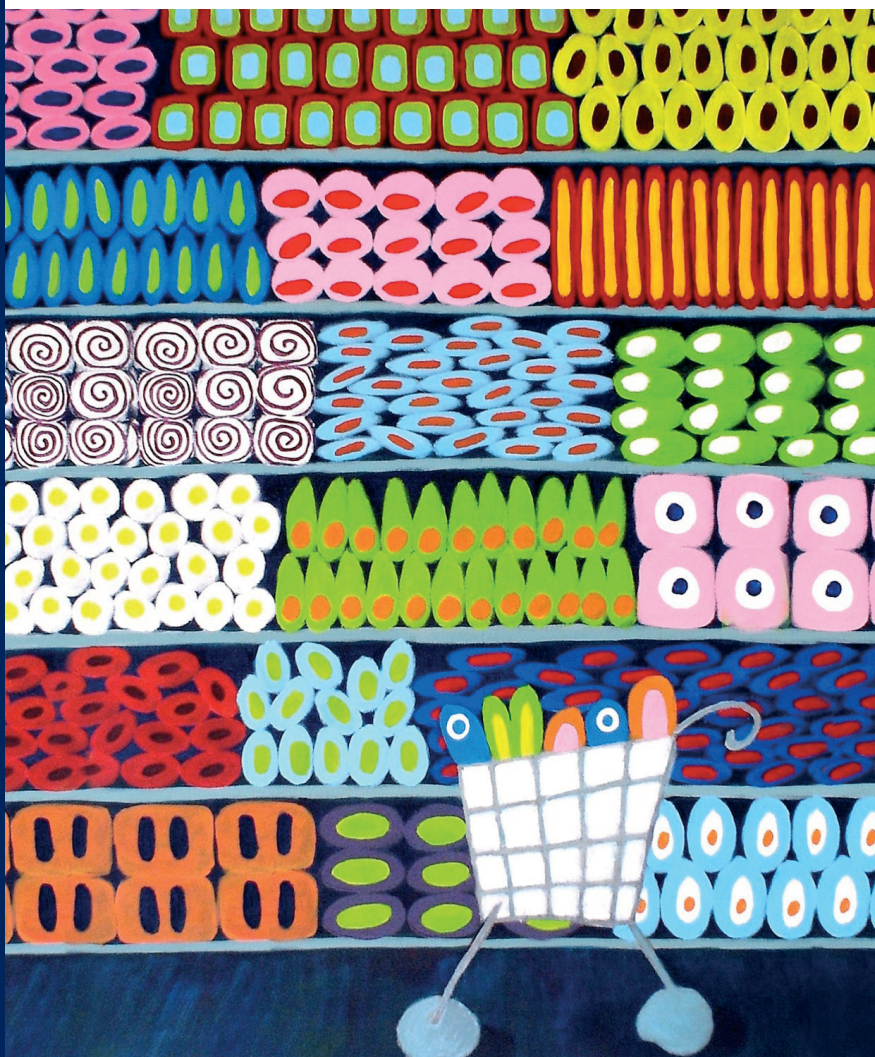
ELINE DE VRIES-VAN KETEL

How Assortment Variety Affects Assortment Attractiveness

A Consumer Perspective



How Assortment Variety Affects Assortment Attractiveness: A Consumer Perspective

How Assortment Variety Affects Assortment Attractiveness: A Consumer Perspective

Hoe variëteit in assortimenten de aantrekkelijkheid van assortimenten beïnvloedt: een consumentenperspectief

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Variety can be found all over. Life offers you an abundance of choices every day. I chose to write this thesis. The thesis deals with a consumer perspective on variety in retail assortments – a hot topic nowadays. Since everyone is a consumer, the issue is easy to explain. At the same time, everyone seems to have an explicit opinion on the topic. I hope this research will bring more understanding of when, why, and to what extent consumers actually find variety in assortments attractive. Before turning to the introduction of this thesis, I would like to express my gratitude to the variety of people who have been very important to me in writing this thesis.

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1 Introduction

1.1 Introduction

Nowadays, variety is abundant in many different areas. Over and over again, people have to choose from huge amounts of possibilities. In almost every sphere of life, people are overwhelmed by the necessity of picking their preferred solution from a vast and growing number of alternatives, which according to some people can even have a detrimental effect on our psychological and emotional well-being (Schwartz 2004). Matters to decide on range from fundamental issues to daily groceries. Fundamental questions involve: What kind of career will I aim at? Where will I live? For each answer ample possibilities are at hand. A profusion of choices is also available for somewhat less crucial, but potentially consequential issues such as selecting a retirement pension plan or a holiday destination. At the other end of the spectrum, consumers daily face an immense variety of options to choose from. Dutch supermarkets carry up to 20,000 products on average (Oosterhout 2005). They offer, for instance, huge amounts of different detergents, soft drinks, yogurts, vegetables, and jars of jam.

More variety can be beneficial to consumers, as prior research has clearly shown (e.g., Oppewal and Koelemeijer 2005). As variety enlarges a consumer's chance for a successful shopping trip (Baumol and Ide 1956), it is supposed to attract potential buyers to a store. Hence, for long, the conventional wisdom among retailers has been that 'more variety is better' (Boatwright and Nunes 2001). Retailers want to appeal to a heterogeneous group of customers, optimally suiting them all. Thus, variety in their assortments is a key asset for retailers.

However, do consumers actually value the high variety presented to them for all the choices they have to make, even for repetitive decisions on daily groceries? Though variety is appealing to people, a wide variety of options has also been suggested to lower consumer well-being (Desmeules 2002). Variety can cause stress and unhappiness (Schwartz 2004). The knowledge that an immense array of options is open can reduce a consumer's motivation to purchase a product out of fear for later regret (Iyengar and Lepper 2000). Considering this, is it truly a wise strategy of retailers to offer such vast quantities of products and services? Do consumers actually want to choose from a huge variety of options each time they purchase a product or service?

Retailers currently seem to realize that there are limits to how much variety consumers want to be confronted with. They recognize that consumers do not want to be continuously overloaded with a myriad of products (Baltezen 2004;

Gottfredson and Aspinall 2005; Segaar 2002). This view is to some extent affirmed by the immense success of discount stores such as Aldi and Lidl in Europe. Although consumers visit these stores mainly because of the low discount prices, judging from the increasing market shares of both stores consumers do not seem to mind their limited assortments. From a retailer's perspective, providing high variety in many product categories is expensive. It heightens not only inventory handling, delivery, and merchandise presentation costs (Smith and Agrawal 2000), but also purchasing costs due to lower average volumes and administration costs. Despite these higher retail expenses of carrying a great deal of variety, most retailers are still not keen on cutting down on the variety levels they offer for fear of losing customers (Boatwright and Nunes 2001; Kahn and Ratner 2005).

As a result of the contrasting effects of variety, many retailers are struggling to find levels of variety that are most appealing to consumers. Director of Schuitema (parent company of grocery store C1000), René Bakker, states, for example, that C1000 offers much less choice in its assortment than its competitor Albert Heijn: 'Should you offer twenty different types of strawberry jam or just three? Too much is just too much of a good thing' (Segaar 2002). In accordance with this, director Eduard Buitelaar informs about Edah Lekker & Laag: 'We don't need seven types of apricot jam. We offer one national brand of apricot jam and one private label - that is enough' (Baltezen 2004). Even Anders Moberg, CEO of service supermarket chain Ahold, says: 'I think we should offer more alternatives than our competitors do, but let's not overdo it'. He claims that shelves can become overcrowded. 'It is all about balance in the assortment' (Distrifood 2003). Apparently, retailers are aware that more variety is not always more alluring to consumers. Though what does make up an attractive level of variety is not yet exactly clear.

It is necessary to reach a better understanding of how variety makes an assortment attractive to consumers. Detailed insights into the effects of assortment variety can help retailers in further optimizing their assortments. Both manufacturers and retailers could benefit from such knowledge (Bucklin and Gupta 1999). This thesis aims at developing an understanding of the effects of variety. To what extent is more variety more appealing to consumers and why? How can we explain the impact of variety on the attractiveness of an assortment? The objective of this thesis is to provide insights into the relationship between the

amount of variety in a retailer's assortment and how attractive the assortment is from a consumer's point of view.

1.2 Research framework and research questions

The term 'assortment' has been used in numerous meanings and can refer to many different concepts (Van Herpen 2001). Examples are 'the combination of all products made available in a store' and 'a set of products offered within a product category'. In this thesis, we concentrate on assortments at the product category level, such as an assortment of jars of jam. These products form a set because they share similar physical characteristics (Van Herpen 2001). Henceforth, we define assortment as a set of products offered within a product category. Each assortment carries a certain level of variety. Variety can be reflected by different characteristics, such as the number of different products, the amount of shelf space, or the attribute pattern of the products (Broniarczyk, Hoyer, and McAlister 1998; Van Herpen and Pieters 2002). In this thesis, we concentrate on two important aspects of variety, namely the size and the composition of an assortment. More specifically, the focus is on (1) the number of different products in an assortment ('assortment size') and (2) the availability of the favorite product of a consumer. The rationale for selecting these specific characteristics of variety is discussed in Chapter 3.

In this thesis, we strive for a better understanding of whether and why consumers value variety in an assortment. We therefore study how variety in a retailer's assortment affects the attractiveness of the assortment from a consumer perspective. Assortment attractiveness refers to how appealing an assortment is to a consumer and has been identified as an important dependent variable in previous research (e.g., Oppewal and Koelemeijer 2005). Consequently, the main research question of this thesis is:

How does assortment variety affect assortment attractiveness?

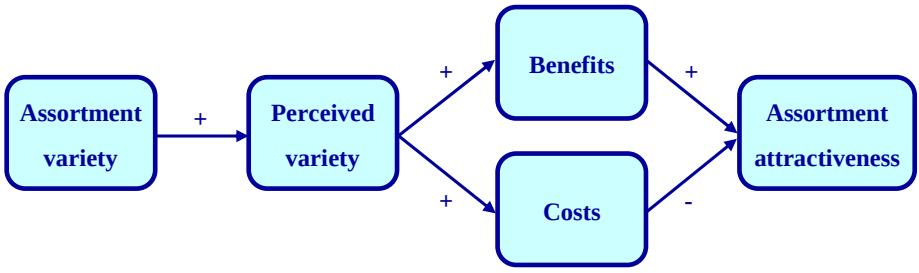
We propose that this overall relationship can be explained by an underlying process as reflected in Figure 1.1 in a condensed research framework. The starting point of this research framework is the level of variety that is offered in an assortment (assortment variety). The objective level of assortment variety can differ from subjective consumer perceptions of variety (Kahn 1998). In

general, perceived variety will be higher in an assortment that offers more objective assortment variety (Hoch, Bradlow, and Wansink 1999). Consumers welcome perceiving more variety since it brings them numerous benefits. One important benefit is for instance the chance of a perfect match between what you want and what an assortment offers. This chance will be higher if an assortment offers more products (Baumol and Ide 1956). However, higher perceptions of variety are not only beneficial, they also create costs for consumers, as retailers have started to recognize. For example, consumers can feel overloaded with information when confronted with high variety (Huffman and Kahn 1998). We propose that consumers make a trade-off between the benefits and costs of variety, which determines how attractive an assortment is to them (assortment attractiveness). We intend to obtain a better understanding of this underlying process of the relationship between assortment variety and assortment attractiveness, in particularly by studying in detail the separate benefits and costs of variety. Hence, we put forward the following more specific research questions:

(1) How can the relationship between assortment variety and assortment attractiveness be explained by consumer perceptions of variety?

(2) How can the relationship between assortment variety and assortment attractiveness be explained by the benefits and costs that variety brings to consumers?

Figure 1.1 Research framework (condensed)



As the variety offered in an assortment increases, the task of choosing a product becomes more complex. Thus, variety is a source of task complexity.

When choosing from an assortment, task complexity could also be caused by more attributes on which the products in an assortment differ or by feelings of time pressure (Payne, Bettman, and Johnson 1993). In more general terms, a choice task can become more complex not only due to variety as such, but also as a result of (1) the level of complexity of the products in an assortment or (2) the situation the consumer finds him-/herself in. We will refer to the latter two sources of task complexity as assortment-inherent and situation-specific task complexity, respectively. It is crucial to find out to what extent the research framework depicted in Figure 1.1 holds across the different sources of task complexity. Task complexity will enlarge the costs of variety, which will in turn influence the attractiveness of an assortment. Two sources of task complexity are investigated in this thesis: product complexity, which is assortment-inherent, and time pressure, which is situation-specific. We intend to examine how these two frequently encountered sources of task complexity influence the relationship between assortment variety and assortment attractiveness. This brings us to the following two more specific research questions:

(3) What is the role of product complexity in the relationship between assortment variety and assortment attractiveness?

(4) What is the role of time pressure in the relationship between assortment variety and assortment attractiveness?

The main research question as well as the four more specific research questions are addressed in three different studies. The research method in each of these studies is a laboratory experiment.

Study 1. In the first study, we focus on the main research question as well as the first two specific research questions. Thus, we examine how assortment variety affects the attractiveness of an assortment, while we also investigate the underlying process of this relationship. In a laboratory experiment the impact of a wide range of assortment sizes (5 to 65 products) is tested for assortments of simple grocery products, i.e., jam and potato chips. The experiment was preceded by an extensive pilot test (N = 130) in which the measurement scales and experimental procedure were tested. Results of the subsequent laboratory experiment (N = 156) provide tentative support for an inverted U-shape relationship between the size of an assortment and its attractiveness. Further,

Study 1 demonstrates a key role for consumer perceptions of variety, for several benefits of variety, and for one cost of variety (i.e., lack of overview) in explaining the impact of assortment variety on the attractiveness of an assortment. The results point out that although multiple costs of variety emerge for simple products, they are all rather low and most of them do not strongly influence assortment attractiveness. In this thesis, assortment variety is captured by assortment size and the availability of the favorite product. Assortment size actually reflects two related aspects, namely the number of stockkeeping units (SKUs) and shelf space. As an extension to the previous study, an additional experiment (N = 196) was conducted that disentangled the effects of these two aspects by changing the number of facings per SKU while shelf space was kept constant. This experiment demonstrates that the results described above are mainly driven by the number of different SKUs and not by the amount of shelf space an assortment occupies.

Study 2. Surprised by the relatively limited influence of the costs of variety on assortment attractiveness in Study 1, we decided to examine the effects of assortment variety in a situation that is likely to generate higher costs of variety. Therefore, in Study 2 we investigate the role of product complexity in the relationship between assortment variety and assortment attractiveness, thus dealing with the main research question and the first three specific research questions. Compared to choosing a simple product, selecting a complex product, such as a digital camera, will normally involve more input from the consumer. The task is more complex, because generally a much higher number of attributes is taken into account (Burnham, Frels, and Mahajan 2003). Potentially, variety is less appreciated if the consumer is already facing the difficult task of selecting a complex product. This was examined in a comparable experiment as in Study 1 with complex products as stimuli (N = 288), namely digital cameras and laptops. The findings show that the costs of variety are indeed higher for more complex products. In addition, an increase in the size of an assortment of complex products does not appear to make the assortment more (or less) attractive: no inverted U-shape between assortment size and assortment attractiveness was detected. Study 2 further provides the important results that the basic underlying process of the relationship between assortment variety and assortment attractiveness is similar across different levels of product complexity in that the overall effect is mediated by perceptions of variety, some benefits and few costs of variety. One relevant difference in the underlying process is the role of potential regret in assortments of

complex products. The fear of later regretting your choice makes an assortment of complex products less attractive.

Study 3. Apart from the type of products in an assortment, the situation a consumer is in can also make the choice task more difficult. The third study examines the role of a situation-specific source of task complexity, i.e., time pressure, in the relationship between assortment variety and assortment attractiveness and hence gives an answer to the fourth specific research question. Many consumers are familiar with the experience of a hurried shopping trip (Dhar and Nowlis 1999). The same level of variety has to be processed in a smaller amount of time, which makes choosing a product from a large choice set more complex. Thus, it is important to see whether high variety is still appreciated by consumers when they buy their groceries under time pressure. The results of a laboratory experiment with simple grocery products (N = 155) illustrate that feelings of time pressure directly enlarge several costs of variety. We find that, as a result of higher costs and lower benefits of variety, a highly varied assortment is less attractive if the consumer experiences higher feelings of time pressure, implying that less variety might already suffice.

1.3 Contribution

The scientific contribution of this thesis is threefold. One crucial contribution is that we are the first to empirically study the process underlying the relationship between assortment variety and assortment attractiveness in full detail. In particular, we examine the differential importance of the various benefits and costs of variety. Whereas previous research identified a number of benefits and costs that result from variety (e.g., Gourville and Soman 2005; Van Herpen 2001), we set out to study *which* of these benefits and costs are most important in influencing the attractiveness of an assortment. By studying multiple relevant benefits and costs of variety, we assess their relative importance. These insights are required in order to clarify the underlying mechanism that explains how assortment variety affects assortment attractiveness and to come up with more specific implications for retailers.

The second contribution of this thesis is that we explore potential nonlinear relationships. Whereas previous experimental work on the effects of assortment variety mainly manipulated the size of an assortment at two levels (e.g., Iyengar and Lepper 2000), we allow assortment size to vary at a much wider

range. This enables us to investigate whether larger assortments are increasingly more attractive, or whether the attractiveness decreases again after a certain assortment size. The existence of such an inverted U-shape has often been suggested in the literature (e.g., Desmeules 2002; Dhar, Hoch, and Kumar 2001), though not yet empirically demonstrated. We do study these potential nonlinear effects.

Finally, we investigate the generalizability of the relationship between assortment variety and assortment attractiveness across both different types of assortments and different buying situations. First, we reveal the moderating impact of product complexity on the effect of assortment variety on assortment evaluations. In doing so, we extend recent research that addressed this moderating role of product complexity on the relationship between assortment size and choice likelihood (Gourville and Soman 2005). Moreover, we investigate whether the same benefits and costs of variety are critical for simple products as for complex products. Second, we are the first to uncover the impact of feelings of time pressure on the benefits and costs of variety as well as on assortment evaluations when a consumer is confronted with a high level of variety. We thus follow up on previous research on how consumers react to and cope with time pressure when they choose from an assortment (Dhar and Nowlis 1999; Pieters and Warlop 1999).

1.4 Outline of the thesis

The next chapter surveys existing literature on the effects of assortment variety. It identifies what is already known about the relationship between assortment variety and assortment attractiveness and what needs more investigation. In Chapter 3, we develop the theoretical research framework on this relationship. The condensed research framework introduced in Figure 1.1 is discussed in full detail.

The next chapters are empirical in nature. Chapter 4 presents Study 1 and focuses on the effects of variety in assortments of simple products. In Chapter 5, Study 2 on assortments of more complex products is addressed. In Chapter 6, we report Study 3 in which the role of time pressure regarding variety in assortments of simple products is examined.

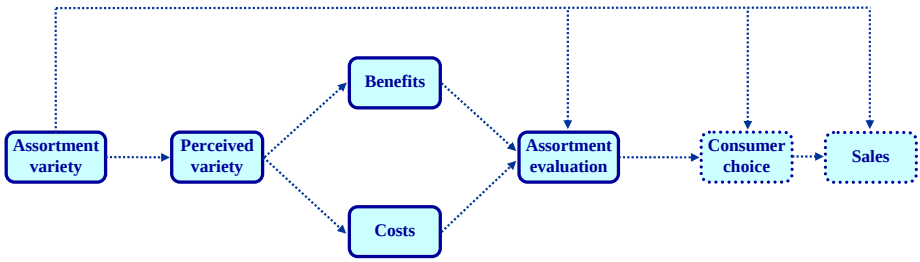
The final chapter discusses the main findings of these three studies as well as their scientific contribution. We also provide managerial implications and suggestions for future research.

2 Literature Review

2.1 Introduction

This chapter reviews the existing literature on the relationship between assortment variety and assortment attractiveness. The basis for our discussion is provided in Figure 2.1. It displays the condensed research framework presented in the previous chapter plus consumer choice from an assortment and sales. Studies on these two variables are included in our literature review, because they provide relevant insights into the effects of assortment variety and into the process through which assortment variety affects these variables. In this chapter, we discuss what previous studies have found on the relationships between the variables shown in Figure 2.1 and what knowledge is still lacking. In doing so, we identify the gap in the literature and define the contribution of our study.

Figure 2.1 What is known about the effects of assortment variety?



Variety has been captured in many different ways and on different levels. It has for instance been reflected by the number of product categories (e.g., Bhatnagar and Ratchford 2004) and by the number of stockkeeping units (SKUs) (e.g., Dhar et al. 2001). Further, the most commonly used levels on which variety has been measured are the store level (e.g., Brynjolfsson, Hu, and Smith 2003) and the product category level (e.g., Dhar et al. 2001). Though in this thesis we study two aspects of variety at the product category level, i.e., assortment size and the availability of a favorite product, existing insights into other aspects of variety and at other levels are also relevant to consider in this respect and hence will be discussed in this chapter.

The structure of this chapter as follows. We start with reviewing the overall effects of variety on consumer choice and sales in Section 2.2. Next, we

investigate these relationships more deeply by looking at the underlying psychological process. Step-by-step, we examine consumer assortment evaluations (Section 2.3), variety perceptions (Section 2.4), and benefits and costs of variety (Section 2.5). The final section provides the conclusion. Based on our review of the existing literature on assortment variety we identify a set of interesting research issues.

2.2 The effects of assortment variety on consumer choice and sales

Are consumers more likely to choose from a more varied assortment? Does variety in an assortment have a positive impact on sales or related variables, such as shopping frequency? Many studies are available on the effects of variety in an assortment on such objective outcomes. The studies that are discussed in this section provide findings on objective effects of variety, without explaining these findings on the basis of perceived variety or benefits and costs that variety can bring. The subsections are organized based on the level at which variety is studied, i.e., retail center/store level versus product category level, and the type of effects, namely consumer choice versus sales and sales related variables, such as shopping frequency. In some of the articles the level at which variety is studied, overlaps between the store and product category level. An example is a flower store (e.g., Oppewal and Koelemeijer 2005), where the store consists of only one product category. These studies are discussed with the ones at the store level, which is also the level the specific studies refer to.

The next subsection investigates the effect of variety at the retail center and store level on consumer choice. It shows that variety at the retail center or store level attracts customers. Store sales also increase with variety at the store level in most studies (Subsection 2.2.2). Variety in a product category can have an impact on consumer choice, namely on the likelihood that a consumer chooses from a product category (Subsection 2.2.3). The final subsection shows that the effect of variety at the product category level on sales depends on the role of the product category and on which products are added or removed.

2.2.1 The effects of variety on retail center and store choice

Table 2.1 displays a summary of studies that have investigated the impact of variety offered at a retail center, at a store format (e.g., a supermarket or a

hypermarket), or at a store on consumer choice. Most of these studies collected data by means of a survey. Overall, the studies clearly demonstrate that variety positively affects the likelihood of consumers to select a specific retail center, store format, or store. However, the suggested inverted U-shape by one of the studies (Brown 1978) indicates that more variety does not always seem to be better.

Table 2.1 Studies on the effects of variety on retail center, store format, and store choice

Reference	Variety related variable	Consumer choice	Direction of effect
Retail center choice			
Gautschi (1981)	Assortment	Retail center choice	Assortment has a positive effect on repeat retail center choice.
Oppewal, Louviere, and Timmermans (1997)	Breadth (number of store types) and depth (number of stores of each type)	Shopping center choice	Breadth and depth have a positive effect on shopping center choice.
Store format choice			
Bhatnagar and Ratchford (2004)	Breadth (number of product categories) and depth (number of brands in product category)	Store format choice	Breadth and depth have a positive effect on the likelihood of repeated retail format choice.
Solgaard and Hansen (2003)	Assortment	Supermarket format choice	Assortment has a positive effect on consumers' choice between formats.

continued

Table 2.1 continued

Reference	Variety related variable	Consumer choice	Direction of effect
Store choice			
Arnold, Ma, and Tigert (1978)	Assortment	Store choice	Assortment has a positive effect on repeat store choice.
Arnold, Oum, and Tigert (1983)	Assortment	Store choice	Assortment has a positive effect on repeat store choice.
Louviere and Gaeth (1987)	Selection	Store choice	Selection has a positive effect on store choice.
Brown (1978)	Store size	Number of visits to the store	The effect of store size on the number of visits to the store shows an inverted U-shape.

Retail center choice. The choice for a consumer of which retail center to visit depends partly on assortment. A good variety of merchandise influences retail center patronage (Gautschi 1981). Also, the total number of stores or store departments appears to be the most important determinant in the decision at which shopping center to buy (Oppewal et al. 1997). Oppewal et al. (1997) found this both for food stores and for clothing and shoes stores.

Store format choice. The choice of consumers between different types of store formats, such as supermarkets, convenience stores, and food warehouses, can also be positively influenced by assortment. Bhatnagar and Ratchford (2004) developed a general model of store format choice for non-durable goods. They found that as perceptions of the depth of an assortment at the supermarket increases, the likelihood of patronizing supermarkets also increases. In addition, supermarkets carrying broad assortments are preferred by consumers if they buy from more than a threshold number of categories. Another model of consumer's choice between different supermarket formats, namely conventional supermarkets, discount stores, and hypermarkets, has been developed by Solgaard and Hansen

(2003). They also detected a positive relationship between assortment and format choice. In brief, the assortment a retail center or a store format carries is a positive factor for consumers to select that specific center or format.

Store choice. When choosing a specific store, assortment variety also is an important factor for consumers. Assortment is, next to price and location, a critical determinant in store selection and patronage, both in food and fashion clothing stores (Arnold et al. 1978; Arnold et al. 1983). Consumers care for the variety of products that a store offers. Louviere and Gaeth (1987) also found a positive relationship between the selection a supermarket offers and the decision to visit that store. This was found for variety in different clusters of products in the store, namely meats, produce, packaged goods, and dairy products. So, not only at the retail center and store format level, but also at the store level, assortment is an important factor for consumer choice.

However, this does not imply that more variety is always better. An empirical study by Brown (1978) from a very small panel of 10 consumers who in sum made 992 visits to local grocery stores provided some evidence for the existence of an optimal level of assortment variety. The relationship between the size of a grocery store (measured in square feet of floor space) and patronage was approximately inverted U-shaped over different store size intervals. Averaged sized stores received more actual patronage than either smaller or larger stores.

In sum, almost all empirical studies demonstrated a positive impact of variety. It has a positive effect on retail center choice, store format choice, and store choice. Only one study (Brown 1978) empirically indicated the potential existence of an inverted U-shape for variety. In the next section, we will see whether these overall positive effects of variety are translated into higher store sales.

2.2.2 The effects of variety on store sales

In Table 2.2 we present an overview of studies on the effects of variety in both offline and online stores on sales and sales related variables, such as shopping frequency, purchase frequency, and loyalty. Does more variety imply higher store sales? What becomes clear from Table 2.2 is that indeed most studies demonstrate a positive impact of variety on store sales and sales related variables.

Offline stores. Assortment variety not only has an impact on store choice, but also on store sales. Reinartz and Kumar (1999) studied the impact of store

characteristics (among other aspects) on store performance. They found that increasing assortment size by adding grocery scrambling products (e.g., an in-store deli, a salad bar) and non-grocery scrambling products (e.g., a pharmacy, a video rental) to a store had a positive effect on the performance of the store in terms of sales. Stores that provided a wider variety of offerings performed better. At the same time, they argued, more products bring additional costs to retailers, such as opportunity costs of grocery space. Grocery sales are foregone in the area now occupied by the video rental or the bank. Adding scrambling products to an assortment also brings about relatively high additional expenses in terms of, for example, setting up display shelf systems that do not conform to regular shelf systems (e.g., for salad bars and home videos). As a result, the expansion of an assortment has a detrimental effect on store performance in terms of productivity (i.e., sales per square foot).

Koelemeijer and Oppewal (1999) used a combination of a choice experiment and extended logit models to model consumer decisions regarding the selection of products and assortments. They found that in-store purchase decisions of consumers about whether to buy at the present store, at a competing store, or not at all, were not much affected by the expected choice range (small or large) of the competing store. Results also indicated that an increase in assortment size in the current store attracts additional purchases proportional to the attractiveness of the products added. So, if a consumer is already in the store, the variety offered there is important, whereas the variety carried by a competing store is no longer relevant. From these two studies we learn that more variety at the store level results in additional sales and purchases.

Table 2.2 Studies on the effects of variety on store sales

Reference	Variety related variable	Sales or sales related variable	Direction of effect
Offline stores			
Reinartz and Kumar (1999)	Count of grocery and of non-grocery scrambling products	Store sales and sales per square foot	Number of scrambling products has a positive effect on sales, but a negative effect on sales per square foot.
Koelemeijer and Oppewal (1999)	Assortment size	Number of purchases	Assortment size has a positive effect on number of purchases depending on the attractiveness of the products added.
Online stores			
Lohse and Spiller (1999)	Number of products	Store traffic and sales	Number of products has a positive effect on store traffic, no effect on sales.
Brynjolfsson, Smith, and Hu (2003)	Product variety	Store sales	Product variety has a positive effect on store sales with decreasing marginal returns.
Borle, Boatwright, Kadane, et al. (forthcoming)	Reduction in the number of stockkeeping units (SKUs)	Store sales, shopping frequency, purchase frequency	SKU reductions have a negative effect on store sales, shopping frequency, and purchase frequency.
Srinivasan, Anderson, and Ponnavolu (2002)	Choice	Loyalty (favorable attitude resulting in repeat buying behavior)	Choice has a positive effect on loyalty.

Online stores. A number of studies have investigated the relationship between assortment variety and sales or sales related variables in an online environment. Lohse and Spiller (1999) found that although each additional product in an online store yielded additional store traffic, store size did not have a

significant effect on sales. More products resulted in more traffic to the store, but the additional traffic did not lead to higher sales. One reason the authors provided for this outcome is that consumers may not be able to find the products they are looking for in large online retail stores. However, this could also be the case for the online stores investigated in other studies, such as a book store (Brynjolfsson et al. 2003) and a grocery store (Borle et al. forthcoming), but these studies did find an increase in store sales.

Brynjolfsson et al. (2003) did demonstrate that making more book titles available on a website resulted in higher sales. They also noted that these sales showed decreasing marginal returns.

Borle et al. (forthcoming) showed that removing SKUs from a number of product categories has a negative impact on overall store sales. In addition, using data provided by an online grocer, they found that assortment reduction has a negative impact on both shopping frequency and purchase quantity. An analysis of the data at the product category level revealed that the overall loss in store sales might be moderated if retailers focus on select product categories. The authors discussed that higher sales resulting from assortment reductions may be realized if performed on specific product categories rather than storewide reductions. Another way of interpreting these results is that more variety implies higher product category sales, though this does not hold for all product categories, and higher store sales. In some product categories, more variety will have a negative impact on sales, but averaged across product categories, store sales will increase.

Next to online store sales, E-loyalty is also significantly influenced by the level of choice a retailer offers online (Srinivasan et al. 2002). E-loyalty was defined by Srinivasan et al. (2002) as a customer's favorable attitude toward the e-retailer resulting in repeat buying behavior. A retailer offering a wider range of product categories and a greater variety of products within a given category led to more e-loyal customers.

Concluding, most offline and online studies indicate that more variety leads to higher store sales, though one study demonstrated decreasing marginal returns (Brynjolfsson et al. 2003) and in another study more online store traffic could not be translated into higher sales (Lohse and Spiller 1999). Another interesting result that we found out from these studies is that reducing the number of SKUs can increase sales in some specific product categories and decrease sales in others. Hence, consumer reactions to variety differ between product categories.

2.2.3 The effects of variety on consumer choice from a product category

In the previous two subsections, we showed that, in general, variety has a positive impact on consumer store choice and store sales. In the current and following subsections we examine whether this positive effect can also be found at the product category level. The impact of variety on consumer choice from a product category is discussed here, while the impact on product category sales is left for Subsection 2.2.4. Five studies on the effects of assortment variety at the product category level on consumer choice are summarized in Table 2.3. These studies demonstrate how consumers react in terms of choosing products from an assortment when confronted with a certain amount of variety.

Iyengar and Jiang (2005) investigated the relationship between the number of options in a retirement savings plan and the likelihood of consumers participating in such a plan. Results of a natural experiment with nearly 800,000 people suggested that the likelihood to participate in a retirement savings plan decreased as the number of options increased. More variety decreased the likelihood of choosing even though not choosing was financially costly to people.

The study by Chernev (2003a) also examined the impact of variety on individuals' likelihood to choose from an assortment. With assortment, however, the author refers to the number of products of one brand within a product category. He demonstrated that the impact of assortment size on choice is moderated by the degree to which individuals have articulated preferences (i.e., a favorite product). The results showed that individuals with an articulated ideal point are more likely to choose from larger brand assortments (sixteen versus four chocolates in Experiment 1) than individuals without articulated preferences are. Individuals who have a favorite product face the relatively simple task of searching for the product that best matches their preferences. In contrast, individuals who do not have an articulated ideal point face the more complex task of evaluating the available alternatives while at the same time forming the very criteria to be used in the evaluation process. Since larger assortments are more complex to choose from, these individuals tend to opt for choosing from the smallest brand.

The study by Chernev (2003a) provides some insight into why more variety in a product category can be better in some situations (if you have a favorite product) and worse in others (if you don't have a favorite product). The author states that imposing constraints on the decision problem by limiting the size of the assortment could actually increase the utility derived from choice. However,

he does not provide tools for retailers in terms of which types of assortments to reduce. It could be argued that this would be beneficial in assortments for which consumers generally do not have an articulated ideal point. One could think of infrequently bought rather complex products, such as an assortment of digital cameras.

Table 2.3 Studies on the effects of assortment variety on consumer choice from a product category

Reference	Variety related variable	Consumer choice	Direction of effect
Iyengar and Jiang (2005)	Number of options	Likelihood of participating	Negative relationship between number of options and likelihood of participating.
Chernev (2003a)	Brand assortment size, articulated preference (moderator)	Likelihood of choosing from an assortment	Individuals with an articulated ideal point are more likely to choose from larger brand assortments than individuals without articulated preferences.
Van Trijp, Hoyer, and Inman (1996)	Perceived differences between brands	Variety-seeking behavior	Negative effect of brand differences on variety-seeking behavior.
Narasimhan, Neslin, and Sen (1996)	Number of brands in the product category (moderator)	Promotional elasticity	Negative relationship between number of brands and promotional elasticity (for featured and pure price cuts).
Campo, Gijsbrechts, and Nisol (2000)	Availability of acceptable alternatives (moderator)	Consumer reactions to stock-outs	Consumers will easily switch items rather than defer or switch size when acceptable alternatives are available.

The following three studies investigate the impact of variety on specific consumer responses within a product category. They show how an increase in variety can have an impact on the effectiveness of marketing instruments.

If consumers perceive more differences between the brands in a category (i.e., see more variety) they are likely to show less variety-seeking behavior relative to both repeat purchases and extrinsically motivated purchases (e.g., chosen brand on sale or purchasing for someone else) (Van Trijp et al. 1996). The authors argued that when perceived differences between brands become larger, probably fewer brands perfectly fulfill a consumer's needs. So, there is less drive to switch between brands, simply because one is the best. People will then purchase the same brand repeatedly or for externally driven motivations. When the differences between the brands become smaller, brands may be perceived as more substitutable, thereby lessening the motivation to select the one brand that perfectly fulfills the consumer's needs. A marketing implication of this consumer reaction is that brand differentiation by suppliers prevents consumers from switching to other brands.

Narasimhan, Neslin, and Sen (1996) looked at the moderating impact of the number of brands in a product category on consumer reactions to a promotion. The authors proposed that the number of brands theoretically could have two contrasting effects on promotion responses. On the one hand, many brands in a category may signal that there is much room for product differentiation. Promotions in such categories will induce less brand switching and promotional response, in the same line of reasoning as was used by Van Trijp et al. (1996) above. On the other hand, many brands in a category may be associated positively with brand switching. Manufacturers might then find it attractive to add even more brands to ensure that at least one of their brands is on promotion. The authors found support for the first effect. They detected a negative relationship between the number of brands in a product category and promotional elasticity for (1) featured price cuts (the brand is advertised in a store circular) and (2) pure price cuts (price reduction without feature or display). An increase in the number of brands in a product category decreased promotional response for these two types of promotion. Therefore, the marketing instrument promotion is less effective if there are more brands in a product category.

In the previous two studies more variety led to less switching behavior. Variety was reflected by the number of brands and the differences between these brands. In the following study variety was captured by the number of products that

are acceptable to consumers. Campo, Gijsbrechts, and Nisol (2000) looked at consumer reactions to out of stock situations, which reactions are dependent on the variety offered in the product category (moderator). When more acceptable alternative products are available in an assortment and the consumer is confronted with out of stock, consumers are more inclined to choose another SKU from the product category instead of deferring the purchase or switching package size (Campo et al. 2000). More variety (in terms of the number of acceptable alternatives) results in more switching behavior. In this situation the number of potentially 'best matches' increases with variety, making products to be perceived as being more substitutable, which results in enhanced switching behavior. This means that the danger of stock-outs is less severe (i.e., consumers will less easily defer their purchase) if there are more acceptable alternatives.

In brief, the studies discussed in this subsection demonstrated how consumers behave within a product category when confronted with a certain level of variety. The effectiveness of marketing instruments can differ between assortments offering low or high variety. Furthermore, variety has a negative impact on choice likelihood. We also perceive that consumers who have a favorite product prefer choosing from larger assortments of a specific brand, while those who are not aware of an ideal point want to choose from smaller assortments. In the next section, we will see what the effects of variety at the product category level are on product category sales and sales related variables.

2.2.4 The effects of variety on product category sales

In Table 2.4, studies on the effects of variety at the product category level on sales and sales related variables are presented. The first study demonstrates that, on average, product category sales increase with variety reductions. The second shows that the specific effect of variety in a product category on the performance of a retailer depends on the type or role of the product category. The other two studies show that variety can have a negative impact on private label market share.

Boatwright and Nunes (2001) studied the effect of variety at the product category level on category sales. The authors looked at the effect of different types of SKU reductions sales. They analyzed data from a natural experiment conducted by an online grocer. Product category sales tended to increase rather than decrease, on average, as a result of a modest SKU reduction. Sales rose in more than two-

thirds of the product categories. Despite this overall increase in sales, category purchase probability decreased, indicating that some consumers stopped purchasing in some product categories. Eliminating brands and flavors, in other words lowering variety, to a small degree helped sales, but deep cuts led to a decrease in sales. Stating it the other way around one could argue that more variety leads to higher sales, but that too much variety can actually decrease sales again, indicating the existence of an inverted U-shape. However, this issue was left for further research. The authors showed that eliminating products, especially low-selling SKUs, could increase product category sales. They did not provide insights into why sales increase or decrease in specific product categories.

Table 2.4 Studies on the effects of variety on product category sales

Reference	Variety related variable	Sales or sales related variable	Direction of effect
Boatwright and Nunes (2001)	Reduction in the number of stockkeeping units (SKUs)	Product category sales	Positive effect of SKU reductions on product category sales (on average).
Dhar, Hoch, and Kumar (2001)	Assortment breadth (number of brands in a product category) and depth (number of stockkeeping units in a product category)	Retailer performance	Positive effect of breadth and depth on retailer performance for variety-enhancers, niches, and fill-ins, but not for staples.
Hoch and Banerji (1993)	Number of national brands and item proliferation	Private label market share	Negative effect of number of national brands on private label market share, but no effect of item proliferation.
Dhar and Hoch (1997)	Assortment breadth (number of brands) and depth (average number of stockkeeping units carried in a product category averaged across stores in a retail chain)	Private label market share	Negative effect of breadth and depth on private label market share.

The following study did investigate how the effects of variety differ between product categories. The effect of assortment breadth and depth in a product category on the performance of a retailer overall depends on the role of the product category. Dhar, Hoch, and Kumar (2001) distinguished four different roles for product categories depending on penetration (the percentage of households that purchases from the product category) and frequency (number of times per year the product category is purchased from). Assortment depth (number of SKUs in a product category) and breadth (number of brands in a product category) were found to have a positive effect on the relative category performance of a retailer for variety enhancers (high penetration, low frequency), niches (low penetration, high frequency) and fill-ins (low penetration, low frequency). Staples (high penetration, high frequency) do not benefit from an increase in assortment breadth or depth. This may be because most retailers already have large assortments in these key product categories (e.g., coffee). The authors suggested that too large an assortment could be actually detrimental for retail performance, indicating the existence of an inverted U-shape for variety.

The next two studies show that the effectiveness of a private label as a marketing instrument depends on how much variety an assortment offers. Hoch and Banerji (1993) found that item proliferation in a product category does not affect private label shares systematically. They did find a negative impact of the number of national manufacturers in a product category on private label share. The authors recognized that one could argue that more players simply mean a lower share for everybody. They did find, however, that the effect was much stronger for private labels. Therefore, offering a private label will be less effective in a product category with more rather than less national brands.

Another study also found a negative impact of variety on private label market share (Dhar and Hoch 1997). This study not so much focused on explaining across-category variation, as the previous study did, but considered across-retailer variation in private label sales within a product category. The authors determined, after controlling for product category differences, what the key factors of private label market share for a specific retailer are. Based on data from 106 major supermarket chains the authors found that assortment depth (the average number of SKUs carried in a product category averaged across stores in a particular retail chain) and assortment breadth (the number of brands) both had a negative impact on private label market share. When retailers carry many brands, there is a pure crowding out effect. More variety leads to relatively lower private

label sales. Hence, in product categories offering high (versus low) variety carrying a private label might be less effective.

To sum up, we understand that more variety leads to higher sales in most product categories, except for product categories from which many consumers buy very often (e.g., coffee) (Dhar et al. 2001). Removing slow selling items, i.e., lowering variety, also increases product category sales on average, but deep cuts in the number of SKUs have a negative effect on sales (Boatwright and Nunes 2001). Thus, more variety is better, but not in all product categories. At the same time, a reduction in the number of products can also be better, but not in all product categories and too deep cuts in variety are actually bad. In addition, we showed that offering a private label in a product category might be more effective if the product category offers less variety. In order to get insight into the underlying process of the relationship between variety and objective outcomes, such as consumer choice, we now turn to more subjective assortment evaluations. This is done in the following section.

2.3 The effects of variety on consumer assortment evaluations

Are more varied assortments evaluated more positively by consumers? Or does this differ per product category? In this section we show that multiple studies have demonstrated that, overall, variety has a positive impact on consumer evaluations of assortments. The referenced articles can be found in Table 2.5.

Kahn and Lehmann (1991) built a model for describing consumer decision making among assortments. In laboratory experiments they found support for a positive impact of (1) the number of acceptable options in an assortment, (2) the type of options (their value), and (3) the variety of the options (uniqueness) on the value of an assortment. They detected a significant three-way interaction of the number of options by the value of the options by the variety of the options. Variety as captured by the number of acceptable options and their uniqueness was found to have a positive effect on assortment evaluations by consumers.

More specific results were found with another model for assortment value built by Kim, Allenby, and Rossi (2002). Instead of studying the effect of a small range of assortment sizes, they computed the value of each flavor in an assortment and the compensating value for removing each flavor. Calculations showed that households highly value popular flavors and that they would suffer substantial

utility losses from removal of these flavors from the assortment. A retailer offering low variety must compensate the consumers with, for example, a lower price level. In their computations, they assumed that for each (additional) flavor the assortment is evaluated more positively if at least one household buys the flavor. In other words, they suggested that more variety is better.

Table 2.5 Studies on the effects of variety on consumer assortment evaluations

Reference	Variety related variable	Evaluation related variable	Direction of effect
Kahn and Lehmann (1991)	Number of options, type of options (value), variety of options (uniqueness)	Assortment value	Positive effect of all variety related variables on assortment value.
Kim, Allenby, and Rossi (2002)	Assortment variety	Assortment value	Removing popular flavors leads to utility loss from the assortment.
Van Herpen (2001, Chapter 4)	Assortment size, dispersion across attribute levels, dissociation between attributes	Assortment preference	Positive effect of size and dispersion, no effect of dissociation on assortment preference.
Oppewal and Koelemeijer (2005)	Assortment size and favorite available	Assortment evaluation	Positive effect of assortment size on assortment evaluations, but no general effect of favorite available.
Szymanski and Hise (2000)	Number and variety of offerings	E-satisfaction	No relationship between number and variety of offerings on e-satisfaction.

Van Herpen (2001, Chapter 4) investigated the impact of three aspects of variety on assortment preference. The three aspects are: (1) assortment size, (2) dispersion across attribute levels, e.g., if all products have the same color or different colors, and (3) dissociation between the attributes, e.g., if product color and package size are unrelated (the reader is referred to Subsection 3.3.1 for a more in-depth discussion on these variety-related assortment characteristics). Two

moderating variables, expertise with the product category and awareness of a favorite product, were also included in the study. Results showed a main positive effect of assortment size ('few' versus 'many products') and attribute dispersion ('few' versus 'many differences') on assortment preference, but no effect for attribute dissociation ('high' versus 'low connection').

With respect to the moderating role of expertise, Van Herpen found that experts prefer large assortments with a high degree of attribute dispersion. Novices prefer small assortments and assortments that offer a high degree of attribute dispersion. The author also found that consumers who do not have an articulated preference (i.e., a favorite product) before entering a store prefer larger assortments and assortments with more dispersion of the attribute levels than consumers with high preference awareness. Consumers, who do know what product they want *and* know that this product is available in the store, prefer an assortment that offers few products. These consumers do not care about the diversity of the products in an assortment.

Note that this appears to be exactly the opposite of what was found by Chernev (2003a). In his study, consumers who know what product they want are more likely to choose from larger instead of smaller assortments of a specific brand. This difference in findings can be explained by the differences in the design of both studies. In the Van Herpen study, subjects had to rank order assortments, based on general attributes like 'few products'. If they were aware of their favorite product (which was manipulated), they knew for sure that the store (small or large) carried this favorite product. As a result, they preferred small assortments, thus minimizing search costs. In the Chernev study, subjects did not rank order assortments, but had to choose from an assortment that contained four products of one brand ('the small assortment') and sixteen products of another brand ('the large assortment'). If subjects were not aware of a favorite product, they had to construct their preferences to be able to make a choice. This is easier if you choose from a small assortment. As a result, now subjects who do *not* have a favorite product prefer smaller assortments. In short, the difference in effects can be mainly explained by the fact that subjects in the Chernev study actually experienced the variety in the assortment, while subjects in the Van Herpen study did not. What we can conclude is that the awareness of a favorite product is an important moderating factor if we consider the effects of assortment variety.

Oppewal and Koelemeijer (2005) also studied the relationship between assortment variety and assortment evaluation. More specifically, they investigated

the effects of assortment size, assortment composition, and the presence of a favorite product. Results from a choice experiment in the cut flowers category showed that larger assortments were rated more positively. This relationship did not have decreasing marginal returns as was expected by the authors. The addition of different products led to higher assortment evaluations. According to the authors, the lack of decreasing marginal returns might be explained by the small range of assortment sizes (five to twelve products) that they used in their experiment. The authors also did not find an effect of the presence of an individual's preferred product on assortment evaluations, as was found by Broniarczyk, Hoyer and McAlister (1998). However, when they specified separate favorite available effects for the different product (flower) types, they found strong effects for some specific product types. Furthermore, they tested whether the impact of assortment size on assortment evaluations differed with consumer preferences for the products in the assortment. This was not the case. Larger assortments are generally preferable to smaller assortments, even if the small assortment contains the preferred or favorite product.

This is again does not seem to be in line with Van Herpen (2001, Chapter 4) who found that consumers who have a favorite alternative prefer smaller assortments. However, in this study by Van Herpen, subjects had no information on the other potentially preferable products. Thus, it was unclear to subjects whether larger assortments offered more acceptable alternatives (which may generally be the case). In the Oppewal and Koelemeijer study, subjects saw all available products. Moreover, subjects in the Van Herpen study were sure that their favorite product (if they were aware of it) was available in the assortment under consideration. Consequently, since they probably did not want to search long for their favorite product, subjects who had a favorite product preferred smaller assortments. In the Oppewal and Koelemeijer study, subjects did not choose between assortments, they were actually confronted with one. As a result, their assortment evaluations were based on experience with the assortment.

In a different study the number of offerings and the variety of offerings did not have an impact on customer satisfaction, as defined by how customers feel about an Internet-shopping experience (Szymanski and Hise 2000). Greater breadth of offerings has no unique impact on e-satisfaction levels. The authors did not find a positive impact of product offerings as the other studies did, which can be explained by the fact that e-satisfaction is not related to satisfaction with an assortment or the value of an assortment. The other studies in Table 2.5 all focus

on the impact of variety on consumer evaluations of an assortment, whereas the study of Szymanski and Hise did not.

In this section we showed that, overall, assortment variety has a positive impact on subjective consumer evaluations of an assortment. The studies described here did not investigate whether this impact differs per product category. They did demonstrate that consumer awareness of a favorite product has an important impact on whether consumers prefer low or high variety. Consumers prefer smaller assortments in two situations: (1) if they do not know what they want (Chernev 2003a) or (2) if they do know what they want *and* are sure that this product is offered in the store (Van Herpen 2001). Consumers will opt for larger assortments, if they do know what they want but are not sure about whether the store carries their favorite product (Chernev 2003a; Oppewal and Koelemeijer 2005). One step further inside the process of explaining the relationship between assortment variety and assortment evaluations brings us to consumer perceptions of variety, which are discussed in the next section.

2.4 The mediating role of perceived variety

Studies that include perceptions of variety in explaining the effects of assortment variety are given in Table 2.6. In this table one can identify a number of important assortment characteristics that influence perceived variety, such as the number of stockkeeping units (SKUs), favorite available, and information structure.

Broniarczyk et al. (1998) studied three different assortment cues that have an impact on perceived variety, namely (1) the number of SKUs in an assortment, (2) whether the favorite product of the consumer is available, and (3) the amount of shelf space devoted to the product category. All three cues were found to have a positive impact on perceived variety and store choice. The cues affect store choice through perceived variety, although favorite available also has a direct link to store choice. The main results of the study showed that substantial reductions in the number of SKUs do not have to affect perceived variety negatively, as long as only low-preference products are eliminated and product category shelf space (or the total number of products) is held constant.

Table 2.6 Studies on the effects of assortment variety on perceived variety

Reference	Variety related variable	Perceived variety related variable	Direction of effect
Broniarczyk, Hoyer, and McAlister (1998)	Number of stockkeeping units, favorite available, product category shelf space	Perceived variety (mediator), store choice	Positive effects of all variety related variables on store choice through perceived variety. Also a direct link from favorite available to store choice.
Hoch, Bradlow, and Wansink (1999)	Information structure (attribute level differences between objects) and level of organization	Perceived variety (mediator), satisfaction, store choice	Positive effect of information structure on perceived variety, with decreasing marginal returns. Positive effect of perceived variety and organization on satisfaction and store choice. For holistic processing random displays offer more variety, but not for analytic processing.
Van Herpen and Pieters (2002)	Assortment size, dispersion across attribute levels, dissociation between attributes	Perceived variety	Attribute-based measures to predict perceived variety perform better than product-based measures.
Hoch, Bradlow, and Wansink (2002)	Attribute and product based measures of perceived variety	Perceived variety	Both attribute- and product-based measures contribute to the variety perception process.

continued

Table 2.6 continued

Reference	Variety related variable	Perceived variety related variable	Direction of effect
Kahn and Wansink (2004)	Actual variety (number of distinct products), organization (moderator), symmetry (moderator)	Perceived variety (mediator), consumption quantity	Positive effect of actual variety on consumption quantity through perceived variety. Organization and symmetry moderate the effect of actual variety on consumption quantity. For organized/asymmetric assortments, more actual variety increases consumption quantities to a greater degree than it does with disorganized/symmetric assortments.

Hoch, Bradlow and Wansink (1999) also included perceptions of variety in explaining the relationship between assortment variety and its effect on stated satisfaction and store choice. The authors built a general mathematical model for understanding how people perceive the variety contained in an assortment. An important finding of the study is that the information structure of the assortment (i.e., the attribute level differences between products) has a big impact on perceived variety. This relationship shows decreasing marginal returns for increases in the number of attributes on which product pairs differ. Thus, consumers less easily notice additional variety. Also, whether the products of an assortment are placed on the shelf in an organized or in a random way has an impact on variety perceptions. When people engage in analytic processing (i.e., inspect the assortment thoroughly), organization does not influence perceived variety (Hoch et al. 1999, p. 540). When processing is more holistic (i.e., when consumers only browse the assortment), random displays are seen as more varied than organized displays. Both perceived variety and organization have an impact on stated satisfaction and store choice. Consumers are more satisfied and likely to choose stores carrying assortments that are perceived as offering high variety and that are displayed in an organized (versus random) way. The influence of the

information structure of an assortment on satisfaction and store choice is almost completely mediated by perceived variety.

The previous paper by Hoch et al. (1999) provided a model to measure consumer perceptions of variety. The model utilized a product-based approach by concentrating on the dissimilarity between product pairs in an assortment. Van Herpen and Pieters (2002) extended this research by proposing a model that is based on attribute differences instead of product differences. Their model used two measures that relate to the dispersion of attribute levels and the dissociation between attributes (see Subsection 3.3.1 for an explanation of these measures). The conclusion of their experiment is that the attribute based measures account best for consumers' perceptions of variety. In their study assortment size was not a good proxy for variety perceptions. Hoch, Bradlow, and Wansink (2002) commented on this study and showed that both approaches to measure perceived variety are very similar mathematically. They concluded that most likely both approaches contribute to the perception process.

A study that introduces perceptions of variety in explaining the relationship between actual variety and consumption quantity was performed by Kahn and Wansink (2004). Actual variety was defined here by the following two components: the number of products and the number of replicates in an assortment. The authors found that the relationship between actual variety and how much people consume is mediated by perceived variety (next to anticipated consumption utility). The relationship was moderated by the organization of products on the shelf and the relative symmetry in the frequencies of products (i.e., dispersion of the attribute levels). The authors found that as actual variety increases consumption quantities also increase with organized assortments but less with disorganized assortments, and with asymmetric assortments but less with symmetric assortments.

The most important findings of the studies discussed in this section for this thesis are the following. Consumer perceptions of variety depend on a number of assortment characteristics, namely the number of SKUs in an assortment, product category shelf space (Broniarczyk et al. 1998), the number of replicates (Kahn and Wansink 2004), dispersion across attribute levels, dissociation between attributes (Van Herpen and Pieters 2002), the organization of products on the shelf (Hoch et al. 1999), and whether the favorite product of a consumer is available (Broniarczyk et al. 1998). A change in any of these assortment characteristics

changes how much variety consumers perceive. Perceived variety in turn has a positive impact on satisfaction, store choice (Hoch et al. 1999), and consumption quantity (Kahn and Wansink 2004). These studies specifically show that more objective assortment variety leads to higher perceived variety and that higher variety is generally evaluated more positively, as we also saw in the previous section. However, more variety does not only bring benefits to consumers, it can also induce costs. In the next section, we take a closer look at these benefits and costs that variety brings.

2.5 The mediating role of the benefits and costs of variety

To what extent can the benefits and costs of variety explain the effect of assortment variety on consumer assortment evaluations, consumer choice from an assortment, and sales? The studies that are discussed in this section investigate the role of the benefits and costs that variety brings to consumers. Table 2.7 displays a brief summary of these articles. Variety brings about a considerable number of benefits and costs to consumers. Whereas the benefits lead to more positive evaluations of larger assortments, the costs of variety could have a negative function in making high variety in an assortment less attractive.

In an early conceptual paper of Baumol and Ide (1956), the authors built a simplified but elegant model that analyses the relationship between the number of products stocked by a retailer and consumer choice and the retailer's sales, costs, and profits. The greater the number of products carried, the greater the chance of a successful shopping trip. At the same time, the difficulty of shopping increases with the number of products carried by the store: the more products are available, the further one must walk to get to the spot where some products are kept. The authors concluded that high variety is an advantage to consumers only up to a certain point. Ultimately, a store may stock such a large variety of products that shopping costs become prohibitive. This implies an inverted U-shape and, hence, the existence of an optimal level of variety that maximizes consumer store choice and retailer profits.

Table 2.7 Studies on the benefits and costs of variety

Reference	Variety related variable	Dependent variable	Direction of effect
Baumol and Ide (1956)[a]	Number of products	Store choice	The effect of number of products on store choice shows an inverted U-shape.
Handelsman and Munson (1985)[a]	Assortment size	Assortment utility	The effect of assortment size on assortment utility shows an inverted U-shape.
Desmeules (2002)[a]	Variety (or freedom of choice)	Consumer happiness	The effect of variety on consumer happiness shows an inverted U-shape.
Mick, Broniarczyk, and Haidt (2004)[a]	Consumer hyperchoice	Benefits and costs	Hyperchoice is initially attractive, but it confuses people and increases regret, it is ultimately unsatisfying and psychologically draining.
Loewenstein (1999)[a]	Number of options	Benefits and costs	Positive effect of number of options on benefits and costs.
De Clerck, Gijsbrechts, Steenkamp, and Dekimpe (2001)	Changes in the number of stockkeeping units (SKUs)	Consumer benefits and costs (mediator), product category sales	SKU additions and deletions lead to higher product category sales (on average).
Reibstein, Youngblood, and Fromkin (1975)	Number of products	Perceived decision freedom, satisfaction, consumption level	Positive effect of number of products on perceived decision freedom and consumption level, but not on satisfaction.
Sloot, Fok, and Verhoef (2005)	Number of SKUs	Perceived variety, perceived search efficiency, assortment satisfaction, and product category sales	A SKU reduction leads to higher perceived search efficiency and assortment satisfaction and to lower product category sales, but has no impact on perceived variety.

continued

Table 2.7 continued

Reference	Variety related variable	Dependent variable	Direction of effect
Van Herpen (2001, Chapter 3)	Assortment size, number of attribute levels, dispersion across attribute levels, dissociation between attributes	Perceived variety, likelihood of success, choice effort	Positive effect of all variety related variables on perceived variety and likelihood of success. Positive effect of assortment size and dissociation on choice effort. No relationship between dispersion and choice effort.
Chernev (2003b)	Assortment size, ideal point availability (moderator)	Preference strength	The effect of assortment size on preference strength is moderated by ideal point availability: increasing size has a positive (negative) effect on preference strength if the consumer has (has not) got an ideal point.
Gourville and Soman (2005)	Assortment size and assortment type	Brand choice likelihood, potential regret (moderator), choice overload (moderator)	The effect of assortment size on brand choice likelihood is moderated by assortment type: increasing alignable assortments has a positive impact on brand choice, increasing non-alignable assortments has a negative impact on brand choice due to potential regret and choice overload.

continued

Table 2.7 continued

Reference	Variety related variable	Dependent variable	Direction of effect
Iyengar and Lepper (2000)	Assortment size	Initial attraction, purchasing behavior, decision to write essay, quality essay, initial satisfaction, expectations, subsequent satisfaction, purchasing behavior	At first, more products seem more attractive. However, people are more likely to purchase or to write an essay, they are more satisfied and write better essays if they are offered a limited (versus extensive) array of choice.

[a] Conceptual paper. All other papers are empirical.

In another conceptual paper that builds on the previous one, Handelsman and Munson (1985) proposed an inverted U-shaped function for the relationship between assortment size and assortment utility. They suggested that consumers should favor assortment sizes that fall within close proximity to the peak of their 'individual' assortment utility curve. The reasoning behind this inverted U-shape was the contrasting effects of consumers' needs for variety and the confusion and fatigue aroused by too much variety.

Desmeules (2002) provided a conceptual framework that was used to study the impact of high variety strategies on 'consumer happiness'. In this paper, the author also proposed an inverted U-shape for the relationship between variety and the positiveness of consumption experiences. At the upward part of the slope satisfaction (a benefit) can be reached by adding options to an assortment. At the upper plateau section options can be considered (or ignored) without much affecting the positiveness of the experience. At the downward section regret (a cost) starts being effective. At this part of the slope the positiveness goes down as a result of, among other things, stress, frustration, or anticipated regret (Desmeules 2002). In a brief essay Mick, Broniarczyk and Haidt (2004) also suggested that choice, or 'hyperchoice', is initially attractive to consumers, but that it confuses people too, increases regret, and that it is ultimately unsatisfying.

Loewenstein (1999) was more specific in the benefits and costs that variety can bring. He recognized the following benefits: (1) when people have

highly differentiated tastes and needs, variety lets them satisfy their particular wants and (2) even when people have similar needs, more choice can be beneficial if it promotes competition among providers that lead to lower prices or improved quality. The costs that the author distinguished are: (1) time: the opportunity costs of spending time making decisions that could be used for other activities, (2) error: the tendency to choose badly when people lack expertise, and (3) psychic costs: anxiety about making decisions under conditions of uncertainty, and regret if they turn out badly.

The four articles mentioned so far in this subsection all acknowledge the benefits and costs of variety. They explain why more variety is better only up to a specific point. Do empirical studies also recognize the benefits and costs of variety? Do they demonstrate the proposed resulting inverted U-shape?

An empirical study that takes multiple benefits and costs of variety into account is a working paper by De Clerck et al. (2001). The paper investigated the relationship between changes in the number of SKUs in a product category and product category sales. This relationship was explained on the basis of the following benefits and costs. For benefits of variety the authors distinguished: (1) fulfill heterogeneity in tastes, (2) provide variety-seeking possibilities, (3) offer a hedge against preference uncertainty, and (4) provide feelings of autonomy. The following costs of variety were taken into account: (1) information overload, (2) decision conflict, and (3) potential regret. These benefit and cost variables were not directly measured, but provided a framework for explaining the effect of SKU additions and deletions on sales. Results showed that, surprisingly, both an increase and a decrease in the number of SKUs can lead, on average, to higher product category sales. However, the results pointed to substantial heterogeneity in effects across product categories. Not only the direction, but also the strength of the impact of SKU additions and deletions varies between product categories. The authors explained the differences in effects by including moderators: product and product category characteristics. Nevertheless, it remains unclear which are the most important benefits and costs that variety brings about, because the benefits and costs were not directly measured.

A study that did directly measure one potential benefit of variety, namely decision freedom, was performed by Reibstein, Youngblood and Fromkin (1975). In an experiment the authors studied the effect of assortment size (two or four soft drinks) and perceived decision freedom on satisfaction with the choice and actual consumption. A larger assortment leads to greater perceived decision freedom, but

not to higher satisfaction with the chosen alternative. Assortment size was found to have a positive impact on consumption: the number of products available directly influences consumption behavior. Note that in this study the dependent variables do not include an evaluation of the assortment itself.

A study that included a direct measurement of a cost of variety is a paper of Sloot, Fok, and Verhoef (2005). The authors investigated a 25% reduction in the number of SKUs in an assortment of detergents. Assortment size was varied at two levels. Based on customer loyalty card data the results showed that the assortment reduction had a substantive negative effect on short-term product category sales and only a weak negative effect on long-term sales. In an additional study the impact of a SKU reduction on perceived variety, search complexity, and assortment satisfaction was examined. Search complexity is a cost of variety. The SKU reduction appeared to go unnoticed by subjects in terms of perceived variety. At the same time, subjects experienced lower search complexity and evaluated the assortment to be more satisfying.

In the previous studies, only one benefit or one cost of variety was directly measured. Van Herpen (2001, Chapter 3) included a direct measurement of both a benefit and a cost of variety, namely the benefit of expected success likelihood and the cost of expected choice effort. She examined the effects of different variety components on the benefit and the cost. Two studies showed that consumers expect a higher likelihood of success in larger assortments, in assortments with more attribute levels, a higher dispersion across the attribute levels, and a higher dissociation between the attributes. Expected choice effort increases when assortments are extended with either additional products or additional attribute levels. Attribute dispersion or attribute dissociation does not seem to lead to higher expected choice effort.

Although this study focused on the impact of variety on benefits and costs of variety, it only included one (though important) benefit and cost of variety, without measuring at the same time the resulting evaluation of the assortment by consumers. What will be the result of the trade-off between this benefit and cost? Is more variety better? Van Herpen (2001, Chapter 4) showed a positive main effect of assortment size and attribute dispersion on assortment preference (see Table 2.5). However, would an inverted U-shape have been present, this could not have been uncovered since only two levels of assortment size were presented (‘few’ versus ‘many products’). Although Van Herpen measured both a benefit

and a cost, she did not study a situation in which the costs of variety might become prohibitive.

In four different experiments Chernev (2003b) studied the effect of assortment size on preference strength, where the latter was operationalized by the propensity to switch between products. This relationship was proposed to be moderated by ideal point availability (i.e., you know what specific 'ideal' product you want). Measurements of perceived variety and the cost of perceived decision difficulty were also included in the study. In all experiments, perceived variety was higher for the larger (versus the smaller) assortment. Overall, choosing from a large assortment was perceived to be more difficult than choosing from a small assortment. It was theorized that consumers who do not have an ideal point face the relatively complex task of simultaneously forming their ideal attribute combination and searching for the option that best matches their favorite. Consequently, for choices from large assortments, ideal point availability can simplify choice, leading to a stronger preference for the selected alternative. For choices made from smaller assortments, in which the ideal point is less likely to be found, ideal point availability has the opposite effect, leading to weaker preferences for the selected alternative.

Another study that considered benefits and cost of variety is an article by Gourville and Soman (2005). The main goal of this paper was to show that the relationship between assortment size and brand market share depends on assortment type. The two types that are distinguished are an 'alignable' and a 'non-alignable' assortment. An alignable assortment is defined as a set of brand variants that differ along a single, compensatory dimension such that choosing from that assortment only requires within-attribute trade-offs. An example is an assortment of identical cars that differ only with respect to engine size (e.g., a 2.2, a 2.6, and a 3.0 engine). In contrast, they defined a non-alignable assortment as a set of brand variants that simultaneously vary along multiple, non-compensatory dimensions, demanding between-attribute trade-offs. An example is an assortment of cars where one has a sunroof, another has an alarm system, and a third has five doors.

Results demonstrated that when a brand's assortment is alignable, the brand's market share (i.e., the likelihood of choosing from the brand) will increase with assortment share. Thus, more variety is better. Conversely, when a brand's assortment is non-alignable, the brand's market share decreases with assortment share. In this case, more variety, or overchoice, makes the consumer worse off.

The authors explained this negative effect of overchoice by the moderating role of two costs of variety, namely the potential for regret and cognitive overload. These two costs were manipulated, thereby verifying the negative role of the costs in assortment evaluations. In addition, we can conclude that the complexity (or alignability) of a brand's assortment is an important moderating factor when considering the effects of variety.

In three different studies Iyengar and Lepper (2000) studied the positive and negative effects of assortment size. In their first study, they found that although more consumers were initially attracted to a tasting booth of twenty-four flavors of jam rather than six flavors, consumers were subsequently more likely to purchase if they had encountered only the small assortment of jam (six flavors). The authors concluded that variety though initially appealing can negatively influence purchase behavior.

All consumers who approached the tasting booth received a coupon for a $1-discount off the purchase of any flavor of jam of the presented brand. They could select the jam of their choice at the relevant jam shelf. So, at the actual purchase making moment all consumers were confronted with the entire display of jam flavors (Iyengar and Lepper 2000). It could have been the case that the subjects in the limited choice condition were pleasantly surprised by this larger display and, hence, were more motivated to purchase than those in the extended choice condition were. Moreover, the tasting booth with extensive choice did not include the more traditional common flavors such as strawberry jam, while the limited choice tasting booth did. As a result, consumers in the extensive choice condition were potentially less likely to find their favorite product. What might have happened is that these subjects, when confronted with the actual shelf (including the most popular flavors), did not notice the difference with the tasting booth (not including the most popular flavors) hence believing that their favorite would not be present on the shelf. Therefore, they might have decided not to purchase whereas the pleasantly surprised limited choice condition subjects did. This is an alternative explanation of why consumers purchased less in the extensive (versus limited) choice set condition.

The second study of Iyengar and Lepper (2000) revealed that students were more likely to write an essay for extra credit when they were provided with a small assortment of potential topics (six topics) rather than with a large assortment (thirty topics). Moreover, the students who chose to write an essay wrote higher quality essays if their topic had been picked from the small (versus the large)

assortment. In the third study, it was demonstrated that consumers who selected chocolates from a larger assortment (thirty products) enjoyed the process of choosing more than those who chose from a smaller assortment (six products). At the same time, they thought the process also to be more difficult and frustrating, they were more dissatisfied and regretful of the choices they made and were subsequently less likely to choose chocolates rather than money as compensation for their participation. This study confirms what we saw before in this chapter, namely that variety is a critical determinant in store choice: variety is initially attractive. However, once confronted with an assortment during the actual decision-making process consumers experience the downsides of variety, such as potential regret and cognitive overload, making highly varied assortments less attractive (Iyengar and Lepper 2000).

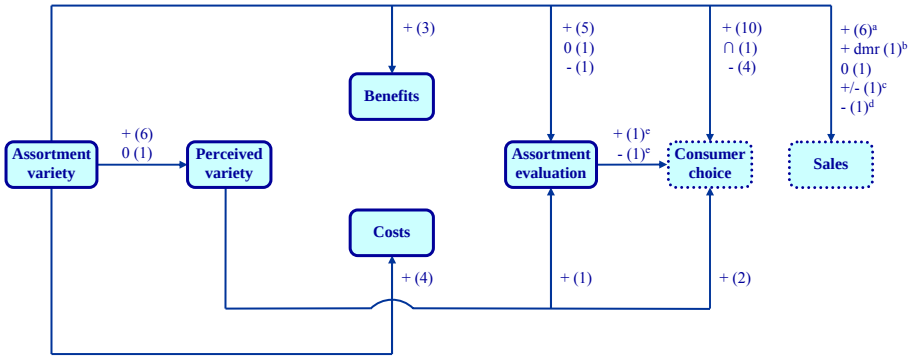
In brief, in this section we discussed several papers that identified benefits and costs that variety can bring. As a result of these benefits and costs, some researchers have theoretically proposed that the relationship between assortment variety and assortment evaluations shows an inverted U-shape. The benefits positively influence evaluations and the costs have a negative impact. Initially, more variety is more attractive due to additional benefits, such as the likelihood of a successful shopping trip. After a certain level of variety, the costs, such as cognitive overload, become significant and reduce the attractiveness again. This inverted U-shape, however, has not be empirically confirmed (except for to some extent by Brown 1978). Furthermore, a number of benefits and costs have been identified, but only some of them have been empirically tested. Hence, we do not know which are the determinant benefits and costs of variety. In addition, the relationship between variety in a brand's assortment and choice likelihood not only depends on these benefits and costs, but is moderated by the complexity of the assortments: for difficult (non-alignable) assortments consumers prefer less variety than for simple (alignable) assortments (Gourville and Soman 2005).

2.6 Conclusions

This chapter identified what is known about the effects of variety, and what is not yet clear and needs more in-depth investigation. A summary of the main empirical findings on the impact of assortment variety can be found in Figure 2.2. The figure is similar to Figure 2.1 displayed in the beginning of this chapter, but now we

indicate what previous research has found on the effects of assortment variety. We present the effects of two characteristics of assortment variety, namely the size of an assortment and the availability of the favorite product of a consumer, which are the independent variables of this thesis. These variety-related assortment characteristic were studied most often and were most often found to have an impact on assortment evaluations, consumer choice, and sales. Figure 2.2 shows the effects of the empirical studies discussed in this chapter. One can find the direction of the effects (-, 0, +, ∩) as well as the number of studies that demonstrated this direction (in parentheses). The studies referred to in Figure 2.2 are given in Appendix 2.A.

Figure 2.2 Summary of findings of empirical studies on the effects of assortment variety



NOTES. Assortment variety reflects both assortment size and favorite available. The number of studies is presented in parentheses.

[a] Included are Borle et al. (forthcoming): a decrease in size leads to lower store sales, and Dhar, Hoch, and Kumar (2001): an increase in size leads to higher sales in three out of four product categories.

[b] dmr = decreasing marginal returns.

[c] De Clerck et al. (2001): product category sales increase as a result of an increase or a decrease in assortment size.

[d] Boatwright and Nunes (2001): product category sales increase as a result of a (moderate) decrease in assortment size.

[e] No direction of effect was presented in the study. These effects are derived from the results.

Going from left to right, Figure 2.2 tells us that consumers perceive more variety in larger assortments. Larger assortments bring about both benefits (such as feelings of decision freedom) and costs (like potential regret). On average, consumers evaluate assortments that offer more variety more positively. Many studies also demonstrated a positive impact of assortment size, favorite available, and perceived variety on consumer choice. Results with respect to the effect of assortment size on sales are mixed. Most studies (seven) showed a clear positive effect on (mostly: store) sales. However, no effect (on store sales) and even a positive effect (on product category sales) of a size reduction were also empirically demonstrated.

From Figure 2.2, we can see that what is lacking in the literature are: (1) a link between perceived variety and the benefits and costs of variety and (2) a link between the benefits and costs of variety and assortment evaluations. As a result, we do not know which benefits influence assortment evaluations positively and which costs (if any) have a negative impact on assortment evaluations. Insights into this underlying process of the relationship between assortment variety and assortment attractiveness are currently lacking. We will give this interesting area more in-depth investigation so that we can clarify the mechanism through which assortment variety is able to influence consumer assortment evaluations. This helps us in properly understanding the opposing effects of the benefits and costs of variety. From a retailer perspective it is also important to identify on which specific benefits and costs they should focus in order to optimize their assortments. Should, for instance, information overload have a severe negative impact on the attractiveness of an assortment, retailers could consider to provide more overview in their assortments.

Most empirical studies shown in Figure 2.2 found a positive effect of assortment variety on assortment evaluations. However, in the theoretical literature several times an inverted U-shape has been proposed (e.g., Desmeules 2002; Dhar et al. 2001; Handelsman and Munson 1985). We propose that this difference in overall effects is due to the design of previous empirical studies in which often only two levels of assortment size were investigated (i.e., Van Herpen 2001, Chapter 4; Iyengar and Lepper 2000; Kahn and Lehmann 1991, Study 1; Sloot et al. 2005). This makes it impossible to find nonlinear effects. To verify whether an inverted U-shape actually exists, we will study the effects of a wide range of assortment sizes and at more levels than previous studies did.

The empirical studies discussed in this chapter were performed across a variety of types of stores and product categories. Store types ranged from (offline and online) grocery stores, on which most studies concentrated, to clothing stores, florist stores, and online bookstores. Product categories that were used included simple products (e.g., chocolates, yogurt, beer, jam, and popcorn), complex products (e.g., digital cameras, dishwashers, microwave ovens, and laptop computers), and even non-existing hypothetical products ('jinko's' developed by Hoch, Bradlow, and Wansink 1999). Given this diversity, no systematic insights are available into the role of the type of products concerned on the effects of assortment variety.

In this thesis, we particularly investigate product complexity. Recently, Gourville and Soman (2005) also examined this issue and found that product complexity moderates the impact of assortment size on consumer choice likelihood. However, more systematic research into the role of product complexity is needed, especially into the resulting effects on assortment evaluations, since higher evaluations do not automatically have to imply higher choice likelihood (Iyengar and Lepper 2000). Assortment evaluations could be lower for more complex products, since choosing a more complex product might instigate higher costs of variety. Apart from assortment-inherent product complexity, we study the buying situation a consumer is in, more specifically, the situation of time pressure. No research yet exists that has examined the impact of time pressure regarding the effects of assortment variety on assortment evaluations. In sum, we examine to what extent the effects of assortment variety can be generalized across the different contingencies of product complexity and time pressure.

To conclude, in this thesis we intend to clarify the underlying psychological process of the relationship between assortment variety and consumer assortment evaluations. Further, we check whether the theoretically proposed inverted U-shape for the impact of assortment size on assortment evaluations exists, by studying assortment size at a wide range. Finally, we investigate to what extent the effects of assortment variety can be generalized across different contingencies, i.e., different types of products and shopping situations.

3 Research Framework

3.1 Introduction

This chapter provides an integrated research framework that explains the effect of assortment variety on assortment attractiveness on the basis of perceptions of variety and the benefits and costs that variety generates. It builds the stage for the empirical studies in the subsequent chapters that test the research framework.

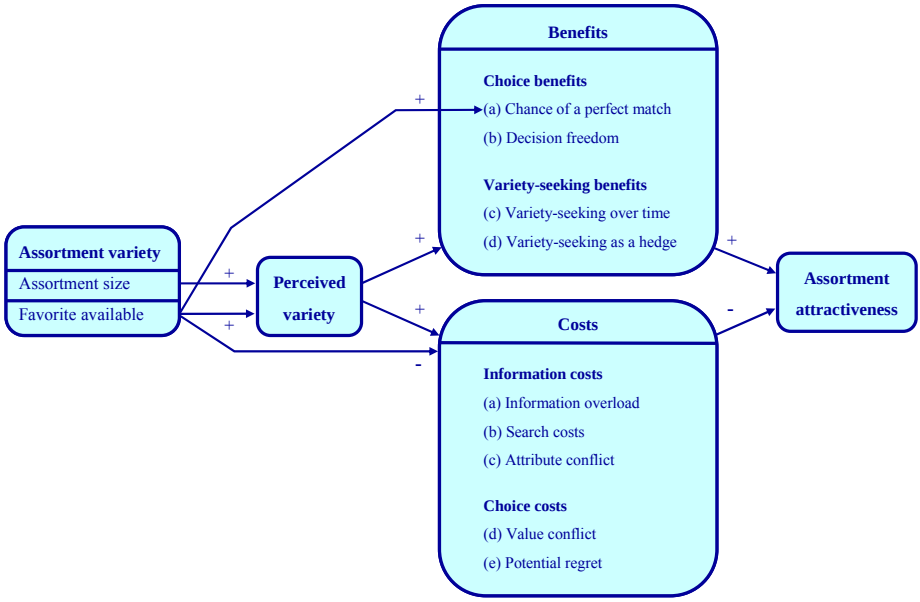
This chapter is organized as follows. In Section 3.2, we present the main research framework. All variables of the research framework and hypotheses on the relationships between these variables are discussed successively in the next sections. In Section 3.3, we give an overview of different variety related assortment characteristics. Two of these characteristics are selected as independent variables in this thesis, namely assortment size and favorite available. We discuss the effects of assortment size and favorite available on how much variety consumers actually perceive. Sections 3.4 and 3.5 present the benefits and costs that variety can bring to consumers. In Section 3.6, we discuss how the benefits and costs, in turn, affect the attractiveness of an assortment and explain the possibility of the existence of an optimal amount of variety with maximal attractiveness. The final section provides a summary of the hypotheses.

3.2 Research framework

In Figure 3.1, the research framework visualizes the relationship between assortment variety and assortment attractiveness. We propose that the relationship between assortment variety and assortment attractiveness can be explained on the basis of consumer perceptions of variety and the benefits and costs that variety brings to consumers. It is expected that if an assortment is larger and/or offers the favorite product of consumers, they will perceive more variety. This, in turn, will bring about benefits, such as feelings of decision freedom, and costs, for instance information overload, to consumers. We suggest that higher benefits make an assortment more attractive, while higher costs have a negative impact on assortment attractiveness. The trade-off between the benefits and costs of variety is proposed to result in how attractive the assortment is to consumers. Next to these mediating relationships, we also suggest direct links from favorite available to one of the benefits, namely the chance of a perfect match between what you want and what the assortment offers, and to all costs of variety. We expect for instance that if the favorite product of a consumer is available, search costs will be

lower. All relationships of the research framework are discussed in the following sections.

Figure 3.1 Research framework



3.3 Assortment variety

In this section, we discuss our conceptualization of assortment variety. Variety in an assortment can be reflected by different assortment characteristics, such as the number of products in an assortment (more products implies more variety) or the differences between the products in an assortment (more differences means more variety). In the next subsection, a classification of variety related assortment characteristics is provided. In Subsection 3.3.2, we explain why two of the assortment characteristics, namely assortment size and whether the favorite product of a consumer is available, are focused on in this thesis. In Subsections 3.3.3 and 3.3.4, we successively investigate the impact of assortment size and favorite available on perceived variety, the first mediating variable of our research framework.

3.3.1 What is assortment variety?

Assortment variety can be captured by a number of different assortment characteristics. Based on the literature review in Chapter 2, we distinguish seven variety related assortment characteristics. We classify these characteristics as follows:

Assortment size
(1) The total number of stockkeeping units (SKUs) offered (Broniarczyk et al. 1998),
(2) The amount of shelf space devoted to a product category (Broniarczyk et al. 1998),

Assortment composition
(3) The number of facings per SKU or duplicate products (Hoch et al. 1999),
(4) The attribute structure of the products in an assortment (Van Herpen and Pieters 2002),
(5) The organization or arrangement of the products on the shelf (Hoch et al. 1999),

Product preference
(6) Whether or not the favorite product of the consumer is available in an assortment (Broniarczyk et al. 1998), and
(7) The number of options in an assortment that are acceptable to the consumer (Kahn and Lehmann 1991).

Assortment size. The first two characteristics relate to the size of an assortment. Larger assortments generally contain more variety. The (1) *total number of SKUs* is the number of different products in an assortment, for example ten or thirty different products. Each specific product, i.e., a specific combination of brand, flavor and package size, is a different SKU. The total number of SKUs has a positive impact on consumer variety perceptions (Broniarczyk et al. 1998). People see more variety in an assortment with more different products.

The second assortment size related characteristic is (2) *product category shelf space*, which refers to the length and height of the shelf in terms of meters. If a product category occupies more shelf space, the assortment offers more variety.

Shelf space is highly related to both the total number of SKUs and the number of facings per SKU. Shelf space can be increased by putting more SKUs on the shelf. It can also be increased by enlarging the number of facings of the products that are already on the shelf.

Assortment composition. The next three characteristics, including the number of facings, reflect the composition of an assortment. The composition results from the combination of specific products in the assortment and how these products are placed on the shelf. Which specific products with which specific attributes are put on the shelf and how they are put on the shelf, the organization, also determines variety, next to the number of SKUs and shelf space. The availability of (3) *facings or duplicate products*, i.e. products with exactly the same attribute levels, determines variety in the following way. If product category shelf space is fixed, more facings per SKU lowers perceived variety (Hoch et al. 1999). For instance, an assortment of ten duplicated products (ten facings per SKU) offers less variety than an assortment of ten different products (one facing per SKU). If shelf space is not fixed, then an increase in the number of facings per SKU leads to an increase in shelf space and variety perceptions. Thus, this characteristic is closely related to shelf space.

The (4) *attribute structure* of the products in an assortment refers to the combination of attributes and attribute levels that are presented. Attribute structure can be decomposed into two components: dispersion of the attribute levels and dissociation across the attributes. The first component, dispersion, is the relative frequency with which the attribute levels of a specific attribute (e.g., orange and apple flavor) appear in an assortment. If the relative frequencies with which attribute levels occur increases then dispersion is higher. More dispersion implies more variety (Van Herpen and Pieters 2002). Van Herpen and Pieters (2002) used the Entropy measure to capture dispersion. The Entropy of attribute *m* is:

$$Entropy_m = -\sum_{l=1}^{L} p_l \ln p_l ,$$

where
m = an attribute,
l = an attribute level, and
p_l = the proportion of products in the assortment with attribute level l.

Entropy is highest if all attribute levels occur in equal proportions. Consider, for example, an assortment of three bottles of orange juice and three of apple juice versus an assortment of five bottles of orange juice and one of apple juice. In the first assortment, the relative frequency with which both attribute levels (orange and apple flavor) occur is higher than in the second assortment. Thus, the first assortment is more dispersed and, hence, offers more variety. The assortment with three bottles of orange juice and three of apple juice seems to offer a wider variety of choices than the assortment in which most products are of the same flavor. For the assortment with three bottles of orange juice and three of apple juice, p_l is 0.50 for the two attribute levels orange and apple flavor. As a result, Entropy is 0.69. Entropy is 0 if only one attribute level is present, for example, if all bottles contain apple juice. Higher values of Entropy, i.e., more dispersion, means more variety in the assortment (Van Herpen and Pieters 2002).

The second component of attribute structure is dissociation between the attributes. Dissociation is the exact opposite of association. Dissociation refers to the degree to which products with a specific attribute level (e.g., a certain brand name) do not also have another attribute level (e.g., a certain flavor). If the attribute levels are highly dissociated, association between the attributes is low. An assortment is more varied to the extent that the dissociation between each pair of attributes is higher (Van Herpen and Pieters 2002). Van Herpen and Pieters (2002) captured dissociation with the measure (1 – Lambda):

$$1 - Lambda_{mf} = 1 - \frac{\sum_{l=1}^{L} \max_o(n_{lo}) + \sum_{o=1}^{O} \max_l(n_{lo}) - \max_o(n_{\theta o}) - \max_l(n_{l\theta})}{2N - \max_o(n_{\theta o}) - \max_l(n_{l\theta})},$$

where
m = an attribute,
f = an attribute,
l = an attribute level,
o = an attribute level,
N = the number of products in the assortment,
n_{lo} = the number of products with attribute levels l and o,
$n_{l\theta}$ = the number of products with attribute levels l for attribute m (marginal count), and
$n_{\theta o}$ = the number of products with attribute levels o for attribute f (marginal count).

If dissociation (1-Lambda) increases, more unique products become available. Hence, variety increases. Consider for example an assortment with four products in which two brands A and B both carry two flavors, apple and orange juice. In this assortment, the association between brand name and flavor is low, meaning that the dissociation between the attributes is high. Lambda is 0 (no association) and 1-Lambda is 1 (full dissociation). If, for instance, all orange juice bottles are from brand A and all apple juice bottles carry brand B, association is high, while dissociation is low. In that case, Lambda is 1 (full association) and 1-Lambda is 0 (no dissociation). In this latter example, there are fewer unique products, making the assortment less varied.

The third assortment composition related characteristic is the (5) *organization of products on the shelf*. Are the products presented in an organized way (e.g., by brand name) or in an unorganized or random way? The organization can either increase or decrease variety perceptions. Whether consumers see more variety in a disorganized or in an organized assortment depends on how they look at the assortment (Hoch et al. 1999). It could be argued that consumers perceive more variety in a disorganized assortment. In a disorganized assortment, the same brand could be presented on two opposite sides of the shelf. Consumers might not initially notice this and, hence, see more variety.

However, this is only true if consumers approach the assortment in a holistic orientation, i.e., if they are just browsing the assortment. Thus, when consumers process in a holistic way, random displays are seen as more varied (Hoch et al. 1999). Should, however, consumers inspect the assortment more closely, in a more analytical way, then they will find out that the assortment does not offer as much variety as it appeared to. Analytic processing is likely to occur when a consumer is actually in the process of trying to buy something out of an assortment. When consumers engage in analytical processing, i.e., when they pay extra attention to the task of making a choice, the organization of the products on the shelf has no influence on variety perceptions (Hoch et al. 1999, p. 540). Thus, consumers in a holistic orientation see more variety in a more disorganized assortment, while consumers in an analytical orientation do not perceive a difference in variety between organized and disorganized assortments.

Product preference. The next assortment characteristics are more subjective in nature in that they consider consumer preferences with respect to the products in the assortment. (6) *Favorite available* asks whether the favorite product of a consumer is available in the assortment, assuming the consumer has a

favorite product. Highly preferred or favorite products have a higher probability to be noticed by consumers. As a result, favorite available has a positive effect on variety perceptions (Broniarczyk et al. 1998). A consumer, who notices his/her favorite product, will conclude that the assortment offers more variety, because the assortment *even* carries *his/her* favorite product.

The number of *acceptable options* (7) that are present in an assortment (for example none or ten) also determines variety. Consumers perceive more variety if the number of acceptable options increases. The more acceptable options an assortment offers, the better the assortment (Kahn and Lehmann 1991). A consumer who sees more products that are acceptable will conclude that the assortment offers more variety, because it offers so many of his/her preferred products.

All seven aspects discussed above can have an impact on how much variety consumers actually perceive (Boatwright and Nunes 2001). Broniarczyk et al. (1998) suggested that there might be two types of assortment cues for perceived variety. The first type of cues focuses more on cognitive aspects related to the 'count' of products available. These cues can be determined objectively. Examples of such aspects are the number of products, brands, package sizes, and flavors. The second type of cues might be considered more affective. It relates to 'fit to needs'. These cues are more subjective in nature. Examples of these more subjective cues that the authors mentioned are the availability of a favorite product and the ease of shopping. The authors found tentative support for these two types of cues for perceived variety.

We can divide our seven variety related assortment characteristics into an objective and a subjective 'fit to needs' group as suggested by Broniarczyk et al. (1998) (see Table 3.1). In the objective group, we classify the assortment size characteristics (number of SKUs and product category shelf space) and the assortment composition characteristics (number of facings per SKU, attribute structure, and organization of products). In the subjective group, we distinguish the product preference characteristics (favorite available and number of acceptable options). Although both groups capture different aspects of variety perceptions, they are also strongly related to each other. For example, an assortment containing more SKUs (objective) generally offers a higher chance that the consumer's favorite product is available (subjective). The number of acceptable options (subjective) can likewise be expected to depend on the number of SKUs (objective). When studying the effects of assortment variety it is, therefore,

relevant to consider both objective and subjective assortment characteristics. Consequently, we selected one objective and one subjective variety related assortment characteristic as independent variables.

Table 3.1 Variety related assortment characteristics

Objective characteristics	Subjective characteristics
Assortment size	*Product preference*
(1) Number of SKUs	(6) Favorite available
(2) Product category shelf space	(7) Number of acceptable options
Assortment composition	
(3) Number of facings per SKU	
(4) Attribute structure	
(5) Organization of products	

3.3.2 Selection of assortment size and favorite available

Two variety related assortment characteristics were selected as independent variables in our study. We chose the number of different SKUs in an assortment from the objective characteristics. This variable will be referred to as 'assortment size'. From the subjective characteristics, we chose favorite available as an independent variable. In this subsection, these choices are motivated.

Assortment size was selected for the following reasons. Theoretically, assortment size is sure to have an impact on the variables in our research framework. A number of studies discussed in the previous chapter showed that assortment size has an impact on multiple important variables, such as perceived variety, store sales, and product category sales. Thus, by selecting assortment size as an independent variable, it can be expected that it will also have an impact on the benefits and costs of variety and on assortment attractiveness.

Another more managerially relevant reason for selecting assortment size instead of one of the other characteristics is that assortment size is a characteristic that is relatively easy to manage for retailers. Of all objective aspects of variety that were considered in the previous subsection, assortment size is a relatively flexible one to adapt. Assortment size can be increased by enlarging product category shelf space with new SKUs or by replacing existing facings with new SKUs. Enlarging shelf space is somewhat more difficult, because the total amount of shelf space of a brick-and-mortar store is generally fixed. Overall, assortment

size, which is closely related to shelf space and the number of facings, is relatively easy to manage.

Managing other objective assortment characteristics is more difficult. First, it is hard to change the attribute structure in an assortment while keeping assortment size and the number of facings constant. These three assortment characteristics are highly related to each other. For instance, manipulating attribute structure by adding new attribute levels to an assortment will potentially also increase the size of the assortment. Thus, attribute structure alone is not a very advantageous tool for influencing assortment variety. Second, changing the organization of products on the shelf is also not a practical tool. Its effect on consumer perceptions of variety depends on how consumers approach the assortment, in a holistic or an analytical way (Hoch et al. 1999). More importantly, the arrangement of products in, for example, supermarkets is usually well organized. Therefore, it is not a practical solution to adjust the arrangement of products into a disorganized or random one. Overall, we consider assortment size to be one of the most important objective variety related assortment characteristics that very likely will influence the attractiveness of an assortment. In addition, of all objective assortment characteristics, it is relatively easy to manage for retailers.

Next to assortment size, we selected a highly important subjective variety related assortment characteristic, namely favorite available. Consumers want their favorite products to be available all of the time (Geuens, Brengman, and S'Jegers 2003).What counts is not only how many products are offered in an assortment, but also how consumers appreciate the products that are provided. Do the products in the assortment fit to the needs of a heterogeneous consumer group? Are most popular brands, sizes, and flavors available? Does the assortment contain the favorite product of most consumers? Retailers can manage this aspect of variety by selecting as many popular, well selling, products on the shelves.

3.3.3 The effect of assortment size on perceived variety

Perceived variety means how much variety consumers actually see. Do consumers perceive more variety in an assortment with fifty versus five products? They probably will. Do they see more variety in an assortment with fifty versus forty-nine products? They probably will not. Intuitively, we can expect that if an assortment carries more products, consumers will perceive more variety in the assortment. We can also expect that small increases in the number of products will

go unnoticed, especially in large assortments. Increasing assortment size from forty-nine to fifty products will less easily increase variety perceptions than increasing assortment size from four to five products. As a result, we expect that consumer perceptions of variety increase with assortment size and that this relationship shows decreasing marginal returns. Note that we consider perceived variety as a perception, not as an evaluation, as a small number of other researchers has done (e.g., Broniarczyk et al. 1998, Study 1).

A positive effect of assortment size on perceived variety was found by Van Herpen (2001, Chapter 3). Subjects perceived more variety if they were confronted with sixteen hypothetical products, called 'jinko's', than if they saw only eight products (Study 1). Perceived variety was also higher with assortments of eighteen versus twelve dishwashers (Study 2). Since size was manipulated on only two levels, potential nonlinear effects could not be demonstrated. Perceived variety also increased as a function of assortment size in a study of Kahn and Wansink (2004, Study 5). Assortment size was manipulated at two levels (six versus twenty-four colors of jellybeans). Thus, no nonlinear effects could have been found. Finally, Chernev (2003b) also demonstrated that perceived variety was higher for a larger than a smaller assortment. Again, no nonlinear effects were examined.

The underlying rationale for decreasing marginal returns is found in the well-known Weber's Law. This psychophysical law is based on the fact that a consumer's ability to detect a difference between two stimuli is relative. Weber stated in 1834 that the amount of change that is necessary to be noticed is systematically related to the intensity of the original stimulus (Solomon 2002). The law posits that, as the intensity of the stimulus increases, the ability to detect a difference between two levels of the stimulus decreases (Mowen and Minor 2001). The stronger the initial stimulus, the greater a change must be for it to be noticed (Solomon 2002). We apply Weber's Law to the effect of assortment size on perceived variety. The stimulus is the assortment and the intensity is the level of assortment size. For larger assortments, the ability of consumers to perceive a difference between two assortments decreases. Hence, we propose decreasing marginal returns for the relationship between assortment size and perceived variety.

Some empirical support for the decreasing marginal returns of assortment size on perceived variety can be found in the following study. Broniarczyk et al. (1998) reduced the number of SKUs in an assortment of microwavable popcorn

with 25%, 50%, and 75% (Study 2). Perceived variety was measured by asking whether subjects perceived more or less variety in the test store (with fewer SKUs) compared to the base store (offering 48 SKUs). Subjects perceived that the test store with 25% fewer SKUs and the base store offered the same level of variety. Thus, the difference between 48 and 36 products went unnoticed by consumers. Subjects did perceive that the test store offered less variety than the base store when SKUs were reduced by 50% or by 75% (Broniarczyk et al. 1998). These results support the decreasing marginal returns of assortment size.

Some additional empirical support for the decreasing marginal returns can be found in a paper by Hoch et al. (1999). They found decreasing marginal returns for the relationship between the number of distinctions between products and perceived variety. Fewer duplicates (i.e., identical products) in an assortment implied more distinctions between products, which led to higher variety perceptions, while decreasing marginal returns accompanied increases in the number of distinctions. Based on these insights, we hypothesize:

H_1: An increase in assortment size will increase perceived variety, with decreasing marginal returns.

3.3.4 The effect of favorite available on perceived variety

With favorite available, we mean whether the favorite product of a consumer is available in an assortment, yes or no. Note that it is only possible to determine whether the favorite product is available, if the consumer actually has, or is aware of, one favorite product. Consumers might or might not be aware of which attributes their ideal product consists of (Chernev 2003a). Only if a consumer is aware of his/her favorite product is it can be determined whether this favorite product is present in the assortment.

Consumers will more easily notice their favorite product than other products in an assortment (Broniarczyk et al. 1998). We can reason that if consumers notice their favorite product they will think that the assortment contains more variety, because, besides the other products, it *even* carries *their* favorite product. Broniarczyk et al. (1998) indeed found that perceptions of variety were higher if the most preferred (versus least preferred) SKUs were available in an assortment. Hence, we conjecture that if a consumer has a favorite product and if this favorite product is available, this has a positive impact on perceived variety:

H_2: If a consumer has a favorite product, perceived variety will be higher if the favorite product is available in an assortment compared to if it is not available.

3.4 Benefits of variety

In the previous section, we proposed that two important aspects of variety, assortment size and favorite availability, have a positive impact on perceived variety. In this section, we discuss how higher perceptions of variety in an assortment bring a number of benefits to consumers. There is no question that more variety to choose from brings benefits to consumers, as prior research has clearly shown (e.g., Van Herpen 2001; Iyengar and Lepper 2000). In this thesis, we distinguish two important groups of benefits that are proposed to mediate the relationship between perceived variety and assortment attractiveness. The first group of benefits relate to choosing one product from an assortment (choice benefits). Making a choice from a more varied assortment brings about important benefits: (a) a higher chance of a perfect match between what you are looking for and what the assortment offers, and (b) larger feelings of decision freedom. The second group of benefits relate to the opportunity for consumers to seek variety in their choices (variety-seeking benefits). Now, the focus is not on choosing one product, but on choosing a variety of products either (c) over time, or (d) at once.

The first of the choice-related benefits of variety is what we will refer to as (a) *the chance of a perfect match*, i.e., the chance of a perfect match between what the consumer wants and what the assortment offers. A more varied assortment enlarges the chance of a successful shopping trip. The chance that a consumer finds a specific product that matches his/her preferences, even if the consumer does not know these preferences beforehand, is larger for more varied assortments. Different individuals have different preferences, but an assortment cannot offer the perfect match of every consumer. The more varied an assortment is, the more likely a consumer is to find and select a product that matches his/her preferences (Baumol and Ide 1956; De Clerck et al. 2001). Hence, we expect a positive impact of perceived variety on this benefit.

The second choice-related benefit is (b) *decision freedom*. Decision freedom is literally the freedom to choose and is defined here as the freedom that the consumer perceives to have in making his/her own choice. More specifically, the benefit exists in that consumers have the feeling that they are free to choose

from an assortment and that it was not the retailer who already made the choice for them. In general, consumers value decision freedom. Varied assortments enhance feelings of decision freedom (Reibstein et al. 1975). A consumer's decision freedom increases as the number of preferred products from which to choose increases, as was found by Reibstein et al. (1975). More variety, which generally includes more preferred products, henceforth increases decision freedom.

The second group of benefits of variety are the variety-seeking benefits. Consumers can engage in variety-seeking behavior, which is the tendency to seek diversity in their choices of goods. Kahn (1995) distinguished three main motivations why consumers seek variety in their purchases. First, they may seek variety because of an internal need for variety due to satiation or because of a need for stimulation. Second, consumers may seek variety because of changes in the external environment, such as price promotions. Third, variety-seeking behavior may also occur as a hedge against uncertainty in future tastes. Variety-seeking behavior may thus arise over time or within purchase occasions (Kahn 1995). An assortment that offers more variety increases the possibility to seek variety over time and within purchase occasions.

The first variety-seeking benefit we refer to as the possibility for (c) *variety-seeking over time*. The need to switch between different products over time can be catered by offering variety in an assortment. Suppose you select a specific flavor now and become bored with this flavor. A more varied assortment offers more possibilities to select another flavor of your liking the next time you are confronted with the assortment. Therefore, higher perceptions of variety in an assortment lead to better possibilities for variety-seeking over time.

The second variety-seeking benefit is the possibility for (d) *variety-seeking as a hedge against uncertainty.* Consumers can select a varied portfolio of products now, within one purchase occasion, for future consumption. A motivation for this variety-seeking behavior at one point in time is preference uncertainty or taste misprediction: consumers are uncertain about their own future preferences (Kahn 1995). Suppose a consumer wants to buy two bottles of fruit juice now, for future consumption. At this moment, he/she is unsure about which flavor(s) he/she will prefer in the future. Two times apple juice? Two times orange juice? Consumers are motivated to postpone this decision to the future by selecting a varied portfolio now (i.e., one bottle of apple juice and one of orange juice). Consumers seek variety as a hedge against uncertainty in their future tastes, which can be interpreted as a risk-reduction strategy. A varied portfolio of products

increases the likelihood that the consumer will be able to choose his or her most preferred product in the future (Kahn 1995; Simonson 1990). A more varied assortment offers more possibilities to select a varied portfolio of products as a hedge against uncertainty. Hence, we propose a positive effect of perceived variety on variety-seeking as a hedge against uncertainty.

In brief, we propose that an increase in perceived variety leads to an increase in the two choice benefits and the two variety-seeking benefits of variety:

H_3: An increase in perceived variety will increase: (a) the chance of a perfect match, (b) decision freedom, (c) variety-seeking over time, and (d) variety-seeking as a hedge against uncertainty.

Regarding the impact of perceived variety on the benefits, we do not make any inferences on the differential strength of the relationships between perceived variety and the different benefits. If consumers perceive more variety in an assortment, this will bring about these four benefits. However, we do not conjecture that, for example, the increase in the chance of a perfect match will be larger than the increase in feelings of decision freedom or one of the other two benefits. Our results will provide insights into the differential impact of perceived variety on the benefits of variety.

In this thesis, we study the benefits of variety that consumers experience when they make a choice from an assortment. We include benefits consumers experience while choosing one product (choice benefits) or multiple products (variety-seeking benefits). We do acknowledge that other benefits of variety may exist, such as the opportunity to learn from and explore an assortment (Van Herpen 2001). However, we focus on the variety in an assortment to choose from, not on variety to learn from. De Clerck et al. (2001) distinguished the same four benefits as we do (although they named them slightly different[1]) to have an impact on product category sales, indicating the importance of the benefits that we concentrate on.

Favorite available. We proposed that assortment size and favorite available have a positive impact on perceived variety (H_1 and H_2), and that perceived variety, in turn, leads to four different benefits (H_3). In addition, we

[1] The authors used the following labels: heterogeneity in tastes (= chance of a perfect match), autonomy (= decision freedom), variety-seeking (= variety-seeking over time), and preference uncertainty (= hedge against uncertainty).

suggest that favorite available also has a direct impact on one of the benefits, namely on the chance of a perfect match. A consumer who notices his/her favorite product in an assortment will immediately attribute a higher chance of a perfect match to the assortment, because he/she sees his/her perfect match. Hence, we hypothesize a direct positive link between favorite available and the chance of a perfect match:

H_4: If a consumer has a favorite product, the chance of a perfect match will be higher if the favorite product is available in an assortment compared to if it is not available.

We do not expect that the availability of a favorite product directly enlarges the other benefits, i.e., feelings of decision freedom or variety-seeking benefits. Consumers will focus on their favorite product and as a result pay less attention to other attractive products. Since decision freedom and variety-seeking benefits arise from multiple products the consumer might favor, we do not assume these benefits to increase directly from the availability of one favorite product.

3.5 Costs of variety

Variety does not only bring benefits to consumers, it also has its costs. Iyengar and Lepper (2000) showed that if consumers are confronted with larger assortments they experience the decision-making process as being simultaneously more enjoyable and more difficult and frustrating. Chernev (2003b) also demonstrated that choosing from a large assortment is perceived to be relatively more difficult than choosing from a small assortment. Difficulty, however, is a very broad concept, since it can be difficult to choose for a number of different reasons. Choosing can be difficult because, for example, there is too much information to take into account, or because there are multiple attractive products and you are afraid of making the wrong choice.

In this thesis, we refine the broad concept of decision difficulty. We distinguish two groups of costs that are proposed to mediate the relationship between perceived variety and assortment attractiveness: information costs and choice costs. We propose that both groups of costs occur when a consumer is confronted with a certain level of assortment variety and has to make a choice from the assortment. Consumers often use a two-step process in decision making

(Ursic and Helgeson 1990). They tend to start with attribute-based evaluations and comparisons, turning to brand processing during the second phase of the choice process (Bettman and Park 1980). In line with this, we argue that the choice making process consists of the following two phases. First, the consumer has to gather information on the available products, he/she has to search for an acceptable product, and he/she needs to trade-off the information on the attributes of the products. Within this group of costs, or phase, we distinguish the following costs of variety: (a) information overload, (b) search costs, and (c) attribute conflict. Second, the consumer actually has to make a choice. Now it may be difficult to choose because several products are equally attractive, or because the consumer is afraid that he/she will regret the choice later on. In this group, we identify two costs of variety: (d) value conflict and (e) potential regret.

The first information cost is (a) *information overload*. The information load paradigm is based on the proposition that consumers have finite limits to the amount of information they can assimilate and process during any given unit of time. Information overload occurs when these limits are exceeded (Malhotra, Jain, and Lagakos 1982). If consumers have to process more information, it is more likely that they become overloaded with this information. Variety can cause complexity resulting in information overload (Huffman and Kahn 1998). It can make consumers feel overwhelmed and dissatisfied or make them choose not to select a product at all (Jacoby, Speller, and Berning 1974). Higher levels of variety imply more information to process, which increases the chance of information overload. Therefore, we propose a positive effect of perceived variety on information overload.

The second information cost is (b) *search costs*. With search costs, we mean the amount of mental and physical effort it takes to find the product that you want to buy. Larger assortments require more physical (Baumol and Ide 1956) and mental effort to find a specific product category or product. If variety increases, it takes longer to find the product you prefer, simply because you have to cover more store ground (Baumol and Ide 1956). You have to walk longer which takes more physical effort. In addition, if you have to choose from a more varied assortment it will take more mental effort to find your preferred product. Searching for your most preferred product becomes harder. Hence, as perceived variety increases, physical and mental search costs will increase.

Choice conflict is the difficulty consumers experience while making a choice. Conflict arises because, for example, consumers may not know how to

trade-off the costs of a product against its benefits. As a consequence, it can be hard to make a decision (Tversky and Shafir 1992). Since variety implies choice, it can lead to choice conflict. We distinguish two ways in which choice conflict can take place. Choice conflict can occur because consumers have to trade-off between important attributes, such as a higher price against a more preferred color (Zeelenberg 1999). An assortment that offers more variety contains more attributes and/or attribute levels to base the selection on. Trading-off these attributes and attribute levels thus becomes harder as variety increases. We will refer to this variable as (c) *attribute conflict*, which is categorized under the information costs. Attribute conflict can be defined as the conflict that consumers experience because they have to trade-off attributes and attribute levels against each other. We conjecture that higher perceived variety leads to higher attribute conflict.

The second group of costs of variety consists of the choice costs that occur during the actual choice-making phase. Choice conflict can take place not only because the trade-offs between the attributes become harder (attribute conflict), but also because options are close in attractiveness (Zeelenberg 1999). Research has shown that as the attractiveness of products in an assortment rises, individuals experience conflict (Iyengar and Lepper 2000). To illustrate, for simple products it is harder time to choose between four equally attractive products than between a set of two equally attractive products and two equally unattractive products (Hendrick, Mills, and Kiesler 1968). With more variety, chances are higher that multiple attractive products are available. Choosing from multiple equally valued products will be harder than choosing from an assortment that contains only one favorite product. We will refer to this variable as (d) *value conflict*. We propose that an increase in perceived variety increases value conflict.

The second choice cost is (e) *potential regret*. Regret is the psychological state induced by comparing an outcome to the outcome of a forgone alternative (Inman, Dyer, and Jia 1997). Regret can affect people's choices before the decision is made, when they anticipate the regret they may feel later if the decision turns out badly (Zeelenberg et al. 1996; Zeelenberg and Pieters 2004). Choosing from a more varied assortment will lead to a higher potential for regret, because there are probably more attractive products that you cannot choose. In a set of experiments by Iyengar and Lepper (2000), subjects were asked to choose from an assortment offering either low variety or high variety. The authors found that although the more varied assortments may be initially more appealing, these assortments are also more likely to hamper people's intrinsic motivation. They

suggested that choosers in the high variety situation might actually feel more committed to the choice making process, because of the large number of products available. Choice-makers in the high variety situation might feel more responsible for their choices given the potential opportunity of finding the very best option (Iyengar and Lepper 2000). We conjecture that because of these strong feelings of responsibility with more varied assortments potential regret may also increase. Therefore, as variety increases, potential regret will increase.

For the costs of variety, we hypothesize that they all increase with perceived variety:

H_5: An increase in perceived variety will increase: (a) information overload, (b) search costs, (c) attribute conflict, (d) value conflict, and (e) potential regret.

As with the benefits, we do not propose any differences in the strength of the effects of perceived variety on the different costs. If consumers perceive more variety, this will result in these five costs of variety. However, we do not conjecture for instance that the increase in information overload will be higher than the increase in potential regret or any of the other costs, because, currently, there is no clear theoretical evidence available on this issue. The results of our studies will uncover the differential impact of perceived variety on the costs of variety.

We focus on the costs of variety that most likely have an impact on assortment attractiveness. Compared to other studies, we offer a refined set of costs. Where others have studied for example choice difficulty (e.g., Iyengar and Lepper 2000) or the effort required to make a choice (e.g., Van Herpen 2001, Chapter 3), we use variables that provide more insights into these costs. We include costs that explain *why* it is difficult to make a choice. Is the decision making hard during the information collection process? There we distinguish between the costs of information overload, search costs, and attribute conflict. Is the decision making difficult during the act of making the choice? Then it is proposed to be hard to choose because of value conflict or potential regret. Thus, our framework explains in-depth the relationship between assortment variety and assortment attractiveness.

Favorite available. Favorite available was proposed to positively influence perceived variety (H_2), which in turn leads to a number of benefits (H_3) and costs

(H_5). Thus, the availability of a favorite product indirectly results in higher costs of variety. In the previous subsection, we hypothesized a direct link between favorite available and one of the benefits of variety, the chance of a perfect match (H_4). Here, we also conjecture a direct impact of favorite available on the costs of variety. In general, we propose that all costs will directly decline if the favorite product of a consumer is available. In that case, consumers will probably focus their attention on this product and be less inclined to process information on and evaluate the other products. However, if the favorite product is not available, the consumer faces the task of constructing his/her preferences and at the same time making a choice. More products will be taken into account, making the choice task more demanding.

Information costs will be lower if the favorite product is available. Consumers who have a favorite product will be less easily overloaded with information. They will probably process less of the available information, because their focus is on the favorite product. In addition, it will take them less physical and mental search costs to make a choice. They only have to search for their favorite product; they do not have to construct their preferences at the same time. They will also be less inclined to make difficult attribute trade-offs, because their focus is on one (favorite) product. We also propose that favorite available has a direct negative effect on the choice costs: value conflict and potential regret. These costs will be lower if consumers find their favorite product, since then they will probably not so much care about the attractiveness of the other available products. In brief, we hypothesize that favorite available has a direct negative impact on all costs of variety:

H_6: If the consumer has a favorite product, (a) information overload, (b) search costs, (c) attribute conflict, (d) value conflict, and (e) potential regret will be lower if the favorite product is available in an assortment compared to if it is not available.

3.6 Assortment attractiveness

In this section, the focus is on the dependent variable of our research framework, assortment attractiveness. In Subsection 3.6.1, we explain what assortment attractiveness is and how the benefits and costs of variety influence it. The mediating role of perceived variety and the benefits and costs in the relationship

between assortment size and assortment attractiveness is also discussed. Subsection 3.6.2 investigates the overall relationship between assortment size and assortment attractiveness, proposing that an optimal level of assortment size exists.

3.6.1 The effect of the benefits and costs of variety on assortment attractiveness

In this thesis, we investigate the overall effect of assortment variety on a subjective consumer evaluation of the assortment, namely assortment attractiveness. What is assortment attractiveness? We define assortment attractiveness as the evaluation of an assortment by a consumer. We focus on the evaluation of an assortment while the consumer is making a choice from it.

How do the benefits and costs that emerge from variety relate to the attractiveness of an assortment? Intuitively, one can see that higher benefits of variety make an assortment more attractive, while higher costs of variety have a negative impact on assortment attractiveness. The consumer will make a trade-off between these positive benefits and negative costs in order to determine how attractive the assortment is to him/her. Hence, we hypothesize that:

H_7: An increase in (a) the chance of a perfect match, (b) decision freedom, (c) variety-seeking over time, or (d) variety-seeking as a hedge against uncertainty, will increase the attractiveness of an assortment.

H_8: An increase in (a) information overload, (b) search costs, (c) attribute conflict, (d) value conflict, or (e) potential regret will decrease the attractiveness of an assortment.

Assortment attractiveness will depend on the strength of the four different benefits and the five different costs. Assortment attractiveness also depends on the importance consumers attach to each specific benefit and cost. We do not make inferences on the differences in impact between the different benefits and costs.

Mediation. The fact that the relationship between assortment variety (independent variable) and assortment attractiveness (dependent variable) can be explained on the basis of perceived variety and the benefits and costs of variety, implies that perceived variety and these benefits and costs are mediating variables. These mediating variables represent a mechanism through which the independent

variable is able to influence the dependent variable (Baron and Kenny 1986). In the literature, we find support for the mediating role of perceived variety. Broniarczyk et al. (1998) empirically demonstrated that perceived variety mediates the positive impact of the number of SKUs in an assortment and favorite available on store choice. Hoch et al. (1999) empirically showed that perceived variety almost completely mediated the influence of variety in the attribute levels of products (i.e., information structure) on satisfaction with the assortment and store choice. Kahn and Wansink (2004) also empirically uncovered a mediating role for perceived variety in the relationship between the number of distinct products and consumption quantity. Thus, there is empirical evidence for the mediating role of perceived variety.

With respect to the mediating role of the benefits and costs of variety in the relationship between (assortment or perceived) variety and assortment evaluations, no prior research is available (see Figure 2.2 in Chapter 2). As far as we are aware of, no studies have empirically investigated the impact of perceived variety on benefits and costs of variety, and, at the same time, the effect of these benefits and costs on consumer assortment evaluations. Earlier, we proposed that an increase in assortment size increases perceived variety (H_1) and that favorite available has a positive effect on perceived variety (H_2), on one of the benefits of variety (H_4) and a negative effect on all costs (H_6). We also showed how perceived variety can bring about both benefits and costs to consumers (H_3 and H_5). In addition, we explained the effects of the benefits and costs on assortment attractiveness (H_7 and H_8). These hypotheses and the empirical evidence on the mediating role of perceived variety, lead to the following proposition that perceived variety and the benefits and costs of variety are mediating variables in the relationship between assortment variety (assortment size and favorite available) and assortment attractiveness:

H_9: The relationship between assortment variety (assortment size and favorite available) and assortment attractiveness is mediated by both perceived variety and the benefits and costs of variety.

3.6.2 An optimal level of assortment size?

In the previous sections, we developed hypotheses on the underlying process of the relationship between assortment variety and assortment attractiveness. An important question for retailers is how as a result of this process, overall, the size of an assortment affects the attractiveness of an assortment. Does an optimal level of assortment size exist?

It seems intuitive that the impact of assortment size on the attractiveness of an assortment shows an inverted U-shape. This means that initially larger assortments are more attractive for consumers, due to the higher benefits they entail. However, since the costs of variety also increase strongly with assortment size, after a certain level of assortment size the attractiveness can be expected to decrease again. The costs can become prohibitive, thus lowering assortment evaluations. This inverted U-shape has been suggested often both in conceptual papers and in future research sections of empirical studies though it has never been empirically demonstrated for the size of an assortment at the product category level.

In a conceptual paper, Baumol and Ide (1956) proposed an inverted U-shape for a consumer's expected benefit of entering a store as a function of the number of products kept. An increase in variety will enlarge the probability of success in shopping. However, ultimately a store may stock so many products that the shopping costs of covering store ground become prohibitive. Handelsman and Munson (1985) also proposed an inverted U-shape. They suggested the disadvantage of confusion aroused by too much variety and stated that an optimal range of assortment size is apparent. Desmeules (2002) conjectured an inverted U-shape for the relationship between variety and the positiveness of consumption experiences. Satisfaction increases with variety, but at the downward part of the curve, regret starts being effective. A formal theoretical model that supports the inverted U-shape under certain reasonable conditions was provided by Lu, Chen and Chang (2005).

The existence of an inverted U-shape was also proposed in further research sections of a number of empirical studies. Boatwright and Nunes (2001) suggested than an area for future research should be to explore whether an optimal selection of products exists. Kahn (1998) also posed the question of 'when is too much variety too much?' for future research. Dhar, Hoch and Kumar (2001) proposed that larger assortments are better able to meet the heterogeneous needs of

the retailer's customer base, but that too large an assortment can actually be detrimental. A more recent empirical study on variety reductions also suggested the existence of an optimal level of variety. Borle et al. (forthcoming) stated that the effect of SKU reductions is likely to follow an inverted U-shaped process, where consumers welcome initial cuts while extensive cuts leave product categories overly sparse. These studies all suggested the existence of an inverted U-shape for future research.

Empirically, there is one paper, by Brown (1978), that supports the inverted U-shape for variety. Based on 992 shopping trips to local grocery stores by (only) ten consumers they demonstrated an inverted U-shape relationship between the size of a grocery store (measured in square feet of floor space) and number of visits. However, the independent variable is store size, while we focus on the size of a product category, i.e., assortment size. In addition, it is a rather old and not very extensive study. In this thesis, we empirically investigate whether the frequently suggested optimal level of variety actually exists. This is possible, because we study assortment size at a wide range.

Our following hypothesis is based on the possibility of an optimal point of assortment size. Assortment attractiveness is proposed to rise with assortment size until a certain optimum is reached. After this point, the attractiveness declines again. Thus, we hypothesize an inverted U-shape for the relationship between assortment size and the attractiveness of an assortment:

H_{10}: The impact of assortment size on the attractiveness of an assortment will show an inverted U-shape.

3.7 Summary

This chapter offered a first step in uncovering the effects of assortment variety. We developed an integrated research framework that can explain the relationship between assortment variety and assortment attractiveness. Two variety related assortment characteristics were selected: an objective one, assortment size, and a subjective one, favorite available. Propositions were built on how both assortment size and favorite available have a positive impact on perceived variety and how perceived variety, in turn, brings about four different benefits (chance of a perfect match, decision freedom, variety-seeking over time, and variety-seeking as a hedge against uncertainty) and five different costs (information overload, search

costs, attribute conflict, value conflict, and potential regret). We explained that the benefits influence assortment attractiveness positively, while the costs have a negative effect on the attractiveness of an assortment. A mediating role for both perceived variety and the benefits and costs of variety was proposed. Finally, we suggested an inverted U-shape for the overall relationship between assortment size and assortment attractiveness. An overview of the hypotheses is shown in Table 3.2.

The research framework presented in this chapter creates an understanding of the relationship between assortment variety and assortment attractiveness, which is the goal of this thesis. The framework is empirically tested in the following three chapters.

Table 3.2 Overview of hypotheses in the main research framework

Independent variable	Dependent variable	Hypothesis	Expected sign
Assortment size	Perceived variety	1	+, decreasing marginal returns
Favorite available	Perceived variety	2	+
Perceived variety	Perfect match	3a	+
	Decision freedom	3b	+
	Variety-seeking over time	3c	+
	Variety-seeking as a hedge	3d	+
Favorite available	Perfect match	4	+
Perceived variety	Information overload	5a	+
	Search costs	5b	+
	Attribute conflict	5c	+
	Value conflict	5d	+
	Potential regret	5e	+
Favorite available	Information overload	6a	-
	Search costs	6b	-
	Attribute conflict	6c	-
	Value conflict	6d	-
	Potential regret	6e	-
Perfect match	Attractiveness	7a	+
Decision freedom	Attractiveness	7b	+
Variety-seeking over time	Attractiveness	7c	+
Variety-seeking as a hedge	Attractiveness	7d	+
Information overload	Attractiveness	8a	-
Search costs	Attractiveness	8b	-
Attribute conflict	Attractiveness	8c	-
Value conflict	Attractiveness	8d	-
Potential regret	Attractiveness	8e	-
Assortment size and favorite available	Attractiveness	9	Mediation
Assortment size	Attractiveness	10	Inverted U-shape

4 Variety is Sweet, Variety is Bitter: Understanding Assortments of Grocery Products

4.1 Introduction

Consumers nowadays face an abundance of choices available in supermarkets and other grocery stores. A typical Dutch supermarket carries about 20,000 products (Oosterhout 2005). High variety can be found in a wide array of product categories, such as (canned) vegetables, bread, margarines, jam, yogurts, potato chips, wine, and sodas. Though variety is beneficial, it also brings its costs to consumers. Hence, we need to know to what extent variety in assortments of simple grocery products is actually appreciated by consumers. Therefore, the goal of this chapter is to answer the main research question: How does assortment variety affect assortment attractiveness? More specifically, we investigate to what extent this relationship can be explained on the basis of perceptions of variety (research question 1) and the benefits and costs that variety brings to consumers (research question 2). In the previous chapter, hypotheses were developed on the relationship between assortment variety and assortment attractiveness. These hypotheses are empirically tested in the current chapter.

The proposed relationship between assortment variety and assortment attractiveness is tested in a laboratory setting with assortments of simple grocery products, namely jam and potato chips. We investigate how assortment size and favorite available, the independent variables, affect assortment attractiveness, the dependent variable, and to what extent the variables perceived variety and the benefits and costs of variety can explain the relationship between assortment variety and assortment attractiveness. In Section 4.2 the methodology of the experiment is explained. The results of the study are discussed in Section 4.3. In Section 4.4 we present the conclusions.

4.2 Method

4.2.1 Subjects and experimental design

One hundred and fifty-six students participated in the experiment. The students were recruited on the university campus where the experiment took place. The 156 subjects (62% male, 38% female) ranged in age from 18 to 35 years.

In the experiment, we manipulated one aspect of assortment variety, namely assortment size. All subjects were presented one of five different assortment sizes. Subjects were randomly assigned to the conditions. Thus, we

used an experimental design in which assortment size was varied between-subjects. The final number of subjects per assortment size ranged from 28 to 35 subjects. Table 4.1 provides the specific number of subjects for each condition.

Table 4.1 Number of subjects per assortment size condition

	Assortment size					
	5	20	35	50	65	Total
Number of subjects	31	32	35	28	30	156

Within the same condition, i.e., the same assortment size, subjects successively answered questions on assortments of two different product categories, jam and potato chips. The order of the product categories was random. The final number of subjects who saw jam first and the number of subjects who saw potato chips first were both 78. We tested for potential order effects of the product category by conducting a MANOVA with two between-subjects factors: order and assortment size. Details of the test are provided in Appendix 4.A. Results revealed no significant impact of the order of the product categories on the items measured. Therefore, for the analyses the data were collapsed over the first and second assortment exposure.

In addition, we investigated with multiple ANOVA's whether a number of covariates differed significantly between assortment sizes. This was done for product involvement, purchase involvement, purchase risk, and product expertise for both product categories separately, and for the personal variables variety-seeking tendency and need for cognition. No significant differences between assortment sizes for any of these variables were found. Thus, a random assignment of subjects to conditions had been achieved.

4.2.2 Stimuli

In this subsection, we first explain why we chose the two product categories jam and potato chips. Then, the composition of the five assortments is discussed, followed by an evaluation of the realism of these assortments.

Product category selection. We selected two product categories that are relatively simple, namely jam and potato chips. Most consumers are familiar with these products and buy them on a regular basis. In our sample, the mean number of jars of jam that subjects bought per year was 9, ranging from 0 to 104 (two jars per

week). Nine subjects never bought jam. The mean number of bags of potato chips subjects bought per year was 47 (about once a week). The number of bags ranged from 2 to 520 (10 bags per week). In general, potato chips are bought more often than jam. This can be explained by the fact that it takes much longer to finish a jar of jam than a bag of potato chips. Because of the high purchase incidence of both product categories, we can assume that subjects were able to judge the level of variety in the assortments and evaluate the attractiveness of the assortments. Furthermore, both jam and potato chips are low involvement products, although subjects were more involved with potato chips that with jam. More detailed information on product category specific consumer characteristics, such as product involvement, for the two product categories are provided in Appendix 4.B.

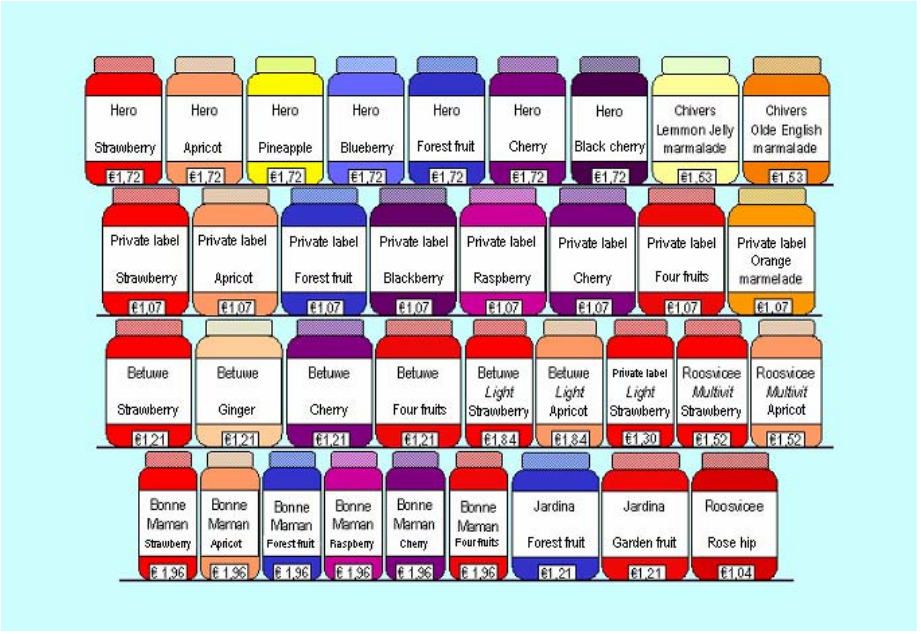
A practical reason for choosing jam and potato chips is that the product attributes on which consumers make a selection, such as brand name and flavor, can be easily identified and manipulated. This gave us the opportunity to compose assortments that differed systematically in size and not in other variety related assortment characteristics, such as the attribute structure of the products.

Assortment composition. Subjects were confronted with one assortment of jam and one of potato chips (in random order). For each subject, the assortment size of the two product categories they saw was equal. The two assortments consisted of 5, 20, 35, 50, or 65 different products (jars of jam or bags of potato chips). As we showed in Chapter 2, most of the previous studies on the relationship between variety and assortment evaluations manipulated assortment size at only two levels. We advocated that it is necessary to study a wider range of assortment sizes.

We determined the five assortment sizes as follows. The basis of our selection was the number of products that were available in supermarkets in the test area. In a pretest, the composition of jam and potato chips assortments in a range of small, medium sized, and large (online and offline) supermarkets was determined. Assortment sizes varied much across stores. For instance, for jam the number of different jars of jam ranged from 13 to 57 per store, with a mean number of 36 jars (N = 9 stores). These real life assortment compositions formed the basis of our manipulations. The two extreme assortment sizes that we selected (5 and 65 products) go beyond the limits of what was available in supermarkets in the test area. This helps us to investigate the effects of levels of assortment variety that retailers are not willing to offer in the supermarket. We opted for five different assortment size levels. The assortment sizes are equally distributed within the two

extreme levels (5 and 65 products), in such a way that each higher assortment size carried the products of the smaller assortments plus an additional 15 products. We did not allow for duplicates, so all products were different. Consequently, a higher assortment size implies more SKUs, but also more product category shelf space.

Figure 4.1 Example of an assortment of jam (size 35)



All products were available in one or more supermarkets in the test area in order to make the task as familiar and realistic as possible. The attributes of these products formed the basis of selection of the specific products for each assortment. In a pretest, 35 subjects were asked what attributes of jam and potato chips they pay attention to during their buying decision. The most frequently mentioned attributes for jam were: brand name, flavor, price, weight, and fruit percentage. These attributes, except for the last which is typically not visible on the outside of the jar, were used to select the products, as well as color of the jam and type (such as light jam). With respect to potato chips the most frequently reported attributes were: brand name, flavor, price, weight, type (e.g., ridged), fat content, packaging

color and packaging type (e.g., bag or box). These attributes were all used to select the products for each assortment in the following way.

Figure 4.2 Example of an assortment of potato chips (size 20)

Attribute patterns (Van Herpen and Pieters 2002), such as the relative degree with which a specific brand name occurs, were kept as constant as possible across the assortments, such that only *size* differed systematically between the assortments. For the interested reader, in Appendix 4.C we provide dispersion and dissociation levels for the three in the pretest most frequently mentioned attributes, namely brand name, flavor and price, for both jam and potato chips. Overall, dispersion and dissociation for these attributes were relatively constant across assortment sizes. Attribute levels that occur most frequently in the supermarkets also appeared most often in the composed assortments. So, the most popular flavors, major national brands, and a private label were included in the assortments (Campo, Gijsbrechts, and Guerra 1999). The products were organized by brand, as is common in leading supermarkets in the test area. Figure 4.1 and Figure 4.2

display two of the stimuli, i.e., an assortment of jam of size 35 and an assortment of potato chips of size 20. Note that the original words were in Dutch.

Realism of assortments. We measured how realistic the assortments were to the subjects. For each assortment (jam and potato chips) subjects had to indicate whether they thought the assortment could be found in an existing supermarket (*'1 = no, definitely not, 4 = maybe, 7 = yes, definitely'*). Table 4.2 displays mean values as well as standard deviations of this variable for each assortment size.

Mean levels of assortment realism were highest for assortment size 20, 35, and 50 for both jam and potato chips. The two assortment sizes 5 and 65 go beyond what was presented in existing supermarkets. Hence, it is logical that assortments of these extreme sizes were thought of as having less realism than the other assortments. We can conclude that the averaged sized assortments used in this experiment, more than the extreme sized assortments, were seen as being realistic.

Table 4.2 Means and standard deviations of assortment realism per assortment size and product category

	Assortment size				
Product category	5	20	35	50	65
Jam	3.68	5.31	5.40	4.50	4.10
	(1.90)	(1.31)	(1.44)	(1.77)	(2.01)
Potato chips	3.55	5.31	5.83	5.00	4.23
	(1.98)	(1.28)	(1.25)	(1.72)	(2.18)

NOTE. Assortment realism was measured on a 1-7 scale. Standard deviations are given in parentheses.

4.2.3 Procedure

Data collection was administered on a personal computer using the software program Authorware (Macromedia 2001). Instructions on the computer screen informed subjects that they would see an assortment of jam (or potato chips, depending on the random assignment), and that, although the jars of jam were represented by pictures, they should answer the questions as if they saw real jars of jam in a real supermarket. For the potato chips part of the experiment, extra emphasis was placed on the importance of the study. This was done to enlarge the natural difference in involvement (Petty, Cacioppo, and Schumann 1983) between

jam and potato chips which was found in a pretest[1]. This instruction will enlarge the generalizability of the results across different product categories.

After these instructions, the first assortment was shown. All questions appeared at the lower part of the computer screen while the assortment stayed visible at the upper part. First, subjects were exposed to the questions on assortment attractiveness. Then, the items on perceived variety and the chance of a perfect match were presented in random order. Next, subjects were asked to choose a product that closest matched their needs. The choice task was included in order to have subjects actually experience the benefits and costs of variety. Subsequently, subjects were requested to recall their choice while answering the next questions, which were (in random order) on decision freedom, variety-seeking over time, variety-seeking as a hedge against uncertainty, information overload, search costs, attribute conflict, value conflict, and potential regret. If multiple items were used to measure a construct, the items appeared in random order, but grouped by construct. Favorite available as well as product involvement, purchase involvement, purchase risk, product expertise, and buying behavior were measured afterwards. Subjects were then introduced to the assortment of the other product category for which the whole sequence of questions and tasks was repeated.

The experiment ended with questions on variety-seeking tendency, need for cognition, and several demographics. All subjects proceeded at their own pace. Subjects took on average 22 minutes to complete the study (SD = 5). After completion they were debriefed and received a box of potato chips for their participation.

4.2.4 Measures

Perceived variety, the benefits and costs of variety, and assortment attractiveness were measured both on single- and multi-item scales. Existing measures were used if available. Each item was evaluated on a seven-point (1-7) scale and was originally stated in Dutch. An overview of the measures is provided in Table 4.3.

Perceived variety. The variable perceived variety was measured with three items. The first item was based on Hoch et al. (1999), the second item on Van Herpen and Pieters (2002), while the third item was developed especially for this

[1] A pretest with 22 subjects showed that product involvement was significantly higher with potato chips (*mean* = 4.04) than with jam (*mean* = 3.11) ($t = 2.59$, $p = .017$).

study. Cronbach's α was .93 for jam and .95 for potato chips, indicating high reliability.

Benefits. The four benefits of variety are the chance of a perfect match between what you want and what the assortment offers, feelings of decision freedom, the opportunity of variety-seeking of time and of variety-seeking as a hedge against uncertainty about future preferences. To measure perfect match one item was adapted from the success likelihood scales of Van Herpen (2001). The item for decision freedom was based on work of Reibstein, Youngblood and Fromkin (1975). The variety-seeking benefits (over time and as a hedge against uncertainty) were phrased in terms of the *possibility* to select multiple products of the subject's liking (the next time and at once).

Costs. The costs of variety that we distinguish are information overload, search costs, attribute conflict, value conflict, and potential regret.

Information overload can be reflected by two different aspects, namely (1) lack of overview and (2) feelings of confusion. The two aspects can be considered as capturing two phases. If the level of variety increases, the level of available information increases, which might imply less overview, and, as a result, a higher chance of feelings of confusion. We will refer to these costs as 'information overload~lack of overview' and 'information overload~confusion'. Two self-report items were developed to measure information overload~lack of overview and information overload~confusion by drawing on the work of Malhotra, Jain and Lagakos (1982). Pearson correlations between the two constructs were .39 for jam ($p < .001$) and .37 for potato chips ($p < .001$). Thus, the two constructs are related, but cover different aspects of information overload.

Search costs were captured with two items. The items measured search costs by asking how much time and how much effort it cost to select a product. Cronbach's α was .86 for jam and .90 for potato chips, indicating high reliability. The attribute conflict measure was based on a study of Zeelenberg (1999).

Table 4.3 Overview measures jam and potato chips

Construct	Item	Cronbach's α Jam	Cronbach's α Potato chips
Perceived variety	1. This assortment of {jam/potato chips} offers (very little variety – very much variety) 2. This assortment of {jam/potato chips} offers (very little diversity – very much diversity) 3. This assortment of {jam/potato chips} is (not varied at all – very much varied)	.93	.95
Benefits			
Chance of a perfect match	Suppose you want to buy a {jar of jam/bag of potato chips}. How large is the chance that this assortment contains a {jar of jam/bag of potato chips} that completely matches your needs? (very small – very large)		
Decision freedom	How much decision freedom did you feel while choosing the {jar of jam/bag of potato chips}? (very little freedom – very much freedom)		
Variety-seeking over time	The possibility to choose another {jar of jam/bag of potato chips} of my liking from this assortment next time is (very small – very large)		
Variety-seeking as a hedge against uncertainty	Suppose you decide to buy several {jars of jam/bags of potato chips} from this assortment at once. How large is the possibility to select several {jars of jam/bags of potato chips} of your liking from this assortment at once? (very little – very large)		
Costs			
Info overload~ lack of overview	While choosing, I felt I had (very little overview – very much overview)[a]		
Info overload~ confusion	While choosing, I felt (not at all – very much) confused		
Search costs	1. Selecting a {jar of jam/bag of potato chips} of my liking, cost me (very little time – very much time) 2. Selecting the most attractive {jar of jam/bag of potato chips}, cost me (very little effort – very much effort)	.86	.90
Attribute conflict	Trading-off the different attributes of the {jars of jam/bags of potato chips} was (very easy – very difficult)		
Value conflict	1. How many {jars of jam/bags of potato chips} in this assortment are attractive to you? (none – one – several) 2. Since (none – several) {jars of jam/bags of potato chips} are attractive to me, choosing was (very easy – very hard)[b]		

continued

Table 4.3 continued

Construct	Item	Cronbach's α: Jam	Cronbach's α: Potato chips
Potential regret	1. The chance that I will feel regret later on because I did not choose another {jar of jam/bag of potato chips} now, is (very small – very large) 2. The chance that I will feel disappointed for not having chosen another {jar of jam/bag of potato chips} is (very small – very large)	.92	.90
Assortment attractiveness	1. To me, this assortment of {jam/potato chips} is (very unattractive – very attractive) 2. To me, this assortment of {jam/potato chips} is (not inviting at all – very much inviting) 3. My opinion on this assortment of {jam/potato chips} is (very negative – very positive)	.88	.86

NOTE. All items were measured on a seven-point (1-7) scale, except for the first item of value conflict.

[a] The item is reverse coded.

[b] This variable took the value 1 if subjects indicated that one product was attractive. The variable took the value 1 (very easy) to 7 (very hard) if none or several products were found to be attractive.

Value conflict was measured in two steps. First, subjects indicated how many products in the assortment were attractive to them (none, one, or several). Second, we asked how hard this made the choice for them. If subjects indicated that only one product was attractive to them, the variable automatically took the value 1, which means that choosing was very easy because there was only one attractive product instead of none or multiple attractive products. In this case of one attractive product, value conflict because several products are equally attractive is theoretically not possible. In case subjects had stated that none or several products were attractive to them, the variable took the value that subjects had entered for the question how hard it was to make a choice.

To measure potential regret we utilized measures of regret of Park, Jun and Macinnis (2000) and Simonson (1992). Cronbach's α was .92 for jam and .90 for potato chips. Thus, this measure yielded good reliability.

Assortment attractiveness. Three items were developed to measure how attractive an assortment was to our subjects. The first item was based on Simonson (1990), while the other two items were especially constructed for this study. Cronbach's α was .88 for jam and .86 for potato chips. Thus, our measure of assortment attractiveness was reliable.

Favorite available. Whether the favorite product of a subject was available in the assortment was measured in two steps. First, we asked whether the subject already preferred a specific jar of jam/bag of potato chips before he/she saw the assortment (i.e., whether he/she was aware of a favorite product). If the answer was affirmative, we asked whether this specific product was available in the assortment (based on Broniarczyk et al. 1998). This dummy variable took the value 1 if the favorite product was available and the value 0 if it was not. If subjects did not already prefer a specific product, the second question was not asked, since it was not applicable. Thus, favorite available was measured only if subjects were aware of what their favorite product was. The favorite available value was missing, i.e., not applicable, for those subjects who were not aware of a favorite product (N = 54 for jam, N = 34 for potato chips). Thus, for this variable the number of observations was less than the total number of subjects (N = 156).

Regarding the measurements of the main variables of the research framework described above, in all cases the assortment (the object) is rated on a specific attribute by a group of potential consumers (the rater entity) (Rossiter 2002). For instance, consumers can rate an assortment on its attractiveness. Furthermore, for all variables (except for search costs) the attribute to be rated can be classified as concrete, i.e., nearly everyone would describe this attribute identically. For example, the attribute of feelings of decision freedom is hard to interpret differently. Because the attributes are relatively straightforward, we are allowed to use single item scales (Rossiter 2002). We opted for doing this for most variables, except for the two most important variables of the research framework, namely perceived variety and assortment attractiveness, as well as potential regret. These variables were measured with multiple item scales. This way we took the potential unreliability of these variables into account and we avoided identification problems in our structural equation models (Baumgartner and Homburg 1996).

Mean levels and standard deviations of the main variables for each level of assortment size are provided in Table 4.4 for jam and in Table 4.5 for potato chips. For the multi-item variables, the item scores were averaged across the items. All variables were measured on a seven-point (1-7) scale, except for the dummy variable favorite available.

A first glance at Table 4.4 and 4.5 shows the following. First, one can see that the benefits of variety generally score higher than the costs of variety. Second, one can also distinguish the tendency of increasing perceived variety, benefits and costs with higher assortment sizes, although the increase in costs does not seem to

continue after assortment size 50. An ANOVA test across assortment sizes was performed for each variable. Overall, mean levels of perceived variety, all benefits, some costs, and assortment attractiveness differed significantly across assortment sizes. In Tables 4.4 and 4.5 it is indicated which mean levels differ significantly from each other (investigated with least-significant difference[2]). Note that in multiple cases it was assortment size 5 that differed significantly from the other sizes. For example, for jam and potato chips the chance of a perfect match was significantly lower for assortment size 5 than for the other assortment sizes, while the mean level of this variable did not differ significantly between assortment sizes 20 through 65. More detailed analyses of the effects of increasing variety will be given in Section 4.3 where the results are discussed.

[2] The least-significant difference test compares the mean level of each assortment size to the mean of every other assortment size with a *t*-test. As a result, we present significant differences between separate assortment sizes, although overall mean levels might not differ significantly across assortment sizes as investigated with an ANOVA.

Table 4.4 Means and standard deviations of all main variables per assortment size for jam

	Assortment size					
Variable	5	20	35	50	65	*F*
Favorite available	0.67[a] (0.48)	0.92[b] (0.28)	1.00[b] (0.00)	1.00[b] (0.00)	0.95[b] (0.23)	5.12**
Perceived variety	3.49[a] (1.32)	5.03[b] (0.99)	5.57[c] (1.05)	5.64[c] (1.05)	5.76[c] (0.86)	24.05***
Benefits						
Perfect match	4.26[a] (1.81)	5.88[b] (0.98)	5.91[b] (1.15)	5.82[b] (1.36)	6.03[b] (0.96)	10.40***
Decision freedom	3.65[a] (1.50)	5.06[b] (1.16)	5.49[b] (1.31)	5.11[b] (1.40)	5.53[b] (1.20)	10.67***
Var-seek over time	3.35[a] (1.64)	4.94[b] (1.39)	5.37[b] (1.37)	5.07[b] (1.46)	4.83[b] (1.34)	9.34***
Var-seek as a hedge	3.68[a] (1.83)	5.16[b] (1.32)	5.09[b] (1.54)	5.11[b] (1.42)	5.20[b] (1.21)	6.02***
Costs						
Information overload~ lack of overview	2.81[a] (1.01)	3.81[b,c,d] (1.55)	3.29[a,c,d] (1.58)	4.43[b,d] (1.53)	3.83[d] (1.58)	5.24**
Information overload~ confusion	2.61[a] (1.23)	3.12[a,c] (1.41)	2.94[a,c] (1.45)	3.50[b,c] (1.45)	3.07[a,c] (1.53)	1.51
Search costs	2.34[a] (1.19)	2.70[a,b] (1.00)	2.71[a,b] (1.31)	3.02[b] (1.21)	2.80[a,b] (1.45)	1.17
Attribute conflict	2.74[a,b] (1.24)	2.91[a,b] (1.12)	2.63[a] (1.31)	3.07[a,b] (1.41)	3.30[b] (1.47)	1.30
Value conflict	2.42[a] (1.61)	3.31[b] (1.26)	3.23[b] (1.42)	3.36[b] (1.37)	3.37[b] (1.40)	2.52*
Potential regret	2.19[a] (1.35)	2.20[a] (1.33)	2.41[a,b] (1.32)	2.88[b] (1.01)	2.25[a,b] (1.17)	1.52
Attractiveness	3.90[a] (1.21)	4.73[b] (0.63)	4.74[b] (0.97)	4.73[b] (1.05)	4.32[a,b] (1.03)	4.49**
N[e]	31	32	35	28	30	

NOTES. All variables were measured on a seven-point (1-7) scale, except for favorite available (0 = not available, 1 = available). Standard deviations are given in parentheses.

[a,b,c,d] Non-matching letters indicate a significant difference between the cell means of a *row* at $p < .05$. For example, all cells with 'a' differ significant from the cells with 'b', but not from cells with 'a'.

[e] Number of observations for all variables, except for favorite available. Numbers for favorite available are presented in Table 4.D.1.

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

Table 4.5 Means and standard deviations of all main variables per assortment size for potato chips

	Assortment size					
Variable	5	20	35	50	65	*F*
Favorite available	0.57[a] (0.51)	0.89[b] (0.32)	0.96[b] (0.19)	0.96[b] (0.21)	0.91[b] (0.29)	5.94***
Perceived variety	2.76[a] (1.13)	4.53[b] (0.96)	5.23[c,d] (1.10)	4.99[b,c] (1.30)	5.71[d] (0.90)	34.03***
Benefits						
Perfect match	4.13[a] (1.80)	5.69[b] (1.23)	5.97[b] (1.20)	6.07[b] (1.02)	6.23[b] (0.82)	14.18***
Decision freedom	2.81[a] (1.05)	5.13[b,c] (1.13)	5.40[b,c] (1.31)	4.86[b] (1.48)	5.73[c] (1.05)	28.12***
Var-seek over time	3.52[a] (1.59)	4.88[b] (1.60)	5.51[c] (1.12)	5.54[b,c] (0.92)	5.73[c] (1.11)	15.00***
Var-seek as a hedge	3.42[a] (1.82)	5.19[b] (1.60)	5.51[b] (1.29)	5.61[b] (1.10)	5.73[b] (1.11)	14.05***
Costs						
Information overload~ lack of overview	2.52[a] (1.12)	3.44[b] (1.16)	3.89[b] (1.62)	3.79[b] (1.47)	3.40[b] (1.30)	5.00**
Information overload~ confusion	2.42[a] (1.29)	2.59[a,b] (1.29)	3.00[a,b] (1.50)	3.29[b] (1.46)	2.80[a,b] (1.40)	1.79
Search costs	2.15[a] (0.98)	2.41[a,b] (1.08)	2.89[b] (1.37)	2.77[a,b] (1.46)	2.55[a,b] (1.22)	1.81
Attribute conflict	2.45[a] (1.06)	2.91[a,b] (1.28)	2.71[a,b] (1.32)	3.18[b] (1.52)	3.10[a,b] (1.37)	1.53
Value conflict	2.26[a] (1.44)	3.28[b] (1.35)	3.09[b] (1.34)	3.43[b] (1.55)	3.27[b] (1.23)	3.49**
Potential regret	2.13[a] (1.18)	2.19[a] (1.13)	2.04[a] (1.13)	3.13[b] (1.58)	2.25[a] (1.38)	3.46*
Attractiveness	3.59[a] (1.07)	4.64[b] (1.11)	4.81[b] (1.34)	5.00[b] (0.98)	4.91[b] (0.87)	8.42***
N [e]	31	32	35	28	30	

NOTES. All variables were measured on a seven-point (1-7) scale, except for favorite available (0 = not available, 1 = available). Standard deviations are given in parentheses.

[a,b,c,d] Non-matching letters indicate a significant difference between the cell means of a *row* at $p < .05$. For example, all cells with 'a' differ significant from the cells with 'b', but not from cells with 'a'.

[e] Numbers of observations for all variables, except for favorite available. Numbers for favorite available are presented in Table 4.D.1.

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

Covariates. In addition to the main variables of the research framework, we measured a number of covariates, mainly product category specific consumer characteristics. We measured *product involvement* with the products jam and potato chips by using the shortened version of the Personal Involvement Inventory (PII) scale (Zaichkowsky 1994), which contains items such as *'To me {jam/potato chips} is (important - unimportant)'*. The scale consisted of ten items. Cronbach's α calculated across subjects was 0.89 for both jam and potato chips. We measured *purchase involvement* with jam and potato chips with a Likert-type scale (three items) of Mittal and Lee (1989), with items such as *'I would choose my {jar of jam/bag of potato chips} very carefully'*. Cronbach's α was 0.73 for jam and 0.75 for potato chips.

Our measure of *purchase risk* for jam and potato chips was based on McQuarrie and Munson (1987). We used three items of their multidimensional scale that refer to decision risk. One of the items read for example '*Choosing a {jar of jam/bag of potato chips} is (easy to go wrong – hard to go wrong)'*. Cronbach's α was 0.76 for jam and 0.79 for potato chips.

To measure the level of *expertise* with a product category, researchers use objective measures (e.g., Moreau, Markman, and Lehmann 2001), subjective measures, or a combination (e.g., Maheswaran and Sternthal 1990; Mitchell and Dacin 1996). We chose the subjective measure of expertise of Mitchell and Dacin (1996) and changed the Likert-type scale into a semantic differential scale. The four-item scale contained items such as *'I know (very little - a lot) about {jam/potato chips}'*. Cronbach's α for the scale was 0.84 for jam and 0.80 for potato chips.

The VARSEEK scale developed by Van Trijp and Steenkamp (1992) was used to measure the *variety-seeking tendency* within the food domain of our subjects. The scale consists of eight items. The items were adjusted by transforming the Likert-type scales into scales with neutral stems. The scales contained items such as *'I am (not at all – very much) curious about food products I am not familiar with'*. Cronbach's α for the scale was 0.93.

We measured *need for cognition* with a Dutch version of the scale, developed by Pieters, Verplanken and Modde (1987). The scale consists of fifteen items, statements that refer to the individual disposition to engage in and enjoy thinking. Cronbach's α calculated across subjects was 0.81.

4.2.5 Analysis of measurement model

A measurement model that included all items of the main variables of the research framework was constructed. The items of the variables included were those of *ln*(size), favorite available, perceived variety, all benefits, all costs, and assortment attractiveness.

Ln(size) was used instead of assortment size to account for the nonlinear relationship between assortment size and perceived variety. Table 4.6 displays a linear, a semi-logarithmic, and a quadratic regression model to explain the relationship between assortment size and perceived variety (the items were averaged). The variance in perceived variety that can be explained is higher in the semi-logarithmic model (40.2%) than in the linear model (31.7%) or in the quadratic model (39.0%). Since the semi-logarithmic model performed best, the relationship between assortment size and perceived variety can best be described as positive with decreasing marginal returns, which is in line with H_1. An appropriate solution to this nonlinearity is to take the natural logarithm of assortment size. Therefore, in the subsequent analyses, we will use *ln*(size) instead of assortment size. Other relationships of the research framework did not deviate significantly from linearity.

Table 4.6 Regression results of perceived variety as a function of assortment size for jam and potato chips (pooled)

Model	Variable	Unstandardized coefficient	*t*-value	R^2_{adj}	*F*
Linear	Constant	3.55	12.63*	.317	145.30*
	Assortment size	0.04	12.05*		
Semi-logarithmic	Constant	1.62	6.97*	.402	209.86*
	Ln(assortment size)	1.00	14.49*		
Quadratic	Constant	2.74	15.37*	.390	100.59*
	Assortment size	0.11	9.20*		
	(Assortment size)^2	-0.001	-6.19*		

* $p < .001$.

The favorite available values used in the measurement model included imputed means per assortment size to overcome the issue of missing values for those subjects who were not aware of a favorite product ($N = 54$ for jam and $N = 34$ for potato chips). The reader is referred to Appendix 4.D for details on this

imputation procedure. For a number of variables in the measurement model only a single item was available. For these items we set λ to 1 and θ_δ to 0. Since *ln*(size) was manipulated, λ was set at 1 and its θ_δ was equaled to 0. For each multi-item measure, the first λ was set to 1. The covariance matrices of jam and potato chips were used as input matrices, as was recommended by Baumgartner and Homburg (1996). The estimation technique that we applied is maximum likelihood estimation. Both the LISREL and SIMPLIS command language of LISREL version 8.50 were used (Jöreskog and Sörbom 2000a).

To test for measurement invariance across the two product categories, we followed the procedure for assessing measurement invariance across countries that was proposed by Steenkamp and Baumgartner (1998). We tested for invariant variance-covariance matrices across the two groups. The fit of this model was satisfactory. Although chi-square[3] was significant ($\chi^2(210) = 258.86$, $p = .012$), RMSEA as well as NNFI and CFI indicated good fit (RMSEA = .039, NNFI = .97, CFI = .98). The latter three fit indices were all below (RMSEA < .06) or above (NNFI and CFI > .95) their recommended cutoff criteria (Hu and Bentler 1999). Hence, we decided to pool the data across product categories. In the pooled data, the measurements on the two product categories, jam and potato chips, were considered as separate cases[4]. As a result, the total number of observations for the pooled data was 312. The covariance matrix of the pooled data is given in Appendix 4.E.

The measurement model for the pooled data is presented in Table 4.7. Note that the Satorra-Bentler (SB) scaled chi-square statistic and robust standard errors were computed. These statistics were used in order to adjust for non-normality of the data (Satorra and Bentler 1990; West et al. 1995). In order to

[3] It was not possible to use the Satorra-Bentler scaled chi-square statistic and robust standard errors to overcome non-normality of the data (Satorra and Bentler 1990), because the sample size of each group was too small to compute the asymptotic covariance matrices (Diamantopoulos and Siguaw 2000). As a result, the goodness-of-fit indices might be modestly underestimated (West, Finch and Curran 1995), which we do not consider problematic here since the fit of the model was satisfactory.

[4] Structural equation modeling assumes that the observations are independent. This is not the case when pooling the data across jam and potato chips, because one sample rated both product categories. To check the sensitivity of the results to this assumption we performed an additional set of analyses, in which the data for each product category were analyzed individually. The outcomes of these analyses revealed a similar structure and standardized coefficients as the outcomes of the pooled analyses. Only significance went down because of the smaller sample size. Pooling the data was therefore not considered problematic here.

obtain these statistics we provided the asymptotic covariance matrix, computed with PRELIS 2.50 (Jöreskog and Sörbom 2000b), in addition to the covariance matrix, as input matrix. The measurement model showed excellent fit ($SB\chi^2(89) = 91.79$, $p = .40$, RMSEA = .010, NNFI = .99, CFI = .99) and was the basis for further analyses.

We assessed convergent validity by examining the factor loadings of the measures on their respective constructs. Convergent validity was supported by all factor loadings being significant ($p < .01$) and all R^2 (inter-item reliabilities) exceeding .50 (Hildebrandt 1987). The factor loadings were all greater than twice their standard errors (Anderson and Gerbing 1988), also supporting convergent validity.

Reliability was examined by computing composite reliability and average variance extracted (Baumgartner and Homburg 1996; Steenkamp and Van Trijp 1991) (see Table 4.7). Composite reliability ranged between .84 and .89 and exceeded the suggested cutoff value of .70 (Nunnally and Bernstein 1994). Furthermore, all average variances extracted were above the recommended cutoff value of 0.50 (Fornell and Larcker 1981a), ranging from .64 to .77.

Discriminant validity was assessed by two methods. First, the average variance extracted exceeded the squared correlations of the multi-item constructs with the other constructs (Fornell and Larcker 1981b). Second, almost all correlations were less than 1 by an amount greater than twice their respective standard errors (Bagozzi and Warshaw 1990). Only one exception was found. The correlation between variety-seeking over time and variety-seeking as a hedge was .66 (standard error = 0.19). These variables are closely related, but differ conceptually from each other. We do not consider this high correlation to be problematic, especially since later analyses will clearly demonstrate the different function of both benefits[5].

[5] We also investigated multicollinearity statistics of a regression analysis of the two variety-seeking benefits on assortment attractiveness. The coefficients of both benefits were significant ($p < .01$). The tolerance statistic was .563 and the variance inflation factor was 1.78, indicating the absence of serious multicollinearity problems.

Table 4.7 Results of measurement model (jam and potato chips, pooled)

Construct/item	Standardized factor loading	Satorra-Bentler robust standard error	*t*-value	Composite reliability (average variance extracted)
Assortment variety				
Ln(size)	1.00			
Favorite available	1.00			
Perceived variety				.89 (.73)
item 1	0.92			
item 2	0.91	0.03	29.53	
item 3	0.93	0.03	28.79	
Benefits				
Perfect match	1.00			
Decision freedom	1.00			
Var-seek over time	1.00			
Var-seek as a hedge	1.00			
Costs				
Info overload~lack of overview	1.00			
Info overload~confusion	1.00			
Search costs				.87 (.77)
item 1	0.86			
item 2	0.92	0.07	17.34	
Attribute conflict	1.00			
Value conflict	1.00			
Potential regret				.86 (.76)
item 1	0.95			
item 2	0.88	0.07	12.31	
Attractiveness				.84 (.64)
item 1	0.79			
item 2	0.78	0.06	15.53	
item 3	0.93	0.06	15.69	

NOTE. *N* is 312.

4.3 Results

In this section, first, Pearson correlations for the main variables of the research framework are inspected. Second, we evaluate the structural model that represents the research framework developed in Chapter 3. Third, we test the hypotheses on the relationships of the research framework by means of the structural model. Next, we test whether an optimal level of variety exists. Finally, we examine the differential impact of the number of SKUs in an assortment and product category shelf space. Note that, except when otherwise indicated, a significance level of .05 was employed.

4.3.1 Pearson correlations

Pearson correlations between the main variables are given in Table 4.8 for both product categories. The correlation matrix reveals specific patterns for both jam and potato chips. These patterns can give a first indication on whether our hypotheses will be supported. In the following subsection the hypotheses will be formally tested.

Eyeballing the correlations indicates that assortment size and favorite available were significantly and positively correlated with perceived variety (in line with H_1 and H_2). Perceived variety was also significantly and positively correlated with all benefits (in line with H_3) and several of the costs (partly in line with H_5). Favorite available was positively correlated with the benefit chance of a perfect match (in line with H_4). Favorite available was not significantly negatively correlated with the costs of variety (not in line with H_6). Assortment attractiveness was positively and significantly correlated with the benefits of variety (in line with H_7) and, rather surprisingly, positively with one of the costs, value conflict. Value conflict seems to behave as a benefit variable rather than a cost variable, since it was positively correlated with the benefits of variety and with assortment attractiveness. Assortment attractiveness was not significantly negatively correlated with the costs of variety (not in line with H_8).

All benefits were positively and significantly correlated with each other. Almost all costs were also positively and significantly mutually correlated with each other. In addition, except for value conflict and variety-seeking over time and as a hedge, most benefits and costs were not strongly correlated with each other. Analyses in Subsection 4.3.3 will provide more details on these findings.

Table 4.8 Pearson correlations between all main variables per product category

JAM	SIZE	FA	PV	PM	DF	VS	HU
Assortment size (SIZE)							
Favorite available (FA)	.36***						
Perceived variety (PV)	.54***	.34***					
Perfect match (PM)	.34***	.35***	.64***				
Decision freedom (DF)	.37***	.28***	.57***	.55***			
Var-seek over time (VS)	.27**	.28***	.50***	.54***	.53***		
Var-seek as a hedge (HU)	.27**	.12	.47***	.59***	.48***	.67***	
Info overload~overview (IOO)	.24**	.09	.12	.01	-.03	.02	-.10
Info overload~confusion (IOC)	.12	-.11	.16*	.08	.11	.33***	.19*
Search costs (SC)	.14	.00	.17*	.15	.13	.33***	.19*
Attribute conflict (AC)	.14	-.02	-.02	-.08	.01	.18*	.02
Value conflict (VC)	.19*	.04	.27**	.25**	.23**	.46***	.35***
Potential regret (PR)	.09	-.04	.06	-.07	.01	.18*	.05
Attractiveness (AA)	.06	.24**	.33***	.40**	.37***	.41***	.43***

JAM	IOO	IOC	SC	AC	VC	PR
Info overload~overview (IOO)						
Info overload~confusion (IOC)	.39***					
Search costs (SC)	.20*	.56***				
Attribute conflict (AC)	.22**	.47***	.60***			
Value conflict (VC)	.08	.41***	.61***	.45***		
Potential regret (PR)	.13	.29***	.47***	.48***	.45***	
Attractiveness (AA)	-.15	.06	.14	-.03	.28***	.11

NOTES. N = 156 for all variables, except for favorite available (FA) for which the original data (without the imputed means for the missing values) are displayed. The number of observations for FA can be found in Table 4.D.1.

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

POTATO CHIPS	SIZE	FA	PV	PM	DF	VS	HU
Assortment size (SIZE)							
Favorite available (FA)	.34***						
Perceived variety (PV)	.61***	.44***					
Perfect match (PM)	.44***	.56***	.62***				
Decision freedom (DF)	.50***	.35***	.74***	.55***			
Var-seek over time (VS)	.47***	.38***	.57***	.46***	.50***		
Var-seek as a hedge (HU)	.43***	.41***	.62***	.61***	.55***	.65***	
Info overload~overview (IOO)	.21**	.25**	.10	.11	.04	.00	.02
Info overload~confusion (IOC)	.14	.15	.10	.03	-.02	.17*	.06
Search costs (SC)	.13	-.01	.11	-.03	-.06	.10	-.03
Attribute conflict (AC)	.16*	.07	.24**	.08	.10	.16*	.15
Value conflict (VC)	.21**	.18*	.26**	.22**	.20*	.36***	.38***
Potential regret (PR)	.12	-.02	.03	-.08	.05	.09	.01
Attractiveness (AA)	.35***	.30***	.59***	.54***	.49***	.45***	.56***

POTATO CHIPS	IOO	IOC	SC	AC	VC	PR
Info overload~overview (IOO)						
Info overload~confusion (IOC)	.37***					
Search costs (SC)	.26**	.48***				
Attribute conflict (AC)	.15	.35***	.57***			
Value conflict (VC)	.13	.42***	.45***	.44***		
Potential regret (PR)	.14	.29***	.40***	.44***	.32***	
Attractiveness (AA)	-.12	.05	-.04	.05	.29***	-.05

NOTES. N = 156 for all variables, except for favorite available (FA) for which the original data (without the imputed means for the missing values) are displayed. The number of observations for FA can be found in Table 4.D.1.

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

4.3.2 Structural model evaluation

The research framework in Figure 3.1 was translated to a structural equations model to test hypotheses H_1 to H_9 simultaneously. We used the measurement model for the pooled data discussed in Subsection 4.2.5. In the structural model, all benefits were allowed to covary and so were all the costs. The reason to do this is that these constructs are highly related to each other. For example, the benefit of variety-seeking over time is strongly related to the benefit of variety-seeking as a hedge.

In Table 4.9 we show the fit indices for the structural model (model 1). Although the SB scaled chi-square of the structural model was significant ($SB\chi^2(129) = 200.12$, $p < .001$), overall, the model showed good fit (RMSEA = .042, NNFI = .96, CFI = .97). The model accounted for approximately 39% of the variance (i.e., R^2) in assortment attractiveness.

We examined the modification indices for this structural model. Constraints that have large modification indices should be relaxed only if the resulting parameter change is theoretically and practically meaningful (Baumgartner and Homburg 1996). The highest modification index (MI) that was also justifiable suggested the addition of a direct path from *ln*(size) to information overload~lack of overview (MI = 14.49). A direct path from *ln*(size) to information overload~lack of overview suggests that the mere number of products, disregarding how much variety consumers perceive, creates a lack of overview resulting from information overload.

We added a path to model 1 from *ln*(size) to information overload~lack of overview. In Table 4.9 the fit indices of this modified model are provided (model 2). The fit of model 2 was good, although SB scaled chi-square was significant ($SB\chi^2(128) = 191.96$, $p < .001$, RMSEA = .040, NNFI = .96, CFI = .97). The model accounted for 39% of the variance in assortment attractiveness. We compared this modified model (model 2) with the original model (model 1) by performing a chi-squared difference test for the SB scaled chi-square (Satorra and Bentler 2001). Model 2 performed significantly better than model 1 ($\Delta SB\chi^2(1) = 8.60$, $p < .01$). Next, modification indices for model 2 were inspected, but no

theoretically justifiable modification indices larger than 3.84 were present[6]. Therefore, model 2 was selected for further analyses[7].

Table 4.9 Comparison of original versus modified structural model (jam and potato chips, pooled)

Model	df	χ^2	Satorra-Bentler χ^2	*p*-value	RMSEA	NNFI	CFI
1. Original model	129	224.25	200.12	.0001	.042	.96	.97
2. Model 1 + path from *ln*(size) to information overload~lack of overview	128	215.21	191.96	.0002	.040	.96	.97

4.3.3 Results of testing the research framework

Estimation results of model 2 are shown in Table 4.10. We present the completely standardized coefficients. In Figure 4.3, we display the empirical results on the research framework with the significant paths only ($p < .05$). The results of the structural model are used to test the hypotheses on the main research framework.

[6] We did find a modification index of 6.49 for a direct path between perceived variety and assortment attractiveness. Analyses for the two product categories separately, revealed a significant modification index for this path for potato chips (MI = 16.41), but not for jam (MI = 0). We have no clear theoretical ground for this path nor for assuming that this path should differ for the two product categories. Hence, we decided not to include this additional path.

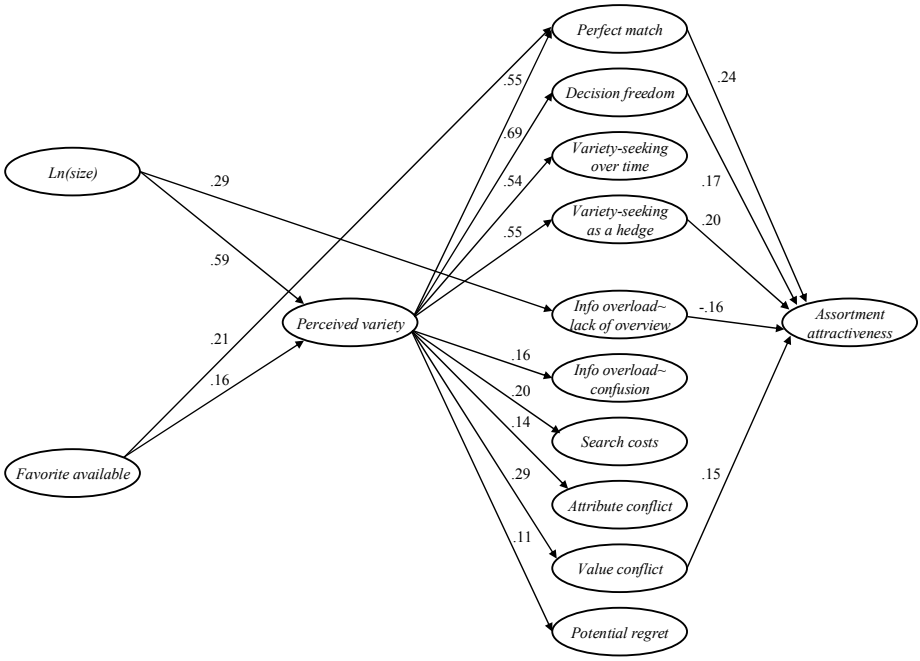
[7] We also performed a multiple-group analysis for the structural model with all beta's and gamma's constrained across groups to investigate which relationships differed significantly across the two groups. Compared to the structural model on the pooled data, this resulted in a slightly worse fit, but few differences in the strengths of paths. The modification indices also indicated a direct path from *ln*(size) to information overload~lack of overview. The modification indices of the model that included this path suggested freeing the path from perceived variety to attribute conflict across groups. However, we do not have theoretical reasons to assume that this path differs between jam and potato chips.

Table 4.10 Results of structural model (jam and potato chips, pooled)

Path from	Path to	Hypothesis	Standardized coefficient	*t*-value
Ln(size)	Perceived variety	1 (+)	0.59	10.62***
Favorite available	Perceived variety	2 (+)	0.16	2.98**
Perceived variety	Perfect match	3a (+)	0.55	8.52***
	Decision freedom	3b (+)	0.69	14.55***
	Var-seek over time	3c (+)	0.54	9.06***
	Var-seek as a hedge	3d (+)	0.55	9.24***
Favorite available	Perfect match	4 (+)	0.21	3.77***
Perceived variety	Info overload~lack of overview	5a1 (+)	-0.12	-1.46
	Info overload~confusion	5a2 (+)	0.16	2.43**
	Search costs	5b (+)	0.20	3.16***
	Attribute conflict	5c (+)	0.14	2.26*
	Value conflict	5d (+)	0.29	4.68***
	Potential regret	5e (+)	0.11	1.72*
Ln (size)	Info overload~lack of overview		0.29	4.58***
Favorite available	Info overload~lack of overview	6a1 (-)	0.10	1.65
	Info overload~confusion	6a2 (-)	-0.03	-0.48
	Search costs	6b (-)	-0.08	-1.37
	Attribute conflict	6c (-)	-0.03	-0.51
	Value conflict	6d (-)	-0.01	-0.10
	Potential regret	6e (-)	-0.08	-1.08
Perfect match	Attractiveness	7a (+)	0.24	3.77***
Decision freedom	Attractiveness	7b (+)	0.17	2.40**
Var-seek over time	Attractiveness	7c (+)	0.10	1.49
Var-seek as a hedge	Attractiveness	7d (+)	0.20	2.51**
Info overload~lack of overview	Attractiveness	8a1 (-)	-0.16	-2.77**
Info overload~ confusion	Attractiveness	8a2 (-)	0.01	0.11
Search costs	Attractiveness	8b (-)	-0.04	-0.49
Attribute conflict	Attractiveness	8c (-)	-0.04	-0.62
Value conflict	Attractiveness	8d (-)	0.15	2.28*
Potential regret	Attractiveness	8e (-)	0.01	0.10

NOTES. $N = 312$. R^2 for assortment attractiveness = .39.
* $p < .05$, ** $p < .01$, *** $p < .001$.

Figure 4.3 Path model jam and potato chips (pooled) with significant paths only



NOTES. $N = 312$. Significant standardized coefficients ($p < .05$) are shown only.

The first two hypotheses of the research framework proposed a positive impact of two aspects of assortment variety, assortment size and the availability of the favorite product, on consumer perceptions of variety. Table 4.10 indicates that *ln*(size) has a positive and significant effect on perceived variety ($\beta = .59$, $t = 10.62$). Thus, H_1, that an increase in assortment size leads to higher perceptions of variety, was supported. This relationship shows decreasing marginal returns. The positive impact of favorite available on perceived variety, as proposed by H_2, was also supported ($\beta = .16$, $t = 2.98$). The correlation between *ln*(size) and favorite available was .46. Thus, our experimental design implied more favorite products in larger assortments.

Next, we proposed that an increase in perceived variety leads to different benefits of variety. We found support for H_3 that perceived variety has a positive and significant impact on all benefits, namely the chance of a perfect match ($\beta =$

.55, t = 8.52), decision freedom (β = .69, t = 14.55), variety-seeking over time (β = .54, t = 9.06), and variety-seeking as a hedge against uncertainty (β = .55, t = 9.24). In addition, we also suggested the existence of a direct path from favorite availability to the benefit chance of a perfect match (H_4). H_4 was supported. When the favorite product was available, the benefit chance of a perfect match was significantly higher (β = .21, t = 3.77) than when the favorite product was not available.

Perceived variety was proposed to have a positive impact not only on the benefits, but also on the costs of variety (H_5). We found support for H_5 for all but one of the costs. Perceived variety had a positive and significant effect on information overload~confusion (β = .16, t = 2.43), search costs (β = .20, t = 3.16), attribute conflict (β = .14, t = 2.26), value conflict (β = .29, t = 4.68), and potential regret (β = .11, t = 1.72). However, higher perceived variety did not increase the lack of overview associated with information overload (β = -.12, t = -1.46). Thus, H_{5a1} was not supported, while H_{5a2}, H_{5b}, H_{5c}, H_{5d}, and H_{5e} were supported. We did find a direct significantly positive effect of *ln*(size) on information overload~lack of overview (β = .29, t = 4.58). Thus, larger assortments directly imply a lack of overview. This effect is not mediated by consumer perceptions of variety.

In addition to the indirect effects of assortment variety, through perceived variety, on the costs of variety, we also conjectured that the availability of the favorite product would directly lower the costs of variety (H_6). There was no significant support for this hypothesis, although five of the six coefficients were indeed negative. Favorite available did not have a significant effect on information overload~lack of overview (β = .10, t = 1.65), information overload~confusion (β = -.03, t = -0.48), search costs (β = -.08, t = -1.37), attribute conflict (β = -.03, t = -0.51), value conflict (β = .01, t = -0.10), or potential regret (β = -.08, t = -1.08). As a result, H_6 was not supported.

The following hypotheses proposed that the attractiveness of an assortment would be positively influenced by the benefits of variety and negatively by the costs of variety. This positive impact of the benefits of variety on assortment attractiveness can be confirmed for three of the four benefits. We found a significant and positive impact of the chance of a perfect match (β = .24, t = 3.77), decision freedom (β = .17, t = 2.40), and variety-seeking as a hedge (β = .20, t = 2.51) on assortment attractiveness. H_{7a}, H_{7b}, and H_{7d} were supported. H_{7c} regarding the positive effect of variety-seeking over time could not be supported (β = .10, t = 1.49).

A negative impact of all costs of variety on assortment attractiveness was suggested in H_8. This negative impact could only be found for information overload~lack of overview (β = -.16, t = -2.77). All other cost variables did not have a significantly negative effect on assortment attractiveness. One of the costs surprisingly even had a significantly positive impact on attractiveness, namely value conflict (β = .15, t = 2.28). This positive effect might be due to the ambiguousness of the measurement. Subjects might have focused more on the first part of the measurement, the word 'attractive', than on the second part, 'the difficulty of choosing'. In this sense, subjects might have interpreted the measure not as a cost, but rather as a benefit. The measure may not have captured what it was intended to measure. Regarding the negative impact of the costs of variety on assortment attractiveness, H_{8a1} was supported, while H_{8a2}, H_{8b}, H_{8c}, H_{8d}, and H_{8e} were not supported.

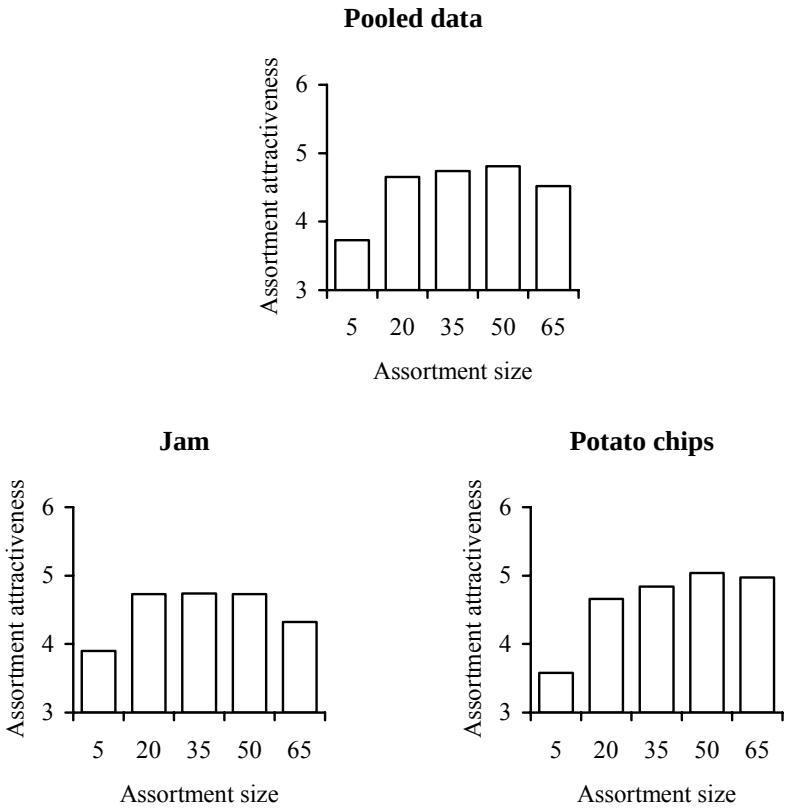
Mediation. H_9 proposed that the relationship between assortment variety (assortment size and favorite available) and assortment attractiveness is fully mediated by perceived variety and the benefits and costs of variety. This can be tested by comparing the magnitudes of the standardized direct effects of *ln*(size) and favorite available on assortment attractiveness with the standardized indirect effects. The total effect (both direct and indirect) of *ln*(size) on assortment attractiveness was 0.23 ($p < .001$). The indirect effect was also 0.23 and the direct effect was therefore 0. The total effect of favorite available on assortment attractiveness was 0.11 ($p < .001$). The indirect effect was also 0.11 and, hence, the direct effect was 0. Thus, the effects of *ln*(size) and favorite available went 100% through perceived variety and the benefits and costs of variety. Therefore, we found support for H_9, that the relationship between assortment variety (assortment size and favorite available) and assortment attractiveness is fully mediated by perceived variety and the benefits and costs of variety.

4.3.4 Results of testing the optimal level of variety

The final hypothesis that needs to be tested proposed that the overall relationship between assortment size and assortment attractiveness shows an inverted U-shape (H_{10}). We conjectured that an increase in assortment size will increase assortment attractiveness up to a specific point after which the attractiveness will decrease again. In this subsection, this hypothesis is tested with regression analyses.

In Figure 4.4, we display the relationship between assortment size and assortment attractiveness (measured on a 1-7 scale) for the pooled data and for jam and potato chips separately. We investigated jam and potato chips separately, because the potential optimal level of assortment size could differ between the two product categories. All three pictures in Figure 4.4 suggest the existence of an optimal level of variety.

Figure 4.4 Assortment attractiveness (means) as a function of assortment size (jam and potato chips)



In order to test H_{10} formally, we estimated a number of rival regression models. Estimation results of a linear, a semi-logarithmic, and a quadratic model are shown in Table 4.11 for the pooled data and for jam and potato chips

separately. The unstandardized coefficients are reported. We find support for H_{10} if the quadratic model performs best and if it shows an inverted U-shape, i.e., if the coefficient of assortment size is larger than 0 and if the coefficient of (assortment size)^2 is smaller than 0.

For the pooled data, the quadratic model performed best. R^2_{adj} was highest for this model (.10). In addition, the coefficients had the proposed signs, i.e., positive for assortment size and negative for (assortment size)^2. For jam, the quadratic model also performed best (R^2_{adj} = .07) and the coefficients had the proposed signs. Finally, for potato chips, model fit did not differ substantially between the semi-logarithmic model (R^2_{adj} = .1653) and the quadratic model (R^2_{adj} = .1636). Coefficients of the quadratic model had the expected signs. Furthermore, we formally compared the fit of the linear models with the fit of the quadratic models. Including (assortment size)^2 in the models did significantly improve their fit ($F(1,309) = 21.39$, $p < .001$ for the pooled data; $F(1,153) = 12.52$, $p < .01$ for jam; $F(1,153) = 9.46$, $p < .01$ for potato chips).

Considering these results and the pictures in Figure 4.4, we conclude that the relationship between assortment size and assortment attractiveness tends to show an inverted U-shape. Thus, H_{10} is supported. Based on the regression results of the quadratic models in Table 4.11, we computed the optimal levels of assortment size. This was 43 products for the pooled data, which resulted from an optimal level of 37 products for jam and 49 for potato chips.

Table 4.11 Regression results of assortment attractiveness as a function of assortment size

Product category	Model	Variable	Coefficient	*t*-value	R^2_{adj}	*F*
Pooled (jam and potato chips)	Linear	Constant	4.09	32.62**	.04	13.83**
		Assortment size	0.01	3.72**		
	Semi-logarithmic	Constant	3.30	13.83**	.08	27.16**
		Ln(assortment size)	0.37	5.21**		
	Quadratic	Constant	3.49	19.53**	.10	18.07**
		Assortment size	0.07	5.44**		
		(Assortment size)^2	-0.001	-4.63**		

continued

Table 4.11 continued

Product category	Model	Variable	Coefficient	*t*-value	R^2_{adj}	*F*
Jam	Linear	Constant	4.29	24.18**	-.00	0.51
		Assortment size	0.003	0.72		
	Semi-logarithmic	Constant	3.78	11.09**	.02	3.60
		Ln(assortment size)	0.19	1.90		
	Quadratic	Constant	3.64	14.47**	.07	6.54*
		Assortment size	0.06	3.61**		
		(Assortment size)^2	-0.001	-3.54**		
Potato chips	Linear	Constant	3.90	22.50**	.12	21.67**
		Assortment size	0.02	4.66**		
	Semi-logarithmic	Constant	2.82	8.63**	.17	31.70**
		Ln(assortment size)	0.55	5.63**		
	Quadratic	Constant	3.34	13.48**	.16	16.16**
		Assortment size	0.07	4.18*		
		(Assortment size)^2	-0.001	-3.08**		

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

4.3.5 SKUs versus shelf space

So far in this chapter, we have empirically investigated the effects of assortment size and the availability of a favorite product on the attractiveness of an assortment. Assortment size though actually reflects two assortment characteristics, namely the total number of stockkeeping units (SKUs) in an assortment and the amount of product category shelf space (Broniarczyk et al. 1998). In our experimental design these two assortment characteristics, number of SKUs and shelf space, were confounded. We manipulated the number of SKUs while each SKU had only one facing. As a result, in each assortment the number of SKUs was identical to the amount of shelf space. In order to verify that our results were not entirely driven by shelf space, we need to disentangle the effects of these two variety related assortment characteristics.

To this end, we conducted an additional experiment in which shelf space was kept constant at 65 products. In a between-subjects design with five

conditions, the number of SKUs was varied from five to 65 products. For instance, in the assortment of five SKUs, each SKU carried 13 facings, while in the assortment of 65 SKUs, each SKU had only one facing. Thus, 'larger' assortments offered more SKUs with relatively less facings per SKU. A total of 196 subjects participated in the experiment. The stimuli employed were assortments of simple products, i.e., potato chips. The procedure of data collection and the measures used were identical to the ones described in Section 4.2.

The results of this experiment were compared to those described in the previous subsections and can be briefly summarized as follows. Mean values of the main variables of the research framework overall did not depend on the number of facings per SKU across assortment sizes. First, perceptions of variety did not differ between one or multiple facings per SKU. Second, although for assortments with more facings per product the benefits of variety tended to be somewhat lower while the costs seemed to be somewhat higher, these differences were not significant across assortment sizes. Third, assortment attractiveness tended to be lower if more facings per SKU were presented. Again, this difference was not significant across assortment sizes. Finally, a structural equation model revealed overall similar results when only the number of SKUs was varied as when both the number of SKUs and shelf space were varied. This implies that increasing the number of SKUs only, basically has the same effects as increasing both the number of SKUs and shelf space.

In sum, the additional experiment showed that the results presented in the previous subsections seem to be driven by the number of SKUs and not by product category shelf space. The results described in the previous subsections are thus validly interpreted in terms of the number of SKUs and cannot be attributed to the amount of shelf space an assortment occupies. Consumers actually look at the different SKUs offered in an assortment instead of forming an evaluation based on the total amount of products they see.

4.3.6 Summary

An overview of the results is given in Table 4.12. The main findings presented in this section are the following. Most parts of the research framework were supported.

Firstly, higher assortment variety led to higher perceptions of variety. It was demonstrated that the impact of assortment size on consumer perceptions of

variety was nonlinear and showed decreasing marginal returns, following Weber's Law (Mowen and Minor 2001). Perceived variety was also higher if the favorite product of the consumer was available, as Broniarczyk et al. (1998) found, most likely because the assortment *even* carries the favorite product of the consumer.

Higher perceptions of variety resulted in larger benefits and costs. An increase in perceived variety led to a higher chance of a perfect match for the consumer. It also meant higher feelings of decision freedom. In addition, more perceived variety resulted in more possibilities to seek variety both over time and as a hedge against uncertainty about future preferences. An increase in perceived variety increased almost all costs although higher perceived variety did not lead to less overview resulting from information overload. We did find a positive impact of assortment size on information overload~lack of overview, which effect was not mediated by perceived variety. The mere number of products seems to reduce the overview consumers have of an assortment. Higher perceived variety did lead to feelings of confusion because of information overload, higher search costs, attribute conflict, value conflict, and higher potential regret. Thus, more variety in assortments of low involvement products brings about both benefits and costs.

It was confirmed that the benefit of the chance of a perfect match was higher if consumers saw their favorite product, which is logical. It was also proposed that the availability of the favorite product would make people focus on this product and ignore the others. As a result, the choice-making process would be easier, leading to, for example, lower search costs and attribute conflict. The results suggested a negative impact of the availability of the favorite product on most of the costs of variety. However, these effects were not significant.

Table 4.12 Overview results on assortments of simple products

Independent variable	Dependent variable	Hypothesis	Result
Assortment size	Perceived variety	1 (+)	Supported
Favorite available	Perceived variety	2 (+)	Supported
Perceived variety	Perfect match	3a (+)	Supported
	Decision freedom	3b (+)	Supported
	Variety-seeking over time	3c (+)	Supported
	Variety-seeking as a hedge	3d (+)	Supported
Favorite available	Perfect match	4 (+)	Supported
Perceived variety	Info overload~lack of overview	5a1 (+)	Not supported
	Info overload~ confusion	5a2 (+)	Supported
	Search costs	5b (+)	Supported
	Attribute conflict	5c (+)	Supported
	Value conflict	5d (+)	Supported
	Potential regret	5e (+)	Supported
Assortment size	Info overload~lack of overview		Added
Favorite available	Info overload~lack of overview	6a1 (-)	Not supported
	Info overload~ confusion	6a2 (-)	Not supported
	Search costs	6b (-)	Not supported
	Attribute conflict	6c (-)	Not supported
	Value conflict	6d (-)	Not supported
	Potential regret	6e (-)	Not supported
Perfect match	Attractiveness	7a (+)	Supported
Decision freedom	Attractiveness	7b (+)	Supported
Variety-seeking over time	Attractiveness	7c (+)	Not supported
Variety-seeking as a hedge	Attractiveness	7d (+)	Supported
Info overload~lack of overview	Attractiveness	8a1 (-)	Supported
Info overload~ confusion	Attractiveness	8a2 (-)	Not supported
Search costs	Attractiveness	8b (-)	Not supported

continued

Table 4.12 continued

Attribute conflict	Attractiveness	8c (-)	Not supported
Value conflict	Attractiveness	8d (-)	Not supported
Potential regret	Attractiveness	8e (-)	Not supported
Assortment size and favorite available	Attractiveness	9 (mediation)	Supported
Assortment size	Attractiveness	10 (inverted U-shape)	Supported

It was conjectured that the attractiveness of an assortment depends on a trade-off between the positive benefits and the negative costs. Three out of four benefits significantly and positively influenced assortment attractiveness: the chance of a perfect match, feelings of decision freedom, and variety-seeking as a hedge against uncertainty. The benefit of variety-seeking over time, although present, did not significantly influence assortment attractiveness. Probably, consumers judge the attractiveness of an assortment on the basis of current benefits, not on future benefits. The three benefits that did have a positive impact on assortment attractiveness are all present at the moment the consumer has to make choice. The benefit of variety-seeking over time might not be important if you have to make a choice now.

One of the costs had a significantly negative impact on assortment attractiveness, the others surprisingly did not. Higher information overload as reflected by a lack of overview implied a lower evaluation of assortment attractiveness. If consumers lose overview, they think the assortment is less attractive. Thus, lack of overview is the only cost that seems to matter when a consumer evaluates an assortment of simple products. The other costs, although they were present, did not have a negative impact on assortment attractiveness. The absolute values of all costs were low, even for large assortments.

Regarding the overall impact of assortment size on assortment attractiveness, initially larger assortments are seen as being more attractive. However, this relationship tends to shows an inverted U-shape. The attractiveness seems to decrease again after a certain level of assortment size has been reached. Hence, there are limits to how much variety is attractive.

Finally, in an additional experiment we found that the results presented above are driven by the number of SKUs in an assortment and cannot be attributed to product category shelf space.

4.4 Conclusions

Supermarkets as well as other providers of groceries offer huge levels of variety in many product categories. Though variety in an assortment brings about numerous benefits, it also creates costs for consumers. Hence, it is questionable whether very high variety in assortments of grocery products is actually attractive. The main objective of this chapter was to investigate the relationship between the variety in an assortment of simple grocery products and the attractiveness of the assortment from a consumer perspective as well as the underlying process of this relationship. We empirically examined this relationship for assortments of simple grocery products while taking into account consumer perceptions of variety, benefits, and costs of variety.

A first important conclusion is that an optimal level of assortment size seems to exist for simple grocery products. We found tentative support for an inverted U-shape for the relationship between assortment size and the attractiveness of an assortment. This implies that more variety is more appealing to consumers, but that variety also has its limits. With very high variety the attractiveness of an assortment seems to decrease again. Such an inverted U-shape has been frequently suggested in the literature (e.g., Desmeules 2002; Dhar et al. 2001), though it has not yet been empirically demonstrated. Previous empirical research mostly found a positive impact of assortment size on evaluations of assortments of simple products (e.g., Iyengar and Lepper 2000; Oppewal and Koelemeijer 2005). However, these studies mainly investigated two levels or a very small range of assortment sizes. Our research examined the impact of assortment size at a wide range allowing us to detect nonlinear effects.

The most optimal assortment size for jam in this study did not differ substantially from the average number of products that supermarkets in the test area offer. Thus, medium-sized supermarkets in the test area did well with respect to optimizing variety. Some supermarkets offer less than this optimum. Depending on their overall strategy, which could for example be service oriented (implying high variety) or price oriented (implying low variety), they might consider enlarging assortment size in order to increase assortment attractiveness. Other supermarkets carry more than the optimal assortment size. Again, within the boundaries of their strategy, retailers might create higher attractiveness by removing specific items. Assortment attractiveness tended to show an inverted U-shape for assortment size. If retail costs, such as handling and inventory costs,

increase at least linearly with assortment size, then, from a retailer perspective, an optimal level of variety clearly exists.

The overall relationship between assortment variety and assortment attractiveness can be explained by an underlying process. More specifically, it was shown that the relationship can be explained on the basis of consumer perceptions of variety, current benefits of variety, and one cost of variety. Previous research has already identified several relevant benefits and costs that result from variety (e.g., Gourville and Soman 2005). By including these as well as other important benefits and costs of variety in our study, we were able to identify which ones are in fact essential.

The benefits of variety that make an assortment of simple products more attractive are the chance of a perfect match between what the consumer wants and what the assortment offers, feelings of decision freedom, and the possibility to seek variety when selecting a portfolio of products as a hedge against uncertainty about future preferences. The most important cost of variety is information overload reflected by a lack of overview. This is the only cost of variety that makes an assortment of simple products less attractive. Thus, retailers who want to enhance the attractiveness of their assortments could consider creating a clear overview in their assortments. A clear overview might be attained by, for instance, distinctively different packaging for each brand, clear signs for different brands, or arranging the products according to the decision tree of most consumers within the specific product category (Morales et al. 2005).

A lack of overview is the only cost of variety that makes an assortment less attractive. Many other costs of variety are also present. However, they do not influence assortment evaluations. Furthermore, compared to the high benefits of variety, all costs of variety are relatively low. Why are the costs of variety so low? Why do almost none of these costs have a negative effect on assortment attractiveness? Choosing a simple product, such as a bag of potato chips, is a relatively easy task. Furthermore, the consequences of selecting a wrong product are small. If you make the wrong choice from such product categories, you can buy a new product the next time you visit the supermarket. Thus, the potential to deeply regret one's choice is small when a simple product is bought.

The question is whether these findings are generalizable to situations that involve a more difficult choice task. Higher costs of variety can be anticipated if the complexity of the choice task increases. Decision-making processes can become more difficult due to either (1) the assortment itself, or (2) the situation a

consumer finds him-/herself in. First, an assortment of more complex products, such as digital cameras or mobile phones, would require more effort from the consumer. It would make the task more difficult. Second, the task of choosing a product could also be more complex due to a situation of cognitive load, i.e., if more data have to be processed per unit of time (Wright 1974). One frequently occurring situation of cognitive load is time pressure. It will take more input from the consumer to decide on a product under feelings of time pressure. Both types of task complexity, assortment-inherent and situation-specific task complexity, could be expected to create higher costs of variety. It is important to examine the generalizability of our findings for simple grocery products to other types of assortments and buying situations. The potentially higher costs of variety associated with higher task complexity might have a more severe impact on the attractiveness of an assortment. As a result, the optimal level of assortment size could be reached at a much lower level. This means that less variety would suffice if the task of choosing were more difficult.

How task complexity influences the relationship between assortment variety and assortment attractiveness is empirically examined in the next two chapters. Chapter 5 investigates the role of assortment-inherent task complexity, namely product complexity. Chapter 6 addresses the role of a situation-specific source of task complexity, i.e., time pressure.

5 When Assortment Variety and Product Complexity go Hand in Hand: On the Costs of Variety

5.1 Introduction

In the previous chapter, we showed that up to certain limits consumers are able to deal with the high levels of variety they regularly encounter in assortments of simple grocery products. It was demonstrated that the costs of variety that consumers experience in such assortments are relatively low and that hardly any of these costs have a negative impact on the attractiveness of an assortment. In this chapter, we test the robustness of these findings by focusing on a more difficult choice task, namely choosing a complex product from an assortment. On the one hand, consumers could prefer many options when choosing a complex product, like a digital camera or a laptop, because the choice is such a consequential one. On the other hand, choosing a complex product, which is generally described on many attributes (Burnham et al. 2003), from a highly varied assortment is a demanding and difficult task. It is important to learn whether consumers want to choose from an assortment offering high variety when they are already facing the difficult task of choosing a complex product. In this chapter, we aim at understanding how the relationship between assortment variety and assortment attractiveness for products that involve a more complex decision-making process differs from this relationship for simple products. The objective of this chapter is to answer the subsequent research question: What is the role of product complexity in the relationship between assortment variety and assortment attractiveness?

The effects of variety in assortments of simple grocery products presented in the previous chapter were based on the type of consumer decisions that can be classified as limited problem solving (Solomon 2002). Limited problem solving is done for low-cost products that are frequently purchased. Choosing a jar of jam or a bag of potato chips is such a simple task. The amount of effort that goes into the decision is relatively small. Buying simple products corresponds to low consumer involvement and to familiarity with the product class and brands. It involves little thought, search effort, or time given to the purchase (Solomon 2002). An interesting hypothesis is that the low level of variety costs and their negligent impact that were found for assortments of simple products are due to the simplicity of the choice task.

Choosing from an assortment of complex shopping goods requires more extensive problem solving. Examples of products that involve a more complex decision are durables like digital cameras, laptops, dishwashers, or refrigerators.

Choosing these types of products, i.e., dealing with assortment-inherent task complexity, requires extensive problem solving and effort. These products are generally more expensive and infrequently bought than simple products. Usually, the consumer is less familiar with the product class and the brands. In addition, these complex products instigate more thought, search, and time given to the purchase (Solomon 2002).

What differences in effects of assortment variety do we expect between assortments of complex and simple products? Our main expectation is that the costs of variety will be higher for more complex products. It will be harder to process all available information, it will be more difficult to make the right choice, and consumers will be more inclined to anticipate regretting their decision. We speculate that these higher costs have a stronger impact on assortment attractiveness. As a result, an optimal level of assortment size might be reached at an earlier stage than for assortments of simple products.

By including a wide range of assortment sizes we examine whether the relationship between assortment size and assortment attractiveness reveals an inverted U-shape for complex products, as it tentatively did for simple products. Little research has been done on the relationship between variety in assortments of complex products and their evaluations. An exception is a study by Van Herpen (2001, Chapter 4). She demonstrated that consumers prefer an assortment with many complex products over an assortment carrying few complex products. Overall, investigating how a wide range of sizes of assortments of complex products influences their attractiveness can provide insights into whether an optimal level of assortment size also exists for complex products. We examine whether this optimum will be reached at a lower level due to the expected higher costs of variety. Further, we provide insights into the underlying process of the impact of assortment variety on assortment evaluations and show which benefits and costs are actually relevant in assortments of complex products.

In the following section, we build hypotheses on how product complexity influences the relationship between assortment variety and assortment attractiveness. In Section 5.3, we explain the methodology of the laboratory experiment. The stimuli used are assortments of digital cameras and laptops. The results of the study are examined in Section 5.4. The final section provides the conclusions.

5.2 Product complexity

Product complexity can be defined as the extent to which a consumer perceives a product to be difficult to understand or use (Rogers 2003). A product is perceived as being more complex if it offers a larger number of options or if it requires a larger number of steps in its use (Burnham et al. 2003). Furthermore, complex products are associated with a larger number of attributes (Burnham et al. 2003). This makes information collection and direct comparisons of attributes more costly (Shugan 1980). Finally, when products are more complex, consumers are likely to perceive higher risks. The difficulty of understanding the products leads to uncertainty, which consumers feel might lead to an unknown negative outcome (Burnham et al. 2003). An example of a complex product is a mobile phone, which takes more steps to use properly, is evaluated on more attributes, and is associated with higher risks than for instance a bag of potato chips. Hence, from a consumer perspective a mobile phone is more complex than a bag of potato chips.

Product complexity is likely to influence the relationship between assortment variety and assortment attractiveness. The effects of assortment variety can be expected to differ between assortments of complex products and assortments of simple products in a number of ways. These differences are examined below. First, we make conjectures on the effects of product complexity on perceptions of variety, and on the benefits and costs of variety. Then, we discuss which part of the underlying process of the relationship between assortment variety and assortment attractiveness will potentially differ with product complexity.

5.2.1 The effects of product complexity on perceived variety and the benefits and costs of variety

In this subsection, we discuss how product complexity is expected to influence perceptions of variety, benefits, and costs of variety.

Perceived variety. We conjecture that the level of variety that consumers see is higher in assortments of complex products than in assortments of simple products. Complex products, such as cars and dishwashers, are generally evaluated on more attributes (i.e., on more information) than simple products, such as yogurt and peanut butter (Burnham et al. 2003). There are more attributes on which these products can differ. Hoch et al. (1999) showed relatively higher variety

perceptions when the number of attribute levels increases. Perceptions of variety will probably also be higher when products are described on more attributes (instead of attribute levels). As a result, we hypothesize that variety perceptions will increase with product complexity for all assortment sizes:

H_1: An increase in product complexity will increase perceived variety.

Benefits. Regarding the choice benefits of variety, i.e., the chance of a perfect match and decision freedom, we propose these to decrease with increasing product complexity. The choice benefits of an assortment will be lower in an assortment of complex products. Consumers buy complex products less often and are thus less familiar with product categories of complex products (Solomon 2002). They perceive higher risks (Burnham et al. 2003), because they are less sure about which products are acceptable and which one is the best option. In addition, it will be harder to get a clear overview of the acceptable products in the assortment due to the higher number of attributes. As a result, not all products will be taken into account, so that potentially the perfect match goes unnoticed by the consumers. Hence, they will tend to estimate the chance that an assortment offers a perfect match to be lower. Further, when they are confronted with relatively unfamiliar complex products and if they do not have a clear overview of all potentially relevant products in an assortment, they will evaluate the freedom the assortment offers them to choose to be lower. Thus, feelings of decision freedom will be lower for more complex products. In short, we hypothesize for all assortment sizes:

H_2: An increase in product complexity will decrease: (a) the chance of a perfect match and (b) decision freedom.

Variety-seeking benefits are not as relevant for assortments of complex products as for simple products. Complex products are infrequently bought and used for an extensive period of time. Therefore, consumers will not normally switch between different complex products, such as refrigerators, purely for the sake of variety. Furthermore, they will not buy multiple complex products at once because they are unsure which one they want to use in the future. Thus, variety-seeking over time and variety-seeking as a hedge against uncertainty about future preferences are not applicable with respect to assortments of complex products.

Costs. While the choice benefits were conjectured to decrease, all costs of variety (information costs and choice costs) are proposed to increase with product complexity. To begin with, we propose that the information costs (information overload, search costs, and attribute conflict) will be higher for assortments of complex products than for assortments of simple products. First, complex products generally imply more information, more attributes to process. In other words, consumers have to put in more effort (Solomon 2002) to process all the information. They will be easily distracted by the large amount of information (Payne et al. 1993). Because of the extra information to handle, lack of overview as well as confusion from information overload will be higher. Second, buying a complex product involves more search effort by the consumer (Solomon 2002). Decision problems of increasing complexity take longer and are viewed as more effortful (Bettman, Johnson, and Payne 1990). Thus, search costs are also proposed to be higher. Third, when choosing a complex product more attributes and attribute levels have to be traded-off against each other, implying higher attribute conflict. In brief, we propose that information overload, search costs, and attribute conflict will be higher for assortments of complex products than for simple products.

Furthermore, choice costs (value conflict and potential regret) are also expected to be higher for assortments of more complex products. Complex products, which require extensive problem solving, are generally more expensive (Solomon 2002). Since the value (price) of these types of products is higher it will be more difficult to choose between equally attractive products. The purchase risk associated with such a choice is higher. It will be harder to choose between two products that cost € 200 than between two products of € 2. Hence, value conflict is expected to be higher for more complex products. In addition, because of the higher value of complex products, potential regret will also be higher. Consumers are more likely to consider products they will not choose if their purchase involves a lot of money and if the product will not be replaced for a long period of time. Thus, value conflict and potential regret will be higher for assortments of complex products than for assortments of simple products. Hence, we hypothesize:

H_3: An increase in product complexity will increase: (a1) lack of overview from information overload, (a2) confusion from information overload, (b) search costs, (c) attribute conflict, (d) value conflict, and (e) potential regret.

In short, we propose that if the products in an assortment are more complex, consumers perceive more variety in the assortment. Furthermore, the choice benefits of variety will be lower. Moreover, the costs of variety in assortments of complex products are presumably much higher. It will be more difficult to deal with high variety when choosing a complex product. The lower choice benefits and the higher costs of variety could imply that less variety is already sufficient. This might mean that consumers are satisfied with less variety than they want to encounter in an assortment offering simpler products.

5.2.2 The effects of product complexity on the underlying process

In this subsection, we explore to what extent the underlying process of the relationship between assortment variety and assortment attractiveness for complex products will differ from simple products. Two differences can be anticipated.

Impact of benefits and costs. Potentially the choice benefits and the costs of variety will more strongly influence the attractiveness of an assortment of complex than of simple products. Complex products are generally more expensive. Furthermore, they are bought for a longer period of time. Hence, it is more important to make the right choice. A wrong choice can not be easily overcome on the next shopping trip. Thus, it will be more relevant that an assortment offers a perfect match and the freedom to choose. In addition, it will be much more annoying if one experiences high costs of variety, i.e., information overload, search costs, attribute or value conflict, or potential regret. Probably consumers do not want to be bothered with the high costs of variety, because the choice is such an important one. As a result, it can be expected that the impact of the choice benefits and the costs of variety on assortment attractiveness will be stronger in assortments of complex products than in assortments of simple products. This remains an exploratory issue.

Favorite available. The second difference that we expect concerns the impact of the availability of a favorite product. It could be argued that for complex products, the availability of a favorite product will directly lower the costs of variety. This effect was not found for simple products. Since consumers are less familiar with product categories of more complex products (Solomon 2002), fewer consumers will actually have a favorite product. However, if they do have a favorite product this might immensely help them in their decision, leading to lower costs of variety. If a consumer knows what he/she wants, this can simplify choice

(Chernev 2003b), particularly in complex situations. Consumers do not have to process all the available information if they don't want to, because they can simply opt for their favorite. In addition, the existence of one favorite product implies that other products are probably less attractive than this preferred product. This, in turn, means that value conflict as well as potential regret will be lower. Consumers will anticipate regret of choosing a wrong product less if they can just select their favorite one. Thus, we speculate that favorite available *will* have a negative effect on the costs of variety in assortments of complex products. However, this remains an open issue.

In brief, we hypothesized that product complexity increases perceptions of variety, that it lowers the choice benefits of variety, and that it increases all costs of variety. We also suggested that the impact of these lower benefits and higher costs of variety on assortment attractiveness could be stronger. This might imply that an optimal level of assortment size is reached at an earlier level for more complex products. In addition, we speculated that for higher product complexity favorite available will significantly lower the costs of variety.

5.3 Method

5.3.1 Subjects and experimental design

Two hundred and ninety subjects participated in the laboratory experiment. Two subjects were removed from the sample. One subject was removed because he did not perform the task seriously. Another subject took part in the experiment twice, wherefore data on the second time he joined were removed. As a result, the final sample size was 288. The sample consisted of mostly students who were invited on the university campus to participate. Fifty-eight percent of the subjects were male, 42% female. Subjects ranged in age from 15 to 32 years, with a mean of 22 ($N = 287$).

The experimental design was similar to the design used in the previous chapter. Assortment size was again manipulated at five different levels. All subjects saw one of these five different assortment sizes (a between-subjects design). Subjects were randomly assigned to one of the conditions.

Subjects saw only one of two different product categories: digital cameras or laptops. They were randomly assigned to the product category. The final

number of subjects per assortment size and per product category is provided in Table 5.1. In total, 149 subjects were presented an assortment with digital cameras, while 139 subjects saw an assortment of laptops.

Random assignment of subjects across assortment sizes was verified by inspecting a number of covariates. We examined with multiple ANOVA's whether the covariates differed significantly between assortment sizes. No significant differences across assortment sizes were detected for product involvement, purchase involvement, purchase risk, product expertise, change seeking index and need for cognition. Therefore, random assignment of subjects across assortment sizes was successful.

Table 5.1 Number of subjects per assortment size and product category

	Assortment size					
Product category	5	20	35	50	65	Total
Digital cameras	29	28	26	35	31	149
Laptops	27	30	28	27	27	139
Total	56	58	54	62	58	288

5.3.2 Stimuli

In this subsection, we first explain our selection of digital cameras and laptops as complex products. Second, we discuss the composition of the assortments. Third, we analyze the perceived realism of the assortments.

Product category selection. In a pretest with 27 subjects four potentially complex products were included, namely digital cameras, laptops, mobile phones, and DVD players. Each subject rated these products on product complexity (see Table 5.2). The measure of product complexity was based on a study by Park (1976). The first item (asked on a 1-7 scale) was *'If I buy a {product}, I evaluate it on the basis of (a relatively small number of products characteristics – a relatively large number of products characteristics)'*. Mean levels were higher for digital cameras (*mean* = 5.74, *SD* = 1.61) and significantly ($p < .05$) higher for laptops (*mean* = 6.15, *SD* = 1.35) than for both mobile phones (*mean* = 5.07, *SD* = 1.33) and DVD players (*mean* = 5.15, *SD* = 1.70). The second item of product complexity was measured (on a 1-7 scale) with *'How complex is a {product} for you to evaluate? (very easy – very complex)'*. Means were significantly ($p < .05$)

higher for digital cameras (*mean* = 5.67, *SD* = 1.39) and laptops (*mean* = 5.44, *SD* = 1.65) than for mobile phones (*mean* = 4.26, *SD* = 1.58) and DVD players (*mean* = 4.48, *SD* = 1.60). Since our goal was to present assortments of products that are clearly complex, digital cameras and laptops were selected. The first item of product complexity did not differ significantly between digital cameras and laptops ($t = 1.84$, $p = .078$), nor did the second item ($t = 0.72$, $p = .477$), as paired-samples *t*-tests showed.

Table 5.2 Means and standard deviations of product complexity per product category

	Product category			
Item	Digital cameras	Laptops	Mobile phones	DVD players
1. If I buy a {product}, I evaluate it on the basis of (a relatively small number of products characteristics – a relatively large number of products characteristics)	5.74[a,b] (1.61)	6.15[a] (1.35)	5.07[b] (1.33)	5.15[b] (1.70)
2. How complex is a {product} for you to evaluate? (very easy – very complex)	5.67[a] (1.39)	5.44[a] (1.65)	4.26[b] (1.58)	4.48[b] (1.60)

NOTES. $N = 27$. Measurements were on a 1-7 scale. Standard deviations are given in parentheses.
[a,b] Non-matching letters indicate a significant difference between the cell means of a *row* at $p < .05$ as was investigated with paired samples *t*-tests. For example, all cells with 'a' differ significant from the cells with 'b', but not from cells with 'a'.

A large part of the 288 subjects who took part in the experiment had some experience with buying either a digital camera or a laptop. Forty percent of the subjects who were confronted with an assortment of digital cameras had ever bought a digital camera. Of the subjects who saw an assortment of laptops, 35% had ever bought one. In addition, subjects were quite involved with both product categories (*mean* = 4.60 for digital cameras, *mean* = 4.58 for laptops; measured on a 1-7 scale). For more detailed information on product category specific consumer characteristics, like product involvement, for digital cameras and laptops, we refer to Appendix 5.A.

Assortment composition. Subjects were confronted with an assortment of digital cameras or laptops (random assignment). The assortments consisted of 5, 20, 35, 50, or 65 different products. Our experimental design thus closely followed the one described in Chapter 4, where the same numbers of products were used. These specific numbers were selected to make the two experiments comparable.

The main difference was the level of product complexity. Generally, complex products are described and evaluated on more attributes than simple products. Thus, also in our experiment, the number of attributes of the digital cameras and laptops shown was larger than for the jam and potato chips used in Chapter 4. For both digital cameras and laptops 31 attributes and their respective levels were provided.

Figure 5.1 Example of an assortment of digital cameras (size 5)

All products were available in one or more online stores that operate on the Dutch market. This was done to make the task as realistic as possible. The products were selected on the basis of how often they were offered across different stores, as was investigated in a pretest. Products that were offered most often in real stores were also presented in the smallest assortments. Each larger assortment carried the products of the smaller assortments plus an additional 15 products that were subsequently less popular. All products were different, i.e., the assortments did not contain duplicates. Thus, shelf space varied along with assortment size.

In a pretest with 27 subjects, we asked what aspects they pay attention to when choosing and buying a digital camera or a laptop. The attributes that emerged from this pretest were used to compose the assortments. The most

frequently mentioned attributes for digital cameras were: price, number of pixels, brand name, dimensions (i.e., size), memory, and extra features. For laptops, the most frequently mentioned attributes were: price, memory (RAM), brand name, processor speed, screen size, and hard drive size. Attribute patterns (Van Herpen and Pieters 2002) in the assortments were kept as constant as possible across sizes. Appendix 5.B gives dispersion and dissociation levels for three of the most frequently mentioned attributes. These numbers show that attribute patterns were relatively stable across assortment sizes, such that only *size* varied systematically across the assortments. The products were organized by brand, which is common in real stores. Two examples of the stimuli are provided in Figure 5.1 (digital cameras) and Figure 5.2 (laptops). As can be seen from these figures, products were represented by real photos. Product characteristics could be retrieved by clicking on the photo of a product.

Figure 5.2 Example of an assortment of laptops (size 50)

Realism of assortments. The perceived realism of each assortment was measured by asking *'Could this assortment of {products} be found in an existing store?* (*1 = no, definitely not, 4 = maybe, 7 = yes, definitely*)*'*. Results for the realism of each assortment are presented in Table 5.3.

Table 5.3 Means and standard deviations of assortment realism per assortment size and product category

	Assortment size				
Product category	5	20	35	50	65
Digital cameras	5.41	5.36	5.27	4.97	5.06
	(1.70)	(1.52)	(1.12)	(1.54)	(1.73)
Laptops	5.15	4.93	4.18	4.26	3.78
	(1.49)	(1.36)	(1.70)	(1.63)	(1.74)

NOTES. N = 288. The measurement was on a 1-7 scale. Standard deviations are given in parentheses.

Mean levels of realism were all higher than 4 (measured on a 1-7 scale), except for the assortment with 65 laptops. This indicates that one may find comparable assortments in real stores. The realism was found highest for the smallest assortment size (5 products) for both digital cameras and laptops and tended to decrease with assortment size. Our larger assortments offered more than what is generally available in real computer stores. Thus, in this design our largest assortment sizes were more extreme than what subjects are used to. Note that for the jam and potato chips assortments employed in the previous chapter both the smallest and largest assortments were more extreme. Overall, we can conclude that the smallest assortments of digital cameras and laptops were seen as somewhat more realistic than the larger assortments.

5.3.3 Procedure

Data collection was conducted in a similar setting as the laboratory experiment described in Chapter 4. Again, subjects answered questions about an assortment of products on a computer screen.

The current laboratory experiment with digital cameras and laptops differed from the experiment with jam and potato chips on the following aspects. Subjects saw only one assortment, consisting of either digital cameras or laptops, instead of two assortments (jam and potato chips). Since the experiment was

preceded by an unrelated experiment and since the stimuli of the current experiment consisted of complex products, only one assortment was presented to prevent subjects from boredom and fatigue. Accordingly, the instruction to enhance the natural difference in product involvement between jam and potato chips was no longer present in the current experiment. Furthermore, the number of attributes of the digital cameras and laptops (31) was much larger than for jam and potato chips (about eight).

These attributes and attribute levels, in other words the product characteristics, could not be presented simultaneously with the assortment. Subjects were instructed that they could retrieve product characteristics by clicking on the photo of a product. Retrieving product characteristics was possible (1) at the start of the experiment, and (2) just before subjects had to select a product. When clicking on the photo of a product, subjects were presented a larger photo of the product as well as the attributes and attribute levels of this specific product. An example of what subjects saw after clicking on a photo is provided in Figure 5.3. The original words were in Dutch. Below the product characteristics, we also provided a 'help' button. This button led subjects to several screens with explanations on the attributes. Appendix 5.C displays an example of such a screen.

Besides these differences, the procedure was similar to the one described in Chapter 4. After inspecting the assortment and retrieving product characteristics, subjects were asked questions on the attractiveness of the assortment. Next, the items on perceived variety and chance of a perfect match were presented in random order. Then, subjects were again allowed to retrieve product characteristics before making a choice from the assortment. Afterwards, subjects selected the product that most closely matched their needs. Subsequently, subjects answered the next questions, which were (in random order) on decision freedom, information overload, search costs, attribute conflict, value conflict, and potential regret. In case multiple items were used to measure a construct, the items were grouped by construct and appeared in random order. Afterwards, favorite available as well as product involvement, purchase involvement, purchase risk, product expertise, product complexity, and buying behavior were measured. The final questions were on need for cognition, change seeker index, and several demographics. Subjects took 13 minutes on average to complete the experiment with digital cameras or laptops (SD = 4 for both digital cameras and laptops). Afterwards they were debriefed and received a box of potato chips for their participation.

Figure 5.3 Example of product characteristics (laptops)

Brand name	Apple
Type	Ibook12
Price	€ 1,438.71
Processor speed (CPU)	900Mhz
Processor type (CPU)	PowerPC G3
Cache	512 KB
Front Side Bus	100 Mhz
RAM memory MB	256 MB
RAM memory MB (extra)	640 MB
Hard Drive GB	40 GB
Screen (type)	XGA TFT
Screen (dimensions)	14.1 inch
Screen (resolution)	1024 x 768
CD drive type	CD-RW/DVD-ROM
CD-Rom drive speed	24 X
CD-(re)writer speed	24 X
Diskette drive	No
Sound card	Yes
LAN adapter	Yes
Modem speed	56 KBPS
TV Out port	Yes
USB ports	2
Wireless Lan	No
Infrared support	N/A
Videomemory MB	32 MB
Mouse (type)	Touchpad
Operating System	Mac OS
Battery (type)	Lithium Ion
Battery (life)	360 minutes
Dimensions	32.3 (w) x 25.9 (d) x 3.40 (h)
Weight (kg)	2.7kg

help go back

5.3.4 Measures

Measures for the current experiment were the same as those employed in Chapter 4. For the origin of the measures the reader is referred to Subsection 4.2.4. Each item was evaluated on a seven-point (1-7) scale and originally stated in Dutch. Table 5.4 displays an overview of the measures of the main variables of the research framework, namely of perceived variety, the choice benefits, all costs of variety, and assortment attractiveness.

The measures were identical to the ones used in Chapter 4, except for the name of the product categories inserted: digital cameras or laptops instead of jam or potato chips (see Table 5.4). The two variety-seeking benefits are not included. Because complex products are mostly expensive and infrequently bought, people do not tend to seek variety in their choices of these types of products. Variety-seeking over time or as a hedge against uncertainty in future tastes is generally not applicable to complex products. Consequently, both benefits were not measured.

Table 5.4 Overview measures digital cameras and laptops

Construct	Item	Cronbach's α Digital cameras	Cronbach's α Laptops
Perceived variety	1. This assortment of {digital cameras/laptops} offers (very little variety) – (very much variety) 2. This assortment of {digital cameras/laptops} offers (very little diversity – very much diversity) 3. This assortment of {digital cameras/laptops} is (not varied at all – very much varied)	.95	.90
Choice benefits			
Chance of a perfect match	Suppose you want to buy a {digital camera/laptop}. How large is the chance that this assortment contains a {digital camera/laptop} that completely matches your needs? (very small) – (very large)		
Decision freedom	How much decision freedom did you feel while choosing the {digital camera/laptop}? (very little freedom) – (very much freedom)		
Costs			
Info overload~ lack of overview	While choosing, I felt I had (very little overview) – (very much overview)[a]		
Info overload~ confusion	While choosing, I felt (not at all) – (very much) confused		
Search costs	1. Selecting a {digital camera/laptop} of my liking, cost me (very little time) – (very much time) 2. Selecting the most attractive {digital camera/laptop}, cost me (very little effort) – (very much effort)	.87	.84
Attribute conflict	Trading-off the different attributes of the {digital cameras/laptops} was (very easy) – (very difficult)		
Value conflict	1. How many {digital cameras/laptops} in this assortment are attractive to you? (none – one – several) 2. Since (none – several){digital cameras/laptops} are attractive to me, choosing was (very easy) – (very hard)[b]		
Potential regret	1. The chance that I will feel regret later on because I did not choose another {digital camera/laptop} now, is (very small) – (very large) 2. The chance that I will feel disappointed for not having chosen another {digital camera/laptop} is (very small – very large)	.91	.94

continued

Table 5.4 continued

Construct	Item	Cronbach's α: Digital cameras	Cronbach's α: Laptops
Assortment attractiveness	1. To me, this assortment of {digital cameras/laptops} is (very unattractive – very attractive) 2. To me, this assortment of {digital cameras/laptops} is (not inviting at all – very much inviting) 3. My opinion on this assortment of {digital cameras/laptops} is (very negative – very positive)	.85	.85

NOTE. All items were measured on a seven-point (1-7) scale, except for the first item of value conflict.

[a] The item is reverse coded.

[b] This variable took the value 1 if subjects indicated that one product was attractive. The variable took the value 1 (very easy) to 7 (very hard) if none or several products were found to be attractive.

Cronbach's α's of the multi-item scales are also provided in Table 5.4. They were all higher than .83, indicating good reliability.

Favorite available was measured in a similar way as in Chapter 4. First, we asked whether the subjects already preferred a specific digital camera/laptop before they had seen the assortment. If they did, they were asked whether this favorite product was available, yes (value = 1) or no (value = 0). If they did not have a preference beforehand, the favorite available variable was not asked and was coded as missing (50% of the subjects for digital cameras, 59% of the subjects for laptops).

Covariates. Apart from the main variables of the research framework, a number of covariates were measured as well. We used identical measures to those employed in Chapter 4 for the following covariates: product involvement (Cronbach's α = .91 for digital cameras and .86 for laptops), purchase involvement (Cronbach's α = .73 for digital cameras and .83 for laptops), purchase risk (Cronbach's α = .76 for digital cameras and .73 for laptops), and expertise with a product category (Cronbach's α = .93 for digital cameras and .95 for laptops). In addition, we measured product complexity. This measure was based on a study of Park (1976) and was the same as the one used in one of the pretests (see Subsection 5.3.2). To measure need for cognition, we used a reduced version of the scale of Pieters, Verplanken and Modde (1987) with six items. Cronbach's α for need for cognition calculated across subjects was .99. We also employed a reduced 7-item version of the change seeker index (Steenkamp and Baumgartner 1995) with a seven-point (1-7) scale. Cronbach's α was .99 for this measure.

5.3.5 Analysis of measurement model

We developed a measurement model that was identical to the one employed in Chapter 4. All items of the main variables of the research framework were included: *ln*(size), favorite available, perceived variety, the choice benefits and all costs of variety, and assortment attractiveness.

Before estimating the measurement model, the linearity of the relationships between the main variables was inspected. As with the experiment on simple products, in the current experiment with complex products, we found a nonlinear relationship between assortment size and perceived variety. In Table 5.5, three regression models for this relationship are shown: a linear, a semi-logarithmic, and a quadratic regression model. The variance in perceived variety (the items were averaged) that can be explained by assortment size was higher for the semi-logarithmic model (28.0%) than for the linear model (24.9%) or the quadratic model (27.1%). Hence, the semi-logarithmic model performed best. The relationship between assortment size and perceived variety in assortments of complex products is positive and shows decreasing marginal returns. This had also been demonstrated for assortments of simple products. In the subsequent analyses we will use the natural logarithm of assortment size, *ln*(size), as a solution for the nonlinear relationship. Other relationships did not deviate significantly from linearity.

Table 5.5 Regression results of perceived variety as a function of assortment size for digital cameras and laptops (pooled)

Model	Variable	Coefficient	*t*-value	R^2_{adj}	*F*
Linear	Constant	3.83	29.48**	.249	95.97**
	Assortment size	0.03	9.80**		
Semi-logarithmic	Constant	2.42	9.91**	.280	112.44**
	Ln(assortment size)	0.76	10.60**		
Quadratic	Constant	3.40	18.13**	.271	54.31**
	Assortment size	0.07	5.45**		
	(Assortment size)^2	-0.001	-3.12*		

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

The structural equation modeling procedure was identical to the one applied in Chapter 4. For the missing data of the favorite available variable (N =

75 for digital cameras, N = 82 for laptops) a means imputation method per assortment size was applied. The imputed means as well as their justification can be found in Appendix 5.D. For the single-item measures and for *ln*(size) we set λ to 1 and θ_δ to 0. For the multi-item measures, the first λ was set to 1. We used the covariance matrices of both product categories as input matrices and applied maximum likelihood estimation.

We tested for invariance of the variance-covariance matrices between the two product categories, following the Steenkamp and Baumgartner procedure (1998). The fit of this model was good ($\chi^2(171) = 203.02$, $p = .048$, RMSEA = .036, NNFI = .97, CFI = .98). Except for the just significant value of chi-square[1], the fit indices were below or above their recommended cutoff criteria, i.e., smaller than .06 for RMSEA and larger than .95 for NNFI and CFI (Hu and Bentler 1999). Therefore, we decided to pool the data. The measurements of the two product categories, digital cameras and laptops, were considered as distinct cases. The resulting number of observations was 288. The covariance matrix of the pooled data is provided in Appendix 5.E.

The pooled data formed the basis for further analyses. The covariance matrix and the asymptotic covariance matrix of the pooled data were used as input data for the measurement model. Table 5.6 contains the results of the measurement model[2]. The completely standardized factor loadings as well as the Satorra-Bentler (SB) robust standard errors are presented. We computed the SB scaled chi-square statistic and robust standard errors to overcome non-normality of the data (Satorra and Bentler 1990; West et al. 1995). The fit of the measurement model was excellent ($SB\chi^2(78) = 83.25$, $p = .32$, RMSEA = .015, NNFI = .99, CFI = .99). The measurement model was the basis for further analyses.

[1] As with the data on jam and potato chips, with the current data it was not possible to use the Satorra-Bentler scaled chi-square statistic and robust standard errors to overcome non-normality of the data (Satorra and Bentler 1990), since the sample size of each group was too small to compute the asymptotic covariance matrices (Diamantopoulos and Siguaw 2000). The goodness-of-fit indices might be somewhat underestimated (West, Finch and Curran 1995), which we do not consider problematic here since the fit of the model was good.

[2] The error variance of the second item of potential regret was set equal to 0 as this value was slightly negative in the initial run of the model. This did not produce a significant change in any of the fit statistics (Ployhart, et al. 2003). In the subsequent analyses this restriction was no longer needed.

Table 5.6 Results of measurement model (digital cameras and laptops, pooled)

Construct/item	Standardized factor loading	Satorra-Bentler robust standard error	*t*-value	Composite reliability (average variance extracted)
Assortment variety				
Ln(size)	1.00			
Favorite available	1.00			
Perceived variety				.90 (.75)
item 1	0.90			
item 2	0.92	0.04	24.89	
item 3	0.90	0.04	23.19	
Choice benefits				
Perfect match	1.00			
Decision freedom	1.00			
Costs				
Info overload~lack of overview	1.00			
Info overload~confusion	1.00			
Search costs				.82 (.70)
item 1	0.79			
item 2	0.95	0.10	12.37	
Attribute conflict	1.00			
Value conflict	1.00			
Potential regret				.88 (.78)
item 1	0.87			
item 2	1.00	0.04	25.88	
Attractiveness				.81 (.59)
item 1	0.84			
item 2	0.76	0.07	13.89	
item 3	0.85	0.06	13.53	

NOTE. $N = 288$.

We investigated convergent validity on the basis of the factor loadings. All factor loadings were significant ($p < .01$) and all R^2 values (inter-item reliabilities) exceeded .50 (Hildebrandt 1987). In addition, the factor loadings were all greater

than twice their standard errors (Anderson and Gerbing 1988), which also supports convergent validity.

Reliability was assessed by computing the composite reliability and average variance extracted (Baumgartner and Homburg 1996; Steenkamp and Van Trijp1991) (see Table 5.6). Composite reliability varied from .81 to .90 and was higher than the suggested cutoff value of .70 (Nunnally and Bernstein 1994). In addition, all average variances extracted were above the recommended cutoff value of 0.50 (Fornell and Larcker 1981a), ranging from .59 to .78.

We examined discriminant validity in two ways. The average variance extracted exceeded the squared correlations of the multi-item constructs with the other constructs (Fornell and Larcker 1981b). Furthermore, all correlations were less than 1 by an amount greater than twice their respective standard errors (Bagozzi and Warshaw 1990), confirming discriminant validity.

5.4 Results

Whether the choice benefits are actually lower and whether the costs of variety are actually higher for assortments of complex (versus simple) products is analyzed in this section. Furthermore, it is shown to what extent the parameters of the relationships of the research framework are the same for assortments of complex as for simple products. The structure of this section is as follows. First, we discuss the direct effects of product complexity. We examine mean levels of the main variables of the research framework and show how their levels differ as a function of product complexity. Second, the structural equation model of the research framework is discussed. Third, we investigate how product complexity has an impact on the underlying process of the research framework. We compare the relationships of the research framework for assortments of complex products with those for simple products. Finally, we analyze the potential existence of an optimal level of assortment size for complex products.

5.4.1 Results of testing the effects of product complexity

In this subsection, we examine the differences in means of the main variables of the research framework between low and high product complexity. Recall that we hypothesized higher perceptions of variety (H_1), lower choice benefits (H_2) and higher costs of variety (H_3) for higher product complexity.

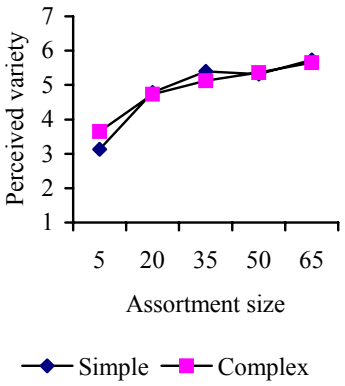
We compare the mean values of the main variables for simple products (jam and potato chips) with those for complex products (digital cameras and laptops) across assortment sizes. The data for simple products were pooled across jam and potato chips (Chapter 4). The data for complex products were pooled across digital cameras and laptops (current experiment). We compare the means of the main variables between the two levels of product complexity across assortment sizes, which is done separately for each variable. The variety-seeking benefits are excluded from the analyses since they are not relevant for assortments of complex products and hence were not measured in the current experiment.

The differences in means between low and high product complexity were statistically examined by performing two-way ANOVA's for all variables of the research framework separately[3]. Both product complexity and assortment size were between-subjects factors. An interaction between product complexity and assortment size was also included. In addition, post hoc independent-samples *t*-tests were conducted to compare the means of each variable between the two levels of product complexity separately for each assortment size.

Perceived variety. In Figure 5.4 we present the mean values of perceived variety across assortment sizes separately for assortments of simple and complex products. On the left-hand side of Figure 5.4, the means are shown graphically. On the right-hand side, we provide the mean values of perceived variety, standard deviations, and *t*-values of the independent samples *t*-tests. Both for simple and complex products perceived variety increases with assortment size, though with decreasing marginal returns. Thus, consumers see more variety in larger assortments disregarding how complex the products in the assortment are.

[3] MANOVA's were also performed for the benefits and costs of variety separately. Univariate analyses did not lead to different results from the ANOVA's. Hence, ANOVA results are reported only.

Figure 5.4 Perceived variety (means) as a function of assortment size per product complexity



Size	Product complexity: Simple	Product complexity: Complex	*t*-value
5	3.13	3.65	2.04*
	(1.27)	(1.49)	
20	4.78	4.73	-0.28
	(1.00)	(1.03)	
35	5.40	5.13	-1.37
	(1.08)	(1.10)	
50	5.32	5.36	0.23
	(1.22)	(0.91)	
65	5.73	5.66	-0.46
	(0.87)	(0.97)	

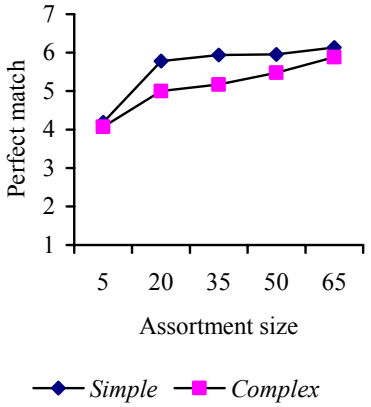
NOTE. Standard deviations are given in parentheses.
* $p < .05$

Levels of perceived variety do not differ much between assortments of simple and complex products. The ANOVA with perceived variety as dependent variable revealed no significant effect of product complexity ($F(1,590) = 0.13$, $p = .716$) nor of the interaction term between product complexity and assortment size ($F(4,590) = 2.13$, $p = .076$), but a significant impact of assortment size ($F(4,590) = 78.85$, $p < .001$). The hypothesis that perceived variety would be higher for assortments of more complex products (H_1) was not supported. Only for one assortment size (5), perceived variety was significantly higher for complex than for simple products ($t = 2.04$, $p = .043$). Underlying our predictions was the idea that the higher number of attributes on which the complex products are described would lead to higher perceptions of variety. On the other hand, subjects might have been more selective in their attention. They might have focused on the most important products and attributes by being selective in their information attention (Payne et al. 1993). This could have led to lower variety perceptions. These opposing processes seem to be balanced. As a net result, perceived variety did not differ between assortments of simple and complex products.

Benefits: Chance of a perfect match. Figure 5.5 displays mean levels of the benefit chance of a perfect match across assortment sizes separately for simple and complex products. The chance of a perfect match between what a consumer

wants and what the assortment offers increases with assortment size for both simple and complex products.

Figure 5.5 Perfect match (means) as a function of assortment size per product complexity



Size	Product complexity: Simple	Product complexity: Complex	*t*-value
5	4.19	4.07	-0.37
	(1.79)	(1.78)	
20	5.78	5.00	-3.24**
	(1.11)	(1.54)	
35	5.94	5.17	-3.27**
	(1.17)	(1.48)	
50	5.95	5.48	-2.04*
	(1.20)	(1.26)	
65	6.13	5.88	-1.34
	(0.89)	(1.16)	

NOTE. Standard deviations are given in parentheses.
* $p < .05$, ** $p < .01$.

Mean levels of chance of a perfect match are higher for assortments of simple products than for assortments of complex products for all assortment sizes, as was conjectured in H_{2a}. The ANOVA analysis revealed a significant effect of product complexity ($F(1,590) = 18.53$, $p < .001$), of assortment size ($F(4,590) = 33.29$, $p < .001$), but not of the interaction term between the two variables ($F(4,590) = 1.45$, $p < .216$). Thus, overall, subjects rated assortments of simple products to have a significantly higher chance of a perfect match than assortments of complex products. Therefore, H_{2a} that product complexity decreases the chance of a perfect match was supported.

The chance of a perfect match was not significantly lower for complex products for all assortment sizes. For the two extreme assortment sizes (5 and 65) the mean levels of chance of a perfect match did not differ significantly between assortments of simple and complex products ($t = -0.37$, $p = .711$ for assortment size 5; $t = -1.34$, $p = .183$ for assortment size 65). If the assortment contains only 5 products it is relatively simple to form a judgment on whether the assortment will offer a consumer's perfect product both for simple and for complex products. For

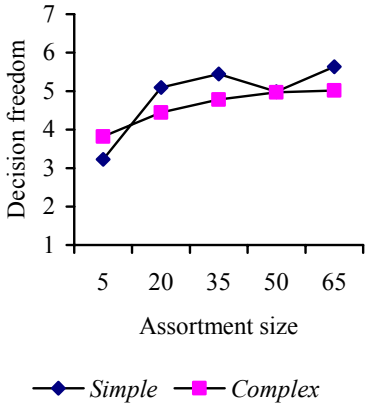
the assortment sizes in between the two extremes it is easier to evaluate the chance of a perfect match for assortments of simple products than for assortments complex products. Consumers are less familiar with the complex products which they buy less frequently. This makes it harder to estimate the probability to find a perfect product. However, if the assortment becomes extremely large consumers will have the feeling that the assortment *must* offer their perfect product whether it is simple or complex, even if they cannot make a clear judgment on this chance. Potentially therefore, mean levels of chance of a perfect match did not differ significantly between assortments of simple and complex products for assortment size 65.

Decision freedom. Feelings of decision freedom increase with the size of an assortment both for assortments of simple and complex products with decreasing marginal return (see Figure 5.6).

Overall, feelings of decision freedom seem to be somewhat lower for more complex products (in line with H_{2b}). The ANOVA analysis showed that the difference in decision freedom across the two types of product complexity was significant ($F(1,590) = 5.87$, $p = .016$). Furthermore, we found a significant impact on decision freedom of assortment size ($F(4,590) = 32.33$, $p < .001$) and of the interaction term between the two variables ($F(4,590) = 4.97$, $p = .001$). Thus, we found support for H_{2b} that product complexity decreases decision freedom.

Only for the smallest assortment size this effect was the other way around, which could explain the significant interaction term. For assortment size 5 feelings of decision freedom were significantly lower for assortments of simple than of complex products ($t = 2.24$, $p = .027$). The reason for this difference is probably that subjects know that an assortment of five jars of jam or bags of potato chips really offers very little freedom to choose. For assortments of five digital cameras or laptops they might be less sure of this lack of freedom and judge their freedom to be higher. For larger assortments of complex products it is harder to evaluate the freedom to choose than for larger assortments of simple products. In brief, the freedom to decide on a complex (versus simple) product is less easy to evaluate since consumers are less familiar with them. As a result, feelings of decision freedom are mostly lower for assortments of complex products if assortment size increases.

Figure 5.6 Decision freedom (means) as a function of assortment size per product complexity



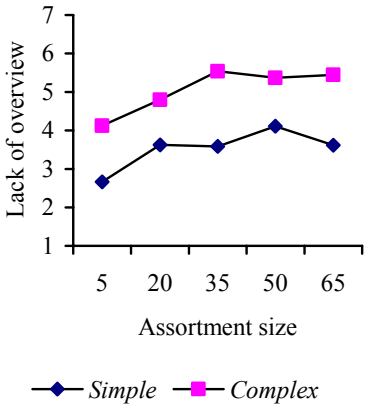
Size	Product complexity: Simple	Product complexity: Complex	*t*-value
5	3.23 (1.35)	3.82 (1.54)	2.24*
20	5.09 (1.14)	4.45 (1.35)	-2.86**
35	5.44 (1.30)	4.78 (1.44)	-2.69**
50	4.98 (1.43)	4.97 (1.33)	-0.06
65	5.63 (1.12)	5.02 (1.55)	-2.48*

NOTE. Standard deviations are given in parentheses.
* $p < .05$, ** $p < .01$.

In short, regarding the two choice benefits of variety (chance of a perfect match and decision freedom), they tend to be lower for assortments of complex products than for assortments of simple products (H_2 was supported). Since consumers are less familiar with complex products and because they have less overview of the assortment, it is harder for them to estimate the chance of finding a perfect product or to assess how free they actually are to choose.

Costs: Information overload~lack of overview. Feelings of a lack of overview as a result of information overload appear to increase with assortment size both for simple and complex products, as can be seen from Figure 5.7. The increase in lack of overview seems to decrease with assortment size.

Figure 5.7 Information overload~lack of overview (means) as a function of assortment size per product complexity



Size	Product complexity: Simple	Product complexity: Complex	*t*-value
5	2.66	4.13	5.30*
	(1.07)	(1.86)	
20	3.63	4.79	4.37*
	(1.37)	(1.58)	
35	3.59	5.54	7.16*
	(1.62)	(1.34)	
50	4.11	5.37	4.40*
	(1.52)	(1.59)	
65	3.62	5.45	6.91*
	(1.45)	(1.43)	

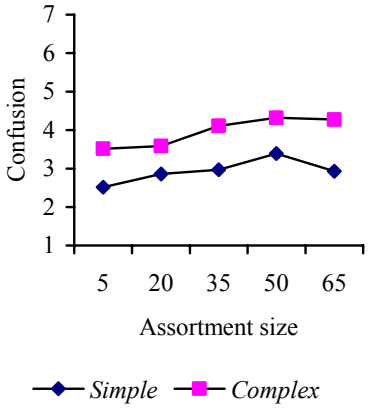
NOTE. Standard deviations are given in parentheses.
* $p < .001$.

Figure 5.7 clearly shows that this cost of variety is higher for assortments of more complex products, as was expected (H_{3a1}). The ANOVA analysis confirmed what we could already see from Figure 5.7. Lack of overview differed significantly between low and high product complexity ($F(1,590) = 157.37$, $p < .001$) and between the different assortment sizes ($F(4,590) = 15.11$, $p < .001$). No interaction between the two variables was present ($F(4,590) = 1.60$, $p = .173$). Thus, H_{3a1} was supported. Consumers experience less overview in an assortment of infrequently bought complex products that can be described on many attributes than in an assortment of simple products.

Information overload~confusion. Figure 5.8 displays mean levels of the other aspect of information overload, namely feelings of confusion. It can be seen that subjects experienced more confusion in larger assortments, but also that these feelings of confusion were higher for assortments of complex (versus simple) products, as was hypothesized (H_{3a2}). The differences in confusion are statistically significant across product complexity ($F(1,590) = 69.82$, $p < .001$) and assortment size ($F(4,590) = 5.73$, $p < .001$). The interaction term between product complexity and assortment size was not significant ($F(4,590) = 0.70$, $p = .589$). Hence, we found support for H_{3a2}. Because consumers are less familiar with complex

products and because these products can be described on many attributes, an assortment with complex products leads to more confusion than an assortment with simple products.

Figure 5.8 Information overload~confusion (means) as a function of assortment size per product complexity

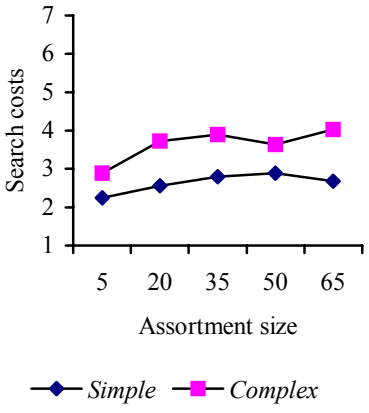


	Product complexity		
Size	Simple	Complex	*t*-value
5	2.52	3.52	3.80**
	(1.25)	(1.61)	
20	2.86	3.59	2.71*
	(1.37)	(1.59)	
35	2.97	4.11	3.87**
	(1.46)	(1.82)	
50	3.39	4.32	3.42*
	(1.45)	(1.50)	
65	2.93	4.28	4.90**
	(1.46)	(1.52)	

NOTE. Standard deviations are given in parentheses.
* $p < .01$, ** $p < .001$.

Search costs. Mean levels of search costs across assortment sizes per level of product complexity are presented in Figure 5.9. Larger assortments require somewhat more mental and physical search costs for a consumer to find the product he/she wants to buy.

Figure 5.9 **Search costs (means) as a function of assortment size per product complexity**



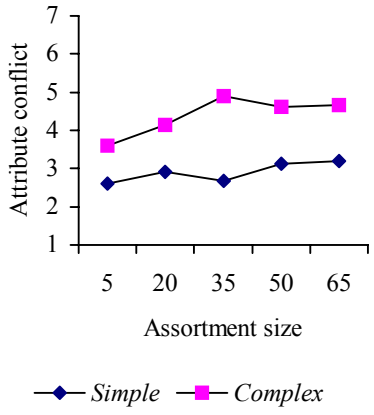
Size	Product complexity: Simple	Product complexity: Complex	*t*-value
5	2.24	2.89	3.13*
	(1.09)	(1.17)	
20	2.55	3.72	5.32**
	(1.04)	(1.38)	
35	2.80	3.90	4.12**
	(1.34)	(1.63)	
50	2.89	3.64	3.00*
	(1.33)	(1.36)	
65	2.68	4.03	5.46**
	(1.33)	(1.35)	

NOTE. Standard deviations are given in parentheses.
* $p < .01$, ** $p < .001$.

We also see that, as expected (H_{3b}), search costs are higher if a consumer chooses a more complex product. The ANOVA demonstrated a significant difference in search costs across product complexity ($F(1,590) = 87.83$, $p < .001$) and assortment size ($F(4,590) = 7.46$, $p < .001$). The interaction term was not significant ($F(4,590) = 1.51$, $p = .198$). Search costs are significantly higher for complex products for all assortment sizes ($p < .01$). H_{3b} was supported. Consumers are less familiar with complex products. Furthermore, there are more attributes to take into account. Therefore, it takes more mental effort to make a final choice. Also, because of the much higher number of attributes, it takes more physical effort to locate the preferred product.

Attribute conflict. Figure 5.10 displays mean values of attribute conflict, which seem to increase with assortment size. It becomes relatively harder to make a trade-off between all relevant attributes in larger assortments, regardless the level of complexity of the products in the assortment.

Figure 5.10 Attribute conflict (means) as a function of assortment size per product complexity



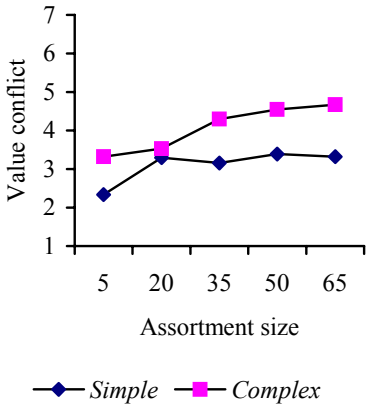
	Product complexity		
Size	Simple	Complex	*t*-value
5	2.60	3.61	4.13*
	(1.15)	(1.50)	
20	2.91	4.14	5.01*
	(1.19)	(1.52)	
35	2.67	4.91	8.59*
	(1.30)	(1.59)	
50	3.13	4.61	5.40*
	(1.45)	(1.53)	
65	3.20	4.66	5.31*
	(1.41)	(1.56)	

NOTE. Standard deviations are given in parentheses.
* $p < .001$.

Furthermore, as conjectured (H_{3c}), conflict because the attributes have to be traded-off against each other is higher in assortments of complex products. The ANOVA demonstrated that mean levels of attribute conflict significantly differed across product complexity ($F(1,590) = 162.67$, $p < .001$) and assortment size ($F(4,590) = 6.73$, $p < .001$). In addition, the interaction term was also significant ($F(4,590) = 3.19$, $p = .013$). Attribute conflict was significantly higher for complex products for all assortment sizes separately ($p < .001$). Hence, we found support for H_{3c}. It is harder to trade-off the attributes in assortments of complex products than in assortments of simple products, since complex products generally have more attributes. The difference in attribute conflict between assortments of simple and complex products even appears to increase with assortment size. For larger assortments of complex products compared to simple products it is relatively harder to make a trade-off between the attributes than in smaller assortments. The number of attributes that a consumer feels he/she needs to consider seems to explode for very large assortments, resulting in relatively higher attribute conflict. This could explain the significant interaction term between product complexity and assortment size.

Value conflict. Figure 5.11 shows us that it becomes harder to choose from larger assortments of complex products since there are equally valued alternatives present in the assortment. Value conflict increases with assortment size for complex products. In assortments of simple products, value conflict is lower for assortment size 5, but it does not differ much between larger assortment sizes. Apparently, for simple products it is not harder to choose if there are more equally valued products in larger assortments. A wrong choice can be easily overcome on the next shopping trip.

Figure 5.11 Value conflict (means) as a function of assortment size per product complexity



	Product complexity		
Size	Simple	Complex	*t*-value
5	2.34	3.32	3.28*
	(1.51)	(1.74)	
20	3.30	3.53	0.88
	(1.29)	(1.69)	
35	3.16	4.30	4.01**
	(1.37)	(1.80)	
50	3.39	4.55	4.37**
	(1.45)	(1.42)	
65	3.32	4.67	5.21**
	(1.31)	(1.51)	

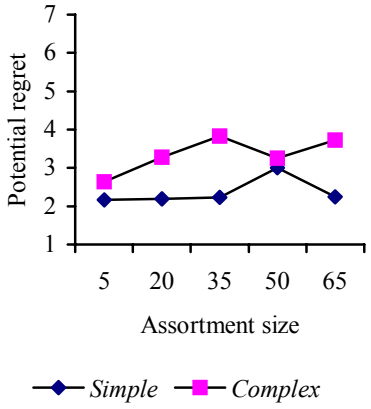
NOTE. Standard deviations are given in parentheses.
* $p < .01$, ** $p < .001$.

For all but one of the assortment sizes, value conflict was significantly ($p < .01$) higher for more complex products, as was hypothesized (H_{3d}). ANOVA results display that value conflict differs significantly across the two levels of product complexity ($F(1,590) = 62.12$, $p < .001$) and across assortment sizes ($F(4,590) = 12.10$, $p < .001$). Furthermore, the interaction term was also significant ($F(4,590) = 2.48$, $p = .043$). H_{3d} was supported. Product complexity directly increases value conflict. It is harder to choose between equally valued alternatives if these alternatives are more complex in nature, as was conjectured. The reason is that these products are more expensive and less frequently bought.

The choice becomes even harder in larger assortments if a consumer is confronted with equally valued complex products as the significant interaction term between product complexity and assortment size appears to imply. In larger assortments, the number of equally attractive products generally increases. Consumers may have the feeling that there *must* be multiple attractive products in such large assortments, which makes the task even more difficult.

Potential regret. Mean values of potential regret across assortment sizes for simple and complex products are shown in Figure 5.12. For simple products, feelings of potential regret are low and save a small peak at assortment size 50, they do not seem to differ between assortment sizes. For complex products, an initial increase in potential regret with assortment size can be seen. However, mean levels of potential regret do not rise with assortment size for larger assortments.

Figure 5.12 Potential regret (means) as a function of assortment size per product complexity



Size	Product complexity: Simple	Product complexity: Complex	*t*-value
5	2.16 (1.26)	2.63 (1.16)	2.12*
20	2.20 (1.22)	3.28 (1.47)	4.46**
35	2.23 (1.24)	3.82 (1.73)	5.99**
50	3.00 (1.32)	3.26 (1.45)	1.01
65	2.25 (1.26)	3.72 (1.78)	5.20**

NOTE. Standard deviations are given in parentheses.
* $p < .05$, ** $p < .001$.

What can be demonstrated from Figure 5.12 is that feelings of potential regret are somewhat higher for assortments of complex products than for assortments of simple products, as was expected (H_{3e}). The results of the ANOVA showed a significant impact of product complexity ($F(1,590) = 73.07$, $p < .001$),

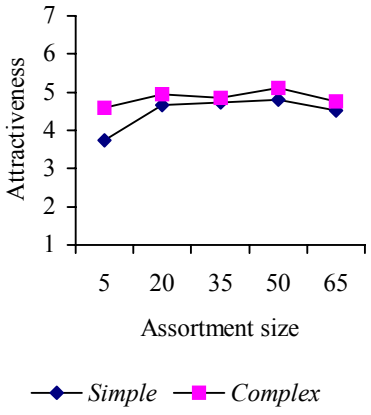
assortment size ($F(4,590) = 5.21$, $p < .001$), and the interaction term between the two variables ($F(4,590) = 5.38$, $p < .001$). Thus, H_{3e} was supported. The effect of product complexity on potential regret was significant for all assortment sizes ($p < .05$), except for assortment size 50 ($p = .317$). Complex products are generally more expensive than simple product and they are used for a longer period of time. Making the wrong choice cannot be easily overcome. Consumers are more likely to consider products they will not choose if their purchase involves a lot of money. Hence, the potential for regret is higher for more complex products.

The significant interaction term cannot be easily interpreted, since Figure 5.12 does not show a clear pattern in the combined relationship of product complexity and assortment size. We can conclude, however, that more expensive complex products entail higher feelings of potential regret. Consumers are more afraid that they will make the wrong choice buying a complex product than buying a simple product.

In brief, as was conjectured in H_3, indeed all costs of variety were significantly higher for assortments of complex products than for assortments of simple products. Because complex products are generally more expensive and infrequently bought, because they are described on more attributes, and since consumers are less familiar with these types of products, choosing a complex product entails more costs of variety than choosing a simple product. This difference in costs of variety even seems to increase with the size of the assortment for attribute conflict and value conflict. The conflict of trading-off attributes and because several products are equally attractive becomes relatively stronger in larger assortments.

Assortment attractiveness. The overall relationship between the size of an assortment of simple products and how attractive this assortment is from a consumer viewpoint tends to show an inverted U-shape. This was empirically demonstrated in the previous chapter. Figure 5.13 presents mean levels of assortment attractiveness for assortments of simple and complex products. For complex products assortment attractiveness does not clearly seem to increase and/or decrease with assortment size. Subjects considered both smaller and larger assortments of complex products to be about equally attractive. More details on the relationship between assortment size and the attractiveness of assortments of complex products are provided in Subsection 5.4.4.

Figure 5.13 Assortment attractiveness (means) as a function of assortment size per product complexity



Size	Product complexity: Simple	Product complexity: Complex	*t*-value
5	3.73	4.60	4.14*
	(1.19)	(1.06)	
20	4.65	4.94	1.44
	(0.92)	(1.26)	
35	4.74	4.86	0.51
	(1.20)	(1.33)	
50	4.81	5.11	1.64
	(1.08)	(0.93)	
65	4.52	4.76	1.04
	(1.14)	(1.32)	

NOTE. Standard deviations are given in parentheses.
* $p < .001$.

Earlier in the current subsection, we demonstrated that the choice benefits were lower and the costs of variety were substantially higher for complex (versus) simple products. One could expect that the lower choice benefits and the higher costs would result in a lower level of assortment attractiveness for each assortment size. However, assortment attractiveness was actually somewhat higher for assortments of complex products. This difference was significant. ANOVA results demonstrated that the attractiveness differed significantly across product complexity ($F(1,590) = 14.69$, $p < .001$) and assortment size ($F(4,590) = 8.36$, $p < .001$). The interaction term between product complexity and assortment size was not significant ($F(4,590) = 1.89$, $p = .110$). However, the significant difference in assortment attractiveness between simple and complex products was mainly due to a significantly higher attractiveness of assortment size 5 ($p < .001$). For the other assortment sizes, assortment attractiveness was higher for complex products but did not differ significantly between simple and complex products. It is surprising that the lower choice benefits and the higher costs of variety for complex products did not result in a lower level of assortment attractiveness.

In additional analyses, it was shown that the relatively high level of assortment attractiveness for complex products results from the higher levels of

product involvement that these products entail. Generally, consumers are more involved with more complex products. If product involvement was included as a covariate in the previous ANOVA analysis, the significantly positive effect of product complexity on assortment attractiveness disappeared ($F(1,589) = 0.34$, $p = .558$), while the effect of product involvement was highly significant ($F(1,589) = 46.31$, $p < .001$). Further, there was a significant effect of assortment size ($F(4,589) = 7.17$, $p < .001$), but no significant effect of the interaction term between product complexity and assortment size ($F(4,589) = 1.81$, $p = .125$). Thus, involvement with the product category is an important factor in consumer evaluations of assortments. Subjects are more involved with and attracted to more complex products. It is important to note here that the significant differences of the choice benefits and costs of variety across product complexity did not disappear if product involvement was included in the analyses.

Summary. In this subsection, we examined how product complexity has a direct impact on perceptions of variety, the benefits and costs of variety, and the attractiveness of an assortment, across assortment sizes. It was shown that consumers do not perceive different levels of variety between assortments of simple and complex products. At the same time, we found that the choice benefits are lower in an assortment of complex (versus simple) products since consumers are less familiar with these products and experience less overview. Moreover, for the same reason and because complex products are evaluated on more attributes, all costs of variety were substantially higher for more complex products. The lower choice benefits and the higher costs of variety do not lead to lower attractiveness levels. Assortment attractiveness even seems to be higher for assortments of complex (versus simple) products, which could be explained by the higher level of involvement that complex products entail. In order to get more insights into the effects of the benefits and costs of variety on the attractiveness of an assortment of complex products, a structural equation model was built, which is discussed in the following subsection.

5.4.2 Structural model evaluation

We translated the main research framework to a structural equations model in the same way as was done in Chapter 4. The only difference is that now no variety-seeking benefits are included. The choice benefits were allowed to covary and so were all the costs. Fit indices for the structural model (model 1) are given in Table

5.7. Although the Satorra-Bentler (SB) scaled chi-square of the structural model was significant ($SB\chi^2(101) = 134.21$, $p = .015$), overall, the model showed good fit (RMSEA = .034, NNFI = .97, CFI = .98). The model accounted for 30% of the variance in assortment attractiveness.

Table 5.7 Comparison of original versus modified structural model (digital cameras and laptops, pooled)

Model	df	χ^2	Satorra-Bentler χ^2	*p*-value	RMSEA	NNFI	CFI
1. Original model	101	150.88	134.21	.015	.034	.97	.98
2. Model 1 + path from *ln*(size) to information overload~lack of overview	100	140.67	125.16	.045	.030	.97	.98

NOTE. Model 2 is identical to the final model used in Chapter 4, except for the fact that the variety-seeking benefits are not included.

Modification indices for this structural model were investigated to see whether it could be improved. We examined theoretically justifiable modification indices. The highest modification index (MI) that was also justifiable suggested the addition of a direct path from *ln*(size) to information overload~lack of overview (MI = 12.06). The same path had been suggested and added in the previous chapter for the assortments of jam and potato chips.

We again added this path from *ln*(size) to information overload~lack of overview to model 1. In Table 5.7 the fit indices of this modified model are given (model 2). Although SB scaled chi-square was just significant, the fit of this model was good ($SB\chi^2(100) = 125.16$, $p = .045$, RMSEA = .030, NNFI = .97, CFI = .98). The model accounted for approximately 30% of the variance in assortment attractiveness. Model 1 and model 2 were compared applying a chi-squared difference test for the SB scaled chi-square (Satorra and Bentler 2001). The model that included the direct path from *ln*(size) to information overload~lack of overview (model 2) performed significantly better than model 1 ($\Delta SB\chi^2(1) = 8.86$, $p < .01$). Modification indices for model 2 were also inspected, but no theoretically justifiable modification indices larger than 3.84 were present[4]. In the following

[4] We found an MI of 5.13 for a direct path between perceived variety and assortment attractiveness. Analyses for the two product categories separately revealed no significant MI's for this path for digital cameras (MI = 0.06) nor for laptops (MI = 3.72). Thus, we

subsection, model 2, which was identical to the one used in Chapter 4 except for the absence of the variety-seeking benefits, will be used to compare its paths with those found for assortments of simple products. Model 2 allows us to determine whether the same effects of assortment variety are present for assortments of complex as for assortments of simple products[5].

However, the strengths of the paths of model 2 cannot be compared statistically to those found for simple products. We are not allowed to perform a multiple-group analysis, since the number of variables differs between both groups: the variety-seeking benefits were not measured for complex products. These data were missing, but not at random, which is a prerequisite for a multiple-group analysis with missing data (Kline 1998). To be able to test for the differences in strengths of paths in a more formal way, we constructed a multiple-group structural equation model that did not include the variety-seeking benefits. The two groups consisted of complex products (digital cameras and laptops, pooled) and simple products (jam and potato chips, pooled). The structural model was identical to model 2 presented above.

Before estimating the multiple-group structural equation model, configural and metric invariance between complex and simple products were tested (Steenkamp and Baumgartner 1998). Scalar invariance is not required since we focus on the validation of a structural model across groups: no absolute comparisons of scores are made. Configural invariance was supported since the fit of this model[6] was very good ($\chi^2(179) = 204.82$, $p = .090$, RMSEA = .022, NNFI = .99, CFI = .99). Full metric invariance was tested by constraining the factor

decided not to include this additional path. Furthermore, an MI of 5.60 was present for a direct path from *ln*(size) to potential regret. No significant MI's were found when we analyzed the two product categories separately (MI = 3.75 for digital cameras, MI = 0.18 for laptops). We did not include this additional path.

[5] We also performed a multiple-group analysis for the structural model with all beta's and gamma's constrained across groups (digital cameras and laptops) to investigate which relationships differed significantly across the two groups. Compared to the structural model on the pooled data, this resulted in a slightly worse fit, but few differences in the strengths of paths. The MI's also indicated a direct path from *ln*(size) to information overload~lack of overview. The MI's of the model including this path suggested freeing the paths from *ln*(size) to perceived variety and from chance of a perfect match to assortment attractiveness across groups. However, we do not have theoretical reasons to assume that these paths differ between digital cameras and laptops.

[6] The error variance of the second item of potential regret was set equal to 0 for complex products as this value was slightly negative in the initial run of the model. This did not produce a significant change in any of the fit statistics (Ployhart, et al. 2003).

loadings to be invariant across groups. The fit of this model was still very good ($\chi^2(185) = 218.66$, $p = .046$, RMSEA = .025, NNFI = .99, CFI = .99). However, there was a significant decrease in chi-square between the model of configural and the model of full metric invariance ($\Delta\chi^2(6) = 13.84$, $p = .032$). Examination of the modification indices revealed that the significant increase in chi-square was due to a lack of invariance of two loadings that clearly stood out. The expected change statistics indicated that the factor loadings of the first item of potential regret and the third item of assortment attractiveness were lower for complex than for simple products. The MIs for these loadings were 7.33 and 6.02 respectively for simple products and 7.33 and 5.95 for complex products. Full metric invariance was not supported.

Partial metric invariance was then tested by sequentially relaxing the constraints on these two parameters. The fit of the final partial model was very good ($\chi^2(183) = 208.35$, $p = .096$, RMSEA = .022, NNFI = .99, CFI = .99). The fit of this model was not significantly worse than the fit of the configural invariance model ($\Delta\chi^2(4) = 3.53$, $p = .473$). Thus, partial metric invariance was supported. This partial invariant model is the basis for our multiple-group structural model with all structural paths constrained across groups (model 3). Though chi-square was significant, the fit of this structural model was good ($\chi^2(231) = 317.29$, $p = .0001$, RMSEA = .035, NNFI = .98, CFI = .98). Note that in order to test for equal paths between groups, for each construct at least two items need to have invariant factor loadings. This was the case for assortment attractiveness (three-item measure), but not for potential regret (two-item measure). As a result, we are not allowed to test for differences in strengths of paths to and from potential regret.

In the subsequent analyses we will use model 2 to investigate whether the paths from assortment variety to assortment attractiveness are similar between assortments of simple and complex products. Model 3 will be employed to get an indication on the extent to which the strengths of these paths differ.

5.4.3 Results of testing the research framework

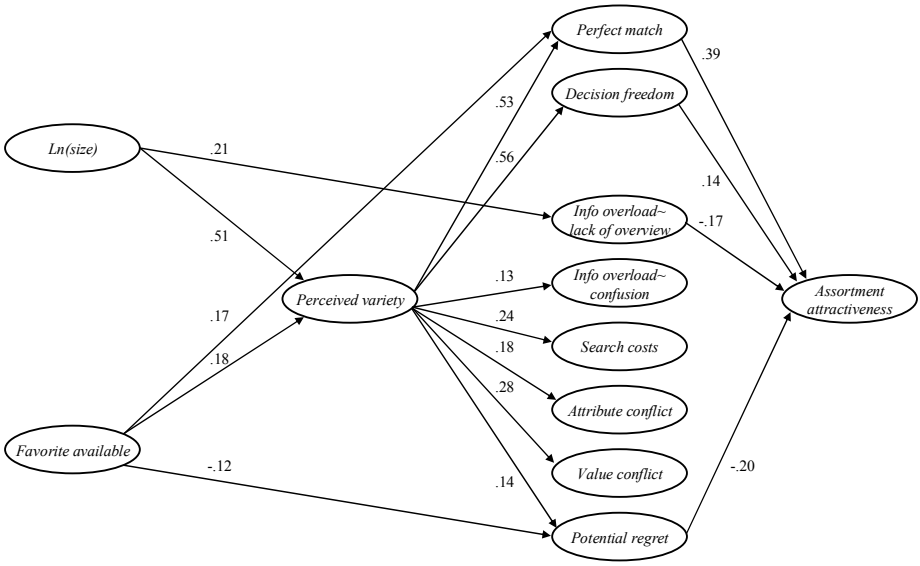
In this subsection, we examine the effects of product complexity on the underlying process of the relationship between assortment variety and assortment attractiveness. We investigate similarities and dissimilarities in results on the research framework between assortments of simple and complex products. Our main suggestions were that for complex products (1) the impact of the choice

benefits and the costs of variety on assortment attractiveness would be higher, and that (2) the availability of a favorite product would directly lower the costs of variety.

Results of the structural equation model for assortments of complex products (model 2) are reflected in Figure 5.14. This figure presents the empirical results with the significant paths only ($p < .05$). The full results of the structural equation model are given in Appendix 5.F. We compare Figure 5.14 with Figure 5.15 that shows the results for assortments of simple products. Figure 5.15 was repeated from Chapter 4 (Figure 4.3). We compare paths and strengths of paths. Afterwards we test whether perceived variety and the benefits and costs of variety mediate the overall relationship between assortment size and assortment attractiveness for complex products, as they did for simple products.

Paths. Essentially, the path model for complex products (Figure 5.14) is very similar to the path model for simple products (Figure 5.15). The results on the research framework are very similar in structure and in the size of the relationships across assortments of complex and simple products. This confirms our findings on the underlying process of the relationship between assortment variety and assortment attractiveness found for assortments of simple products. It is crucial to see that although in assortments of complex products all costs of variety were higher, still only two of these costs negatively influenced assortment attractiveness, namely lack of overview and potential regret. The other costs of variety, although present, did not have a significantly negative impact on assortment attractiveness.

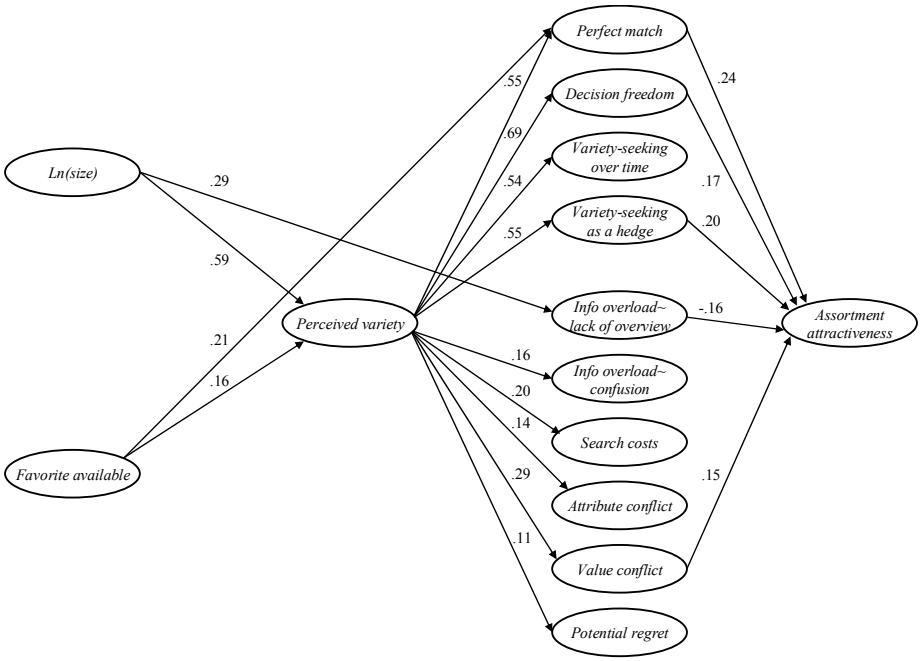
Figure 5.14 Path model for complex products (digital cameras and laptops, pooled) with significant paths only



NOTES. $N = 288$. Significant standardized coefficients ($p < .05$) are shown only.

The most important difference between the two figures is the role of potential regret. First, there was a direct path from favorite available to potential regret for assortments of complex products. Whereas there also was an indirect positive effect of favorite available on potential regret through consumer perceptions of variety for both types of assortments, an additional direct negative effect was found for assortments of complex products. Subjects directly anticipated lower regret of not having chosen another product if their favorite product was present in the assortment. For assortments of complex products, the positive effect through perceived variety and the direct negative effect resulted in a total standardized effect of -.10. Thus, offering favorite products lowered the potential for regret. The direct negative effect was not demonstrated for simple products. Second, potential regret had a significantly negative impact on assortment attractiveness for complex products. If a subject anticipated more regret he/she evaluated the assortment as being less attractive. Again, this negative effect was not found for assortments of simple products.

Figure 5.15 Path model for simple products (jam and potato chips, pooled) with significant paths only



NOTES. $N = 312$. Significant standardized coefficients ($p < .05$) are shown only.
Repeated Figure 4.3.

Other differences in the presence of significant paths between assortments of simple and complex products were that for complex products (1) variety-seeking benefits were not relevant, and, hence, not included, and that (2) there was no (unexpected) positive effect of value conflict on assortment attractiveness. In assortments of simple products we argued that the positive effect of value conflict could be the result of the ambiguousness of the measurement (see Subsection 4.3.3). In assortments of complex products this measurement was not problematic. Also note that, contrary to our expectations, the availability of a favorite product did not directly significantly lower all costs of variety in assortments of complex products, but only the potential for regret. Apparently, a favorite product does not make the choice from an assortment of complex products a much easier task.

Concluding, the relationship between assortment variety and assortment attractiveness can chiefly be explained by the same underlying process for assortments of complex products as for assortments of simple products. Although all costs of variety increased as a function of product complexity, only lack of overview and potential regret had a negative impact on assortment attractiveness. The negative impact of potential regret, which is important in assortments of complex products, had not been present in assortments of simple products.

S*trengths of paths.* Regarding the strength of the paths in the research framework, we observe the following. Most significant standardized coefficients did not differ much between assortments of complex (Figure 5.14) and simple (Figure 5.15) products. Thus, most relationships between the variables of the research framework tend to be stable across different levels of product complexity.

However, the overall impact of *ln*(size) and favorite availability on assortment attractiveness differed between assortments of simple and complex products. First, the total effect of *ln*(size) on assortment attractiveness was stronger in assortments of simple products (total effect = .23) than in assortments of complex products (total effect = .10). This difference was significant ($p < .05$)[7]. The next section gives more details on the overall relationship between assortment size and assortment attractiveness.

Second, for assortments of complex products the availability of a favorite product (total effect = .14) appeared to have a stronger overall influence on assortment attractiveness than for assortments of simple products (total effect = .11). This difference was significant ($p < .05$)[8]. This means that offering favorite products has a higher positive impact on the attractiveness of an assortment of complex products than on the attractiveness of an assortment of simple products. Since choosing a more complex product is generally more consequential and more difficult, consumers appreciate it more if their favorite product is offered.

[7] Based on the 95% confidence interval (CI) on the *un*standardized total effects (CI = 0.275 - 0.286 for simple products; CI = 0.115 - 0.125 for complex products). We computed the CI's for the unstandardized effects, not on the standardized effects which would require noncentral *t* distributions (Cumming and Finch 2001).

[8] Based on the 95% CI interval on the *un*standardized total effects (CI = 0.485 – 0.515 for complex products; CI = 0.416 – 0.444 for simple products).

Next to these overall differences in effects, three[9] somewhat larger differences in strengths of paths can be detected by comparing Figure 5.14 with Figure 5.15. First, the direct effects of *ln*(size) appeared to be stronger for assortments of simple than of complex products. The impact of *ln*(size) on perceived variety was higher for simple products (β = .59, t = 10.62) than for complex products (β = .51, t = 8.21). In addition, the effect of *ln*(size) on information overload~lack of overview was also stronger for simple products (β = .29, t = 4.58) than for complex products (β = .21, t = 3.49). To check whether these differences are significant we inspected the results of the multiple-group model in which the two groups constitute of simple and complex products (model 3). Modification indices were examined to detect potential significant differences between the two groups for the effects of *ln*(size). Modification indices indicated that the model could be significantly ($p < .05$) improved by freeing the impact of *ln*(size) on perceived variety between groups (β = .55, MI = 4.67 for simple products, MI = 4.57 for complex products). Thus, the mere number of products seems to increase perceptions of variety to a larger extent in assortments of simpler products. The effect of *ln*(size) on information overload~lack of overview did not differ significantly between groups (β = .25, MI = 0.07 for both simple and complex products). The impact of the size of an assortment on information overload~lack of overview appears to be robust across product complexity.

Second, the path from perceived variety to decision freedom in assortments of complex products (β = .56, t = 9.67) was less strong than the one found for simple products (β = .69, t = 14.55). However, the modification indices of the multiple-group model did not indicate a significant ($p < .05$) model improvement by relaxing the constraint of equal betas (β = .63, MI = 2.37 for simple and for complex products). Thus, the different impact of perceived variety on decision freedom can that can be seen from Figures 5.14 and 5.15 was not significant. The effect appears to be robust across product complexity.

Third, for complex products the impact of chance of a perfect match on assortment attractiveness (β = .39, t = 5.93) was higher than for simple products (β = .24, t = 3.77). This is an indication that the chance of a perfect match is more important when a more critical choice has to be made. Modification indices of the multiple-group structural equation model did not reveal a significant ($p < .05$)

[9] We only discuss these three somewhat larger differences. The other strengths of paths did not seem to differ significantly as modification indices of the multiple-group model (model 3) indicated ($p < .05$).

difference across groups (β = .35, MI = 0.33 for simple products, MI = 0.29 for complex products). However, in our multiple-group model the variety-seeking benefits were not included making it harder to statistically compare the differences in impact of the chance of a perfect match. For simple products, part of the effect of chance of a perfect match might have been picked up by the benefit hedge against uncertainty. Variety-seeking as a hedge against uncertainty implies that the assortment carries 'multiple perfect matches'. This could explain the lower effect of chance of a perfect match on assortment attractiveness for simple products.

In brief, most strengths of paths did not differ between assortments of simple and complex products. One exception is that we found a stronger effect of *ln*(size) on perceptions of variety for simple products than for complex products. Further, recall that we suggested a stronger impact of the choice benefits and the costs of variety on the attractiveness of assortments of complex products. This was only found for the impact of potential regret and tentatively for the effect of the chance of a perfect match. Finally, overall, the availability of favorite products is more important for complex products, while the size of an assortment is more critical for simple products.

Mediation. The overall relationship between variety in an assortment of simple products and assortment attractiveness was found to be fully mediated by perceived variety and the benefits and costs of variety in Chapter 4. This finding was confirmed for assortments of complex products. It was tested by comparing the standardized total effects of *ln*(size) and favorite available on assortment attractiveness of model 2 with their standardized indirect effects. The total effect (both direct and indirect) as well as the indirect effect of *ln*(size) on assortment attractiveness were both 0.10 ($p < .01$). Thus, the direct effect was 0. Furthermore, the total effect and the indirect effect of favorite available on assortment attractiveness were both 0.14 ($p < .001$), so that the direct effect was 0 as well. Hence, full mediation was supported. The relationship between assortment variety and the attractiveness of both assortments of simple and assortments of complex products is mediated by perceptions of variety, benefits and costs of variety.

To summarize, we demonstrated that product complexity leads to lower choice benefits and higher costs of variety. Almost none of these lower benefits and higher costs had a stronger impact on the attractiveness of an assortment. Two

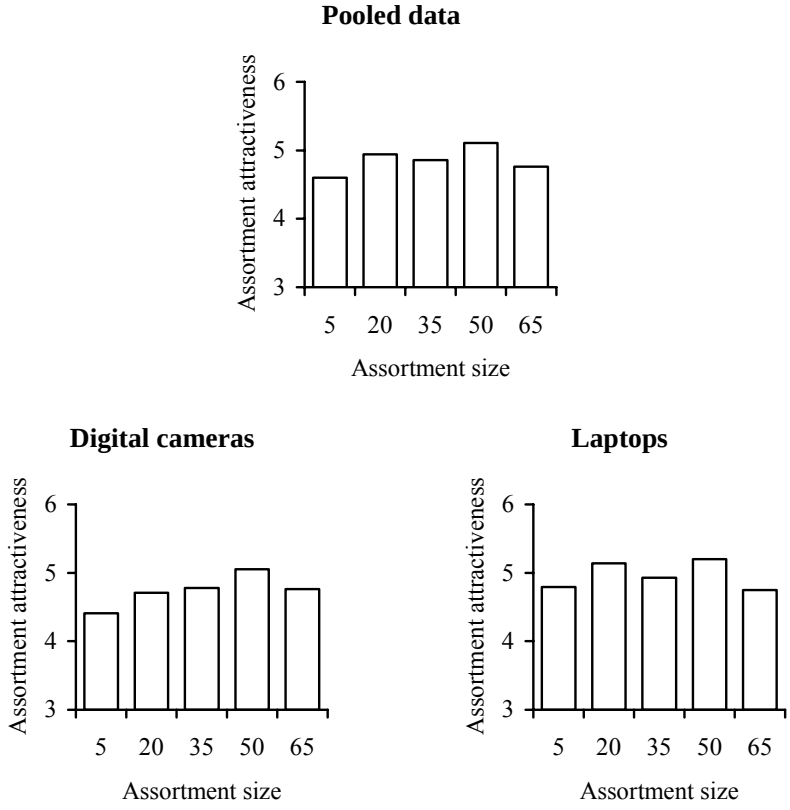
exceptions are the significant influence of potential regret, which makes an assortment of complex products less attractive and the significant impact of chance of a perfect match which seems to be more important for complex products. We also showed that the overall impact of favorite available is stronger for complex products, while the effect of assortment size on assortment attractiveness is stronger in assortments of simple products. In the next section, we will explore the overall impact of assortment size on assortment attractiveness in more detail.

5.4.4 Results of testing the optimal level of variety

In Subsection 5.4.1, we already provided some insights into the relationship between assortment size and assortment attractiveness (see Figure 5.13). There, we investigated the impact of product complexity on assortment attractiveness across assortment sizes. In the current subsection, we examine whether an optimal level of assortment size exists for complex products, as it tentatively did for simple products.

In Figure 5.16, the relationship between assortment size and assortment attractiveness (measured on a 1-7 scale) is shown for the pooled data of digital cameras and laptops and for both product categories separately. Mean levels of assortment attractiveness are presented. An inverted U-shape is slightly suggested. The mean levels of assortment attractiveness do not appear to differ much between assortment sizes, though the attractiveness of the extreme sized assortments seems to be somewhat lower than the attractiveness of the medium sized assortments.

Figure 5.16 Assortment attractiveness (means) as a function of assortment size (digital cameras and laptops)



In order to test for the presence of an inverted U-shape in a formal way, we estimated a number of alternative regression models: a linear, a semi-logarithmic, and a quadratic model. Assortment size was the independent variable, while assortment attractiveness was the dependent variable. None of the regression models performed well. All R^2_{adj} values and F statistics were low, as can be seen from Table 5.8. More specifically, none of the models was significant. Therefore, we can conclude that the relationship between assortment size and assortment attractiveness for complex products cannot be captured well by a linear, a semi-logarithmic, or a quadratic model. The inverted U-shape that was tentatively found

for assortments of simple products was not demonstrated for assortments of complex products. The attractiveness of an assortment of complex products does not significantly increase and/or decrease with the size of an assortment.

Table 5.8 Regression results of assortment attractiveness as a function of assortment size

		Assortment attractiveness	
Product category	Model	R^2_{adj}	F
Pooled (digital cameras and laptops)	Linear	.0001	1.04
	Semi-logarithmic	.005	2.37
	Quadratic	.008	2.22
Digital cameras	Linear	.008	2.33
	Semi-logarithmic	.015	3.21
	Quadratic	.013	1.94
Laptops	Linear	-.007	0.003
	Semi-logarithmic	-.006	0.16
	Quadratic	-.002	0.87

NOTE. F statistics of the overall models are provided.

We performed additional analyses to get more insights into the relationship between assortment size and assortment attractiveness. Why didn't the higher costs of variety for larger assortments lower assortment attractiveness? A possible explanation could lie in the fact that when consumers are confronted with larger assortments of complex products, they might switch to simpler strategies of choosing and focus on only the most important information by selective information attention (Payne et al. 1993). This way, they might have handled the higher costs of variety. To test this explanation we inspected subjects' strategies for choosing and focusing by looking at the number of products on which subjects had retrieved product characteristics. They could retrieve product characteristics at the start of the experiment and just before they had to choose a product.

Figure 5.17 Number of products inspected as a function of assortment size

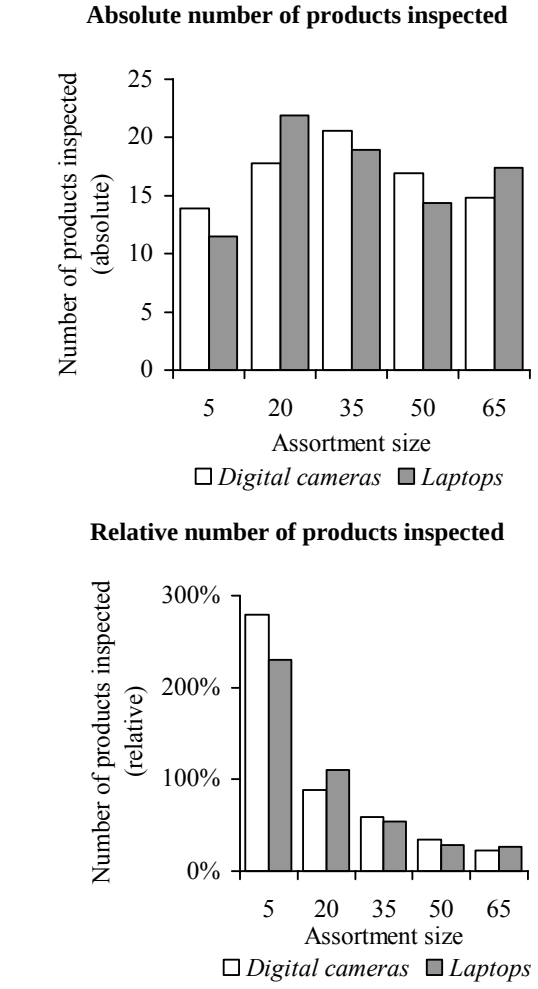


Figure 5.17 displays the number of products on which subjects had retrieved product characteristics as a function of assortment size, per product category. In the upper part, we provide mean levels of the absolute number of products. In the assortments of size 5, the same products were inspected multiple times (i.e., 2.8 times on average for digital cameras, 2.3 times on average for laptops). For both product categories the relationship between assortment size and the absolute number of products examined tends to show an inverted U-shape. In

the lower part of Figure 5.17 we present relative values, i.e., the mean of the absolute number of products inspected divided by assortment size. The relative number of products examined decreases dramatically with assortment size. The part of an assortment that is closely being looked at decreases as the assortment becomes larger.

The absolute number of products on which subjects had retrieved product characteristics differed significantly between assortment sizes, as was checked with an ANOVA on the data pooled across digital cameras and laptops ($F(4,283) = 2.65$, $p = .033$). The absolute number of products inspected was significantly lower in the smallest assortment than in assortment size 20 ($p = .006$) and assortment size 35 ($p = .009$), as was examined with a post-hoc analysis (least-significant difference). Between all other assortment sizes, the mean absolute number of products inspected did not differ significantly. Apparently, after a certain limit subjects were no longer able to process the additional increasing number of products and attributes, which can be explained by the fact that people have only limited conscious processing capacity (Dijksterhuis 2004).

The lower part of Figure 5.17 shows that the relative number of products looked at decreased with assortment size. This relative number of products differed significantly across assortment sizes, as an ANOVA showed ($F(4,283) = 88.72$, $p < .001$). Post-hoc analyses (least-significant difference) revealed that all relative numbers differed significantly ($p < .05$) between assortment sizes, except for assortment size 50, which did not differ significantly from assortment size 35 ($p = .081$) nor from assortment size 65 ($p = .618$). Overall, in larger assortments consumers appear to concentrate on relatively fewer products. This is well-known strategy of consumers to deal with product complexity (Payne et al. 1993). They focus on the most important products and attributes only by being selective in their attention, because they cannot possibly handle all available information.

Concluding, although the costs of variety strongly increase with product complexity, this does not lead to an inverted U-shape for complex products as it seems to do for simple products. Assortment attractiveness does not seem to increase or decrease with assortment size. Apparently, consumers cope with the substantial costs of variety by becoming more selective in their attention in larger assortments. By only paying attention to a limited number of products, they are able to deal with the difficult task of choosing a complex product described on many attributes from a varied assortment. A disadvantage of such selective attention is that it could lead to a suboptimal choice.

5.5 Conclusions

In the previous chapter, we demonstrated that, up to certain limits, consumers consider more varied assortments of simple grocery products to be more attractive. Variety in such assortments hardly brings any costs to them. In the current chapter, we examined to what extent these findings can be generalized to a more difficult decision task, namely choosing a complex product such as a mobile phone, a digital camera, or a dishwasher. The objective of this chapter was to provide insights into the role of product complexity in the relationship between assortment variety and assortment attractiveness. Variety in assortments of complex products will be much harder to handle than variety in assortments of simple products due to the nature of these products. We argued that the higher costs of variety associated with complex products might have a stronger impact on the attractiveness of an assortment, potentially resulting in a lower optimal assortment size level.

First of all, our results reveal that consumers indeed experience substantially higher costs of variety if the decision-making process is more complex. In addition, they see less benefits of variety in an assortment of more complex products. Variety in an assortment of more complex products is thus less rewarding and more difficult. More information has to be processed before a decision can be made. At the same time, the decision itself is more important, due to the generally higher value of the product and the fact that the product will not be replaced for a long time. In sum, compared to simple products, variety in assortments of complex products generates lower benefits for consumers and is also much harder to handle.

Surprisingly, overall, these higher costs of variety do not have a stronger negative impact on assortment attractiveness. Of all costs of variety, only two of them lower the attractiveness of an assortment. These costs are lack of overview and potential regret. Lack of overview is thus a critical cost in assortments of both simple and complex products. This suggests that products should be placed on the shelves in an organized way. Another means of creating more overview, especially in assortments of complex products, would be to reduce the number of attributes on which the products are described. These most important attributes may be detected with market research. Suppliers could take advantage of this finding by developing simpler products, like Apple's iPod.

The other cost of variety that negatively affects assortment attractiveness, i.e., potential regret, seems to be crucial only in assortments of more complex products. When confronted with an assortment of simple products, consumers are not as afraid of purchasing the wrong product. A suboptimal choice can be easily overcome during the next shopping trip. However, in assortments of complex products the regret of buying the wrong product that consumers anticipate is much more relevant. Since the decision regarding a complex product has long-term consequences, the risk of picking a wrong product is significant. Thus, when consumers anticipate regret, this has a negative impact on assortment attractiveness. Feelings of potential regret can for instance be reduced by offering smaller assortments or by providing favorite products in an assortment. We found that consumers are less afraid of making the wrong choice if they spot their favorite product.

Contrary to our expectations, the other high information and choice costs of variety do not have a negative impact on assortment attractiveness. We had argued that because the choice of a complex product is such an important one, consumers would not want to be hindered by high confusion, search costs, attribute conflict, and value conflict. However, consumers apparently accept these high costs. We speculate that because the choice is so consequential, they are motivated to invest more effort, which makes for instance high search costs less of a problem. Furthermore, consumers are able to deal with the high costs, as we will explain later on. At the same time, if consumers lose their overview of an assortment or if they fear they might be purchasing the wrong product, this does have a key impact on how attractive they think an assortment is. Identifying the crucial impact of these two costs of variety (lack of overview and potential regret) is an essential contribution to the literature. Previous research had already recognized a number of variety costs for assortments of complex products, such as potential regret (Gourville and Soman 2005). However, we demonstrated which of these different costs actually matter.

Our results reveal that the basic underlying process of the relationship between assortment variety and assortment attractiveness is similar for assortments of simple products as for assortments of complex products. This means that the relationship can be explained by perceptions of variety, benefits of variety, and costs of variety. More specifically, the overall relationship is mediated by these variables. Consumers see more variety in larger assortments, though with decreasing marginal returns. Consumers also perceive more variety in an

assortment if it offers their favorite product. Perceived variety, in turn, leads to the following benefits disregarding the type of assortment concerned: the chance of a perfect match between what you want and what an assortment offers and feelings of decision freedom. Furthermore, perceived variety results in multiple costs: confusion from information overload, search costs, attribute conflict, value conflict, and potential regret. Lack of overview from information overload increases directly as a function of assortment size. Across assortment types, we demonstrated that the benefits chance of a perfect match and decision freedom make an assortment more attractive, while a lack of overview has a downward impact on the attractiveness of an assortment. The most important differences in underlying process between different levels of product complexity are the absence of variety-seeking benefits and the presence of the negative impact of potential regret in assortments of complex products. However, we can conclude that essentially our results on the underlying process of the relationship between assortment variety and assortment attractiveness are robust across assortments of simple and complex products.

The underlying process is assumed to determine the overall relationship between assortment variety and assortment attractiveness. Given the high costs of variety and their relatively low impact, how does variety in assortments of complex products overall affects assortment attractiveness? An optimal level of assortment size as was tentatively found for simple products is not present for complex products. Surprisingly, small assortments of complex products appear to be as attractive to consumers as large assortments. Variety in assortments of complex products brings high costs to consumers. These costs, however, do not become prohibitive in that they actually lower the attractiveness again after a certain level of assortment size. We show that more variety in assortments of complex products does not appear to be more attractive to consumers.

The fact that the attractiveness of an assortment of complex products does not decrease as a result of the high costs of variety can be potentially explained as follows. Firstly, as we speculated above, consumers could be more motivated to invest effort in the choice, because the product is expensive and has to last for a long period of time. Further, though variety is hard to handle when a complex product has to be chosen, consumers appear to cope with these high costs of variety by becoming selective in their attention. Consumers can deal with all the products, attributes, and attribute levels by focusing on only a selection of them. This is a well-known strategy to handle complexity (Payne et al. 1993). We

showed that as the size of an assortment of complex products increases, consumers inspect relatively fewer products. They start attending to the available products in a selective way. Future research could investigate whether consumers actually turn to different decision-making processes when confronted with more variety in assortments of complex products. Note that because consumers are generally unfamiliar with the product category of complex products, selective attention could lead to suboptimal decisions. Therefore, it is relevant for retailers to help consumers in bringing down the assortment to a smaller choice set that contains potential optimal products. Sales persons or shopbots can fulfill an important task in this respect. They could help consumers in defining their shopping goals. Based on these goals consumers could be assisted in quickly bringing down the total assortment of complex products to a smaller set from which the final decision can be made.

Though assortment size does not significantly influence the attractiveness of an assortment of complex products, favorite available does. In assortments of simple products and assortments of complex products, the availability of a favorite product indirectly positively affects the attractiveness of an assortment. Favorite available has a positive impact on perceptions of variety. Perceived variety, in turn, influences the benefits and costs of variety that determine assortment attractiveness. Besides, favorite available also directly influences the chance of a perfect match, while it lowers feelings of potential regret in assortments of complex products. The latter two processes both make an assortment more attractive to consumers. Previous research had already demonstrated the important role of favorite available (e.g., Broniarczyk et al. 1998). However, we show that its role is even more crucial in assortments of more complex products. When offering simple products it is important to provide popular products. If a consumer locates his/her favorite product this increases how attractive he/she thinks the assortment is. However, carrying favorite products is even more beneficial for retailers offering complex products since it has a much stronger impact on the attractiveness of an assortment. Consumers are less familiar with complex products. Furthermore, the choice of a complex product is more difficult and more risky. The availability of the product a consumer favors brings clarity in this complex task. This implies that retailers should have accurate insights into what their customers truly want.

6 Shopping for Groceries in Top Gear: On the Combined Effects of Assortment Variety and Time Pressure

6.1 Introduction

Consumers barely undergo costs of variety in assortments of simple grocery products, as we demonstrated in Chapter 4. Only one of these costs, lack of overview, makes such assortments less attractive to consumers. We argued that it is important to investigate the generalizability of these findings to situations that involve a more difficult choice task. Therefore, in the previous chapter, we examined the impact of variety in assortments of complex products. In the current chapter, we focus on another contingency, namely a shopping situation that involves simple groceries but a more difficult decision-making process. The costs of variety are anticipated to be higher if the consumer is confronted with a situation of cognitive load, i.e., with the requirement to process more data per unit of time (Wright 1974). One frequently occurring situation of cognitive load is time pressure, on which phenomenon we focus in this chapter. We examine whether choosing from an assortment of simple groceries offering high variety is still attractive under time pressure. The goal of this chapter is to answer the following research question: What is the role of time pressure in the relationship between assortment variety and assortment attractiveness[1]?

In this chapter, we examine situation-specific task complexity in relation to assortment variety. A shopping situation that can make the buying task more difficult is if the consumer has to deal with higher cognitive load, next to selecting a product. Cognitive load can rise by increasing the total amount of information in the immediate environment such that the consumer becomes distracted (Wright 1974). Examples of such situations are if the consumer has to take care of a crying baby, worry about whether there is enough money in the parking meter, or have a social chat with another customer, next to the shopping task. Cognitive load can also increase if the data have to be processed in less time (Wright 1974). Thus, time pressure can also make the choice task more complex (Payne et al. 1993). The focus of the current chapter is on time pressure. Time pressure can be expected to influence the way consumers evaluate the attractiveness of an assortment.

What differences do we anticipate in assortment evaluations between low and high feelings of time pressure? Our main conjectures are that time pressure directly lowers the benefits of variety and enlarges the costs of variety in

[1] We would like to express our thanks to Drs. F. Demirag for her insights into this research and for her help in the data collection.

assortments of simple products. Consumers have less time to assess all the benefits variety brings. In addition, they have to process the same amount of information in less time, making the task more demanding. It is interesting to determine which benefits and costs of variety are particularly affected by time pressure. Furthermore, it is important to find out to what extent the lower benefits and higher costs of variety will have an impact on the attractiveness of an assortment. Offering high variety to hurrying consumers might not be a wise strategy if the lower benefits and the higher costs decrease the attractiveness of an assortment.

Previous research has investigated how consumers cope with and react to time pressure when they choose a product from an assortment. Consumers adapt to time pressure by speeding up their visual scanning, filtering the available information, and switching to cognitively less taxing scanning strategies (Pieters and Warlop 1999). Furthermore, time pressure can prevent people from not choosing at all when facing a difficult choice, due to the use of noncompensatory decision rules (Dhar and Nowlis 1999). The studies of Pieters and Warlop (1999) and Dhar and Nowlis (1999) investigated small assortments carrying only two to six products. In real life, consumers are often confronted with much higher levels of assortment variety. Furthermore, these studies focused on how consumers cope with and react to time pressure. They did not examine whether and how time pressure influences the attractiveness of an assortment. Thus, our contribution is that we investigate to what extent a source of situation-specific task complexity, namely time pressure, leads to higher costs of variety in highly varied assortments of simple grocery products and whether these potentially higher costs of variety affect assortment attractiveness.

In the next section, potential effects of time pressure are discussed. Conjectures are built on how time pressure influences the main variables of the research framework. In Section 6.3, the methodology of the laboratory experiment is explained. In the experiment, subjects are confronted with an assortment of potato chips, which they see either under low or under high time pressure. In Section 6.4, the results of the experiment are analyzed. Section 6.5 provides the conclusions of the study.

6.2 Time pressure

Time pressure has been defined as the perceived constriction of time available for the consumer to perform a given task (Iyer 1989). It may increase the level of

arousal and psychological stress (Edland and Svenson 1993). If a consumer is confronted with time pressure on a shopping trip, this can have an impact on the consumer's response. Time pressure will influence the amount of information processing and strategy of information processing needed to perform a task such as choosing a product from an assortment or evaluating an assortment.

In this section, we discuss how time pressure will influence the benefits and costs that variety in an assortment of grocery products brings to consumers. We anticipate that the benefits are lower and that the costs of variety are higher if a consumer experiences time pressure. Similar results had been found for the effects of product complexity in the previous chapter. Our conjectures are discussed in detail below.

Benefits. We conjecture that time pressure will lower all benefits of variety in an assortment of simple products, i.e., the choice benefits and the variety-seeking benefits.

In the previous chapter it was demonstrated that the choice benefits are lower for assortments with more complex products. These choice benefits will also decrease as a result of time pressure. Consumers who are in a hurry have limited time available to scan an assortment. Therefore, under time pressure consumers will use a satisfying rule (Janis and Mann 1977) instead of processing all the information and choosing the most optimal product. They simply do not have time to take all alternatives into account. As a result, it will be harder for them to assess the probability that an assortment offers their perfect match. The benefit of the chance of a perfect match between the consumer's preferences and what is offered is thus expected to be lower under high versus low time pressure.

Furthermore, since they only superficially scan most obvious alternatives due to the little time available (Janis and Mann 1977), consumers have no clear idea how many attractive products the assortment has to offer. They can no more inspect all available products. Because they necessarily have to be more selective in their attention (Dhar and Nowlis 1999), their feelings of decision freedom will be based on fewer products. Furthermore, they will feel less free to choose, simply because they have to make a choice quickly. They are forced to hurry and as such are less free to select the most preferred option. As a result, feelings of decision freedom will also go down under higher time pressure.

In addition, time pressure will place more focus on the current shopping trip and will make potential needs for variety in the future less salient. Thus, the benefit of variety-seeking over time will decrease with time pressure. Also,

consumers who quickly need to select a product will not care so much if the assortment offers the possibility to select multiple attractive products. The possibility to choose a variety of different products now in order to postpone the final decision to the future will not be important. Instead, one satisfying option has to be chosen quickly. Therefore, the benefit of variety-seeking as a hedge against uncertainty will also be lower in a situation of higher time pressure. In brief, we hypothesize:

H_1: An increase in time pressure will decrease: (a) the chance of a perfect match, (b) decision freedom, (c) variety-seeking over time, and (d) variety-seeking as a hedge against uncertainty.

Costs. We conjecture that all costs of variety will be higher when consumers experience time pressure.

First, since under high time pressure consumers have to process the same amount of information in a shorter time frame, feelings of information overload can be expected to be higher. Consumers have to speed up their information collection and processing (Pieters and Warlop 1999), making the task more demanding. They will lose overview, because they have to search the assortment quickly for an acceptable alternative. Time pressure also directly induces feelings of stress (Edland and Svenson 1993). Consumers will more easily feel overwhelmed by all the available information if they have to make a choice more quickly. This can result in confusion. Thus, lack of overview and confusion from information overload are expected to increase with feelings of time pressure.

Search costs will also increase as a function of time pressure. Acceleration of information processing under time pressure (Pieters and Warlop 1999) takes more mental and physical effort to locate the preferred product. Looking for a preferred product in a varied assortment will be harder if the choice has to be made more quickly. Thus, searching will become more difficult. Hence, higher time pressure will lead to higher search costs.

As to attribute conflict we also expect that due to the acceleration of information processing under time pressure (Pieters and Warlop 1999), trading-off all the information will be more difficult. The consumer cannot easily compare and trade-off the attributes any more. Therefore, we propose that for an increase in time pressure attribute conflict will increase.

With respect to value conflict and potential regret we also expect that they will be higher for higher time pressure. Consumers who are under high time pressure superficially scan most obvious alternatives (Janis and Mann 1977). They have no time to inspect all products thoroughly. Under high time pressure consumers can potentially distinguish less easily between an attractive and a slightly less attractive product. It is harder to recognize the exact differences between the products. Thus, under time pressure products might appear to be closer in attractiveness, increasing value conflict. Hence, we propose that value conflict increases with time pressure.

Regarding potential regret, we also hypothesize it to increase with time pressure. Consumers who are under time pressure tend to choose a satisfying product instead of the most optimal product (Janis and Mann 1977). Since they are less likely to choose their perfect match, they have a higher possibility to feel regret about the choice later on. It has indeed been suggested that a tendency towards spontaneous post-decisional regret will occur if a consumer is under time pressure (Janis and Mann 1977). Consumers will anticipate this regret. Therefore, we expect that for higher time pressure potential regret will be higher. In brief, we hypothesize:

H_2: An increase in time pressure will increase: (a1) lack of overview from information overload, (a2) confusion from information overload, (b) search costs, (c) attribute conflict, (d) value conflict, and (e) potential regret.

To sum up, our main conjectures are that an increase in time pressure will lead to a decrease in the benefits of variety and to an increase in the costs of variety. Potentially these lower benefits and higher costs of variety make an assortment less attractive under time pressure.

6.3 Method

6.3.1 Subjects and experimental design

One hundred and fifty-six subjects took part in the laboratory experiment. One outlier was removed from the sample, resulting in a final sample size of 155.

Subjects were mostly students (67% male, 33% female, $N = 153$) ranging in age from 17 to 29 years (*mean* = 21, $N = 151$ with two outliers in age).

Time pressure was manipulated at two different levels. Subjects saw an assortment of 50 bags of potato chips either under low or under high time pressure (a between-subjects design). Assortment size was not manipulated. All subjects were confronted with the same assortment size. We chose not to vary assortment size in addition to time pressure, because we conjecture that the underlying process of the relationship between assortment variety and assortment attractiveness is similar across different levels of task complexity. In the previous chapter the basic underlying process had been demonstrated to be similar across different levels of product complexity, one source of task complexity. No major interaction between assortment size and product complexity had been detected. Thus, we assume that the underlying process is also basically similar across different levels of another source of task complexity, namely time pressure. Hence, we decided not to include a manipulation of assortment size, which conveniently limits the complexity of the experimental design.

We manipulated time pressure at a low and a high level. In the low time pressure condition, the assortment was presented for a maximum duration of 90 seconds, while in the high time pressure condition the assortment was shown for a maximum of 30 seconds. Treatments in time pressure studies usually consist of two levels, in which subjects in the high time pressure condition are given one-half or less of the amount of time of the low time pressure condition (Hwang 1994). A pilot study had shown that in both conditions subjects had sufficient time to inspect the assortment and were able to select a product from the assortment. At the same time there was a significant difference in feelings of time pressure between the two conditions. Subjects were randomly assigned to one of the two time pressure conditions. The number of subjects was 81 in the low time pressure condition and 74 in the high time pressure condition.

To check for a random assignment of subjects across conditions, we inspected for a number of covariates whether they significantly differed between the two conditions. Multiple independent samples *t*-tests showed no significant differences for product involvement, purchase involvement, product expertise,

variety-seeking tendency, and need for cognition[2]. Thus, we found support for a random assignment of subjects across conditions.

6.3.2 Stimuli

The assortment that subjects were confronted with contained 50 different bags of potato chips. The assortment was identical to the one used in Chapter 4. We wanted to investigate the frequently encountered situation of high variety, to see if consumers still care about high variety when they do their shopping under time pressure. Assortment size 50 was chosen. This level lies close to the optimal level of assortment size that we found for potato chips in Chapter 4, namely 49 products. By selecting assortment size 50, we can examine whether such a high optimal level of assortment size is still attractive under time pressure. In addition, it is a realistic assortment size, because this size is actually available in supermarkets, whereas larger assortments are less common.

Most subjects were familiar with buying potato chips. The mean number of bags of potato chips that subjects buy was 59 per year, ranging from 0 to 312 (6 bags per week). One subject never buys potato chips. Subjects were not really involved with potato chips (*mean* = 3.96, measured on a 1-7 scale). We refer to Appendix 6.A for more details on product category specific consumer characteristics.

The mean level of realism of the assortment of potato chips was 5.15 (*SD* = 1.62), measured on a 1-7 scale. The measurement for realism was similar to the one used in Chapter 4. The mean level did not differ significantly from the mean level of realism of the same assortment used in Chapter 4 (*mean* = 5.00, *SD* = 1.72, $N = 28$, $t = -.46$, $p = .646$). The level of realism also did not differ significantly between the two time pressure conditions ($t = 0.74$, $p = .462$).

6.3.3 Procedure

The procedure of the laboratory experiment was similar to the one described in Chapter 4. Subjects answered questions on an assortment of products presented on a computer screen. The current study differed from the experiment with jam and

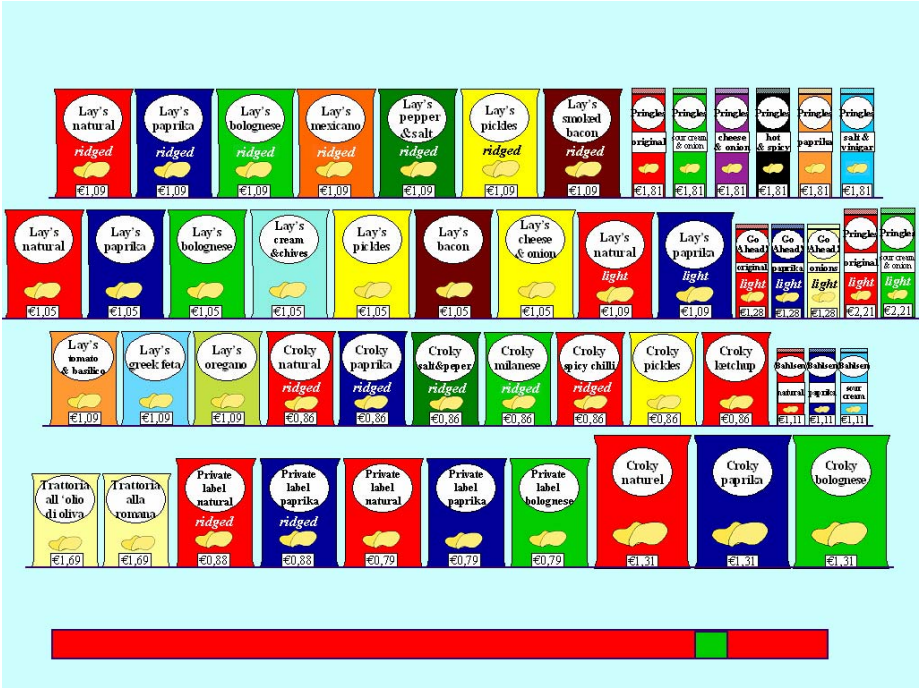
[2] Purchase risk was significantly higher in the high (versus low) time pressure condition. However, this is not due to a difference between the two groups of subjects, but rather to the fact that choosing under high time pressure enhances feelings of risk.

potato chips described in Chapter 4 regarding the following aspects. Time pressure, instead of assortment size, was manipulated. In addition, subjects saw only one assortment instead of two. The assortment offered 50 bags of potato chips for all subjects.

The time pressure condition was created by means of a red bar that was presented below the assortment of potato chips (see Figure 6.1). As long as the assortment was visible a small green square moved from the right to the left part of the red bar. In the low time pressure condition, the square took 90 seconds to reach the left part, while in the high time pressure condition the square moved to the left part in 30 seconds. Thus, subjects could make a judgment on how much time was left to study the assortment. In contrast to the experiment with jam and potato chips where the assortment stayed visible when the questions appeared, in the current experiment this was not the case. The assortment was shown only twice for 90 seconds or twice for 30 seconds. The assortment was visible (1) at the start of the experiment and (2) when subjects had to select a product. Thus, subjects in the low time pressure condition saw the assortment twice for 90 seconds, while subjects in the high time pressure condition saw the assortment twice for 30 seconds.

Next to these differences, the procedure was similar to the one described in Chapter 4. The experiment started with a short instruction in which, similarly to the experiment with jam and potato chips, extra emphasis was placed on the importance of the study with potato chips. After the instruction, the assortment appeared for either 90 or 30 seconds. Next, questions were asked on assortment attractiveness. Then, in random order, questions were posed on perceived variety and the chance of a perfect match. Subjects were then instructed that they would see the assortment again and that they would have to choose a product that closest matched their needs within the given time frame. The time the assortment was then shown was the same as at the beginning of the experiment, except when subjects had selected a product and pressed the ‘continue’-button before the green square had reached the left part of the red bar. Some subjects were not in time to select a product. Two of the 81 subjects (2%) in the low time pressure condition and 6 of the 74 subjects (8%) in the high time pressure condition did not choose a product before the red square had reached the left part of the green bar. Those subjects who had not chosen in time still needed to make a choice in order to continue to the next question.

Figure 6.1 Example of the assortment of potato chips with time pressure manipulation



Next, subjects answered questions on the other benefits of variety and on all costs of variety. All constructs appeared in random order, but grouped by construct. Note that potential regret was not measured if subjects had not been in time to select a product. The reason is that this measure directly referred to the product chosen and that in this case the product had not been chosen within one of the two time pressure conditions.

After the measure of favorite available, a manipulation check for time pressure was included. Next, we measured product involvement, purchase involvement, purchase risk, product expertise, and buying behavior. Finally, variety-seeking tendency, need for cognition, and several demographics were measured. Subjects in the low time pressure condition took 16 minutes on average to complete the experiment (SD = 4, N = 81), while subjects in the high time pressure condition took approximately the same amount of time, namely 15

minutes (*SD* = 3, *N* = 72). At the end, they were debriefed and received a box of potato chips for their participation.

6.3.4 Measures

The measures used in the current experiment were identical to the ones employed in Chapter 4. An overview of the measures of the main variables of the research framework, namely perceived variety, all benefits, all costs, and assortment attractiveness, can be found in Table 4.3 in Chapter 4. Each item was evaluated on a 1-7 scale and was originally stated in Dutch. Cronbach's α's of the multi-item measures were .77 (low time pressure) and .87 (high time pressure) for perceived variety, .81 (low and high time pressure) for search costs, .95 (low time pressure) and .81 (high time pressure) for potential regret, and .88 (low time pressure) and .71 (high time pressure) for assortment attractiveness. All values were above the generally agreed upon lower limit of .70 (Hair et al. 1998).

We checked our manipulation of time pressure with the following three items: *'How much time pressure did you feel when choosing? (1) no time pressure at all – (7) very much time pressure'* (Dhar and Nowlis 1999), *'While choosing I felt I had (1) very little time available – (7) very much time available'* (based on Suri and Monroe 2003), and *'While choosing I (1) did not have to hurry at all – (7) had to hurry a lot'* (based on Dhar and Nowlis 1999). The second item was reversed coded. Cronbach's α for this measure was 0.92. The three items were averaged.

Subjects in the high time pressure condition indicated to feel significantly more time pressure while choosing a product than subjects in the low time pressure condition (*mean* = 4.82 versus 2.08, $t = -13.79$, $p < .001$). This means that the experimental manipulation was successful in creating a difference in felt time pressure.

With the same measures as used in Chapter 4, we measured favorite available and a number of covariates. Cronbach's α's for the covariates were .90 for product involvement, .72 for purchase involvement, .54 for purchase risk, .88 for product expertise, .80 for need for cognition, and .93 for variety-seeking tendency, indicating good reliability except for purchase risk.

6.3.5 Analysis of measurement model

A measurement model was built which was similar to the one developed in Chapter 4. It included the items of all variables of the main research framework except for assortment size, which was replaced by time pressure. The measurement model consisted of items for time pressure, favorite available, perceived variety, all benefits and all costs of variety, and assortment attractiveness.

Time pressure was a dummy variable (0 = low time pressure, 1 = high time pressure). Two variables, favorite available and potential regret, contained missing values. Since SEM is sensitive to missing values (West et al. 1995), we replaced them by mean values. For the missing data of favorite available (N = 8 in the low time pressure condition, N = 16 in the high time pressure condition) we imputed mean values per time pressure condition. The imputed means are presented in Appendix 6.B. The variable potential regret also contained missing values, since this measure had not been asked if subjects had not chosen a product within the given time limits. For these missing values (N = 2 in the low time pressure condition, N = 6 in the high time pressure condition) we also applied a means imputation method per time pressure condition. More details on this procedure are provided in Appendix 6.C.

For the single-item measures λ was set to 1 and θ_δ to 0. For the multi-item measures, we set the first λ equal to 1. The model was estimated with maximum likelihood using LISREL 8.50 (Jöreskog and Sörbom 2000a).

To see whether we were allowed to pool the data across the two time pressure conditions we examined measurement invariance. We tested for invariant variance-covariance matrices first (Steenkamp and Baumgartner 1998), though the sample sizes were small relative to the number of parameters to be estimated. The variance-covariance matrices contained the variances and covariances between all variables mentioned above save time pressure. The fit of the model was acceptable ($\chi^2(190) = 242.22$, $p = .006$, RMSEA = .060, NNFI = .83, CFI = .91). Hence, we decided to pool the data across time pressure conditions. As a result, the total number of observations was 155. In the pooled data set we included the dummy variable time pressure. Because this dummy variable is assumed to reflect an underlying continuous variable we computed polyserial correlations (with LISREL 8.50, Jöreskog and Sörbom 2000a) between this variable and all other variables. The correlation matrix with these polyserial correlations as well as Pearson

correlations between all other variables served as input matrix and is given in Appendix 6.D.

The results of the measurement model are shown in Table 6.1. The fit of the model was acceptable, though chi-square was significant ($\chi^2(89) = 115.02$, $p = .033$, RMSEA = .044, NNFI = .93, CFI = .97). The model was the basis for analyses on convergent validity, reliability, and discriminant validity.

Convergent validity was examined using the factor loadings. Factor loadings were all significant ($p < .01$). R^2 values (inter-item reliabilities) all exceeded .50 (Hildebrandt 1987). Furthermore, factor loadings were greater than twice their standard errors (Anderson and Gerbing 1988). Thus, our measures showed convergent validity.

We investigated reliability on the basis of composite reliability and average variance extracted (Baumgartner and Homburg 1996; Steenkamp and Van Trijp 1991) (see Table 6.1). Composite reliability ranged from .70 to .85 and were equal to or exceeded the suggested threshold of .70 (Nunnally and Bernstein 1994). All average variances extracted were above the recommended cutoff value of 0.50 (Fornell and Larcker 1981a) and ranged from .54 to .74.

Discriminant validity was examined in two ways. First, the average variance extracted exceeded the squared correlations of the multi-item constructs with the other constructs (Fornell and Larcker 1981b). Second, correlations were less than 1 by an amount greater than twice their respective standard errors (Bagozzi and Warshaw 1990). It can be concluded that discriminant validity was established.

Table 6.1 Results of measurement model (time pressure)

Construct/item	Standardized factor loading	Standard error	*t*-value	Composite reliability (average variance extracted)
Time pressure	1.00			
Favorite available	1.00			
Perceived variety				.82 (.61)
item 1	0.81			
item 2	0.76	0.10	9.26	
item 3	0.78	0.11	9.38	
Benefits				
Perfect match	1.00			
Decision freedom	1.00			
Var-seek over time	1.00			
Var-seek as a hedge	1.00			
Costs				
Info overload~lack of overview	1.00			
Info overload ~confusion	1.00			
Search costs				.70 (.54)
item 1	0.93			
item 2	0.73	0.08	9.42	
Attribute conflict	1.00			
Value conflict	1.00			
Potential regret				.85 (.74)
item 1	0.84			
item 2	0.94	0.10	10.87	
Attractiveness				.84 (.64)
item 1	0.75			
item 2	0.74	0.13	8.61	
item 3	0.82	0.11	9.32	

NOTE. $N = 155$.

6.4 Results

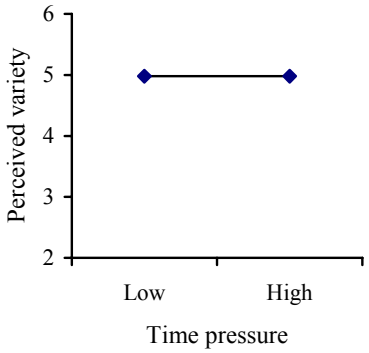
In this section, we first compare the mean values of the main variables of the research framework between low and high time pressure. Second, we examine whether the impact of time pressure on assortment attractiveness that we find is mediated by the benefits and costs of variety. We apply a .05 significance level, unless otherwise indicated.

6.4.1 Results of testing the effects of time pressure

In this subsection, we examine the effects of time pressure on the main variables of the research framework. Recall that it was conjectured that the benefits of variety would be lower (H_1), while the costs would be higher (H_2) under high (versus low) time pressure.

Perceived variety. Mean values of perceived variety per time pressure condition are presented in Figure 6.2. This figure clearly shows no differences in perceived variety between low and high time pressure. The difference in means of perceived variety was 0.00. An independent samples *t*-test for perceived variety of course did not yield a significant difference between the two conditions ($t = .01$, $p = .991$). Thus, perceptions of variety do not differ between low and high time pressure. Apparently, it does not take much time to form an impression of the level of variety an assortment offers. Perceptions of variety also did not differ between assortments of simple and complex products as the previous chapter had shown.

Figure 6.2 Perceived variety (means) as a function time pressure

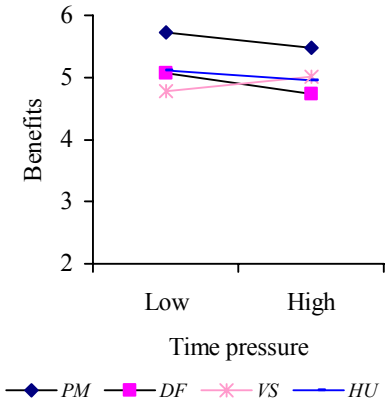


Variable	Time pressure		*F*-value
	Low	High	
Perceived variety	4.98 (1.03)	4.98 (1.19)	0.00

NOTE. Standard deviations are given in parentheses.

Benefits. It was hypothesized that the benefits of variety would be lower under high than under low time pressure (H_1). Figure 6.3 shows that three out of four benefits were indeed lower with higher time pressure. The chance of a perfect match, decision freedom, and variety-seeking as a hedge were all lower under high time pressure. A MANOVA was conducted with time pressure as between-subjects factor and all four benefits of variety as dependent variables. Although three of the four benefits were directionally lower under high time pressure, these differences were not significant (Wilk's λ = .958, $F(4,150)$ = 1.63, p = .170). Therefore, we found no significant support for H_1. Although the benefits of variety might have been less salient, they were not significantly lower under higher time pressure. Note that the choice benefits of variety did significantly decrease with product complexity (Chapter 5). Variety is significantly less rewarding in assortments of more complex products, but not under higher time pressure.

Figure 6.3 Benefits of variety (means) as a function time pressure

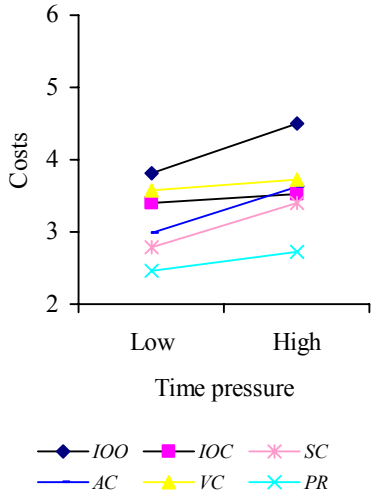


Benefit	Time pressure Low	High	*F*-value
Perfect match (PM)	5.72 (1.37)	5.47 (1.23)	1.34
Decision freedom (DF)	5.07 (1.35)	4.73 (1.46)	2.34
Var-seek over time (VS)	4.78 (1.58)	5.01 (1.34)	0.99
Var-seek as a hedge (HU)	5.12 (1.44)	4.95 (1.25)	0.67

NOTES. Standard deviations are given in parentheses. We provide *F*-values of the univariate analyses.

Costs. It was conjectured that the costs of variety would be higher under high time pressure than under low time pressure (H_2). All costs of variety were indeed higher under high time pressure as can be seen from Figure 6.4. A MANOVA was performed on the costs of variety with time pressure as between-subjects factor. The results demonstrated that the costs differed significantly between low and high time pressure (Wilk's $\lambda = .881$, $F(6,148) = 3.34$, $p = .004$).

Figure 6.4 Costs of variety (means) as a function time pressure



Cost	Time pressure Low	High	*F*-value
Lack of overview (IOO)	3.81 (1.52)	4.50 (1.45)	8.25*
Confusion (IOC)	3.40 (1.52)	3.53 (1.57)	0.28
Search costs (SC)	2.79 (1.27)	3.40 (1.43)	7.87*
Attribute conflict (AC)	2.99 (1.31)	3.62 (1.47)	8.08*
Value conflict (VC)	3.57 (1.52)	3.73 (1.62)	0.41
Potential regret (PR)	2.46 (1.25)	2.72 (1.27)	1.72

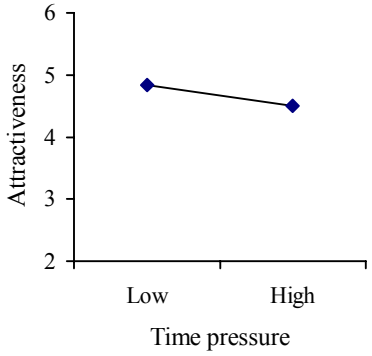
NOTES. Standard deviations are given in parentheses. We provide *F*-values of the univariate analyses.

* $p < .01$.

Univariate analyses revealed significantly higher costs under high time pressure for information overload~lack of overview (p = .005), search costs (p =.006), and attribute conflict (p = .005), but not for information overload~confusion (p = .596), value conflict (p = .523), or potential regret (p =.192). As a result, we found support for hypotheses H_{2a1}, H_{2b}, and H_{2c}, but not for hypotheses H_{2a2}, H_{2d}, and H_{2e}. In brief, if subjects experienced more time pressure several costs of variety directly increased. The idea that the same amount of information has to be processed in less time enlarged almost all information costs of variety (lack of overview, search costs, and attribute conflict). The fact that consumers tend to choose a satisfying product instead of the most optimal product appeared to enhance value conflict and feelings of potential regret, though not significantly. The latter two costs are significantly higher with increasing product complexity as was demonstrated in the previous chapter. However, this impact of product complexity on the choice costs was probably due to the higher value of more complex products, making the choice more difficult.

Assortment attractiveness. Under high time pressure assortment attractiveness was lower (*mean* = 4.50) than under low time pressure (*mean* = 4.84), as Figure 6.5 indicates. This difference (0.34) was significant ($t = 2.04$, $p = .043$). Thus, the attractiveness of the same assortment is lower if the consumer experiences higher feelings of time pressure. Contrarily, assortment attractiveness does not change as a function of product complexity when controlling for product involvement, as the previous chapter showed.

Figure 6.5 Assortment attractiveness (means) as a function time pressure



	Time pressure		
Variable	Low	High	*F*-value
Attractive-ness	4.84 (1.10)	4.50 (0.98)	4.16*

NOTES. Standard deviations are given in parentheses.
* $p < .05$.

In brief, perceptions of variety were not dependent on time pressure. The benefits of variety tended to decrease with time pressure, though not significantly. Almost all information costs of variety increased with time pressure. Choice costs were also higher under high time pressure, though not significantly. Finally, assortment attractiveness was significantly lower if time pressure was higher. In the next section, we investigate whether the negative impact of time pressure on assortment attractiveness is due to the lower benefits and the higher costs of variety or whether time pressure also has a direct negative influence on the attractiveness of an assortment.

6.4.2 Results of testing for mediation of the benefits and costs of variety

We want to examine the mediating role of the benefits and costs of variety in the negative relationship between time pressure and assortment attractiveness. To test for this a structural equation model was constructed. The structural model was similar to the one described in Chapter 4, with the exception that assortment size was not included, while time pressure was. All paths were similar to the ones estimated in Chapter 4. We built in direct paths from the dummy variable time pressure to all benefits and all costs of variety. All benefits were allowed to covary, as were all the costs. The fit of this structural model was acceptable, though chi-square was significant ($\chi^2(120) = 157.55$, $p = .012$, RMSEA = .045, NNFI = .93, CFI = .96). The model accounted for 46% of the variance in assortment attractiveness.

We tested for mediation of the benefits and costs of variety by comparing the standardized total effect of time pressure on assortment attractiveness with the standardized indirect effect. The total effect was -.17, while the indirect effect was also -.17. Thus, the direct effect was 0. The negative impact of time pressure on assortment attractiveness is not a direct one, but is fully mediated by lower benefits and higher costs of variety. Though only the path through lack of overview was significant (standardized total effect = -.03), the other benefits and costs also contributed in mediating the impact of time pressure on assortment attractiveness. This implies that when consumers have less time to inspect an assortment, they see less benefits of the variety it offers while it enlarges the costs of variety it produces. These lower benefits and higher costs in turn make the assortment less appealing.

6.5 Conclusions

Assortments of groceries commonly present vast levels of variety. Consumers are, to a certain extent, able to handle such high levels of variety. At the same time, consumers are often confronted with situations that make the choice of a simple grocery product more difficult. More specifically, they frequently encounter cognitive load next to the shopping task. It is important to find out whether consumers still value high variety if they face additional cognitive load. The focus of this chapter was on one particular aspect of cognitive load, namely time pressure. The goal of this chapter was to attain insights into the role of time

pressure in the relationship between assortment variety and assortment attractiveness. We anticipated that time pressure would lower the benefits of variety because there is less time available to assess these benefits. We also expected that time pressure would enlarge the costs of variety, since the same amount of information has to be processed in less time. The lower benefits and the higher costs of variety could in turn result in less attractive assortments. For that reason, this study aimed at gaining insights into whether consumers who shop under time pressure actually still appreciate high variety in an assortment of simple grocery products.

First, perceptions of variety do not change as a function of time pressure. Perceived variety is the same under low and high feelings of time pressure. Apparently, these perceptions are quickly made. Perceptions of variety also do not depend on the complexity of the products offered, as we showed in the previous chapter. In brief, based on the products in an assortment, and not on their attributes, consumers can quickly form an impression of how much variety an assortment offers.

Second, as expected, our results indeed show that almost all information costs increase as a function of time pressure. An increase in time pressure leads to higher lack of overview, search costs, and attribute conflict. Although consumers might focus on specific attributes and products, they still have to process the same amount of information in less time. This induces high information costs. Apparently, consumers find it hard to process high variety in an assortment quickly. Though choice costs, i.e., value conflict and potential regret, are also higher under higher time pressure, this effect is not significant. Note that choice costs are significantly higher for more complex products, as the previous chapter showed. Whereas product complexity results in both higher information costs and higher choice costs, time pressure only leads to higher information costs. This difference could be explained by the normally higher value of more complex products, which makes the final choice more critical. Furthermore, while product complexity significantly lowers the benefits of variety, this is not the case for time pressure. Although consumers tend to see less benefits of variety if they experience time pressure, this effect is not significant.

Third, the higher costs of variety and the tentatively lower benefits of variety that result from feelings of time pressure, make an assortment less attractive. Thus, consumers evaluate the attractiveness of an assortment to be lower if they experience higher feelings of time pressure. Exactly the same

assortment offering high variety is evaluated less positively if a consumer shops under higher time pressure. Thus, we can conclude that consumers are less appreciative of high variety when they buy their groceries under high time pressure. Previous research that investigated the effects of time pressure on consumer decision making from an assortment looked at relatively small assortments and focused on how consumers cope with and react to time pressure (Dhar and Nowlis 1999; Pieters and Warlop 1999). They found that consumers cope with time pressure by accelerating visual scanning, filtering information, and switching to other scanning strategies (Pieters and Warlop 1999). Time pressure also prevents people from not choosing at all (Dhar and Nowlis 1999). We show that for frequently encountered larger assortments time pressure makes an assortment less attractive. This implies that perhaps less variety already suffices. Since we did not manipulate assortment size in this experiment, we cannot make inferences on a potentially lower optimal level of assortment size under time pressure. Future research could examine to what extent less variety is more optimal in a situation of high time pressure.

It is crucial for every supermarket and other groceries selling stores to understand how consumers evaluate variety in assortments of simple products when they experience time pressure. Many consumers buy their daily or weekly groceries under at least a bit of time pressure. Since time pressure indirectly lowers the attractiveness of an assortment, it is important for retailers to reduce such feelings of time pressure for consumers when standing in front of the shelves. Given the fact that only a limited amount of time is available for shopping, as much of this time as possible should be spent in front of the shelves. Retailers could achieve this by reducing the time needed for other activities, such as searching for a parking spot or waiting in line for the checkout. Providing sufficient parking space and many checkouts could lower feelings of time pressure in front of the assortment, making the assortment more attractive. In addition, time pressure can imply stress (Edland and Svenson 1993). Retailers could try and reduce other stress factors such as crowding, impolite staff (Aylott and Mitchell 1999), or combinations of ambient scent and background music that are not congruent with each other (Mattila and Wirtz 2001). Creating a calm and quiet shopping environment for consumers could help in lowering feelings of stress in general and time pressure in specific, which in turn will increase assortment attractiveness.

In this chapter, we studied one specific source of situation-specific task complexity, namely time pressure. Under time pressure, which is one form of cognitive load, the same amount of information has to be processed in less time. We found this to lower the attractiveness of an assortment. Another form of cognitive load that can make the task of choosing a product from an assortment more complex is if *more* information has to be processed in the *same* amount of time. This is the case if a consumer is distracted, for example by crowdedness, or preoccupied with another task, such as talking to another customer, next to the choice task. We anticipate that this source of situation-specific task complexity also leads to higher information costs, which in turn will lower the attractiveness of an assortment. Future research however could test for such generalizations.

7 Conclusions

7.1 Introduction

For many choices in life, people have to choose from a rich variety of options. Also in the area of retailing, an overwhelming amount of possibilities is often encountered. Evidently, high variety enlarges the chance of making the most optimal choice (Baumol and Ide 1956). As a result, retailers who want to appeal to a heterogeneous group of customers are not keen on cutting down on their variety levels. However, variety can also make the choice complicated and frustrating for consumers (Iyengar and Lepper 2000). It is therefore questionable whether consumers actually value high levels of variety offered by retailers in their assortments. The overall objective of this thesis was to clarify the relationship between the variety in an assortment and the attractiveness of the assortment from a consumer perspective by examining the underlying process of this relationship. Therefore, in Chapter 1, the main research question was formulated as follows:

How does assortment variety affect assortment attractiveness?

This research question, as well as four more specific research questions, were addressed in three related studies. Each study was described in one chapter of this thesis. In Chapter 4, we examined the relationship between assortment variety and assortment attractiveness for assortments of simple grocery products, such as potato chips. We showed how this relationship could be explained by perceptions of variety (research question 1) and benefits and costs of variety (research question 2). Chapter 5 discussed the same relationship and underlying process for assortments of complex products, such as digital cameras (research question 3). In Chapter 6, we addressed the role of time pressure in this relationship for assortments of simple grocery products (research question 4). Chapters 5 and 6 enabled us to examine the generalizability of the impact of assortment variety on assortment attractiveness across different sources of task complexity, i.e., assortment-inherent and situation-specific task complexity respectively. In brief, we have provided an understanding of how variety affects the attractiveness of an assortment, while extending these insights across different contingencies.

In this chapter, we summarize and discuss the most important findings and their contribution. Furthermore, implications are derived as well as suggestions for future research.

7.2 Discussion of main findings

How does assortment variety affect assortment attractiveness? Our answer to this question begins with addressing the issue *to what extent* more variety is more attractive to consumers. We deal with the overall impact of the size of an assortment and the availability of the favorite product on assortment attractiveness in Subsections 7.2.1 and 7.2.2 successively. We then consider *how* assortment variety influences the attractiveness of an assortment by providing a discussion on the underlying process of this relationship (Subsection 7.2.3).

7.2.1 The effect of assortment size on assortment attractiveness

A store that offers more variety generally attracts more customers to the store (e.g., Arnold et al. 1983) and generates higher store sales (e.g., Borle et al. forthcoming). Thus, more variety in a store appears to be appealing to consumers. An important question though is whether consumers, once inside the store, still appreciate to find high levels of variety in the product categories they have to choose from. Are more products in an assortment at the product category level more attractive to consumers or can there be too much variety? More specifically, what does the overall effect of the size of an assortment on its attractiveness look like? A main conclusion of our thesis is that this impact depends on the difficulty of the choice task, more specifically, on the complexity of the products in the assortment. For assortments of simple grocery products, such as potato chips, we found that larger assortments are initially more attractive, but that very large assortments tend to become less attractive again. For assortments of more complex products, such as digital cameras, we demonstrated that larger assortments are not more (or less) attractive than smaller assortments. This differential impact of product complexity supports the recent findings of Gourville and Soman (2005) who studied the moderating role of product complexity in the relationship between assortment size and the likelihood to choose from an assortment.

More specifically, regarding assortments of simple groceries, we found that, because variety brings benefits to consumers, more variety makes an assortment more attractive up to a relatively high assortment size. Increasing the size beyond this high level tends to make an assortment less attractive mainly due to the increasing costs of variety. These findings thus suggest the existence of an inverted U-shape for the relationship between assortment size and assortment

attractiveness for simple grocery products. Such an inverted U-shape has often been suggested in the literature (e.g., Desmeules 2002; Dhar et al. 2001; Handelsman and Munson 1985), but not yet demonstrated. Previous studies most likely were not able to show a potential optimum, because they investigated only very narrow ranges of assortment sizes (e.g., Iyengar and Lepper 2000; Sloot et al. 2005). We, however, varied assortment size at a much wider range enabling us to study potential nonlinear effects of assortment size.

Surprisingly, we did not find such a nonlinear effect of assortment size on the attractiveness of an assortment for more complex products, such as laptops, that are described on many more attributes than simple products. Such decisions are inherently more complex, which could make variety more difficult to handle. Our results revealed that the attractiveness of an assortment of complex products does not seem to increase or decrease with the size of the assortment. Very little research is available on the effects of the size of an assortment of complex products on consumer evaluations of these assortments (an exception is Van Herpen 2001, Chapter 4). This thesis looked at a wide range of assortment sizes and found that larger assortments do not appear to be more (or less) attractive.

An important question is why the attractiveness of an assortment of complex products does not decrease with size for very large assortment sizes as it tends to do for simple products. One would expect that the much higher costs of variety in assortments of complex products make larger assortments less attractive. The fact that this is not the case can have the following reasons. Consumers are most likely more motivated to invest effort in the choice of a complex (versus simple) product, because the choice is more consequential. A complex product is generally more expensive and has to last for a longer period of time than a simple product. Because they are motivated to make the right choice, consumers might mind less about the accompanying high costs of variety. Potentially, therefore, the costs do not lower assortment evaluations. At the same time, although consumers are motivated to process all relevant information, they may not have the ability to do so. Our findings demonstrated that consumers become selective in their attention, i.e., they inspect increasingly fewer products in larger assortments of complex products. This selective attention, which is a well-known strategy of consumers to deal with complexity (Payne et al. 1993), seems to serve as a coping mechanism to handle the high costs of variety. This could be an additional reason why an increase in assortment size does not result in lower assortment attractiveness in large assortments of complex products. Although we provide

several plausible explanations, further research is needed to gain insights into the differences in the effect of assortment size on assortment attractiveness between different types of products. More specifically, we recommend research that includes measurements of consumers' motivation and ability in order to fully understand why the costs of variety do not lower assortment attractiveness and thus why no inverted U-shape was found for complex products.

Implications. Our findings on the effects of assortment size have a number of implications for retailers. First, retailers offering simple grocery products are advised to detect the optimal number of products in their assortments. Our results suggest that this number is fairly high, because the attractiveness went down only after 37 jars of jam and 49 bags of potato chips. High variety is important in service oriented supermarkets, such as Albert Heijn that offers 19,000 SKUs in total (Laan 2004). Our findings imply that high variety in such service oriented supermarkets is indeed attractive, but also that such retailers should be careful in expanding their assortments beyond the optimum, which would lead to lower assortment attractiveness. For discounters, variety is less critical than price and hence these types of stores carry fewer products. Consider for instance Aldi that offers only 800 SKUs (Laan 2004). Our results imply that discounters could consider providing larger assortments, as long as it fits their low cost structure, since larger assortments are initially more attractive.

Second, how can retailers offering complex products optimize assortment sizes? We found that large assortments of complex products are not more attractive than small assortments. However, we also showed that in larger assortments of complex products consumers become selective in their attention, which indicates that they find a way to cope with the high costs of variety. Since they focus their attention on a limited set of products and attributes, they may not take into account all potential alternatives. As a consequence, the quality of the decision can decrease (Payne et al. 1993). Consumers are thus more likely to make a suboptimal choice and we see that they anticipate regret about buying the 'wrong' product. To remedy that, in large assortments of complex products, consumers should be aided in their decision. We propose that a main role in this respect has to be given to sales assistance. Sales assistance is useful when products are more complex and newer to buyers (Wernerfelt 1994). It can help consumers in defining their shopping goals and quickly reducing the assortment to a small set of preferred products from which the final choice can be made. Consequently,

stores providing high service levels can carry large assortments as long as adequate sales assistance is available for the consumer. Sales assistance though is expensive (Wernerfelt 1994) and therefore there are limits to how much variety is feasible. Stores that focus on price instead of service cannot afford sales assistance and hence are advised to offer smaller assortments, which is of course congruent with their low cost strategy. A prerequisite for a small assortment is that it contains the favorite product of many consumers, which is obviously a challenging exercise.

Third, what implications do our results provide for retailers selling products online? Whereas in an offline store expanding assortments is limited due to the fixed amount of physical shelf space, this limitation is not present in an online environment where a virtually unlimited number of products can be offered (Häubl and Trifts 2000). Consumers' shopping behavior in online stores may fundamentally differ from that in traditional brick-and-mortar stores (Alba et al. 1997; Winer et al. 1997). We suggest that, due to the availability of interactive decision tools online (Swaminathan 2003), it might be easier to get an overview of an assortment. This would imply that the optimal assortment size for simple products is higher in an online versus an offline setting. Online decision aids can also be helpful regarding complex products. However, we argue that it is harder to get consumers' shopping goals clear by means of the currently available online interactive decision tools than by asking an adequately trained sales person. A salesperson can listen to consumers and help them identify their needs in order to come up with a good solution (Kotler 1994). Online decision tools, on the other hand, have to be very sophisticated to reach the same assistance level and hence should be able to do much more than simply rank products according to brand name and/or price as many websites presently do. Only if decision tools are sophisticated, can retailers offer large assortments of complex products online. To conclude, we realize that online and offline retailers take into account other considerations to determine their assortment sizes besides consumer assortment evaluations and psychological benefits and costs of variety to consumers, e.g., logistical costs.

The impact of situation-specific task complexity.

The complexity of the products in an assortment influences how many products are optimal. This optimal number of products is most likely also to be contingent on the buying situation the consumer is in, more specifically, on the situation-

specific complexity of the choice task. One important source of task complexity related to the situation is time pressure, which implies that the same amount of information has to be processed in less time. We are the first to demonstrate that an assortment carrying many products is less attractive if consumers buy their groceries under time pressure. If consumers have limited ability to fully inspect an assortment, less variety might already suffice under a situation of time pressure. Less variety may also already be sufficient when the consumer is facing other sources of situation-specific task complexity, such as distraction by crowding. This will especially hold in a combined situation of high situation-specific task complexity (like time pressure) and high assortment-inherent task complexity (such as product complexity), which might justify very limited assortments.

Implications. Our finding that an assortment carrying many simple groceries is less attractive under higher feelings of time pressure has the following implications for retailers. It is crucial to reduce feelings of time pressure, so that consumers can spend all their cognitive resources at the decision-making process. This could be achieved by lowering actual time pressure through reducing the time needed for shopping related activities, such as finding a parking spot or waiting in line at the checkout (Aylott and Mitchell 1999). Apart from decreasing actual time pressure, feelings of time pressure, which can imply stress (Edland and Svenson 1993), could also be reduced by lowering other stress related factors, e.g., by means of creating a relaxed atmosphere. These suggestions are particularly relevant for retailers catering many hurried consumers, such as retailers located near a railway station, but also for other retailers, such as supermarkets, since consumers often buy their daily groceries in a hurry (Dhar and Nowlis 1999).

Further research. The notion that time pressure can cause stress and negative emotional responses for consumers (Machleit and Eroglu 2000) provides an interesting area for further research into the effects of assortment variety. One important dimension of emotions in this setting is arousal, which refers to the degree of stimulation caused by the surroundings (Mehrabian and Russell 1974). Too much arousal can be experienced as hectic and unpleasant (Gröppel-Klein 1998). Little knowledge is available on the impact of arousal evoked by in-store environmental stimuli, such as assortment variety, on decision-making processes (Gröppel-Klein 2005). We therefore encourage research directed towards understanding how assortment variety elicits feelings of arousal and how these feelings would influence assortment evaluations. Insights could be attained by

means of physiological measurements, e.g., with Electrodermal Reaction (EDR) (Gröppel-Klein 2005).

How to determine the optimal level of assortment size?

We have discussed how product complexity and the buying situation influence the optimal level of assortment size. A critical question for retailers is also *how* they can identify this suggested optimal size. How can the attractiveness of their assortments be maximized? One approach to find out the optimal assortment size is to perform experimental research in a similar way as was done in the current thesis, e.g., by means of virtual store research. Such a laboratory method allows the researcher to test for the effects of any possible assortment size and/or composition of the assortment. Even sales assistance for choosing a complex product can be offered by interactive decision tools, such as recommendation agents (Häubl and Trifts 2000; Swaminathan 2003). Note that the recommended set should be limited in order to prevent consumers from making low-quality decisions (Diehl 2005). If laboratory research tools are not accessible, retailers could perform systematic field experiments, starting with pilot projects in only a small selection of product categories (see for instance Sloot et al. 2005) in order to investigate the impact of (major) reductions and extensions to an assortment.

When performing laboratory experimental research on assortment variety, it is important to consider to what extent such findings can be generalized to a real store environment. We think that the costs of variety may be higher in a real setting with real customers. First, the physical shelf space is larger in reality than the single computer screen in our experiment. In real life, consumers actually have to walk in front of the shelves implying higher search costs. Second, 'real' buyers will have a lower average capacity to handle all the information an assortment offers than the students who participated in our experiments, which also could result in higher costs of variety in a real store. Third, in a real setting, consumers might be more motivated to make the right choice because their own money is involved. Even though this could make them willing to process more information, they may also take a wider range of products and product attributes into account in order to reach the best solution, leading to higher costs of variety. In short, we argue that the costs of variety could be higher in a real life environment than in our laboratory setting and thus that fewer products might already suffice in real stores. Future research should test the robustness of our findings.

7.2.2 The effect of favorite available on assortment attractiveness

Next to determining the size of an assortment, it is at least as critical to consider the composition of the assortment. Our research demonstrated that it is highly important to offer favorite products, since they make an assortment more attractive to consumers, irrespective of the size of the assortment. Moreover, we are the first to show that the importance of the availability of the favorite product of a consumer depends on the complexity of the products involved. The positive effect of favorite products on the attractiveness of an assortment is even stronger in an assortment of complex products than in an assortment of simple products. We suggest that because the choice of a complex product is much more difficult and more risky, spotting the favorite product will strongly simplify this complex choice task for consumers. Previous research found that the availability of the favorite product of a consumer increases the value of an assortment to consumers and that it enlarges the likelihood that they choose a specific store (Broniarczyk et al. 1998; Kim et al. 2002). We extend the results of these studies by showing that the positive impact of favorite available is even stronger in assortments of complex products than in assortments of simple products.

Generally, larger assortments carry the favorite products of more consumers, i.e., they fit the needs of a more heterogeneous group of customers. An important question is: what is more crucial, the size of an assortment or the availability of a favorite product? Our results showed that this is contingent on the complexity of the products involved. For simple products, carrying large assortments is more critical than offering favorite products, though favorite products still make an assortment more attractive. Contrarily, for complex products the availability of the favorite product has a stronger influence than the size of an assortment, which, as we discussed before, does not significantly affect assortment attractiveness. In brief, whereas for simple products assortment size is more relevant, for complex products the availability of favorite products is more crucial.

Implications. The importance of favorite products implies that it is essential for retailers to select the most popular products, especially in assortments of complex products. Insights into which products are preferred over others are crucial in this respect. It is not recommended here to remove popular products or attributes. Redundant attributes might be eliminated, though the removal of

specific brands, package sizes, and flavors should be minimized (Boatwright and Nunes 2001).

7.2.3 The underlying process of the relationship between assortment variety and assortment attractiveness

Given the fact that the overall relationship between, on the one hand, assortment size and favorite available, and, on the other hand, the attractiveness of an assortment, differs between assortments of simple and complex products, can one question to what extent the underlying process of these relationships also differs across different types of assortments. On the whole, our results showed that the basic underlying process between assortment variety and assortment attractiveness is similar for assortments of simple products as for assortments of complex products. This process can be described as follows. Firstly, consumers see more variety in an assortment that offers more variety. Higher perceptions of variety bring both benefits and costs to consumers. Only a selection of these benefits and costs, in turn, influence the attractiveness of an assortment. Despite some differences between simple and complex products, which will be explicated later on, the underlying process is essentially the same. We will now discuss this process in more detail, starting with consumer perceptions of variety.

Perceived variety. Our findings showed that as the size of an assortment increases, consumers see more variety. This positive relationship displays decreasing marginal returns for both simple and complex products, in accordance with Weber's Law (Mowen and Minor 2001). This implies that in larger assortments many additional products are needed to create the same increase in perceived variety. Previous research already showed that consumers see more variety in larger assortments (Broniarczyk et al. 1998; Van Herpen and Pieters 2002; Kahn and Wansink 2004). Some empirical support for the decreasing marginal returns of assortment size was provided by Broniarczyk et al. (1998). However, we are the first to provide more substantive evidence in support of this phenomenon by examining a wide range of assortment sizes for different types of products.

The newness of our findings lies in our demonstration that consumer perceptions of variety are similar across the different contingencies of product complexity and time pressure. Our results revealed that variety perceptions neither differ between assortments of simple and complex products nor between low and

high feelings of time pressure. Apparently, consumers base their perceptions on the number of products in an assortment, and not on the number of attributes on which these products are described (which is a distinguishing feature between simple and complex products). Further, the nonsignificant role of time pressure suggests that perceptions of variety are quickly formed.

Implications. If retailers want to increase perceptions of variety, then they would need to offer more additional products in larger assortments. Our results showed that this goes hand in hand with a higher lack of overview. Perceived variety could also be enlarged in other ways. First, offering relatively more favorite products heightens perceived variety (see also Broniarczyk et al. 1998). Second, perceived variety could be increased by means of increasing the dispersion of the attribute levels of the products offered, i.e., the relative frequency with which attribute levels occur, for example, by offering two bottles of orange juice and two bottles of apple juice instead of three bottles of orange juice and one bottle of apple juice. Van Herpen (2001) has shown that dispersion of the attribute levels increases perceived variety and indirectly has a positive impact on the preference for an assortment. Thus, perceptions of variety could be enlarged by offering more products, but also by providing favorite products or by increasing the dispersion of the attribute levels of the products.

Benefits of variety. The underlying process of the relationship between assortment variety and assortment attractiveness consists of perceptions of variety, but also of a number of benefits that variety leads to. We investigated a broad set of potential benefits of variety and identified the ones that are crucial in that they make an assortment more attractive to consumers. A higher chance of a perfect match between what you want and what an assortment offers clearly makes the assortment more attractive. Obviously, consumers want to find what they are looking for. In addition, higher feelings of decision freedom also enlarge assortment attractiveness. Consumers value their freedom to choose rather than feeling that the retailer has limited their choices. Finally, though only in assortments of simple products, consumers appreciate the possibility to seek variety in a portfolio of products. Due to uncertainty about their future preferences, they want to be able to postpone their final choice to the future by selecting a varied set of products now. Though these benefits of variety have been suggested before as positive drivers of assortment evaluations (De Clerck et al.

2001), we empirically demonstrate that they indeed make an assortment more attractive to consumers.

Implication. An implication of the relevance of these specific benefits is that emphasizing high variety in their assortments can be a successful advertising strategy for retailers. Consumers value the idea that they have many options to select from. Care should be taken though that they do not experience the accompanying costs of variety, as will be described below.

Costs of variety. Variety leads to benefits for consumers, but also brings about costs. Throughout this thesis only a small selection of the existing costs of variety appeared to play a crucial role. First, we found that a lack of overview is a severe danger in assortments of simple as well as complex products since it makes the assortment less attractive. Consumers do not want to be overloaded with information and lose overview. Second, we demonstrated that if consumers anticipate regret of not choosing another product, this has a significantly negative impact on assortment attractiveness, though for complex products only. We argue that the anticipation of regret plays a significant role in assortments of complex products and not in assortments of simple products, because consumers are typically less familiar with buying a complex product. As a result, they will feel less confident about their choice. In addition, they will feel less sure, because they have lower ability to make the right choice since many more attributes have to be taken into account when choosing a complex product. Finally, the choice of a complex product is generally more consequential, which also enhances feelings of potential regret. Numerous costs that result from variety have been identified in previous research (e.g., Gourville and Soman 2005; Iyengar and Lepper 2000). However, the novelty of our findings lies in the fact that, in this thesis, we found out which ones matter most.

Implications. If consumers experience a lack of overview of an assortment, this makes the assortment less attractive. This means that retailers are recommended to provide clearly structured assortments that by no means give a cluttered appearance. Overview can, for instance, be created by putting products on the shelves in the appropriate way. The way products are placed on the shelf can make it easier for consumers to acquire and use the information presented (Bettman et al. 1990). Few specific guidelines to create overview are available for retailers. One such guideline is provided by Morales et al. (2005). They state that the way products should be presented depends on how familiar consumers are with

the product category. If consumers are familiar with a product category, which is usually the case with simple grocery products, it is important for a retailer to match the layout of the shelf with consumers' internal organization of the product category (Morales et al. 2005). Thus, shelf space layout should be congruent with how consumers mentally organize the products, such as by brand or by type. This way, consumers are better able to process the information and less prone to lose overview.

For unfamiliar, more complex product categories, shopping goals (e.g., buy a laptop with 512 MB internal memory) are useful in helping consumers. These shopping goals serve as a guiding force in product selection. They make the processing of information easier (Morales et al. 2005). Shopping goals help to reduce the huge amount of products and attributes to a smaller, easier to handle set, lowering feelings of information overload. We suggest that by means of sales assistance, consumers can be helped in detecting their shopping goals and thus reducing the huge assortment to a smaller final choice set. If complex products are offered in an online environment, sales assistance could be provided by interactive decision aids (Swaminathan 2003), as was suggested before. Interactive decision aids, such as recommendation agents, can serve consumers in decreasing the size but increasing the quality of their consideration set, while they also seem to improve the quality of the final purchase decision (Häubl and Trifts 2000).

We also recommend retailers offering complex products to try to prevent consumers from anticipating regret since this lowers assortment evaluations. This can be achieved in multiple ways. First, again, offering the favorite complex products is crucial. Consumers who see their favorite product directly experience a lower potential for regret. Their fear of making the wrong choice is lower. Second, the products offered in an assortment should not be too close in attractiveness. When there are more options of roughly equal attractiveness, consumers will worry more about the consequences (Zeelenberg 1999). Thus, it is better to offer a differentiated set of products which can fulfill the needs of different consumers. Third, potential regret can be lowered by providing more specific information on the outcomes of each product (Zeelenberg 1999). If consumers are unsure about what attributes are relevant, they will also feel less sure about whether they are making the right choice. Hence, the presence of sales assistance is recommendable, since it can help consumers in identifying which information is relevant. This could make them feel surer about their choice. Finally, a liberal return policy of both retailers and suppliers can reduce the anticipation of regret

(Gourville and Soman 2005). If consumers can easily change a product when they discover to have made the wrong choice, this might lower potential regret.

7.3 A final note

The three studies presented in this thesis have advanced our knowledge of how the variety of an assortment influences its attractiveness. Investigating a wide range of assortment sizes enabled us to examine the linearity of the effect of assortment size and to show how it depends on the complexity of the products involved. Furthermore, we clarified the underlying process of the relationship between assortment variety and assortment attractiveness. More specifically, a comprehensive research framework was provided and empirically tested that singled out the critical benefits and costs of variety. Finally, we generalized our results across different contingencies, i.e., different types of assortments and buying situations. We realize that because we conducted laboratory experiments with student samples, we have to be careful in generalizing the results to the real world, though we made sure to employ realistic assortments offering different types of products. Future research should test the robustness of our findings in real life settings.

This thesis concentrated on the question how assortment variety affects assortment attractiveness, which is a critical and hot topic for retailers. We have learned that no simple answer to this question is available. Different contingencies influence the relationship between the amount of variety in an assortment and the attractiveness of the assortment in different ways. This thesis took an important step in contributing to solving the assortment variety puzzle.

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Appendix 2.A Summary of findings of empirical studies on the effects of variety

Independent variable	Dependent variable	Direction of effect	References
Assortment size	Perceived variety	Positive	Broniarczyk, Hoyer and McAlister (1998), Van Herpen (2001), Van Herpen and Pieters (2002), Kahn and Wansink (2004), Chernev (2003b)
		No effect	Sloot (2005)
Favorite available	Perceived variety	Positive	Broniarczyk, Hoyer and McAlister (1998)
Assortment size	Benefits	Positive	Reibstein, Youngblood and Fromkin (1975), Iyengar and Lepper (2000), Van Herpen (2001)
Assortment size	Costs	Positive	Iyengar and Lepper (2000), Van Herpen (2001), Chernev (2003b), Sloot (2005)
Assortment size	Assortment evaluation	Positive	Kahn and Lehmann (1991), Iyengar and Lepper (2000), Kim, Allenby and Rossi (2002), Van Herpen (2001, Chapter 4), Oppewal and Koelemeijer (2005)
		Negative	Sloot (2005)
Favorite available	Assortment evaluation	No effect	Oppewal and Koelemeijer (2005)
Perceived variety	Assortment evaluation	Positive	Hoch, Bradlow and Wansink (1999)
Assortment size	Choice	Positive	Arnold, Ma and Tigert (1978), Gautschi (1981), Arnold, Oum and Tigert (1983), Louviere and Gaeth (1987), Oppewal, Louviere and Timmermans (1997), Chernev (2003a), Solgaard and Hansen (2003), Bhatnagar and Ratchford (2004), Gourville and Soman (2005)

continued

Appendix 2.A continued

Independent variable	Dependent variable	Direction of effect	References
		Inverted U	Brown (1978)
		Negative	Iyengar and Lepper (2000), Chernev (2003a), Iyengar and Jiang (2005), Gourville and Soman (2005)
Favorite available	Choice	Positive	Broniarczyk, Hoyer and McAlister (1998)
Perceived variety	Choice	Positive	Broniarczyk, Hoyer and McAlister (1998), Hoch, Bradlow and Wansink (1999)
Assortment size	Sales	Positive	Koelemeijer and Oppewal (1999), Reinartz and Kumar (1999), Dhar, Hoch and Kumar (2001)[b], Srinivasan, Anderson and Ponnavolu (2002), Borle, Boatwright, Kadane, et al. (forthcoming)[c], Sloot (2005)
		Positive, decreasing marginal returns	Brynjolfsson, Smith and Hu (2003)
		No effect	Lohse and Spiller (1999)
		Positive/negative	De Clerck, Gijsbrechts, Steenkamp and Dekimpe (2001)[d]
		Negative	Boatwright and Nunes (2001)[e]
Assortment evaluation	Choice	Positive	Hoch, Bradlow and Wansink (1999)[f]
		Negative	Iyengar and Lepper (2000)[f]

[a] Excluded are non-empirical studies.
[b] An increase in assortment size leads to higher sales in three out of four product category types.
[c] A decrease in assortment size leads to lower store sales.
[d] An increase and a decrease in assortment size both lead to higher product category sales.
[e] A (moderate) decrease in assortment size leads to higher product category sales.
[f] No direction of effect was presented in the study. These effects are derived from the results.

Appendix 4.A Potential order effects (jam and potato chips)

To investigate order effects a MANOVA with two between-subjects factors, order and assortment size, was performed on the data pooled across jam and potato chips. The factor order was a dummy variable for the order of the product category. The factor took the value 0 if the jam assortment was presented first; it was 1 if the potato chips assortment was presented first. Assortment size was included as a factor, because order effects could differ between assortment sizes. The dependent variables were all items of the main variables of our research framework, namely the items of favorite available, perceived variety, the benefits and costs of variety, and assortment attractiveness for jam and potato chips.

Results of the MANOVA are given in Table 4.A.1. The results showed a significant impact of the factor assortment size on the items, but not of the order of the product categories nor of the interaction term between order and assortment size. Thus, answers on the second assortment were not significantly higher or lower than answers on the first assortment. We can conclude that there were no order effects present in our data.

Table 4.A.1 MANOVA results of potential order effects

Factor	Wilks' Lambda	df	*F*
Order	0.93	19, 290	1.11
Assortment size	0.60	19, 290	10.41*
Order x assortment size	0.95	19, 290	0.77

NOTE. Dependent variables are all items of favorite available, perceived variety, the benefits and costs of variety, and assortment attractiveness.
* $p < .001$.

We also conducted a repeated measures MANOVA on the pooled data with the same factors and dependent variables to detect specific patterns in the answers. We found a significant impact of assortment size, but not of the order of the product categories nor of the interaction term. Thus, no specific patterns were present in the answers.

Appendix 4.B Product category specific consumer characteristics (jam and potato chips)

In Table 4.B.1, one can find means and standard deviations for a number of product category specific consumer characteristics. All characteristics were measured on a 1-7 scale. As was expected and intended, subjects were not very much involved with jam and potato chips (*mean* = 3.34 for jam, *mean* = 3.78 for potato chips), but a paired-samples *t*-test showed that they were significantly more involved with potato chips than with jam ($t = 4.08$, $p < .001$). Our goal was to present two low involvement products in the experiment. We succeeded in doing this.

Table 4.B.1 Means and standard deviations of product category specific consumer characteristics per product category

Product category specific consumer characteristics	Jam	Potato chips	*t*-value
Product involvement	3.34 (0.96)	3.78 (1.04)	4.08**
Purchase involvement	4.09 (1.40)	4.34 (1.34)	2.05*
Purchase risk	2.95 (1.22)	2.80 (1.18)	-1.63
Product expertise	4.01 (0.98)	4.76 (0.82)	8.68**

NOTES. $N = 156$ for both jam and potato chips. Measurements were on a 1-7 scale. Standard deviations are given in parentheses.
* $p < .05$, ** $p < .001$.

Subjects were somewhat more involved with the purchase of jam and potato chips than with the products themselves. Mean purchase involvement was 4.09 for jam and 4.34 for potato chips. Again, this difference is significant ($t = 2.05$, $p = .042$). Subjects were more involved with buying potato chips than with buying jam. Purchase risk was low for both jam (*mean* = 2.95) and potato chips (*mean* = 2.80). There was no significant difference in purchase risk between jam and potato chips ($t = -1.63$, $p = .106$). In other words, it is hard to go wrong when buying such low involvement, relatively cheap products. Subjects scored around the midpoint of the scale for product expertise for both products (*mean* = 4.01 for

jam, *mean* = 4.76 for potato chips). Subjects thought themselves to have more expertise on potato chips than on jam ($t = 8.68$, $p < .001$).

Concluding, subjects were more involved with potato chips than with jam. In addition, they were more involved with buying potato chips and they had more expertise on potato chips.

Appendix 4.C Dispersion and dissociation (jam and potato chips)

Attribute patterns, i.e. dispersion and dissociation, were kept as constant as possible across assortment sizes. Dispersion of the attribute levels was measured with Relative Entropy, which is equal to Entropy (see Subsection 3.3.1) divided by the maximum level of Entropy possible given assortment size. Relative Entropy can take a level from 0 (no dispersion) to 1 (maximal dispersion). Dissociation between the attributes was measured with 1-Lambda (see Subsection 3.3.1). Here we provide the dispersion and dissociation levels of the three in a pretest with 35 subjects most frequently mentioned attributes on which they base their selection. These attributes were brand name, flavor, and price both for jam and potato chips. Overall, dispersion and dissociation levels of these attributes were relatively constant across assortment sizes as Tables 4.C.1 and 4.C.2 show.

Table 4.C.1 Dispersion: Relative Entropy

Product category	Attribute	Assortment size 5	20	35	50	65
Jam	Brand name	.86	.87	.85	.87	.88
	Flavor	.83	.90	.90	.89	.89
	Price	.86	.86	.88	.87	.88
Potato chips	Brand name	.96	.88	.81	.86	.87
	Flavor	.96	.84	.87	.88	.86
	Price	.96	.93	.89	.92	.91

Table 4.C.2 Dissociation: 1-Lambda

Product category	Attributes	Assortment size 5	20	35	50	65
Jam	Brand name, flavor	.60	.85	.81	.83	.82
	Brand name, price	.00	.04	.11	.14	.11
	Flavor, price	.60	.86	.75	.80	.81
Potato chips	Brand name, flavor	.50	.62	.61	.59	.59
	Brand name, price	.17	.27	.25	.18	.13
	Flavor, price	.38	.67	.65	.64	.63

Appendix 4.D Imputation method for favorite available (jam and potato chips)

Our data contained missing values for one variable, namely favorite available. For a number of subjects the question related to this variable was not posed, because it was not applicable. Subjects, who did not have a preference for a specific product, were not asked whether this product was available in the assortment. This was the case for 54 subjects for the jam assortments (35% of the subjects) and for 34 subjects for the potato chips assortments (22% of the subjects).

SEM is sensitive to missing values and dichotomous variables (West et al. 1995). As a remedy for these missing data, an imputation method was used. The missing values were estimated based on valid values of the favorite available variable. We assumed that the probability that a favorite product is available is the same for consumers who are and for those who are not aware of their favorite product. Therefore, mean substitution of the favorite available variable was applied. We imputed the mean level of favorite available separately for each assortment size. The reason to do this is that larger assortments generally have a higher chance to contain the favorite product of a consumer. By taking into account these higher chances, we get a more realistic estimation of the missing values. The imputed values reflect the best estimate of the chance that a favorite product is available.

Table 4.D.1 Means of favorite available per assortment size and product category

		Assortment size					
Product category		5	20	35	50	65	Total
Jam	*Mean*	.67	.92	1.00	1.00	.95	.90
	SD	.48	.28	.00	.00	.23	.30
	N	21	24	23	15	19	102
Potato chips	*Mean*	.57	.89	.96	.96	.91	.87
	SD	.51	.32	.19	.21	.29	.34
	N	21	27	28	23	23	122

NOTE. Favorite available was measured as a dummy variable (0 = favorite is not available, 1 = favorite is available).

In Table 4.D.1, we provide the mean levels of favorite available (favorite is not available = 0, favorite is available = 1) for each assortment size, which were

imputed in the missing values. Except for assortment size 65 of both product categories, larger assortments indeed implied a higher chance of the availability of a favorite product. For the jam assortment of size 65, for one out of 19 subjects his/her favorite product was not available. For the potato chips assortment of size 65, for two out of 23 subjects it was not available. Although larger assortments contained all products of the smaller assortments, there still remained a chance that the favorite product of a subject was not available.

Using imputed means might lead to significant effects of favorite available that would otherwise not have been significant. To test for this potential flaw we performed independent samples *t*-tests on the raw data of favorite available (favorite is not available = 0, favorite is available = 1) for all hypothesized effects on perceived variety, chance of a perfect match, and all costs of variety. We found exactly the same results with the *t*-tests as with structural equation modeling. Thus, our solution of imputation was adequate.

Appendix 4.E Covariance matrix (jam and potato chips, pooled)

	LNSI	FA	PV1	PV2	PV3	PM	DF	VS	HU	IOO	IOC	SC1	SC2
Ln(size) (LNSI)	0.81												
Favorite available (FA)	0.11	0.08											
Perceived variety1 (PV1)	0.85	0.16	2.35										
Perceived variety2 (PV2)	0.82	0.16	1.94	2.29									
Perceived variety3 (PV3)	0.79	0.16	1.93	1.88	2.15								
Perfect match (PM)	0.61	0.19	1.31	1.30	1.21	2.09							
Decision freedom (DF)	0.72	0.14	1.48	1.42	1.43	1.21	2.33						
Var-seek over time (VS)	0.63	0.14	1.15	1.15	1.11	1.12	1.21	2.44					
Var-seek as a hedge (HU)	0.61	0.12	1.24	1.23	1.18	1.40	1.26	1.66	2.60				
Info overload~ overview (IOO)	0.37	0.08	0.23	0.28	0.23	0.11	0.02	0.01	-0.11	2.21			
Info overload~ confusion (IOC)	0.20	0.01	0.26	0.32	0.29	0.11	0.10	0.53	0.26	0.81	2.01		
Search costs1 (SC1)	0.15	-0.01	0.18	0.20	0.22	0.08	0.03	0.39	0.16	0.33	0.86	1.60	
Search costs2 (SC2)	0.21	0.01	0.30	0.33	0.33	0.13	0.12	0.43	0.13	0.51	0.98	1.37	1.86

continued

Appendix 4.E continued

	LNSI	FA	PV1	PV2	PV3	PM	DF	VS	HU	IOO	IOC	SC1	SC2
Attribute conflict (AC)	0.16	0.01	0.25	0.20	0.24	0.00	0.11	0.34	0.17	0.37	0.77	0.88	1.05
Value conflict (VC)	0.32	0.05	0.54	0.54	0.54	0.48	0.47	0.92	0.84	0.23	0.85	0.91	0.97
Potential regret1 (PR1)	0.17	-0.01	0.14	0.20	0.21	-0.07	0.14	0.33	0.10	0.20	0.54	0.67	0.80
Potential regret2 (PR2)	0.07	-0.01	-0.08	0.02	0.04	-0.21	-0.02	0.21	0.01	0.31	0.53	0.60	0.69
Attractiveness1 (AA1)	0.33	0.09	0.77	0.66	0.67	0.79	0.64	0.73	0.90	-0.29	0.12	0.16	0.03
Attractiveness2 (AA2)	0.23	0.08	0.76	0.66	0.70	0.73	0.82	0.83	0.93	-0.18	0.08	0.06	-0.03
Attractiveness3 (AA3)	0.35	0.10	0.90	0.82	0.87	0.87	0.84	0.85	1.00	-0.26	0.04	0.11	0.05

	AC	VC	PR1	PR2	AA1	AA2	AA3
Attribute conflict (AC)	1.73						
Value conflict (VC)	0.84	2.05					
Potential regret1 (PR1)	0.81	0.75	1.83				
Potential regret2 (PR2)	0.75	0.66	1.51	1.79			
Attractiveness1 (AA1)	-0.01	0.46	0.10	-0.06	2.06		
Attractiveness2 (AA2)	0.00	0.51	0.11	0.06	1.15	1.63	
Attractiveness3 (AA3)	0.04	0.46	0.03	-0.02	1.32	1.14	1.53

NOTE. $N = 312$.

Appendix 5.A Product category specific consumer characteristics (digital cameras and laptops)

Means and standard deviations for a number of product category specific consumer characteristics are given in the table below. Measurements were on a 1-7 scale. Subjects were rather involved with both digital cameras and laptops (*mean* = 4.60 for digital cameras, *mean* = 4.58 for laptops). An independent samples *t*-test revealed no significant differences in involvement between the two products (t = 0.21, p = .834). Subjects were also quite involved with the purchase of a digital camera (*mean* = 5.84) or a laptop (*mean* = 5.92). These mean levels of purchase involvement did not differ significantly (t = -0.53, p = .597). The risk associated with buying a digital camera or laptop was judged to be moderate (*mean* = 4.56 for digital cameras, *mean* = 4.64 for laptops). No significant difference between these mean levels was present (t = -0.58, p = .560). Scores on product expertise were also just above the midpoint of the scale (*mean* = 4.45 for digital cameras, *mean* = 4.21 for laptops) and did not differ significantly between the two product categories (t = 1.38, p = .169).

Table 5.A.1 Means and standard deviations of product category specific consumer characteristics per product category

Product category specific consumer characteristic	Product category: Digital cameras	Product category: Laptops	*t*-value
Product involvement	4.60 (1.13)	4.58 (1.05)	0.21
Purchase involvement	5.84 (1.16)	5.92 (1.31)	-0.53
Purchase risk	4.56 (1.13)	4.64 (1.16)	-0.58
Product expertise	4.45 (1.39)	4.21 (1.56)	1.38
Product complexity 1	4.61 (1.70)	4.78 (1.72)	-0.83
Product complexity 2	4.58 (1.33)	4.76 (1.30)	-1.11

NOTES. N = 149 for digital cameras and N = 139 for laptops. Measurements were on a 1-7 scale. Standard deviations are given in parentheses.

Digital cameras and laptops were judged to be rather complex, measured by item 1 (*mean* = 4.61 for digital cameras, *mean* = 4.78 for laptops) and by item 2 (*mean* = 4.58 for digital cameras, *mean* = 4.76 for laptops). Again, no significant differences between the two product categories were present (t = -0.83, p = .409 for item 1, t = -1.11, p = .269 for item 2).

Concluding, product category specific consumer characteristics did not differ significantly between digital cameras and laptops. Subjects were quite involved with the two rather complex products.

Appendix 5.B Dispersion and dissociation (digital cameras and laptops)

Attribute patterns, i.e. dispersion and dissociation (Van Herpen and Pieters 2002), were kept as constant as possible across assortment sizes. Dispersion of the attribute levels was measured with Relative Entropy, which is equal to Entropy (see Subsection 3.3.1) divided by the maximum level of Entropy possible given assortment size. Relative Entropy can take a level from 0 (no dispersion) to 1 (maximal dispersion). Dissociation between the attributes was measured with 1-Lambda (see Subsection 3.3.1). Here we provide the dispersion and dissociation levels of three in a pretest with 27 subjects most frequently mentioned attributes on which they base their selection. These attributes were brand name, number of megapixels, and price for digital cameras and brand name, internal memory, and price for laptops. For ease of interpretation, prices were grouped by truncating price values at hundreds (for example, € 2.400 became € 2.000). As a result of this procedure, there appeared to be no dispersion for price for the assortment of five digital cameras. However, all digital camera prices of this assortment size were different and ranged from € 300 to € 400. Overall, dispersion and dissociation levels were relatively stable across assortment sizes (see Tables 5.B.1 and 5.B.2).

Table 5.B.1 Dispersion: Relative Entropy

		Assortment size				
Product category	Attribute	5	20	35	50	65
Digital cameras	Brand name	.96	.96	.96	.97	.93
	Megapixels	.96	.87	.86	.90	.91
	Price	.00	.88	.85	.84	.83
Laptops	Brand name	.96	.94	.94	.96	.93
	Memory	.97	.78	.69	.70	.59
	Price	.96	.94	.95	.95	.94

Table 5.B.2 Dissociation: 1-Lambda

Product category	Attributes	Assortment size 5	20	35	50	65
Digital cameras	Brand name, megapixels	.38	.50	.53	.61	.65
	Brand name, price	.50	.62	.67	.70	.68
	Megapixels, price	.50	.41	.52	.54	.59
Laptops	Brand name, memory	.50	.47	.52	.51	.49
	Brand name, price	.17	.56	.64	.69	.69
	Memory, price	.50	.56	.59	.61	.62

Appendix 5.C Example of help screen (laptops)

Processor kloksnelheid (CPU)
De kloksnelheid in Mhz (Megahertz) van de processor. Het type processor bepaalt voor een groot deel de prestaties van een notebook. Zo staat 800Mhz voor 800 miljoen clockcycles per seconde. De CPU (Central Processing Unit) of processor is de centrale verwerkingseenheid van een notebook. Een processor draagt zorg voor alle bewerkingen die nodig zijn om het besturingssysteem en programma's te laten draaien. Hoe hoger de kloksnelheid van de processor, hoe beter de prestaties.

Processor type (CPU)
De CPU (Central Processing Unit) of processor is de centrale verwerkingseenheid van een notebook. Een processor draagt zorg voor alle bewerkingen die nodig zijn om het besturingssysteem en programma's te laten draaien. Naast CPU wordt ook de term CVE, Centrale VerwerkingsEenheid, gebruikt. De kloksnelheid in Mhz (Megahertz) en het type processor bepalen voor een groot deel de prestaties van een notebook. Zo staat 800Mhz voor 800 miljoen clockcycles per seconde. Nieuwe notebooks zijn veelal uitgerust met het type processor Pentium III. Bekende fabrikanten van processoren zijn AMD en INTEL.

Cache
Het Cache geheugen in Kb (kilobytes) is de hoeveelheid werkgeheugen in de desktop computer. In het cache geheugen worden gegevens opgeslagen zodat ze snel toegankelijk zijn. Hoe groter het cache hoe stabieler de data toevoer naar de processor zal zijn.

Front Side Bus
De FSB is de bus waar de processor in gaat, de snelheid wordt veelal weergegeven in mHz (megaHertz). De meest gangbare snelheid is tegenwoordig 100 mHz. Een snelheid van 133 mHz is echter geen uitzondering. In een notebook worden op het moederbord de processor door een bus gekoppeld aan bijvoorbeeld de harddisk en CD-ROM driver.

Intern geheugen in MB (uitbreidbaar)
Het maximaal uit te breiden intern geheugen in MB (megabytes). Tegenwoordig worden notebooks uitgerust met minimaal 32 mb, meer dan 64 mb is echter geen uitzondering. Het geheugen is veelal uitbreidbaar tot 256 mb of meer.

Intern geheugen upgrade slots
Het aantal RAM slots in de notebook om het intern geheugen uit te breiden. RAM slots worden gebruikt om de geheugenchips op het moederbord van de computer aan te sluiten.

Harde schijf opslag in GB
De maximale hoeveelheid data die u kunt opslaan op de harde schijf, gemeten in megabytes MB of gigabytes GB. 1 GB is gelijk aan 1024 MB. Software programma's worden vanwege nieuwe toepassingen steeds groter, het is raadzaam hier rekening mee te houden, zodat u ook in de toekomst voldoende opslagcapaciteit heeft.

Beeldscherm (type)
Er zijn diverse type notebook beeldschermen. De meest voorkomende zijn TFT (Thin Film Transistor) en HPA uitvoeringen. Vooral als uw notebook veelvuldig gebruikt is een TFT scherm aan te raden. Een TFT scherm is beter in kwaliteit, echter ook duurder in aanschaf.

Ga terug

Appendix 5.D Imputation method for favorite available (digital cameras and laptops)

The variable favorite available contained missing values for those subjects who did not prefer a specific product beforehand. If subjects did not have a preference for a specific product, the favorite available variable was not asked and coded as missing. This was the case for 75 subjects for digital cameras (50% of the subjects) and for 82 subjects for laptops (59% of the subjects).

The means imputation per assortment size method employed was identical to the one used for jam and potato chips. The imputed mean levels can be found in Table 5.D.1.

Table 5.D.1 Means of favorite available per assortment size and product category

		Assortment size					
Product category		5	20	35	50	65	Total
Digital cameras	*Mean*	.50	.58	.67	.71	.91	.70
	SD	.52	.51	.50	.47	.29	.46
	N	14	12	9	17	22	74
Laptops	*Mean*	.75	.67	.64	.75	1.00	.75
	SD	.45	.49	.50	.45	.00	.43
	N	12	12	11	12	10	57

NOTE. Favorite available was measured as a dummy variable (0 = favorite is not available, 1 = favorite is available).

Table 5.D.1 shows that larger assortments of digital cameras more often contained the favorite product of a subject: mean levels of favorite available increased with assortment size. For laptops, however, this did not hold. Smaller assortment of laptops also had a relatively high mean for favorite available. Potential explanations for why favorite available did not increase with assortment size are the following. One explanation could be that consumers defined their preference for a favorite laptop in very broad terms (e.g., an Apple laptop) instead of more specific terms (e.g., an Apple Ibook12 with a CPU of 900 Mhz and a modem speed of at least 56 KBPS). This would result in the availability of more favorite products for each assortment size. A second explanation could be that there is only a small number of favorite, popular laptops on the market and that

these were present in all assortment sizes. In short, in our experimental design, larger assortments increased the availability of favorite digital cameras, but not of favorite laptops. Mean levels of favorite available per assortment size were imputed for the missing values.

The imputation method might have led to significant effects of favorite available on other variables in the main research framework, which would otherwise have been insignificant. Independent samples *t*-tests on the raw data for favorite available (favorite is not available = 0, favorite is available = 1) for the hypothesized effects of favorite available on perceived variety, chance of a perfect match and the costs of variety were performed. Identical results were obtained as with structural equation modeling. Hence, our imputation method was acceptable.

Appendix 5.E Covariance matrix (digital cameras and laptops, pooled)

	LNSI	FA	PV1	PV2	PV3	PM	DF	IOO	IOC	SC1	SC2
Ln(size) (LNSI)	0.82										
Favorite available (FA)	0.08	0.10									
Perceived variety1 (PV1)	0.64	0.12	1.88								
Perceived variety2 (PV2)	0.60	0.13	1.60	1.95							
Perceived variety3 (PV3)	0.64	0.13	1.56	1.61	1.96						
Perfect match (PM)	0.54	0.17	1.13	1.14	1.15	2.45					
Decision freedom (DF)	0.40	0.09	0.97	1.06	1.15	1.17	2.24				
Info overload~ overview (IOO)	0.46	0.03	0.29	0.24	0.32	0.34	0.30	2.71			
Info overload~ confusion (IOC)	0.28	0.02	0.22	0.28	0.25	0.41	0.08	1.17	2.66		
Search costs1 (SC1)	0.30	0.00	0.20	0.29	0.33	0.24	0.13	0.69	0.87	2.27	
Search costs2 (SC2)	0.34	0.02	0.34	0.39	0.46	0.54	0.30	0.78	1.11	1.75	2.40
Attribute conflict (AC)	0.37	0.02	0.33	0.26	0.36	0.47	0.39	1.13	1.28	0.91	1.22
Value conflict (VC)	0.46	0.07	0.55	0.61	0.62	0.81	0.47	0.79	1.11	1.19	1.39

continued

Appendix 5.E continued

	LNSI	FA	PV1	PV2	PV3	PM	DF	IOO	IOC	SC1	SC2
Potential regret1 (PR1)	0.30	-0.02	0.11	0.23	0.23	0.05	0.03	0.78	0.84	0.70	0.88
Potential regret2 (PR2)	0.34	-0.04	0.15	0.26	0.20	0.08	-0.06	0.88	0.98	0.79	0.96
Attractiveness1 (AA1)	0.09	0.06	0.48	0.54	0.60	0.76	0.55	-0.25	-0.08	-0.07	0.01
Attractiveness2 (AA2)	0.09	0.03	0.38	0.44	0.43	0.73	0.58	-0.36	-0.26	0.18	0.06
Attractiveness3 (AA3)	0.11	0.05	0.44	0.47	0.50	0.74	0.51	-0.33	-0.31	-0.04	-0.05

	AC	VC	PR1	PR2	AA1	AA2	AA3
Attribute conflict (AC)	2.54						
Value conflict (VC)	1.32	2.93					
Potential regret1 (PR1)	0.99	0.82	2.68				
Potential regret2 (PR2)	1.07	0.88	2.32	2.65			
Attractiveness1 (AA1)	-0.08	0.07	-0.47	-0.53	1.87		
Attractiveness2 (AA2)	0.06	0.27	-0.20	-0.29	1.34	2.23	
Attractiveness3 (AA3)	-0.12	0.12	-0.31	-0.40	1.16	1.13	1.41

NOTE. $N = 288$.

Appendix 5.F Results of structural model (digital cameras and laptops, pooled)

Path from	Path to	Hypo-thesis[a]	Standardized coefficient	*t*-value
Ln(size)	Perceived variety	1 (+)	0.51	8.21***
Favorite available	Perceived variety	2 (+)	0.18	3.49***
Perceived variety	Perfect match	3a (+)	0.53	7.97***
	Decision freedom	3b (+)	0.56	9.67***
Favorite available	Perfect match	4 (+)	0.17	2.78**
Perceived variety	Info overload~lack of overview	5a1 (+)	0.04	0.49
	Info overload~ confusion	5a2 (+)	0.13	2.09*
	Search costs	5b (+)	0.24	3.41***
	Attribute conflict	5c (+)	0.18	2.73**
	Value conflict	5d (+)	0.28	4.03***
	Potential regret	5e (+)	0.14	2.25*
Ln (size)	Info overload~lack of overview		0.21	3.49***
Favorite available	Info overload~lack of overview	6a1 (-)	-0.02	-0.31
	Info overload~ confusion	6a2 (-)	-0.01	-0.13
	Search costs	6b (-)	-0.04	-0.70
	Attribute conflict	6c (-)	-0.02	-0.32
	Value conflict	6d (-)	0.04	0.61
	Potential regret	6e (-)	-0.12	-1.94*
Perfect match	Attractiveness	7a (+)	0.39	5.93***
Decision freedom	Attractiveness	7b (+)	0.14	2.01*
Info overload~lack of overview	Attractiveness	8a1 (-)	-0.17	-2.96**
Info overload~ confusion	Attractiveness	8a2 (-)	-0.08	-1.21
Search costs	Attractiveness	8b (-)	0.04	0.44
Attribute conflict	Attractiveness	8c (-)	0.02	0.34
Value conflict	Attractiveness	8d (-)	0.04	0.64
Potential regret	Attractiveness	8e (-)	-0.20	-2.88**

NOTES. $N = 288$. R^2 for assortment attractiveness = .30. The correlation between *ln*(size) and favorite available was .27.

[a] These hypotheses were formulated in Chapter 3 and were tested in Chapter 4 with jam and potato chips.

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

Appendix 6.A Product category specific consumer characteristics (time pressure)

A number of product category specific consumer characteristics were measured, namely product involvement, purchase involvement, purchase risk, and product expertise. Mean levels of these characteristics did not differ significantly between low and high time pressure as was investigated with independent samples *t*-tests, except for purchase risk.

Subjects were not really involved with the product potato chips (*mean* = 3.96, *SD* = 1.07), but they were somewhat more involved with the purchase of potato chips (*mean* = 4.57, *SD* = 1.33). The risk associated with purchasing potato chips was low (*mean* = 3.08, *SD* = 1.02). Purchase risk was significantly higher in the high time pressure condition (*mean* = 3.27, *SD* = 1.07) than in the low time pressure condition (*mean* = 2.90, *SD* = 1.01; t = -2.24, p = .027). Apparently, subjects experienced higher risks if there was only limited time available to inspect the assortment. Subjects thought themselves to have quite some expertise on potato chips (*mean* = 4.64, *SD* = 1.02). Overall, these numbers did not deviate much from those found for potato chips in Chapter 4 (see Appendix 4.B).

Appendix 6.B Imputation method for favorite available (time pressure)

The variable favorite available contained missing values. For subjects who did not prefer a specific product, it was not asked whether their favorite product was available. The variable favorite available was coded as missing for 8 subjects in the low time pressure condition (10%) and for 16 subjects in the high time pressure condition (22%). We imputed mean values of favorite available per time pressure condition in the missing values. The reason to impute values per time pressure condition is that it might be more difficult to find your favorite product under higher time pressure. By taking this into account, we get a more realistic estimation of the missing values. The imputed means were 0.89 (SD = 0.31, N = 73) in the low time pressure condition and 0.91 (SD = 0.28, N = 58) in the high time pressure condition. This difference was not significant as we investigated with an independent samples t-test (t = 0.44, p = .660).

Appendix 6.C Imputation method for potential regret (time pressure)

The variable potential regret contained missing values, since it was not measured if subjects had not chosen a product within the given time limits. Potential regret had been measured with the following two questions: (1) *'The chance that I will feel regret later on because I did not choose another bag of potato chips now, is (very small – very large)'* and (2) *'The chance that I will feel disappointed for not having chosen another bag of potato chips is (very little – very large)'*. Since the focus of both questions is specifically on the choice made, the questions were not posed for those subjects who had not chosen under normal time pressure conditions. This was the case for 2 subjects in the low time pressure condition (2%) and for 6 subjects in the high time pressure condition (8%).

SEM is sensitive to missing values (West et al. 1995). Therefore, we imputed the means per condition into the missing values. The same procedure was applied for the missing values of favorite available. The mean levels per condition were imputed, taking care of potential differences in potential regret between low and high time pressure. The mean level of the first item of potential regret was 2.47 (SD = 1.34, N = 79) in the low time pressure condition and 2.76 (SD = 1.50, N = 68) in the high time pressure condition. The mean level of the second item was 2.44 (SD = 1.25, N = 79) in the low time pressure condition, while it was 2.68 (SD = 1.39, N = 68) in the high time pressure condition.

Appendix 6.D Correlation matrix (time pressure)

	TP	FA	PV1	PV2	PV3	PM	DF	VS	HU	IOO	IOC	SC1	SC2
Time pressure (TP)	1.00												
Favorite available (FA)	0.05	1.00											
Perceived variety1 (PV1)	-0.01	0.16	1.00										
Perceived variety2 (PV2)	0.03	0.05	0.61	1.00									
Perceived variety3 (PV3)	-0.02	0.15	0.63	0.61	1.00								
Perfect match (PM)	-0.12	0.33	0.40	0.28	0.27	1.00							
Decision freedom (DF)	-0.15	0.04	0.37	0.38	0.40	0.31	1.00						
Var-seek over time (VS)	0.10	0.14	0.31	0.31	0.19	0.28	0.38	1.00					
Var-seek as a hedge (HU)	-0.08	0.04	0.30	0.26	0.14	0.41	0.43	0.35	1.00				
Info overload~ overview (IOO)	0.28	0.15	-0.13	-0.11	-0.07	-0.13	-0.23	-0.03	-0.20	1.00			
Info overload~ confusion (IOC)	0.05	0.08	-0.04	-0.06	-0.02	-0.10	-0.05	-0.04	-0.07	0.38	1.00		
Search costs1 (SC1)	0.38	0.04	0.06	0.10	0.09	0.05	0.14	0.10	0.14	0.19	0.49	1.00	
Search costs2 (SC2)	0.12	-0.09	0.02	0.09	0.08	-0.07	0.06	0.04	0.08	0.21	0.36	0.68	1.00

continued

Appendix 6.D continued

	TP	FA	PV1	PV2	PV3	PM	DF	VS	HU	IOO	IOC	SC1	SC2	AC
Attribute conflict (AC)	0.28	0.06	0.05	0.01	0.06	-0.05	-0.01	0.08	0.02	0.28	0.37	0.55	0.48	1.00
Value conflict (VC)	0.07	-0.03	0.09	0.09	0.03	0.09	0.20	0.22	0.22	0.16	0.31	0.46	0.48	0.47
Potential regret1 (PR1)	0.14	-0.09	0.07	0.09	0.08	-0.10	0.08	0.09	-0.04	0.17	0.39	0.41	0.33	0.46
Potential regret2 (PR2)	0.12	-0.11	-0.07	-0.04	-0.05	-0.14	-0.03	-0.06	-0.16	0.25	0.39	0.45	0.41	0.48
Attractiveness1 (AA1)	-0.28	0.05	0.37	0.26	0.23	0.39	0.34	0.07	0.41	-0.22	-0.13	-0.02	-0.04	-0.13
Attractiveness2 (AA2)	-0.13	0.09	0.27	0.28	0.17	0.35	0.25	0.06	0.39	-0.37	-0.23	-0.09	-0.14	-0.08
Attractiveness3 (AA3)	-0.12	0.20	0.29	0.19	0.18	0.44	0.24	0.07	0.40	-0.23	-0.22	-0.10	-0.20	-0.16

	VC	PR1	PR2	AA1	AA2	AA3
Value conflict (VC)	1.00					
Potential regret1 (PR1)	0.31	1.00				
Potential regret2 (PR2)	0.33	0.79	1.00			
Attractiveness1 (AA1)	0.14	-0.11	-0.10	1.00		
Attractiveness2 (AA2)	0.04	-0.19	-0.24	0.53	1.00	
Attractiveness3 (AA3)	0.01	-0.14	-0.23	0.63	0.62	1.00

NOTES. N = 155. All correlations are Pearson correlations, except for those with the dummy variable time pressure which are polyserial correlations. For favorite available and potential regret we provide correlations on the variables with imputed means for the missing values (see Appendices 6.B and 6.C).

Summary

Nowadays, variety is abundant in many different areas. Over and over again, people have to choose from huge amounts of possibilities. However, do consumers actually value the high variety presented to them for all the choices they have to make, even for repetitive decisions on daily groceries? Though more variety can be beneficial, it also has its costs for consumers. Retailers currently realize that there are limits to how much variety consumers want to be confronted with. Though what makes up an attractive level of variety is not yet exactly clear. It is necessary to reach a better understanding of how variety makes an assortment attractive to consumers. Therefore, the objective of this thesis is to provide insights into the relationship between the amount of variety in a retailer's assortment and how attractive the assortment is from a consumer's point of view. Accordingly, the main research question of this thesis is:

How does assortment variety affect assortment attractiveness?

This thesis comprises a rich quantity of experimental data that helps us in uncovering the relationship between assortment variety and the attractiveness of an assortment. Though a lot is already known about the effects of assortment variety, three important gaps in the literature that need more in-depth investigation are identified in Chapter 2. First, we intend to uncover the underlying psychological process of the relationship between assortment variety and consumer assortment evaluations, since it currently lacks a clear understanding. Second, while previous studies mostly found a positive impact of assortment size on assortment evaluations, we check whether the theoretically often proposed inverted U-shape for the impact of assortment size on assortment evaluations exists, by studying a wide range of assortment sizes. Finally, we investigate to what extent the effects of assortment variety can be generalized across different contingencies, i.e., different types of products and shopping situations.

In Chapter 3, a research framework is built that proposes that the relationship between assortment variety and assortment attractiveness can be explained by consumer perceptions of variety and by the benefits and costs that variety brings. In this thesis, assortment variety is captured by two assortment characteristics: the size of an assortment and the availability of a favorite product. Consumers are proposed to see more variety in an assortment that is larger and/or

in an assortment that offers the favorite product of a consumer. Higher perceptions of variety, in turn, can bring multiple benefits to consumers. We distinguish (1) the chance of a perfect match between what you want and what an assortment offers, (2) feelings of decision freedom, (3) the possibility for variety-seeking over time, and (4) variety-seeking in a portfolio of products as a hedge against uncertainty about future preferences. These benefits are proposed to make an assortment more attractive to consumers.

On the other hand, variety does not only bring benefits to consumers, it also has its costs. More perceived variety is proposed to lead to costs: (1) information overload, (2) search costs, and (3) a more difficult trade-off between the attributes of the products (attribute conflict). In addition, (4) it will be harder to choose between equally valued alternatives (value conflict) and (5) consumers will anticipate regret for not choosing another product (potential regret). These costs of variety are conjectured to lower assortment attractiveness. We propose that consumers make a trade-off between the benefits and costs of variety that result in how attractive they think an assortment is. Regarding the overall impact of assortment size on assortment attractiveness we hypothesize an inverted U-shape, which has been frequently suggested in the literature before. This means that initially larger assortments will be more attractive. However, after a certain optimum the attractiveness will go down again due to the higher costs of variety.

The research framework is empirically tested in Chapter 4 for assortments of simple grocery products. The objective of this chapter is to investigate the relationship between the variety in an assortment of simple products and the attractiveness of the assortment as well as the underlying process. The methodology used was a laboratory experiment in which assortment size was manipulated at a wide range, allowing us to detect potential nonlinear relationships. The stimuli employed were assortments of jam and of potato chips.

The most important results of this chapter are that we detected nonlinear effects of assortment size. We show how larger assortments lead to higher variety perceptions with decreasing marginal returns. Moreover, we find tentative support for the existence of an optimal level of assortment size. Larger assortments are more attractive to consumers. However, there is also a limit. Enlarging assortments further after this limit tends to lead to less attractive assortments. This overall relationship between assortment variety and assortment attractiveness can be explained by consumer perceptions of variety, multiple benefits of variety and one cost of variety. Though more variety leads to multiple costs of variety, only

one of them, a lack of overview, negatively affects the attractiveness of an assortment. The type of products under consideration offered a possible explanation for the fact that the costs of variety only had a small impact on assortment attractiveness. The type of simple grocery products studied in Chapter 4 generally involve limited problem solving. However, choosing a more complex product requires more extensive problem solving. Hence, the costs of variety induced by an assortment of complex products might be higher than for assortments of simple products.

In order to examine whether this is the case, we test the research framework in Chapter 5 for assortments of complex products. The objective of this study is to provide insights into the role of product complexity in the relationship between assortment variety and assortment attractiveness. A laboratory experiment was conducted in which we manipulated the size of assortments of digital cameras and laptops. Results of this experiment indeed showed much higher costs of variety when a more complex product has to be chosen. Variety in an assortment of complex products is difficult to handle. We also see that despite some differences the basic underlying process of the relationship between assortment variety and assortment attractiveness is similar for assortment of complex products as for assortments of simple products. In brief, the relationship between assortment variety and assortment attractiveness can be explained by perceptions of variety, benefits of variety, and costs of variety.

Some interesting differences in the underlying process between assortments of simple and complex products were also detected. First, the potential for regret has a more prominent role in assortments of complex products. The chance of purchasing the wrong product is much more relevant when an expensive complex product is bought that has to last for a number of years. In assortments of complex products a lack of overview as well as the potential for regret are critical in that they both make an assortment less attractive. Second, though the availability of a favorite product is important in assortments of simple as well as in assortments of complex products, it is more crucial in the latter. The availability of the product a consumer favors can bring clarity in the difficult task of choosing a complex product. Regarding the overall impact of assortment size on assortment attractiveness we found that large assortments of complex products are not more attractive than small assortments. Assortment attractiveness does not increase or decrease with assortment size. Consumers appear to cope with the high costs of variety in larger assortments by focusing only on a selection of products.

The complexity of the choice task discussed in Chapter 5 results from the assortment itself. However, task complexity can also stem from the situation a consumer finds him-/herself in. In Chapter 6, we study one specific complex situation, namely time pressure, which is a frequently occurring phenomenon. The goal of this chapter is to examine the role of time pressure in the relationship between assortment variety and assortment attractiveness. Again, a laboratory experiment was conducted. However, now we manipulated time pressure instead of assortment size. The stimuli consisted of an assortment of simple products, i.e., bags of potato chips, offering high variety.

The results show that most costs of variety that result from processing information increase with time pressure. An equal amount of information has to be processed in less time, which makes the task more demanding. Through the higher costs of variety and the somewhat lower benefits of variety, time pressure indirectly makes an assortment less attractive to consumers. The same assortment offering high variety is less attractive if it is encountered under higher feelings of time pressure. Thus, consumers do not seem to value high variety when they shop under time pressure.

In the final chapter (Chapter 7) we present an overview of the main findings of these three studies as well as their scientific contribution and managerial implications. The managerial implications of this thesis can be captured as follows. Retailers offering simple groceries should try to determine the optimal level of assortment size. Retailers carrying more complex products are advised to help consumers in their decision-making process by means of sales assistance. If such assistance is not feasible, retailers should consider offering small assortments. Further, overview in an assortment is crucial. A lack of overview directly makes an assortment less appealing from a consumer point of view. In addition, the availability of favorite products is also critical, especially in assortments of complex products. In such assortments, it is also relevant to lower consumers' feelings of potential regret. This could be achieved by for example offering favorite products or by providing explicit knowledge about the products. Finally, feelings of time pressure make a highly varied assortment less attractive to consumers. Retailers catering many hurried consumers might try to control time needed for shopping related activities, such as waiting in line at the checkout, in order to limit the negative effects of time pressure on the attractiveness of an assortment.

Summary (in Dutch)

Variëteit is overal aanwezig. Steeds weer moeten mensen kiezen uit een enorme hoeveelheid mogelijkheden. Waarderen consumenten zoveel variëteit eigenlijk wel in al de keuzes die ze moeten maken, zelfs bij dagelijks terugkerende boodschappen? Hoewel variëteit voordelen heeft, brengt het ook nadelen met zich mee voor de consument. Retailers realiseren zich dat er grenzen zijn aan de hoeveelheid variëteit waar consumenten mee geconfronteerd willen worden. Maar hoeveel variëteit nu werkelijk aantrekkelijk is, is nog niet bekend. Het is belangrijk om te achterhalen hoe de variëteit in een assortiment de aantrekkelijkheid ervan beïnvloedt. Het doel van dit proefschrift is daarom om inzicht te krijgen in de relatie tussen de hoeveelheid variëteit in het assortiment van een retailer en de aantrekkelijkheid van dit assortiment vanuit een consumentenperspectief. De onderzoeksvraag van dit proefschrift is dan ook:

Hoe beïnvloedt de variëteit in een assortiment de aantrekkelijkheid van het assortiment?

Op basis van een rijke hoeveelheid experimentele data wordt in dit proefschrift de relatie tussen variëteit in een assortiment en de aantrekkelijkheid van het assortiment onderzocht. Hoewel al veel bekend is over de effecten van variëteit, worden in hoofdstuk 2 drie hiaten in de literatuur vastgesteld die meer diepgaand onderzoek vergen. Allereerst willen we het onderliggende proces van de relatie tussen variëteit en de waardering van het assortiment door consumenten onderzoeken, aangezien het momenteel ontbreekt aan duidelijk inzicht in dit proces. Ten tweede vonden eerdere studies voornamelijk een positief effect van assortimentsgrootte op de evaluatie van een assortiment. Theoretisch is voor dit effect vaak een omgekeerde U-vorm voorgesteld. Dat wil zeggen dat de aantrekkelijkheid van een assortiment toeneemt met de grootte ervan, maar dat bij erg grote assortimenten de aantrekkelijkheid weer afneemt. Wij gaan na of de omgekeerde U-vorm bestaat door een brede range aan assortimentsgroottes te bestuderen. Ten slotte onderzoeken we in hoeverre de effecten van variëteit gegeneraliseerd kunnen worden naar verschillende omstandigheden, namelijk naar verschillende typen producten en koopsituaties.

Hoofdstuk 3 presenteert een onderzoeksraamwerk dat ervan uitgaat dat de relatie tussen de variëteit in een assortiment en de aantrekkelijkheid ervan

verklaard kan worden aan de hand van consumentenpercepties van variëteit en de voor- en nadelen van variëteit. We bestuderen twee aspecten van variëteit, namelijk assortimentsgrootte en de aanwezigheid van het favoriete product van de consument. We veronderstellen dat consumenten meer variëteit zien als een assortiment groter is en/of als het zijn of haar favoriete product bevat. Hogere gepercipieerde variëteit leidt vervolgens tot verschillende voordelen. We onderscheiden: (1) de kans op een perfecte match tussen wat de consument wil en wat het assortiment biedt, (2) een gevoel van keuzevrijheid, (3) de mogelijkheid om over de tijd heen te variëren tussen verschillende producten en (4) de mogelijkheid om te variëren als men in één keer meerdere producten koopt, dit om de uiteindelijke keuze uit te kunnen stellen naar de toekomst. We veronderstellen dat deze voordelen een assortiment aantrekkelijker maken voor consumenten.

Variëteit brengt niet alleen voordelen, maar ook nadelen met zich mee. Hogere percepties van variëteit worden verondersteld te leiden tot: (1) een overload, dat wil zeggen een teveel aan informatie, (2) hogere zoekkosten om het gewenste product te vinden en te kiezen en (3) een moeilijkere afweging tussen de verschillende eigenschappen, zoals prijs en merk, van de producten. Daarnaast zal het ook (4) lastiger zijn om te kiezen tussen producten die ongeveer even aantrekkelijk zijn en (5) zullen consumenten bij meer variëteit eerder verwachten dat ze spijt krijgen omdat ze een ander product niet kiezen. Deze nadelen zullen een assortiment minder aantrekkelijk maken. We veronderstellen dat consumenten de voor- en nadelen van variëteit tegen elkaar afwegen, wat uiteindelijk bepaalt hoe aantrekkelijk ze een assortiment vinden. We veronderstellen ook dat het totale effect van assortimentsgrootte op de aantrekkelijkheid een omgekeerde U-vorm zal vertonen, zoals regelmatig in de literatuur is gesuggereerd.

In hoofdstuk 4 wordt het onderzoeksraamwerk empirisch getest voor eenvoudige producten. Het doel van dit hoofdstuk is om de relatie tussen variëteit in een assortiment en de aantrekkelijkheid van het assortiment evenals het onderliggende proces hiervan te onderzoeken. De methode is een laboratoriumexperiment waarbij assortimentsgrootte over een grote range wordt gemanipuleerd (van 5 tot 65 producten), wat ons de mogelijkheid geeft om niet-lineaire verbanden te ontdekken. De gehanteerde stimuli zijn assortimenten met relatief eenvoudige producten, namelijk jam en chips.

Een van de belangrijkste resultaten van dit hoofdstuk is dat we niet-lineaire effecten van assortimentsgrootte constateren. We vinden dat grotere assortimenten leiden tot hogere percepties van variëteit met afnemende

meeropbrengsten. Daarnaast vinden we een voorzichtig bewijs voor het bestaan van een optimale hoeveelheid producten in een assortiment. Grotere assortimenten zijn aantrekkelijker voor consumenten, maar er is een grens. Het vergroten van het assortiment na deze grens lijkt te leiden tot een minder aantrekkelijk assortiment. Deze relatie tussen assortimentsgrootte en aantrekkelijkheid kan verklaard worden door percepties van variëteit, verschillende voordelen en één nadeel van variëteit. Hoewel variëteit tot meerdere nadelen leidt, heeft slechts één ervan, het gebrek aan overzicht door een overload aan informatie, een significant negatief effect op de aantrekkelijkheid van een assortiment. Dit komt mogelijk door het type producten dat is onderzocht. Eenvoudige producten zoals jam en chips leveren doorgaans geen ingewikkelde keuze op. Het kiezen van een complexer product vereist echter meer inspanning van de consument. De nadelen van variëteit zouden daarom bij het kiezen van een complexer product groter kunnen zijn.

Om dit uit te zoeken, testen we in hoofdstuk 5 het onderzoeksraamwerk voor complexe producten. Het doel van dit hoofdstuk is om inzicht te krijgen in de rol van product complexiteit op de relatie tussen variëteit in een assortiment en de aantrekkelijkheid ervan. In een laboratoriumexperiment manipuleren we de grootte van assortimenten van laptops en van digitale camera's. De resultaten van het experiment laten inderdaad veel sterkere nadelen van variëteit zien. Daarnaast tonen we aan dat het onderliggende proces van de relatie tussen variëteit in een assortiment en de aantrekkelijkheid ervan in essentie hetzelfde is voor assortimenten met complexe producten als voor assortimenten met eenvoudige producten. Kortom, de relatie tussen variëteit in een assortiment en de aantrekkelijkheid ervan kan worden verklaard door percepties van variëteit, voordelen en nadelen van variëteit.

Hiernaast laten de resultaten ook een paar interessante verschillen tussen complexe en eenvoudige producten zien in het onderliggende proces. Ten eerste speelt verwachte spijt een veel grotere rol bij complexe producten. Het maken van een foute keuze is veel erger als een duur complex product dat nog een tijd mee moet gaan, wordt gekocht. In assortimenten met complexe producten zijn dus zowel een gebrek aan overzicht als het verwachten van spijt cruciaal, omdat ze beide de aantrekkelijkheid van een assortiment verlagen. Ten tweede is, hoewel het ook relevant is voor eenvoudige producten, de aanwezigheid van het favoriete product van een consument belangrijker in een assortiment met complexe producten. De aanwezigheid van het favoriete product maakt de lastige keuze van een complex product makkelijker. Opvallend is daarnaast dat het totale effect van

assortimentsgrootte op de aantrekkelijkheid van het assortiment niet positief of negatief is. Kleine en grote assortimenten lijken even aantrekkelijk te zijn. Wel is het zo dat in grote assortimenten consumenten hun aandacht richten op relatief minder producten, wat kan leiden tot een suboptimale keuze. Vanuit dit oogpunt lijkt een kleiner assortiment van complexe producten dus beter.

De complexiteit van de keuze die in hoofdstuk 5 is besproken, is inherent aan het assortiment. De keuze kan echter ook complexer worden door de situatie waarin de consument zich bevindt. In hoofdstuk 6 onderzoeken we zo'n situatie, namelijk het veelvoorkomende fenomeen van tijdsdruk. Het doel van het hoofdstuk is om de rol van tijdsdruk in de relatie tussen variëteit in een assortiment en de aantrekkelijkheid ervan te bestuderen. Opnieuw wordt een laboratoriumexperiment uitgevoerd, maar nu wordt tijdsdruk gemanipuleerd. Als stimulus dient een assortiment met veel eenvoudige producten, namelijk chips.

Uit de resultaten wordt duidelijk dat tijdsdruk leidt tot grotere nadelen die te maken hebben met het verwerken van informatie. In minder tijd moet er evenveel informatie worden verwerkt, wat de taak lastiger maakt. Door grotere nadelen en enigszins kleinere voordelen, maakt tijdsdruk een assortiment minder aantrekkelijk voor consumenten. Hetzelfde assortiment dat veel variëteit aanbiedt, is minder aantrekkelijk als het onder tijdsdruk wordt benaderd. Het lijkt er dus op dat consumenten veel variëteit niet waarderen als ze onder tijdsdruk hun boodschappen doen.

Hoofdstuk 7 geeft een overzicht van de belangrijkste bevindingen van deze drie studies evenals de wetenschappelijke bijdrage ervan en de relevantie voor managers. De wetenschappelijke bijdrage is drieledig. Allereerst gaan we het effect na van een brede range van assortimentsgroottes op de aantrekkelijkheid van een assortiment. We laten zien hoe dit effect afhankelijk is van de complexiteit van de producten in het assortiment. Ten tweede geven we inzicht in het onderliggende proces van de relatie tussen variëteit in een assortiment en de aantrekkelijkheid ervan. Ten derde generaliseren we onze resultaten naar verschillende typen producten en koopsituaties.

De relevantie voor managers kan als volgt worden samengevat. Aangezien onze resultaten het bestaan van een optimale assortimentsgrootte suggereren voor eenvoudige producten, zouden retailers die dergelijke producten aanbieden deze optimale assortimentsgrootte moeten proberen te bepalen. Het advies aan retailers die meer complexe producten aanbieden, is om consumenten te helpen in hun beslissingsproces met behulp van verkoopmedewerkers, omdat de selectie van een

complex product uit een groot assortiment kan leiden tot een suboptimale keuze. Als dat niet mogelijk is, wordt aangeraden om kleine assortimenten aan te bieden. Verder is het essentieel dat consumenten overzicht van het assortiment hebben. Een gebrek aan overzicht maakt een assortiment minder aantrekkelijk. Daarnaast is ook de aanwezigheid van favoriete producten noodzakelijk, vooral in assortimenten met complexe producten. In zulke assortimenten is het ook belangrijk om verwachte spijt te voorkomen. Verwachte spijt kan bijvoorbeeld beperkt worden door favoriete producten aan te bieden of door specifieke informatie over de producten te geven. Tijdsdruk, ten slotte, maakt een assortiment met veel producten minder aantrekkelijk. Retailers die veel gehaaste consumenten bedienen kunnen bijvoorbeeld de tijd die nodig is voor koopgerelateerde activiteiten, zoals voor de kassa wachten, verminderen om het negatieve effect van tijdsdruk te beperken.

Curriculum Vitae

Eline de Vries - van Ketel (Voorst, 1973) received her gymnasium diploma in 1992 at the Stedelijk Gymnasium in Apeldoorn. She obtained her Propaedeutics degree in Psychology at the University of Utrecht. She turned to the University of Amsterdam to study Economics and received her Master of Arts degree in 1998. Her specialization was in Business Economics. She worked for one and a half year at an auditing firm (Walgemoed Accountants & Adviseurs, merged with BDO CampsObers in 2000) and for the same period of time as a business analyst at the marketing department of a commercial mortgage bank (FGH Bank N.V., subsidiary of Rabobank Group since 2003). At the end of 2000 Eline returned to academia and started her PhD in marketing management at the Erasmus Research Institute of Management, Erasmus University Rotterdam. She built expertise on consumer behavior and retailing research. She has presented her work at leading international conferences on marketing in Europe and North America. During two years she taught a course on retail assortments and supervised Bachelor's and Master's theses. Apart from her work, she enjoys to draw and paint, also on assignment.

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How Assortment Variety Affects Assortment Attractiveness

A Consumer Perspective

Nowadays, variety is abundant in many different areas. Over and over again, people have to choose from huge amounts of possibilities. However, do consumers actually value the high variety presented to them for all the choices they have to make, even for repetitive decisions on daily groceries? Retailers currently realize that although more variety can be beneficial, it has its costs for consumers as well. This thesis provides insights into the relationship between the amount of variety in a retailer's assortment and how attractive the assortment is from a consumer's point of view. Based on a rich quantity of experimental data this thesis uncovers the overall effects of assortment variety as well as the underlying processes, more specifically the perceived benefits and costs of variety. The relationship is examined across different types of assortments and buying situations. The thesis demonstrates that an optimal level of assortment size, which has been frequently suggested in the literature, seems to exist for simple groceries, such as potato chips. In addition, buying such products under time pressure makes a large assortment less appealing to consumers. For more complex products, like laptops, small and large assortments seem to be as attractive: a carefully selected small set of products already suffices. In-depth analyses reveal the role of consumer perceptions of variety and the benefits that make an assortment attractive. For instance, we reveal the important impact of feelings of decision freedom. Moreover, it is shown that although variety leads to multiple costs of variety, only a small selection of them makes an assortment less appealing. One such cost, a lack of overview, damages assortment attractiveness, making a clear organization of products on the shelf essential. In particular for complex products, anticipated regret of making the wrong choice is critical, since this too lowers assortment evaluations. Ultimately, this thesis offers a better understanding of the effects of variety in assortments on consumer assortment evaluations.

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