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MSc Thesis Marketing & Consumer Behaviour

The influence of online scarcity cues on consumers purchase intention

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Abstract

Background/objective: Online retailers frequently use scarcity statements in their marketing communications. These statements are used to communicate that the availability of products in stock is limited (e.g. “Limited edition”, “Hurry up, only few items left”) or that the offer is valid for a limited amount of time (e.g. “This offer expires in ..”). These tactics are often incorporated in offers with price discounts in order to make products appear even more attractive or to put pressure on the buying decision. Since scarcity appeals are used so frequently in online offers nowadays, it is possible that consumers became sceptical about such marketing tactics. For them it is difficult to assess whether these scarcity statements are based on actual demand or supply for the product, or on the contrary, are deployed arbitrarily by marketers to stimulate consumer interest.

Besides the fact that consumers can become sceptical and therefore may ignore the scarcity tactic, it is also possible that scarcity tactics actually affect consumer inferences in such a manner that it has an impact on their purchase intention. In such case it is likely that scarcity affects consumer’s perceived popularity of the offer and consequently their perceived quality of the product. When this happens scarcity could raise feelings of competitiveness towards other consumers.

The current research aims to gain a better understanding in the persuasiveness of scarcity statements in an online context, by examining if these statements raise scepticism and competitive arousal.

Methods: To test the research model an experiment was conducted. The study had a 3 x 2 between-subject design that consisted of quantity scarcity (demand vs. supply vs. absent) vs. time scarcity (present vs. absent). Data of 130 respondents who recently bought products on the internet was gathered. The manipulation of scarcity and the measurement of dependent variables was based on past literature.

Findings:

The results show that time scarcity significantly raised scepticism. Scarcity due to limited supply and excess demand scarcity did not raise scepticism. Furthermore, the negative effect of time scarcity was attenuated when it was presented along with one of the quantity scarcity cues. In addition, scarcity due to excess demand had a positive effect on competitive arousal which mediated the eventual purchase decision.

Keywords: scarcity tactics, limited availability, consumer scepticism, product quality, offer popularity, consumer competitive arousal, e-commerce

1. Introduction

More and more consumers have discovered the ease of online shopping (GFK, 2014). In contrast to offline shopping, online shopping can dramatically reduce consumers search effort for price and product information. However, despite the benefits of these reduced search costs for product and price information, consumers may feel troubled in evaluating non-price attributes in an online setting. Consumers may be apprehensive about buying something without touching or feeling it because of quality uncertainty (Figueiredo, 2000). Online retailers use a variety of tactics to reduce this uncertainty. One frequently used tactic to manage this is a so-called 'scarcity appeal'. A scarcity appeal is defined as "a restriction in either quantity or time, on the opportunity of accessing a promotional offer *and/or* product during a specific sales promotion" (Soni, 2013, p 20). Besides a restriction on the offers' availability marketers can also pre-determine the number of units available, such as in the case of limited edition product (Eisend, 2008). 'Quantity scarcity' thus arises when marketers deliberately limit the supply of a product, put quantity restrictions on offers, or when many consumers actually bought the product. 'Time scarcity' on the other hand arises when marketers pre-determine the time period of a sales promotion or in the case of limited purchase opportunities.

Past research has shown that scarcity claims can have a powerful impact on consumer's purchase behaviour, because items and opportunities appear more attractive as they become less available (Lynn, 1991). Moreover, if scarcity of a product is caused because it is popular among large groups of consumers, fellow consumers logically infer that such high demand should arise because the product is considered valuable (van Herpen, Pieters & Zeelenberg, 2009). Scarcity can thus be a powerful persuasive tactic, however nowadays there is such an abundance of scarcity appeals online that it is possible that consumers became sceptical about such marketing tactics. It is imaginable that consumers sometimes doubt whether the scarcity statements are really based on actual demand or supply for the product, since they are easily deployed arbitrarily by marketers purely to stimulate consumer interest.

1.2 Problem definition

For marketers who frequently incorporate limited availability claims in their offers it is interesting to know when these claims drive or inhibit consumer's buying intentions. Worchel (1992) already argued that not all scarcity strategies enhance value. Recent studies on this matter focussed for instance on the content of the scarcity claim and how the scarcity claim relates to other information in the promotional message. One study shows that a high time restriction in combination with a weak message content, negatively affects the persuasiveness of a promotional message, because consumers become sceptic (Shen, 2013). Other research (Tan & Chua, 2004) shows that an explicit (vs. vague) scarcity statement positively affects its effectiveness (e.g. only 3 items left vs. only few items left).

Noticing the actual number of product left in the statement seemed more credible then a vague statement. One of the goals of the current study is to further explore the persuasiveness of scarcity in an online context by examining if the different types and combinations of online scarcity cues could raise scepticism. 'Scepticism' is in this study defined as: "*consumers' perceptions that scarcity appeals are artificial and purely used by marketers to stimulate consumer interest*".

The second focus of this study is on the effect of scarcity appeals on consumer competitive arousal (Nichols, 2012). Past research shows that scarcity implies competition, and successfully obtaining something scarce signifies that one has won the competition (Knowles & Linn, 2004, Gupta, 2013). When none or minimal scepticism is raised it is likely that consumers who notice a scarcity appeal feel an urge to buy quickly. This may occur because consumers assume that the stocks are limited. Obtaining the scarce product right away then fulfils their desire to win the game against the retailer (i.e. being a "smart shopper") and other consumers (Nichols, 2012). This 'competitive arousal' may function as an extra buying motivation on top of the enhanced value perception of the product, because consumer's also put value on the unique opportunity they get. They may experience a sense of triumph when they were able to purchase the scarce product before others did. This study builds on this premise, and experimentally tests the level of aroused competiveness of different scarcity cues in an online context. Besides scepticism this study thus attempts to find out whether a scarcity cue in an online context can instigate competitive arousal and if competitive arousal serves to influence decision making (i.e. has a mediating effect on purchase intention) (Mowen, 2004; Malhotra, 2010). If scepticism about the scarcity cue(s) is low and typical inferences drawn from scarcity can freely operate, then it is more likely that scarcity prompts feelings of competitiveness.

In sum, this study uses the concept of consumer scepticism and competitive arousal to examine the persuasiveness of quantity and time scarcity appeals in advertising messages in an online context. It is postulated that online scarcity appeals; promotional messages with a limitation in quantity and/or a time restriction, affect beliefs about the manipulative intent of the marketer. This raised scepticism in turn negatively affects the persuasiveness of the entire marketing communication, in that it decreases the positive effect of scarcity on consumers' perception and evaluation of the product. In addition, when none or minimal scepticism is raised it is more likely that consumers' purchase intention is influenced by competitive arousal.

This study has the following research objective: "*gain a better understanding in the persuasiveness of scarcity cues in an online context by examining if online scarcity cues and a combination of them raise scepticism and competitive arousal"*

1.3 Contributions

The contributions of this study are twofold. First, this study aims to provide a better understanding on the influence scarcity cues on raised scepticism and competitive arousal in an online context. Scarcity effects have received interests of many researchers for decades and its applications have long been practiced in marketing, in both online and offline business. Many studies have been conducted in various aspects of scarcity by applying different analysing methods. Surprisingly, relatively few studies have been done on the effects of scarcity in an online context (Jeong & Kwon 2012; Zheng, Lui & Zhao 2013; Bae & Lee 2005).

Secondly this study contributes to the existing literature of scarcity because it goes beyond a signalling perspective of scarcity ("scarce = value"). It aims to identify a boundary condition (i.e. scepticism) for the effect of scarcity in promotional messages on product and deal evaluation. A practical contribution of this study is that the interpretation of results can help online retailers crafting powerful promotional messages which incorporate scarcity. The study examines in which conditions there is a synergy between the different scarcity cues (quantity vs. time) or when they attenuate each other. It thus aims to find out if combinations of scarcity cues raise more or less scepticism than the use of one scarcity cue alone. Results can provide guidance for retailers how to make optimal use of scarcity appeals in marketing communications in an online context.

1.4 Research questions

The above discussion generates the following general research question:

What is the effect of different types of scarcity cues embedded in online offers on consumer scepticism and competitive arousal?

1. Are there differences in the level of raised scepticism between the types of quantity scarcity cues?
2. Does raised scepticism affect consumers' inferences about product quality and popularity of the offer?
3. Is there a direct effect of quantity scarcity on the perceived quality of the product and perceived popularity of the offer?
4. Does quantity scarcity trigger consumers' competitive arousal?
5. Does the addition of a time scarcity cue to an offer with a quantity scarcity cue affect consumers' inferences differently?
6. Is there an effect of quantity scarcity cues on purchase intention and is this influenced by other inferences?

1.5 Research structure

This research is structured in the following way. In the next chapter past research on scarcity effects is discussed and analysed. It briefly describes different findings of the effect of scarcity and scarcity appeals in marketing communications on consumers' perceptions and evaluations. It should be noted that it does not address early theories associated with scarcity (i.e. commodity theory, uniqueness theory and reactance theory (Brock & Mazzocco 2004)) because this goes beyond the scope of this study. After the scarcity section, past research on consumer scepticism of sales tactics and the concept of competitive arousal is addressed.

After the literature review follows the hypothesis formation and the conceptual framework is visualized. Chapter 4 involves the research methodology. This chapter addresses the chosen research approach which includes; pre-test results, the design and procedure, the manipulations and stimuli, and the measurement of variables. The following chapter consists of the results of the experiment, while the last chapter ends with the conclusion and implications. Here an interpretation of the results regarding the hypotheses is given. Moreover limitations of this study are discussed and suggestions for future research are given.

2. Theory and literature review

2.1.1 The concept of scarcity

Literature describes three conditions of scarcity; restricted availability, limited availability and conditional availability (Verhallen and Robben, 1995). In this study "scarcity" refers to the second type; limited availability which is caused by market circumstances. Verhallen and Robben (1994) suggest that limited availability in quantity enhances the intention to buy in the case when the scarcity is a result of market circumstances and when the scarce good is relevant and desirable. Thus, "scarcity alone does not have an effect on preference; it is the consumer's perception of the cause of the scarcity that influences preference" (Castro, 2010, p.6). When consumers are not aware of the cause of quantity scarcity or when it is caused due to nonmarket circumstances, it may be perceived negatively and is therefore less likely to affect product value (Lynn, 1992). In fact, when this happens scarcity represents a practical feature related to the ease of attaining the product (acquisition utility). It is then more likely that purchase intention is merely affected by feasibility considerations and not by increased involvement towards the product (Steinhart et al., 2013).

This study is built on the premise that consumers are capable enough to identify the cause of scarcity when used as a claim in an online offer. It should be noted that the term 'scarcity' referring to limited availability of a specific product in offline and online situations is somewhat debatable. Scarcity at one brick-and-mortar store or webshop does not directly imply that the particular product is also scarce in another store or webshop.

2.1.2 Types of scarcity

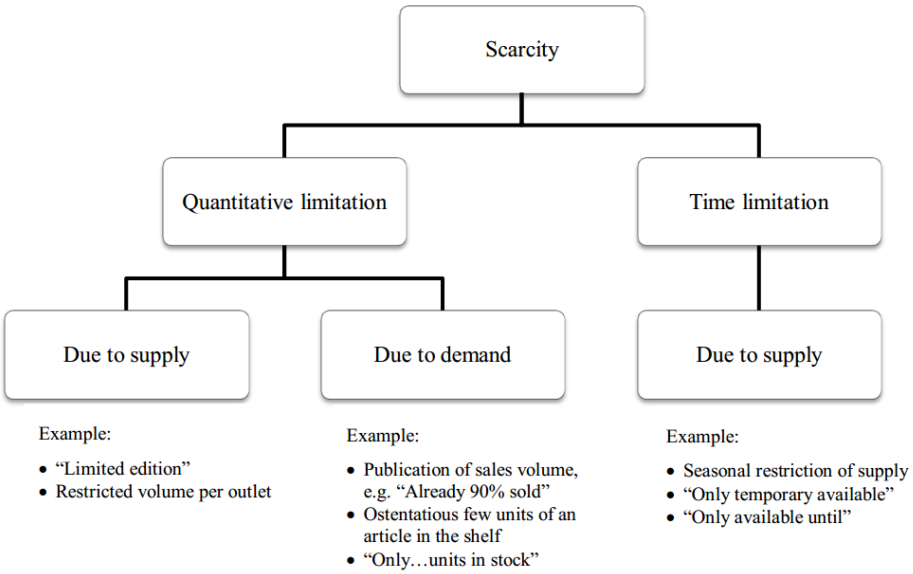
Scarcity is used in marketing communications in different ways, for instance; the offering of a limited edition product, having exclusive distribution, limiting an offer for a limited time, restricting maximum order size, etc. These tactics are broadly divided into *quantity* and *time* scarcity (see Figure 1) (Gierl et al., 2008). The different types of scarcity each affect consumers' inferences and behaviour in their own manner.

Quantity scarcity of the product itself stems from changes in supply and demand. Supply-caused scarcity results from a limitation of the available units caused by the producer or the vendor. "Scarcity due to limited supply implies that the number of potential co-owners of a product is restricted from the beginning of the market process" (Gierl & Huettl, 2010, p. 227). A limited edition product is a classical application of this type of scarcity, in which the market quantity is set initially by marketers before launching the product. The other type of quantity scarcity, demand-caused scarcity, is limited availability resulting from excess demand which is not met by supply of the producer or the vendor. It is thus caused by an interplay between supply and demand. In this case, retailers simply reveal the

forthcoming sell-out of the product, for example “only... units left in stock”, to communicate the scarcity to consumers.

The second type, time scarcity is scarcity which results from a limitation in time. That means that in the case of a temporary discount invented by the retailer the deal or offer is scarce and not the product itself. A typical example of this tactic is used by so-called deal-websites (e.g. Groupon). They embed a countdown timer on their websites showing the exact remaining selling time up to seconds. There are also other forms of time scarcity, like for instance a limited purchase opportunity (e.g. merchandise at a concert, pop-up store) or the seasonal availability of products but they are beyond the scope of the current study. This study is merely focussed on consumers’ responses to online time scarcity cues which are invented by the retailer to increase the pressure on the buying decision.

Figure 1: Types of scarcity (Gierl et al., 2008)



2.1.3 Outcomes and theories of scarcity

Past research shows that scarcity in terms of quantity and time often increases product evaluation. This effect appears to be robust, for a variety of products in both utilitarian and hedonic product categories (Fitzsimons, 2000; Inman et al., 1997; Stock and Balachander, 2005; Van Herpen et al., 2009) across countries and cultures (Jung & Kellaris, 2004). Lynn (1992) explained the effect of scarcity by “naive economic theories” held by consumers. These naive economic theories are the beliefs and expectations of consumers regarding causal relationships between economic variables. According to this theory, consumers prefer scarce products because they believe that scarce products are more expensive, have a high quality, and are good investments (Lynn 1992). Note that this explanation is

contrary to classical micro economic theory which posits the under scarcity the price should raise and consequently demand declines.

Many researchers conducted research on the effect of quantity scarcity and time scarcity. In the scarcity literature was found that individuals prefer cookies (Worchel, Lee & Adewole 1975), recipe books (Verhallen and Robben, 1994), and paintings (Lynn 1989) that are scarce. Esch & Winter (2010) found that introducing a fast-moving-consumer-good [FMCG] as a 'limited edition' improved consumers' attitude towards the brand and their perceptions of brand creativity. Swami and Khairnar (2003) showed that highlighting a limitation in the number of theatre tickets available increased box office ticket sales, while Balachander et al. (2009) found that scarcity at the time of a product launch increased the demand for cars. Scarcity thus enhances the perceived value of products, resulting in higher product desirability, increased quantities purchased, shorter searches, and greater satisfaction with the purchased product (Aggarwal, Yun, and Huh 2011; Lynn 1991). Another study by Mittone and Savadori (2009) suggest that scarcity messages not only increase the choice of a good, but also increase the willingness to pay. Another typical finding in the scarcity literature is that consumers who have a high need-for-uniqueness [NFU] show more positive attitudes towards products that are scarce due to limited supply, while low-NFU consumers show more interest in products that are scarce due to excess demand (van Herpen, Pieters & Zeelenberg, 2005; Gwee & Chang, 2013; Roy & Sharma, 2015).
Past literature regarding time scarcity showed that announcements emphasizing the limited time of an offer (e.g., "For one month only") increased purchase intent toward the promoted product (Simonson, 1992). Inman et al. (1997) showed that advertising with a time scarcity appeal (e.g. "Only available for a limited time") increased consumer evaluations of FMCG. Devlin, Ennew, McKechnie, and Smith (2007) found that people preferred TV's promoted under a limited time offer (e.g., "For one week only") over those promoted without a limited time offer. Brannon and Brock (2001) showed that a snack food (i.e. cinnamon twist) promoted under high scarcity in time (i.e. "today only") led to greater sales than the same product promoted under low scarcity in time (i.e. "all year").

As is clear by now, consumers' perceptions and evaluations of scarcity is a widely investigated topic of research (e.g. Lessne & Notarantonio, 1988; Lynn & Bogert, 1996; Wu & Hsing, 2006). Interestingly, research on the exact effects of scarcity appeals on consumer behaviour has led to two theories with contradicting propositions. Some researchers (Inman, et al., 1997, Cialdini, 2001) have argued that scarcity functions as a *heuristic cue* for product value. These researchers posit that the positive effect of scarcity on purchase intention is caused by the fact that scarcity acts as a signal of consumer demand, and hence product quality (Inman et al., 1997; Verhallen and Robben 1994). It has been

argued that when consumers see a scarce product, they logically infer that scarcity is caused by a large number of other consumers buying the product. Such excess demand, in turn, should arise when the product is considered valuable by many consumers (van Herpen et al., 2009). In this manner, scarcity acts as a market-based or social signal of product value (Lee, 2012). This phenomenon is also consistent with bandwagon reasoning which posits that people prefer popular products because popularity prompts inferences of product quality (Kardes et al., 2004). Besides the heuristic-cue theory (i.e. scarcity = value) there is a contrary theory, the *motivation-enhancement* theory. This theory posits that scarcity functions as personal involvement which motivates consumers to scrutinize the product message and make decisions on the basis of true quality of a product (Brannon & Brock, 2001; Chen, 2013). In situations with high scarcity consumers are then more inclined to think about the true merits of an object (i.e. systematic thinking) (Bozzolo & Brock, 1992). The controversy is whether scarcity is a heuristic cue or a motivation enhancer because it is impossible for scarcity to function as both.

Further discussion of how scarcity affects consumer behaviour goes beyond the scope of this study, hence the remainder of past research on quantity scarcity is summarized in table 1 and past research on time scarcity in table 2 (see Appendix I).

2.2 Scepticism

One of the foremost challenges for online retailers is convincing consumers that promotional information is truthful. Credibility is a necessary precondition for the effectiveness of any persuasion claim (Kirmani & Rao, 2000). Past research shows that when the ulterior motives of the marketer are too salient, consumers become sceptical (Ham, Nelson & Das, 2015). As a consequence consumers then ignore the persuasive tactic, attempt a more balanced elaboration of the message, or discount the message (Shu & Carlson, 2013).

Several researchers have brought scarcity in relation with scepticism (Yeo & Park, 2009; Jeong & Kwon, 2012; Parker & Lehman, 2009; Lee, 2012, Acquirre-Rodriquez, 2013). These studies examined the possibility that consumers could suspect that marketers are making an inaccurate statement about limited availability, in order to give an artificial signal of popularity for a product that would otherwise be less attractive. Parker & Lehman (2011) found that when retailers' persuasion motives and tactics are made salient there is no longer a strong and positive impact of scarcity on choice. Yeo and Park, 2009 postulate that consumers' generation of suspicion about the persuasive intent of a scarcity message and acting on it requires a considerable amount of cognitive resources. Results of their study show that scarcity had a positive effect on consumer evaluations only when cognitive resources where distracted, otherwise the scarcity tactic raised scepticism. Lee (2012) found three activators of scepticism towards scarcity appeals. The activators where: "frequency of exposure to scarcity" which

is defined as the number of times scarcity claims are encountered within a given time period, "disconfirmation of scarcity" which is defined as marketplace information that appears to be inconsistent with the scarcity claim, and "decision reversibility" which is defined as the ability to undo a purchase decision (Lee, 2012). Other research by Acquirre-Rodriquez (2013) found that supply-caused scarcity messages are less likely to raise scepticism than demand-caused scarcity messages, however message specificity moderated this effect. These findings evince that stating the appeal in specific (vs. vague) terms can decrease the persuasiveness of supply-related scarcity appeals.

Past research thus shows that consumers can interpret a scarcity appeal as a false claim being made by marketers to increase sales. Researchers have proven that scarcity is a successful tactic in influencing consumers to purchase a product and moreover that it tends to increase consumers susceptibility for a promotional offer (Aggarwal & Vaidyanathan, 2003). However when consumers infer that scarcity is a false claim being made by marketers, scarcity would no longer be an accurate signal of limited supply or excess demand and hence product value (Eisend, 2008). As a result, the positive effect of scarcity on product evaluation would then be attenuated. In other words, when scepticism is raised it is likely that it has a negative effect on subsequent inferences that are typically drawn from scarcity appeals such as product quality inferences and offer popularity inferences. A study by Jeong and Kwon (2012) even found that an entire message with a scarcity appeal in an online context was perceived as less credible then a message without a scarcity appeal because consumers became sceptical. Besides the fact that scepticism can attenuate scarcity's signal of value at one moment it is also likely that consumer develop a greater aversion against scarcity claims every time they notice a similar tactic in the future occasions. In such case it is likely that scarcity tactics are perceived as inappropriate more and more automatically.

2.3 Consumer competitive arousal

A competition has been defined as a situation that stimulates an individual to strive against others while trying to gain what another is trying to gain at the same time (Maller, 1929). Competitiveness plays an important role in consumer decision making under conditions of scarcity. Competitiveness arises when the same product meets the preferences of at least two individuals but there is (probably) not enough in stock to satisfy both. Successfully obtaining something scarce then signifies that one has won the competition (Knowles & Linn, 2004). According to this perspective, Nichols (2012) suggests that scarcity is an important antecedent for so-called 'consumer competitive arousal' (CCAR). This concept is defined as: "feelings and thoughts regarding the competitive nature of a purchase situation, and the belief that one would need to compete with other buyers to achieve a goal in a particular buying situation" (Nichols, 2012, p. 193).

When competitive arousal is triggered consumers are more likely to rely on heuristics to come to their judgements, as a consequence it affects rational decision making. Results of Nichols (2012) as well as Aggarwal et al. (2011) show that when products are advertised with scarcity messages (e.g. 'only five per store, hurry in!') people's competitive instincts are activated and they make their choices accordingly. Results of Nichols (2012) also reveal that when a scarcity sales message was presented, participants had a significantly higher performance anxiety, more feelings of rivalry and greater perceptions of scarcity when compared with a sales message without a scarcity appeal. Also Yoon, Chang & Lee (2014) found that a restrictive message which limits the availability of a service is perceived as competitive by consumers. However in their study a quantity restriction was perceived as more competitive than a time restriction. Results of past research thus reveal that competitive arousal can be an important mediator, giving an explanation of the desirability of product or services that are scarce in quantity.

The current study attempts to extend Nichols' (2012) research by assessing if competitive arousal is triggered when consumers notice scarcity cues in an online context (vs. offline context). Besides that, it also attempts to explore if findings by Yoon et al., (2014) hold in an online situation with consumer products and not services. The current study also seeks to find out if adding a time scarcity cue to a quantity scarcity cue initiates changes in the intensity of competitive arousal compared to the use of a quantity scarcity cue alone.

3. Hypotheses and research framework

3.1 Scepticism raised by different types of scarcity

As mentioned, the different types of scarcity cues that are used in online offers are induced by different sources. Quantity scarcity is generated due to an interplay between supply and demand. Supply-caused scarcity arises when the retailer deliberately controls the supply of the product in the marketplace, i.e. supply is limited intentionally. On the other hand, in the case of demand-caused scarcity the retailer does not limit the supply of the product but the scarcity arises due to high demand for the product thus leading to stock depletion, i.e., demand exceeding supply. In this case the retailer simply displays the items available in stock accompanied with a scarcity message (e.g. “while stock lasts!”). In the case of time scarcity the vendor intentionally places restrictions on the time to make a decision. All three are thus forms of human-induced scarcity but their origins are different, as one is controlled by the marketer, the other is controlled by the consumer and the last one is controlled by the webshop (see table 1).

It is likely that because of the frequent and continuous use of scarcity tactics in offline and online situations consumers became aware of the fact that statements such as "Hurry, only few items left," or "Limited quantities!" are not based on actual demand or supply for the product, but could, instead, be deployed arbitrarily by marketers to stimulate consumers to purchase the product in the offer. Besides that, it is also possible that consumers became sceptical about time scarcity cues such as countdown timers. This may happen because the internet allows them to easily search for other websites where the product is on discount.

The more consumers activate the association that scarcity is a marketing tool, the stronger these associations become, which results in more scepticism in future events. This could be detrimental to the sales of products advertised with either a quantity or time scarcity cue, because the positive effect of scarcity on product evaluation would then be attenuated. This study builds on this, it argues that due to online marketplace experience consumers have a certain perception of scarcity appeals and have learned to how to deal with them. Yet they are more and more aware of the cause of scarcity and are capable to distinguish the different sources of quantity scarcity.

Table 1. Scarcity types

Scarcity type	**Induced by**	**Level of scepticism**
Demand	Fellow consumers	Low
Supply	Supplier/marketer	Moderate
Time	Webshop	High

When a website incorporates a demand scarcity cue in their offer, the excess demand is induced by fellow consumers and is not controlled by the retailer as in the case of a supply scarcity cue. I therefore argue that in an online shopping context the supply scarcity cue raises more scepticism than a demand scarcity cue, because the demand scarcity cue seems more truthful. It follows that:

> H1a. An online offer with a supply scarcity cue raises *more* scepticism than an offer with a demand scarcity cue

Based on the above I also propose that time scarcity raises more scepticism than the both types of quantity scarcity. This may be the case because it is deliberately used by the vendor to put pressure on the buying decision and consumers are aware of that. Moreover, in an online situation consumers may feel hindered in thoroughly examining the product in a greater extend then one of the both quantity scarcities. The current study attempts to find out if a combination of scarcity cues (time scarcity cue + a quantity scarcity cue) has an effect on the intensity of raised scepticism.
I argue that a when a time scarcity cue and a quantity scarcity cue are combined it raises less scepticism than when a time scarcity cue is used alone. This may occur because time scarcity is indirectly related to consumer demand since marketers would be expected to put time restrictions on popular products and products labelled as 'limited edition'. It is thus possible that a combination of a quantity scarcity cue and a time scarcity cue minimizes inferences of manipulative intent because the information that is presented is congruent and therefore seems more logical and truthful. From the logic above follows:

> H1b. When in an online offer a time scarcity cue is added to one of the quantity scarcity cues it raises less scepticism than when a time scarcity cue is used without any quantity scarcity cue.

When consumers have to make a buying decision in a limited time period, whether or not they perceived this as inconvenient, they experience some pressure. As consequence they tend to rely on easily obtained information that is available, rather than invest more time in gathering additional information (Maule & Edland, 1997). In practice this would mean that consumers are more inclined to judge and decide on the basis of specific information in the online offer. Thus, when a time scarcity cue is presented along with a quantity scarcity cue, consumers should be more likely to rely on the 'scarcity=value' heuristic again which has been reinforced by intuition and evolution (Inman et al., 1997). I already argued that in this respect a demand scarcity cue is more credible than a supply scarcity cue, therefore it follows that:

H1c. When in an online offer a time scarcity cue is added to a supply scarcity cue it raises *more* scepticism than when a time scarcity cue is added to a demand scarcity cue.

3.2 Popularity and quality inferences drawn from quantity scarcity

Several studies found that scarcity promotes inferences of product popularity and that product popularity signals the superiority to alternative products (Castro, 2010, Parker & Lehmann, 2011; van Herpen et al., 2008; 2009). Castro (2010) and van Herpen et al., (2009) in particular found that this even holds in a situation of shelf-based scarcity which resembled a real life shopping experience. The studies come to the conclusion that consumers assume that the scarce product is popular and they therefore perceive that the product has a better quality than the other available alternatives available at that moment. (Castro, 2010; van Herpen et al. 2009; Parker & Lehmann, 2011). Similarly, Eisend (2008) found that quantity scarcity appeals in advertisements (i.e. 'limited edition') also result in the enhancement of perceived product quality. Past research thus shows that the link between scarcity and perceived quality and perceived popularity is made in intuitive manner and the inference is therefore likely to be made automatic. Thus in a situation where none or minimal scepticism is raised, quantity scarcity could have a direct effect on offer popularity inferences and product quality inferences. It would be interesting to find out if there are differences in these inferences between supply-caused scarcity and demand-caused scarcity. Since demand-caused scarcity is induced by fellow consumers and not by the marketer it follows that:

> H2a. Perceptions of offer popularity are *higher* in an online offer with a demand scarcity cue when compared to a supply scarcity cue.

When comparing the types of quantity scarcity on product quality inferences it is not so obvious. Consumer could in both cases infer that a product has high quality. This could happen due to popularity inferences which signal quality, or due to the fact that consumer expect that limited editions are exceptional products. It follows that:

> H2b. There is no significant difference in product quality perceptions between a demand scarcity cue and a supply scarcity cue.

It is also argued that perceived offer popularity is positively related to perceived product quality. This corresponds with the bandwagon theory discussed earlier. Therefore:

H2c. The effect of quantity scarcity on perceived product quality is *positively* influenced by offer popularity inferences.

Besides the direct effect of scarcity, this study also attempts to find out if scepticism interacts with popularity and quality inferences. It is proposed that when scepticism is raised it negatively affects the positive effect of quantity scarcity on product quality inferences and offer popularity inferences. From this follows:

H2d. The effect of quantity scarcity on perceptions of offer popularity is *negatively* influenced by consumers' scepticism

H2e. The effect of quantity scarcity on perceptions of product quality is *negatively* influenced by consumers' scepticism

3.3 Consumer competitive arousal triggered by quantity scarcity

Previous research associates scarcity with competition and suggests that successfully obtaining something scarce signifies one winning the competition (Knowles and Linn 2004; Nichols 2012). Aggarwal, Jun & Huh (2011) showed for that consumer competition mediates the effect a scarcity message on purchase intention. In this case consumers were thinking about their possible regret when the particular item they like is sold to another customer. As mentioned in the case of demand scarcity many consumers bought the product, other hand in the case of supply scarcity it is controlled by the marketer. In both situations consumers could get the feeling they are in a competition. This is explainable because an individual's probability of getting the product in the offer is negatively correlated with that of another's. In other words, the degree of scarcity in quantitative limitation increases with each marginal unit sold. In the discussion that led to hypothesis 1 is proposed that the effectiveness of a demand scarcity cue is higher than a supply scarcity cue, since it induced by fellow consumers. The same logic is applied here, it follows that:

H3a. Competitive arousal is *higher* in an online offer with a demand scarcity cue when compared to a supply scarcity cue

A study by Yoon, Chang & Lee (2014) found that a restrictive message which limits the availability of the product amount (i.e. quantity scarcity) is perceived as more competitive by consumers then a restriction on purchasing time (i.e. time scarcity). A time-limited offer thus has significantly less influence on competitive arousal, because in principle all consumers can get the deal without

competing with their fellow consumers, as long as they make the purchase before the time limit expires. However, when the offer contains a time scarcity cue in combination with a quantity scarcity cue it could be different. Then it may be true that a time scarcity cue and quantity scarcity cue strengthen each other, since marketers are expected to put time limits on scarce items. In this case there is even more competitive arousal. It follows that.

> H3b. When in an online offer a time scarcity cue is added to one of the quantity scarcity cues it induces *more* competitive arousal then when one of the quantity scarcity cues is used alone.

Scarcity appeals can thus induce feeling of competitiveness, however only when positive offer popularity and product quality inferences are drawn from one of the quantity scarcity cues. When consumers do not infer that an offer is popular they will not experience competitive arousal. In addition when a product is not desirable (due to good quality) there is no need to win the competition. From this it follows that:

> H3c. Positive offer popularity inferences drawn from a quantity scarcity cue *increase* the level of competitive arousal

> H3d. Positive product quality inferences drawn from a quantity scarcity cue *increase* the level of competitive arousal

3.4 Scarcity and purchase intention

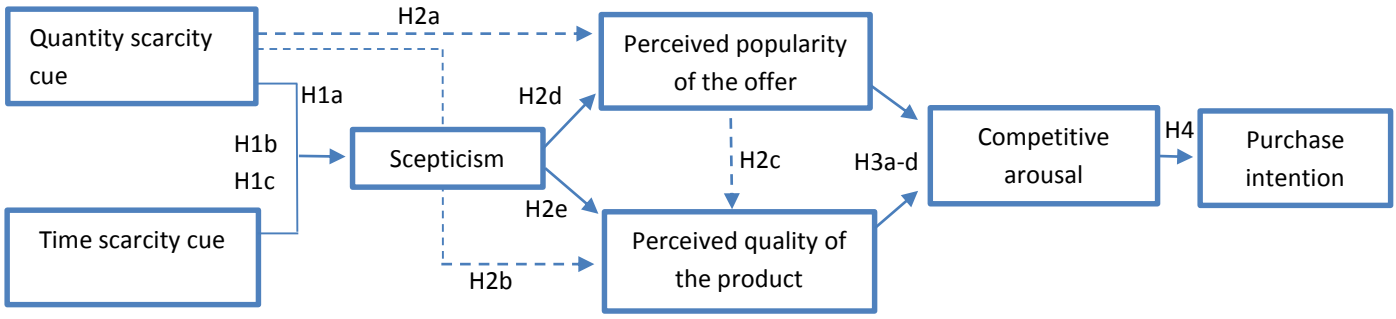
Purchase intention is a critical factor to predict consumer behaviour (Fishbein & Ajzen, 1975). Purchase intention can measure the possibility of a consumer to buy a product, and the higher the purchase intention is, the higher a consumer's willingness is to buy a product (Dodds, et al., 1991). It is reasonable that competitive arousal affects purchase intention in a positive manner. Therefore it is proposed that there is an indirect effect of quantity scarcity, via competitive arousal, on purchase intention. It follows that:

> H4. The effect of quantity scarcity on purchase intention is mediated by competitive arousal

3.5 Conceptual framework

The following research framework gives an overview of the relationships between the variables. All the proposed relationships are experimentally tested in this study.

Figure 2: Conceptual framework



3. Research methodology

3.1 Product selection

Prior to the main experiment a pre-test was conducted to find a suitable brand, a reasonable price and a familiar webshop. To rule out the moderating influence of product type on the main effect of scarcity, prior to the pre-test "digital camera" was selected as the appropriate product for the main study because it has both hedonic and utilitarian features (see Ku, Kuo & Kuo 2012). Besides product type, previous research also suggests that consumers' brand familiarity moderates the effect of a scarcity appeals on purchase intention. Research has shown that it can have a negative impact (e.g. Bae & Lee, 2005; Jung & Kellaris, 2004) as well as a positive impact (Huang et al., 2011). Since this study only seeks to find out if scepticism is raised by (one of the) scarcity cues is chosen for a real brand because a fictitious brand could directly influence subject's responses on the scepticism scale. Thus, to avoid any interference of consumers' brand familiarity it was decided to use a high familiar brand.

3.2 Pre-test

In order to select the brand, participants in the pre-test (N=21) were asked to select the brand that came first to mind when they think about compact digital cameras. The results showed that "Canon" was selected by more than half of the participants (52,4%), hence this brand was selected. Next, there was a question in order to decide a suitable price for the camera, avoiding the circumstance in which the scarcity has no effect due to the extreme prices (Inman et al., 1997). In order to eliminate the assumed expensiveness explanation in the main study (Lynn, 1987), price will be provided in each experimental condition. In order to select the price, participants were asked to give a reasonable price for the brand of camera they chose in the in previous question. It was found that €120 is a suitable price for the model of Canon camera used in this study. The actual price used in the main study was set at €119,95 because webshops often use a psychological pricing strategy. Next, participants in the pre-test were introduced to the concept of so-called deal-websites. In order to rule out issues with website preference participants were asked to select the deal-website they were most familiar with. The results showed that 57.1% of the respondents chose "Groupon.nl" as a familiar website, hence this website was chosen for the main study.

In the main study the inventory level will be displayed in conditions of quantity scarcity, while in conditions with time scarcity a countdown timer appears. Both of these manipulations will be held constant across the conditions, since this could directly affect participants' inferences of for instance offer popularity inferences. The remainder of questions in the pre-test were thus on the manipulation of scarcity and consisted of the inventory level and set time for a countdown timer. Participants were

shown a screenshot (see appendix II) of a Dutch daily-deal website and were asked to select the amount of products for both quantity scarcity conditions by which they thought there were relatively high and relatively low amount of products in stock. The mean was taken (corrected for one outlier) and showed that a quantity of "3" products in stock was perceived as relatively scarce. Besides that, participants were also asked to report the remaining time in which they thought they had enough time to make a purchase decision and the time in which they thought they had relatively limited time to make a purchase decision. The result showed that the countdown timer should be set at "0 hours; 18 minutes; 32 seconds" in order for consumers to experience a certain time pressure due to a time scarcity cue.

The pre-test ended with open questions asking participants' opinion about the Dutch translations of the statements in order to improve the main questionnaire. The comments were used to get the translations exactly right, to prevent for errors in the interpretation of the questions.

3.3 Design and procedure

Participants were surveyed in an online questionnaire using Qualtrics. The sampling technique used in this research was the non-probability convenience sampling technique, characterized by its absence of a complete list of the population (Saunders et al., 2009). Subjects have been reached in several ways: by sending the online survey to family, friends and fellow students, by posting a link to the survey on my personal Facebook and a Facebook especially for academic research participants, by personally asking students on the university if they wanted to cooperate, and by placing flyers on the announcement walls of the university.

All participants were be given a task of purchasing a new camera. Considering that the subject's brand preference (Jung & Kellaris 2004) and website preference (Lee, Oh & Sung, 2014) may affect the level of aroused scepticism I selected a well-known brand and webshop as mentioned in the pre-test section. Subjects' scepticism ratings are thus completely based on the offer at hand.

Based on the fact that scarcity is a signal of value, past research has identified that the extent of a price discount moderates the effectiveness of scarcity appeals (Inman et al. 1997). For this reason price discount percentage is held constant across conditions (40% off). Besides that, warranty is also held constant, and participants do not have access to reviews of fellow consumers since these factors are likely to affect ratings of product quality. Lastly, delivery time is also predetermined and held constant across conditions.

In the introductory text of the survey participants were told to imagine that they go on an unexpected cultural vacation and therefore they need a new compact digital camera because their old one broke down. Subjects had to imagine that while searching on the internet for good deals they stumbled upon

a promotional offer via a comparison website. Participants were told to imagine that this represents a real shopping situation. Next, participants were randomly assigned to one of the experimental conditions (see table 2) with one or more scarcity cue(s) embedded in them. After the offer was shown in the form of a screenshot subjects were asked to give their opinion about statements which were related to the screenshot. After this, participants had to fill in their age, gender, education level and the average amount of products they purchase online per quarter of the year. Finally, they were thanked for their participation and were and asked to fill in their email address if they want to make a chance on a gift voucher of € 10,- for a large online electronic supplies store in the Netherlands.

Table 2. Experimental groups

	Demand scarcity	**Supply scarcity**	**Control**
Time scarcity present	"Due to high demand only few items in stock!" + "items left: 3" & "this offer expires in 0 hours, 18 minutes, 32 seconds"	"Limited edition, supplies are limited! + "items left: 3" & "this offer expires in 0 hours, 18 minutes, 32 seconds"	"this offer expires in 0 hours, 18 minutes, 32 seconds"
Time scarcity absent	"Due to high demand only few items in stock!" + "items left: 3"	"Limited edition, supplies are limited! + "items left: 3"	Control ("enough in stock")

3.4 Manipulation and stimuli

In order to test the conceptual framework the study has an experimental 3 x 2 between-subject design that consists of quantity scarcity (demand vs. supply vs. absent) vs. time scarcity (present vs. absent). In table 2 can be seen that the presented scarcity information is manipulated into six conditions. In the demand scarcity condition the participants were provided with (objective) item availability information (inventory: 3) with a message that the product is scarce cue to excess demand ("due to high demand only few items in stock!"). In the supply scarcity condition the product in the offer was labelled as a "Limited Edition" product with an accompanying message that supply is limited because it is a limited edition product ("Limited edition, supplies are limited!") and again displaying item availability information (inventory: 3). In the time scarcity condition participants were provided with a countdown timer near the products' picture ("this offer expires in 0 hours; 18 minutes; 32 seconds". In the combination conditions the participants were provided with either the demand or supply scarcity cue

in combination with the countdown timer. In the control condition no scarcity information is provided. In each condition a picture and a detailed description of the product is given. Table 3 gives an overview of the coding of the independent variables.

Table 3. Coding of independent variables

Quantity scarcity	**Code**	**Time scarcity**	**Code**
Control	0	Absent	0
Demand	1	Present	1
Supply	2		

3.5 Measurements

3.5.1 Manipulation check

Perceived scarcity refers to the limitation of product amount or time, which induces buyer's perception of scarcity. To check if the manipulation was successful, perceived scarcity was measured on a 7 point scale (from "totally disagree" to "totally agree") in each condition. The statements of perceived quantity scarcity were: "The amount of available cameras is limited", "When somebody wants to buy the camera in this offer later this day it will probably not be in stock anymore" ($\alpha = .87$). The statement of perceived time scarcity was: "This offer is only valid for a specific amount of time".

3.5.2 Measurement of dependent variables

The following scales are used in the current study. Note that the Cronbach's alphas were all sufficient, namely above or close to the threshold of 0.7 (see appendix IV).

Scepticism

A slightly modified scale by Campbell (1995) was used to measure consumer scepticism. The questions were asked after respondents answered the questions on perceived quality, perceived popularity, competitive arousal and purchase intention in order to prevent that these questions made the consumers cautious. The scale of scepticism used in this study is a 7-item response scale which consists of four statements labelled "totally agree" to "totally disagree": "The offer was being honest about the number of cameras available for purchase", "I believe that the information in the offer was trustworthy", "I think other people would be very likely to be influenced favourably by this offer", "I think this offer deliberately uses insincere sales tactics in order to increase sales" (reverse coded). After inspecting the reliability measures it became clear that deletion of the third item improves the scale. I think this is explainable since the statement was related to scepticism of others, and not of one

individual. It was decided to delete the item because participants in the experiment should indicate their own scepticism related to the offer at hand and not consider possible scepticism of others. After excluding the item the Cronbach's alpha became α = .73.

Perceived product quality

Perceived product quality was measured on 7-point scales labelled "totally disagree" to "totally agree" on three statements: "This camera is attractive", "I think this camera is of high quality", "I think this camera is desirable" (van Herpen et al., 2009). The Cronbach's alpha was α = .88.

Perceived popularity of the offer

Perceived popularity of the offer is measured on 7-point scales labelled 'totally disagree' to 'totally agree' on three statements: "This offer is popular", "I think that many people want to buy this offer" and "This offer is sold well" (van Herpen et al., 2009). The Cronbach's alpha was α = .87.

Consumer competitive arousal

The degree of consumer competitive arousal is measured by a modified scale developed by Nichols (2012). Each item is formatted in to a 7-point response scale anchored at 'totally disagree' to 'totally agree'. There are six statements that measured this construct namely: "I will have to compete with others to buy the camera", "I will be seeking out something that other are also seeking out", "Other potential buyers are potential 'rivals' of mine", "If others who want to buy the camera are NOT able to buy this camera, it means they 'lost'", "Trying to buy the camera will be a competition against the retailer", and "I will feel successful if I am able to buy this camera on this day". The items cover the three key principles of competitive arousal: Performance anxiety, rivalry and scarcity recognition (Malhotra, 2000). The Cronbach's alpha for this scale was α = .86.

Purchase intention

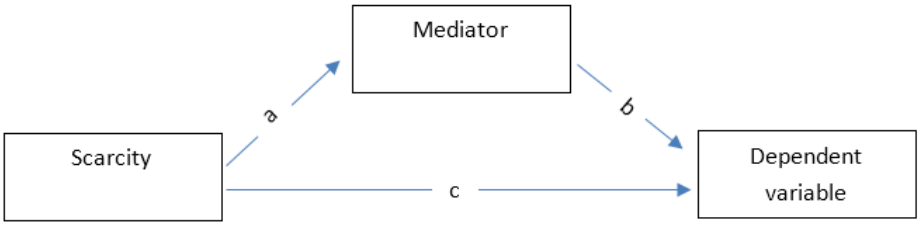
Purchase intention was measured by a measurement scale adopted from Dodds et al. (1991) and Wu et al. (2012). The scale was slightly modified and now contains two statements which are rated on 7-point scales anchored at "totally disagree" to "totally agree": "I am willing to purchase this camera" and "It is likely that I will purchase this camera". The Cronbach's alpha was α = .68.

3.6 Analysis of results

Besides ANOVA's to test the main effects of scarcity on the dependent variables, also mediation effects were tested. Mediation occurs when scarcity has a significant effect on the dependent variable via a mediator variable. For instance, scarcity should have a direct effect on purchase intention; second,

scarcity should have a significant effect on the mediating variable, in this case competitive arousal; third, competitive arousal should have a significant effect on the purchase intention; fourth, the direct effect of scarcity on purchase intention should get smaller when a competitive arousal is added as mediator (see figure 2).

Figure 3. Mediation paths



To test for mediating moderation effects I employed Preacher and Hayes's (2008) INDIRECT syntax for SPSS. Preacher and Hayes's non-parametric resampling procedures for testing mediation hypotheses generates bootstrap confidence intervals. Bootstrapping is a preferred method for testing mediation because it does not rely on the assumption of normality of the sampling distribution of the indirect effect (Preacher & Hayes, 2008). The type of path is directly related to the hypothesis (see table 4).

Table 4. Paths

Hypothesis	Paths	Type of path	Proposed effect
1a	Quantity scarcity → scepticism	a-path	(+)
1b	Time scarcity → scepticism	a-path	(++)
1b/1c	Quantity scarcity * Time scarcity → scepticism	a-path	(+)
2a	Quantity scarcity → perceived offer popularity	c-path	(+)
2b	Quantity scarcity → perceived product quality	c-path	(+)
2c	Perceived offer popularity → perceived product quality	b-path	(+)
2d	Scepticism → perceived offer popularity	b-path	(-)
2e	Scepticism → perceived product quality	b-path	(-)
3a	Quantity scarcity → competitive arousal	c-path	(+)
3b	Quantity scarcity * time scarcity → competitive arousal	c-path	(++)
3c	Perceived offer popularity → competitive arousal	b-path	(+)
3d	Perceived product quality → competitive arousal	b-path	(+)
4	Quantity scarcity → purchase intention	c-path	(+)
4	Quantity scarcity → competitive arousal	a-path	(+)
4	Competitive arousal → purchase intention	b-path	(+)

4. Results

4.1 Sample and response

The data of this study was collected in approximately four weeks. Because the nature of this research was focussed on product's sale and advertising on the internet, only participants who had experience or intent to purchase any commodities from the internet were selected for further analysis (only respondents who purchased on average ≥1 products per quarter of a year were included). After this selection there were still some partially completed surveys, these were not included in the dataset. After these corrections the final dataset consisted of 130 respondents of which 40% were male (N= 52) and 60% were female (N = 78) The age of respondents ranged between 14 and 62 years, however the majority (79.1%) of respondents were aged between 18 and 26 years. The educational level of respondents was relatively high, more than three-quarters (80.1%) had an educational level of HBO, WO-Bachelor or WO-Master (see appendix III). In the survey there was an effort to obtain approximately equal sample sizes in each condition because unbalanced designs can cause statistical complications (Field, 2009). Table 5 gives an overview of the sample sizes per condition. It shows that they are more or less equal.

Table 5. Sample sizes of experimental conditions

Control	Demand	Supply	Time	Demand*Time	Supply*Time
20	22	22	22	20	24

4.2 Normality and homogeneity of variance

Statistical approaches for significance level testing of quantitative data have certain requirements, namely normally distributed data and homogeneity of variance. According to the central limit theory, samples N ≥30 tend to be normally distributed regardless the actual shape of the sample distribution presented in histograms (Field, 2009). However, the total sample in this experiment is 130, but the number of respondents per condition was approximately 22. In order to ensure robustness of performed statistical tests, a visual and quantitative analysis regarding data distribution have been conducted.

The histograms and Q-Q Plots (Appendix VI) indicate that the data was slightly different than normally distributed. All histograms show a slight deviation from a normal distribution. This is echoed by the Q-Q plots that show some deviations from the exemplary diagonal line.

Besides the visual distribution of means, the data have been tested on normality trough the Shapiro-Wilk test for normality (Appendix VI). The analysis involves comparing groups, so what's important is the distribution of each group and not the overall distribution (Field, 2009). Hence this test is conducted per condition to get a better insight in which variables could cause statistical complications. The test provides evidence that especially the data of "perceived product quality" and "purchase intention" deviate from a normal distribution, since in four of the six conditions the tests are significant (see appendix VI). For the other variables some the distribution was close to normal (i.e. popularity, competitive arousal) or all variables were not significantly non-normal (i.e. scepticism) ($p > .05$). Since the data was only slightly non-normal I expected no major problems with running ANOVA's in SPSS. Moreover mediation analysis is conducted with the bootstrapping method, which is a non-parametric test.

Homogeneity of variance is tested as well. This assumption means that the variance of the dependent variables is the same for each condition (Field, 2009). To test the data, a Levene's test which was based on the mean was performed. Results indicated that the variances were equal, for scepticism $F(5, 124) = 1.82$, $p > .05$, for perceived offer popularity $F(5,124) = .763$, $p > .05$, for competitive arousal $F(5,124) = 2.28$, $p > .05$, and for purchase intention $F(5,124) = .969$, $p > .05$. For perceived product quality the variances were slightly different $F(5,124) = 1.81$, $p = .032$. However the Levene's test based on the median was non-significant $F(5,124) = 1.32$, $p = .260$. Field (2009) posits that ANOVA can still be used when variances are only approximately equal or if the number of subjects in each condition is equal.

4.3 Manipulation checks

The manipulation check tests whether the different scarcity cues in the online offer caused different perceptions of product scarcity and time scarcity. The ANOVA results in Appendix VII provide evidence there was a significant difference in perceptions of product scarcity between the conditions $F(5,124) = 13.32$, *p = .000.)* Perceptions of product scarcity were significantly higher in the demand ($M = 4.89$, $SD = 1.53$, $p = .000$), supply ($M = 4.68$, $SD = 1.31$, $p = .001$), demand*time ($M = 5.48$, SD = 1.27, $p = .000$), and the supply*time condition ($M = 4.79$, $SD = 1.55$, $p = .000$) when compared to the control condition *(*$M = 3.05$*,* $SD = 1.68$).

The results also show that there was a significant difference in perceptions of time scarcity between the conditions $F(5,124) = 14.03$, $p = .000$. Perceptions of time scarcity were significantly higher in the control*time ($M = 5.27$, $SD = 1.72$, $p = .000$), demand*time ($M = 5.95$, $SD = 1.00$, *p = .000*) and supply*time ($M = 5.79$, $SD = 1.14$, $p = .000$) when compared to the control condition without time scarcity (M = 3.05, $SD = 2.09$). These results indicate that the both manipulations of scarcity had the desired effect.

4.4 Main results of scarcity

We are interested whether scarcity had a direct effect on the dependent variables. Table 6 gives an overview of the means per condition. With use of ANOVA is tested whether the differences in means are significantly different.

Table 6. Means per condition

Condition		Scepticism	Popularity	Quality	Competitive arousal	Purchase intention
Control	No time	3.45	4.75	4.58	3.22	4.43
	Time	5.20	4.80	4.21	3.13	4.25
Demand	No time	3.85	5.67	5.19	3.91	4.86
	Time	3.90	5.90	5.57	4.63	5.45
Supply	No time	4.12	4.90	4.94	3.65	4.64
	Time	4.63	5.26	4.92	3.99	5.04

4.4.1 Scarcity and scepticism

An ANOVA compared the effect of scarcity on raised scepticism (see appendix VIII for outputs). The analysis provides evidence that that quantity scarcity had no significant effect on scepticism $F(2,124) = 2.38$, $p = .097$, $\eta_p^2 = .037$, however time scarcity did $F(1,124) = 14.06$, $p = .000$, $\eta_p^2 = .102$. There was also a significant interaction effect between quantity scarcity and time scarcity on scepticism $F(2,124) = 8.10$, $p = .003$, $\eta_p^2 = .088$. Since there is an interaction effect simple effects need to be interpreted in the context of the interaction result.

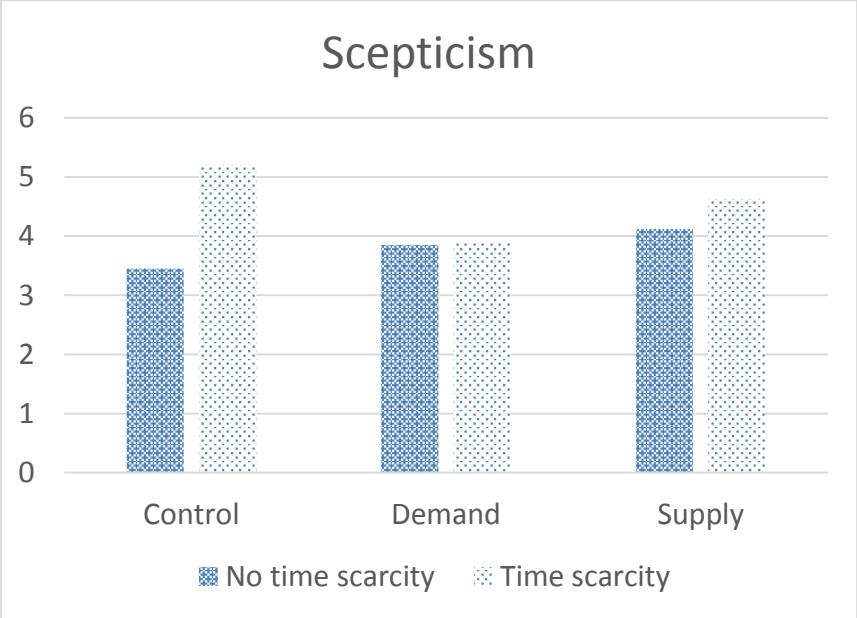
Results of post hoc comparisons using Tukey HSD show that the difference in raised scepticism between the demand ($M = 3.87$, $SD = 1.24$) and supply condition ($M = 4.38$, $SD = 1.20$) was not significant ($p = .103$). This fails to support hypothesis 1a, an online offer with a supply scarcity cue does not raise significantly *more* scepticism than an offer with a demand scarcity cue.

Results of a univariate test of the interaction effect show that there was a significant effect of adding a time scarcity cue to the control condition $F(1,124) = 23.58$, $p = .000$, $\eta_p^2 = .160$. But there was no significant effect on raised scepticism when a time scarcity cue is added to a demand scarcity cue $F(1,124) = .021$, $p = .886$, $\eta_p^2 = .000$, or when a time scarcity cue was added to a supply scarcity cue $F(1,124) = 2.15$, $p = .145$, $\eta_p^2 = .017$ (see figure 3). Only adding time scarcity to the control condition significantly changed consumers' perceptions of manipulative intent.

Results show that the difference in scepticism ratings between the control*time condition (*M* = 5.20, *SD* = .70) and the demand*time condition (*M* = 3.90, *SD* = 1.12) was a statistically significant (*p* = .000), however the difference of the supply*time condition (*M* = 4.63, *SD* = 1.21) was not significant (*p* = .099. This partially supports hypothesis 1b, when a time scarcity cue is added to either one of the quantity scarcity cues it raises *less* scepticism than when a time scarcity cue is used without any quantity scarcity cue. The hypothesis only holds in the case of demand scarcity. This indicates that an offer with a combination of demand scarcity and time scarcity raised *less* scepticism then an offer with a time scarcity cue alone.

Results also indicate that the addition of a time scarcity cue to a supply scarcity cue raised *more* scepticism than adding a time scarcity cue to a demand scarcity cue (*p* = .042), this supports hypothesis 1c. In practice this would mean that a demand scarcity cue in combination with a time scarcity cue seemed more truthful than a supply scarcity cue in combination with a time scarcity cue.

Figure 4. Interaction effect scepticism



4.4.2 Scarcity and perceived offer popularity

An ANOVA analysis was conducted to compare the effects of scarcity on perceived offer popularity. Results show that quantity scarcity had a significant effect on perceived offer popularity *F*(2,124) = 9.28, *p* = .000, η_p^2 = .130, however time scarcity had no significant effect *F*(1,124) = 1.23, *p* = .270, η_p^2 = .010. Besides, there was no significant interaction effect between quantity scarcity and time scarcity on perceived offer popularity *F*(2,124) = .209, *p* = .812, η_p^2 = .003.

Post hoc comparisons using the Tukey HSD test indicate that the mean for conditions where demand scarcity was present (*M* = 5.78, *SD* = .86) was significantly higher than mean of the control condition (M = 4.78, SD = 1.24, *p* = .000) and the conditions with supply scarcity (*M* = 5.09, *SD* = 1.13, *p* = .012). This supports hypothesis 2a, perceptions of popularity are *higher* in an offer with a demand scarcity cue when compared to a supply scarcity cue, regardless of the presence of time scarcity. In addition, results also show no significant difference in means between the supply condition and the control condition (*p* = .370). This means that a supply scarcity cue had no effect on offer popularity inferences.

4.4.3 Scarcity and perceived product quality

An ANOVA analysis was conducted to compare the effects of scarcity on perceived product quality. Outputs provide evidence that quantity scarcity had a significant effect on perceived product quality *F*(2,124) = 8.77, *p* = .000, η_p^2 = .124, while time scarcity did not *F*(1,124) = .00, *p* = .991, η_p^2 = .000. In addition, there was no significant interaction effect of quantity scarcity and time scarcity on ratings of product quality *F*(2,124) = 1.39, *p* = .253, η_p^2 = .022.

Post hoc comparisons indicate that the mean for the control condition (*M* = 4.39, *SD* = .95) was significantly lower than mean of the demand condition (*M* = 5.36, *SD* = .77, *p* = .000) and the supply condition (M = 4.93, SD = 1.35, *p* = .049). In addition, there was no significant difference in means between the conditions where demand scarcity was present and conditions where supply scarcity was present (*p* = .144). This supports hypothesis 2b, there is no significant difference in perceptions of product quality between the offer with a demand scarcity and a supply scarcity cue, regardless of the presence of time scarcity.

4.4.4 Scarcity and competitive arousal

An ANOVA analysis was conducted to compare the effects of scarcity on competitive arousal. Outputs reveal that there was a significant effect of quantity scarcity on competitive arousal *F*(2,124) = 8.86, *p* = .000, η_p^2 = .125, but no significant effect of time scarcity on competitive arousal *F*(1,124) = 2.38, *p* =.125, η_p^2 = .019. Moreover there was no significant interaction effect between quantity and time scarcity on ratings of competitive arousal *F*(2,124) = 1.20, *p* = .305, η_p^2 = .019.

Tukey HSD test indicate that the mean for the control condition (*M* = 3.17, *SD* = 1.13) was significantly lower than the mean of conditions where demand scarcity was present (*M* = 4.25, *SD* = 1.18, *p* = .000) and conditions where supply scarcity was present (M = 4.82, SD = 1.30, *p* = .030). Results also show that there was no significant difference in means between the demand and the supply conditions (*p* = .227), hence hypothesis 3a is rejected. Competitive arousal was not significantly higher in an offer with

a demand scarcity cue when compared to an offer with a supply scarcity cue is, regardless of the presence of time scarcity.

Pairwise comparisons show that competitive arousal was significantly *lower* in the control condition*time condition (*M* = 3.13, *SD* = 1.08) when compared to the demand*time condition (*M* = 4.63, *SD* = 1.07, *p* = .000) and the supply*time condition (*M* = 3.99, *SD* = 1.47, *p* = .016). This supports hypothesis 3b, when a time scarcity cue is added to either one of the quantity scarcity cues it induces *more* competitive arousal than when a time scarcity cue is added to the control condition. A quantity scarcity cue in combination with a time scarcity cue can thus be an important driver of competitive arousal. It can also be concluded that the addition of a time scarcity cue to a demand scarcity cue raised does not induce more competitive arousal than adding a time scarcity cue to a supply scarcity cue (*p* = .081). There is thus no difference in competitive arousal between the combination of demand scarcity cue with a time scarcity cue and the combination of a supply scarcity cue and a time scarcity cue.

4.4.5 Scarcity and purchase intention

An ANOVA analysis compared the effects of scarcity on purchase intention. There was a significant effect of quantity scarcity on purchase intention *F*(2,124) = 5.08, *p* = .008, η_p^2 = .076, but no significant effect of time scarcity on purchase intention *F*(1,124) = 1.70, *p* = .194, η_p^2 = .014. Moreover there was a non-significant interaction effect between quantity and time scarcity on purchase intention *F*(2,124) = 1.18, *p* = .310, η_p^2 = .019. It can thus be concluded that only quantity scarcity had an effect on purchase intention, regardless of whether it was presented in combination with a time scarcity cue.

The Tukey HSD test indicated that the mean of conditions where demand scarcity was present (*M* = 5.14, *SD* = 1.21) was significantly higher than the mean of the control condition (*M* = 4.33, *SD* = 1.21, *p* = .006). However, the mean of conditions where supply scarcity was present (*M* = 4.85, *SD* = 1.16) was not significantly higher than the control condition *(p* = .109). In addition, results show no significant difference in means between the demand and the supply conditions (*p* = .476). It can be concluded that only demand scarcity had a significant effect on purchase intention.

Results of ANOVA analyses show a stable effect of a demand scarcity cue on all the dependent variables. There was only a significant interaction effect of demand scarcity and time scarcity on scepticism, but not on the other ratings. It was found that a demand scarcity cue in combination with a time scarcity cue actually attenuated the negative effect that time scarcity had on scepticism in the first place. Results also showed no significant effect of a supply scarcity cue on either one of the

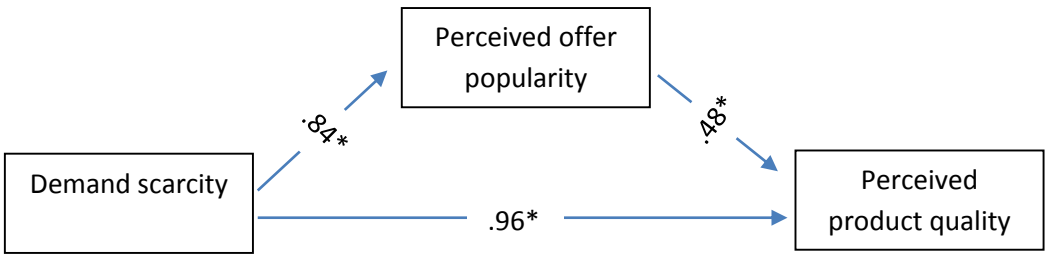
dependent variables, regardless of whether it was presented with time scarcity. Hence, the independent variable quantity scarcity was split, so mediation analysis could be performed with only demand scarcity.

4.5 Mediation effects

4.5.1 Perceived offer popularity and perceived product quality

Multiple analyses were conducted to assess if offer popularity inferences mediate perceived product quality. We already saw that demand scarcity was positively related to perceived product quality (B = .69, *t* (127) = 3.39, *p* = .0009). It was also found that demand scarcity was positively related to perceived offer popularity (B = .84, *t* (127) = 4.06, *p* = .0001). Lastly was found that the mediator perceived offer popularity was positively related to perceived product quality (B = .48, *t* (127) = 6.26, *p* = .0000). Because all paths were significant, mediation was tested using the bootstrapping method with bias corrected confidence estimates (Preacher & Hayes, 2008). The 95% confidence interval of the indirect effect was obtained with 5000 bootstrap resamples. Results of the mediation analysis confirmed the mediating role of perceived offer popularity in the relation between demand scarcity and perceived product quality (B = .40, CI = 0.21 to .66). In addition, results indicated that the direct effect of demand scarcity on perceived product quality became non-significant (B = .29, *t* (127) = 1.52, *p* = .131) when controlling for perceived offer popularity, thus suggesting full mediation (see figure 5). This partially supports hypothesis H2c, only the effect of demand scarcity on product quality was mediated by offer popularity inferences.

Figure 5. Mediating role of perceived offer popularity on perceived product quality

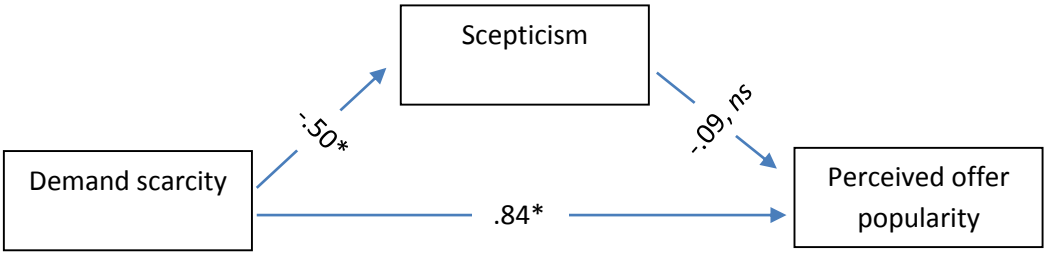


4.5.2 Scepticism and offer popularity

A mediation analysis was conducted to assess each component of the proposed model. As seen in the previous analysis it was found that demand scarcity was positively related to perceived offer popularity (B = .84, *t* (127) = 4.06, *p* = .001). It was also found that demand scarcity was negatively related to scepticism (B = -.50, *t* (127) = -2.13, *p* = .04). Lastly is was found that the mediator scepticism was not significantly related to perceived offer popularity (B = -.09, *t* (127) = -1.11, *p* > .05). Since the a-path

and c-path were significant, but the b-path was not, it can be concluded that the effect of demand scarcity on perceived offer popularity was not mediated by scepticism (B = .04, CI = -.03 to .19) (see figure 6). This does not support hypothesis H2d and is therefore rejected.

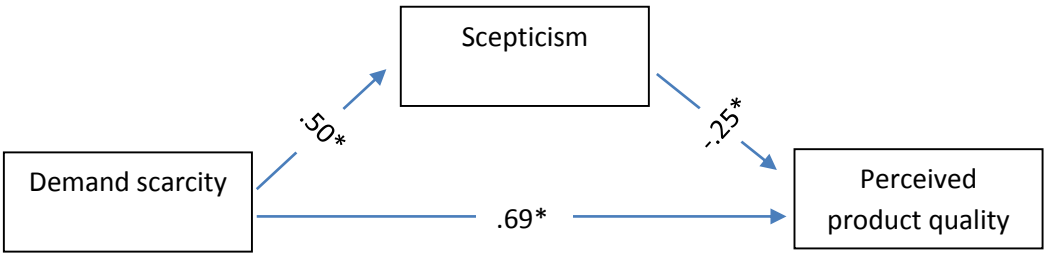
Figure 6. Mediating role of scepticism on perceived offer popularity



4.5.3 Scepticism and quality inferences

It was tested if the effect of demand scarcity on perceived product quality was weakened by scepticism. We already saw that demand scarcity was positively related to perceived product quality (B = .69, *t* (127) = 3.39, *p* = .0009), but negatively related to scepticism (B = -.50, *t* (127) = -2.13, *p* = 0.0355). Moreover it was found that the mediator scepticism was negatively related to perceived product quality (B = -.25, *t* (127) = -3.49, *p* = .0007). Since all paths were significant, analysis was continued using bootstrapping. Results showed a mediating role of scepticism in the relationship between demand scarcity and product quality inferences (B = .13, CI = .01 to .33). In addition, results also indicate that the direct effect of demand scarcity on perceived product quality stayed significant, which suggests partial mediation (see figure 7). Hypothesis H2e was partially supported, only the effect of demand scarcity on perceived product quality was mediated by scepticism.

Figure 7. Mediating role of scepticism on perceived product quality

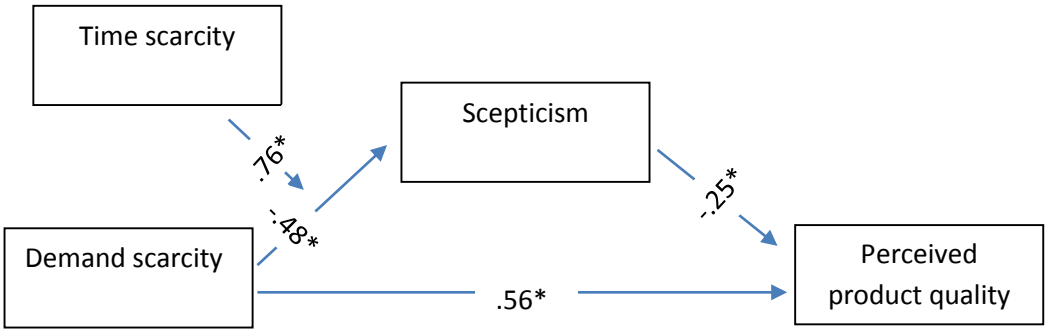


4.5.4 Scepticism and quality inferences with moderator time scarcity

As discussed earlier, the interaction of demand scarcity and time scarcity on scepticism was significant. With the use of the PROCESS macro (Hayes, 2013) was tested if the addition of time scarcity has an

effect on the relationship between demand scarcity on perceived quality via scepticism. The mediation model that is applicable in this analysis is model number 7 (see Hayes, 2013), where time scarcity moderates the a-path. This so-called moderating mediation effect is found when the confidence intervals of the equality test of the conditional indirect effect do not contain zero. Results of this test confirmed that the indirect effect of demand scarcity, via scepticism on perceived product quality was moderated by time scarcity (B= .28, CI = .05 to .67). In addition the direct effect stayed significant (B = 56, *t* (127) = 2.83, *p* = .0054). So there was partial mediation but the addition of time scarcity had a negative effect on scepticism (see figure 8).

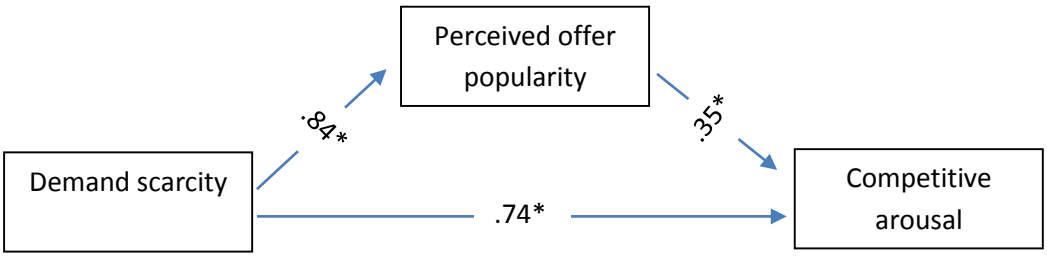
Figure 8. Conditional indirect effect of time scarcity



4.5.5 Popularity inferences and competitive arousal

It was tested whether offer popularity inferences mediates the relation between demand scarcity and competitive arousal. Results already showed that demand scarcity was positively related to competitive arousal (B = .74, *t* (127) = 3.19, *p* = .0018) and that demand scarcity was positively related to perceived offer popularity (B = .84, *t* (127) = 4.06, *p* = .0001). In addition, the current analysis revealed that the mediator perceived offer popularity was positively related to competitive arousal (B = .35, *t* (127) = 4.64, *p* = .0004). Since all paths were significant, mediation analysis was continued with the bootstrapping method. Results confirmed the mediating role of perceived offer popularity in the relation between demand scarcity and competitive arousal (B = .29, CI = .13 to .50) (see figure 8). In addition, results indicated that the direct effect of demand scarcity on competitive arousal became non-significant (B = .45, *t* (127) = 1.91, *p* = > .05) when controlling for perceived offer popularity. The results thus suggest full mediation. This finding partially supports hypothesis H3c, only the effect of demand scarcity on competitive arousal was positively mediated by offer popularity inferences (see figure 9). Supply scarcity had no significant effect on popularity inferences neither on competitive arousal.

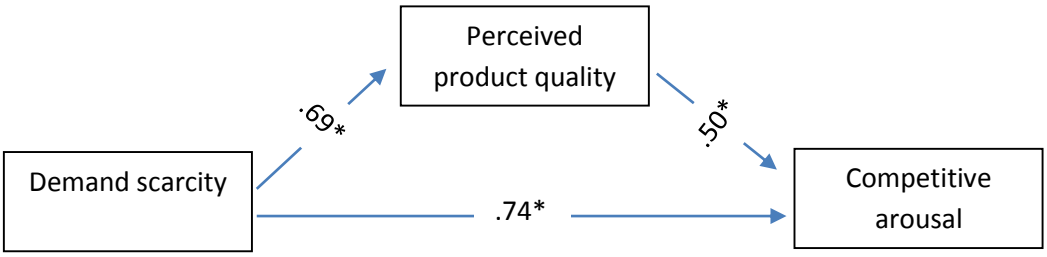
Figure 9. Mediating role of perceived offer popularity on competitive arousal



4.5.6 Quality inferences and competitive arousal

It was tested if perceived product quality mediates the relationship between demand scarcity and competitive arousal. It was already found that demand scarcity was positively related to perceived product quality (B = .69, *t* = (127) = 3.38, *p* = 0.001) and competitive arousal (B = .74, *t* (127) = 3.19, *p* = .0018). Moreover the mediator perceived product quality was positively related to competitive arousal (B = .50, *t* (127) = *p* = .0000). Results of remaining analysis indicate the mediating role of perceived product quality in the relation between demand scarcity and competitive arousal (B = .34, CI = .18 to .56). In addition, the direct effect of demand scarcity on competitive arousal became non-significant (B = .41, *t* (127) = 1.90, *p* = .0711) when controlling for perceived product quality, thus suggesting full mediation (see figure 10). Hypothesis H3d is partially supported, only product quality inferences drawn from a demand scarcity cue increase the level of competitive arousal.

Figure 10. Mediating role of perceived product quality on competitive arousal

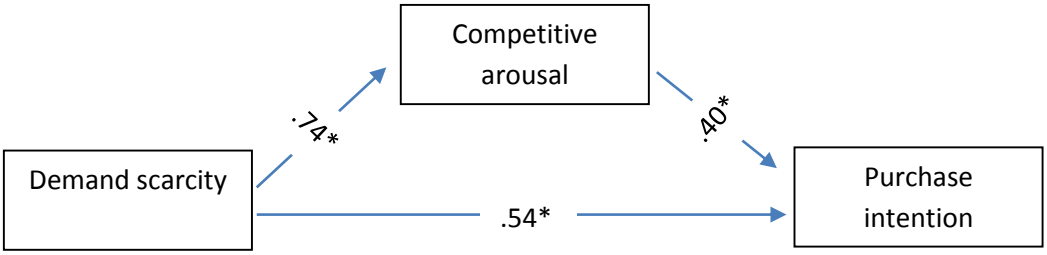


When both mediators (perceived offer popularity and perceived product quality) were put in the model simultaneously the effect of the mediator perceived offer popularity on competitive arousal became non-significant (B = .84, *t* (127) = 1.38, *p* = .1673), while the effect of the mediator perceived product quality on competitive arousal stayed significant (B = .43, *t* (127) = 4.07, *p* = .0001), This indicates that the mediators do not operate in parallel, but significantly affect each other.

4.5.7 Competitive arousal and purchase intention

It was tested whether the effect of demand scarcity on purchase intention was mediated by competitive arousal. It was already found that a-path (B = .74, *t* (127) = 3.19, *p* = .0018) and c-path (B = .54, *t* (127) = 2.39, *p* = .0183) were significant, so only the b-path needs to be tested. Results indicate that there was a positive relationship between competitive arousal and purchase intention (B = .40, *t* (127) = 5.10, *p* = .0000) and that competitive arousal had a mediating role in the relation between demand scarcity and purchase intention (B = .29, CI = .13 to .55). Moreover, when controlling for competitive arousal the effect of demand scarcity on purchase intention became non-significant (B = .24, *t* (127) = 1.13, *p* > .05), suggesting that there was full mediation (see figure 11). These results partially support hypothesis 4, the effect of demand scarcity on purchase intention was mediated by competitive arousal, while the effect of supply scarcity was not.

Figure 11. Mediating role of competitive arousal on purchase intention



In sum, multiple mediation analyses showed that there were indirect effects of demand scarcity. First, demand scarcity had an effect on quality inferences via popularity inferences and scepticism. An additional analysis with both mediators included showed that they do not operate in parallel. Moreover the direct effect of demand scarcity on quality inferences became non-significant (B = .19, *t* (127) = 1.09, *p* = .2795). Indicating that both mediators fully mediate this relationship. Second, demand scarcity had an effect on perceived product quality via scepticism, but when time scarcity was added there was also a significant interaction effect on scepticism. Third, demand scarcity had an effect on competitive arousal which was mediated by perceived offer popularity and product quality. Lastly, demand scarcity had an effect on purchase intention, which was fully mediated by competitive arousal.

5. Conclusion and implications

The purpose of this research was to investigate scarcity effects in an online context. Past research has demonstrated effects of scarcity on consumer purchase intention in various categories of commodities and attempted to explain the factors underlying such effects. However, there is little study on scarcity effects in an online context. Besides that, this study aimed to identify a boundary condition (i.e. scepticism) on the effectiveness of different types of scarcity. Moreover this study was conducted to get a better understanding in how competitive arousal triggered by quantity scarcity influences purchase intention. Although this empirical study did not find support for all proposed hypotheses, support was found for multiple interesting new relationships between online scarcity strategies and consumer scepticism, perceived offer popularity, perceived product quality, competitive arousal, and purchase intention. Theoretical and managerial implications are discussed as well as limitations and future research.

5.1. Scepticism

Past research shows that scarcity can have a positive effect on deal and product evaluation and purchase intention. This positive effect has been explained by a 'scarcity=value' heuristic. However the current study proposed that scarcity only increases product evaluation and purchase intention within a certain boundary condition, namely when no or minimal scepticism is raised. When a scarcity cue seems untruthful or incongruent with other information in the offer it could raise scepticism. In this situation the manipulative intent of the marketer becomes to salient, which negatively affects the persuasiveness of the entire online offer. In order to test this proposition, each of the six scarcity treatments in the experiment were tested on scepticism ratings.

It was found that demand scarcity had a significant negative effect on scepticism ratings, but supply scarcity did not. It was also found that there was no significant difference in raised scepticism between a demand scarcity cue and a supply scarcity cue when used without time scarcity. When used alone, both quantity scarcities did not raise significantly more or less scepticism then in the control condition.

Results also showed a significant effect of time scarcity and an interaction effect between quantity scarcity and time scarcity on scepticism. Especially the interaction between demand scarcity and time scarcity was significant. Adding a time scarcity cue to the control condition raised a lot of scepticism, but when a time scarcity cue was added to the demand scarcity cue the negative effect that time scarcity had in the first place seemed to be weakened. This provides evidence that an offer with a combination of demand scarcity and time scarcity is perceived as more credible than time scarcity alone and time scarcity with supply scarcity. A possible explanation of this finding is that a demand scarcity cue is perceived as very truthful. So when a time scarcity cue is added consumers may think

less about the marketer's manipulative intent. Since marketers are expected to put time limits on popular products, consumers perceive that the time scarcity cue is congruent with the demand scarcity cue.

5.1.2 Offer popularity inferences and product quality inferences

It was proposed that both quantity scarcity cues had a significant effect on perceived offer popularity and perceived product quality. However, results indicated that only demand scarcity (vs. supply scarcity) had a positive effect on these perceptions. It was even found that the effect of demand scarcity on perceived product quality was fully mediated by offer popularity inferences. This is consistent with past literature (Parker & Lehman 2011, van Herpen et al, 2009) and is explained as the bandwagon effect. When a product in an online offer is scarce because many others bought it, consumers logically infer that this product is more popular and it therefore must be of good quality.

It was also tested whether the effect of demand scarcity on popularity inferences and quality inferences was mediated by scepticism. The former mediation was not confirmed, while the latter was. It can thus be concluded that the effect of demand scarcity on perceived product quality is mediated by scepticism and perceived offer popularity.

The fact that supply scarcity had no significant effect on product quality inferences is quite remarkable, since past research found strong evidence for this relation (e.g. Eisend, 2008).

5.1.3 Competitive arousal

Another goal of the current study was to examine whether quantity scarcity had an effect on competitive arousal. Moreover it was examined whether the addition of a time scarcity cue changed competitive arousal significantly. Past research (Aggarwal et al., 2011) found that limited-quantity messages are more effective than limited-time messages in influencing consumers' product evaluations and purchase intentions because limited quantity messages trigger competitive arousal. However it was not examined whether a combination of these scarcity types significantly affect competitive arousal.

Result of the current study indicate that only demand scarcity had an effect on competitive arousal. This is explainable because one individual's probability of getting the product in the offer is negatively correlated with that of another's. This is also the case with a supply scarcity cue, but it is less salient. In addition, it was found that the interaction between quantity scarcity and time scarcity was not significant. Despite this, results show that the combinations demand*time and supply*time induced significantly more competitive arousal then when a time scarcity cue was used alone. A combination of scarcity cues can thus complement each in terms of competitive arousal.

5.1.4 Purchase intention

Past research has extensively explained the relation between quantity and time scarcity and purchase intention (e.g. Bae & Lee, 2005; Abendroth & Diehl, 2005; Wu & Hsing, 2006; Eisend, 2008). Results of this study indicate that only demand scarcity had a positive effect on purchase intention, while supply scarcity did not. In addition, there was also no interaction effect between both quantity scarcities and time scarcity.

Past research came up with several mediators of the scarcity effect on purchase intention like for instance assumed expensiveness, perceived uniqueness and anticipated regret. The current study came up with another mediator, namely competitive arousal. Past research already found that when competitive arousal is triggered it can have a strong positive effect on purchase intention (Aggarwal et al., 2011; Nichols, 2012; Yoon et al., 2014). Results of this study confirm this. It was found that the effect of demand scarcity on purchase intention was fully mediated by competitive arousal. This is explainable since in the case of demand scarcity consumers logically infer that the degree of scarcity increases with each marginal unit sold. This has a positive effect on purchase intention, because consumers probably do not want to waste the opportunity of acquiring a popular product with an attractive discount.

5.1.3 Implications

Past research extensively researched the effects of scarcity, however to my knowledge there is no study which combines quantity scarcity and time scarcity. This study has come up with a new interesting relationship between demand scarcity and time scarcity. It is shown that both cues complement each other in terms of raised scepticism. That is, when a demand scarcity cue is presented along with a time scarcity cue it raised significantly less scepticism then when a time scarcity cue was used alone. The use of digital countdown timers with high time precision can thus unnecessarily magnify the passage of time, and thus raise scepticism as the offer is presented without a quantity scarcity cue. This is explainable because when consumers face marketing claims in general, they may try to seek disconfirming evidence against any such claim in order to validate its accuracy. So, when a combination of a demand scarcity cue and a countdown timer are simultaneously embedded in an offer it seems more logical and truthful, because the presented information is congruent. The role of scepticism about time scarcity is consistent with the persuasion knowledge literature, which shows that consumers can be sceptical about marketing techniques used to sell products and services.

Another contribution of this study is that it provides evidence that competitive arousal is a strong psychological construct which can predict consumer purchase behaviour in situations of product scarcity in an online context. This mediating effect was found while controlling for possible moderators such as price discount (Inman et al., 1997), brand familiarity (Jung & Kellaris, 2004) and product type

(Ku et al., 2012) and the mediator assumed expensiveness (Lynn, 1989). This is consistent with a study by Aggarwal et al. (2011), which found that consumer competition mediated the effect of quantity scarcity messages on purchase intentions.

Besides theoretical implications, this research provides useful insights for practitioners that are concerned with the development of persuasive online offers. Based upon the results can be concluded that marketers have to be careful with incorporating scarcity cues and combinations of them in their offers because it is possible that they raise scepticism. Results show that time scarcity with no good reason raises a tremendous amount of scepticism. Moreover supply scarcity in combination with time scarcity is also not recommendable since also raised a relatively large amount of scepticism and it had no effect on the other inferences. On the other hand demand scarcity was found to be a powerful scarcity tactic, regardless of whether it was presented with time scarcity. Overall it was found that demand scarcity had a negative effect on scepticism and a positive effect on perceived offer popularity, perceived product quality, competitive arousal and purchase intention. It can thus be concluded that marketers could deploy a demand scarcity tactic without much concerns. Deal websites who have limited time offers anyway could add a demand scarcity cue in their offers to make optimal use of the scarcity strategy.

5.4 Limitations and future research

One question that could be posed is whether the proposed mediating variable of scepticism is different from the dependent variable of product quality. I argue that scepticism is conceptually different from product evaluation due to the following reasons. First, scepticism and product quality have different foci. Scepticism refers to consumers' interpretation of whether a scarcity cue and other information in the offer is true or false. In contrast, perceived product quality refers to consumers' evaluation of the product as a whole, and not just the scarcity claim. These dissimilar foci indicate that the two constructs are conceptually different.

A limitation of this study could be the fact that a real camera brand was used in the online offers. This could have a direct effect on product quality inferences. It is thus possible that perceived product quality was merely based on the brand rather than a quantity scarcity cue. However, when a fictional brand was used this could have an effect on raised scepticism. Future research could thus use a fictional brand, but in that case it is not recommendable that they examine both scepticism and quality. So, in a study with a fictional brand it would be easier to assess whether quantity scarcity has a direct effect on quality inferences without the possible interference of brand familiarity. On the other hand, studies using multiple real brands could examine whether there is an interaction effect of brand and

quantity scarcity on scepticism and competitive arousal, without examining the effect on product quality inferences.

Besides possible interferences of the brand it is also possible that product type influenced participants' ratings on the dependent variables. In this study was chosen for a digital camera because it has both utilitarian and hedonic features. Future research could examine if the degree of competitive arousal is different for an indisputable hedonic product (e.g. exclusive perfume). Moreover such product is more likely to be presented as a limited edition. In this case it could be true that the supply scarcity cue triggers a significant amount of competitive arousal.

Another limitation of this study is that it did not examined possible moderating effects. It could be that gender and age had an influence on the scepticism ratings. It is for instance possible that specific age categories are less sceptical about time scarcity in an offer. This holds especially for older consumers with minimal online shopping experience. Their exposure to disconfirmation of scarcity in an online context is probably not very frequent and therefore it is likely that scarcity raises no or minimal scepticism. Future research could examine whether there is an interaction effect of scarcity and age on the variables discussed in this study.

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Appendix I: Tables past research on scarcity effects

Table 1: Past research on quantity scarcity (appeals)

Article	**Manipulation of scarcity**	**Dependent variable(s)**	**Moderating variable(s)**	**Mediating variable(s)**	**Outcomes**	**Product category (ies)**
Acquire-Rodriquez (2013)	Supply-caused vs. demand-caused scarcity	Activation of persuasion knowledge	Message specificity		Supply-related scarcity appeal messages were less likely to activate persuasion knowledge than demand-related scarcity appeal messages	Ticket for a game
Amaldoss & Jain (2005)	Exclusivity of the product	Consumer demand, product price	Need for uniqueness (NFU)		Consumers with a high [low] NFU showed increased [decreased] demand for an exclusive product when its price increased	Conspicuous products
Aggarwal, Jun & Huh (2011)	a) Available in limited quantities only b) Restricted amount of consumers (i.e. "first 100 customers only)	Purchase intention	Brand concept	Competitive arousal	Limited-quantity messages are more effective than limited-time messages in influencing consumers purchase intentions because limited quantity messages evoke competitive arousal	Wrist watch (real brand)
Bae & Lee (2005)	Scarcity claims: quantity vs. time vs. absent	Purchase intention	Product involvement, product knowledge		a) A message with a scarcity claim (quantity and time) on consumer's purchase intention on the internet was more effective than a message with no scarcity claim b) The effect of a scarcity claim on purchase intention was found to be effective when the level of product involvement and consumer's product knowledge was low	Laptop, hair drier
Balachander, Lui & Stock (2009)	Product supply: abundant vs. scarce	Consumer demand			Scarcity at the time of product introduction has a positive effect on demand	Car brands

Castro, Moralis & Nowlis (2013)	Level of (visible) product inventory: high vs. low	Purchase intention	Organization of the shelf, brand familiarity		a) Scarcity increased consumers purchase intention for the unfamiliar non-food product but not for the familiar non-food product. b) Scarcity lowered purchase intention for the familiar food product due to contamination	Non-food & food FMCG
Chen & Sun (2014)	Precondition: Consumers who purchased a limited edition computer game participate in the study	Purchase intention		Assumed expensiveness, perceived quality, perceived sacrifice, perceived uniqueness, perceived value	Perceived quality and perceived uniqueness, significantly increased by product scarcity, was shown of significant positive impact on perceived value, which significantly enhanced purchase intention	Computer games
DeGraba (1995)	The scarcity induces by the sellers	Product price, purchase intention			The scarcity induced by sellers prompts consumers to buy the product at a higher price	Video games
Eisend (2008)	Scarcity claims (e.g. limited edition): absent vs. present	Perceived value, purchase intention		Perceptions of susceptibility	Advertising with a scarcity appeal (e.g. limited edition) increased consumer evaluations and purchase intention of the product. Perceptions of personal susceptibility and the susceptibility of others mediate this.	Clothing products
Esch & Winter (2010)	Limitation of supply present vs. absent	Perceived novelty, attitude towards product, trial interest, brand fit, attitude towards brand, brand creativity	Personality traits, level of cognitive processing		a) Exploration seekers express a more positive attitude judgement and trial interest towards a limited edition product then exploration avoiders b) Deep processing (vs. low depth of processing) of the limited edition leads to a more positive attitude towards the product and a more positive trial interest c) Introduction of limited edition product has a positive effect the perceived creativity of the brand, regardless of strength of the brand	FMCG

Ge, Paul & Jin (2009)	Sold-out products in choice set: absent vs. present	Purchase intention towards available products, choice deferral			The presence of sold-out product increases purchase intention toward available options and decreases choice deferral	Ski pass tickets, wine products, gym pass tickets
Gierl, Plantsch & Schweidler (2008)	Limited edition product, scarcity claims (e.g. "as long stock lasts")	Desirability	Product type, scarcity type		a) A supply-related scarcity claim had a positive effect on the desirability of the conspicuous product, but not on the non-conspicuous product. b) A limited edition product intensified the persuasive impact of strong attribute arguments, but not weak arguments	Non-conspicuous products, conspicuous products
Gierl & Huettl (2010)	Supply and demand scarcity claims (i.e. due to high demand [limited supply] only few units left)	Attitude towards product	Product type, scarcity type		a) For a conspicuous product, signals of scarcity due to limited supply are advantageous compared to signals of scarcity due to high demand. b) For a non-conspicuous product, signals of scarcity due to high demand result in more favourable product evaluations compared to signals of limited supply	Non-conspicuous products, conspicuous products (real brands)
Gupta (2013)	Level of supply: abundant vs. scarce	Urgency to buy, in-store hoarding, in-store hiding	Traits: competitiveness, hedonic shopping motivations, need for uniqueness	Anticipated regret	a) Scarcity's positive effect on urgency to buy is mediated by anticipated regret b) Consumers which are competitive, have high hedonic shopping motivations and a high NFU are more likely to exhibit in-store hoarding and in-store hiding. c) Males with high hedonic shopping motivations are more likely to exhibit in–store hoarding and in–store hiding as compared to females	Fashion clothes
Gwee & Chang (2013)	Quantity and time scarcity claims: absent vs. present	Impulse purchase	Need for uniqueness	Desirability	n/a, research-in-progress	Stationaries for school

van Herpen, Pieters & Zeelenberg (2009)	Level of (visible) product inventory: high vs. low	Choice	Cause of scarcity, ownership by close others	Perceived quality, perceived popularity	a) The positive effect of demand-caused scarcity is weakened under conditions of possible ownership by close others of the scarce product b) The positive effect of scarcity is weakened when scarcity is said to be caused by limited supply c) The positive effect of scarcity is strengthened when scarcity is seen to arise as a result of excess demand	Wine, shirts
van Herpen, Pieters & Zeelenberg (2014)	a) Level of (visible) product inventory: high vs. low b) Number of shelf facings: wide vs. narrow c) Verbal message	Perceived popularity, exclusiveness, quality, preference, choice	Creative choice counter conformity, product involvement, cause of scarcity		a) High NFU consumers prefer supply-scarce wines over non-scarce wines, yet they show no aversion to a wine which is scarce due to excess demand b) Consumers respond more strongly to scarcity when they have a high product involvement, yet low-involved consumers may still choose the scarce product, but in a lesser extent	Wine
Inman, Peter & Raghubir (1997)	Quantity restriction in offer (e.g. "limit X per customer")	Product sales, deal evaluation, purchase intent	Need for cognition, price discount		The positive effect of scarcity is stronger when need for cognition is low or the price discount is high	Supermarket brands (FMCG)
Jeong & Kwon (2012)	Scarcity claim abundant vs. scarce	a) Perceived product quality, purchase intention b) Message credibility, perceived message reactance	Risk aversion tendency		a) The scarcity claim had no influence on quality perceptions and purchase intention, because of low message credibility and lack of aroused psychological reactance b) Consumers' risk aversion tendency did not moderate the relationship between perceived scarcity and quality inferences	USB flash drive
Jung & Kellaris (2004)	Product supply: high vs. low	Purchase intention	Cross-national difference (U.S. vs. France), need for		The positive effect of scarcity was stronger for consumers in the US compared to France, when individuals are less familiar with the product, and	Wine products

			cognitive closure, product familiarity		when individual's need for cognitive closure is high compared to low	
Ku, Kuo & Kuo (2012)	Supply and demand scarcity present vs. absent	Purchase intention	Self-regulatory focus (primed and persistent), product type		a) Prevention focused consumers had a higher purchase intention for a demand-scarce product and a lower purchase intention for a supply-scarce product. The reverse is true for promotion focused consumers b) A prevention focused product (sunscreen) enhanced purchase intention only when scarcity was caused by excess demand, not as it was caused by limited supply. The reverse is true for a promotion focused product (perfume) c) Demand scarce products advertised with prevention focused claims enhanced purchase intention, while a promotion focus was more effective when scarcity was caused by limited supply	Digital camera, cruiser bike, sunscreen, perfume
Ku, Kuo, Yang & Chung (2013)	Supply and demand scarcity claims (i.e. "due to high demand [limited supply] only few products left in stock")	Purchase intention	Product type, level of self-monitoring, public vs. private consumption		a) Consumers shopping for a utilitarian product respond more positively to demand-caused scarcity and less to supply-caused scarcity, whereas the converse holds true for a hedonic product b) Expectations of how fellow consumers evaluate their decision moderate high-self monitor evaluations of demand-caused scarcity vs. supply-caused scarcity, but nut those of low-self monitors	Utilitarian product (sunscreen), hedonic product (chocolate)
Lee & Seidle (2012)	Supply scarcity (limited edition) present vs. absent	Purchase intention, WTP, attitude towards product	Personality trait: narcissism		a) Supply scarcity increased purchase intention and WTP for high narcissistic consumers, but not for low narcissistic consumers b) For consumers with high narcissism, scarcity reduced depth of processing (they process	Wristwatch (fictitious brand)

					heuristically) while there was no effect on consumers with low narcissism (they process systematically)	
Lee, Oh & Jung (2014)	Quantity restriction	Inferences of manipulative intent, product evaluation	Cognitive resources, company reputation		a) When consumers had sufficient cognitive resources available to draw inferences about persuasion motives they were more likely to perceive scarcity as a sales tactic, however company reputation influences this and hence moderates the effect of scarcity on product evaluation	(unknown)
Lessne & Notarantonio (1988)	Quantity restriction in advertisement: absent vs. present	Purchase intention		Severity of restriction	A quantity restriction in an advertisement results in a higher purchase intention than an advertisement without a limitation, however it depends on the severity of the limit	Consumer products
Lynn (1989)	Level of supply: abundant vs. scarce	Desirability, purchase intention			Scarcity increases the perceived value of paintings	Paintings, wines
Lynn & Bogert (1996)	Level of supply: abundant vs. scarce	Anticipated price appreciation, desirability			a) Scarcity increased the anticipated price appreciation of two collectible products. b) No effect of scarcity on desirability	U.S. stamp, U.S. coin
Parker & Lehmann (2011)	Level of (visible) product inventory: high vs. low	Preference for the product	Choice context, congruency of sales ranking information, quality ratings, prior preferences, price promotions	Quality inferences, popularity inferences	Scarcity's positive effect on preference was weakened by incongruent sales ranking information, quality ratings, brand familiarity, strong prior preferences and price promotions	FMCG (e.g. wine, toilet paper, soup)
Steinhart, Mazurski & Kamins (2013)	Scarcity due to limited supply vs. no scarcity	Purchase intention		Consumer involvement, perceived feasibility	a) When scarcity was perceived positively, it influenced purchase intentions via consumer involvement. b) When scarcity was perceived negatively it influenced purchase intentions via perceived feasibility, irrespective of consumer involvement	T-shirt

Swami & Khairnar (2003)	Scarcity due to limited availability of seats	Sales of the event ticket at a theatre			Highlighting limited number of tickets available increased box office sales	Event ticket
Tan & Chua (2004)	Vague scarcity message (i.e. "while stock lasts"): absent vs. present	Perceived savings, informational value of the offer, attitude and reaction towards restriction	Price reduction (plausible vs. exaggerated), claim format (tensile vs. objective)		Framing a sales offer with a vague scarcity claim and using a tensile claim format improved the consumers perceived informational value of the offer, but only with exaggerated price discount	Sport shoes, personal computers
Terman (2007)	Scarcity present vs. absent	Product evaluation	Desire for unique consumer products [DUCP], Need for uniqueness [NFU]		a) Perceived scarcity of consumer products (vs. non-consumer products) polarized the ratings of high DUCP consumers, but not low DUCP consumers b) A general measure of NFU does not moderate scarcity's effect on neither consumer products nor non-consumer products evaluations	Consumer product, non-consumer product
Verhallen & Robben (1994)	Product availability: low vs. middle vs. high	Choice			Consumers prefer recipe books that a relatively scarce	Recipe books
Ward (2007)	Level of (visible) product inventory: high vs. low	Preference for the product	Involvement, contextual factors		a) Consumer's dependence on shelf-based scarcity as heuristic cue is particularly effective in low-involvement choices (vs. high-involvement choices) b) Preference for the scarce item of consumers primed with uniqueness diminished when it has already been sold to many others, while for consumers primed with conformity preference increased	Clocks
Worchel, Lee & Adewole (1975)	Level of supply: high vs. low	Attitude toward the product			Cookies in scarce supply are considered more desirable than freely available cookies	Cookies
Wu, Lu, Wu & Fu (2012)	Level of supply: high vs. low	Perceived value, purchase intention		Assumed expensiveness,	The effects of scarcity on purchase intention trough perceived uniqueness, perceived sacrifice	Handbag

				perceived uniqueness,	and perceived value are stronger than scarcity effects trough assumed expensiveness, perceived quality, perceived sacrifice and perceived value	
Wu & Hsing (2006)	Level of supply: high vs. low	Perceived value, Purchase intention		Assumed expensiveness, perceived quality, perceived symbolic benefit, perceived monetary sacrifice	Scarcity enhances value perceptions and consequently purchase intention directly through mediating mechanisms: assumed expensiveness, perceived quality and perceived symbolic benefits and indirectly via price-quality and price-symbolic benefit associations	Consumer products
Yeo & Park (2009)	Scarcity message: absent vs. present	Evaluation of the product	Cognitive load	Scepticism	A scarcity message compared to a non-scarcity message led to more favourable evaluations of the target product, but only when cognitive resources where distracted so that inferences about the manipulative intent where less likely to be evoked	MP3 player
Yoon, Chang & Lee (2014)	Restrictive message: quantity vs. time	Attitude towards sales promotion, attitude towards product, perceived competitiveness, purchase intention	Gender		a) A quantity scarcity message is perceived as more competitive than a time scarcity message b) A quantity scarcity sales promotions led to a more positive attitude and a higher purchase intention for male consumers as compared to female consumers.	Membership of fitness club
Yoon & Vargas (2011)	Upper quantity restriction (i.e. 40% off, limit 3 per customer) vs. lower quantity restriction	Purchase amount			A discount with a upper quantity restriction led consumers want to buy more than the specified amount (i.e. counterfactual thoughts)	FMCG
Zheng, Lui & Zhao (2013)	Scarcity claims: time vs. quantity vs. frequency of promotion vs. absent	Planned buying shortfall, unplanned (i.e. impulse) buying			An online scarce promotion decreased consumer planned buying shortfall and increased consumers unplanned buying, hence contributing to the growth of consumer's buying relative to their intended plans	Consumer products (e.g. coffee, books, shampoo)

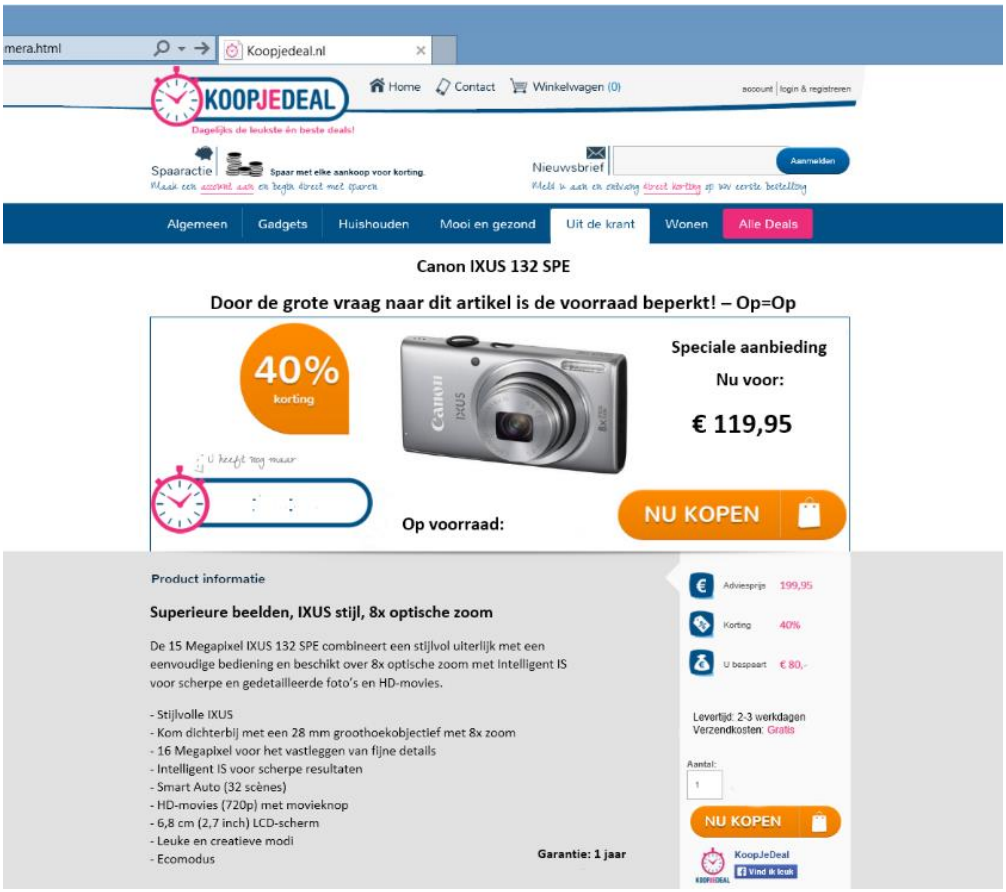
Table 2: Past research on time scarcity (appeals)

Author(s)	Manipulation of scarcity	Dependent variable(s)	Mediator(s)	Moderator(s)	Outcomes	Product category (ies)
Abendroth & Diehl (2006)	Limited purchase opportunity: low vs. high	Purchase intention	Anticipated regret		Limited purchase opportunity increases anticipated regret associated with non-purchase decision	Shirt and CD's
Aggarwal et al. (2011)	Level of temporal scarcity: low vs. high	Purchase intention	Competitive arousal	Brand concept	a) Scarcity had a positive effect on purchase intention and consumers have greater satisfaction with the product b) Restricted offers will affect purchase intentions more for a symbolic brand than for a functional brand	(Unknown)
Aggarwal & Vaidyanathan (2003)	Level of temporal scarcity: low vs. high	Search behaviour, willingness to buy, attitude towards deal			A time limited offer had a: a) Negative effect on willingness to wait b) Positive effect on willingness to buy c) Positive effect on attitude towards deal	Stereo music system
Bae & Lee (2005)	Message with time limit: absent vs. present	Purchase intention		Product involvement, product knowledge	Higher purchase intention as compared to non-scarcity message, but only when product involvement and product knowledge is low	(Not specified)
Brannon & Brock (2001)	Time scarcity claims (e.g. "only today"): absent vs. present	Sales of snack food		Product arguments	The positive effect of time scarcity is stronger when message arguments are strong	Snack food
Brannon & McCabe (2001)	Level of temporal scarcity: low vs. high	Sales		Message content	Scarcity in time increased consumers' scrutiny of message merit. Positive effect on sales when the message is strong, but not when the message is weak.	Special recipe
Devlin et al., (2007)	Time scarcity claims (e.g. "for one week only"): absent vs. present	Purchase intention	Perceived value	Discount percentage	a) Time scarcity had no direct impact on value perception, searching further information and purchase intention b) Huge interaction between limited time and discount percentage.	TV's

Gierl et al., (2008)	Level of temporal scarcity: low vs. high (e.g. "only available for four weeks" vs. "only available for one week")	Product desirability		Product type	a) Time scarcity had no effect on desirability of the conspicuous consumption good irrespective of degree of scarcity b) Time scarcity had a positive effect on the desirability of the non-conspicuous consumption goods, but only when time limit is short	Mobile phone, wrist watch, wine
Huang et al., 2011	Level of temporal scarcity: low vs. high	Purchase intention		Consumer involvement, product familiarity	Online time-limited promotion has a positive influence on purchase intention but is negatively moderated by involvement and positively moderated by product familiarity	Mobile phone, digital camera, instant coffee, fruit juice
Inman et al. (1997)	Scarcity messages: absent vs. present (e.g. "offer expires on…", "offer available till…", "restricted offer")	Purchase intention	Deal evaluation	Discount percentage	A time limit had a positive effect on deal evaluation and purchase intention, but only with a substantial discount level	Batteries, audiocassette, toothbrush
Inmann & McAlister (2004)	Length of coupon expiration date: low vs. high	Coupon redemptions			Coupons with expiration dates are redeemed more	Coupons for spaghetti sauce
Kurtz (2008)	Level of temporal scarcity: low vs. high	Preference, purchase intention			Increased preference and participation intent for the events	College related events
Lessne (1987)	Time scarcity: absent vs. present (e.g. "one day only" sale)	Purchase likelihood			Greater purchase likelihood in high scarcity condition than sale of longer or unstated duration	Retail products
Simonson (1992)	Time limited offer: absent vs. present	Product choice			Time scarcity increases product choice	Camcorder, VCR
Sinha et al., (1999)	Two time scarcity messages: "offer valid for one week" , "only on Thursday/Friday"	Deal evaluation			Negative effect on deal evaluation (i.e. time restriction obfuscates deal value)	(Unknown)

Shen (2011)	Level of temporal scarcity: low vs. high (e.g. “available for 6 months” vs. “available only one week”)	Product evaluation	Product message processing	Message congruity	Scarcity functioned as heuristic cue in the congruity condition but lost its function as a heuristic cue in the incongruent condition	Soft drink
Suri et al. (2007)	Time scarcity: absent vs. present	Purchase intention	Perceived quality, perceived sacrifice, perceived value	Motivation to process information, product price	a) The increase in perceptions of value for the low-price product in the low-motivation condition is due to a decrease in the perceptions of sacrifice b) The increase in perceptions of value for the high-price product in the high-motivation condition is due to an increase perceptions of quality	Tour package
Swain et al., (2006)	Time restriction: low vs. high	Purchase intention	Deal valuation, perceived urgency, anticipated regret		Shorter time restrictions lower purchase intent by lowering deal evaluations caused by perceptions of inconvenience, while they can also increase purchase intent by increasing consumers’ sense of urgency caused by anticipated regret associated with non-purchase	Movie coupon, (real) coupon for a sandwich

Appendix II: Screenshot pre-test demand-caused scarcity



Appendix III: Examples of screenshots in main study

Screenshot Supply condition

Screenshot Demand + Time condition

Appendix IV: Descriptive statistics

Table I. Gender

Q10 Wat is uw geslacht?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 Man	52	40,0	40,0	40,0
	2 Vrouw	78	60,0	60,0	100,0
	Total	130	100,0	100,0	

Table II. Age

Q11 Wat is uw leeftijd?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	14	1	,8	,8	,8
	15	1	,8	,8	1,5
	16	2	1,5	1,5	3,1
	17	3	2,3	2,3	5,4
	18	6	4,6	4,6	10,0
	19	13	10,0	10,0	20,0
	20	18	13,8	13,8	33,8
	21	12	9,2	9,2	43,1
	22	10	7,7	7,7	50,8
	23	12	9,2	9,2	60,0
	24	13	10,0	10,0	70,0
	25	13	10,0	10,0	80,0
	26	6	4,6	4,6	84,6
	27	3	2,3	2,3	86,9
	28	3	2,3	2,3	89,2
	29	1	,8	,8	90,0
	30	1	,8	,8	90,8
	31	1	,8	,8	91,5
	32	1	,8	,8	92,3
	38	1	,8	,8	93,1
	43	1	,8	,8	93,8
	48	1	,8	,8	94,6
	50	1	,8	,8	95,4
	52	1	,8	,8	96,2
	53	1	,8	,8	96,9
	56	1	,8	,8	97,7
	57	1	,8	,8	98,5
	60	1	,8	,8	99,2
	62	1	,8	,8	100,0
	Total	130	100,0	100,0	

Table III. Education level

Q12 Wat is u hoogst genoten opleidingsniveau?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 Geen / lager of - basisonderwijs	1	,8	,8	,8
	2 VMBO / MAVO / LBO	4	3,1	3,1	3,8
	3 MBO	6	4,6	4,6	8,5
	4 HAVO / VWO	15	11,5	11,5	20,0
	5 HBO	17	13,1	13,1	33,1
	6 WO-bachelor of kandidaats	53	40,8	40,8	73,8
	7 WO-doctoraal of master	34	26,2	26,2	100,0
	Total	130	100,0	100,0	

Appendix V: Reliability measures

Scale: Scepticism

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,726	,726	3

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Q8_1_recode De aanbieding is eerlijk over het aantal beschikbare camera's	8,8268	6,906	,588	,350	,589
Q8_2_recode Ik vind de informatie in de aanbieding geloofwaardig	9,1339	8,006	,496	,247	,699
Q8_4 Ik denk dat in deze aanbieding gebruik wordt gemaakt van onoprechte verkooptechnieken	7,2992	6,688	,565	,329	,619

Scale: Quality

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,872	,872	3

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Q4_1 Ik vind deze digitale camera aantrekkelijk	9,80	5,112	,759	,581	,814
Q4_2 Ik denk dat deze digitale camera een hoge kwaliteit heeft	9,60	5,068	,732	,537	,839
Q4_3 Ik vind deze digitale camera begerenswaardig	10,11	4,972	,770	,595	,804

Scale: Popularity

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,870	,871	3

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Q5_1 Ik denk dat deze aanbieding populair is	10,50	5,458	,691	,486	,873
Q5_2 Ik denk dat veel consumenten de digitale camera in de aanbieding willen kopen	10,31	5,627	,758	,616	,812
Q5_3 De digitale camera in deze aanbieding wordt goed verkocht	10,67	5,128	,809	,669	,762

Scale: Purchase Intention

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,680	,683	2

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Q6_1 Ik zou overwegen om de digitale camera in de aanbieding te kopen	4,50	2,157	,519	,269	.[a]
Q6_2 Het is aannemelijk dat ik de digitale camera in de aanbieding zou kopen	5,01	1,738	,519	,269	.[a]

a. The value is negative due to a negative average covariance among items. This violates reliability model assumptions. You may want to check item codings.

Scale: Competition Scale

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,859	,859	6

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Q7_1 Ik zal moeten strijden tegen anderen om deze camera te kunnen kopen	19,06	39,806	,783	,659	,811
Q7_2 Ik ben naar iets op zoek waar andere consumenten ook naar op zoek zijn	18,16	46,975	,471	,369	,865
Q7_3 Andere potentiele kopers van de camera zijn eigenlijk concurrenten van mij	19,01	40,294	,726	,597	,821
Q7_4 Als andere consumenten niet in staat zijn om de camera vandaag te kopen hebben ze verloren	19,57	40,422	,751	,606	,817
Q7_5 Ik voel me succesvol als ik de camera vandaag kan kopen	18,51	42,220	,605	,410	,844
Q7_6 Proberen om de camera te kopen zal een soort wedstrijd tegen de online verkoper zijn	19,20	42,032	,579	,449	,850

Scale: Quantity Scarcity

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,870	,870	2

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Q9_1 Het aantal beschikbare digitale camera's in de aanbieding is beperkt	4,20	3,513	,770	,593	.[a]
Q9_2 Als iemand de digitale camera in de aanbieding vandaag op een later tijdstip wil kopen, dan is deze waarschijnlijk niet meer op voorraad	4,33	3,588	,770	,593	.[a]

a. The value is negative due to a negative average covariance among items. This violates reliability model assumptions. You may want to check item codings.

Scale: Time Scarcity Scale

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,575	,577	2

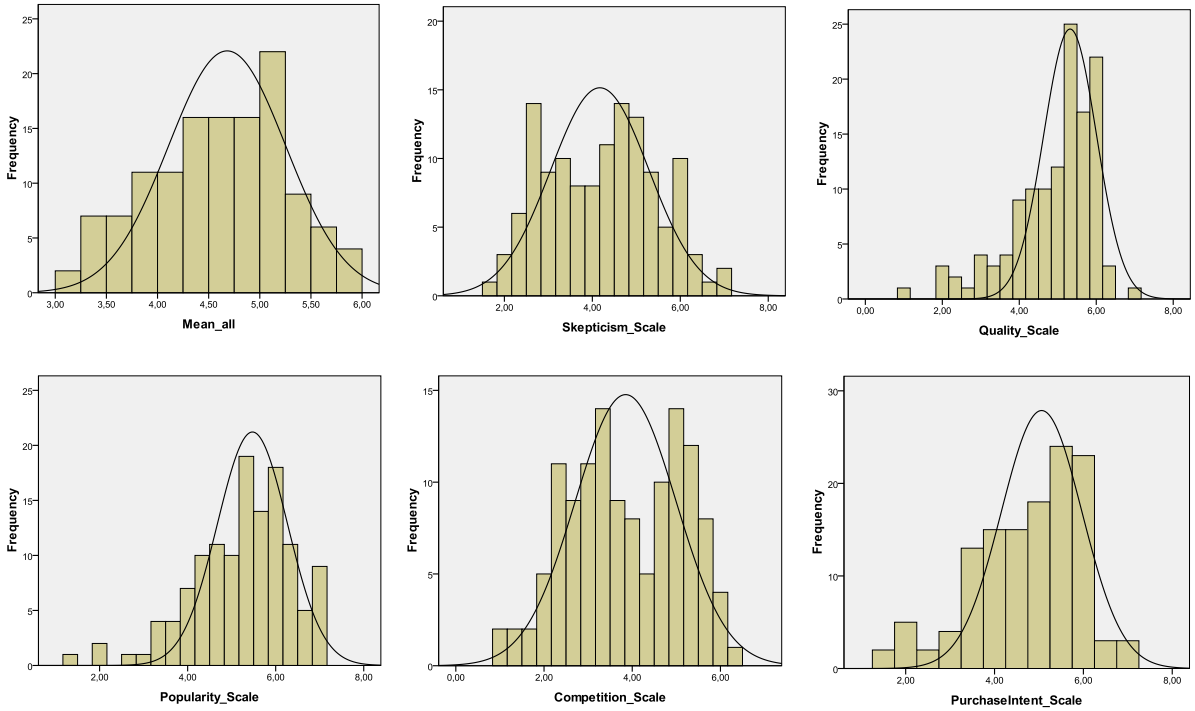
Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Q9_3_recode Als ik besluit om de digitale camera in deze aanbieding te kopen dan kan ik dit morgen ook nog doen	4,5118	4,220	,406	,165	.[a]
Q9_4 De aanbieding is maar voor een beperkte tijd geldig	4,3543	3,373	,406	,165	.[a]

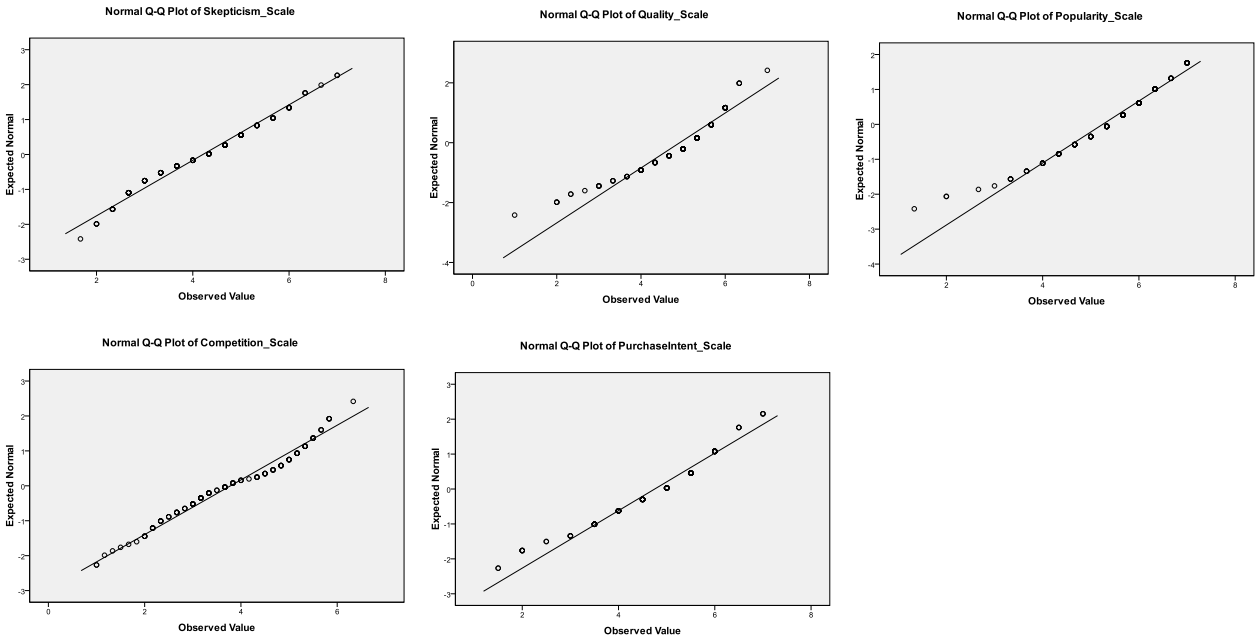
a. The value is negative due to a negative average covariance among items. This violates reliability model assumptions. You may want to check item codings.

Appendix VI: Normality and homogeneity of variance tests

Histograms of means dependent variables



Q-Q plots dependent variables



Normality statistics displayed per condition

Tests of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
Condition Experimental condition of participant		Statistic	df	Sig.	Statistic	df	Sig.
Skepticism_Scale	1,00 Control	,223	20	,010	,905	20	,051
	2,00 Demand	,189	22	,040	,923	22	,088
	3,00 Supply	,151	22	,200*	,944	22	,234
	4,00 Time	,184	22	,051	,915	22	,060
	5,00 DemandTime	,193	20	,050	,931	20	,161
	6,00 SupplyTime	,128	24	,200*	,946	24	,220
Quality_Scale	1,00 Control	,167	20	,146	,952	20	,404
	2,00 Demand	,217	22	,008	,908	22	,042
	3,00 Supply	,290	22	,000	,731	22	,000
	4,00 Time	,145	22	,200*	,957	22	,422
	5,00 DemandTime	,212	20	,019	,881	20	,018
	6,00 SupplyTime	,209	24	,008	,864	24	,004
Popularity_Scale	1,00 Control	,140	20	,200*	,975	20	,853
	2,00 Demand	,233	22	,003	,901	22	,031
	3,00 Supply	,211	22	,012	,872	22	,009
	4,00 Time	,226	22	,005	,909	22	,044
	5,00 DemandTime	,142	20	,200*	,937	20	,206
	6,00 SupplyTime	,154	24	,146	,963	24	,496
Competition_Scale	1,00 Control	,216	20	,015	,897	20	,036
	2,00 Demand	,191	22	,037	,899	22	,029
	3,00 Supply	,142	22	,200*	,970	22	,712
	4,00 Time	,121	22	,200*	,964	22	,571
	5,00 DemandTime	,174	20	,112	,937	20	,210
	6,00 SupplyTime	,177	24	,051	,891	24	,014
PurchaseIntent_Scale	1,00 Control	,187	20	,066	,957	20	,477
	2,00 Demand	,229	22	,004	,859	22	,005
	3,00 Supply	,212	22	,011	,854	22	,004
	4,00 Time	,133	22	,200*	,976	22	,845
	5,00 DemandTime	,270	20	,001	,749	20	,000
	6,00 SupplyTime	,184	24	,035	,930	24	,100

a. Lilliefors Significance Correction

*. This is a lower bound of the true significance.

Levene's test for homogeneity of variance

Test of Homogeneity of Variance

		Levene Statistic	df1	df2	Sig.
Skepticism_Scale	Based on Mean	1,818	5	124	,114
	Based on Median	1,462	5	124	,207
	Based on Median and with adjusted df	1,462	5	106,319	,208
	Based on trimmed mean	1,743	5	124	,130
Quality_Scale	Based on Mean	2,543	5	124	,032
	Based on Median	1,321	5	124	,260
	Based on Median and with adjusted df	1,321	5	80,226	,264
	Based on trimmed mean	2,069	5	124	,074
Popularity_Scale	Based on Mean	,763	5	124	,578
	Based on Median	,713	5	124	,615
	Based on Median and with adjusted df	,713	5	99,853	,615
	Based on trimmed mean	,736	5	124	,598
Competition_Scale	Based on Mean	2,276	5	124	,051
	Based on Median	1,496	5	124	,196
	Based on Median and with adjusted df	1,496	5	115,511	,197
	Based on trimmed mean	2,230	5	124	,055
PurchaseIntent_Scale	Based on Mean	,969	5	124	,440
	Based on Median	,555	5	124	,734
	Based on Median and with adjusted df	,555	5	115,289	,734
	Based on trimmed mean	,950	5	124	,451

Appendix VII: Manipulation checks

Manipulation check quantity scarcity

ANOVA

Quantity_Scarcity_Scale Quantity_Scarcity_Scale

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	**142,784**	**5**	**28,557**	**13,320**	**,000**
Within Groups	**265,839**	**124**	**2,144**		
Total	**408,623**	**129**			

Multiple Comparisons

Quantity_Scarcity_Scale Quantity_Scarcity_Scale
Dunnett t (>control)[a]

(I) Condition Experimental condition of participant	(J) Condition Experimental condition of participant	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound
2,00 Demand	1,00 Control	**1,83636***	**,45237**	**,000**	**,8188**
3,00 Supply	1,00 Control	**1,63182***	**,45237**	**,001**	**,6143**
4,00 Time	1,00 Control	**-,50455**	**,45237**	**,988**	**-1,5221**
5,00 DemandTime	1,00 Control	**2,42500***	**,46302**	**,000**	**1,3835**
6,00 SupplyTime	1,00 Control	**1,74167***	**,44331**	**,000**	**,7445**

a. Dunnett t-tests treat one group as a control, and compare all other groups against it.

*. The mean difference is significant at the 0.05 level.

Manipulation check time scarcity

ANOVA

Q9_4 De aanbieding is maar voor een beperkte tijd geldig

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	**197,436**	**5**	**39,487**	**14,030**	**,000**
Within Groups	**348,995**	**124**	**2,814**		
Total	**546,431**	**129**			

Multiple Comparisons

Q9_4 De aanbieding is maar voor een beperkte tijd geldig
Dunnett t (>control)[a]

(I) Condition Experimental condition of participant	(J) Condition Experimental condition of participant	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound
2,00 Demand	1,00 Control	**,450**	**,518**	**,467**	**-,72**
3,00 Supply	1,00 Control	**,132**	**,518**	**,738**	**-1,03**
4,00 Time	1,00 Control	**2,223***	**,518**	**,000**	**1,06**
5,00 DemandTime	1,00 Control	**2,900***	**,531**	**,000**	**1,71**
6,00 SupplyTime	1,00 Control	**2,742***	**,508**	**,000**	**1,60**

a. Dunnett t-tests treat one group as a control, and compare all other groups against it.

*. The mean difference is significant at the 0.05 level.

Appendix VIII: ANOVA outputs

Scepticism

Tests of Between-Subjects Effects

Dependent Variable:Skepticism_Scale

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	42,085[a]	5	8,417	6,208	,000	,200
Intercept	2273,505	1	2273,505	1676,690	,000	,931
Cond_Quantity_scarcity	6,459	2	3,230	2,382	,097	,037
Cond_Time_scarcity	19,064	1	19,064	14,060	,000	,102
Cond_Quantity_scarcity * Cond_Time_scarcity	16,217	2	8,108	5,980	,003	,088
Error	168,138	124	1,356			
Total	2517,444	130				
Corrected Total	210,223	129				

a. R Squared = ,200 (Adjusted R Squared = ,168)

Univariate Tests

Dependent Variable:Skepticism_Scale

Condition quantity_scarcity		Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
,00	Contrast	31,972	1	31,972	23,579	,000	,160
	Error	168,138	124	1,356			
1,00	Contrast	,028	1	,028	,021	,886	,000
	Error	168,138	124	1,356			
2,00	Contrast	2,913	1	2,913	2,148	,145	,017
	Error	168,138	124	1,356			

Each F tests the simple effects of Condition Time scarcity within each level combination of the other effects shown. These tests are based on the linearly independent pairwise comparisons among the estimated marginal means.

Tests of Between-Subjects Effects

Dependent Variable:Skepticism_Scale

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	33,611[a]	3	11,204	7,993	,000	,160
Intercept	1918,802	1	1918,802	1368,923	,000	,916
Cond_demand	6,423	1	6,423	4,582	,034	,035
Cond_Time_scarcity	9,354	1	9,354	6,674	,011	,050
Cond_demand * Cond_Time_scarcity	7,751	1	7,751	5,530	,020	,042
Error	176,613	126	1,402			
Total	2517,444	130				
Corrected Total	210,223	129				

a. R Squared = ,160 (Adjusted R Squared = ,140)

Tests of Between-Subjects Effects

Dependent Variable:Skepticism_Scale

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	22,800[a]	3	7,600	5,109	,002	,108
Intercept	2140,909	1	2140,909	1439,279	,000	,920
Cond_supply	1,916	1	1,916	1,288	,259	,010
Cond_Time_scarcity	15,058	1	15,058	10,123	,002	,074
Cond_supply * Cond_Time_scarcity	1,290	1	1,290	,867	,354	,007
Error	187,423	126	1,487			
Total	2517,444	130				
Corrected Total	210,223	129				

a. R Squared = ,108 (Adjusted R Squared = ,087)

Popularity

Tests of Between-Subjects Effects

Dependent Variable:Popularity_Scale

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	24,046[a]	5	4,809	3,995	,002	,139
Intercept	3522,032	1	3522,032	2925,437	,000	,959
Cond_Quantity_scarcity	22,349	2	11,174	9,282	,000	,130
Cond_Time_scarcity	1,479	1	1,479	1,228	,270	,010
Cond_Quantity_scarcity * Cond_Time_scarcity	,502	2	,251	,209	,812	,003
Error	149,288	124	1,204			
Total	3705,889	130				
Corrected Total	173,334	129				

a. R Squared = ,139 (Adjusted R Squared = ,104)

Quality

Tests of Between-Subjects Effects

Dependent Variable:Quality_Scale

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	22,902[a]	5	4,580	4,069	,002	,141
Intercept	3105,666	1	3105,666	2758,804	,000	,957
Cond_Quantity_scarcity	19,733	2	9,867	8,765	,000	,124
Cond_Time_scarcity	,000	1	,000	,000	,991	,000
Cond_Quantity_scarcity * Cond_Time_scarcity	3,126	2	1,563	1,388	,253	,022
Error	139,590	124	1,126			
Total	3274,000	130				
Corrected Total	162,492	129				

a. R Squared = ,141 (Adjusted R Squared = ,106)

Competitive arousal

Tests of Between-Subjects Effects

Dependent Variable:Competition_Scale

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	31,970[a]	5	6,394	4,431	,001	,152
Intercept	1826,101	1	1826,101	1265,500	,000	,911
Cond_Quantity_scarcity	25,581	2	12,791	8,864	,000	,125
Cond_Time_scarcity	3,440	1	3,440	2,384	,125	,019
Cond_Quantity_scarcity * Cond_Time_scarcity	3,459	2	1,729	1,198	,305	,019
Error	178,930	124	1,443			
Total	2042,778	130				
Corrected Total	210,901	129				

a. R Squared = ,152 (Adjusted R Squared = ,117)

Purchase intention

Tests of Between-Subjects Effects

Dependent Variable:PurchaseIntent_Scale

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	19,928[a]	5	3,986	2,831	,019	,102
Intercept	2955,713	1	2955,713	2099,100	,000	,944
Cond_Quantity_scarcity	14,315	2	7,158	5,083	,008	,076
Cond_Time_scarcity	2,399	1	2,399	1,704	,194	,014
Cond_Quantity_scarcity * Cond_Time_scarcity	3,332	2	1,666	1,183	,310	,019
Error	174,603	124	1,408			
Total	3161,000	130				
Corrected Total	194,531	129				

a. R Squared = ,102 (Adjusted R Squared = ,066)