

When Shelf-based Scarcity Impacts Consumer Preferences
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ABSTRACT

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Scarcity has long been known to impact consumers' choices. Yet, the impact of shelf-based scarcity in retail environments, created by stocking level depletion, has received almost no attention in the literature. Indeed, little research to date has even examined if consumers will attend to shelf-based scarcity in retail environments, much less how this cue can impact choice. A priori, given the inherently noisy and cue-filled nature of retail environments, it is quite reasonable to expect that shelf-based scarcity would play little to no role in consumers' choices. However, across six chapters, this dissertation demonstrates that shelf-based scarcity can impact consumers' choices and identifies the mechanism underlying these effects.

To begin, Chapter 1 introduces the research question, while Chapter 2 outlines the relevant extant literature and develops the hypotheses to be tested. Chapter 3 demonstrates not only that shelf-based scarcity can impact choices, but also that it does so through the inferences that it induces (i.e., the process through which shelf-based scarcity impacts choice is an inferential one). Chapter 4 examines moderators of the effect, demonstrating that shelf-based scarcity effects are reversed when popular products are considered undesirable. Further, Chapter 4 shows that (i) the shelf locations of the available alternatives and (ii) the consumer's concern about persuasion attempts can impact the inferences that consumers make regarding shelf-based scarcity, thereby attenuating its impact on choice.

Next, Chapter 5 focuses its attention on the robustness of shelf-based scarcity effects, showing that shelf-based scarcity impacts choices when (i) the choice is made either for oneself or for others, (ii) sales ranking, objective quality, or brand name information is available, and (iii) the choices being made are real. Chapter 5 also demonstrates two boundary conditions under which shelf-based scarcity effects are attenuated or overwhelmed. Specifically, shelf-based scarcity does not impact choices either when the consumer has prior strong preferences or when a price promotion is available in the category of interest. Finally, Chapter 6 closes this dissertation with a summary of the findings as well as a discussion of the implications of this work, its limitations, and potentially fruitful directions for future research.

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DEDICATION

For Pam.

1

Introduction

Choices made in retail environments can be surprisingly complex; a consumer perusing the multitudes of product categories available in a typical North American grocery store will find an endless array of brands, prices, promotions, and so on. To make matters even more complex, the decisional inputs of the choice situation are not limited to the product-specific attributes of the available alternatives. Indeed, contextual factors including, but not limited to, store layout and design (Baker, Grewal, and Parasuraman 1994), in-store music (Mattila and Wirtz 2001), in-store displays (Chevalier 1975), shelf location (Valenzuela and Raghurir 2009), number of shelf facings (Curhan 1972), lighting (Areni and Kim 1994), and aisle width (Levav and Zhu 2009) can all impact a consumer's ultimate choice in or among product categories. This dissertation examines another such contextual factor (environmental cue) that may also impact consumers' choices; the relative stocking level depletion, or scarcity, of the alternatives. Might a consumer's choice among alternatives in a given category be affected by how well-stocked each alternative is relative to its competitors? If so, is it better to be more or less well-stocked, and when and why will shelf-based scarcity impact consumers' preferences?

Context and Choice

Very few choices are context independent: most are impacted by some aspect of the choice environment. When I speak of context, I am not referring to the relatively narrow concept of context effects (e.g., the compromise effect: Simonson 1989; asymmetric dominance: Huber, Payne, and Puto 1982; or assimilation/contrast effects: e.g., Herr 1989). Instead, I am referring to the all-encompassing circumstances that

invariably frame every decision we, as consumers, make. For instance, when deciding whether to have a hot or iced coffee I am particularly affected by the day's weather. Rarely will I choose a hot coffee on a sunny summer day or an iced coffee on a blustery winter day. Likewise, when ordering at a restaurant, it's unlikely that I will choose a dish that has already been ordered by a fellow diner (Ariely and Levav 2000). Even "inherent" preferences (Simonson 2008) are unlikely to impact choices in a consistent manner across all situations. I might truly prefer chocolate over all other foods, but I am unlikely to choose it as a pizza topping if given the opportunity or order a decadent chocolate mousse over a healthy dessert in front of a dieting friend.

Why does context play such a strong role? After all, the context is, by definition, external to the alternatives from which the choice will be made; it changes nothing about the alternatives themselves (a hot coffee is a hot coffee no matter the season). Nonetheless, context may impact choice because the context can (i) provide the consumer with information about the alternatives, (ii) give a "reason" to choose one alternative over another (Shafir, Tversky, and Simonson 1993), and/or (iii) change the expected or actual experience of consuming the product, as in the coffee and chocolate examples. Of these three influential means, a context's potential informational qualities are particularly relevant to this dissertation.

Unlike product-specific attributes or cues, contextual cues rarely provide explicit information about any of the alternatives. Instead, it is frequently up to the consumer to use the contextual cues to make inferences about the available alternatives and use this "information" in making their choice (or not). Under certain circumstances, these inferences may even occur automatically, outside of the consumer's awareness.

Imagine if you will a typical grocery-store shelf stocked with various brands of laundry detergent. Moving one brand from an upper to a lower shelf, or adding or eliminating shelving slots for this brand does not change this or any other brand in any objective way. Accordingly, one might expect such actions to have little impact on the choice shares of the brands in this category. However, a consumer may interpret one brand being on a lower shelf than another brand as a signal that it is of relatively lower quality, or they may feel that a brand with more shelf space is more popular than a brand with less shelf space. Further, as is well-documented, the relative quality or popularity of alternatives can have a significant impact on consumers' preferences. Thus, changing shelf location or allocated shelf space, seemingly minor shifts in the choice context, could potentially lead consumers to choose one alternative over another. Put simply, the inferences induced by the context provide a measuring stick (other than the available product-specific attributes) that the consumer can use to judge the available alternatives and make a choice. Moreover, changing elements or cues of the context can have a dramatic impact on what consumers choose.

Shelf-Based Scarcity: A Cue for Choice?

That context can impact choice is not a matter of debate; it can and does. The question examined in this dissertation is whether or not shelf-based scarcity is a contextual cue that can impact choice. As will be discussed, there are a number of reasons to believe that shelf-based scarcity should have no effect on consumers' preferences. Still, imagine yourself shopping in a given product category at your local grocery store. As you scan the shelf you find multiple prices, various package sizes, and

numerous ingredient or component configurations, as well as assorted packaging shapes and designs (Yang and Raghurir 2005) from which to choose. You also notice that one alternative's stocking level is noticeably more depleted (i.e., it is scarcer) than the others. Would you choose this alternative?

The answer to this question will depend to some degree on whether or not you already have a preferred alternative or brand in this category (i.e., whether or not your decision was made before you reached the shelf). Of course, many purchases are routine and made from well-known product categories where strong preferences have been established (Hoyer 1984), yet many others are made from product categories or choice sets where no strong preferences exist. In these latter situations, the consumer may seek help in choosing the "right" product. In retail contexts, this help may come in the form of (i) product-specific attributes or cues such as brand names, prices, ingredients, quality ratings, and recommendations, or (ii) contextual cues such as shelf location, aisle width, shelf space, and so on. Both types of cues can lead to inferences about the available products (e.g., a high price means high quality; Kardes, et al. 2004; Rao and Monroe 1988, 1989), which the consumer can then use as information to help them choose. While many of these contextual cues have been examined in the literature, shelf-based scarcity has received almost no attention. As such, it is not clear if, when, or how shelf-based scarcity may impact consumers' preferences.

This dissertation shows that shelf-based scarcity is another contextual cue that consumers use to help them make their choices. The findings presented here demonstrate that, despite its ambiguous nature (i.e., the cause and, consequently, meaning of shelf-based scarcity is often unknown to the consumer), consumers consistently infer that

shelf-based scarcity is caused by the choices of preceding customers; scarcer alternatives are believed to be more popular. Additionally, these popularity inferences are shown to bolster the choice shares of scarcer alternatives both directly (people prefer the item simply because it is popular) and indirectly (by inducing inferences that the scarcer alternative is of relatively greater quality). The following section outlines the conceptual framework and findings presented in this dissertation.

A Preview of Things to Come

Chapter 2 (i) introduces the conceptual framework and (ii) presents the formal hypotheses that are tested throughout the empirical portion of this dissertation. Beginning with a close examination of the traditional scarcity literature, it is argued that while many of the causal theories of traditional scarcity effects would be unable to explain a shelf-based scarcity effect, others would likely predict no effect of shelf-based scarcity on consumers' preferences at all. However, building on the literature on consumers' propensity to make inferences based on contextual cues, it is hypothesized that consumers will prefer scarcer products in retail environments because they believe them to be (i) more popular, and (ii) of higher quality. It is further hypothesized that popularity inferences will be the primary driver of shelf-based scarcity effects as they will impact choices both directly (i.e., consumers will prefer scarcer products simply because they believe they are more popular) and indirectly (by inducing inferences that scarcer products are of higher quality).

Subsequently a series of hypotheses are developed that predict when scarcity will and will not impact consumers preferences. First, the positive effect of shelf-based

scarcity on choice shares is predicted to be reversed when popularity is considered to be an undesirable attribute. Second, a specific contextual cue (shelf location) and an individual-specific difference (persuasion knowledge) are both predicted to attenuate the positive impact of shelf-based scarcity by interfering with the inferences consumers make based on the scarcity cue. Finally, a series of predictions are made regarding the impact of several competing cues (e.g., price promotions, quality ratings) on shelf-based effects.

Next, Chapter 3 begins the empirical portion of this dissertation by presenting three studies that (i) show strong evidence that shelf-based scarcity can impact consumer preferences and (ii) test the inferential process that underlies shelf-based scarcity effects. First, Study 3.1 asks participants to imagine that they are shopping in a small foreign shop. They are then shown a wine shelf containing two white wines, two red wines, and two cheeses. In each category one of the alternatives is only half stocked while the other is nearly fully stocked. Participants are then asked to (i) choose one alternative from each category, (ii) explain the reasoning behind their choice of white wine in an open-end measure, and then (iii) indicate which, if any, of several reactions they had to the lesser-stocked (scarcer) white wine. As expected, it is found that participants strongly prefer the scarcer alternatives in each of the categories. Further, the open-end responses indicate that the majority of participants choosing the scarcer white wine do so because they believe it to be more popular. Finally, the closed-end “reaction” measure reveals that the majority of participants believe that the scarcer wine is more popular and of higher quality.

Study 3.2 extends these findings by demonstrating that the result can be generalized to more than two levels of scarcity. Specifically, participants in this study

read a scenario very similar to that used in the first study and choose from two product categories (red and white wines), each containing three alternatives. The three alternatives in each category have different scarcity levels ranging from very scarce to not scarce. After making their choices, participants are asked to explain the reason for their white wine choice in an open-end format and indicate which, if any, of several reactions they had to the white wine they have chosen. The results show that consumer preferences are linearly related to scarcity levels; the scarcer the wine the higher its choice share. Further, both the open- and closed-end measures show that participants are more likely to make inferences of popularity, and base their decision on these inferences, the scarcer an alternative is.

Closing Chapter 3, Study 3.3 focuses on identifying the process through which shelf-based scarcity impacts choices using mediation analysis. Participants in this study first indicate which of two red wines they prefer. As in the preceding studies, one wine is scarcer (less stocked) than the other. After making their choice, the participants then rate each wine in terms of perceived popularity, expected quality, and frequency of restocking. Replicating the first two studies, participants again significantly prefer the scarcer of the two wines. Further, using the popularity, quality, and restocking ratings, it is found that popularity mediates the impact of shelf-based scarcity on choice and on quality ratings; that is, shelf-based scarcity does not have a direct effect on either choice or quality inferences, *per se*. Further, while popularity inferences are found to lead to quality inferences, it is also shown that they have a direct impact on choice (participants are more likely to pick scarcer alternatives simply because they believe they are more popular). Thus, popularity inferences are found to be the main driver of the shelf-based

scarcity effects. Finally, no difference is found in the expected frequency of restocking between the scarcer and more abundant wine, indicating that the participants did not feel the shelf-based scarcity was due to the retailers actions.

Building on Chapter 3's findings, Chapter 4 turns its attention to testing the proposed process through which shelf-based scarcity impacts choice by identifying moderators of this process. Specifically, given the strong role found to be played by popularity inferences, this chapter focuses on factors that moderate the link between shelf-based scarcity and choice by moderating either (i) the effect of popularity on choice (Studies 4.1 and 4.2) or (ii) the effect of shelf-based scarcity on popularity inferences (Studies 4.3 and 4.4).

Study 4.1 examines the impact of shelf-based scarcity when participants are explicitly told to either choose or avoid popular alternatives. Specifically, participants in this study are asked to imagine that they will be attending a soccer game in a foreign country and that they will be meeting a friend at this game. This friend requests that the participant wear either the team jersey most popular with the locals or the team jersey not typically worn by the locals. The participants are then asked to imagine visiting the stadium store to purchase a jersey and are shown two jerseys for the home team that differ in appearance and scarcity level. As predicted, the participants' preference for the scarcer alternative is significantly greater when their friend has asked them to wear the jersey most popular with the local fans, as opposed to when they request that the participant wear the jersey least popular with the local fans.

In a subtler test of how the desirability of popularity moderates shelf-based scarcity effects, Study 4.2 examines the role of consumers' need for uniqueness in

determining the impact of shelf-based scarcity on consumer preferences. Participants in this study are asked to imagine that they are searching for a new winter jacket. After searching a local clothing store, they find two jackets which suit them. All participants are told that there are only two jackets of one of the styles remaining on the rack (i.e., the scarcer alternative) while the other is nearly fully stocked (i.e., the abundant alternative). Further, participants are told, between subjects, that the jackets either differ conspicuously (i.e., in a manner easily identifiable by others) or inconspicuously (i.e., in a manner not obvious to others). It is predicted that those participants with a high need for uniqueness will be much less likely to choose the scarcer jacket, but only when the jackets differ in a conspicuous manner. The results fully support this prediction, thereby providing further evidence of the crucial role played by popularity inferences in determining the impact of shelf-based scarcity on choice.

Throughout this dissertation, a strong and persistent link is found between shelf-based scarcity and popularity inferences; consumers reliably believe that scarcer alternatives are more popular. This raises an interesting question: when will consumers not think scarcer alternatives are more popular? Studies 4.3 and 4.4 present two circumstances under which consumers are less likely to believe that scarcer products are more popular. First, Study 4.3 shows that shelf location can affect how consumers interpret shelf-based scarcity. Specifically, building on recent research that consumers make both popularity and quality inferences on the basis of shelf location, it is found that when a scarcer alternative is located on the bottom (vs. an upper) shelf, consumers do not believe that it is more popular than the other, more abundant alternatives. It is proposed that this is due to consumers not expecting to find popular alternatives located on a

bottom shelf and, hence, assuming that the scarcer product is scarce for some reason other than the choices of preceding consumers. Consequently, the positive impact of being the scarcer alternative on choice is fully attenuated when the scarcer product is located on the bottom shelf.

Study 4.4 takes a slightly different perspective and investigates what happens when consumers are concerned that retailers may be attempting to manipulate their choices (i.e., persuade them to purchase a certain product or brand). To manipulate concern for persuasion attempts, participants in this study are asked to read one of two articles ostensibly taken from a respected business journal. The control article is simply a story about the entrance of national retailers into more rural areas. The “high persuasion concern” article, however, informs the participants that retailers are actively trying to manipulate their choices in order to make higher profits and that they often do so by manipulating various cues at the shelf. In accordance with previous research, this latter article is expected to raise the participants’ concerns that retailers are attempting to manipulate their choices. Further, this concern for persuasion attempts should lead these participants to question and discount cues they find in the retail environment, thereby reducing the positive impact of shelf-based scarcity. This is exactly what is found.

After reading the article, the participants begin a “new” study which asks them to choose one of two available barbecue sauces, one of which is scarcer than the other. As expected, participants who have read the “high persuasion concern” article are significantly less likely to prefer the scarcer alternative over the abundant alternative than those in the control condition. Thus, the positive impact of shelf-based scarcity may be

attenuated when consumers are concerned that retailers are attempting to manipulate their choices or surreptitiously persuade them to choose one brand or product over another.

Concluding the empirical portion of this dissertation, Chapter 5 introduces a series of competing cues that are common in retail environments. Since retail environments are complex, containing many different contextual and product-specific cues, it is important to examine the impact of shelf-based scarcity in the presence of such cues. While the cues tested in this chapter are expected to compete with shelf-based scarcity to impact choice, they are not necessarily expected to affect the *process* through which shelf-based scarcity impacts preferences. That is, despite potentially affecting shelf-based scarcity's impact on choice, these cues may have no impact on (i) the inferences consumers make or (ii) the attractiveness of popularity, as was found in Chapter 4.

Study 5.1 replicates Study 3.3 with two important differences. First, Study 5.1 examines if making choices for oneself, versus for others, impacts the choice shares of scarcer alternatives: no difference is found. Second, Study 5.1 adds sales-ranking information, an explicit macro-popularity cue, to the choice environment. The choice share of a randomly chosen target wine is analyzed in a 2 (target wine relative scarcity: scarcer vs. more abundant) x 2 (target wine relative sales ranking: higher vs. lower) between-subjects design. The results show that while being a lower-ranked alternative can negatively impact choice shares, shelf-based scarcity can still positively impact an alternative's choice share regardless of its relative sales ranking.

Study 5.2 once again asks participants to choose from two different wines, one of which is scarcer than the other. However, participants in this study are given objective quality ratings ostensibly taken from a well-known publication on wines. It is expected

that the effect of shelf-based scarcity on preferences will be overwhelmed when the scarcer wine is found to be of either objectively higher or lower quality. This prediction is fully supported. However, given the evidence that the popularity inferences induced by shelf-based scarcity have a direct impact on choice, a positive effect of shelf-based scarcity is expected and found when the quality levels of the wines are equal.

Study 5.3 makes a significant contribution to the generalizability of the findings in this dissertation. First, Study 5.3a asks participants to make choices from six different frequent-purchase categories (e.g., toilet paper and spray cleaner) containing branded alternatives. Even though the brands used in this study are well-known and familiar to the vast majority of the participants, a positive and significant effect of shelf-based scarcity is found. Study 5.3b generalizes this finding further by having participants make real choices (i.e., choose and pay for products they will keep) from real brands in familiar product categories. Again, a significant and positive effect of shelf-based scarcity is found.

An interesting finding in Studies 5.3a and 5.3b is that, while statistically significant, the magnitude of the positive impact of shelf-based scarcity in these studies is lower than in the preceding studies. The most likely cause of this is the use of familiar brands for which some participants are likely to have prior preferences. In fact, it is predicted that shelf-based scarcity should have much less, if any, impact on consumers with strong prior preferences. This prediction is tested in Study 5.4. Additionally, Study 5.4 examines whether or not the presence of price promotions, a ubiquitous and powerful cue, affects the impact of shelf-based scarcity on choice.

Participants in Study 5.4a are asked to imagine that they are shopping for one quart of synthetic motor oil and that upon arrival at the local auto parts store they find a shelf containing four well-known brands of motor oil that meet their needs. For half of the subjects, Mobil 1 is relatively scarcer than the rest of the brands. For the other half, Valvoline is relatively scarcer. Additionally, one half of the participants find Mobil 1 to be on sale for twenty percent off the regular price, while the other half find no brands on sale, thereby creating a 2 (scarce brand: Mobil 1 vs. Valvoline) x 2 (price promotion: present vs. absent) between-subjects design. Finally, we ask participants to indicate if they have a strong preference for any of the available brands of motor oil. Following predictions, shelf-based scarcity is found to have no effect on the choices of those participants with strong preferences (a finding which is largely replicated in Study 5.4b). Additionally, among those with no strong preferences, shelf-based scarcity is found to have no effect on preferences when a price promotion is available in the product category; they simply choose the brand on promotion. Thus, two important boundary conditions of shelf-based scarcity effects are identified.

Collectively, the results of the three empirical chapters strongly support the main prediction of this dissertation that consumers will most frequently prefer scarcer products in retail environments as well as the proposed inferential process driving these effects. Further, a great deal of evidence is presented demonstrating the robustness and generalizability of this effect and two crucial boundary conditions are identified. Chapter 6 closes this dissertation with a summary of the results, discussions of both the theoretical and managerial implications of the current work, and a look forward to future research opportunities in this area.

2

Literature and Hypotheses

Does shelf-based scarcity positively impact consumers' choices? One might expect not considering the many other, often more overt, cues in retail environments which consumers can use to help them make their choices. Additionally, even if consumers notice and consider shelf-based scarcity when choosing, one could easily argue that consumers should tend to prefer more stocked alternatives for a variety of reasons including, but not limited to, perceptual salience or perceived freshness. Contrary to both of these arguments, this dissertation proposes not only that consumers will notice and consider shelf-based scarcity, but that shelf-based scarcity will have a positive effect on choice (i.e., consumers will prefer scarcer products). In the course of reviewing the pertinent extant literature, this chapter introduces a series of formal hypotheses regarding the impact of shelf-based scarcity on choice which are tested in the subsequent chapters of this dissertation. The discussion begins by hypothesizing the positive relationship between shelf-based scarcity and choice as well as outlining the predicted psychological process driving this effect. Afterwards, hypotheses are developed identifying potential moderators of the link between shelf-based scarcity and choice. Finally, closing this chapter, several hypotheses predicting the impact of several common choice cues on shelf-based scarcity effects are presented.

Scarcity and Preference

A long stream of research indicates that scarcity can strongly impact consumers' choices. A key perspective on scarcity is Brock's (1968) commodity theory, which states that the value of anything that (i) can be possessed, (ii) is useful to its possessor, and (iii) is transferable from one person to another is increased with its unavailability or scarcity.

Many explanations for the effect of scarcity on consumer preferences have been forwarded since this seminal work.

Some argue that scarcity induces reactance (Brehm 1966) which, in turn, increases the likelihood of scarce goods being chosen. Put simply, it is argued that when a consumer finds an option is scarce, she may feel her freedom to choose this option is threatened (Clee and Wicklund 1980; Worchel, Lee, and Adewole 1975). One manner in which the consumer may re-establish her freedom is to choose the scarce product. From an outside observer's perspective, such choice behavior suggests that the consumer has a greater preference for the scarce product although, in fact, choices made in order to reestablish one's freedom are not necessarily reflective of one's true preferences (other than a preference for freedom of choice). There are, however, a few more problematic issues with explaining scarcity effects, particularly shelf-based scarcity effects, with reactance theory.

First, being scarce does not mean being unavailable. That is, the consumer is still free to choose the scarce product. Unless the consumer desires more than can be had due to scarcity, or must expend more money or effort than would be expected were there no scarcity, there is at most a minimal threat to that consumer's freedom. Second, choosing the scarce item is not the only way the consumer may re-establish her freedom. Indeed, if the consumer finds or simply believes that the retailer or manufacturer is intentionally inducing the scarcity so as to manipulate her choice, the consumer will likely resist such attempts (Friestad and Wright 1994) and might re-establish freedom of choice by choosing anything other than the scarce product (including potentially going to a different retailer). Thus, while the elicitation of reactance is an appealing explanation for scarcity

effects, and while it does receive some support in the literature, it does not wholly explain the phenomenon, nor is it a particularly compelling explanation for scarcity effects which might be found in retail situations where the restriction on freedom of choice is actually quite minimal and frequently temporary (i.e., the scarce product will most likely be restocked at some point).

Another issue with the reactance explanation of scarcity effects is that it predicts a universally positive response to scarce products while there is repeated evidence that scarcity does not always increase consumers' evaluations of, or desire for, the scarce item (Verhallen 1982). For instance, Ditto and Jemmott (1989) found that participants rated beneficial [detrimental] medical conditions as being a more positive [negative] health asset when the condition was described as being less (vs. more) prevalent in the population. In other words, the extremeness of these participants' evaluations of the medical conditions increased with the scarcity (rarity) of the conditions, regardless of valence.

To account for these findings and others like them, Brock and Brannon (1992) proposed a liberalized commodity theory that identifies cognitive elaboration as the mediator between scarcity and evaluative polarization. Building on the Elaboration Likelihood Model (Petty, Cacioppo, and Schumann 1983), this updated view of commodity theory argues that scarcity motivates consumers to think more about the scarce commodity. If these thoughts are predominantly positive [negative] the consumer's attitude about the target will change more extremely toward [dis]liking the target. Of course, the content and valence of these thoughts depends on the information that is available to the consumer at the time of evaluation (Feldman and Lynch 1988). If

external, non-memorial information about the target is available (e.g., the ingredients of a food, the components of a laptop, reviews by other consumers, and so on), the consumer is likely to elaborate on this information. Similarly, the consumer could rely and elaborate on recalled product-specific information when making their evaluations.

Bozzolo and Brock (1992) found evidence supporting the contention that scarcity leads to greater cognitive elaboration, demonstrating that the motivation to scrutinize a persuasive message was increased by perceptions of unavailability, but only for subjects low in *need for cognition* (Cacioppo and Petty 1982; Cacioppo, Petty, and Kao 1984). Similarly, Worchel (1992) found participants wanted to hear a message more, and changed their attitude more to the position advocated by the message, when they believed the message was censored. This effect was particularly strong when participants believed this censorship was personally targeted at them. It is important to note that in each of these studies, participants were given detailed messages to consider. That is, information abounded and attitudes changed.

What of situations where little information is given or recalled? Brock and Brannon (1992) suggest that if no external information is available, “the recipient will generate and elaborate on her or his own thoughts about the commodity.” For instance, the consumer might focus their thoughts on their initial responses (perhaps affective; Zajonc 1980) to the target. Alternatively, when considering consumer goods, the consumer might rely on their naïve economic theories (Lynn 1992) which will increase the desirability of the scarce goods. This line of reasoning holds that consumers tend to believe (infer) that scarce products are more expensive than abundantly available products (Lynn 1989, 1992). Further, consumers often find expensive products more

desirable because they may be used as status symbols (Veblen 1899/1965) and because high prices often signal quality (Rao and Monroe 1988, 1989; Seta and Seta 1992).

Though this explanation of scarcity effects is intuitively appealing and receives some empirical support, with very few exceptions, consumers are aware of the prices of the alternatives available to them in retail environments. Thus, while being a potentially compelling explanation of general scarcity effects in consumer product categories when prices are unknown, this account has little explanatory power for effects related to the more specific shelf-based scarcity which occurs in retail environments. Rather, as is proposed in this dissertation, the consumer may generate inferences about the product other than perceived expensiveness, including inferences about its popularity and/or quality.

Another potential explanation of the impact of scarcity on choices is that consumers simply use a “scarcity heuristic” (Cialdini 1987). Ditto and Jemmott (1989) state that “if all that is known about some object or characteristic is that it is rare, people may rely on a *scarcity principle* to infer an extreme evaluation.” These polarized evaluations then lead to the shifts in choice share commonly associated with scarcity. Similarly, it may occur that, during the socialization and conditioning of a consumer in the marketplace, he or she frequently observes the co-occurrence of products being both scarce and of greater popularity, higher quality, or greater value. These repeated associations may result in a more or less automatic “scarce is good” response, even in the absence of other information. Potentially, such repeated patterns could lead to consumers using context-specific choice strategies to make their decisions (e.g., “pick the scarcer item”; see, e.g., Amir and Levav 2008). In large part, regardless of whether consumers

elaborate more on the information they have or use a basic scarcity heuristic, the outcome is most frequently a polarized evaluation. More specifically, for consumer goods, the outcome is frequently a more positive evaluation given the generally positive associations most consumers have with consumer goods.

The discussions on naïve economics and scarcity heuristics highlight an interesting difference between consumer goods and other forms of commodities that is found in, but not explicitly addressed by, the scarcity literature. In fact, there are important differences between consumer goods and other commodities. For instance, consumers most frequently have positive associations with consumer goods. Accordingly, despite the potential for negative polarization of evaluations, scarcity most frequently increases evaluations for consumer goods. This is less frequently the case for other commodities. Thus, within a retail environment, when choices are being made among common, useful, and desirable consumer goods, we should expect scarcity to increase consumer evaluations as long as the scarcity is noticed and considered a legitimate cue for choice. However, there is reason to believe that shelf-based scarcity will not be considered a legitimate cue.

It has been reliably shown that scarcity effects have a certain *causal dependence* when considering consumer goods (i.e., products that will be acquired, owned, and consumed by the consumer) that is not present with other commodities (e.g., messages or diseases). That is, evidence strongly suggests that scarcity tends to impact choices among consumer goods *only* when consumers believe that market forces (i.e., factors related to supply or demand) have *caused* that scarcity (Verhallen and Robben 1994; Worchel, Lee, and Adewole 1975). When consumers believe that scarcity is caused by accidental or

non-market forces (e.g., a missed order or failed delivery), scarcity effects are not found. Importantly, a consumer is unlikely to know why one alternative is scarcer than another in a retail context. That is, the consumer cannot know the cause of the scarcity in these environments.

Certainly, though, the consumer may make inferences about the cause of the scarcity. For instance, she might infer that one product is scarcer because the retailer has failed to stock the shelf for an extended period of time, because the supplier failed to make a delivery, or perhaps because of an ordering mistake. On the other hand, the consumer could also assume that a product is relatively scarcer because previous consumers have selected this product with greater frequency (i.e., the scarcer product is more popular). On the whole, given the lack of objective information about the cause of shelf-based scarcity, its impact on choice will be greatly affected by the assumptions the consumer makes about the causes of the scarcity. While many of the above assumptions (inferences) are plausible, recent work by van Herpen, Pieters, and Zeelenberg (2009) finds that consumers in retail environments (i) tend to infer that scarcer products are more popular and of higher quality, and (ii) are generally more likely to choose scarcer products. The first objective of this dissertation is to replicate these basic findings. Accordingly, Hypothesis 1 is:

H1 – Consumers will (i) infer that relatively scarcer alternatives (i.e., those with more depleted stocking levels) are more popular and of higher quality than other alternatives and (ii) be more likely to choose scarcer alternatives.

Popularity and Preference

Extending van Herpen, Pieters, and Zeelenberg (2009), the current research explicitly examines the relationship between (i) shelf-based scarcity (i.e., the relative scarcity of the available alternatives), (ii) popularity and quality inferences, and (iii) consumer preferences. If, as suggested by Hypothesis 1, shelf-based scarcity cues lead to beliefs that the scarcer alternative is more popular, how and why will this affect consumers' choices? When in doubt about the best course of action, consumers often infer that other consumers are (more) knowledgeable, and that they might make better decisions by observing and mimicking them (i.e., they seek out "social proof"; Cialdini 1993). Such behavior is related to the economic theory of informational cascades (see, e.g., Bikhchandani, Hirshleifer, and Welch 1992), bandwagon effects (Corneo and Jeanne 1997; Liebenstein 1950) and herd behavior (Banerjee 1992). The important element of both informational cascades and bandwagon effects is that each depends on a preponderance of evidence in the form of others' choices. This suggests that there may be a direct effect of popularity on preference (i.e., consumers may base their choices solely on the relative popularity of the available alternatives) as has been shown when consumers conform to others' behavior independent of their own private signals (Asch 1955).

Aside from any direct effect that perceived popularity might have on preferences, it is also likely to lead to other inferences about the available alternatives (Kardes, Posavac, and Cronley 2004). In particular, consumers are likely to infer that a more popular alternative is of superior quality (Caminal and Vives 1996). The link between

popularity and expected quality is so intuitive that this inference is likely to be automatic. Additionally, inferring that a product is of higher quality will likely increase the chances the consumer chooses that product.

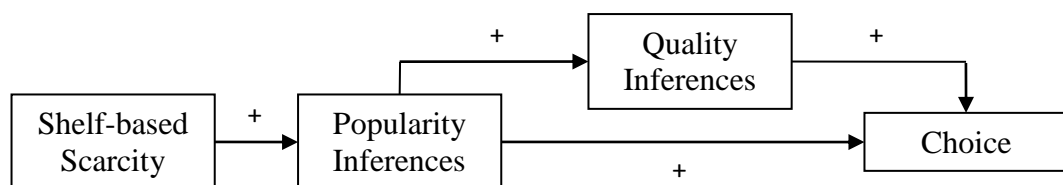
While it is generally possible for consumers to either make inferences of quality based on inferences of popularity, or vice versa, it is proposed that shelf-based scarcity first elicits popularity inferences; consumers believe that scarcer alternatives are more popular. In turn, these popularity inferences induce quality inferences; consumers believe that scarcer alternatives are of higher quality. However, the impact of popularity inferences is not wholly explained (mediated) by quality inferences (i.e., popularity matters, *per se*). Stated formally, these hypotheses are as follows.

H2a – The effect of shelf-based scarcity on preferences operates through (is *fully mediated by*) popularity inferences.

H2b – Popularity inferences driven by shelf-based scarcity will lead to quality inferences about the available alternatives.

H2c – Even after controlling for quality inferences about the available alternatives, popularity inferences will have a significant effect on preferences.

Figure 2.1: Graphical Representation of Hypotheses 1-2



While much evidence suggests that popular products tend to be more preferred (“I’ll have what she’s having.” McFerran, Dahl, Fitzsimons, and Morales 2010), this is certainly not always the case. Indeed, there are instances in which popular products are less preferred and consumers are less likely to choose those products. For example, Berger and Heath (2007) show that consumers are more likely to diverge from the choices of others (i.e., “popular” alternatives) when choosing an identity-relevant good or when the majority choosing the product are members of an out-group (i.e., popularity is undesirable).

One reason why a consumer might not prefer popular goods relates to the degree to which they have a need for uniqueness (Fromkin and Snyder 1980; Snyder and Fromkin 1977). Consumers with a high need for uniqueness wish to feel distinct from those around them. Accordingly, one would not expect these individuals to choose products they believe to be more popular. However, it has been argued that consumers with a high need for uniqueness will prefer scarce products. Indeed, Lynn’s (1991) meta-analysis supports such an argument to a degree. Yet, there is a great deal of heterogeneity in the various effect sizes examined by Lynn. A likely reason for this is that this meta-analysis did not distinguish between studies manipulating scarcity as being demand- versus supply-based. When scarcity is caused by supply restrictions (i.e., there are few available in the world), the scarce product will help consumers signal a unique identity and, therefore, will be more desirable to those consumers with a high need for uniqueness. Conversely, when scarcity is caused by demand restrictions (i.e., many preceding consumers have selected the product), then it is very unlikely that this scarce

product will be considered unique, and those consumers with a high need for uniqueness should not find this scarce product desirable.

In sum, if consumers believe that shelf-based scarcity signals popularity, as suggested in Hypothesis 1, then one would expect them to be less likely to choose scarcer products when popularity is an undesirable attribute. Accordingly, it would be expected that consumers with a high need for uniqueness would be much less likely to choose a scarcer (less-stocked) product, but only when that product is capable of signaling something about their individuality or uniqueness. These hypotheses are formalized as follows.

H3a – Scarcer (less-stocked) products will be less preferred when popularity is an undesirable attribute.

H3b – Consumers with a high need for uniqueness will be much less likely to choose a scarcer (less-stocked) product than a consumer with a low need for uniqueness, but only when the product can be used to signal one’s uniqueness (e.g., is conspicuously consumed).

Does Scarcer Always Mean More Popular?

Hypothesis 1 predicts that consumers will believe that scarcer products are more popular, *ceteris paribus*. However, there could be other cues in the retail environment which suggest an alternative cause of the scarcity. For example, a product located near the rear of the store or on a hard to find shelf might be scarcer simply because the retailer is not attending to that product. A similar cue is shelf-location.

Recent work has shown that consumers make inferences about products based on their shelf location (Valenzuela and Raghurir 2009). In general, consumers believe that products located nearer the horizontal center of a shelf are more popular. More recent findings suggest that vertical orientation can also affect consumers' inferences (Valenzuela and Raghurir 2010). Building off of this work, it is proposed that shelf location will impact the inferences consumers make about scarcer alternatives. Specifically, it is expected that consumers will not expect popular products to be located on the bottom shelf. As such, consumers should be less likely to believe that scarce products located on the bottom shelf are scarce due to popularity. Accordingly, shelf-based scarcity is not expected to have as strong of a positive impact on choice when the scarce product is located on the bottom shelf.

H4 – The positive impact of shelf-based scarcity on choice will be significantly reduced when the scarcer product is located on the bottom (as opposed to an upper) shelf. This will be due to the reduced likelihood of consumers inferring the scarcity is due to the product's popularity.

Consumers might also doubt that scarcer products are relatively more popular when they are concerned about others' attempts to sway their preferences; that is, when they are concerned that they are the target of a persuasion attempt. As consumers progress through life, they develop an intimate understanding of the world around them. Included in this world is the marketplace in which goods and services are exchanged. In

the course of their development in this marketplace, consumers come to an understanding of not only their own mental states, but also the mental states and intentions of other players in the marketplace; that is, they develop marketplace metacognition (Wright 2002). A particularly common element of the marketplace is persuasion attempts. Notably, when consumers become aware of persuasion attempts directed at them, they often use their persuasion knowledge to resist these attempts (Friestad and Wright 1994). This suggests that if consumers believe that the retailer is manipulating marketplace cues to affect their choices, they may come to doubt the diagnosticity of those cues. Particularly relevant to the current discussion, they are likely to discount the meaningfulness of shelf-based scarcity (along with any number of other cues in the environment), becoming less likely to believe scarcer products are more popular. Accordingly, it would be expected that consumers who are concerned with persuasion attempts would be relatively less likely to choose scarcer alternatives.

H5 – Consumers who are concerned with the persuasion attempts of retailers will be significantly less likely to choose scarcer products. This will be due to reduced inferences of popularity on the basis of shelf-based scarcity.

Competing Cues

As opposed to impacting how shelf-based scarcity is interpreted, many cues in the retail environment simply compete against shelf-based scarcity as a cue for choice. Just as in-store signage might compete with package design in influencing consumers'

choices, cues such as sales rankings and quality ratings may compete with shelf-based scarcity. When such cues signal quality or popularity levels that are incongruent with those signaled by (inferred from) shelf-based scarcity, preferences for the scarcer alternative will likely be weakened. In other words, if consumers believe that a given product is more popular (and of higher quality) than its competitors due to it being relatively scarcer, yet find that one of the product's competitors has a higher sales ranking (or quality rating), then the impact of shelf-based scarcity on the choice should be reduced. This makes sense inasmuch as many of these alternative cues more explicitly signal the attributes that can only be inferred on the basis of shelf-based scarcity (popularity and quality). Accordingly, it is predicted that,

H6a – When an explicit popularity or quality cue is [in]congruent with the popularity or quality inferences drawn on the basis of shelf-based scarcity cues, preference for the scarcer alternative will be [reduced] increased.

In many instances consumers find cues suggesting that the available alternatives are of roughly equal quality. However, as proposed in Hypothesis 2c, it is expected that perceived popularity will impact preferences above and beyond the quality inferences it induces (i.e., popularity will have a direct effect on preferences). As such, even when consumers know that the available alternatives are of equal quality, shelf-based scarcity cues are expected to still impact their preferences.

H6b – Even when quality appears to be equal, shelf-based scarcity will still impact choice.

Price promotions are another cue that consumers regularly encounter in retail shopping environments. Recent work has shown that negative quality inferences can reduce the effectiveness of price promotions when there is no product quality assurance (Darke and Chung 2005). In other words, consumers might believe that products that are on sale are of lower quality. Nonetheless, promotions typically have a strong and positive impact on short-term consumer choices (see, e.g., Mela, Gupta, and Lehmann 1997). Further, previous research indicates that a large fraction of the “bump” in sales resulting from a price promotion comes from brand switching (Bell, Chiang, and Padmanabhan 1999; Gupta 1988). Thus, while price promotions might increase primary demand, a large fraction of the impact of price promotions comes from affecting *which* alternative will be chosen. Accordingly, since price promotions play a strong role in determining which alternative will be chosen, the presence of price promotions is expected to significantly reduce the impact of shelf-based scarcity cues.

H7 – Price promotions will reduce the impact of shelf-based scarcity on choices.

Prior Preferences

Consumers often have well established preferences for specific brands, ingredients, package sizes, and so on. Assuming that it is available, and reasonably

priced, these consumers will almost certainly select their preferred alternative. Frequently choices of strongly preferred alternatives occur so rapidly in retail environments that it is unlikely the consumer engages in any decision-making process while at the shelf (Hoyer 1984). If consumers with strong brand preferences forego more in-depth decision processes, then they are unlikely to attend to other cues in the environment. In other words, as long as they can identify and select the brand they want, it is unlikely they will spend much time considering other brands or cues. Accordingly, it is predicted that the choices of consumers without [with] strong prior preferences will [not] be affected by shelf-based scarcity.

H8 – The positive effect of shelf-based scarcity on preferences decreases as the strength of consumers' prior preferences increases.

Chapter Summary

While current literature provides robust support for commodity theory through repeated demonstrations of scarcity effects, much less evidence has been compiled in support of shelf-based scarcity effects. Importantly, the causal source of significantly influences whether shelf-based scarcity will have any impact at all. Since consumers cannot know the cause of shelf-based scarcity, it is reasonable to expect that it will play no role in their choices. Further, given the plethora of other cues that are available in retail environments, it is plausible that the rather ambiguous shelf-based scarcity cue would be largely ignored. Counter to these expectations, this dissertation proposes that

shelf-based scarcity can impact choices and that it does so in a largely positive manner (i.e., scarcer products are typically preferred).

In total, this dissertation tests the eight aforementioned hypotheses (summarized in Table 2.1) which predict how and when shelf-based scarcity will affect consumer preferences. Each hypothesis is tested in one or more of the following three chapters. Chapter 3 demonstrates not only that shelf-based scarcity can impact choices, but also that it does so through the inferences that it induces (i.e., the process through which shelf-based scarcity impacts choice is an inferential one). Chapter 4 examines moderators of the effect, demonstrating that (i) the shelf locations of the available alternatives and (ii) the consumer's concern about persuasion attempts can impact the inferences that consumers make regarding shelf-based scarcity, thereby attenuating its impact on choice. Further, Chapter 4 shows that shelf-based scarcity effects are reversed when popular products are considered undesirable.

Next, Chapter 5 focuses its attention on the robustness of shelf-based scarcity effects, showing that shelf-based scarcity impacts choices when (i) the choice is made either for oneself or for others, (ii) sales ranking, objective quality, or brand name information is available, and (iii) the choices being made are real. Chapter 5 also demonstrates two boundary conditions under which shelf-based scarcity effects are overwhelmed. Specifically, shelf-based scarcity does not impact choices either when the consumer has strong prior preferences or when a price promotion is available in the category of interest. Finally, Chapter 6 closes this dissertation with a summary of the findings as well as a discussion on the implications and limitations of this work.

Table 2.1: Hypotheses

	Consumers will
H1	<p>(a) infer that relatively scarcer alternatives (i.e., those with more depleted stocking levels) are more popular and of higher quality, and</p> <p>(b) be more likely to choose scarcer alternatives.</p>
H2	<p>(a) The effect of shelf-based scarcity on preferences operates through (is <i>fully</i> mediated by) popularity inferences.</p> <p>(b) Popularity inferences driven by shelf-based scarcity will lead to inferences about the available alternatives.</p> <p>(c) Even after controlling for quality inferences about the available alternatives, popularity inferences will have a significant effect on preferences.</p>
H3	<p>(a) Scarcer (less-stocked) products will be less preferred when popularity is an undesirable attribute.</p> <p>(b) Consumers with a high need for uniqueness will be much less likely to choose a scarcer (less-stocked) product than a consumer with a low need for uniqueness, but only when the product can be used to signal one's uniqueness (e.g., is conspicuously consumed).</p>
H4	The positive impact of shelf-based scarcity on choice will be significantly reduced when the scarcer product is located on the bottom (as opposed to an upper) shelf. This will be due to the reduced likelihood of consumers inferring the scarcity is due to the product's popularity.
H5	Consumers who are concerned with the persuasion attempts of retailers will be significantly less likely to choose scarcer products. This will be due to reduced inferences on the basis of shelf-based scarcity.
H6	<p>(a) When an explicit popularity or quality cue is [in]congruent with the popularity or quality inferences drawn on the basis of shelf-based scarcity cues, preference for the scarcer alternative will be [reduced] increased.</p> <p>(b) Even when quality appears to be equal, shelf-based scarcity will impact choice.</p>
H7	Price promotions will reduce the impact of shelf-based scarcity on preferences.
H8	The positive effect of shelf-based scarcity on preferences decreases as the strength of consumers' prior preferences increases.

Table 2.2: List of Studies

	Hypothesis(es) Tested	Notable Design Elements	Product Category(s) Used	
<i>Chapter 3</i>				
Study 3.1	H1	Open-end responses	Wine	
Study 3.2	H1	Multiple levels of scarcity	Wine	
Study 3.3	H1, H2	Mediation analysis	Wine	
<i>Chapter 4</i>				
Study 4.1	H3a	Manipulates desirability of popularity	Sports Jerseys	
Study 4.2	H3b	Tests impact of <i>need for uniqueness</i>	Winter Jackets	
Study 4.3	H4	Manipulates shelf location	Wine	
Study 4.4	H5	Manipulates concern for persuasion attempts	Barbecue Sauce	
<i>Chapter 5</i>				
Study 5.1	H1, H2, H6a	Manipulates relative sales rankings	Wine	
Study 5.2	H6b	Manipulates relative quality rating	Wine	
Study 5.3a	H1(b)	Well-known brand names	Paper Towels Toilet Paper Air Freshener	Shampoo Deodorant Spray Cleaner
Study 5.3b	H1(b)	Real choice	Toothpaste Bandages	Hand Soap Soup
Study 5.4a	H1, H2, H7, H8	Price promotions & prior preferences	Motor Oil	
Study 5.4b	H8	Familiar vs. unfamiliar alternatives	Colas	

3

Shelf-based Scarcity Effects: Evidence and Process

Chapter 3 has three primary goals: (i) demonstrate that shelf-based scarcity can impact consumers' choices, replicating previous findings, (ii) determine if the degree of shelf-based scarcity is monotonically related to choice shares, and (iii) identify and measure the process through which shelf-based scarcity impact consumers' choices, thereby testing Hypotheses 1 and 2. Accordingly, the following three studies are presented. Study 3.1 begins by showing that consumers' choices can be impacted by shelf-based scarcity and presents initial evidence that consumers' choices are affected by the inferences they make about the available products on the basis of their relative scarcity. Study 3.2 replicates and extends these findings by increasing the number of available alternatives as well as the number of different levels of scarcity. These results demonstrate that the level of shelf-based scarcity is monotonically related to choice shares. Finally, Study 3.3 explicitly tests the process through which shelf-based scarcity impacts choice.

Study 3.1: The Impact of Shelf-Based Scarcity

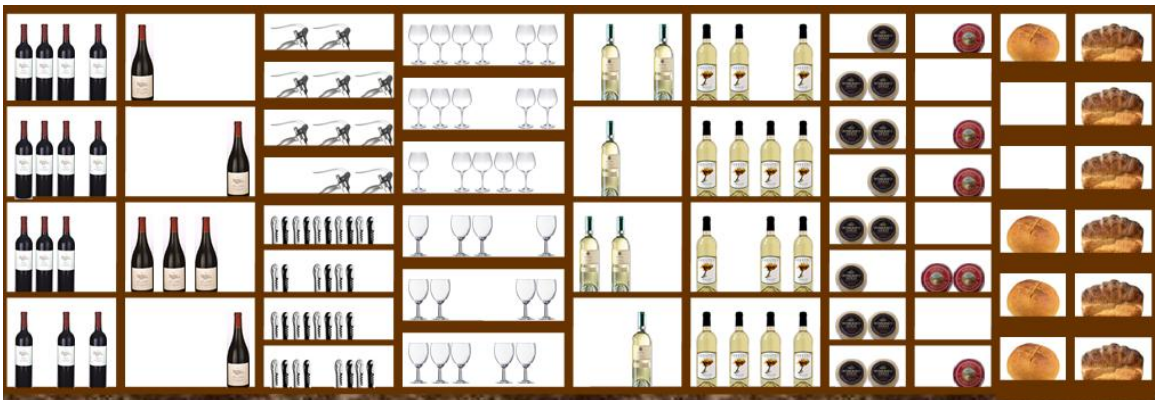
Study 3.1 was designed to show that shelf-based scarcity can impact consumers' choices. The secondary goal of Study 3.1 was to obtain preliminary evidence that any such impact is related to consumers' inferences that scarcer products are relatively more popular and of greater quality. Evidence that shelf-based scarcity has a positive impact on choice and that this impact is due to inferences of popularity and quality would support Hypothesis 1. To test this hypothesis, participants first made choices from three product categories and were subsequently asked in open- and closed-end questions their impressions of the alternatives from which they had chosen.

Method

Seventy undergraduate and graduate students at a large east coast university were paid for their participation in this study. Upon arrival, participants were sat at individual work stations and given packets containing multiple unrelated studies. The current study was the first study completed by all participants.

This study asked participants to imagine they were on a trip in a foreign country where they were familiar with neither the language nor the local products. While traveling to a party held by a friend living in this country, they decided to purchase some items at a local market: a bottle of red wine, a bottle of white wine, and a cheese. They were then told that they entered the market and found a shelf containing each of the product categories they needed (see Figure 3.1 for an example shelf). In each category, one alternative was scarcer (less-stocked) than the other (all were priced equally). The alternative which was scarcer, as well as the location of the alternatives, within each category was counter-balanced across subjects. Participants were asked to mark their choices for each category in the appropriate boxes located below the presented shelf.

Figure 3.1: Sample Stimulus



After the participants made their three choices, they were then asked, in an open-end format, to indicate the reason for their white wine choice. The participants were asked only for the reasoning for their white wine choice to minimize respondent burden. This open-end methodology, though potentially problematic (Nisbett and Wilson 1977), allowed for a subtle investigation of the inferences consumers make on the basis of shelf-based scarcity cues. Subsequently, participants were asked which, if any, of eight possible reactions (see Table 3.1) they had experienced toward *the lesser-stocked white wine*. This phrasing allowed for the investigation of the inferences participants had toward the scarcer wine, regardless of whether they chose this wine or not. The “reactions” included positive and negative responses the participants may have had towards the product, the store and/or the brand.

Results

All 210 observations across the three product choices were pooled to examine the preference for scarcer alternatives. As predicted, 79% of all choices were of the scarcer alternative, significantly greater than chance ($\chi^2(1) = 68.75, p < .01$). The results were similar across the three categories with 74% of the participants selecting the scarcer white wine ($\chi^2(1) = 16.54, p < .01$), 81% selecting the scarcer red wine ($\chi^2(1) = 27.66, p < .01$), and 80% selecting the scarcer cheese ($\chi^2(1) = 25.20, p < .01$).

Analysis of the open-end responses yielded interesting differences between those participants that chose the scarcer and those that chose the more abundant white wine. Fifty-two percent of participants who chose the scarcer wine reported the perceived popularity of that alternative as the main reason for their choice (only one of these

participants additionally mentioned perceived quality). Conversely, only 5.5% of those who chose the more abundant wine indicated perceived popularity as the main reason for their choice. Instead, the product label was the most frequently reported reason for choosing the more-stocked alternative (44%).

Table 3.1: Closed-End Reactions to the Scarcer White Wine

Item	Response %
(a) If I want this brand, I need to buy it now.	37%
(b) Nobody seems to be buying this brand, so it must not be good.	21%
(c) This brand can't be good if they can't keep it in stock.	3%
(d) These must be the old leftovers and can't be good.	9%
(e) The brand is well-stocked, so it must be good.	13%
(f) This store does a poor job of stocking this product.	16%
(g) A lot of people are buying this product, so it must be good.	76%
(h) This store does a good job of stocking this product.	9%

Regarding the closed-end reaction measure toward *the lesser-stocked white wine*, only item g, “A lot of people are buying this product, so it must be good,” was chosen by the majority of participants (76%; Table 3.1). Further, feelings that the store failed to stock the lesser-stocked alternative were rare (3%). Thus, although it would be reasonable for consumers to believe that the shelf-based scarcity was due to the actions of the retailer (either by accident or intention), this proved not to be the case. Neither in the open-end

measure, nor in the closed-end measure, did participants blame the retailer for the shelf-based scarcity.

Discussion

In sum, Study 3.1 provides several pieces of evidence in support of the main contention of this dissertation. First and foremost, the choices of the participants in this study were strongly impacted by shelf-based scarcity: scarcer products were significantly more preferred, supporting Hypothesis 1. Second, both open- and closed-end measures provided evidence that consumers infer that scarcer alternatives are more popular. However, little evidence was found in support of the contention that consumers also infer that scarcer products are of higher quality. This, in fact, may be a byproduct of the process through which shelf-based scarcity is proposed to impact choices. Specifically, participants may not have reported quality inferences because these inferences are an outcome of the popularity inferences they make (i.e., they are a second-order inference) and, thus, are considered less representative of the true reason for choosing. Put simply, the open-end measure used in this study may not be sensitive enough to pick up the impact of quality inferences on choice. This issue is directly addressed in Study 3.3.

While the results of Study 3.1 are supportive of Hypothesis 1, since only two alternatives were available, it is unclear if choice shares are monotonically related to shelf-based scarcity. One might expect that additional alternatives, each with their own unique scarcity level, would alter the relationship between scarcity and choice. For instance, extremeness aversion (Simonson and Tversky 1992; Tversky and Simonson 1993) might result in consumers preferring neither the scarcest nor the most abundant

alternatives. That is, given a somewhat scarce alternative, consumers might gravitate to this alternative and away from choosing either not-scarce or very-scarce alternatives. Alternatively, one might expect that the scarcer an alternative becomes the stronger the inferences the consumer will make about that alternative (i.e., the scarcer it is relative to other alternatives, the more popular it is relative to those alternatives) and the greater the likelihood that alternative will be chosen. Next, Study 3.2 investigates which of these predictions is more accurate.

Study 3.2: Multiple Levels of Scarcity

Study 3.2 asks an important question: does Hypothesis 1 hold in contexts containing more than two options at more than two scarcity levels? Extending Hypothesis 1 to such contexts results in the following prediction: of the available alternatives, the alternative that is the scarcest will be the most preferred, the second scarcest will be the second most preferred, and so on. In other words, the prediction would be that choice shares for the available alternatives would be a monotonic function of the scarcity of those options. To test this prediction, Study 3.2 asked participants to make choices from sets containing three alternatives, all at varying levels of scarcity.

Method

Forty-four students at a private American university were paid for their participation in this study. Study 3.2 was identical to Study 3.1 in most ways. Again, participants were asked to imagine that they were travelling in a foreign country where they were familiar with neither the language nor the products. Likewise, on their way to a

party being held by a friend, they were told they had decided to pick up some wine. Unlike Study 3.1, participants in Study 3.2 were told that they had decided to purchase both a red and a white wine. Thus, participants were asked to make two choices, one from each of the categories, both of which contained three wines at three different stocking levels (all of the bottles were the same size and priced equally); (i) very scarce, (ii) somewhat scarce, and (iii) not scarce. As can be seen by considering the red wine category on the left side of Figure 3.2, the *very-scarce* wine (the right-most alternative) was not completely out of stock, nor was the *not-scarce* wine (the left-most alternative) completely stocked. Thus, while these stocking levels do not extend to the extremes, they do create a broad range of scarcity levels. Lastly, the location and stocking levels of the three wines in each category was counter-balanced across subjects.

Figure 3.2: Sample Stimulus



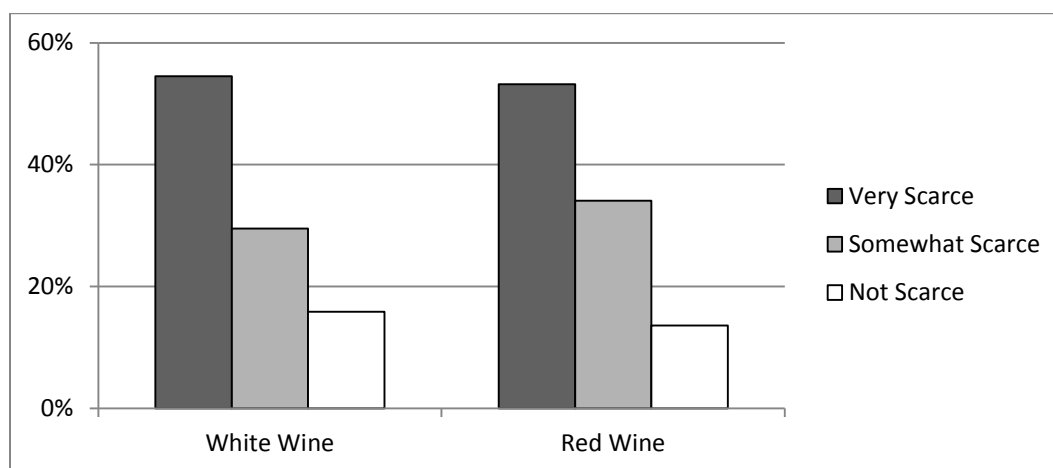
After making their choices, participants were asked, in an open-end format, the reason for their white wine selection, as in Study 3.1. Finally, participants were asked which, if any, of the eight possible reactions (Table 3.2) they had experienced toward *the white wine they had selected*. The different phrasing of the closed-end measure in Study

3.2 was used to more thoroughly examine the different perceptions of those choosing the lesser- versus more-stocked alternatives.

Results

Participants' choices of red and white wines were pooled to analyze the overall choice shares. If preferences are not affected by shelf-based scarcity, it would be expected that each alternative would be chosen with equal frequency, regardless of relative scarcity levels. Conversely, if choice shares are not monotonically related to scarcity levels, we would expect the *somewhat-scarce* alternative to have either the highest or lowest choice share of the three wines. However, as can be seen in Figure 3.3, and in support of Hypothesis 1, choice shares were directly related to relative scarcity levels. For the red wine category, 53.2% chose the very-scarce alternative, 34.1% chose the somewhat-scarce alternative, and 13.6% chose the not-scarce alternative ($\chi^2 (2) = 9.86, p < .01$). For the white wine category, 54.5% chose the very-scarce alternative, 29.5% chose the somewhat-scarce alternative, and 15.9% chose the not-scarce alternative ($\chi^2 (2) = 10.14, p < .01$).

To further investigate the effect of relative stocking levels on preference, a multinomial logistic regression was run. The independent variables were the relative scarcity levels of each wine and the type of wine (white vs. red), both dummy coded. The dependent variable was each participant's choice. As expected, the relative scarcity level significantly impacted choice (very scarce, $\beta = 1.76$, Wald = 23.63, $p < .01$; somewhat scarce, $\beta = .90$, Wald = 5.94 $p < .02$), whereas the type of wine did not play a significant role in participant choice behavior, as Figure 3.3 shows.

Figure 3.3: Choice Shares by Scarcity Level

Regarding the open-ended measure, 75% of the participants that selected the very-scarce white wine reported they had done so on the basis of perceived popularity, whereas only 38% of participants that selected the somewhat-scarce wine, and none of the participants that selected the not-scarce wine mentioned popularity. Interestingly, and consistent with the findings of Study 3.1, only two participants made any mention of quality playing a role in their decision, though both of these individuals did choose the very-scarce alternative. Further, regarding the closed-end reaction measures, those choosing the very- and somewhat- scarce wines were more likely to indicate they perceived their chosen wines to be popular (87.5% and 69.2%, respectively) than those choosing the not-scarce wine (14.2%; see Table 3.2). Conversely, those choosing the not-scarce wine were much more likely to indicate that they believed the wine was good because it was “well-stocked.” Thus, once more, we find that quality inferences play a much smaller role than popularity inferences in determining the impact of shelf-based

scarcity cues on consumer preferences. The full pattern of responses to the closed-end measures are presented in Table 3.2.

Table 3.2: Closed-End Reaction Items and Response Percentages

Item	Wine Chosen by Participant		
	Not Scarce	Somewhat Scarce	Very Scarce
(a) If I want this brand, I need to buy it now.	14%	23%	33%
(b) Nobody seems to be buying this brand, so it must not be good.	0%	31%	25%
(c) This brand can't be good if they can't keep it in stock.	29%	23%	0%
(d) These must be the old leftovers and can't be good.	14%	15%	8%
(e) The brand is well-stocked, so it must be good.	71%	23%	0%
(f) This store does a poor job of stocking this product.	0%	8%	21%
(g) A lot of people are buying this product, so it must be good.	14%	69%	88%
(h) This store does a good job of stocking this product.	71%	15%	0%

Discussion

Study 3.2 has shown that Hypothesis 1 can be extended to contexts with multiple alternatives at multiple stocking levels. Preferences were found to be monotonically related to relative scarcity levels; participants preferred the very-scarce alternatives the most and the not-scarce alternatives the least. Further, a larger proportion of participants who chose the very-scarce wine justified their choice on the basis of the wine being more

popular than did participants choosing either the somewhat-scarce or not-scarce alternatives. Finally, only two participants mentioned inferences of quality to justify their choices, suggesting once more that popularity inferences are the primary driver shelf-based scarcity cue effects.

To this point, it has been demonstrated that shelf-based scarcity cues impact consumer preferences; consumers tend to prefer relatively scarcer products. It has also been shown that this effect is largely driven by inferences that scarcer alternatives are more popular, but that quality inferences might also play a role in the observed preference shifts. However, the subtle nature of the open-end measure might not be accurately assessing the impact of quality inferences. Study 3.3 addresses this weakness by directly measuring popularity and quality inferences and using this information to estimate the degree to which each type of inference is a driver of shelf-based scarcity effects.

Study 3.3: Identifying the Process: The Role of Popularity and Quality Inferences

The previous two studies have shown that shelf-based scarcity can lead to increased choice shares for the scarcer alternative as well as inferences that scarcer alternatives are more popular. Thus far, there has been little evidence that consumers infer that scarcer alternatives are of higher quality. Yet, recent work has found evidence that quality inferences are induced by shelf-based scarcity (van Herpen, Pieters, and Zeelenberg 2009). A potential reason for the differences in findings is that while Studies 2.1 and 2.2 asked participants for the reasoning behind their choices in an open-end format, van Herpen et al. (2009) asked their participants to rate the relative popularity and

quality of the alternatives. Of course, while direct measures may lead participants to make inferences that they might not otherwise (Kardes et al. 2004), open-end responses can be equally unreliable and insensitive to inferences which are, in fact, influential (Nisbett and Wilson 1977). Still, if directly measuring inferences actually induces those inferences then we should find no differences between scarcity conditions or inference types (i.e., popularity and quality inferences should have equal impact).

Study 3.3 adopts the direct measure methodology and uses these measures in mediation analyses to examine the inferential process through which shelf-based scarcity impacts choice. It is argued that consumers infer that scarcer products are both relatively more popular and of higher quality (H1). Further, as stated in Hypothesis 2, it is proposed that perceptions of relatively greater popularity lead not only to increased perceptions of quality (H2b), which then lead to increased preference for the scarcer alternative (H2a), but also directly increase the choice share of the scarcer alternative above and beyond what can be accounted for by increased quality perceptions (H2c).

Method

Seventy-two (primarily graduate) students at a private American university were paid for their participation in this study. Upon arrival, participants were seated at a private work station and given an experimental session packet containing several unrelated studies. This study was the first completed by the participants. Participants first read a scenario nearly identical to that used in Study 3.1. The lone difference between this scenario and that used in Study 3.1 was that participants were told that they decided to pick up a single bottle of wine. The only factor manipulated in Study 3.3 was the

relative scarcity of the two alternatives. Participants were shown a picture of a store shelf on which two wines (A and B, which differed only in their labels and which a pretest found to be equally appealing) were stocked among other products, with one wine being the “scarce” alternative and the other being the “abundant” alternative, and were asked to choose one (no brand names, real or fictional, were provided in this study). The sizes and prices of the wines were equal. The location and relative scarcity of the wines were counterbalanced between subjects.

After choosing a wine, participants rated each wine on three seven-point scales: (i) popularity (1 = very unpopular, 7 = very popular), (ii) expected quality (1 = low quality, 7 = high quality), and (iii) frequency of restocking (1 = hardly ever, 7 = constantly). It was predicted that the alternatives would be rated as more popular and of higher quality when they were (vs. were not) the scarce alternative (H1). Further, if the participants believed that the relative scarcity was caused by demand, no difference in the frequency of restocking estimates should be found.

On a final note, one might argue that it is more appropriate to ask participants “how valuable” they perceive each wine to be as opposed to rate the “perceived quality” of each wine. However, since value is determined by the relationship between cost and quality (either using an additive or ratio function), and since the price of the wines were equal, the perceived value and quality of the wines would be proportionally equivalent.

Results

Choice. In order to determine the mediation properties of popularity and quality inferences, this analysis focuses on the preference for a given alternative when it is,

versus is not, the scarcer alternative. Since the locations and relative scarcity of the wines were counterbalanced across subjects, this analysis focuses on a single “focal” wine (Wine A). As predicted, a binary logistic regression found that significantly more participants chose Wine A when it was (86%) versus was not (41%) the scarcer alternative ($\beta = 2.16$, Wald = 13.48, $p < .001$; Table 1), supporting Hypothesis 1.

Popularity, Quality, and Restocking Frequency. Differences in the popularity, quality, and restocking frequency ratings between the wines were calculated by subtracting the rating for the non-focal wine (Wine B) from the rating for Wine A; positive (negative) differences indicate that Wine A received a higher (lower) rating than Wine B. The means are presented in Table 3.3.

Table 3.3: Choice Shares for Wine A and Ratings Differences

Condition	Rating Differences*			% Choosing Wine A
	Popularity	Quality	Restocking Frequency	
<i>Wine A</i> <i>Scarcer</i> (N = 36)	2.39 ^a	1.03 ^b	.49	86% ^c
<i>Wine B</i> <i>Scarcer</i> (N = 36)	-2.06 ^a	-.31 ^b	.06	41% ^c

*Rating for Wine A minus the rating for Wine B on each of the ratings measures. For example, 2.39 in the upper-left cell indicates that Wine A received an average popularity rating 2.39 points higher than Wine B (on a 7-point popularity scale) when Wine A was the *scarcer* alternative. Conversely, -2.06 in the lower left cell indicates that Wine A received an average popularity rating 2.06 points lower than Wine B when Wine A was the *more abundant* alternative. Significant differences ($p < .001$) within each column and indicated by a superscript.

A single-factor ANOVA revealed that participants rated Wine A as being significantly more popular, relative to Wine B, when it was the scarce (vs. abundant) alternative (Difference = 4.45, $F(1, 70) = 62.38$, $p < .001$). A smaller but still significant difference in perceptions of quality was also found, with participants rating Wine A as

being of significantly higher quality, relative to Wine B, when it was the scarce (vs. abundant) alternative (Difference = 1.34, $F(1, 70) = 13.96$, $p < .001$). These findings support Hypothesis 1, and replicate the findings of van Herpen, Pieters, and Zeelenberg (2009). No significant difference for restocking frequency (Difference = 0.43, $F(1, 70) = 1.39$, $p > .24$) was found, suggesting that participants believed that the scarcity of the wines was created by demand- versus accidental- or supply-related factors.

Mediation Analyses. Tests for mediation (Baron and Kenny 1986) were run to determine whether perceptions of popularity and quality mediated the effect of relative scarcity on preference. The results are presented in Table 3.4. In Model A, the relationship between the independent variable (relative scarcity) and the main dependent variable (choice) was positive and significant (note that the strong relationship between relative scarcity and participants' popularity and quality inferences was documented in the preceding section). Further, as expected, when popularity rating differences were included in the model (Model B), they significantly influenced choice, while the effect of relative scarcity became insignificant and its impact dropped significantly (Sobel $z = 3.40$, $p < .001$), indicating that popularity inferences mediated the effect of relative scarcity on the preference for Wine A, supporting Hypothesis 2a.

Identical analyses were performed on the quality rating differences. Similar to the popularity analysis, the quality rating differences significantly predicted choice (Model C). However, here the impact of relative scarcity remained significant and largely unchanged in value (Sobel $z = 1.92$, $p > .05$), indicating that quality inferences only partially mediated the effect of relative scarcity on preference.

Table 3.4: Mediation Analyses Results

Model	Scarcity of Wine A (1 = Scarcer, 0 = More Abundant)	Relative Popularity Rating	Relative Quality Rating	BIC*
A	2.16 ^a (.589)	---	---	82.19
B	-1.05 (1.12)	.834 ^a (.221)	---	57.66
C	1.72 ^c (.765)	---	1.40 ^b (.407)	58.17
D	-1.35 (1.44)	1.00 ^a (.328)	1.57 ^a (.535)	42.24

*This table presents the parameter estimates of the binary logistic regressions used in the mediation analysis. The dependent variable for each model is the choice of Wine A (1 = yes, 0 = No). Standard errors are in the parentheses below the parameter estimates. * The Bayesian Information Criterion (BIC) is an estimate of model fit in which smaller numbers indicate better fit while accounting for the number of parameters included in the model. ^a $p < .001$, ^b $p < .01$, ^c $p < .05$

Further analyses supported Hypothesis 2b. Separate linear regressions indicated that relative scarcity significantly predicted relative quality ($\beta = 1.56$, $t = 3.74$, $p < .001$) and relative popularity ($\beta = 4.64$, $t = 7.90$, $p < .001$). However, after controlling for relative popularity, relative scarcity was no longer a significant predictor of relative quality ($\beta = .21$, $t = .398$, $p > .69$). Relative popularity, however, remained a significant predictor of relative quality ratings ($\beta = .29$, $t = 3.728$, $p < .001$). Thus, popularity inferences significantly mediated the effect of relative scarcity on quality inferences (Sobel $z = 3.36$, $p < .001$). Finally, Model D indicated that popularity perceptions significantly and positively predicted choice even when both quality perceptions and relative scarcity were controlled for, supporting Hypothesis 2c.

Discussion

The results of Study 3.4 strongly supported both Hypothesis 1 and Hypothesis 2. As expected, direct inference measures showed that consumers do make quality inferences on the basis of shelf-based scarcity. Reasonably, the model that best fits the data based on the Bayesian Information Criterion (BIC; Schwarz 1978), Model D in Table 3.4, shows that both popularity and quality perceptions impact choice. However, the results of Models B and C indicate that the impact of relative scarcity operates primarily through popularity inferences rather than (i) through quality inferences or (ii) directly. Collectively, the mediation analyses strongly support the model presented in Figure 1.1.

Chapter Summary

Taken together, the three studies presented in this chapter present strong evidence that shelf-based scarcity can impact consumers' choices and that it does so through the inferences it induces. Study 3.1 demonstrated the basic shelf-based scarcity effect and found preliminary evidence that consumers make inferences about the popularity of the available alternatives. Study 3.2 extended these findings by showing that the relationship between scarcity and choice is positively monotonic across multiple levels of scarcity. Finally, Study 3.3 replicated the choice findings of Study 3.1 and, using direct inference measures, identified the inferential process through which shelf-based scarcity impacts choice. While this evidence is promising and supportive of the hypotheses, it is only preliminary evidence. The following two chapters turn their focus to examining in more the depth (i) the process through which shelf-based scarcity impacts choices, and (ii) the robustness, generalizability, and external validity of the current findings.

4

Moderators

Chapter 3 showed that popularity inferences mediate the effects shelf-based scarcity on choice; scarcer alternatives were perceived to be more popular (and of higher quality) and were subsequently selected more frequently. However, this process evidence was obtained using direct measures of consumers' inferences, a potentially biased methodology (Kardes et al. 2004). Chapter 4 begins with two studies designed to test the role popularity inferences play in a more subtle manner. Specifically, Study 4.1 directly manipulates the desirability of popularity and shows that scarcer products are less likely to be chosen when consumers wish to avoid popular products. Subsequently, Study 4.2 shows that consumers' degree of need for uniqueness impacts their preference for scarcer (vs. more abundant) products, but only when the available products differ in a conspicuous manner (i.e., only when the product can be used to signal one's uniqueness).

This chapter then turns its attention to the link between shelf-based scarcity and popularity inferences. As shown in Chapter 3, consumers apparently spontaneously infer that scarcer products are more popular than abundant products. Will this always be the case? Are there circumstances under which shelf-based scarcity will not be a signal of popularity to consumers? Studies 4.3 and 4.4 demonstrate that there are. First, Study 4.3 shows that shelf location can moderate inferences and preferences based on shelf-based scarcity. Specifically, it is found that consumers do not believe that scarcer products located on the bottom (vs. and upper) shelf are more popular and, consequently, are not more likely to choose scarcer items when they are located on the bottom-shelf. Study 4.4 then demonstrates that consumers who are concerned that retailers are trying to manipulate their choices are (i) much less likely to infer that scarcer products are more popular, and (ii) much less likely to choose those scarcer products.

Study 4.1 – When Popularity is a Bad Thing

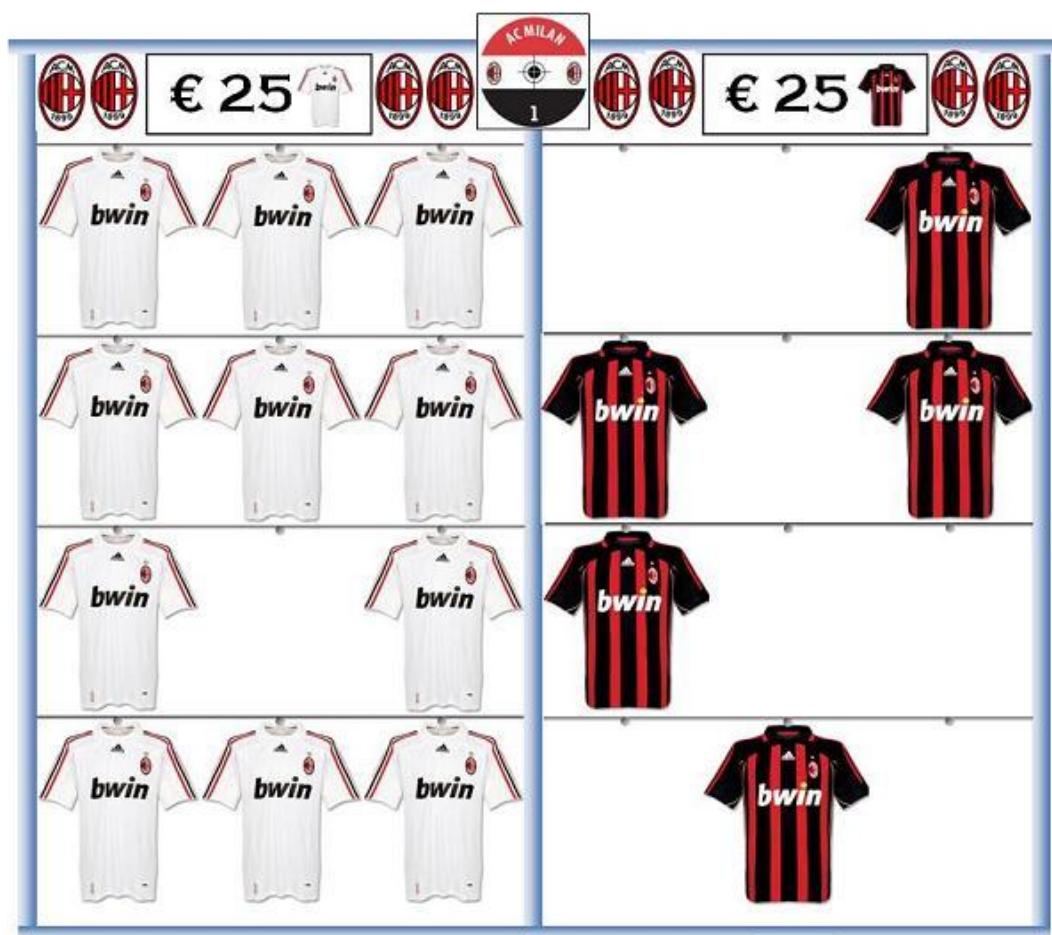
Study 4.1 investigates the role of popularity inferences by manipulating popularity to be either desirable or undesirable. As predicted by Hypothesis 3a, since consumers tend to infer that a relatively scarcer alternative is more popular, when popularity is undesirable, the scarcer alternative should be preferred less than an abundant alternative. Here, popularity desirability was directly manipulated. That is, participants were specifically encouraged to either choose, or not choose, the more popular item.

Method

Sixty-three undergraduate and graduate students at a private American university were paid for their participation in this study. This study was the first study in a longer experimental session and was completed at a computer workstation. A 2 (Popularity: positive vs. negative) x 2 (Scarcity: scarce vs. abundant) between-subjects design was used. The participants were asked to imagine they were travelling in Milan, Italy. While there, a local friend had arranged to take the participant to an *AC Milan* soccer match that evening (where they would meet before the game) and had suggested that the participant purchase a team jersey to wear to the game. At this point, each participant was randomly assigned to one of two popularity conditions. In the popularity-negative condition, the local friend asked the participant to come to the game wearing a team jersey, but *not the jersey most worn by the local fans*, so that the friend might more easily spot the participant in the crowd. In the popularity-positive condition, the local friend asked the

participant to come to the game wearing the jersey *most worn by the local fans* as the club had asked for a show of unified support by the fans for this game. Per Hypothesis 3a, it was expected that participants in the popularity-positive [-negative] condition would be significantly more [less] likely to choose the scarcer, and presumably more popular jersey.

Figure 4.1: Sample Stimulus



The participants were then told they went to the team store near the stadium which carried two jerseys worn by AC Milan: (i) a white jersey and (ii) a red and black

striped jersey (priced equally: see Figure 4.1). Manipulating the relative scarcity factor, one of the two jerseys was scarcer than the other for each participant. Participants were then asked to indicate, on a 6-point scale, which jersey they would select; higher numbers indicated they would be more likely to select the white jersey, while lower numbers indicated that they would be more likely to select the red and black striped jersey. Subsequently, participants were asked to indicate which jersey they believed was of higher quality on a 7-point bipolar scale with higher numbers indicating that the white jersey was of higher quality.

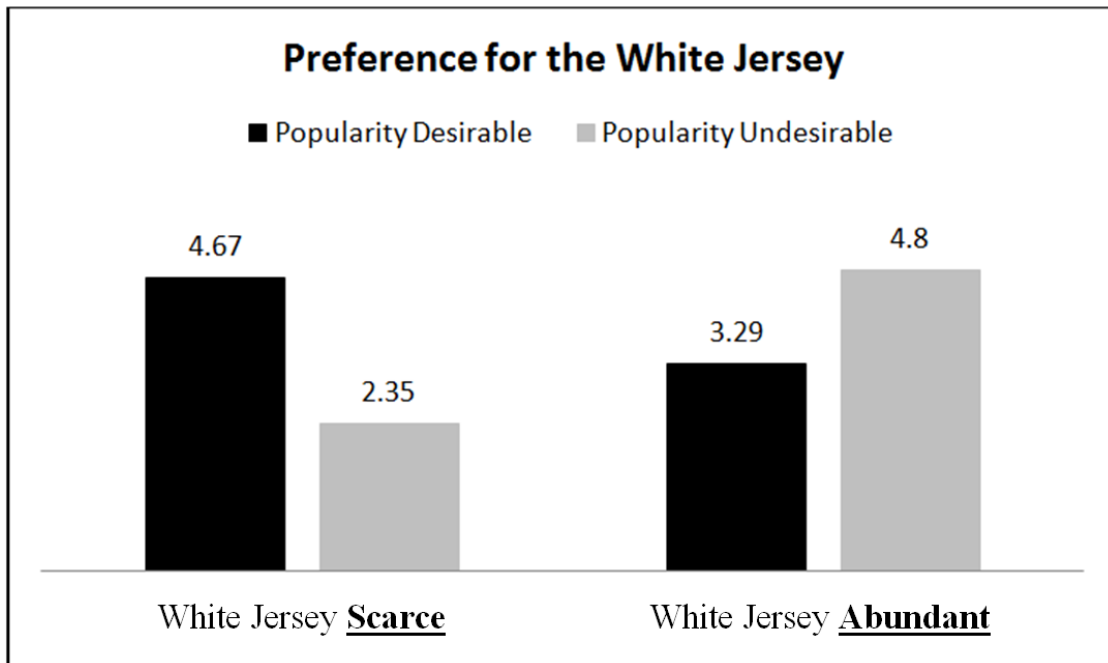
Results

Prior to analyzing the data, six participants who indicated they knew which jersey was *AC Milan's* home jersey (i.e., those who knew which jersey would be most likely worn by local fans) were eliminated from the sample, reducing the total number of participants to 57. To evaluate the effect of relative scarcity and popularity desirability on preference, this analysis focuses on preference for the white jersey. To begin, it was determined that the perceived relative quality of the white jersey was not significantly higher when it was the scarce than (vs. abundant) alternative ($M_{\text{scarce}} = 3.21$ vs. $M_{\text{abundant}} = 2.76$, $F(1, 53) = 2.32$, $p > .13$). Though directionally consistent with the previous results, relative scarcity did not significantly affect inferences of quality.

However, the popularity desirability (positive vs. negative) and relative scarcity manipulations resulted in the expected pattern (Figure 4.2). A two-way ANOVA revealed that there was no significant main effect of either popularity desirability ($M_{\text{positive}} = 3.92$ vs. $M_{\text{negative}} = 3.58$, $F < 1$) or relative scarcity ($M_{\text{scarce}} = 3.39$ vs. $M_{\text{abundant}} = 4.07$, $F(1, 53)$

= 1.13, $p > .29$) on preference for the white jersey. There was, however, a significant interaction between popularity desirability and relative scarcity on preference for the white jersey ($F(1, 53) = 16.36, p < .001$).

Figure 4.2: Preference Results



When the participants were asked by their friend to choose the jersey most worn by the locals (i.e., the popularity-positive condition), the white jersey was *more* preferred when it was the scarcer alternative ($M = 4.67$) than when it was the more abundant alternative ($M = 3.29, F(1, 53) = 4.25, p < .05$). Conversely, when the participants were asked by their friend to choose the jersey *not* worn by the locals (i.e., the popularity-negative condition), the white jersey was *less* preferred when it was the scarcer alternative ($M = 2.35$) than when it was the more abundant alternative ($M = 4.80, F(1, 53) = 15.70, p < .001$). These results fully support Hypothesis 3a. Participants only preferred

the white jersey when it was the scarce alternative and popularity was desirable, or when it was the abundant alternative and popularity was undesirable.

Discussion

As predicted, when popularity was desirable, preferences tended toward the scarcer alternative. Yet when popularity was undesirable, preferences tended toward the more abundant alternative. Additionally, the findings of Study 4.1 speak to two points. First, these results provide additional evidence that consumers believe that shelf-based scarcity cues are typically due to demand related factors. Second, Study 4.1 presents further evidence that popularity beliefs are sufficiently strong, alone, to significantly influence consumers' preferences. However, a particular weakness of Study 4.1 is that the manipulation explicitly asked the participants to consider the popularity of the alternatives they were choosing from. Accordingly, this may have resulted in the participants making popularity inferences they might not have otherwise made. Study 4.2 addresses this weakness by neither mentioning, nor measuring, popularity inferences, yet still examining the impact of popularity desirability.

Study 4.2: The Need for Uniqueness and Conspicuous Differences

While the evidence is mounting that shelf-based scarcity leads to popularity inferences and, to a lesser degree, quality inferences, one could still question whether these results were a mere artifact of either the measures taken or the manipulations used in each of the previous studies. Certainly, the open-end responses from the first two studies in Chapter 3 suggest that popularity inferences are the spontaneous result of shelf-

based scarcity. However, to provide even stronger evidence, the current study uses an even more subtle methodology. Specifically, participants' need for uniqueness was measured and the conspicuousness of the differences between the alternatives (i.e., the degree to which the products could be easily differentiated by sight and, consequentially, used to signal one's uniqueness) was manipulated. The preference for scarcer alternatives was examined as a function of these two factors with the expectation that consumers with a high need for uniqueness would be much less likely to choose a scarcer alternative than consumers with a low need for uniqueness, but only when the difference between the alternatives was conspicuous (i.e., Hypothesis 3b).

Method

One hundred and fourteen subjects were sampled from the online subject pool *Amazon Mechanical Turk* and paid for their participation. Participants were screened based on location (participation was restricted to IP addresses within the United States), prior approval rating (i.e., the percentage of prior tasks they had completed that had been "approved" by the task issuing party was 97% or greater), and age (minimum age = 18 years). Participants were given a link to this study, which was administered on the online survey tool Qualtrics.

To begin the study, participants were asked to imagine that they had decided to purchase a new jacket for the winter months (this study was completed during the early winter months). They then read a scenario describing their visit to a local clothing store. This store was described as being very popular with the local population and a store at which the participant's friends regularly shopped. The participants were told that, after a

bit of browsing, they found two jackets which suited them and had the same price. It was at this point the type of difference between the jackets was manipulated, between-subjects.

In the conspicuous-difference condition, participants were told that the jackets had identical linings (i.e., looked identical on the inside), but had different shells (looked different on the outside). In the inconspicuous-difference condition, participants were told that the jackets had identical shells but different linings and that the difference in linings could not be seen when the jacket is worn (i.e., an observer would not be able to tell the difference between the jackets). The different shell [lining] styles were simply labeled Style A and Style B. No specifics about the different linings or shells were given. This was the lone manipulated factor.

Unlike the rest of the studies in this dissertation, the participants in this study were not shown a shelf display. Instead, they were simply told that one of the styles (lining style or shell style, depending on the condition) only had 2 jackets remaining on the rack, while the other style had many jackets remaining on the rack. The style (A vs. B) which was scarcer was counterbalanced, between-subjects. The participants were then asked to indicate which of these two jackets they would choose. After making their choice, participants completed a series of manipulation and confound checks.

First participants indicated the degree to which they felt others would be likely to know which of the two jackets they had selected were they to wear the jacket in public (1 = very unlikely to 7 = very likely). Next, the participants were asked to indicate on bipolar scales (Style A = 1, Style B = 7) (i) which jacket they believed was more popular and (ii) which had been purchased by more customers. Next, because different linings

and shells can suggest different levels of quality between the jackets, participants were asked to indicate on bipolar scales (Style A = 1, Style B = 7) (i) which jacket they believed was of higher quality and (ii) which was more comfortable. For the purposes of analysis, all four popularity and quality questions were recoded so that higher numbers indicated more favorable ratings for the scarcer alternative. Finally, the participants indicated the degree to which they agreed (1 = disagree, 7 = agree) with three statements adopted from consumers' need for uniqueness scale (Tian, Bearden, and Hunter 2001; Table 4.1).

Table 4.1: Need for Uniqueness Measures

(a)	Often, when buying merchandise, an important goal is to find something that communicates my uniqueness.
(b)	I often try to avoid products or brands that I know are bought by the general population.
(c)	I'm often on the lookout for new products or brands that will add to my personal uniqueness.

Results

Need for Uniqueness. The three need for uniqueness measures were highly correlated (Cronbach's alpha = .77) and, accordingly, averaged to form a single measure of each participant's need for uniqueness. In the following analyses, this measure is used both as a continuous predictor for accuracy and as a binary factor resulting from a median split for ease of presentation.

Manipulation and Confounding Checks. All of the manipulation and confounding check results are summarized in Table 4.2. Of primary concern, it was found that participants in the conspicuous-difference condition felt that it was more likely that others would be able to tell which jacket they had chosen ($M_{\text{Shell}} = 4.76$) than did participants in the inconspicuous-difference condition ($M_{\text{Lining}} = 2.80$, $F(1, 112) = 45.68$, $p < .001$). Interestingly, participants also thought that the scarcer jacket was significantly, although not greatly, more popular ($M_{\text{Shell}} = 6.48$ vs. $M_{\text{Lining}} = 5.88$, $F(1, 112) = 6.48$, $p < .05$) and purchased more frequently ($M_{\text{Shell}} = 6.63$ vs. $M_{\text{Lining}} = 6.17$, $F(1, 112) = 5.13$, $p < .05$) than the more abundant jacket when the differences between the jackets were conspicuous versus inconspicuous.

Table 4.2: Manipulation and Confound Checks

	Condition	
	Conspicuous-Difference (Shell)	Inconspicuous-Difference (Lining)
If you were wearing the jacket in public, how likely is it that others would know which jacket you had purchased?	4.76 ^a	2.80 ^a
Which jacket do you believe is more popular ?*	6.48 ^b	5.88 ^b
Which jacket do you believe has been purchased by more customers ?*	6.63 ^c	6.17 ^c
Which jacket do you believe is of higher quality ?*	4.46	4.43
Which jacket do you believe is more comfortable ?*	4.53	4.52

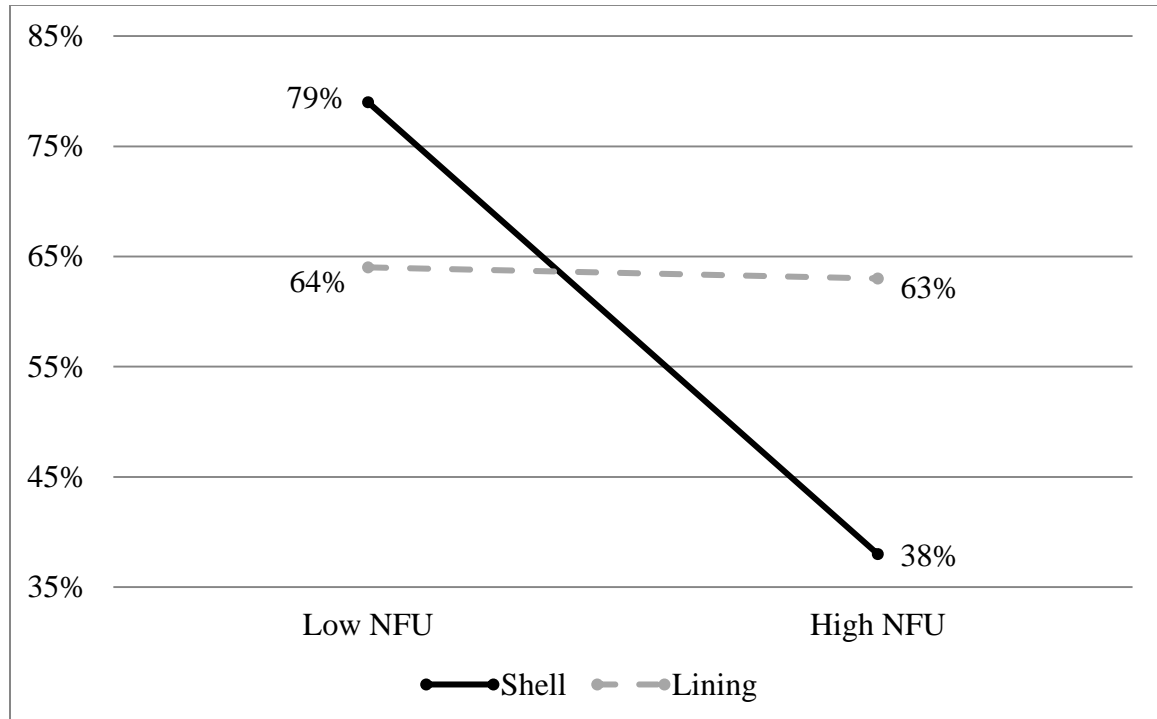
Rows containing superscripts indicate dependent measures which varied significantly as a function of difference conspicuousness. *1 = the more abundant jacket, 7 = the scarcer jacket.

Notably, however, participants expected no difference between the scarcer jacket and the more abundant jacket in terms of quality or comfort (both $F < 1$). In sum, while the difference manipulation (conspicuous vs. inconspicuous) affected the participants' expectations about the likelihood that others could determine which jacket they had chosen (and, consequentially, the degree to which the jacket could be used to signal their uniqueness) and the degree to which they felt the scarcer jacket was more popular than the more abundant jacket, it did not impact their expectations of the objective qualities of the jackets (i.e., their relative quality and comfort levels). In addition, the quality and comfort related measures both fell very near the midpoint of the scales (4) indicating that the expected quality and comfort of the jackets did not vary as a function of the scarcity either. Moreover, participants' need for uniqueness did not interact with difference conspicuousness to impact expected quality and comfort ratings.

Choice Shares. While the need for uniqueness measure is used as a continuous predictor in the following analysis, a median split was performed for the purposes of presentation. Figure 4.3 displays the choice shares of the scarcer jacket by condition. As can be seen, the need for uniqueness factor affected the choice shares of the scarcer alternative only when the jackets differed conspicuously (i.e., when their shells differed). Put simply, when the jackets differed in their linings, they could not be used to signal one's uniqueness. Accordingly, participants with a high need for uniqueness were no less likely to choose the scarcer, and presumably more popular, jacket than those with a low need for uniqueness ($M_{\text{High NFU}} = 63\%$ vs. $M_{\text{Low NFU}} = 64\%$). On average, participants in the inconspicuous-difference condition were more likely than chance to choose the scarcer alternative ($M = 63\%$, $\chi^2(1) = 4.27$, $p < .05$), replicating earlier results. However,

when the jackets differed in their shells they could be used as signals of uniqueness and, consequently, the scarcer jacket was significantly less preferred by those with a high need for uniqueness ($M_{\text{High NFU}} = 38\%$ vs. $M_{\text{Low NFU}} = 79\%$; $\chi^2(1) = 9.38, p < .01$).

Figure 4.3: Choice Shares of the Scarcer Jacket



A binary logistic regression was run to verify these results. The dependent variable was the jacket chosen (1 = scarcer jacket, 0 = more abundant jacket). The independent variables were the manner in which the jackets differed (shell vs. lining) and the continuous measure of each participant's need for uniqueness. While there was no significant main effect of need for uniqueness ($\beta = -.136$, Wald = .757, $p > .38$), there was a significant main effect of difference type ($\beta = 3.12$, Wald = 1.60, $p = .05$). This main effect was qualified by a significant interaction between difference type and participants'

need for uniqueness ($\beta = -.628$, Wald = 4.56, $p < .05$), verifying the apparent difference in need for uniqueness' impact across the two difference conditions.

Discussion

Since scarce alternatives are commonly considered to be more popular, it was expected that participants with a high need for uniqueness would be much less likely to choose the scarce jacket than participants with a low need for uniqueness, but only when the jackets differed in a conspicuous manner (i.e., in a manner which could be identified by others). When the jackets differed in an inconspicuous manner, and therefore could not be used to signal one's uniqueness, no difference in preference for the scarce alternative was predicted. This was the exact pattern of results observed in this study, supporting Hypothesis 3b. Importantly, it was found that manipulating the jacket differences to be either conspicuous or inconspicuous via their shells or linings, respectively, did not impact the participants' expectations of the jackets' objective quality or comfort. Thus, these results cannot be explained by perceptions of quality.

Studies 4.1 and 4.2 have shown that impact of shelf-based scarcity can be negative when popularity is considered undesirable. In other words, by manipulating the link between popularity inferences and choice in Figure 2.1 to be negative, the impact of shelf-based scarcity is reversed. These findings reinforce the contention that it is popularity inferences, and not quality inferences, that are the primary driver of shelf-based scarcity effects; popularity inferences are the avenue through which shelf-based scarcity has its impact. This means that the link between scarcity and popularity inferences is crucial. Interestingly, all of the preceding studies and the findings of van

Herpen, Pieters, and Zeelenberg (2009) find a positive link between shelf-based scarcity and popularity inferences: people always seem to think that shelf-based scarcity is the result of other's choices. But, is this true? Could there be instances when consumers do not believe shelf-based scarcity is due to popularity? Are there other cues that might lead the consumer to doubt that scarcer alternatives are more popular? What if the consumer is concerned that others, perhaps the retailer, are trying to influence their choices? The following studies investigate these questions.

Study 4.3: The Moderating Role of Shelf Location

To this point, it would seem that consumers always infer that scarcer products in retail environments are more popular than their competitors (although there was some evidence in Study 4.2 that this inference is weakened when products differ in an inconspicuous manner). However, it is unlikely that this is actually the case. There must be instances where shelf-based scarcity will be interpreted differently. For example, if the consumer finds that all of the products in a given store are poorly stocked, it is unlikely they will use scarcity as an indicator of popularity. Instead, they will probably simply assume that this store does a poor job of stocking of its products. More generally, it is likely that various elements of the retail context can impact how shelf-based scarcity is interpreted. If the retail context calls into question the plausibility that the shelf-based scarcity is due to popularity, this may result in shelf-based scarcity either negatively impacting choice or simply not impacting choice at all.

One cue in retail environments that has received recent attention in the literature is shelf location. The evidence suggests that a given product's shelf location can impact

the inferences consumers make about that product. For instance, there is evidence that items located near the horizontal center of a display are believed to be more popular and more likely to be chosen (Valenzuela and Raghurir 2009). In a related finding, Valenzuela and Raghurir (2010) find that the vertical location of the product can also impact inferences about that product; products located on higher shelves are inferred to be of higher quality and more expensive. Valenzuela and Raghurir (2010) argue that consumers tend to believe that centrally located products are more popular than more extremely (either vertically or horizontally) located products because centrally located alternatives represent price-quality tradeoffs. Unlike the current work, the popularity inferences that Valenzuela and Raghurir (2010) argue that consumers make are not indicative of a belief by those consumers about the actual choices of those who have preceded them but, instead, are constructed out of the consumer's beliefs about what should be popular: compromise options. In other words, this argument holds that consumers don't necessarily believe that more people *have* selected centrally located products, but they do believe more people *would* select these products.

Aside from research directly related to shelf location, there is additional evidence that verticality plays a role in consumers' perceptions. For example, Meier and Robinson (2004) showed that positive [negative] words were more quickly recognized when they were located at the top [bottom] of a computer screen. It has also been found that people in higher physical locations are perceived to be more powerful (Schubert 2005). In general, consumers seem to consistently hold the belief that higher is better.

Given the largely positive relationship between vertical location and perceptions/attitudes, Study 4.3 investigates whether vertical positioning can moderate

the impact of shelf-based scarcity on preferences, thereby testing Hypothesis 4. Although, as will be seen, the stimuli used in this study manipulate both the vertical and horizontal locations of the available alternatives, this study focuses on the effects of vertical positioning for two reasons. First, the impact of vertical location on consumer beliefs has been found to be a more conscious process (as compared to horizontal location; Valenzuela and Raghurir 2010). Since the inferential process through which consumers evaluate products on the basis of shelf-based scarcity is a conscious process, consumers should be more likely to incorporate the more consciously processed vertical positioning information into their evaluations when making their choices, making it more likely that vertical location will moderate the effects of shelf-based scarcity. Second, the impact of available location on consumer beliefs has been shown to weaken as the number of horizontal locations decreases (Valenzuela and Raghurir 2009).

Given that this study needed to manipulate both location and shelf-based scarcity, and the fact that the visual stimuli were presented on computer screens, it was difficult to include more than three horizontal (or vertical) locations in the stimuli while also retaining the ability to clearly manipulate the relative scarcity of the alternatives. Accordingly, horizontal locations were expected to play little to no role in this study's results; a prediction that ultimately proved true.

Method

Contrary to much of the previous work on shelf-location effects, this study manipulated both vertical and horizontal positioning to increase the realism of the decision (i.e., the shelving unit had multiple columns and rows). Additionally, and again

in contrast to previous research, participants were informed of the prices of the alternatives under consideration (red wines were used in this study and all were priced at \$12). Given these differences from previous research, a pretest was run to verify that participants could indeed make inferences about the presented wines on the basis of their shelf-location as presented in the stimuli used in the main study.

Pretest. Forty-four paid participants recruited on Amazon Mechanical Turk were shown one of several stimuli to be used in the main study. This stimulus showed participants a wine shelving-unit that contained nine wines stocked across three columns and six rows (each wine was allotted two rows of shelf space; see Figure 4.4). All of the wines were equally and nearly fully stocked, were labeled with one of nine letters (a through i), and priced at \$12. Participants were asked to indicate which of the presented wines they believed was the most (and least) popular.

Figure 4.4: Stimulus Used in Study 4.3 Pretest



Confirming the expectation that participants associate vertical location with popularity, 85% of participants indicated that the most popular wine was located on one of the top two rows (55% indicated the top row and 30% indicated the middle row). Conversely, 52% of these same participants indicated that the least popular wine was located on the bottom row, while only 25% and 23% indicated that it was on the middle or top row, respectively. However, popularity inferences did not seem to be affected by horizontal location as 30%, 36%, and 34% indicated the most popular wine was in the left, middle, and right column, respectively (i.e., the percentages were nearly identical across columns). Given the aforementioned findings regarding horizontal location effects, this was not particularly surprising. In sum, the pretest results confirmed that participants make popularity inferences on the basis of shelf-location as presented in the experimental stimuli.

Main Study. Two hundred and seventy-nine subjects were sampled from the online subject pool *Amazon Mechanical Turk* and paid for their participation. Participants were screened based on location (participation was restricted to IP addresses within the United States), prior approval rating (i.e., the percentage of prior tasks they had completed that had been “approved” by the task issuing party was 97% or greater), and age (minimum age = 21 years). Participants were given a link to this study, which was administered on the online survey tool Qualtrics.

This study was very similar to previous studies in that participants were asked to imagine they were shopping for a wine for themselves and were shown a wine shelf similar to that presented in Figure 4.4 and asked to choose a wine. As in Study 3.3,

participants then rated the relative popularity and expected quality of the wines and reported their age and gender. However, there were differences between these two studies. Most notably, participants were given a choice of nine wines, all the same size and all priced at \$12. No brand names were provided.

In order to examine how shelf location affected shelf-based scarcity effects, a target wine was selected. In Figure 4.4, this wine, which had a white label and blue top, can be found in location E (i.e., in the middle of the shelf both horizontally and vertically). This study used a 2 (target wine scarce: yes vs. no) x 6 (target wine location: A, B, E, F, G, I). Half of the participants saw this wine as it is presented in Figure 4.4; nearly fully stocked like the rest of the wines. For the other half of the participants, the target wine was scarcer (i.e., only 6 bottles were on the shelf) while the other wines remained nearly fully stocked. Additionally, the location of the target wine was manipulated between subjects to fall at one of 6 locations. The six locations used in the study were chosen to be as informative as possible. Thus, for example, some participants found the target wine nearly fully stocked and situated in location A, while others found it situated in the same location but scarcer than the other wines. The scarcity of the target wine was manipulated across the A, B, E, F, G, and I locations. As predicted by Hypothesis 4, it was expected that the positive impact of being a scarcer alternative would be significantly reduced when the scarcer alternative was located on the bottom shelf.

Results

Choice. The primary dependent variable was the choice share of the target wine. Of principal interest was the shift in choice shares of the target wine at each tested shelf location when the target wine was (vs. was not) relatively scarcer than the other wines. Table 4.3 presents the incremental choice shares of the target wine at each tested shelf location when that wine was (vs. was not) scarcer than the other wines. As can be seen, the target wine was significantly more likely to chosen when it was the scarcer alternative, but this only held when the target wine was not located on the bottom shelf, as predicted by Hypothesis 4. It is also interesting to note that when the target wine either was or was not relatively scarcer, it received its highest choice share when it was located both vertically and horizontally in the middle of the shelf, supporting previous findings by Valenzuela and Raghubir (2010).

Table 4.3: Choice Share Shifts of the Target Wine by Shelf Location

	Left Column	Middle Column	Right Column
Top Row	Location A**	Location B**	Location C
	33%	35%	
Middle Row	Location D	Location E*	Location F**
		29%	28%
Bottom Row	Location G	Location H	Location I
	4%		-9%

This table is read as follows. When the target wine was situated in location A, its choice share was 33 percentage points higher when it was the scarcer versus an equally abundant alternative. Asterisks indicate that the difference in choice shares of the target wine when it was the scarce alternative, versus when it was an equally abundant, is significant at the **.05 or * .10 level.

A binary logistic regression was run to more thoroughly examine the relationships between the manipulated variables. In this analysis, the dependent variable was whether

or not the target wine was chosen (1 = yes, 0 = no). The predictors were (i) whether or not the target wine was scarcer than the other wines (1 = yes, 0 = no), (ii) the vertical location of the target wine (1 = top shelf, 0 = middle shelf, -1 = bottom shelf), and (iii) the horizontal location of the target wine (1 = left column, 0 = middle column, -1 = right column). The results of this analysis are presented in Table 4.4.

Table 4.4: Binary Logistic Regression Results

Predictor	Coefficient (s.e.)
Constant	-1.55 (.23)**
Target Wine (TW) Scarcity (S)	1.02 (.30)**
TW - Vertical Location (VL)	.04 (.31)
TW - Horizontal Location (HL)	-.13 (.31)
S * VL	1.00 (.42)*
S * HL	-.05 (.40)
VL * HL	-.08 (.38)
S * VL * HL	-.44 (.50)

Standard errors are presented in parentheses. ** $p < .01$, * $p < .05$ level.

Supporting Hypothesis 1, preference for the target wine was greater when it was it was scarcer than the other available wines. This was the only significant main effect. Importantly, and as predicted by Hypothesis 4, there was a significant interaction between the vertical positioning and the relative scarcity of the target wine, indicating the being scarcer had a positive impact on choices only when that wine was located on a higher shelf. None of the remaining interactions were significant indicating, among other

things, that the impact of scarcity was not moderated by the horizontal location of the target wine.

Popularity and Quality Inferences. As in Study 3.3, participants in this study rated all of the available wines, first on popularity and then on expected quality. To analyze this data, the average popularity (expected quality) rating each participant gave *all* of the wines was subtracted from the popularity (expected quality) rating that participant gave the target wine (i.e., the rating given to the target wine was mean-centered for each participant). Accordingly, positive numbers indicate that participants gave the target wine a higher rating than average, and vice versa if this number is negative.

Table 4.5: Popularity and Quality Ratings of the Target Wine by Location

		Left Column	Middle Column	Right Column
		Location A	Location B	Location C
Top Row	Popularity	1.72	1.92	
	Quality	.97	.99	
Middle Row	Popularity		1.83	1.93
	Quality		.49	1.17
Bottom Row	Popularity	.69		-.07
	Quality	.76		-.03

The table is read as follows. When the target wine was situated in location A, participants' mean-centered average popularity rating for the target wine was 1.72 points higher when it was the scarcer (vs. abundant) alternative. Similarly, when the target wine was situated in location A, participants' mean-centered average quality rating for the target wine was .97 points higher when it was the scarcer (vs. abundant) alternative.

The average, mean-centered rating received by the target wine when it was abundant was subtracted from the average, mean-centered rating it received when it was scarcer (see Table 4.5). A quick, visual inspection of the resulting differences reveals a pattern quite similar to that found in the choice data; the differences in relative popularity ratings are much greater when the target wine is located in one of the upper two (vs. the bottom) shelves. Similar, but weaker and less consistent results were found for the expected quality ratings, again suggesting a weaker link between shelf-based scarcity and expected quality than perceived popularity. To examine whether the observed popularity (and, perhaps, expected quality) ratings explained the impact of scarcity and vertical location on choice, these ratings were used in a mediated moderation analysis.

Mediated Moderation. While the ratings and choice results appear to follow similar patterns, it remains to be seen if the popularity ratings mediated the impact of shelf-based scarcity and vertical positioning on choice. To see if this was the case, the procedure outlined by Muller, Judd, and Yzerbyt (2005) was followed. The results of the regressions are presented in Table 3.6.

Model A in Table 4.6 (DV = choice) shows the same choice results previously discussed; the relative scarcity and vertical location of the target wine interact to impact preferences. Model B (DV = quality ratings) shows that while the relative scarcity of the target wine did impact quality inferences, this factor did not interact with the vertical location of the target wine and, thus, cannot explain the observed pattern of choices. Conversely, Model C (DV = popularity ratings) shows that participants' popularity inferences were significantly impacted both by the relative scarcity of the target wine alone and by the interaction between relative scarcity and the vertical location of the

target wine (i.e., the positive impact of being scarcer on popularity inferences decreased significantly when the target wine was located on the bottom shelf).

Of particular importance are the results of Model D (DV = choice^a). This model includes all of the predictors and demonstrates that the impact of the interaction between relative scarcity and vertical location on preferences is reduced to insignificance when popularity ratings, and their interaction with vertical location, are incorporated in the model. Meanwhile, the effect of popularity on choice becomes a significant predictor. Thus, the moderation of scarcity's impact on choice by vertical location is mediated by the corresponding relative popularity inferences.

Table 4.6: Mediated Moderation Analysis Results

Predictor	Dependent Variable			
	Model A	Model B	Model C	Model D
	<i>Choice</i>	<i>Quality Rating</i>	<i>Popularity Rating</i>	<i>Choice^a</i>
Target Wine Scarcity (S)	.97*** (.29)	.75*** (.17)	1.29*** (.19)	.01 (.37)
Target Wine Vertical Location (VL)	-.01 (.27)	-.08 (.15)	.02 (.17)	.15 (.31)
Mean-centered Popularity Rating (P)	--	--	--	.77*** (.12)
S * VL	.85* (.36)	.29 (.21)	.67** (.23)	.70 (.44)
P * VL	--	--	--	-.19 (.15)

*** $p < .001$, ** $p < .01$, * $p < .05$

Discussion

This study has again demonstrated that the positive impact of being a scarcer alternative is driven by consumers' beliefs that scarcer products are more popular, supporting Hypothesis 2a. More importantly, it was found that the positive impact of being the scarcer alternative is significantly weakened when products are located on the bottom shelf because consumers tend to not believe that scarcer products are more popular than abundant products when they are located on the bottom shelf.

Interestingly, quality inferences were much less correlated with choice in this study. There are three potential reasons for this. First, this may be because the primary driver of shelf-based scarcity effects is popularity inferences, as argued in this dissertation. Alternatively, this could be an artifact of the study design as the participants had previously rated all nine wines in terms of popularity. That is, it is possible that response fatigue dampened these results. Finally, this could have occurred because the wines were equally priced, though this did not impact the results of Study 3.3.

It is important to note that, due to sample size constraints, it was not possible to test the impact of scarcity at all of the nine possible locations available in this study. This could potentially influence the results found here. This is particularly true if one believes that the relative effect of vertical location is moderated by horizontal location, or vice versa (e.g., being situated in the middle of a row has a different impact on an upper shelf vs. the bottom shelf). Specifically, consumers might be more or less willing to infer that scarce products are relatively more popular on the bottom shelf, depending on their horizontal location. For instance, it is possible that shelf-based scarcity has a strong positive effect when products are on the bottom shelf, but only when they are located in

the middle of the row. This proposition can be neither refuted nor supported by this study as the effect of scarcity was not tested at this location. The results of Valenzuela and Raghurir (2010) are not informative on this point as the effects of vertical versus horizontal orientations were tested independently in their studies (i.e., were tested between subjects). Thus, it is currently unclear whether or not the effect of horizontal location is moderated by vertical location, or vice versa. This could be a promising avenue of research for future work.

In closing, one concern with the experimental design used in this study could be that participants were less likely to consider wines on the bottom shelf simply because of the effort involved. This is particularly likely if one assumes the wines were considered in the same sequence as the participants would typically read (i.e., top to bottom and left to right). Future research could address this weakness by (i) testing participants' recognition of the available brands after the choice has been made, (ii) using eye-tracking equipment during the choice process, (iii) utilizing an information board methodology, or (iv) simply asking participants to consider all brands before making a choice.

Study 4.4: The Moderating Role of Persuasion Knowledge

The previous study demonstrated that consumers do not always believe that scarcer products are more popular and, consequently, are not always more likely to choose scarcer products. While that study focused on a factor controllable by managers (shelf-location), the current study focuses on a factor that may be considered more of an individual difference. Specifically, Study 4.4 examines if consumers' concern about retailers' persuasion attempts can influence how they respond to shelf-based scarcity.

The Persuasion Knowledge Model (Friestad and Wright 1994) posits that when consumers are aware that another party (e.g., a retailer or salesperson) is trying to persuade them, they may use their own persuasion knowledge (i.e., what they know about the motives and persuasion tactics of the other party), and their own persuasion defense mechanisms to counteract those persuasion attempts. In other words, consumers won't respond to persuasion attempts the same if they do (vs. don't) know that the other party is attempting to persuade them.

In a demonstration of this effect, Morales (2005) showed that the cleaner and more well-organized the store, the higher consumers' willingness to pay. However, she also found that when participants were informed that retailers were aware of this contingency and, consequently, maintained an orderly store appearance to increase their profits, they were no longer willing to pay more on the basis of store appearance. In other words, when they were aware that retailers were using knowledge about them to influence their decisions, these participants counteracted those attempts by discounting the store cleanliness cue.

Hypothesis 5 makes a similar prediction. Specifically, it is expected that if consumers are concerned that retailers are trying to manipulate their choices, they will discount the diagnosticity of shelf-based scarcity (i.e., doubt that it is a true indicator of others' choices) and, hence, the positive effect of being a scarcer alternative on choice will be reduced.

Method

Ninety-seven subjects were sampled from the online subject pool *Amazon Mechanical Turk* and paid for their participation. Participants were screened based on location (participation was restricted to IP addresses within the United States), prior approval rating (i.e., the percentage of prior tasks they had completed that had been “approved” by the task issuing party was 97% or greater), and age (minimum age = 18 years). Participants were given a link to this study, which was administered on the online survey tool Qualtrics.

This study used a 2 (participant concern for persuasion: high vs. low) x 2 (target product relative scarcity: scarcer vs. more abundant) between-subjects design. Participants were told that they would complete two studies. First they would read an “excerpt from a well-known business publication” which they would later evaluate (the participants in the main study did not evaluate these excerpts). These excerpts were created by the researcher to manipulate the degree to which participants would be concerned with retailers’ attempts to manipulate their choices (see Appendix A).

In the high-concern condition, participants read an excerpt in which a consumer behavior expert described how retailers can use tactics such as price promotions, price increases, and shelf location to affect what consumers purchase. No specific mention was made of shelf-based scarcity. It was expected that reading the excerpt would increase the salience of retailers’ motives which would prime the participants to counteract any perceived persuasion attempts (i.e., to discount environmental cues which could be manipulated by the retailer such as shelf-based scarcity). In the low-concern condition, participants read an excerpt that described how national retailers were entering smaller markets at an increasing rate. This excerpt said nothing of retailers’ motives, persuasion

tactics, or persuasion attempts. Accordingly, participants in this condition were not expected to be concerned with the persuasion attempts of retailers and, accordingly, not discount the usefulness of shelf-based scarcity when they made their choice in the subsequent task. Aside from being nearly identical in length, a pretest indicated that these excerpts were equally believable and easy to read.

The “next study” asked participants to imagine they were travelling in the Memphis, Tennessee area and were visiting a popular local store that sold its own special blends of barbecue sauce. They were then shown the barbecue sauce shelf which contained two sauces labeled “BB” and “FS” respectively. For all participants, one of these two sauces was scarcer than the other, as in the preceding studies, while both were the same size and had the same price. Participants were asked to choose a barbecue sauce, after which they rated each sauce in terms of perceived popularity and expected quality.

Results

Choice. The “FS” style of sauce was (arbitrarily) selected as the focal alternative for the following analyses. The choice results (see Table 4.7) were analyzed using a binary logistic regression. While there was no main effect of concern for retailer persuasion attempts on choice, FS was significantly more preferred when it was the scarcer (vs. abundant) alternative ($M_{\text{scarce}} = 66\%$ vs. $M_{\text{abundant}} = 54\%$, $\beta = 1.69$, Wald = 6.74, $p < .01$). Importantly, the interaction between relative scarcity and concern for retailer persuasion attempts was significant ($\beta = -2.27$, Wald = 6.68, $p < .01$). As expected, there was a significantly positive impact of relative scarcity on the choice share

of FS among participants who did not read about retailer persuasion tactics ($M_{\text{scarce}} = 78\%$ vs. $M_{\text{abundant}} = 40\%$, $\chi^2(1) = 7.22, p < .01$). Among participants who did read about retailer persuasion tactics, however, the impact of being the scarcer alternative was actually negative, although insignificantly so ($M_{\text{scarce}} = 54\%$ vs. $M_{\text{abundant}} = 68\%$, $\chi^2(1) < 1$), supporting Hypothesis 5.

Popularity and Quality Inferences. As in Study 3.3, the rating each participant gave BB on popularity (expected quality) was subtracted from the rating they gave FS. Accordingly, positive numbers indicate that participants inferred that FS was more popular (of higher quality). As can be seen in Table 4.7, the differences between FS-scarce and FS-abundant conditions in terms of relative popularity and quality ratings were significantly impacted by whether or not the participants had previously read about retailer persuasion tactics (mirroring the choice results).

Table 4.7: Choice Shares and Ratings

Persuasion Concern	“FS” Relative Scarcity	Rating Differences*		% Choosing “FS”
		Popularity	Quality	
High	<i>Scarce</i> (N = 24)	.29	.21	54%
	<i>Abundant</i> (N = 25)	-.48	.52	68%
Low	<i>Scarce</i> (N = 23)	1.61	1.04	78%
	<i>Abundant</i> (N = 25)	-1.52	-.88	40%

*Rating for FS minus the rating for BB on each of the ratings measures. For example, .29 in the upper-left cell indicates that FS received average popularity rating .29 points higher than BB (on a 7-point popularity scale) when FS was the *scarcer* alternative and participants were manipulated to have high concern about retailers’ motives and persuasion tactics.

Regarding the relative popularity ratings, a two-factor ANOVA revealed a significant main effect of scarcity ($M_{\text{scarce}} = .94$ vs. $M_{\text{abundant}} = -1.00$, $F(1, 93) = 13.12$, $p < .001$), but no main effect of persuasion concern ($F < 1$). Additionally, as with the choice results, there was a significant interaction between relative scarcity and persuasion concern on relative popularity ratings ($F(1, 93) = 4.79$, $p < .05$). Similarly, there was no main effect of persuasion concern on the relative quality ratings, but there was a nearly significant main effect of relative scarcity ($M_{\text{scarce}} = .62$ vs. $M_{\text{abundant}} = -.18$, $F(1, 93) = 3.72$, $p < .06$) and a significant interaction between relative scarcity and persuasion concern ($F(1, 93) = 7.14$, $p < .01$). As expected, planned contrasts revealed significant differences on the basis of relative scarcity for both popularity and quality ratings when participants had *not* read about retailer persuasion tactics (both p 's $< .01$).

Discussion

In sum, the results of Study 4.4 support Hypothesis 5. Participants who [did not] read about retailer persuasion tactics prior to choosing a barbecue sauce were much less [more] positively affected by shelf-based scarcity. This was a consequence of participants discounting the shelf-based scarcity cue as was evidenced by significantly reduced differences in popularity and quality inferences between scarce and abundant conditions. Apparently, when consumers are concerned that they are being manipulated, they will not use shelf-based scarcity as a positive cue for choice.

Chapter Summary

This chapter has focused on identifying circumstances under which shelf-based scarcity has either no effect or a negative effect. Study 4.1 demonstrated that consumers are less likely to choose a scarce product when they are asked to avoid popular products. Following up on this, Study 4.2 showed that consumers with a high need for uniqueness are much less likely to choose a scarcer product than those with a low need for uniqueness, but only when the product category can be used to signal one's personal identity, and uniqueness. Collectively, these first two studies reinforce the proposed important (even crucial) role played by popularity inferences in determining the impact of shelf-based scarcity on choice.

Studies 4.3 and 4.4 focused their attention and examining the crucial link between shelf-based scarcity and popularity inferences, looking for instances where scarcer products are not considered to be more popular. First, Study 4.3 showed that scarcer products are not considered to be more popular when they are located on the bottom shelf and, consequently, are not more likely to be selected. Then, Study 4.4 found that when consumers have been told of retailers' persuasion motives and tactics, they no longer make popularity and quality inferences on the basis of shelf-based scarcity, which attenuates (and even slightly reverses) the impact of shelf-based scarcity on choice.

Taken together, these studies validate the model proposed by Hypothesis 2 and extend our understanding of when and how shelf-based scarcity will impact choice. However, with the exception of Study 4.3, no studies have investigated how shelf-based scarcity operates in the face of the various other cues encountered by consumers in typical retail environments. This issue is addressed in Chapter 5.

5

Competing Cues, Real Choice, and Prior Preferences

Chapter 4 built on the findings of Chapter 3 to demonstrate when shelf-based scarcity will, and will not, have a positive effect on preferences. First, it reinforced the finding that popularity inferences are the primary driver of shelf-based scarcity effects by showing that consumers are significantly less likely to choose scarce products when popularity is considered undesirable. Next, Chapter 4 demonstrated that consumers do not always believe that scarcer alternatives are more popular. Specifically, it was found that shelf-based scarcity may not have a positive effect on preferences either when (i) scarcer alternatives are located on the bottom (vs. an upper) shelf or (ii) consumers are concerned with retailers' persuasion attempts. In sum, Chapter 4 established how changing either the sign of the relationship between popularity and choice or interrupting the link between shelf-based scarcity and popularity inferences can moderate the impact of shelf-based scarcity on preferences. However, not all cues in the retail environment change the desirability of popularity or affect the inferences induced by shelf-based scarcity.

Many cues in retail environments may compete with shelf-based scarcity when consumers are choosing. For instance, the retailer may provide sales ranking or quality rating information to help consumers make their decision (and, perhaps, to affect the choices their customers will make). When these cues favor more abundant alternatives, the consumer may be less inclined to choose scarcer alternatives. In other words, these other cues may overwhelm the effect of shelf-based scarcity without necessarily changing how people interpret the shelf-based scarcity cue.

Chapter 5 investigates several factors which have the potential to overwhelm shelf-based scarcity effects. Throughout, this chapter puts the robustness of shelf-based

scarcity effects to the test and identifies managerially relevant boundary conditions where shelf-based scarcity effects tend to be overwhelmed. Studies 5.1 and 5.2 demonstrate that shelf-based scarcity can impact preferences when explicit sales ranking or quality rating information is given. However, the positive impact of shelf-based scarcity is reduced when either of these cues favors a more abundant alternative. Study 5.3 consists of two studies which demonstrate that shelf-based scarcity can impact choices even when those choices are (i) made from well-known brands and (ii) are real. Finally, Study 5.4 concludes the empirical section of this dissertation by identifying two important boundary conditions to shelf-based scarcity effects. First, consumers with strong prior preferences are found to be unaffected by shelf-based scarcity (Study 5.4a and 5.4b). Second, shelf-based scarcity is found to be almost entirely ignored when there is a price promotion in the product category (Study 5.4a).

Study 5.1: Shelf-Based Scarcity in the Presence of Sales Ranking Information

Study 5.1 examined the first of many competing cues tested that could potentially overwhelm the effects of shelf-based scarcity: sales rankings. Hypothesis 6a predicts that an alternative will receive the highest choice share when both cues favor it (i.e., the alternative is both scarcer and has a higher sales ranking) and the lowest choice share when the alternative is both more abundant and had a lower sales ranking. Further, given the explicit nature of the sales ranking cue, its effect on choice was expected to be stronger than the shelf-based scarcity cue.

Additionally, another factor, which is otherwise ignored in this dissertation, was also investigated. Thus far, no distinction has been made between choices for oneself and

choices for others. It could be argued that choices made for others differ from choices made for the self, especially when preferences may be influenced by the perceived popularity of the available alternatives. Although it is common in the marketing literature to use principal-agent tasks (e.g., Diehl and Poynor 2010), Study 5.1 directly manipulated whether the participants made choices for themselves or for others.

Method

One hundred and eighty subjects were sampled from the online subject pool *Amazon Mechanical Turk* and paid for their participation. Participants were screened based on location (participation was restricted to IP addresses within the United States), prior approval rating (i.e., the percentage of prior tasks they had completed that had been “approved” by the task issuing party was 97% or greater), and age (minimum age = 21 years). Participants were given a link to this study, which was administered on the online survey tool Qualtrics.

This study incorporated a 2 (Purchase: for self vs. for others) x 2 (Scarcity: scarce vs. abundant) x 2 (Sales ranking: higher vs. lower) between-subjects design. Upon opening the link to the survey, participants read a scenario asking them to imagine that they were travelling in Napa Valley and decided to have a picnic lunch with which they would like to enjoy a local red wine. To manipulate whom the purchase was for, participants were told either (i) that they would be having lunch alone (self condition), or (ii) that they would be having lunch with friends (others condition). Participants then proceeded to the next screen where they “entered” a local bodega to purchase the food and drinks for the picnic (in the “others” condition, participants were told that their

friends had headed to a park to secure a location for the picnic). They were then told that the bodega stocked two local red wines. Below this statement was a picture of the red wine shelf at the bodega. The two wines were given fictional brand names (Taskell's and Hant Nook), which a pretest found to be equally appealing. As the following analysis focuses on the relative preference for Taskell's (choosing either brand for analysis will return equivalent results), the remaining two factors are described in relation to the Taskell's brand wine.

Relative scarcity was manipulated by having Taskell's stocking level be more or less depleted (scarcer) than Hant Nook's. Sales rankings were manipulated by placing a sign above each wine indicating their respective sales ranking. In the "higher" condition, Taskell's sales ranking was "Napa Valley's #2 Best Selling Red Wine," while Hant Nook's sales ranking was "Napa Valley's #5 Best Selling Red Wine." In the "lower" condition these sales rankings were reversed. The prices and sizes of the two brands were equal. Participants first indicated which wine they would choose and then, as in Study 3.3, rated each wine on three seven-point scales: (i) popularity, (ii) expected quality, and (iii) frequency of restocking. Next, participants were asked to indicate how much they knew about wine (1 = much less, 7 = much more) and how frequently they drank it (1 = much less frequently, 7 = much more frequently) relative to "most people." Finally, participants indicated their age and gender.

Results

The main dependent variable is the choice share of Taskell's wine. Subjective knowledge and frequency of consumption of wine were not significant predictors of

choice (neither individually nor when averaged), nor did they interact with any of the three primary factors of interest. The same held for age and gender. Therefore, these variables are not discussed further.

Choice. A binary logistic regression found no difference in the choice patterns between the self and other conditions. Nor were there significant two-way interactions with the shelf-based scarcity or sales ranking cues, or a significant three-way interaction. Thus, shelf-based scarcity impacted choice equally when the choice was for oneself or for others and so we collapse across these conditions for the remaining analyses.

Supporting Hypothesis 6a, there was an additive effect of shelf-based scarcity and sales-rankings. A binary logistic regression showed that Taskell's choice share was significantly greater when it was the scarcer wine ($M_{\text{scarce}} = 69\%$ vs. $M_{\text{abundant}} = 47\%$, $\beta = .923$, Wald = 8.82, $p < .05$). Likewise, Taskell's share was significantly greater when it had the higher sales ranking ($M_{\#2} = 81\%$ vs. $M_{\#5} = 35\%$, $\beta = 2.10$, Wald = 36.1, $p < .001$). As expected, the explicit popularity cue, sales rankings, had a stronger effect on preferences. Importantly, being scarcer was less beneficial when Taskell's was ranked #5 (46%) than when it was ranked #2 (93%, $\chi^2(1) = 24.28$, $p < .001$). Conversely, being more abundant was less detrimental when Taskell's was ranked #2 (70%) than when it was ranked #5 (23%, $\chi^2(1) = 19.13$, $p < .001$).

Popularity, Quality, and Restocking Frequency. As in Study 3.3, the rating each participant gave to the Hant Nook wine was subtracted from the rating given to the Taskell's wine on (i) popularity, (ii) expected quality, and (iii) frequency of stocking. Positive differences indicate that the participant gave a higher rating to Taskell's (see Table 5.1). It was expected that relative scarcity and sales rankings would have an

additive effect on the popularity and quality inferences participants made. Thus, for example, the popularity of Taskell's was expected to be highest when Taskell's was the scarcer and higher ranked alternative. No interaction between relative scarcity and relative sales rankings was expected, nor was any effect on relative stocking frequency predicted.

Table 5.1: Choice Shares and Ratings

Taskell's Sales Ranking	Taskell's Relative Scarcity	Rating Differences*			% Choosing Taskell's
		Popularity	Quality	Restocking Frequency	
#2	<i>Scarce</i> (N = 45)	1.78	1.27	.93	93%
	<i>Abundant</i> (N = 46)	-.11	.57	.85	70%
#5	<i>Scarce</i> (N = 46)	.87	.04	-.70	46%
	<i>Abundant</i> (N = 43)	-1.09	-.95	-.65	23%

*Rating for Taskell's minus the rating for Hant Nook on each of the ratings measures. For example, 1.78 in the upper-left cell indicates that Taskell's received average popularity rating 1.78 points higher than Hant Nook (on a 7-point popularity scale) when Taskell's was the *scarcer* alternative and was ranked #2 in sales.

The ratings differences were subjected to two-factor ANOVAs, with relative scarcity and relative sales rankings as the between subjects factors. Replicating Study 3.3, and supporting Hypothesis 1, participants rated Taskell's as being significantly more popular, relative to Hant Nook, when it was the scarcer wine ($M_{\text{scarce}} = 1.32$ vs. $M_{\text{abundant}} = -.58$, $F(1, 176) = 30.69$, $p < .001$). A similar but weaker effect was found for sales rankings; participants rated Taskell's as significantly more popular when it was the higher ranked wine ($M_{\#2} = .82$ vs. $M_{\#5} = -.08$, $F(1, 176) = 7.42$, $p < .01$). As predicted, these main effects were not qualified by an interaction between these two factors ($F < 1$).

Interestingly, although the sales ranking cue had a stronger effect on choice than the relative scarcity cue, it had a weaker effect on popularity inferences.

A similar pattern was found for quality ratings. Replicating Study 3.3, and supporting Hypothesis 1, participants rated Taskell's as being of significantly higher quality, relative to Hant Nook, when it was the scarcer wine ($M_{\text{scarce}} = .65$ vs. $M_{\text{abundant}} = -.17$, $F(1, 176) = 12.25$, $p < .001$). A similar but somewhat stronger effect was found for sales rankings ($M_{\#2} = .91$ vs. $M_{\#5} = -.44$, $F(1, 176) = 31.92$, $p < .001$). As with the popularity inferences, the interaction between these two factors was not significant ($F < 1$).

Finally, as expected and replicating Study 3.3, the restocking frequency ratings did not vary across scarcity conditions ($M_{\text{scarce}} = .12$ vs. $M_{\text{abundant}} = .11$, $F < 1$). There was, however, a significant difference in restocking frequency ratings across sales-ranking conditions. Participants believed that Taskell's was stocked more frequently when it was the higher- (vs. lower-) ranked wine ($M_{\#2} = .89$ vs. $M_{\#5} = -.67$, $F(1, 176) = 26.37$, $p < .001$).

Mediation Analyses. Mediation analyses identical to those in Study 3.3 were performed for both shelf-based scarcity and sales rankings. While no predictions were made regarding the results for sales rankings, Hypothesis 2 was expected to be supported regarding shelf-based scarcity. Because the relationships between the two cues (sales-ranking and shelf-based scarcity) and the assumed mediators (relative popularity and quality inferences) have already been demonstrated, we focus the current analysis on establishing mediation through the popularity and quality inferences (Table 5.2).

Table 5.2: Mediation Analyses Results

Model	Scarcity of Taskell's (1 = Scarcer, 0 = More Abundant)	Relative Popularity Rating	Relative Quality Rating	BIC*
A	.923 ^b (.311)	---	---	240.63
B	.273 (.357)	.464 ^a (.086)	---	208.00
C	.687 ^d (.368)	---	.960 ^a (.169)	188.62
D	.293 (.397)	.330 ^a (.094)	.820 ^a (.168)	180.92

*This table presents the parameter estimates of the binary logistic regressions used in the mediation analysis. The dependent variable for each model is the choice of Taskell's (1 = yes, 0 = No). Standard errors are in the parentheses below the parameter estimates. * The Bayesian Information Criterion (BIC). ^a $p < .001$, ^b $p < .01$, ^c $p < .05$, ^d $p < .07$

As shown in Model A (Table 5.2), the relative scarcity of Taskell's significantly impacted the choice share of Taskell's. Subsequent analyses showed that when relative popularity ratings were controlled for, the effect of relative scarcity on preference for Taskell's became insignificant (Sobel $z = 3.81$, $p < .001$; Model B) while the impact of the relative popularity ratings remained significant. Thus, popularity inferences mediated the impact of shelf-based scarcity on preferences. Further, when relative quality ratings were controlled for, the effect of relative scarcity on preference for Taskell's became marginally significant while the impact of the relative quality ratings was significant (Sobel $z = 2.73$, $p < .01$; Model C), indicating that relative quality only partially mediated the impact of shelf-based scarcity on preferences. Finally, as predicted by Hypothesis 2c, the effect of the relative popularity ratings on choice remained significant even when relative quality ratings were controlled for (Model D).

Identical analyses were performed to determine if either popularity or quality inferences mediated the effect of sales rankings on consumer preferences. Interestingly,

neither popularity nor quality inferences fully mediated the effect of sales rankings on preference. While being higher ranked does lead consumers to perceive a product to be both more popular and of higher quality, these inferences alone do not fully capture the impact of sales rankings on choice; consumers may feel that factors other than popularity and quality (e.g., production levels, shelf space, advertising, etc.) also drive sales rankings.

Discussion

Study 5.1 fully replicated the findings of Study 3.3; participants believed scarcer alternatives were both more popular and of higher quality and chose the scarcer wine more frequently, regardless of whether they were making choices for themselves or for others. As expected, the more explicit popularity cue, sales rankings, had a somewhat stronger effect on participants' preferences and weakened the impact of shelf-based scarcity cues on choice. Finally, popularity and quality inferences mediated the impact of shelf-based scarcity cues but not sales-ranking cues. Study 5.2 examines the influence of explicit quality cues on preferences for scarcer alternatives.

Study 5.2: The Impact of Explicit Quality Information

The preceding studies showed that relative scarcity can result in inferences of greater popularity and higher quality for the scarcer alternative. While the mediation analyses in Studies 3.3 and 5.1 provided evidence that quality inferences do not play as great a role in determining the impact of scarcity cues on choice as do popularity inferences, incorporating quality inferences improved the fit of the regression models.

Further, shelf-based scarcity cues have not yet been placed in direct competition with an explicit quality cue. Accordingly, Study 5.2 assesses the impact of explicit quality ratings on shelf-based scarcity effects.

Hypotheses 6a predicts that if the scarcer alternative is of objectively lower quality, the effect of shelf-based scarcity on preference will be significantly weakened. Conversely, if consumers find that the scarcer alternative is of higher quality, then the effect should be strengthened. If the two alternatives are of equal quality, then one might expect to see each alternative receive roughly the same choice share. However, Hypothesis 6b argues that popularity inferences have a direct effect on consumer preferences, independent of quality inferences, and that consumer preferences should still be affected by shelf-based scarcity leading consumers to prefer the scarcer item even when the quality of the alternatives is equal.

Method

One hundred and twenty-three students at a private American university were paid for their participation in this study. Participants were seated at a private work station and given an experimental session packet containing several unrelated studies of which this was the first. Wine was again used as the product category in this study.

This study used a 2 (scarce option quality: high vs. low) x 2 (abundant option quality: high vs. low) between-subjects design. Participants first read a scenario which asked them to imagine that while on vacation in Napa Valley they decided to have a picnic lunch with wine, essentially identical to the “self” condition scenario in Study 2. Thus, they went to a bodega which offered two local red wines, one being relatively

scarcer than the other. Participants were then shown the bodega's wine shelf as in Study 2 and asked to choose between the two wines. The location and relative scarcity of each wine were counter-balanced between subjects. Above each wine was a sign indicating the price and bottle size of the wine (which were equal for both options) and the quality rating for that wine. Each wine received either a relatively high quality rating (90 out of 100), or a relatively low quality rating (70 out of 100), ostensibly taken from *Wine Spectator*, described as "a well-respected publication on wines."

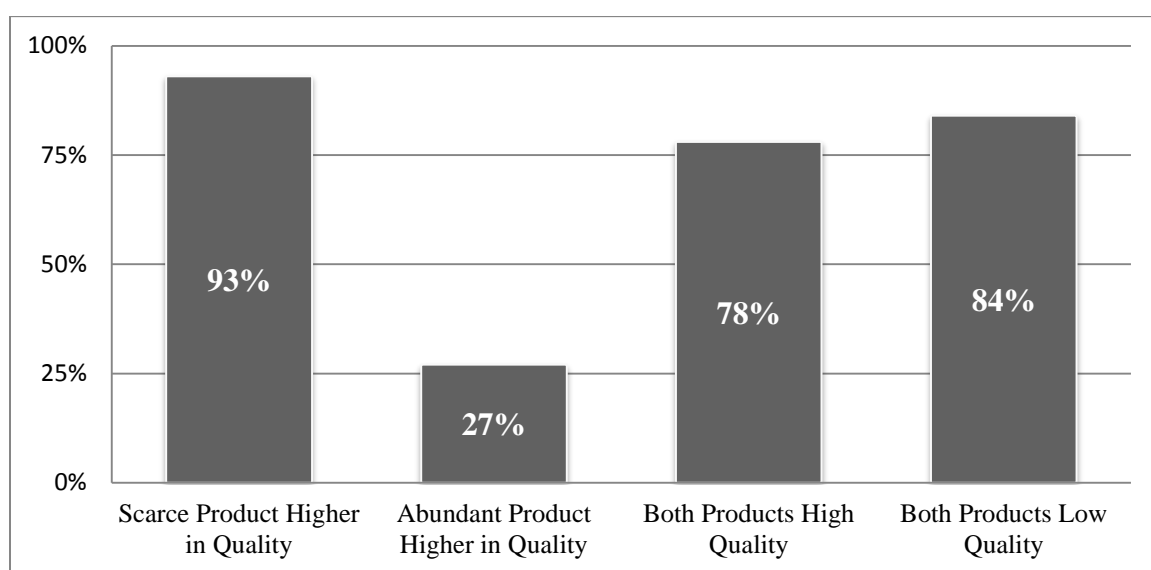
Results

While the Study 5.1 focused on the choice share of a particular wine when it was (vs. was not) the scarcer alternative, this study is focused on the choice share of the "scarcer" wine across the various quality conditions. As predicted by Hypothesis 6, when explicit quality was unequal (i.e., one wine was high quality and the other low), the scarcer wine was more preferred when it received the higher quality rating (93%) than when it received the lower quality rating (27%, $\chi^2(1) = 21.56, p < .01$; see Figure 5.1). Further, while there was no difference in the choice share of the scarcer alternative when both alternatives were of equal quality ($M_{\text{high-high}} = 78\%$ vs. $M_{\text{low-low}} = 84\%$, $\chi^2(1) = .41, p > .5$), the share of the scarcer wine was significantly greater than chance when both wines were of equally high (78%, $\chi^2(1) = 10.13, p < .01$) or equally low quality (84%, $\chi^2(1) = 15.13, p < .01$). Perhaps most interesting is that 27% still chose the scarcer wine even when it was explicitly rated lower in quality (vs. 7% for the abundant wine).

Additionally, preference for the scarcer wine was significantly greater when the scarcer alternative was of relatively higher quality than when both alternatives were of

high quality (93% vs. 78%, $\chi^2(1) = 16.47, p < .001$). However, preference for the scarcer wine was only marginally significantly greater when only the scarcer wine was of higher quality than when both wines were of low quality (93% vs. 84%, $\chi^2(1) = 16.47, p < .1$). It seems the already strong impact of relative scarcity on preferences makes it difficult for other cues to increase choice shares significantly (i.e., there is a ceiling effect).

Figure 5.1: Choice Shares of the Scarcer Wine



Discussion

In Studies 5.1 and 5.2, shelf-based scarcity cues affected choice even when other popularity or quality cues were available. However, explicit popularity and quality cues noticeably reduced the effect when those signals suggested that the scarcer alternative was either less popular or of lower quality. Importantly, the impact of shelf-based scarcity cues on preference persisted when the alternatives were of equal quality, which

again suggests that the effect does not primarily operate through quality inferences, supporting Hypothesis 2.

To this point, it has been demonstrated that consumers tend to prefer scarcer products and that this effect is primarily driven by inferences that scarcer alternatives are more popular. However, the studies thus far have two important weaknesses: (i) only three product categories have been used (wine, barbecue sauce and clothing), and (ii) only fictional brands have been used (when brand names were used at all). It is important to show that this effect holds across a variety of product categories, and in the presence of well-known brands names and other attribute information. The final three studies do just that, increasing the external validity and generalizability of the previous findings.

Study 5.3: Real Brands and Real Choices

Study 5.3 consists of two studies. In Study 5.3a participants made selections from branded products within six repeat-purchase categories (e.g., paper towels). Study 5.3b extends the results of Study 5.3a by having participants make consequential (i.e., real choices) in a richer environment (a simulated store).

Study 5.3a – Repeat Purchase Products with Familiar Brand Names

Consumers are familiar with the brands available in many categories, especially repeat purchase categories such as laundry detergent or paper towels. Further, consumers tend to spend little time or effort deciding which brand to choose in these categories (Hoyer 1984). Accordingly, one might expect that a scarcity cue would have little effect on choices made from frequent-purchase product categories. Study 5.3a examines the

impact of shelf-based scarcity on choices made from frequent-purchase product categories containing branded alternatives.

Method. Fifty-nine paid student participants at a private American university made six choices after reading a scenario which asked them to imagine they were visiting a local grocery store with a friend who had just moved to the country and knew nothing of the local brands (a principal-agent task). This friend had asked for the participant's help in choosing six items. Participants were then asked to imagine that they were walking through a grocery store with their friend, stopping at each relevant shelf. They were then shown six shelf facings, sequentially, each containing two branded alternatives from one of six frequent-purchase product categories (see Table 5.3). The brands were available at most local grocery stores and were pretested on a separate group of participants from the same population to ensure that they were well known; all were recognized by more than 85% of the pretest participants. For the purposes of analysis, the brands from each category were randomly assigned to one of two groups (Group A or Group B; participants were unaware of these groups).

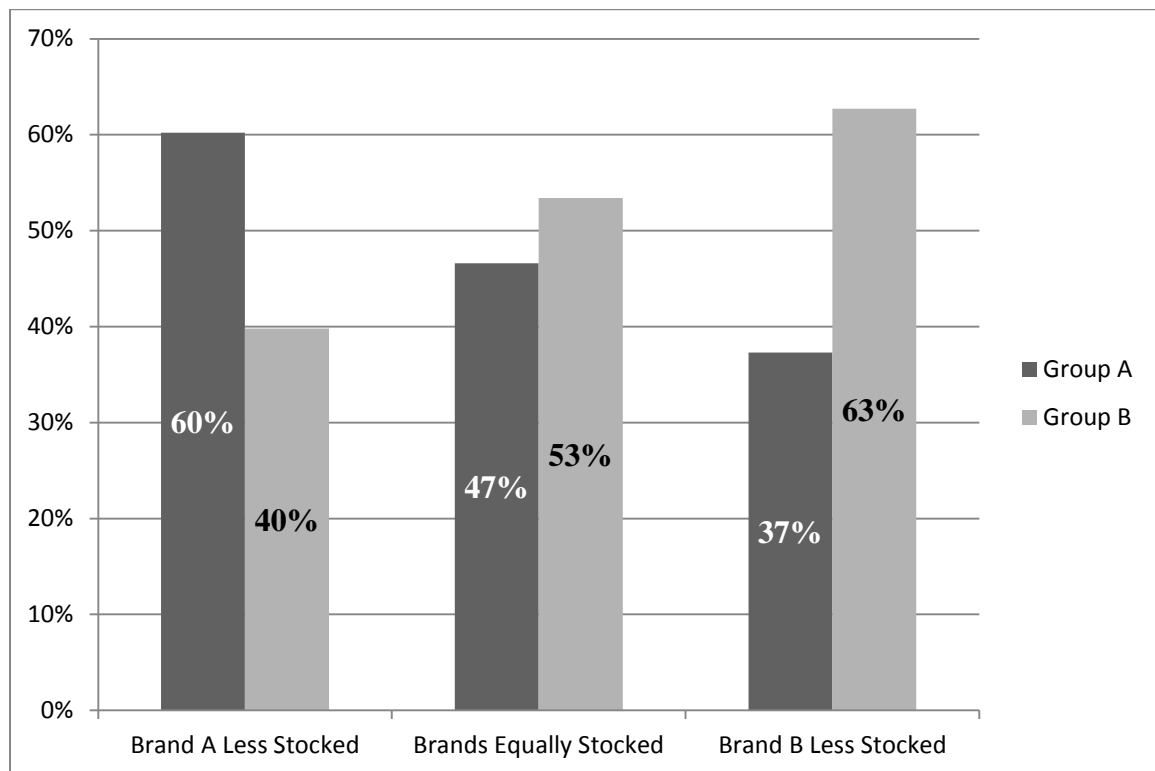
Each participant was exposed to four choice sets where one alternative was scarcer, and two choice sets where the alternatives were equally stocked. The choice sets were presented on a computer and the sequence of choice sets was randomized as were the product categories assigned to each type of choice set (equal vs. unequal stocking). For example, for some participants, the paper towel category was presented with the Scott and Bounty brands equally stocked, for some Scott was relatively scarcer than Bounty, and for the remaining participants Bounty was relatively scarcer than Scott. Likewise, for some participants, paper towels was the first choice set from which they

chose, while for others it was the second, third, fourth, fifth, or sixth. Due to the number of choices made by each participant, and the potential impact on subsequent choices, popularity and quality inferences were not measured.

Table 5.3: Product Categories and Brands by Experimental Group

Product Type	Group A	Group B
<i>Paper Towels</i>	Scott	Bounty
<i>Toilet Paper</i>	Charmin	Cottonelle
<i>Air Freshener</i>	Oust	Glade
<i>Shampoo</i>	Nivea	Suave
<i>Deodorant</i>	Secret	Dove
<i>Spray Cleaner</i>	Oxi	Lysol

Results. The results are presented in Figure 5.2. When the brands were both fully stocked, 53.4% of participants preferred Group B products, indicating that there was no significant overall preference for either group of brands ($\chi^2(1) = .54, p > .46$). However, when the brands of Group A were relatively scarcer, they were preferred by 60.2% of the participants, significantly greater than chance ($\chi^2(1) = 4.88, p < .03$). Further, when the brands of Group B were relatively scarcer, they were preferred by 62.7% of the participants, also significantly greater than chance ($\chi^2(1) = 7.63, p < .01$). Overall, 61.4% of participants preferred the relatively scarcer brands ($\chi^2(1) = 12.36, p < .01$). Thus, relative scarcity affected choices made in frequent-purchase categories with well-known branded alternatives.

Figure 5.2: Choice Shares

Discussion. Study 5.3a presents evidence that shelf-based scarcity can impact consumer preferences even when consumers choose from repeat-purchase categories with well known, branded alternatives. The effect of relative scarcity on consumer preferences was not as strong in this context as in the previous studies, indicating that the presence of brand names (and, perhaps, prior preferences) weakens the impact of shelf-based scarcity. Importantly, a shift in demand of the 10-20% magnitude found here can substantially impact a retailer's profit margins, particularly for high volume retailers where a change in profit of pennies per purchase matters when it is aggregated across millions of transactions.

Study 5.3b – Real Choice

While the effect of relative scarcity on choice appears to be fairly robust, one could question if this will hold for real (consequential) choices. If a consumer is actually choosing a product for themselves, which they have to pay for, this consumer might be more concerned with objective measures of quality (e.g., ingredients, size, etc.) or desirability than relative scarcity. In order to examine this issue, participants in Study 5.3b were asked to make choices from four product categories in a simulated store. Importantly, one of the choices the participants made in this study would be real. Specifically, the participants were informed that one product category would be randomly selected *after* they had made all of their choices (and completed all additional measures) and that they would actually purchase the product they chose from this category with the price (in the range of \$1 to \$3) being subtracted from their participant payment of \$6.

Method. Thirty-eight students at a private American university participated in this study. A simulated store was constructed within a behavioral laboratory. Two full-sized shelves, similar to those typically found in grocery stores, were stocked with four product categories, each containing two brands (see Table 5.4). Within each category, the alternatives varied on several attributes including brand, price, ingredients, benefits, and size. These attributes were not systematically manipulated, but rather were included in order to increase the realism of the shopping experience. The prices were based on prices found at local grocery stores, rounded off to facilitate processing.

All brands had eight shelf-facings and were stocked three deep for a total of 24 possible slots. Within each category, the more abundant brand had two of twenty-four

slots open (un-stocked) while the scarcer brand had fourteen of twenty-four slots open. The location and relative scarcity of the brands were counterbalanced between subjects. Participants were asked to physically remove their chosen alternative from each category and place it on a nearby table, which simulated a shopping cart. Participants then completed a series of seven-point, bipolar scales asking their overall preference between the two brands in each category (e.g., “Which brand of liquid soap do you generally prefer?” 1= Dial, 7= Softsoap). Finally, participants received the product they chose from a randomly selected category and payment for the session, minus the price of the purchased product.

Table 5.4: Categories, Brands, and Attributes

Category	Brand	Package Size	Price	Prominent Attribute(s)
<i>Toothpaste</i>	<i>Pepsodent</i>	6.0 oz.	\$1.00	Anticavity Protection
	<i>Ultra Brite</i>	6.0 oz.	\$1.00	Anticavity Protection, Whitening
<i>Bandages</i>	<i>Band Aid</i>	30 ct.	\$3.00	Flex Fabric
	<i>Curad</i>	40 ct.	\$2.00	Flex Fabric, “Ouchless”
<i>Hand Soap</i>	<i>Softsoap</i>	7.5 oz.	\$1.75	Antibacterial, Odorless
	<i>Dial</i>	7.5 oz.	\$1.75	Antibacterial, “Orchard” scent
<i>Soup</i>	<i>Progresso</i>	15.25 oz.	\$1.50	“Light”/vegetarian
	<i>Campbell’s</i>	15.40 oz.	\$2.00	Made with beef broth

Results. Within each product category, the preferences for one brand were compared when it was (vs. was not) the scarcer alternative. Evidence consistent with

Hypothesis 1 was found in three of the categories: hand soap, bandages, and toothpaste (see Table 5.5). Combining the results for Dial (hand soap), Band Aid (bandages), and Ultra Brite (toothpaste), 64% of the participants chose these brands when they were scarcer, while only 54% chose them when they were not ($p < .09$). Interestingly, this 10% swing in preference is about half the difference found when only brand names were given in Study 5.3a, suggesting that the other attributes did indeed have some impact on choice, as might be expected.

Table 5.5: Choice Shares by Relative Scarcity

Category	Brand	% Preferring Brand When it was <i>Relatively Scarcer</i>	% Preferring Brand When it was <i>Relatively More Abundant</i>
<i>Toothpaste</i>	<i>Pepsodent</i>	26%	16%
	<i>Ultra Brite</i>	84%	74%
<i>Bandages</i>	<i>Band Aid</i>	61%	53%
	<i>Curad</i>	47%	39%
<i>Hand Soap</i>	<i>Softsoap</i>	63%	56%
	<i>Dial</i>	44%	37%
<i>Soup</i>	<i>Progresso</i>	74%	84%
	<i>Campbell's</i>	16%	26%

This table should be interpreted as follows. Within the toothpaste category, 26% of participants preferred Pepsodent when it was the relatively scarcer alternative, while only 16% preferred Pepsodent when it was the relatively more abundant alternative.

Similar, and stronger, results were found in the overall brand preference measures. For toothpaste (1 = Pepsodent, 7 = Ultra Brite), Ultra Brite was more preferred when it was scarcer than when it was not ($M = 4.68$ vs. 3.74 , $F(1, 37) = 4.81$, $p < .04$), as was Band Aid brand bandages ($M = 4.53$ vs. 3.56 , $F(1, 37) = 4.54$, $p < .05$) and Dial ($M = 5.21$ vs. 4.31 , $F(1, 37) = 3.69$, $p < .07$). (Removing all “4”s from the analysis, i.e., those who were seemingly indifferent between the brands, increases the differences of the means on all of the comparisons in the predicted directions.)

Interestingly, brands were more preferred in the microwavable soup category when they were more stocked. This was not entirely unexpected. The last remaining units of a food product are often perceived as being old, leftovers, or near expiration. Thus, being scarcer may be more associated with other, negative inferences in food categories.

Discussion. The data from Study 5.3b suggests that shelf-based scarcity cues can impact choice in real choice contexts when information on ingredients, brands, and prices are available. Overall, Study 5.3 shows that the effect of shelf-based scarcity on preference generalizes to multiple product categories (but not, it would seem, food products), and occurs with real choices. The next and final study investigates the effect shelf-based scarcity has on choice in the presence of one of the most important cues in the retail shopping environment: price promotions. Additionally, the role of prior preferences is explicitly examined.

Study 5.4: The Impact of Promotions and Prior Preferences

Similar to Study 5.3, Study 5.4 consists of two studies, one building on the other. First, Study 5.4a tests the impact of price promotions and prior preferences on shelf-

based scarcity effects. Study 5.4b also examines the impact of prior preferences, replicating the results of Study 5.4a using a different measure of prior preferences.

Study 5.4a – Price Promotions and Self-Reported Prior Preferences

Price promotions have been shown to strongly shift consumer preferences, if only briefly (e.g., Mela, Gupta, and Lehmann 1997). Given their ubiquity and strong influence, it is important to examine the effect of shelf-based scarcity cues in a retail environment containing a price promotion, thereby testing Hypothesis 7. Study 5.4a also (i) examines how consumers' prior preferences impact shelf-based scarcity effects (Hypothesis 8), (ii) increases the number of alternatives to four to increase the realism of the choice for the participants, and (iii) utilizes another product category, motor oil (a durable, multi-use product), to further extend the generalizability of the results.

Method. As in Study 5.1, participants were recruited from the online subject pool *Amazon Mechanical Turk* and paid for their participation. The two hundred and thirty-one participants were screened based on their geographic location (participation was restricted to IP addresses within the United States), their prior approval rating (i.e., prior approval rating: 97% or greater), vehicle ownership (they or a close family member own a car) and age (minimum age = 18). Participants were given a link to this study, which was administered on the online survey tool Qualtrics.

This study incorporated a 2 (Target Brand Scarcity: scarcer vs. more abundant) x 2 (Promotion: yes vs. no) between-subjects design. Upon opening the link to the survey, participants read a scenario asking them to imagine that in preparation for a trip they were doing a basic inspection of their car and found that the oil level was one quart low.

In addition, they were told that the (synthetic) oil currently in their vehicle was in good condition, meaning that they would only need to purchase one quart of oil to fill their vehicle to the appropriate level. Finally, the participants were told that they decided to stop by the local automotive supply store on their way out of town to pick up a quart of oil. On the subsequent screen the participants “entered” the automotive supply store.

As in the preceding studies, participants were shown a picture of the store’s synthetic oil display (Figure 5.3). They were told that after explaining their problem to the store clerk, he had directed them to this display and indicated that any of these oils would meet their needs. Four brands of synthetic oil were available: Valvoline, Quaker State, Mobil 1, and Castrol.

Figure 5.3: Sample Stimulus



The first factor manipulated the relative scarcity of Mobil 1 (the target brand for this study). Mobil 1 was either the scarce alternative, while the remaining three alternatives were relatively abundant, or it was one of the three abundant alternatives, in which case Valvoline was the scarcer alternative. The second factor manipulated price promotion. Mobil 1 either was or was not on sale (no other brand was on sale in any condition). When Mobil 1 had a price promotion, the regular price of \$3.99 was crossed out and a yellow sign reading “\$3.19” was placed below the original price. In addition, a yellow “20% Off Regular Price” sign was placed next to the original price (see Figure 5.3). All brands were the same price (\$3.99) when no price promotion was available.

The participants first indicated which oil they would choose. Next, as in Studies 3.3 and 5.1, participants rated each brand of oil on seven-point popularity and quality scales. Finally, at the end of the study, the participants indicated if they held a strong preference for a specific brand of motor oil and, if so, what brand they preferred.

Choice Results. Of the 291 participants in this study, 112 indicated that they had strong preferences for a specific brand of oil. Of them, four indicated a strong preference for a brand not in available in this study (two mentioned Halvoline, one Shell, and one Pennzoil). These four subjects were categorized as not having strong preferences for the purposes of analysis. The responses of the remaining 108 strong-preference participants (who might have been motivated to use the same brand they currently had in their car to avoid mixing different brands of oils) were analyzed separately to determine if the manipulations impacted their reported preferences.

As indicated in Table 5.6, and verified by a binary logistic regression, there was neither a main effect of Mobil 1 being on sale ($M_{\text{promo}} = 24\%$ vs. $M_{\text{no-promo}} = 19\%$, $\beta =$

.182, $p > .77$), nor a main effect of Mobil 1 being the scarcer alternative ($M_{\text{scarce}} = 21\%$ vs. $M_{\text{abundant}} = 21\%$, $\beta = -.095$, $p > .88$) for those with strong preferences. Likewise, the interaction between promotion and scarcity was not significant ($\beta = .201$, $p > .83$). Essentially, Mobil 1 had approximately a 20% choice share across conditions among those with strong preferences.

Table 5.6: Incidence of Strong Preferences and Choice Shares

Strong Preference	Promotion Condition	Scarcity Condition		% Having a Strong Preference for Mobil*	% Choosing Mobil
No	No Sale	Scarce	(N = 44)	---	57% ^a
		Abundant	(N = 44)	---	18% ^a
	Sale	Scarce	(N = 44)	---	77%
		Abundant	(N = 51)	---	71%
Yes	No Sale	Scarce	(N = 27)	19%	19%
		Abundant	(N = 35)	17%	20%
	Sale	Scarce	(N = 20)	20%	25%
		Abundant	(N = 26)	15%	23%

*The percentage of all participants indicating a strong preference who indicated a strong preference for Mobil 1. Note, cells with a superscript are significantly different from each other.

Additionally, all participants who indicated a strong preference for Mobil 1, Quaker State, or Valvoline ultimately chose that brand (i.e., the manipulations had no effect on their choices). Eight individuals who indicated a strong preference for Castrol ultimately chose Mobil 1, but these observations were not correlated with the manipulated factors. A binary logistic regression verified that the likelihood of reporting a strong preference for Mobil 1 was not affected by the relative scarcity of the Mobil 1

($M_{\text{scarce}} = 7\%$ vs. $M_{\text{abundant}} = 6\%$, $\beta = -.082$, $p > .89$) or the presence or absence of a price promotion ($M_{\text{promo}} = 7\%$ vs. $M_{\text{no-promo}} = 6\%$, $\beta = -.405$, $p > .66$). The interaction between these two factors was also insignificant ($\beta = .278$, $p > .96$). In sum, the price promotion and scarcity manipulations affected neither the proportion of participants indicating a strong preference for Mobil 1 nor the ultimate choices of those participants who indicated strong preferences for any brand.

For the 183 participants who indicated no strong preference for any of the four brands of motor oil used in this study, a binary logistic regression revealed strong main effects for both price promotion ($M_{\text{promo}} = 74\%$ vs. $M_{\text{no-promo}} = 38\%$, $\beta = 2.380$, Wald = 22.90, $p < .001$) and scarcity ($M_{\text{scarce}} = 67\%$ vs. $M_{\text{abundant}} = 46\%$, $\beta = 1.779$, Wald = 12.89, $p < .001$). As expected, these main effects were qualified by a significant interaction ($\beta = -1.430$, Wald = 4.36, $p < .05$). When Mobil 1 was not on sale, the choice share of Mobil 1 was much higher when it was the scarcer (vs. a more abundant) alternative ($M_{\text{scarce}} = 57\%$ vs. $M_{\text{abundant}} = 18\%$, $\chi^2(1) = 14.01$, $p < .001$). However, as predicted by Hypothesis 5, when Mobil 1 was on sale, it was equally and strongly preferred both when it was, and was not, the scarcer alternative ($M_{\text{scarce}} = 77\%$ vs. $M_{\text{abundant}} = 71\%$, $\chi^2 < 1$). Thus, participants tended to ignore the shelf-based scarcity cue when a price promotion was available.

Popularity and Quality Inference Results. The popularity and quality ratings were analyzed as in Studies 3.3 and 5.1. Since there were four alternatives, the difference between the popularity rating for Mobil 1 and the average popularity rating of the remaining three brands was computed. These ratings differences for the 183 participants without strong prior preferences were then subjected to a two-factor MANOVA, with

relative scarcity and relative sales rankings as the between subjects factors. As predicted by Hypothesis 1, participants rated the popularity of Mobil 1 significantly higher, relative to the average of the other three brands, when it was scarcer ($M_{\text{scarce}} = 1.16$ vs. $M_{\text{abundant}} = .36$, $F(1, 179) = 13.58$, $p < .001$). Interestingly, there was a negative effect of price promotion on perceived popularity ($M_{\text{promo}} = .53$ vs. $M_{\text{no-promo}} = .98$, $F(1, 179) = 4.02$, $p < .05$); participants believed that the retailer would not place a popular brand on sale.

Counter to the previous findings, there was no effect of relative scarcity on perceived relative quality ($F < 1$). Interestingly, though, participants rated the quality of Mobil 1 significantly lower, relative to the average of the other three brands, when Mobil 1 was on a price promotion ($M_{\text{promo}} = .03$ vs. $M_{\text{no-promo}} = .45$, $F(1, 179) = 7.52$, $p < .01$), supporting the findings of Darke and Chung (2005). Apparently, having a price reduction signaled that the quality of Mobil 1 was less than that of its competitors. Yet, participants still strongly preferred Mobil 1 when it was on sale. Thus, perceptions of lower quality did not translate into choice share shifts. Finally, there were no significant interactions between relative scarcity and price promotion on either ratings measure. This suggests that while the price promotion did not impact the inferences participants made on the basis of the scarcity cue, it did overwhelm the impact of these inferences on choice.

Discussion. Study 5.4a has shown that (i) shelf-based scarcity only significantly impacts consumers who have no strong prior preferences, and (ii) price promotions overwhelm the effect of shelf-based scarcity. Thus, two important boundary conditions to the effects of relative scarcity in retail shopping contexts have been identified. Combined with earlier findings, these results suggest that the impact of shelf-based scarcity cues will be the strongest when (i) other popularity and quality cues are congruent with the

relative scarcity cue, (ii) the consumer has no strong prior preferences, and (iii) there is no price promotion available on a major brand (or all brands are on similar promotions).

One plausible explanation for the findings of this study is that the participants chose to use a price-promotion heuristic (“Choose what’s on sale.”) instead of a scarcity heuristic (“Choose the scarcest alternative.”). While there is no direct evidence that this is the case, the strong effects of price promotions demonstrated in the literature support the contention that price-promotion heuristics are frequently used, likely at the expense of other heuristics or more in-depth choice rules. Exploring this inference more fully is outside the scope of this dissertation, and hence left for future research.

Study 5.4b – Familiar versus Unfamiliar Brands

Study 5.4b examines the impact of prior preferences in a more subtle and potentially less biased manner. While the analyses in Study 5.4a indicate that the manipulated factors did not impact participants’ self-reported prior preferences, it could still be argued that measuring prior preferences after the participants had been exposed to the experimental manipulations (and made their choices) may result in biased results. Study 5.4b does not explicitly measure prior preferences. Instead, participants in this study were exposed to one of two types of choice sets: (i) a choice set containing largely unfamiliar brands, or (ii) a choice set containing one unfamiliar brand and one familiar brand. While familiarity is not a perfect proxy for preference, it is likely that a consumer will choose (prefer) a familiar brand over an unfamiliar brand within a given product category. Accordingly, the positive impact of shelf-based scarcity was predicted to be

attenuated when participants chose from a set including one familiar, and one unfamiliar brand.

To create choice sets containing either one or no familiar brands, the cola product category was selected. This category has the appealing characteristic of having brands which are very familiar in certain countries while being largely unrecognized in others. For instance, while RC cola is fairly common in the United States, it is not found in India. Conversely, while Thums Up cola is a well-known cola in India, very few Americans have ever heard of it. Thus, Americans choosing from a choice set including RC cola and a fictitious brand should be largely unaffected by shelf-based scarcity since RC will be relatively more familiar. However, if these same Americans are choosing between Thums Up and the fictitious brand, shelf-based scarcity should play a strong role in their choices. Prior to the main study, a pretest verified that the brands RC and Thums Up were differentially familiar to American and Indian participants.

Pretest. One hundred and five paid participants (49 Americans and 56 Indians) were recruited on Amazon Mechanical Turk using the same criteria for participation used in Study 5.4a (except they were not required to have access to a car). The study was administered using Qualtrics. Participants were asked to indicate which of five cola brands they recognized (1 = Yes, 0 = No), how likely they would be able to identify each of these brands in a blind taste test (1 = Very Unlikely, 6 = Very Likely), and how much they knew about each of these brands (1 = Nothing, 6 = Very Much). Of the five pretested brands, the “Star” brand was a fictitious brand created for the purpose of this study. This brand is used as the fictitious brand in the main study.

Table 5.7: Cola Brand Familiarity Pretest

	% Recognizing Each Brand				
	<i>Coke*</i>	<i>Pepsi*</i>	<i>Thums Up*</i>	<i>RC*</i>	<i>Star</i>
Americans	100%	100%	2%	96%	8%
Indians	91%	87%	87%	25%	5%
	Likelihood of Identifying in a Blind Taste Test				
	<i>Coke</i>	<i>Pepsi</i>	<i>Thums Up*</i>	<i>RC</i>	<i>Star*</i>
Americans	4.88	4.84	1.29	3.16	1.33
Indians	4.64	4.64	4.63	2.70	2.21
	Brand Knowledge				
	<i>Coke</i>	<i>Pepsi</i>	<i>Thums Up*</i>	<i>RC*</i>	<i>Star*</i>
Americans	5.27	5.08	1.20	3.39	1.29
Indians	4.95	4.96	4.80	2.55	1.89

* Indicates a significant difference between Americans and Indians for this brand on this measure.

The results of the pretest confirmed expectations (Table 5.7). Thums Up brand cola was recognized by a significantly greater proportion of Indians than Americans. Likewise, Indians indicated they (i) would be much more likely to identify Thums Up in a blind taste test and (ii) know much more about the brand. Conversely, RC cola was recognized by a significantly greater proportion of Americans than Indians. However, Americans did not believe that they would be more likely to identify in RC cola in a blind taste test. Further, although Americans reported greater knowledge of the RC brand, the magnitude of this difference was much smaller than difference found for Thums Up.

Main Study – Method. Three hundred and thirty-four paid participants (160 Americans and 174 Indians) were recruited on Amazon Mechanical Turk using the same criteria for participation used in the pretest. The study was administered using Qualtrics. Upon logging in to the study, participants were asked to imagine that they were vacationing in a popular tourist location (details of the location were omitted) and that after a long day of visiting the local attractions they had built up a thirst. They were then

asked to imagine that they noticed a small shop nearby and that after entering this store they found that it only sold two colas and were shown a shelf similar to that in Figure 5.4 and asked to choose one of the colas. After choosing, participants indicated their country of citizenship.

Figure 5.4: Sample Stimulus

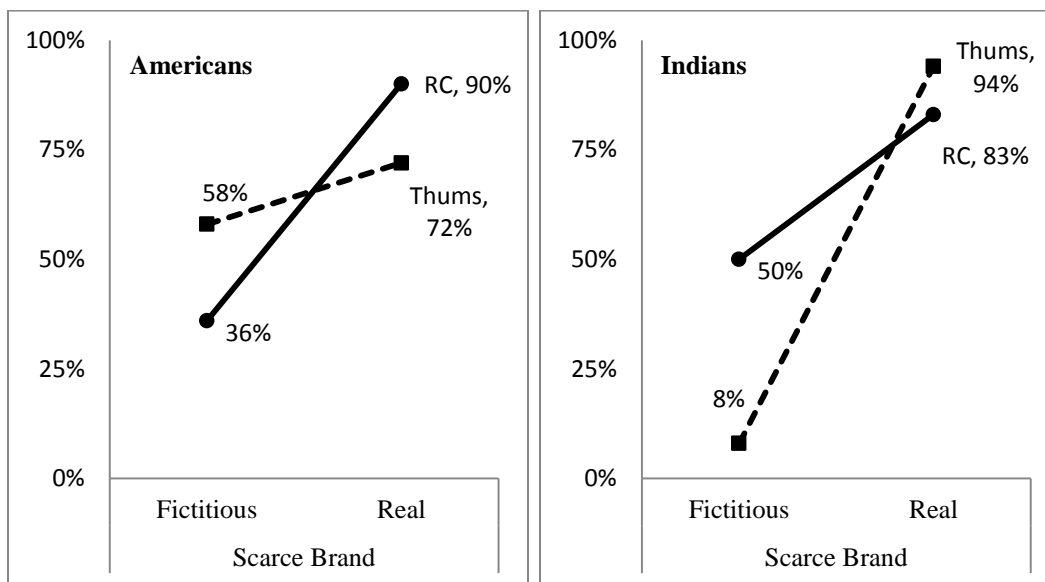


Participants were randomly assigned to one of four between-subjects conditions in a 2 (Real Brand: familiar vs. unfamiliar) x 2 (Scarce Brand: real vs. fictitious) design. All

choice sets included the fictitious Star brand cola. The alternative to this Star brand was either RC cola or Thums Up cola; both real brands. The fictitious brand was scarcer than the real brand for half of the participants and vice versa for the other half. The dependent variable in this study was the choice shares of the scarcer alternative across conditions. It was predicted that the choice shares of the scarcer alternative would be less affected by which brand was scarcer when both brands were unfamiliar than when one brand was familiar and the other unfamiliar.

Main Study – Results. A binary logistic regression verified that the pattern of results was not significantly different between Americans and Indians ($\beta = .778, p > .21$; see Figure 5.5). Accordingly, the following analysis collapses across these two populations.

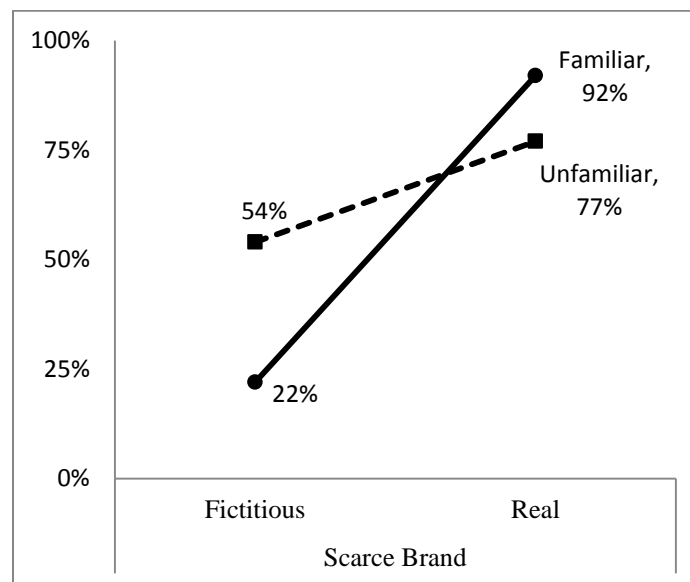
Figure 5.5: Choice Shares of the Scarcer Alternative by Respondent Type and Condition



Combining the American and Indian results produces the pattern pictured in Figure 5.6. A binary logistic regression found that, while there was no main effect of the

presence (or absence) of a familiar brand on the choice shares of the scarcer alternative ($M_{\text{one familiar}} = 61\%$ vs. $M_{\text{all unfamiliar}} = 65\%$, $\beta = .069$, $p > .82$), there was positive impact on choice shares of the scarcer alternative when that alternative was the real brand ($M_{\text{scarcer real}} = 86\%$ vs. $M_{\text{scarcer fictitious}} = 40\%$, $\beta = .543$, $p < .01$). In other words, preference for the scarcer alternative over the more abundant alternative was positively impacted by the scarcer brand being real (vs. fictitious).

Figure 5.6: Choice Shares of the Scarcer Alternative by Condition



Importantly, this main effect was qualified by a significant interaction between the presence (vs. absence) of a familiar brand and whether the real or fictitious brand was the scarcer alternative ($\beta = 1.333$, $p < .001$). As can be seen in Figure 5.6, when the scarcer alternative was the real brand its choice share was significantly higher when it was a familiar brand ($M_{\text{familiar}} = 92\%$ vs. $M_{\text{unfamiliar}} = 77\%$, $\beta = 1.264$, $p < .01$). Conversely, when the scarcer alternative was the fictitious brand its choice share was

significantly higher when the real brand was unfamiliar ($M_{\text{familiar}} = 22\%$ vs. $M_{\text{unfamiliar}} = 54\%$, $\beta = -1.402$, $p < .001$). Further, and consistent Hypothesis 8, the choice share of the scarcer alternative was more positively impacted by being a real (vs. fictitious) brand when the real brand was familiar ($M_{\text{scarcer real}} = 92\%$ vs. $M_{\text{scarcer fictitious}} = 22\%$, $\beta = 1.876$, $p < .001$) than when it was unfamiliar ($M_{\text{scarcer real}} = 77\%$ vs. $M_{\text{scarcer fictitious}} = 54\%$, $\beta = .543$, $p < .01$). Thus, the preference for the scarcer item was strongly impacted by the degree to which participants were familiar with the real brand, once again showing that prior preferences are likely to attenuate shelf-based scarcity effects.

Discussion. Study 5.4b examined the impact of prior preferences on shelf-based scarcity effects using a potentially less biased methodology than that in Study 5.4a. The results replicate the previous study's findings; shelf-based scarcity effects are significantly moderated by prior preferences (as inferred from relative familiarity in this study). In sum, Hypothesis 8 is strongly supported by both of these studies.

Chapter Summary

In closing the empirical portion of this dissertation, Chapter 5 has shown the practical limitations, and the impressive robustness, of shelf-based scarcity's impact on preferences. Of particular importance, it was found that shelf-based scarcity impacts preferences when choices are both real and made from well-known brands. Though one may consider these results preliminary, they are strong indicators that shelf-based scarcity may impact consumers' choices in actual retail environments.

Additionally, several important boundary conditions for shelf-based scarcity effects were found. First, the impact of shelf-based scarcity is attenuated when explicit

popularity or quality ratings favor a more abundant alternative. Though important findings, neither of these results are overly surprising inasmuch as the influence a particular piece of information has on a decision will decrease as the amount of total information increases. In other words, the impact of shelf-based scarcity is not so strong as to overwhelm all other additional information available at the time of choice.

Second, consumers with strong prior preferences largely ignore shelf-based scarcity. This makes sense given the lack of processing at the time of choice typical among those with strong preferences (Hoyer 1984). This suggests that shelf-based scarcity effects are less likely to occur in categories with strong prior preferences (e.g., colas: Coke vs. Pepsi).

Third, it seems that shelf-based scarcity is unlikely to increase choice shares of non-promoted brands when a price promotion is available on another major brand in the category. Given that shelf-based scarcity is expected to primarily impact those with weak preferences, this is a reasonable finding. Lowered prices allow consumers to “test” products with lower risk. Further, the consumer may simply not care enough about the product category to pay more for any brand over any other brand. Combine this with the long line of evidence showing that price promotions strongly impact short-term preferences and it becomes clear that price promotions are likely to overwhelm scarcity effects.

Finally, some evidence has been found that shelf-based scarcity may not operate consistently across all product categories. Specifically, it seems that consumers might be less likely to choose scarcer alternatives when they make choices in food categories; participants in Study 5.3b were less likely to choose a particular soup when it was the

scarcer alternative. Interestingly, this was not the finding in Study 4.4, where participants made choices among barbecue sauces. There are a number of potential reasons why these results differed. First, it may be that consumers are generally less concerned about the freshness of sauces as compared to other types of food (i.e., they may feel that sauces are less perishable). A more likely cause of this difference is the fact that participants in Study 4.4 were making hypothetical choices, whereas those in Study 5.3b were making real choices. Since those participants in Study 5.3b knew that they would potentially have to purchase the soup they chose, they may have become more concerned with the freshness of those soups. Future research may more fruitfully examine this issue.

6

General Discussion

Summary of Findings

This dissertation has documented how and when shelf-based scarcity affects consumers' preferences. To begin, Chapters 1 and 2 drew from the literatures on commodity theory, scarcity effects, popularity effects, the need for uniqueness, price promotions, shelf-location effects, consumer inferences, and persuasion knowledge to develop a conceptual framework and present eight testable hypotheses. The literature review found that, while scarcity effects are quite robust, their underlying causal mechanism is not explicitly present in retail environments; specifically, consumers cannot know why products are more or less scarce in a retail environment; all they know is that there are differences in the stocking levels of the available products. Accordingly, it was proposed the consumers would infer the cause of shelf-based scarcity and that shelf-based scarcity would impact consumers' preferences through these inferences. Hypotheses regarding potential moderators of shelf-based scarcity effects were developed based on the proposed psychological process. In addition, Chapter 2 proposed several cues that are prevalent in retail contexts which might overwhelm, or at least attenuate, the impact of shelf-based scarcity on choice. These hypotheses were tested in the subsequent chapters, the results of which are presented at the end of this Chapter in Table 6.1.

Chapter 3 showed that shelf-based scarcity can positively impact preferences; consumers tend to prefer scarcer alternatives in retail environments (Study 3.1; see Figure 6.1). Extending this basic result, Study 3.2 demonstrated that the relationship between shelf-based scarcity and choice shares is positive and monotonic. Studies 3.1 and 3.2 further showed that consumers spontaneously report inferences that scarcer alternatives are more popular than more abundant alternatives, confirming previous findings (van

Herpen, Pieters, and Zeelenberg 2009). Building off of these studies, and previous literature, Study 3.3 directly measured participants' popularity and expected quality inferences about the available alternatives and found that scarcer alternatives were considered to be significantly more popular and that participants expected significantly higher quality from them as well. Study 3.3 extended previous findings by explicitly testing the psychological process through which shelf-based scarcity impacts preferences via mediation analyses. The results indicated that popularity, and not quality, inferences are the primary driver of shelf-based scarcity effects, supporting the model presented in Figure 2.1.

Having validated the proposed mechanism through which shelf-based scarcity impacts choice, Chapter 4 turned its attention to potential moderators of this effect. Examining the role of popularity inferences, Study 4.1 directly manipulated the desirability of popularity to show that shelf-based scarcity has a negative impact on preferences when popularity is undesirable. Study 4.2 used a more subtle methodology than that employed in Study 4.1. Specifically, participants' need for uniqueness was measured and used to predict when scarcer alternatives would be preferred. As expected, participants with a high need for uniqueness were much less likely to choose scarcer products than participants with a low need for uniqueness, but only when differences in those products could be considered as potential signals of one's uniqueness. Taken together, the results of Studies 4.1 and 4.2 reconfirm the finding that popularity inferences are the primary driver of shelf-based scarcity effects.

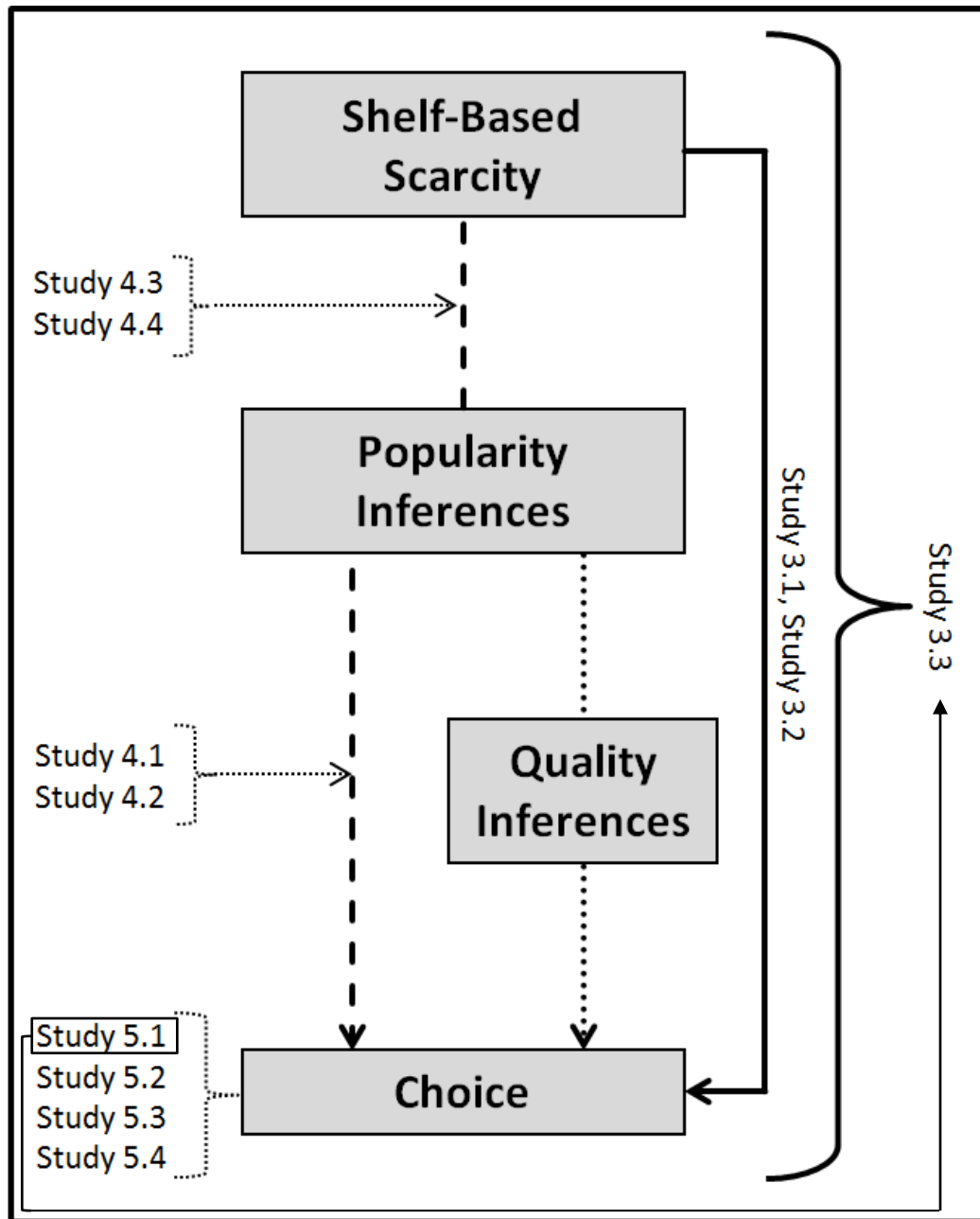
Given the strong evidence that popularity inferences are the primary driver of shelf-based scarcity effects, the remainder of Chapter 4 focused on examining the link

between shelf-based scarcity and popularity inferences. The evidence to this point indicated that consumers always infer that scarcer alternatives are more popular. Yet, this seemed to be an implausible conclusion. Accordingly, Studies 4.3 and 4.4 examined conditions under which consumers would be unlikely to infer that scarcer products are more popular. Study 4.3, building on previous literature, showed that consumers do not expect popular products to be located on a bottom shelf. In general, consumers seem to infer that vertical positioning is positively correlated with popularity. Accordingly, shelf-based scarcity did not result in higher choice shares when the scarcer alternative was located on the bottom (vs. an upper) shelf. Study 4.4 examined a factor less controllable by managers: consumers' concern about persuasion attempts. When participants are made aware that retailers are motivated to manipulate their choices, they do not infer that scarcer products are more popular and are, therefore, not more likely to choose scarcer alternatives.

Concluding the empirical portion of this dissertation, Chapter 5 presented five studies which investigated the general robustness of shelf-based scarcity effects as well as several practically relevant potential boundary conditions. Aside from cues and contexts which might alter the way in which shelf-based scarcity is interpreted, there are likely to be a variety of cues or situations which directly attenuate the impact of shelf-based scarcity without necessarily affecting what that scarcity means to consumers. For instance, as was found in Studies 5.1 and 5.2, when explicit popularity (sales rankings) or quality (quality ratings) cues favor more abundant products, consumers are significantly less likely to choose scarcer alternatives. Yet, even when objective quality measures

indicate that the alternatives under consideration are of equal quality, consumers still prefer scarcer products over more abundant ones.

Figure 6.1: Graphical Representation of Each Study's Primary Purpose



Two important boundary conditions under which shelf-based scarcity has no measurable impact on preferences were identified in Study 5.4. First, consumers with strong prior preferences are not impacted by shelf-based scarcity. Second, shelf-based scarcity did not impact choices made when a price promotion was available in the product category. Thus, it would be expected that shelf-based scarcity affects preferences only when consumers do not have strong prior preferences and when there is either no price promotion in the category, or all of the alternatives have nearly equivalent price promotions applied to them.

Lastly, and importantly, it was found in Study 5.3 that shelf-based scarcity can impact choices that are both real and made from well-known brand names. This suggests that shelf-based scarcity may have widespread effects.

Collectively, the studies presented here show strong support for the main contention of this dissertation: shelf-based scarcity can have a strong, positive impact on preferences, and it does so through the popularity (and to a lesser degree, the quality) inferences it induces. The remaining portion of this dissertation discusses the theoretical and managerial implications of these findings, and identifies areas for future research.

Theoretical Implications: A Better Understanding of Scarcity and Choice

One of the primary contributions this dissertation makes is that it extends our current understanding of scarcity effects. Considering the findings of the vast majority of previous research on scarcity effects with consumer goods, it was doubtful that shelf-based scarcity would have any impact at all on consumer preferences. Much of this doubt stemmed from the fact that consumers generally do not know what caused shelf-based

scarcity (with exceptions such as batteries or milk just before a storm arrives) and the fact that scarcity has been shown to be a cause-dependent phenomenon (i.e., if and how scarcity impacts choice depends on what caused it). Additionally, given that retail environments are packed with so many overt cues explicitly designed to sway preferences, it was questionable if shelf-based scarcity would have much impact even if its cause was known. Yet, the results presented here are robust. Thus, adding to the extensive literature on scarcity effects, we now know better how, when, and why shelf-based scarcity has a significant impact on preferences.

The findings of this dissertation also add to our understanding of how popularity impacts preferences. As discussed, the perceived popularity of products can have strong but complex effects on consumer preferences. An interesting implication of the current findings is that consumers seem to have a strong drive to actively seek out information about the preferences of other consumers, even if they need to infer those preferences (this point is discussed further below). Perhaps even more interesting is the degree of influence that popularity inferences can have on consumers' choices. Not only did popularity inferences affect choice above and beyond the quality inferences they induced in the presented studies, they continued to have an impact on choice even when other, more explicit cues were available to the participants. Indeed, for such an ambiguous and easily manipulated cue to induce inferences that hold such sway over consumers may be considered somewhat alarming.

Though outside the scope of this dissertation, it is interesting to ponder why perceived popularity played such a significant role in the effects found here. Perhaps popularity was such a strong influence because all choices were being made from

relatively low involvement and low risk consumer goods. Maybe these results would not be found were the participants choosing from goods such as drugs, cigarettes, or choosing between healthy and unhealthy foods. Additionally, it may be that consumers rely on relative popularity more when determining which of a set of alternatives to choose as opposed to deciding whether or not to make any purchase in a category at all. This second question is left for the ongoing research on the effects of popularity on choice.

On a final note, the results here seem to suggest that consumers use retail environment cues in a largely additive, or compensatory, manner. That is, they do not appear to ignore one cue in favor of another, but instead combine these cues into an overall evaluation. This is interesting as it could be argued that explicit cues, particularly unambiguous ones, should dominate more implicit cues such as shelf-based scarcity. However, consumers seem to believe that shelf-based scarcity is both a credible (i.e., true indicators of others' preferences) and diagnostic cue (i.e., good information on which to base their choice). Thus, its impact tends to persist even when other cues abound.

On the whole, this dissertation has extended our understanding of the psychological mechanisms underlying the effect of shelf-based scarcity cues on choice. It has also brought to light the impact that mere popularity inferences can have on consumers' choices. Finally, it has shown that the link between popularity and quality inferences, while there, cannot completely explain the impact of popularity on choice.

Managerial Implications: To Stock or Not to Stock?

Consider the implications the current findings have for the retail manager. The modern retailer faces a very complex task in meeting consumers' needs (Grewal, Levy,

and Kumar 2009). Simply getting the consumer in the store is a monumental challenge. Decisions on store location (Hotelling 1929; Hutchinson 1940), store size (Holmes 2001), product assortment (Broniarczyk, Hoyer, and McAlister 1998; Chernev and Hamilton 2009; Kahn and Wansink 2004; Mantrala et al. 2009), pricing (Kopalle et al. 2009; Rao and Monroe 1989) and promotions (Chandon, Wansink, and Laurent 2000; Mela, Gupta, and Lehmann 1997) can all have a substantial impact on the likelihood a consumer will choose to visit the retailer.

Once the consumer is in the store, many factors such as number of the shelf-facings dedicated to a brand or that brand's shelf location (Chandon et al. 2009) can affect consumer preferences. In fact, considerable research shows that consumers frequently use shelf-based cues to make choices. For example, consumers tend to believe that options placed in the center of a display are the most popular (Valenzuela and Raghubir 2009) and it has been found that items allotted more shelf space are more likely to be chosen (e.g., Desmet and Renaudin 1998; Frank and Massy 1970), as are items in more prominent shelf locations (Drèze, Hoch, and Purk 1994). Further, shelf location can impact substitution choices for out-of-stock items (Anupindi, Dada, and Gupta 1998) because consumers look more frequently at nearby (vs. distant) alternatives when choosing those substitutes (Breugelmans, Campo, and Gijsbrechts 2005).

These findings are important because the brand which consumers choose within a product category can dramatically impact a retailer's profits. The profit margins realized by a retailer can vary by as little as a few cents in certain industries (e.g., grocery stores) to many hundreds of dollars in others (e.g., electronics stores). While shifting demand to higher margin brands would seem to be noticeably beneficial only in the latter situation,

it is important to remember that many low margin retailers are also high volume retailers. For instance, the *Food Marketing Institute 2009 Supermarket Industry Overview* (2010) finds that the median average weekly revenue per supermarket is \$485,346. This means that the yearly revenue for the median supermarket exceeds \$25 million. Yet, these same supermarkets have after tax profit margins of only approximately 1.22%; barely more than a cent per dollar of revenue. Collectively, these figures show that supermarkets could potentially benefit (or suffer) greatly by shifting demand in high volume categories, where the margins may differ by mere cents between brands, to higher-margin brands. Of course, there are many methods which the supermarket manager, or a manager in a high margin retail industry, could use to induce consumers to purchase these higher-margin brands (e.g., price promotions, weekly advertisements, in-store signage, etc.). However, most of these methods are costly and, hence, cut into the additional margin which is being sought.

The results of this dissertation suggest that the manager could shift demand in a given product category by 10% (as was found for the real choices made in Study 5.3b) or more (as was found in the others studies reported here) by simply manipulating the scarcity of the available brands. Importantly, it would seem that the retailer could do so with little or no added cost. The retailer simply needs to either stock the target brand less from the beginning, or restock it less frequently throughout the day in order to create shelf-based scarcity.

Should a retailer willingly partially stock their shelves? One might argue that the answer is yes, without a doubt. After all, in the studies presented in this dissertation, shelf-based scarcity was found to have a negative impact only when popularity was

considered undesirable (and for one product category: soup). Under all other circumstances, the shelf-based scarcity had no effect at worst and a very positive effect at best. Thus, as long as the retailer is not dealing in identity relevant and conspicuously different goods, the worst possible outcome would be no change in demand at no added cost.

However, while the direct costs of creating shelf-based scarcity are potentially minimal, the indirect costs may be substantial. For starters, the retailer must consider how creating shelf-based scarcity will impact the appearance of their store. Shelf-based scarcity gives the shelf a somewhat disorderly appearance. Thus, the greater the number of product categories in which shelf-based scarcity is used to influence choice, the more disorderly the store will appear. Given that store appearance can impact consumers' overall willingness to pay (Morales 2005), shelf-based scarcity may backfire if overused. This suggests that shelf-based scarcity may be best used as a tactic and not a strategy and should be reserved for product categories with high sales volumes and large margin differences.

Another issue that arises when shelf-based scarcity is created is that the likelihood of any given consumer encountering a stockout is increased. Consider the two primary outcomes of creating shelf-based scarcity: (i) increased demand, and (ii) decreased stocking levels. The combination of these two outcomes creates a higher probability of a stockout occurring. Stockouts (Farquhar and Pratkanis 1993; Fitzsimons 2000; Sloot, Verhouf, and Franses 2005) can be very disruptive to consumers, leading to potentially negative outcomes for the retailer. Specifically, if the out-of-stock alternative is the consumer's preferred alternative, this consumer must decide whether to choose a

different brand or size (Bass, Pessemer, and Lehmann 1972; Breugelmans, Campo, and Gijsbrechts 2007), or defer the choice to a later time (Emmelhainz, Stock, and Emmelhainz 1991; Greenleaf and Lehmann 1995; Schary and Christopher 1979). At the extreme the consumer may choose to switch retailers, which can result in long-term damage to the retailer's profits (Anderson, Fitzsimons, Simester 2006; Motes and Castleberry 1985) that far exceeds any benefit gained through the shifts in demand induced by the shelf-based scarcity. Interestingly, though, even when the out-of-stock alternative is not the consumer's preferred alternative, the presence of a stockout can reduce choice deferral (Ge, Messinger, and Li 2009; Kramer and Carroll 2009) or shift attribute importances (Doyle et al. 1999; Highhouse 1996; Pettibone and Wedell 2007). Still, the risks associated with stockouts may outweigh the benefits.

Of course, the retailer could reduce the likelihood of stockouts by more frequently restocking the target brand, but this would increase stocking costs and reduce the benefit of using shelf-based scarcity as a persuasion tactic in the first place. However, a second option would be to only use this tactic for brands which are allotted many shelf-facings. A larger number of shelf-facings can have a number of effects. First, it will increase the salience of the brand and perhaps the likelihood of choosing that brand, independent of shelf-based scarcity. Second, it will make the shelf-based scarcity cue more salient, increasing the likelihood it will affect the consumer's decision. Third, it will reduce the likelihood that stocking levels will diminish to zero, creating a stockout. The moderating nature of number of shelf-facings is an interesting question. Future research investigating the relationship between shelf-based scarcity and total shelf space/facings is warranted.

Another concern for retailers is how consumers interpret shelf-based scarcity. While it currently seems that consumers consistently believe that shelf-based scarcity is caused by demand (i.e., the choices of their predecessors), use of shelf-based scarcity as a persuasion tactic may become common knowledge. If consumers come to believe that scarcer products are so because of the actions of retailers, shelf-based scarcity might not only have no effect, it might result in a negative backlash. Simply put, consumers may come to believe that retailers are using stocking practices to trick them into purchasing certain brands over others. Such an outcome could have many consequences. One potential response, suggested by the results of Study 4.4, is that consumers might choose more-stocked alternatives in defiance of the perceived persuasion attempt. Alternatively, they may simply become upset with the retailer and choose to take their business elsewhere.

Finally, it is not exactly clear in which product categories shelf-based scarcity will have a positive effect and in which it will have a negative effect. The results of this dissertation identify two types of product categories where one might expect to find a negative impact of shelf-based scarcity. First, as found in Study 4.2, shelf-based scarcity will not always have a positive impact in product categories which have identity relevant characteristics (e.g., clothing, jewelry, etc.). Indeed, in these categories the effect might be quite negative, but mostly for consumers who wish to avoid popular products (e.g., those with a high need for uniqueness). For others, shelf-based scarcity might still have a positive effect.

Second, it would seem that scarcer products are not always preferred in food categories. Admittedly, the evidence for this contention is a bit more mixed as

participants did prefer a scarcer barbecue sauce in Study 4.4 but preferred a more abundant microwavable soup in Study 5.3b. Of course, there are a number of differences both between the specific products used in these studies and the experimental designs of the studies themselves. First, consumers may hold different beliefs about how perishable canned soups and bottled sauces are or, perhaps, how important freshness is for these two products. Second, participants in Study 4.4 were making hypothetical choices while those in Study 5.3b were making real choices. It is possible that when choices are real, other factors such as perceived/expected freshness play a larger role. Which of these distinctions played a greater role in the differences found in the results is unknown. However, if category differences played a greater role (i.e., the differences between sauces and soups), this suggests that there are definable characteristics of product categories which can help us predict when shelf-based scarcity will have a positive, negative, or no impact. If it is the latter distinction that played a greater role (i.e., the differences between hypothetical and real choices), this suggests that consumers in grocery stores will typically avoid scarcer products in food categories. What is called for is a systematic investigation of the robustness of shelf-based scarcity effects across multiple product categories. Specific attention should be paid to identifying general category characteristics which moderate the impact of shelf-based scarcity on choice.

The grand point here is that retailers should not immediately begin half-stocking their higher margin brands without first considering the consequences of these actions. While the ratio of potential direct benefits to potential direct costs is appealing, the indirect costs of using shelf-based scarcity as either a persuasion tactic or strategy are not

yet well enough understood and may potentially be damaging to the retailer. Hopefully, future research will address many of these points.

Future Directions

Despite its contributions, this dissertation (as with all research) does not provide an exhaustive account of shelf-based scarcity, its antecedents, or its consequences. Aside from the future directions already mentioned, there is much left to learn about this topic. The following is just a partial list of areas which future research could address.

Other Types of Shelf-Based Scarcity

Shelf-based scarcity, as conceptualized and operationalized in this dissertation, has a very specific meaning. The alternatives appear to be differentially depleted. In other words, the units of the scarcer alternative were dispersed throughout their allotted shelf space. Certainly, there are other examples of one product having fewer items on the shelf than others, but not appearing depleted, per se. For instance, the retailer might group all of the units in a single cluster to present a more orderly appearance. In this case, the scarcer alternative would have an equal number of empty shelf facings, but the overall appearance of the shelf would be different. It is plausible to expect that this might reduce (or increase) the likelihood that consumers will infer that this product is the more popular alternative. If so, then the preference for the scarcer alternative might be reduced (increased). Study AU2 (Appendix B) was a first attempt at investigating this question. A more detailed investigation is left for future research.

Alternatively, the retailer may simply allot more [less] shelf space to a given brand. Within certain categories (e.g., colas, toilet paper), this might signal that a brand is more [less popular]. However, in other categories (e.g., wine or jewelry), the opposite might be true as less shelf space might signal that the brand is more rare or unique. Regardless of the particular signal that is sent by this version of shelf-based scarcity, it is important to note that this cue could no longer be considered a direct signal of others' preferences. Instead, it is now clearly a factor under the control of the retailer and, subsequently, less diagnostic of others' preferences. How will this difference in causal source impact consumer preferences? Study AU3 (Appendix B) begins to answer this question, but a more in-depth examination of this question is warranted.

When is Shelf-Based Scarcity a Valued Cue?

A given choice cue or piece of information (e.g., brand attributes) is unlikely to receive equal weight across all decisions a consumer makes. Likewise, shelf-based scarcity will not always have a strong impact on consumers' choices. Some instances where this is found to be the case were documented in Studies 4.3, 4.4, and 5.4. Still there are likely to be many other circumstances under which shelf-based scarcity has little impact on choices, a few of which are discussed here.

It could be argued that shelf-based scarcity may have less of a positive impact on choices as the objective quality of the alternatives increases. Weak evidence of this was found in Study 5.2. In that study, the positive impact of shelf-based scarcity was lower when both products were high quality than when both were low quality. This makes sense inasmuch as choosing from two good products should be less involving and less

stress inducing when the products are of high quality because the consumer finds themselves in a win-win situation; they are getting something good no matter what they choose. However, as the objective quality of the alternatives decreases, then the consumer finds themselves trying to choose between the “lesser of two evils.” This decision, and its potential implications, is likely to be much more stress inducing, leading to higher involvement and a greater likelihood of searching for differentiating information. Thus, as quality decreases, the likelihood of shelf-based scarcity having a positive impact on choice might increase. In general, choices made from less desirable alternatives may be more impacted by shelf-based scarcity than choices made from more desirable alternatives.

One might also expect repeated exposure to shelf-based scarcity to impact how consumers respond to this cue. If a consumer continually finds one brand within a given category to be scarcer than the others, will this accentuate the impact of shelf-based scarcity or will it attenuate it? It could be argued that the consumer should interpret this as repeated evidence of the popularity of this product and, therefore, the shelf-based scarcity effect should be accentuated. Alternatively, it is equally plausible that the repeated exposure to shelf-based scarcity may numb consumers to this cue (i.e., it becomes such a common element of the environment that consumers no longer attend to it), thereby attenuating the effect. Interestingly, this suggests that store-loyal customers may either be more positively, or more negatively, affected (in terms of brand choice) by ongoing shelf-based scarcity than would be non-loyal customers who visit the store less frequently. If it is found that repeated exposure to shelf-based scarcity has an increasing positive [negative] effect on brand choice, then the retailer may choose to stock higher

[lower] margin less fully, or alternatively, stock products in categories more frequently shopped by loyal [non-loyal] customers less fully. In general, the dynamic, long-term impact of shelf-based scarcity is still a very open question.

Finally, one may wonder how preferences would be impacted if only one of many brands was well-stocked (i.e., all other brands were scarcer). Would consumers consider shelf-based scarcity at all in this situation? Would this lone brand be perceived as the least popular brand? The evidence thus far would suggest so, but all studies in this dissertation presented only one brand as being a scarcer alternative. Maybe reversing this ratio would yield opposite results. Such reversals might be due to the visual salience of the lone well-stocked (or scarcer) brand. It is possible that the inferential process identified in this dissertation is dependent on which brand (a scarcer or more abundant brand) is considered first. It is possible that whichever brand is considered first is used as a reference point and that such anchoring affects any subsequent inferences. Future research could examine this by randomly presenting either well-stocked or scarcer alternatives consecutively and examining the resultant inferences and preferences.

Why do Consumers Infer the Cause of Shelf-Based Scarcity?

Though outside the scope of this dissertation, it is interesting to wonder why consumers make inferences on the basis of shelf-based scarcity at all. Why does this cue matter to them? The simplest answer is that consumers care about what others do and think. They care about others' choices, actions, and experiences. Sometimes they care because they want to make the best decision and they think that others possess greater expertise than they do and that, by learning of others' choices, they themselves can make

better decisions (i.e., they seek out “social proof”; Cialdini 1993). At other times, they care because they either wish to fit in with, or stand out from, a given group (Brewer 1990; Fromkin and Snyder 1980; Snyder and Fromkin 1977). This is not to suggest that consumers always choose, or avoid, more popular products. The point is, consumers do not live in a social vacuum, nor do they seemingly wish to choose in one. What others’ have chosen is meaningful and useful information more frequently than not.

Evidence of this desire for social information is all around us, but is most evident on the internet. Online social networks thrive as consumers report their purchases, actions, and experiences; ask for help finding restaurants, day care centers, or other service providers; and see what their friends “like” on Facebook. Likewise, most retail websites provide customer reviews of products and allow the consumer to organize the available products in order of popularity.

But, social information is frequently unavailable, at least explicitly, in offline retail environments. Most brick and mortar retail stores have little information about others’ choices other than the occasional “our best seller” sign. What this means, ultimately, is that the consumer does not have a piece of information they consider valuable when making their choice. In these instances, when a piece of desired information is not available, Kardes, Posavac, and Cronley (2004) argue that consumers will use the available information (e.g., prices, package sizes, shelf-based scarcity, etc.) to infer what is missing. In other words, if it is important to me which alternative is more popular, but there is no explicit information signaling which is more popular, I will use the information that is available to make that determination/inference.

An interesting finding in this dissertation is that consumers made inferences even when they were given explicit information in the form of sales rankings. Why would consumers infer popularity when they were told which alternative was more popular? One reason might be that consumers don't see relative sales rankings as indicators of consumers' preferences between the alternatives being considered. For instance, a consumer might know that Bud Light is the best selling beer in America, but doubt that Bud Light would be chosen over, say, Sam Adams in a head-to-head choice. Instead, they simply think that Bud Light is generally more available (has greater distribution) and, therefore, has greater sales. More generally, it may be that not all popularity cues are perceived as indicative of the choices others would make among a given set of products. Thus, even when these cues are available, the consumer might still search for information regarding preferences more specific to the current consideration set.

Certainly, though, not all choices are impacted by social information. Indeed, some instances where this information is ignored were identified in this dissertation: (i) when consumers had strong prior preferences, and (ii) when a price promotion was available. There are many other factors which are likely to impact whether or not consumers use or even consider social information when they make their choices. For example, experts are unlikely to be heavily swayed by the choices of others. They will be certain in their preferences, in the objective qualities of the available alternatives, and how those two match up. Similarly, social information will carry less weight when the consumer is uncertain of the similarity between their preferences and those of their predecessors. More generally, social information will only be used when it reduces the uncertainty the consumer has in making the decision. Thus, if social information will not

reduce uncertainty, it is possible that consumers will not attempt to infer the choices of their predecessors when choosing.

The question of when and why consumers will take the time and effort to infer the cause of shelf-based scarcity is an interesting one and a more thorough investigation of this topic should be pursued in future research. This dissertation has started that process by presenting a few instances when consumers seem less concerned with social information and, consequently, are less likely to make inferences on the basis of shelf-based scarcity. Additionally, it suggested that uncertainty reduction will be a strong driver of inference formation. Aside from the need to reduce uncertainty, other potential factors influencing inference formation based on shelf-based scarcity which could be investigated include, but are not limited to (i) the visual salience of the shelf-based scarcity, (ii) the degree to which consumers are motivated to make the “best” choice, and (iii) the cognitive resources available to the consumer at the time of choice. In other words, it is likely that contextual, motivational, and cognitive factors will affect the likelihood that shelf-based scarcity will induce the inferences found here.

I'm Too Busy to Think About Shelf-Based Scarcity

The evidence presented in this dissertation overwhelmingly supports an inferential process underlying shelf-based scarcity effects. Thus, one might wonder how cognitive load or mental distractions may impact shelf-based scarcity effects. Inferential processes require cognitive resources, albeit to varying degrees across circumstances. To identify, attend to, and make inferences on the basis of shelf-based scarcity, as well as use these inferences as a basis for choice requires cognitive capacity. Thus, a distracted or

otherwise mentally occupied consumer might not be affected by shelf-based scarcity at all. Yet, the visual nature of this cue might still result in consumers being more likely to choose the scarcer alternative; although, it is equally plausible that a better-stocked product would be more salient and more likely to be chosen. It is important to understand how the availability of cognitive resources will impact shelf-based scarcity effects because consumers are regularly distracted with various aspects of life, be they screaming children (or spouses), work stress, or in-store music.

I Didn't Know I Wanted One Until...

Another interesting question is how shelf-based scarcity impacts primary demand. Recent findings have shown that stockouts can, somewhat ironically, increase primary demand (i.e., increase the likelihood the consumer makes a purchase at all; Ge, Messinger, and Li 2009). Can shelf-based scarcity have a similar effect? One reason that it might have such an effect is due to its visual nature. While shelf-based scarcity seems to operate purely through inferential processes once the consumer is in the process of choosing within a category, it is possible that the shelf-based scarcity can draw attention to the category itself. In other words, a consumer may notice a category in which they had no intention of making a purchase. More importantly, because one or more products are scarce, simply increasing the salience of a category can increase the likelihood that a purchase is made within this category (see, e.g., Frank and Massy 1970).

Alternatively, the consumer may come to wonder why some products are scarce in one category but not another. The inferences they make across categories could potentially be similar to the within-category inferences documented in this dissertation.

Sometimes, after all, all a consumer needs is a reason to make a choice (Shafir, Simonson, and Tversky 1992). If the consumer is choosing between categories that are substitutes (e.g., wine vs. beer) they may actually choose a category on the basis of shelf-based scarcity. Subsequently, perhaps, they will choose within this category on the basis of the same inferences. If such effects exist, this would mean that the true impact of shelf-based scarcity may be underestimated by this dissertation. Naturally, this would have significant implications for retailers.

Increasing Choice Confidence and Reducing Choice Deferral

It is also interesting to consider how shelf-based scarcity might impact choice confidence and choice deferral. As was suggested above, consumers may use shelf-based scarcity to help them make a choice when there is uncertainty. A cue that increases certainty could potentially also increase choice confidence. It would be worthwhile to determine if choices made from sets containing shelf-based scarcity result in more confidence in those choices. In a related direction, it would be interesting to know if choice deferral (Dhar 1997; Greenleaf and Lehmann 1995) decreases or increases when choices are made from sets including shelf-based scarcity. Extending this thinking, could shelf-based scarcity increase the number of units consumers will purchase? If shelf-based scarcity can reduce deferral or increase the number of units purchased, the impact on retailer profits could be substantial.

Individual- and Brand-Specific Differences

While shelf-based scarcity had a strong effect in the majority of the presented studies, not all participants preferred the scarcer alternatives. This certainly could have been due to measurement error, lack of participant involvement, or any number of other trivial explanations. However, it might also suggest that there is heterogeneity in consumers' responses to shelf-based scarcity, which seems a bit more reasonable and certainly more interesting. If so, one wonders if those less affected by shelf-based scarcity are in an identifiable cluster or group. Is there measureable or observable group characteristic that can predict which consumers will and will not prefer scarcer alternatives. Many potential individual differences such as the need for affiliation or the need for cognition may vary between these groups. Identifying these groups would be a worthwhile endeavor.

Similarly, one might suspect that certain types of brands would be more susceptible to losing choice share to scarcer brands. Assume a product category with three brands: (i) a well-known national brand, (ii) a recognized regional brand, and (iii) a store brand. Which of the national and store brands will lose choice share if the regional brand is relatively scarcer? One might suspect the store brand since it is less likely to have a strong following of loyal customers. However, one could also suspect that many consumers choosing the national brand are doing so only because they recognize it and that the additional scarcity cue could lure them away from the national brand and to the regional brand.

Building on this type of thinking, one could develop a taxonomy of product categories or brands based on a variety of dimensions and investigate which product categories or brand types will, and will not, yield strong shelf-based scarcity effects.

Some dimensions could relate to what the product is (e.g., old vs. new brands, high equity vs. low equity brands), while others could relate to consumer behavior patterns within specific product categories (e.g., predictable vs. unpredictable demand patterns, fast vs. slow turnover).

Currently, it is unclear what types of brands will lose choice share to scarcer alternatives, or even which characteristics differentiating brands will determine such effects. Pinpointing these characteristics and categorizing brands in a manner which aids in making such predictions is left for future research.

Taking It to the Streets: Testing the Impact of Shelf-Based Scarcity in the Field

Nothing beats the real thing. While the studies in this dissertation have gone as far as to build a simulated store in a behavioral lab and have participants make real choices from products from which they would pay for, this does not fully replicate the experience of shopping in a genuine retail environment. Thus, it would be beneficial to examine the impact of shelf-based scarcity using field experiments, secondary data, or observational techniques in the real world. In doing so, this research could more explicitly examine store busyness, shelf location within the store, and other ambient factors such as lighting and aisle width affect the impact of shelf-based scarcity on choice. Similarly, examining related issues online by pairing with companies such as Groupon or Living Social would be a fruitful direction for future research.

Chapter Summary

In closing this dissertation, this chapter has summarized the empirical findings, discussed implications of these findings, and outlined potentially fruitful directions for future work on this topic. It is my hope that future research pursues at least some of the suggested directions. The deceptively simple appearing concept of shelf-based scarcity has the potential to be a powerful tool for managers, but it first needs to be more fully understood. To reach this point, the topics listed here, and others, need to be thoroughly investigated.

Table 6.1: Results and Principal Design Elements

Study / Conditions	% Choosing Scarcer Alternative	Product Category(s)	Price	Attributes	No. of Alternatives per Category	Brand Names	Choice Type
<i>Study 3.1</i>							
White Wine	74%	Wine					
Red Wine	81%	Cheese	=	=	2	None	Hypothetical
Cheese	80%						
<i>Study 3.2^a</i>							
White Wine	VS = 54.5% SS = 29.5% NS = 15.9%						
Red Wine	VS = 53.2% SS = 34.1% NS = 13.6%	Wine	=	=	3	None	Hypothetical
<i>Study 3.3</i>							
Wine A Scarce	86%						
Wine B Scarce	59%	Wine	=	=	2	None	Hypothetical
<i>Study 4.1^b</i>							
Popular Good	WJ Scarce 4.67 WJ Abundant 3.29						
Popular Bad	WJ Scarce 2.35 WJ Abundant 4.80	Sports Jerseys	=	≠	2	None	Hypothetical
<i>Study 4.2</i>							
High NFU	Diff. Shell 38% Diff. Lining 63%						
Low NFU	Diff. Shell 79% Diff. Lining 64%	Winter Jackets	=	≠	2	None	Hypothetical
<i>Study 4.3^c</i>							
Vertical	Top 49% Middle 50% Bottom 13%						
		Wine	=	=	9	None	Hypothetical
<i>Study 4.4</i>							
High Concern	"FS" Scarce 54% "FS" Abundant 32%						
Low Concern	"FS" Scarce 78% "FS" Abundant 60%	BBQ Sauce	=	=	2	Fake	Hypothetical

Study / Conditions		% Choosing Scarcer Alternative	Product Category(s)	Price	Attributes	No. of Alternatives per Category	Brand Names	Choice Type
<i>Study 5.1</i>								
Taskell's #2	Task. Scarce	93%	Wine	=	=	2	Fake	Hypothetical
	Task. Abundant	30%						
Taskell's #5	Task. Scarce	46%						
	Task. Abundant	77%						
<i>Study 5.2^d</i>								
Scarce HQ	Abundant HQ	78%	Wine	=	≠	2	None	Hypothetical
	Abundant LQ	93%						
Scarce LQ	Abundant HQ	27%						
	Abundant LQ	84%						
<i>Study 5.3a</i>								
A Scarcer		60%	P. Towels Toil. Paper Air Fresh. Shampoo Deodorant Cleaner	=	≠	2	Real	Hypothetical
B Scarcer		63%						
<i>Study 5.3b</i>								
		64% ^e	Tth. Paste Bandages Soap Soup	≠	≠	2	Real	Real
<i>Study 5.4a^f</i>								
Sale	Mobil Scarce	77%	Motor Oil	≠	=	4	Real	Hypothetical
	Mobil Abund.	14%						
No Sale	Mobil Scarce	57%						
	Mobil Abund.	48%						
<i>Study 5.4b</i>								
Familiar Brand	Star Scarce	22%	Cola	=	=	2	Real / Fake	Hypothetical
	Star Abundant	92%						
Unfamiliar Br.	Star Scarce	54%						
	Star Abundant	78%						

^a choice shares of the very-scarce (VS), somewhat-scarce (SS), not-scarce (NS) alternatives

^b preferences were measured on a 1 (red jersey) to 7 (white jersey) scale

^c represents choice shares of scarcer alternative by vertical location when target alternative was scarcer than its competition

^d HQ = high quality, LQ = low quality

^e does not include results for the microwavable soup category where choice shares were opposite predictions

^f represents the preferences of the 183 participants without strong prior preferences

7 References

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8 Appendices

A – Study 3.4 Persuasion Awareness Stimuli

High Awareness Condition

... In fact, many consumers don't realize that the actions of retailers are affecting their choices.

Dr. Ron Amber, a noted researcher of consumer behavior, has compiled a list of tactics that retailers (e.g., electronics stores, grocery stores, etc.) use to get consumers to buy the products they want them to buy.

“Remember,” says Dr. Amber, “retailers are trying to make money. If selling a certain brand brings them greater profits, they are going to try to get their customers to buy that brand.” While some of the tactics used by retailers are not surprising, some of the items on this list might surprise you. The list is taken from Dr. Amber's book, due out in October.

1. **Sales, coupons, discounts, rebates** – This is one of the most powerful tools the retailer has at their disposal. Consumers love low prices. However, retailers prefer to not give discounts if they can avoid doing so. Also, this isn't such a bad deal for customers as they are saving money.
2. **Raise the price** – Interestingly, raising the price of a brand can increase its sales. High prices often signal quality. Many consumers hold the belief that “you get what you pay for.” Therefore, consumers can come to believe that if they want the best they need to pay the most, and this is simply not true in many cases.

3. **Put the product at the end of the aisle** – Consumers don't want to spend all day looking for products. Putting products at the end of an aisle makes them easy to find. More importantly, more consumers see these products and some consumers who didn't even plan to make a purchase will buy them.
4. **Move the product to eye level** – Similar to putting the product at the end of the aisle, putting the product at eye level on the shelf makes it easier to find and more likely to be purchased.

While the full list is much longer, Dr. Amber says that these are the top tactics that retailers use. Further research by...

Low Awareness Condition

... In fact, many consumers don't realize how many national chains are coming to small towns.

Dr. Ron Amber, a noted researcher of the retailing industry, has been tracking the spread of national chains for the past two decades.

“In the 80's and 90's many national retailers avoided smaller communities,” says Dr. Amber. “The risk was too high because many people felt like the ‘big boys’ were pushing out the mom-and-pop stores. So, if Wal-Mart would move into town, for example, many of the citizens of these towns would not only refuse to shop at the store, they would often hold rallies outside the store accusing Wal-Mart, or whatever retailer it was, of destroying small town America.”

As it turns out, consumer sentiment was not the only factor keeping major retailers out of small towns. “The infrastructure to support the massive stores so common

among these retailers was simply not available. The amount of “behind the scenes” work that goes into running one of these stores would surprise many consumers. Simply being able to get all of the systems, like the cash register system, up and running was a terribly difficult task.”

But, Dr. Amber indicates that things are changing. “The big box stores are popping up in small towns across the country, and they are being very successful. Many of the new stores in small towns are actually outperforming their older counterparts in more populated areas.”

Dr. Amber attributes this new trend to several factors. “First, it’s much easier to set up and maintain cash register, security, and employee time tracking systems. Companies that run such systems are willing to send representatives out to these locations and after the system is installed they offer online support. Further, and more importantly, these national retailers are incorporating a much larger number of local products into their assortments. This smooths over the tensions of old. Anymore, small towns are asking these retailers to come; a significant shift in attitudes, indeed.”

Dr. Amber believes the spread of national retailers will continue....

B – Additional / Unincorporated Studies

Several studies were not included in the main text for a variety of reasons. In some instances the results of the study were redundant with those of other studies. In other instance the study investigated topics that, while interesting, were somewhat tangential to the main thesis of this dissertation. However, in the interest of the academic process, these studies are included here so that they may be helpful to other researchers examining shelf-based scarcity and other retail cues.

Study AU1 – The Basics

The original study for this dissertation (AU1) tested the main hypothesis that consumers would prefer scarcer alternatives more than abundant alternatives using very basic stimuli. Additionally, as with some of the studies reported in the main text of this dissertation, open- and closed-end measures of choice reasoning were collected. The details of this study are reported here.

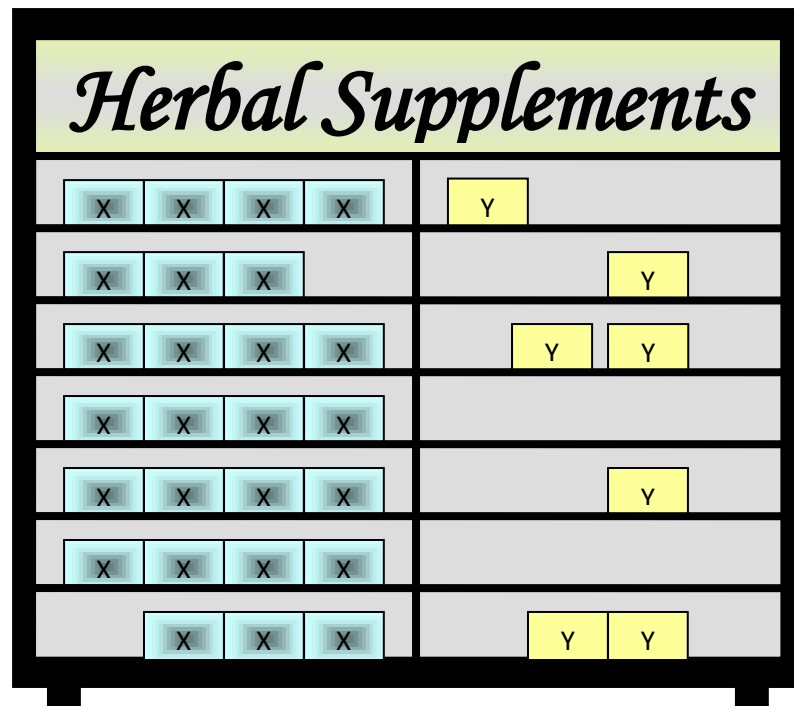
Method

Nineteen participants were recruited for this study. Participants were asked to complete a single page questionnaire at their convenience, and were not compensated for their participation.

The questionnaire asked the participants to imagine that they were sick and seeking an herbal supplement, suggested by a friend, to alleviate their symptoms. After reading the scenario, the participants were presented with a picture of a grocery store style shelving unit displaying two alternatives. The alternatives were described to the

participants as being the same general supplement recommended by their friend, with only minor differences in ingredients (these differences were not specified). For each participant, one of the alternatives was scarcer than the other. The alternative that was scarcer, as well as the side of the shelf on which it was presented, was counterbalanced between subjects. The alternatives were given generic names (brands X and Y), and presented in identical packaging, with exception of color, which was also counterbalanced (see Figure AU1-1). Further, the participants were informed that the two presented alternatives were the only available alternatives and that they were priced equally. The participants were asked to indicate which herbal supplement they would choose.

Figure AU1-1: Sample Stimulus



Once the participants had chosen a supplement, they were asked in an open-end format to indicate why they had chosen that alternative. Finally, the participants were presented with a closed-end, multiple-response question that asked them to indicate which reactions they had about the *lesser-stocked* alternative. This final measure was included to identify the types of reactions the participants had regarding the lesser-stocked alternative as well as any reactions they might have had regarding either the supplier of that alternative or the store where the alternatives were found (see Figure AU1-2). Participants were allowed to check as many of the eight options as they liked.

Figure AU1-2: Open- and Closed-End Measures

Open and Closed-End Questions used in Studies U1	
(1) Which brand would you be most likely to choose? _____	
a. Why?	

(2) For brand Y above which of the following reactions did you have? (Check all that apply)	
a. If I want this brand I need to buy it now.	69%
b. Nobody seems to buying this brand, so it must not be good.	0%
c. This brand can't be good if they can't keep it in stock.	16%
d. These must be the old leftovers and can't be good.	10%
e. This brand is well-stocked, so it must be good.	10%
f. This store does a poor job of stocking this product.	32%
g. A lot of people are buying this product, so it must be good.	79%
h. This store does a good job of stocking this product.	0%

The main dependent variable was the alternative chosen. The secondary dependent variables were the responses to the open and closed-end questions. The coding of the open-end question was determined a posteriori. Categorization of responses was

developed based on participant responses. The closed-end question was evaluated in terms of frequency of responses.

Results and Discussion

As predicted, the scarcer alternative was chosen more often ($n=15$) than the more-abundant alternative ($n=4$). That is, 79% of participants chose the scarcer alternative, which is significantly different from chance (binomial, $p < 0.05$). In the open-end question responses, 60% (9 of 15) of those choosing the scarcer alternative indicated they did so because they perceived it to be more popular. Three participants who chose the scarcer alternative indicated that they thought it was of superior quality. Two of those choosing the scarcer alternative did not respond to this question, and 3 indicated they were not sure why they had chosen the scarcer option. Of the four participants who chose the abundant option, two indicated they thought it was the better product, one did not respond to the question, and one indicated that s/he did not know why s/he had chosen the abundant option.

The results of the closed-end question appear in Figure AU1-2. Seventy-nine percent of participants indicated that they inferred that the scarcer alternative was of high quality based on the belief many people had previously selected this alternative. All participants who selected this response option had selected the scarcer product. However, as mentioned above, only 3 of the participants who chose the scarcer alternative indicated an inference of quality in the open-end question. Further, 69% of participants indicated they believed they would need to purchase the scarcer alternative immediately if they

wanted it. Once again, all participants selecting this response option came from the group of participants that selected the scarcer option.

Finally, 32% of participants indicated that they believed the store did a poor job of stocking the product. All four participants who chose the abundant alternative selected this response option as did two of those who chose the scarcer alternative.

In sum, the main hypothesis of this dissertation was clearly supported in this study. The majority of participants (79%) selected the scarcer alternative and indicated that it was more popular. The difference between the open- and closed-end questions is not shocking as it has been shown that people often find it impossible to report their own mental processes accurately (Nisbett & Wilson, 1977). Regardless, the evidence suggests that quality inferences are less salient than popularity inferences.

Study AU2 – The Role of Organization

Throughout this dissertation, scarcity was manipulated by removing units from the shelf in a random way. Accordingly, the resulting shelf appearance could be described as “disorganized.” Would the results be the same if the scarcer alternatives were organized on their shelf? Specifically, would preference for scarcer alternatives be the same if all the units of the scarcer alternative are grouped in the same area of the shelf? A two-part study, reported here, investigated this question.

Method

Participants were recruited from the online subject pool *Amazon Mechanical Turk* and paid for their participation (N = 128). Participants were screened based on location

(participation was restricted to IP addresses within the United States), prior approval rating (i.e., the percentage of prior tasks they had completed that had been “approved” by the task issuing party was 95% or greater), and age (minimum age = 21 years).

Participants were given a link to this study, which was administered on the online survey tool Qualtrics.

As mentioned, this study had two parts. Participants were randomly assigned to participate in one of the two parts. The first part of the study tested the difference between organized and unorganized scarcity following the same paradigm used throughout this dissertation; relative preference for scarcer alternatives was measured when the scarcer alternative was organized versus disorganized. Figures AU2-1 and AU2-2 show the differences between these conditions. As in many of the main studies, participants were asked to imagine that they were shopping for a wine for themselves. They then chose a wine and rated each wine in terms of perceived popularity and expected quality.

Figure AU2-1: Disorganized Scarcity Sample Stimulus



Figure AU2-2: Organized Scarcity Sample Stimulus

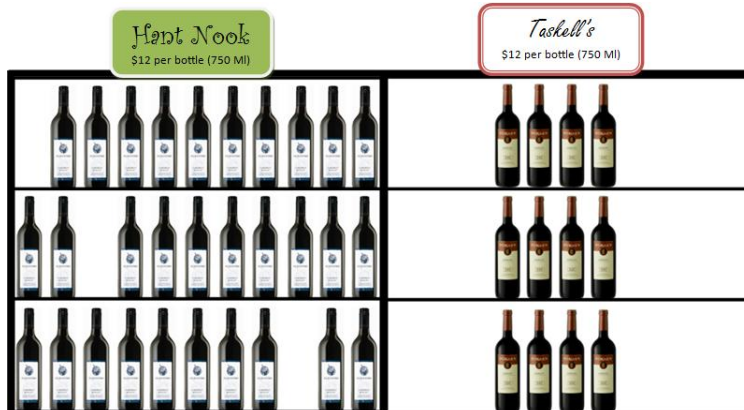


Figure AU2-3: Disorganized vs. Organized Scarcity Sample Stimulus



The second part of this study placed organized and disorganized scarcity in direct competition with each other. That is, for all participants, both of the available wines were scarce, but one was organized while the other was disorganized. This portion of the study was designed in anticipation of the possibility that the first portion might find no differences between organized and disorganized scarcity since shelf-based scarcity is a largely relative phenomenon (i.e., one product is scarcer than the other(s)) and, accordingly, differences in the impact of these two types of scarcity might not be

apparent when they are tested between subjects since one product is always scarcer.

Figure AU2-3 shows the test of differences between the two scarcity types.

Results

The analyses for both portions of this study focus on the choice shares of the Hant Nook wine. Similar to the analyses presented in the main body of this dissertation, the differences in the perceived popularity and the expected quality of the wines will be analyzed by subtracting the rating given to Taskell's from that given to Hant Nook. Thus, positive numbers indicate that Hant Nook received a relatively higher rating.

Part 1 Results. As can be seen in Table AU2-1, the choice shares of Hant Nook were strongly and positively impacted by scarcity regardless of the organization of the scarce alternative's units (i.e., type of scarcity did not have a significant effect). This was confirmed by a binary logistic regression which did find significant results for either type or scarcity or the interaction between type of scarcity and the relative scarcity of Hant Nook. However, consistent with the findings in this dissertation, a binary logistic regression found that the choice share of Hant Nook was significantly greater when it was (vs. was not) the scarcer alternative ($M_{\text{scarce}} = 74\%$ vs. $M_{\text{abundant}} = 31\%$, $\beta = 1.946$, Wald = 7.50, $p < .01$). The same pattern of results was found for the relative popularity and quality ratings. Finally, while not significant, there is an apparent attenuation of the impact of shelf-based scarcity when the scarcer alternative's units are organized. As can be seen in Table AU2-1, the positive impact of being scarce on Hant Nook's choice share is slightly less when its units were organized (41%) than when they were disorganized (45%). The difference is more apparent when comparing the relative popularity ratings

(Difference = 2.14 vs. 4.7) and the relative quality ratings (Difference = 1.31 vs. 2.1). However, even though participants did not make equally strong inferences when the scarcer units were organized, they were able to differentiate the products in terms of popularity and quality and use this information to make their decisions. Interestingly, these differences suggest that, in a head-to-head competition, scarce alternatives which are disorganized should be preferred over scarce units which are organized. This was tested in Part two of this study.

Table AU2-1: Choice and Rating Results (Part 1)

Type of Scarcity	Hant Nook Scarce?	Choice Share of Hant Nook	Popularity Rating Difference*	Quality Rating Difference*
<i>Disorganized</i>	<i>No</i>	25%	-2.65	-.90
	<i>Yes</i>	70%	2.05	1.20
<i>Organized</i>	<i>No</i>	37%	-.58	-.53
	<i>Yes</i>	78%	1.56	.78

*Rating for Hant Nook minus the rating for Taskell's on each of the ratings measures.

Part 2 Results. Recall that for the second part of this study both wines were scarce. However, the units of one wine were organized while the units of the other were disorganized. Which wine (Hant Nook vs. Taskell's) was disorganized was manipulated between subjects. Again, this analysis focuses on the choice share of Hant Nook. As can be seen in Table AU2-2, the choice share of Hant Nook was significantly higher when its units were disorganized (vs. organized; $M = 75\%$ vs. 22% , $\chi^2(1) = 14.21$, $p < .001$). Again, as in the first portion of this study, the same pattern of results was found for the relative popularity and quality ratings.

Table AU2-2: Choice and Rating Results (Part 2)

Hant Nook Organization	Choice Share of Hant Nook	Popularity Rating Difference*	Quality Rating Difference*
<i>Disorganized</i>	75%	1.46	.21
<i>Organized</i>	22%	-.67	-.30

*Rating for Hant Nook minus the rating for Taskell's on each of the ratings measures.

Discussion

Study AU2 found that when only one product is scarce it matters little whether or not the units of the scarce alternative are organized or disorganized; people strongly prefer scarcer alternatives in both scenarios. However, in situations where the scarcity levels of the alternatives are equal, consumers strongly prefer alternatives which are disorganized to alternatives which are organized, perhaps because they see the scarcity as “natural” in the disorganized case and “by design” in the organized case. This suggests that shelf-based scarcity might have a much stronger impact on preferences when the units of the scarce alternative are disorganized. Further, the evidence suggests that disorganized scarcity might have a stronger impact on preferences because it elicits much stronger inferences regarding relative popularity and quality.

Study AU3 – Allotted Shelf-Space: A Popularity Cue from the Retailer?

It is quite common for the different brands in a product category to have varying amounts of allotted shelf space; some will have more slots than others. However, all the brands/alternatives in all of the studies reported in this dissertation were allotted equal shelf space. Since the amount of shelf space allotted to a brand can also serve as a

popularity cue, it is interesting to consider how varying shelf-space allocations will impact shelf-based scarcity's impact on preference. An early study, reported here, investigated this topic.

Method

Ninety-two graduate and undergraduate students were recruited at a large east coast university and paid for their participation. Similar to studies presented in the main text, participants were asked to imagine that they were shopping for wine in a Napa Valley. They were then shown a shelf similar to that presented in Figure AU3-1. One wine was allotted twice as much shelf-space (the “more shelf-space” wine; hereafter, MS) as the other (the “less shelf-space” wine; hereafter, LS).

Figure AU3-1: Sample Stimulus with Varying Allotted Shelf Space



The scarcity level of each wine was manipulated to create a 2 (MS: full vs. scarce) x 2 (LS: full vs. scarce) between-subjects design. When scarce, the stocking levels of the respective wines were reduced by 50%, thereby creating half-empty shelves. The participants were told that the wines were the same volume and price. Participants first chose a wine and then completed the same open- and closed-end measures found in Study AU1. It was expected that when the relative scarcity of the alternatives was equal participants would be more likely to choose the one with more shelf facings (MS), believing it to be the more popular alternative.

Results

Contrary to expectations, when both wines were fully stocked, the LS was preferred more than the MS (62% vs. 38%; Table AU2-3), although not significantly different from chance ($\chi^2(1) = 1.50, p > .20$). In other words, the participants preferred the “objectively” scarcer wine. This unexpected finding, may be due to the use of wine as the target product category. Perhaps the participants believed that the LS was a more rare vintage of wine and, therefore, of higher quality. It is unlikely that this would have been the result had the target product category been a more mundane category such as soft drinks or cat litter.

Interestingly, however, when both wines were depleted by 50% (i.e., both were “scarce”), the choice share of the MS wine jumped to 52% and, thus, was preferred equally to the LS. Perhaps this is because the shelf-based scarcity signaled that each wine was popular with the local population. As can also be seen in upper-right and bottom-left quadrants of Table AU3-1, when either wine was scarcer than the other, this wine was

significantly preferred over the abundant wine (both p 's < .05). Thus, it seems that the impact of shelf-based scarcity outweighed that of allotted shelf space on preferences. It was only under circumstances in which there was no shelf-based scarcity that allotted shelf-space played any role at all, and its effect was opposite of that which was expected. In fact, a binary logistic regression found that the only significant predictor the MS wine's choice share was the relative scarcity of the MS wine ($M_{\text{scarce}} = 68\%$ vs. $M_{\text{abundant}} = 31\%$, $\beta = 2.357$, Wald = 10.56, $p < .01$).

Table AU3-1: Choice Share of MS

		Less Shelf-Space Wine	
		Scarce	Abundant
More Shelf-Space Wine	Scarce	52%	86%
	Abundant	24%	38%

Regarding the open-ended measure, of those who chose the MS when it was scarcer, 79% indicated they had done so because they believed that alternative was more popular. Likewise, of those who chose the LS when it was scarcer, 81% indicated they had done so based on a popularity inference. In both of these “unbalanced scarcity” conditions, no participant that chose the abundant alternative indicated they had done so based on an inference of popularity, even when they selected the MS. In other words, popularity inferences followed relative scarcity levels and not the shelf-space cue. Interestingly, when the MS and LS were equally stocked (either both scarce or both full), participants did tend to indicate they had selected the MS on the basis of a popularity

inference (38% and 56%, respectively). This suggests that while the shelf-space cue can lead to popularity inferences, it is overpowered by shelf-based scarcity.

Discussion

Allotted shelf space is a cue consumers could use to infer the relative popularity of the alternatives and base their choices on. However, despite weak evidence suggesting that the participants believed the wine with more shelf space was more popular, this did not result in this option being chosen more frequently. As noted, this may be a consequence of using wine as the target category. In sum, the evidence suggests that shelf-based scarcity has a much stronger impact on consumer preferences than relative shelf space.

Study AU4 – Learning from Shelf-Based Scarcity

This dissertation shows that shelf-based scarcity can have a significant impact on immediate choice. But, can shelf-based scarcity also have lasting effects on consumers' preferences? Certainly, affecting one choice has the potential to impact subsequent choices, particularly if the initial choice induced a product trial or brand switching. Such events can lead the consumer to establish preferences if they have not already been formed or can change preferences that are not strongly held. Yet, shelf-based scarcity could potentially impact future preferences independent of its impact on the immediate choice.

More specifically, shelf-based scarcity could be used as a cue to aid in the interpretation of other cues in the environment. For example, were one unsure whether

higher or lower scores on a specific scale are more appealing, but found that the item with the lower score was scarcer, one might interpret this as suggesting that lower scores are better. Similarly, one may be unsure how valuable additional points on an apparent quality scale are (i.e., how much more should I pay for a wine rated 90 vs. 80?), but may determine which of several options represents the best tradeoff between this rating and price by finding the scarcest alternative. Study AU4 examined the role shelf-based scarcity plays when consumers attempt to interpret ambiguous retail cues.

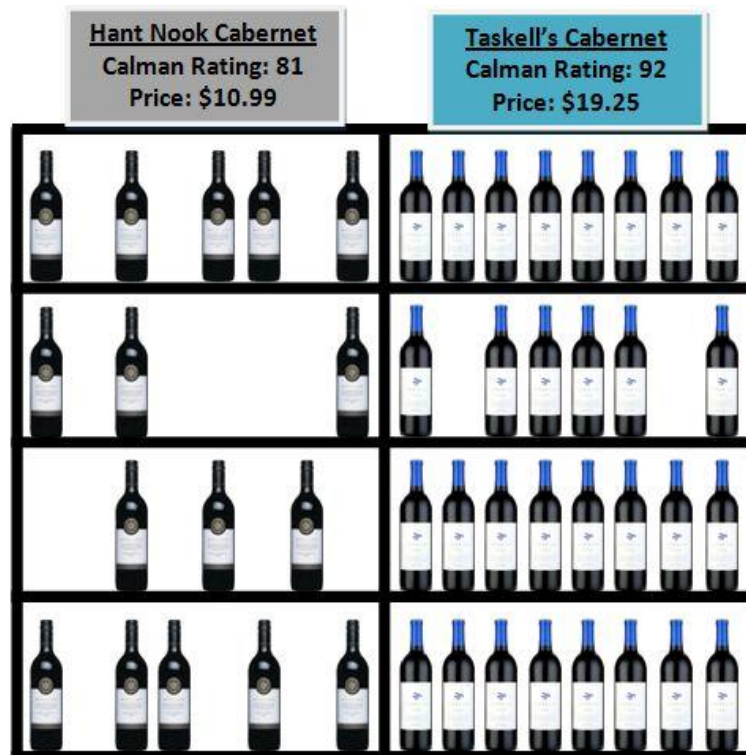
Method

Sixty-six participants were recruited from the online subject pool *Amazon Mechanical Turk* and paid for their participation. Participants were screened based on location (participation was restricted to IP addresses within the United States), prior approval rating (i.e., the percentage of prior tasks they had completed that had been “approved” by the task issuing party was 95% or greater), and age (minimum age = 21 years). Participants were given a link to this study, which was administered on the online survey tool Qualtrics.

Participants were asked to imagine that they were shopping for a wine for themselves in Napa Valley. Upon entering a local bodega, they found a shelf similar to that presented in Figure AU4-1, which contained two local wines. Each wine was labeled with a price and a “Calman” rating (hereafter CR). The CR is a fictitious rating created for the purpose of this study; participants were not told how to interpret this scale. However, the CR was positively correlated with price, suggesting that it might represent some measure of quality. Taskell’s was always the higher-priced/higher-rated wine (Price

= \$19.25, Calman rating = 92) and Hant Nook was always the lower-priced/lower-rated wine (Price = \$10.99, Calman rating = 81). The relative scarcity of these wines was manipulated between subjects; half found Taskell's to be scarcer and half found Hant Nook to be scarcer.

Figure AU4-1: Sample Stimulus with Price and Calman Rating Labels



The participants' first task was to indicate which of these two wines they would choose. After choosing a wine, the wine shelf was removed from view and the participants were asked to imagine that they agreed to complete a short survey for the bodega while the cashier rang up their purchase. This survey explained that the bodega was planning to add a new wine to their lineup and that this wine would have a CR of 86 (this rating was intentionally selected to fall near the midpoint between the two CRs of

the wines on the previously viewed shelf). The participants were then asked to indicate how much they would be willing to pay for a wine with an 86 CR. On the next screen, they were asked to indicate the maximum and minimum prices they would expect to pay for a wine with an 86 CR. Willingness to pay and maximum and minimum expected prices were collected on scales ranging from \$11 to \$19 (i.e., prices between the prices of the wines in the initial choice set). It is interesting to note that if participants assumed that there was a linear relationship between CR and price, the ratings and prices of the wines they had chosen from would suggest that the price for a wine with an 86 CR should cost approximately \$14.74. Finally, the participants were shown the shelf from which they had previously selected a wine and were asked to rate both wines in terms of perceived popularity and expected quality on the same 7-point scales used throughout this dissertation.

The main dependent variables of this study were the participants' willingness to pay for the 86 CR wine and the maximum and minimum prices they would expect for this wine. By comparing participants' willingness to pay for the 86 CR wine, we can determine the importance that participants assign to the CR, relative to price. The main prediction was that, since the participants should infer that the scarcer alternative is more popular, finding the higher-priced/higher-rated [lower-priced/lower-rated] wine to be scarcer should suggest that the majority of customers who have preceded them have [not] been willing to pay more [less] for the higher CR, indicating that CR was more [less] important to them than price when they chose. Since the participants have no objective information about the value of any given CR, this "information" should lead them to value [devalue] the CR and, accordingly, be willing to pay relatively more [less] for the

86 CR wine. Further, a similar pattern of responses should also be found for the maximum and minimum expected prices as well.

Of course, this prediction may be valid only within the attribute ranges provided to the participants. This was the main reason that the target wine for the dependent measures was given a CR of 86, which fell between the ratings of the two wines from which they had previously selected.

Results

The results were as expected (see Table AU4-1). The participants' willingness to pay for the 86 CR wine was significantly lower when Hant Nook (the lower-priced/lower-rated wine) was the scarcer wine than when Taskell's (the higher-priced/higher-rated wine) was the scarcer wine ($M = \$13.53$ vs. $\$14.94$, $F(1, 64) = 7.01$, $p < .01$). The participants' maximum expected price for an 86 CR wine followed the same pattern ($M = \$15.18$ vs. $\$16.38$, $F(1, 64) = 6.63$, $p < .05$), as did their minimum expected price, though the difference was not significant for this measure ($M = \$12.91$ vs. $\$12.12$, $F(1, 64) = 3.06$, $p < .10$). The lower significance of this final measure may be due to a floor effect created by the scale measure being truncated at \$11.

Importantly, the choice, relative popularity, and relative quality results replicate those found in the main studies of this dissertation. Participants preferred Taskell's significantly more when it was the scarcer (vs. abundant) wine (63% vs. 21%, $\chi^2(1) = 11.98$, $p < .001$) and felt it to be both more relatively more popular ($M = 2.66$ vs. -1.94 , $F(1, 64) = 88.81$, $p < .001$) and of relatively higher quality ($M = 1.84$ vs. $.85$, $F(1, 64) = 13.54$, $p < .001$). Interestingly, regardless of which wine was scarcer, participants

consistently believed that Taskell's was of higher quality. This is likely a function of two factors: (i) Taskell's was always the higher priced wine, which probably induced inferences of higher quality, and (ii) Taskell's always had the higher CR, and participants likely inferred that this was a signal of higher quality. Perhaps even more interesting is the fact that shelf-based scarcity still played a significant role in choice despite obvious and significant differences in price. This further demonstrates the robustness shelf-based scarcity effects.

Table AU4-1: Results by Scarcity Condition

DV	The Scarcer Wine	
	Hant Nook (Low \$ / Low CR)	Taskell's (High \$ / High CR)
WTP for 86 CR	\$13.53	\$14.94
Max Price expected for 86 CR	\$15.18	\$16.38
Min Price expected for 86 CR	\$12.91	\$12.12
Choice Share of Taskell's	21%	63%
Relative Popularity (Taskell's – Hant Nook rating)	-1.94	2.66
Relative Quality (Taskell's – Hant Nook rating)	.85	1.84

Discussion

Study AU4 examined if shelf-based scarcity can have lasting effects on consumers' preferences. As expected, it was found that participants used shelf-based

scarcity to interpret the value of an unfamiliar rating scale (the Calman scale).

Participants were willing to pay more [less] for the 86 CR wine when the shelf-based scarcity suggested that more customers had chosen the higher-priced/higher-rated [lower-priced/lower-rate] wine. These results suggest that the impact of shelf-based scarcity may be more widespread than originally thought.

C – Unsuccessful Studies and/or Manipulations

As with all research, not every attempt made in the pursuit of investigating shelf-based scarcity was successful. These unsuccessful studies and manipulations are briefly described in the following list for the benefit of future work in this area.

(1) *Manipulated Context: Store Appearance (N = 109)* – it was expected that the perceived diagnosticity of shelf-based scarcity (i.e., the degree to which it was perceived to accurately reflect the choices of preceding customers) would be reduced when this cue was ubiquitous. In other words, if most of the store is poorly-stocked, then one might not believe that a specific scarce product is necessarily more popular than any other product in the same category. In fact, it would seem more reasonable to assume that the store simply does a poor job of stocking in general. This hypothesis was tested by telling participants in one study that the entire store was either (i) well-stocked, like normal, or (ii) poorly-stocked, like normal. However, this manipulation played no role and participants strongly preferred scarcer alternatives regardless of the store description.

(2) *Manipulated Context: Reference Population (N = 139)* – Since consumers consistently infer that scarcer products are more popular, one might expect that it would matter with whom these products are popular. Specifically, consumers should be more [less] likely, in general, to choose a scarce product if they believe it is popular with their in-group [out-group]. To test this hypothesis, participants were asked to imagine they were shopping for a shirt and that they had found two shirts in

a local store which they felt were acceptable. They were then told that the store was popular with either their (self-identified) in-group or out-group. In-groups [out-groups] were determined by asking participants to identify the gender and age groups in the own communities which they felt had fashion tastes most [least] similar to their own. It was expected that scarcer alternatives found in stores popular with in-groups [out-groups] would be more [less] preferred. This, however, did not occur. Once again, scarcer products were preferred regardless of condition, but to a lesser degree than in many of the studies reported in this dissertation. Ultimately, this null result (and the weak shelf-based scarcity related results) may be due to the use of an identity relevant product category. It is well-known that preferences for conspicuously consumed, identity relevant goods can be dramatically affected by any number of factors. Accordingly, it unclear whether the lack of a finding here was due to the chosen product category or because consumers fail to incorporate relevant population information when using shelf-based scarcity as a choice cue.

- (3) *Stand Alone Presentations (N=60)* – One question of interest was whether or not shelf-based scarcity can affect preferences in the absence of a comparison product/alternative. In other words, will shelf-based scarcity impact preferences (specifically, likelihood of purchase) if there is only one product under consideration. In such instances, this alternative is not “scarcer” than any other product because it is the only available alternative. Yet, there will still be the obvious empty slot cue. Thus, it was expected, but not found, that the likelihood of purchasing a product would increase as the scarcity of the product increased.