number and the distribution of attribute levels. Participants' information search patterns were tracked by means of a Mouselab setup (Payne et al., 1992). In the high-entropy conditions, people focused more on the most important attributes and they acquired less information in total, which suggest an adaptive shift toward a more fast and frugal decision rule.

### **Noncompensatory strategies as a mediator**

Next, based on the example of a simple noncompensatory heuristic, I will lay out in more detail how fast and frugal heuristics may shield decision makers from choice overload and thus may function as a powerful explanation of when and why choice overload occurs.

### **Definition of noncompensatory decision strategies**

In contrast to a compensatory decision strategy such as the weighted additive rule defined previously, a noncompensatory decision rule means that the decision is eventually made based on only one aspect or attribute such that the option that is highest on that single attribute is chosen. When a noncompensatory strategy is applied, an advantage on one attribute cannot compensate for a disadvantage on another attribute and no trade-offs are made (Gigerenzer et al., 1999). A prime example of a noncompensatory strategy is the so-called lexicographic decision rule in which the option that is best on the most important attribute is selected, irrespectively of the values of that option on other, less important attributes. Other examples of noncompensatory strategies are the satisficing rule (Simon, 1956) and the elimination-by-aspect rule (Tversky, 1972) outlined in Chapter I.

### **Interaction between noncompensatory strategies and environment**

For assortments in which attributes are negatively correlated, simulations show that the outcomes of simple noncompensatory decision strategies deviate substantially from the outcome of a weighted additive rule that takes into account all the available information (Bettman et al., 1993). In extension to this, Fasolo, McClelland, and Todd (2007) showed via simulations that two conditions are necessary for a decision to become difficult: First, the structure of the choice environment has to be “unfriendly,” that is, operationalized as a high number of options that are nondominated and described on many attributes. Second, the decision maker has to value multiple attributes as equally or similarly important (e.g. aiming to find something that is cheap and has high quality). In contrast, if only one condition holds but not the other such that the environment is friendly or the decision maker regards only very few attributes as important (e.g. aiming to find something that is cheap, but not bothering much about quality), the choice will become easy with regard to the amount of information that has to be looked up. Fasolo et al. also show that in these latter cases, the outcome of the decision will closely resemble the outcome of a weighted additive decision strategy that takes into account all available information. Yet, as outlined previously, using a weighted additive rule as a normative yardstick is highly controversial.

### **Noncompensatory strategies can increase choice probability**

Analogous to Fasolo et al.’s theoretical predictions, Dhar and Nowlis (1999) found that individuals were less likely to defer choice if they applied a noncompensatory decision strategy. In their experiment, people were given a choice between two options (apartments, microwave ovens, or automobiles) that were described on a number of nonalignable attributes and thus involved trade-offs. What they found was that participants who had to decide under time pressure were less likely to defer the choice as compared to a group that was not put under time pressure. For a control group that decided among two options that were not conflicting because one was better than the other on every attribute, no effect of time pressure was found. Dhar and

Nowlis hypothesized that time pressure led participants to shift their decision strategy toward a less compensatory strategy in which they evaluated fewer attributes. As a consequence, individuals experienced fewer trade-offs and were more likely to choose. In a series of follow-up experiments in which Dhar and Nowlis also tracked participants' information search processes, they found converging evidence in favor of their hypothesis.

#### **Critical evaluation of noncompensatory strategies as a mediator**

In Chapter I argued that finding choice overload could be interpreted as finding failure to adapt the decision strategy to the current situation. This statement can be rendered more precisely now by saying that choice overload will be more likely if decision makers try to apply an elaborate and compensatory strategy that requires them to take into account the full information available. To the degree that people shift toward a noncompensatory strategy, they should be less likely to be overloaded.

#### **Initial screening as a potential mediator**

Besides the use of noncompensatory decision strategies, there are also other heuristics that may moderate the effect of too much choice. One apparently simple heuristic to handle excessive assortments is to engage in an initial screening process in which options are sequentially eliminated based on a few, yet important aspects. (Davey, Olson, and Wallenius, 1994; Grether & Wilde, 1984; Tversky, 1972). For example in a study by Huber and Klein (1991), 75% of the participants who had to search for a new flat decided not to look at a full list with 100 choices but rather eliminated the worst options beforehand by placing strict cutoffs on attributes such as monthly rent or quality.

Likewise, Hauser and Wernerfelt (1990) argued that consumers do not consider all available options but rather a much smaller set. They reported data from a large consumer panel showing that across a large number of product categories, the number of brands that consumers consider seriously when making a purchase is seldom larger than six, with a median of about four. These data indicate that people efficiently narrowed down the number of options to form a manageable consideration set that they could then scrutinize in more detail.

In a similar fashion, the participants in the study by Lenton et al. (2005) avoided overly large numbers of potential mates on an Internet dating site, which could also be interpreted as an initial screening strategy. Screening out options based on very few pieces of information is a successful strategy for narrowing down an assortment to a manageable size. Thus, to the degree that people screen out options, they should be less affected by the initial size of the assortment.

#### **Critical evaluation of initial screening as a mediator**

While such an elimination or screening strategy is commonly regarded as an adaptive way to handle excessive assortments, *ceteris paribus* it leads to a situation in which the

options in the reduced set become more similar as the initial set gets bigger. At the same time it can be shown via simulations and based on real-world examples that as a result of a thorough elimination process the attributes of the remaining options are likely to be conflicting, even if in the initial, unscreened set the correlations were positive (Fasolo et al., 2007). Thus, a presumably adaptive decision strategy might lead to an increased choice difficulty in large assortments as compared to small ones.

As mentioned in Chapter I, Botti and Iyengar (2006) argued that an initial screening comes with the risk that the best alternative might be unwittingly eliminated, which in turn should lead to dissatisfying outcomes. This is because by placing a strict cutoff on one of the attributes, one would eventually eliminate the best alternative on the other attribute. In real-world situations this seems to be less of a problem, though. At least according to Huber and Klein (1991), decision makers seem to be capable of adapting their strategy use accordingly. In their experiment they found that participants adopted less severe cutoffs when attributes were negatively correlated as compared to a choice from an assortment in which attributes were positively correlated.

Taken together, these results suggest that an initial screening seems to be a sensible heuristic to prevent choice overload. On the other hand, the argument that this initial screening amplifies trade-offs and thus leads to decision avoidance rests upon the assumption that a decision maker aims to maximize rather than to satisfice, an aspect that I already discussed and empirically tested as a separate moderator in Chapter III. Thus it seems that if anything, several factors have to interact before choice overload occurs, which would make it difficult to replicate the effect.

### **Hedonic editing and dominance as moderators**

Yet another suggestion for how the too-much-choice effect might be moderated by individual decision strategies is based on the idea that people often do not decide unless they have identified a dominant option (Montgomery, 1983). As mentioned earlier in the present chapter, Gourville and Soman (2005) reported empirical evidence that the motivation to choose is higher if options only differ along a single, compensatory dimension such as price or size as compared to an assortment in which options differ on many different dimensions. With regard to Montgomery's framework according to which people search for a dominant option, in the latter case people are less likely to choose because it is more difficult to identify such a dominant alternative.

Given that many assortments in the real world are characterized by negative attribute correlations and so a dominant option will usually not exist, Montgomery further assumed that such "unfriendly" environments are "edited" by the decision maker, for instance, by changing the subjective importance weights for the attributes

or neglecting certain pieces of information (see Thaler & Johnson, 1990, for the related idea of hedonic editing). From this perspective, a decision maker makes a precommitment for one promising option early in the decision process and then searches for justification of this preliminary choice. According to Montgomery, another way of editing is to apply a noncompensatory decision rule similar to the case described by Dhar and Nowlis (1999), as set out in the present chapter above.

#### **Critical evaluation of finding a dominance structure as a moderator**

Under the assumption that no decision is made unless a dominant option is singled out, Montgomery's framework predicts a too-much-choice effect for environments with similar options and negative attribute correlations in combination with a compensatory decision strategy because in such situations a dominant option is hard to find. The described environmental structure resembles those described by Fasolo et al. (2007) as a result of initial screening. Likewise, the idea of finding a dominance structure is strikingly similar to the notion of maximizing. Even though Montgomery's theory makes a prediction of when and why the effect of too much choice will occur, the data I and others have collected so far do not allow us to test it empirically, mainly because precise data on the process according to which people search and decide are lacking.

To test to what extent decision strategies—such as searching for a dominance structure—and simple heuristics—such as initial screening or noncompensatory weighting of information—moderate the effect of too much choice, the search and decision strategies that people employ within a given situation have to be assessed. While tracking the search process in the music study was a first step in this direction, future studies should collect more detailed process information about individual information search and reaction time and possibly should also ask people about their decision strategies in a more qualitative approach. While each single method has its conceptual limits (e.g. see Nisbett and Wilson, 1977, for the limits of verbal reports about cognitive processes), a combination of different methods might eventually lead to a better understanding of the interaction between decision strategies and the number of options to choose from.

#### **Common comparison standard as a moderator**

According to Cabanac (1992), comparing and trading off qualitatively different attributes relative to each other in a compensatory fashion requires a common value system (see also Sanfey, 2004). For example, Cabanac's theory predicts that when trading off usability against design one would have to determine how much usability should be forgone for a given increase in design. In other words, for means of relative comparison, the decision maker would have to convert the values of more or less incommensurable attributes. Yet, such a common denominator may only exist in rudimentary form. Therefore, Cabanac assumed that the conversion into a common value system is probably somewhat error-prone and the reliability of the option

comparison might be decreased. The reasoning is similar to Zhang and Fitzsimon's (1999) line of argumentation outlined above saying that people are less satisfied when comparing options with nonalignable features because decision makers are insecure about how the features should be traded-off against each other.

Furthermore, the more options there are, the more similar they become and the higher the chance that a blurry comparison standard will change the preference rankings. If the goal is to maximize the outcomes and to find the best option this blurriness increases the risk of making a suboptimal choice. To avoid this risk, people may be more likely to defer the choice. In support of this hypothesis, Dhar (1997) found that people were less likely to defer a choice between two music tapes if they were instructed to assign a monetary value to each attribute (e.g. number of songs, quality of the recordings) as compared to a control group who did not receive specific instructions. Dhar argued that once all the attributes are mapped onto an unidimensional measure such as money, comparison and trade-offs are much easier, which would be in line with the predictions of Cabanac.

The hypothesis that decision difficulty increases with the similarity between options is also supported by the results of an experiment by Böckenholt, Albert, Aschenbrenner, and Schmalhofer (1991), who showed that decision makers searched for more information about possible vacation locations when options had small attribute differences (e.g. in temperature or number of rainy days) as compared to a situation in which the differences on those same attributes were large.

#### **Critical evaluation of a common value system as moderator**

The assumption of a common value system closely resembles the notion of *utility* as a universal currency that decision makers aim to maximize, a concept that has been criticized on several grounds (Brandstätter, Gigerenzer, & Hertwig, 2006; Gigerenzer, 2000). In addition, Cabanac's theory would always predict an effect of too much choice when the number of options exceeds a certain degree of similarity. The degree of similarity between options differed substantially between the experiments that I reviewed and that did not find an effect of too much choice. Therefore, the degree of similarity seems not to be sufficient to explain why and when the effect of too much choice occurs and when it does not.

Furthermore, the "conversion" of attribute values into a common value system (Cabanac, 1992) is only necessary if a decision maker adopts a compensatory choice rule. From the perspective of noncompensatory decision rules such as satisficing or elimination-by-aspects, Byron (2005) pointed out that a common denominator is unnecessary because the decision maker is expected to choose the first option that exceeds his aspiration on each relevant attribute (see also Gigerenzer et al., 1999). For example, for a true satisficer, the decision would not depend on the conflict or the incommensurability between options on different attributes. In line with this, Simon

(1956) pointed out that “we should be skeptical in postulating for humans, or other organisms, elaborate mechanisms for choosing among diverse needs” and that “common denominators among needs may simply not exist” (p. 137).

Finally, insofar as Cabanac’s model implies that the similarity between options increases choice difficulty, it somewhat contradicts the prediction by Kahn and Lehmann (1991), who stated that similarity between options leads to a decrease in variety and by this lowers choice difficulty. These discrepancies are hard to resolve unless a precise model of the decision-making process is spelled out. As such, the results once again stress the importance of widening the perspective by also incorporating decision processes and their interactions with environmental structures.

### **Search costs as a mediator**

As mentioned above, whether a choice is difficult or demotivating depends on the interaction between the assortment structure that the decision maker faces and the strategy that he or she applies to make the choice. So far, I have mainly differentiated decision strategies by the amount of information they require and how that information is combined. In the following, I will focus on yet another important aspect of decision strategies, namely, the “costs” that are required to carry out a certain strategy. Measures of decision costs set a price tag on the amount of time and effort devoted to searching information and also on mental processes such as calculations or comparisons. As I will lay out in more detail below, incorporating decision costs might explain when and why a too-much-choice effect occurs.

#### **Information search and costs**

Heuristic models of search as well as Simon’s notion of satisficing explicitly link information search to costs. For example it has been shown that if information is costly, people are more likely to use a simple heuristic (Rieskamp & Hoffrage, 2006) and they search for less information (Brannon & Gorman, 2002). Payne et al. (1992) developed a measure of computational cost, which they called “elementary information processing” (EIP) units, that aimed to quantify the cognitive effort required to carry out a certain decision strategy. Another attempt to quantify cognitive effort goes back to Shugan (1980), who developed a measure for what he called the “cost of thinking” that basically reflects the expected number of pair-wise comparisons of options and their attributes that a decision strategy requires in a given environment in order to reach a choice.

#### **Optimal search**

As indicated by the results of the music study, the amount of search often increases with the number of options. Trading off more search costs against the benefits of eventually having a better option seems worthwhile as long as the marginal costs of search are smaller than the expected marginal increase in quality. Thus, if choosers

continue to search, at some point their costs will exceed the benefits and the net gain might be negative.

In a theoretical analysis of search, Stigler (1961) found that when searching within an assortment of consumer goods, the probability of finding an option that is cheaper (and thus a better deal) than the already examined options decreases with every additional option that is sampled. In his model, Stigler assumed that the decision maker sequentially obtains price calls and that he or she can go back at any time to the cheapest call encountered so far. Based on these assumptions, the relationship between the money saved and the amount of search is monotonically increasing but negatively accelerated. In other words, the additional benefits of search get smaller the longer the search lasts. From Stigler's model it follows that the benefits of further search will be greater if the distribution of prices widens (such that extreme prices become more likely) but that even for very wide distributions, the benefits of further search are marginally decreasing. Thus, without any search costs, more search will eventually lead to a better outcome and thus more options should always be welcome; even more so if the choice set is heterogeneous.

Because for most cases there is no closed-form function for the relationship between search and the expected return, it can only be approximated (Stigler, 1961). Figure 12 exemplifies this relationship based on the results of a bootstrap simulation run in Matlab 7.0 with 1,000 draws per data point. In this simulation, the distribution of prices in the assortment is assumed to be normal with a mean price of zero. Different colors represent different standard deviations of price, denoted as  $sd$ .

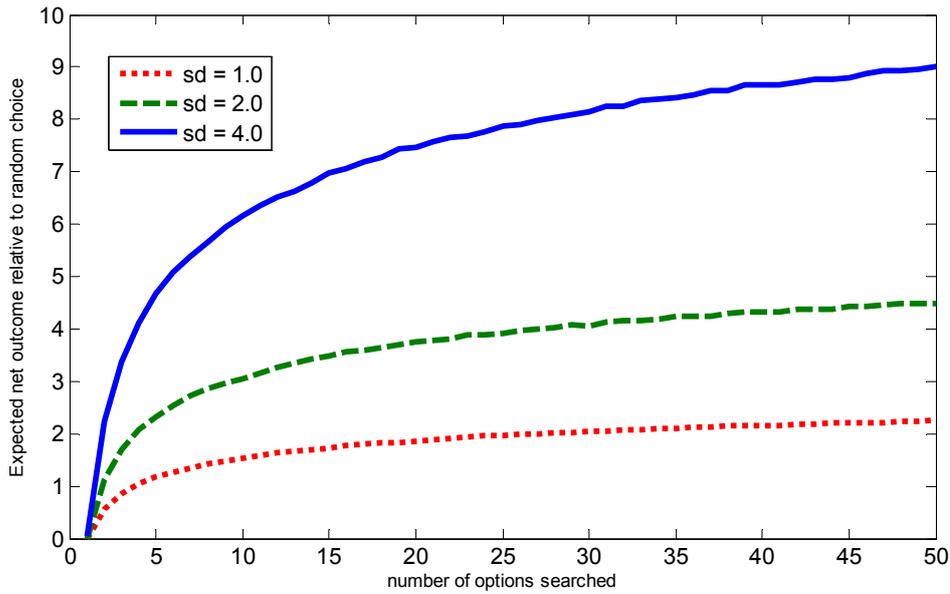


Figure 12: Relationship between the number of searched options on the abscissa and the outcome of the search on the ordinate, expressed as the amount of money saved relative to the mean price within the assortment.

So far, the framework does not incorporate search costs. Under the assumption that searching and evaluating an additional option comes with a fixed cost  $c$ , the net outcome of the search process  $O$  would be

$$O(n) = F(n) - n \cdot c \quad (8)$$

where  $n$  is the number of options searched and  $F(n)$  is the quality function depicted in Figure 12. If costs increase linearly while quality is negatively accelerated with search, the net outcome will eventually be negative depending on the search costs and the distribution of prices. Figure 13 illustrates this relationship. In the example, again price is assumed to be normally distributed with a mean of zero and a standard deviation of 2.0, and the different colors represent different search costs.

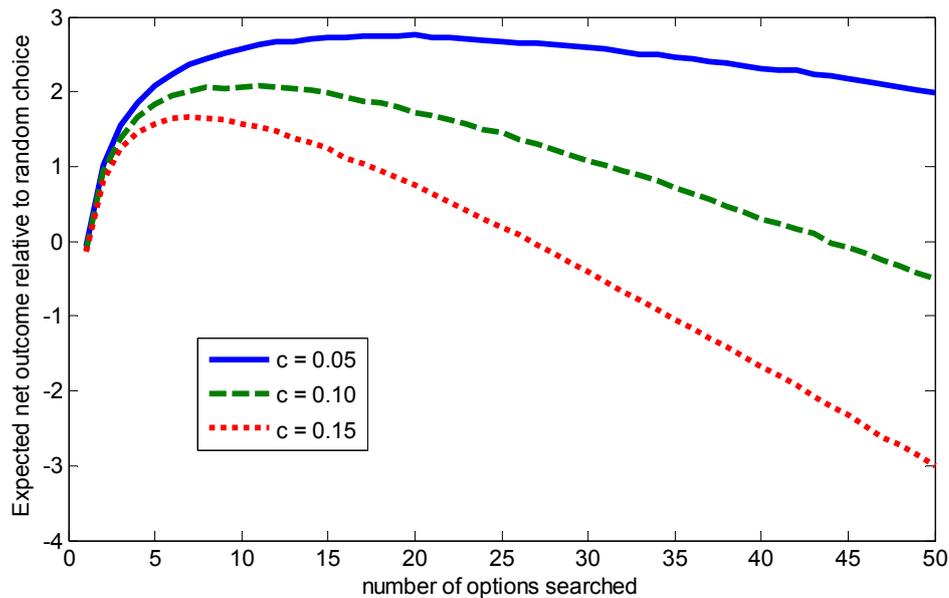


Figure 13: Expected net outcome (amount saved minus search costs) depending on varying search costs  $c$  and the number of options searched.

### Simple heuristics for search

Given the mathematically complex calculation needed to determine the optimal amount of search and the fact that this amount also depends on the quality distribution, which in many cases might be unknown to the decision maker, it can hardly be said that Stigler's model of search is a reasonable standard for human decision making in real-world situations. To overcome this problem, researchers in the past developed simple heuristics that aim to describe actual search behavior also for those cases where the exact distribution of options is unknown. When cognitive limitations are taken into account, it has been shown analytically as well as experimentally that simple heuristics of search can do reasonably well across many environments (Butler & Loomes, 1997; Dudgey & Todd, 2002; Hey, 1980, 1982; Hutchinson & Halupka, 2004). One example among many possible search heuristics is the so-called "one bounce" rule, according to which decision makers should examine at least two options and then stop their search as soon as the last option encountered is worse in quality than the best one examined so far (Hey, 1982).

### Psychological costs of search

Independent of the distribution of options and the actual decision strategy used, Stigler's model and its illustration (Figure 13) exemplify an important aspect with regard to choice overload, namely, that if search is costly, too much search will eventually result in a net loss. In addition, if the overall post-choice satisfaction with a chosen option is a function of the benefits of the chosen option minus the search costs invested to find this option, the relationship between satisfaction and the amount of

search would in principle resemble the function depicted in Figure 13—that if the search costs outweigh the benefits, the satisfaction with the choice will be low (Schwartz, 2000). From this perspective, a too-much-choice effect would occur if an increase in the number of options boosts the decision costs faster than it increases the benefits, for example, by luring people into too much search.

### **Do people search too much?**

Yet, in a summary of several empirical studies on search, Dudey and Todd (2002) as well as Zwick, Rapoport, Lo, and Muthukrishnan (2003) concluded that in most cases, subjects stopped their search earlier than prescribed by the respective theories. Also, in a consumer context, Marmorstein, Grewal, and Fishe (1992) stated that the amount of prepurchase search undertaken by buyers of durable goods is surprisingly low across several empirical studies. In resemblance to Simon's analogy of a pair of scissors, Zwick et al. further argued that whether people search too much or too little relative to an optimal policy depends on the structure of the assortment as well as the heuristic rule an individual applies—and, one might add, it also depends how one defines an optimal search strategy.

In an empirical study, Zwick et al. (2003) tested the effect of search costs and of the total number of options in an assortment on search behavior. In line with my results from the music study, Zwick et al. found that people searched more if the assortment size increased. They further found that people searched less if search costs increased, which is in line with findings from a comparable experiment conducted by Brannon and Gorman (2002). Together, these results support the hypothesis of humans as adaptive decision makers. Yet even though participants adapted to the costs, Zwick et al. found that if search costs were low, most participants tended to search too little and according to Zwick et al.'s analysis, on average, they could have been more successful in their search if they had examined more options. On the other hand, when search was costly, most participants could have done better by searching less. More importantly, the number of options did not lure participants into searching too much or too little. There was an interaction effect solely between the number of options and search costs such that participants had the worst search results when there were many options and search costs were high.

### **Critical evaluation of the search cost hypothesis**

With regard to the too-much-choice effect, it seems that a mere increase in the number of options does not necessarily lead people into searching too much. As outlined above, participants across many studies tend to search too little rather than too much. People's search strategies seem to adapt to the environmental structure such that they search less when the cost of search increases, which should further shield them from searching too much. As mentioned in chapter I, scholars have also argued that a large set of options actually reduces the time and effort needed to reach a decision, and thereby also the search costs (Hutchinson, 2005; Kahn, 1995; Simonson, 1990).

Despite this, even if people who are confronted with a large assortment search too much and thus suffer from increased costs, they should still make a choice as long as the options generate positive outcomes to cover at least some of their losses due to search costs. Thus a search cost model cannot easily explain choice omission or a decrease in motivation to choose. Despite this shortcoming, in theory the model could still explain a decrease in satisfaction with the chosen option.

However, in previous studies on too much choice, there were no explicit search costs and whatever costs occurred must have been nonmonetary, such as time spent or cognitive effort invested. Estimating these costs would be purely speculative and as a consequence, with the data on hand, the search cost hypothesis cannot be fully evaluated. Testing the theory of search costs in real-world environments is further complicated by the fact that individuals search for many different reasons. In a consumer context, they might just enjoy shopping (Marmorstein et al., 1992). Across several contexts, they might value the information acquired in order to gain expertise within a given environment or simply try to satisfy their curiosity (Brannon & Gorman, 2002). Likewise, the time spent searching might be valued more or less. These latter explanations would also match the finding that people sometimes gather more information than necessary before making a choice (Bastardi & Shafir, 1998).

In addition, it is not at all clear that decision makers would indeed incorporate search costs in their final satisfaction rating with the chosen option in a way that more search leads to lower satisfaction. As mentioned in Chapter I, other psychological theories suggest that it might well be the other way round. According to Festinger's (1957) theory of cognitive dissonance, people will boost their liking of a chosen option if they invested a lot of effort in finding it, in order to justify their decision. Likewise, for animals, Kacelnik and Marsh (2002) found that starlings prefer the kind of food that had required an increased effort to obtain in the past. Their study consisted of two stages. In the first no-choice stage, the birds had to either fly a short (4 meter) or a long (16 meter) distance in order to get access to pecking keys that differed in color depending on the length of the distance. Pecking the keys resulted in identical food rewards. At a second stage, the birds got a free choice between the two differently colored keys. At this second stage, most birds pecked the key that was associated to the long flying distance. In resemblance to these results, in the music study outlined in Chapter III, people who searched more were slightly more satisfied with the finally chosen option.

### **(Mal) adaptive aspiration level as a moderator**

As noted at several places throughout the dissertation on hand, the notion of satisficing assumes that people choose the first option that exceeds their aspiration level. This decision strategy implies that no choice would be made if none of the options surpasses the threshold. Thus, if people strictly follow a satisficing strategy, whether a

choice is made or not would depend on the extent of their aspirations. Following up on Stigler's search model, when search costs are low, better options can be expected if the assortment is large, especially if the distribution of options is wide. From the perspective of an adaptive decision maker, in such a situation it would be sensible to increase the aspiration level. In contrast, if the assortment is small or options are similar to each other, the expectations should be lowered. This principle would be in line with Simon's (1955) conclusions. Simon hypothesized that as "the individual, in his exploration of alternatives, finds it easy to discover satisfactory alternatives, his aspiration level rises; as he finds it difficult to discover satisfactory alternatives, his aspiration level falls" (p. 111). As a consequence of this change in aspiration, Simon further conjectured, the consideration set narrows if satisfactory alternatives are discovered easily, and vice versa.

As I will outline in more detail below, if decision makers assume that they are in an environment with large variance whereas in fact they are choosing from an assortment with small variance, the probability that their aspirations will be met will decrease with an increase in assortment size and thus a too-much-choice effect would occur.

#### **A thought experiment**

As an example, imagine two parents, Ms. O and Ms. U. Every Saturday, they send their children to the market to buy an apple. In the city where Ms. O lives, there are two markets: one small market with 6 apple stands and one large market with 30 apple stands. Ms. O knows that in his city, the price of the apples varies a lot between the stands. The average price of an apple is 1 euro and the standard deviation of the apple prices is 20 cent across stands. As Ms. O is very low on money, he only wants to give as much money to his children as they will need to buy an apple on 95 of 100 Saturdays that he sends them to the market. Over the years, he figured out that for the small market, it is sufficient to give 95 cents to his children so that they can buy an apple 95% of the time<sup>6</sup>. When he sends his children to the large market, he only needs to give them 74 cents.

In the city where Ms. U lives, there are also two markets with 6 and 30 stands, and the average price for an apple is also 1 euro, but with a standard deviation of 5 cents across stands, so the difference between the prices is much smaller. When Ms. U sends her children to the small market, they need 99 cents to return with an apple on 95% of the days, only slightly more than the children of Ms. O. However, when Ms. U sends her children to the large market, they still need 94 cents to buy an apple, much more than the children of Ms. O.

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<sup>6</sup> The values in this thought experiment stem from Monte Carlo simulations based on Stigler's (1961) mathematical functions of search costs, carried out in Matlab 7.0

One day, Ms. O and his family move to the city where Ms. U lives. As he did before, every Saturday Ms O sends his children to the market. Because he does not know about the distribution of the prices, he assumes that they are the same as in his old city. But to his surprise, with the money he gives them in the new city his children bring home an apple less often, and especially so when returning from the large market. From the small market, they return an apple on 63 of 100 days but from the large market they almost never—only once in 100—days, bring an apple home.

#### **Critical evaluation of (mal) adaptive aspiration levels as a moderator**

As the example shows, a mal-adapted aspiration level can lead to a decrease in the probability of choice due to an increase in assortment size. Schwartz (2004) conjectured that large assortments lead to an increase in expectations. As outlined above, in general, increasing the aspiration level (which in the example means lowering the price one is willing to pay for an apple) with an increase in the assortment size seems a sensible thing to do, yet the magnitude of this increase needs to be adapted to the structure of the environment, namely, the variance of the options.

If people overestimate the variance, for example, by assuming large differences between options whereas in fact, all options are more or less the same, they will overplay their expectations in the face of an increase in assortment size and this would result in an effect of too much choice. Note that if people underestimate the variance, this framework would predict a reversed too-much-choice effect.

However, while the present model of a changing aspiration level makes explicit and testable predictions, it is not well suited to explain the results of past experiments on too much choice, including my own. That is because it assumes that the aspiration level is determined prior to making a choice and that it cannot change during the search process. In contrast, most of the experiments outlined above were set up to reduce the influence of prior preferences and domain-specific knowledge, which makes it unlikely that decision makers had strong aspirations prior to choice.

#### **Effort invested in choosing as a moderator**

At least in the laboratory studies that I conducted, most participants were highly educated university students in their mid 20s. Also, in the Berlin lab as well as in the Bloomington lab many other experiments require high cognitive skills. Therefore participants may have been expecting a challenging task in the choice experiments and were motivated to invest more time and effort. In line with this, independent of the assortment size, the majority of participants in all lab experiments eventually chose an option. If the too-much-choice effect only occurs for cases in which decision makers are unable or unwilling to put enough effort into making a choice, this could be a potential moderator.

### **Critical evaluation of effort as a moderator**

The hypothesis outlined above rests on the assumption that participants in experiments that show choice overload phenomena were unmotivated. As to my knowledge there is no data to support this claim, the assumption remains speculative. Moreover, Malhotra (1982) provided evidence that at least information overload can hardly be found in studies based on trivial decisions such as selecting rice or peanut butter. From this perspective, choice overload would instead be expected for important and far-reaching decisions. Clearly, any theory on effort needs to be rendered much more precisely before it can be fully evaluated. This is especially important because the concept of effort is somewhat related to the concept of choice motivation, which is often used as a dependent measure, and thus there is a danger of circular reasoning.

### **Individual differences as a moderator**

In the preceding chapters, I discussed several individual differences that might moderate the effect of too much choice. Especially in the music experiment that followed a within-subject design, I explicitly tested for individual differences in domain-specific expertise, cultural differences, search behavior, and the personality construct of maximizing versus satisficing. Yet, none of the proposed variables explained the variance in the individual propensity to be overloaded with choice. Therefore, in the following I will extend the discussion of how individual differences might moderate the effect of too much choice.

#### **Variety seeking**

People seem to have a tendency to seek variety even if it requires them to choose less-preferred options (Ariely & Levav, 2000; Ratner et al., 1999). As variety seeking often leads to choosing something exotic or unique, it has been argued that it is due to people's desire to communicate individuality (Kim & Drolet, 2003). Another possibility might be that people take the opportunity to explore their environment in order to gain new experiences. In any case, a large assortment offers more opportunities for variety seeking and thus may invite decision makers to try something new and thereby put up with a decrease in satisfaction. If so, for people who like to experience new things and who value variety, a large assortment should be more inviting to make a choice, as it promises to reveal something special.

#### **Ability to deal with cognitive complexity**

Beyond satisficing versus maximizing, the degree to which people are affected by the size of an assortment could also depend on their ability to deal with cognitive complexity (Bieri, 1966), a measure that reflects how much information someone is willing to process prior to making a decision. The construct of differences in cognitive complexity is in turn closely linked to the need for cognition (Cacioppo & Petty, 1982) and the intolerance of ambiguity (Frenkel-Brunswick, 1949). Other related concepts distinguish people based on their propensity to make or to avoid decisions

(Beattie et al., 1994; Hanoch et al., 2006) or their tendency to procrastinate (Ferrari, Johnson, & McCown, 1995; Mann, Burnett, Radford, & Ford, 1997).

### **Depression**

Indecisiveness and the tendency to prolong information search has also been linked to depression because depressed decision makers have been found to use less heuristic processing and have difficulties committing themselves to a specific decision. For example, in a study by Lewicka (1997), depressed participants searched for more information about a job candidate before they reached a decision. Because of this difference in the search process, depressed participants ended up with more evenly spread knowledge about available options. Probably because of this, depressed participants also rated the second-best, nonchosen candidate as almost equally attractive as the candidate they chose. Nondepressed participants, on the other hand, at some point tended to search for confirming evidence about the most promising candidate and rated the finally chosen candidate as much more attractive than the second-best one. In line with these results, Lyubomirsky and Ross (1999) found that chronically unhappy people were more vulnerable to post-decisional dissonance and disappointment.

### **Critical evaluation of individual differences as a moderator**

With regard to the data that I collected, there is no particular reason why participants in studies that revealed an effect of too much choice should differ systematically on any of these dimensions from participants in studies where the effect was not found. Of course, it can never be ruled out that a certain attitude or personality is a necessary precondition of the too-much-choice effect but as long as there is no sound theory about the decision processes that lead to the effect of too much choice, the influence of individual differences remains speculative.

### **A closer look at choice motivation as dependent variable**

The too-much-choice effect describes the situation in which an overly large assortment decreases the motivation to make a decision and can eventually lead to no choice for the time being. According to Anderson (2003), making no choice in itself is not a well-defined dependent variable but rather an umbrella term that embraces different phenomena that require different explanations.

Making no choice can be to the result of a preference for having no change, that is the status quo (Johnson & Goldstein, 2003; Ritov & Baron, 1990, 1992). Also, no choice will be made if the decision maker procrastinates, for instance, in order to search for more information (Tversky & Shafir, 1992). In this second case, a choice might be made at a later point in time. However, once delayed, many things never get done (Ariely & Wertenbroch, 2002). These types of no-choice responses require that alternative options be recognized as such, and that the possibility of making a choice

is at least considered. In this sense, not choosing can be seen as the result of a more or less deliberate decision process that could be consistent with a decision maker's intentions.

But no choice can also be made if the possibility of choice as well as the alternative options are not even considered in the first place. In this case, not to choose does not result from a decision process but from the lack thereof. As an example, one might think of a person who passes by a tasting booth full of jam without realizing that the jam may actually be purchased.

With regard to past studies on too much choice, including my own, making no choice could be interpreted in different ways. In experiments such as my studies on restaurants and charity organizations, but also in Iyengar and Lepper's (2000) chocolate study, people were forced to make a choice among several options and choosing a default such as money was one option among many. Thus, a deliberate decision process can be assumed. The same holds for the music study where the amount of search prior to choice indicated participants' deliberate process of actually collecting information and considering several options. In the field studies on jam and wine and to some extent also the lab study on jelly beans, a deliberate process and the sense of having different options is also likely. Yet it may be that people did not consider any option at all and thus did not even enter into a decision-making process or that they procrastinated in making their choice.

As the reasons for no choice could differ significantly depending on the situation, a better understanding of choice overload will be gained by clarifying what people are actually doing if they do not make a choice. The different ways of making no choice also have important implications for cognitive models of the too-much-choice effect (see also Veinott, Jessup, Todd, & Busemeyer, 2006). To get a better understanding of the effect, future studies need to be more explicit in their definition of the dependent variable.

## **Final conclusion**

In his 2004 book *The Paradox of Choice*, Barry Schwartz wrote: "As the number of choices grows further, the negatives escalate until we become overloaded. At this point, choice no longer liberates, but debilitates. It might even be said to tyrannize" (p. 2). On the other hand, Anderson (2006) as well as Postrel (2005) cherish the overabundance of choice as a liberating force that enables individuality and pluralism and that leads to more efficient markets. Also, the research on adaptive decision making provides strong evidence that people have a wide repertoire of choice strategies that they can employ depending on the situation. From this perspective, having many options to choose from does not automatically lead to choice overload. After all, people adapt to choice; they satisfice and they deliberately limit their choices all the time, for instance, by applying a filter, consulting an expert, or reading

*Consumer Reports*. As noted by Schwartz (2004): “A small-town resident who visits Manhattan is overwhelmed by all that is going on. A New Yorker, thoroughly adapted to the city’s hyperstimulation, is oblivious to it.” This latter perspective on choice overload is in line with my empirical findings showing that the effect of too much choice is much less robust than previously thought.

Foreshadowing these challenges in replicating the effect, even though Buridan's hypothesis about choice-overloaded animals also seemed convincingly universal, it could never be supported on empirical grounds. For example, hungry rats that were placed an equal distance between two food patches quickly moved to one patch or the other and showed no tendency to hesitate or vacillate (Klebanoff 1939, cited in Miller 1944).

Yet for the effect of choice overload, the odds for future replications are somewhat better. At least the meta-analytical integration of several studies outlined in Chapter IV shows that the effect of too much choice is real and that there must be certain boundary conditions that explain the differences in its occurrence. While almost none of the variables that I tested experimentally seemed to matter, there are still a number of potential moderators and mediators that remain to be tested that might explain the differences.

From the review of these boundary conditions no finite conclusions on the exact nature of these moderators can be drawn. What can be concluded, however, is that looking solely at the structure of the environment only provides a distorted view of such a complex phenomenon as choice overload. In resemblance to Simon’s (1990) notion of the scissors, whatever the explanation looks like, it has to incorporate the interaction between the structure of the environment and the properties of the decision maker who acts within that environment.

Toward this goal, future research should proceed by building a more precise understanding of the psychological processes and decision mechanisms that people use, the environment structures they face, and the interaction between the two (Todd & Gigerenzer, 2007). Finally, researchers should be precise regarding their dependent variable, be it different forms of making no choice or measures of reduced choice satisfaction.

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