HEC MONTRÉAL
École affiliée à l'Université de Montréal

ESSAYS ON THE EFFECTS OF PRICE STIMULI IN ONLINE DISPLAY ADS

par
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Thèse présentée en vue de l'obtention du grade de Ph. D. en administration
(option Marketing)

Janvier 2019

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Cette thèse intitulée :

ESSAYS ON THE EFFECTS OF PRICE STIMULI IN ONLINE DISPLAY ADS

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Résumé

Les deux articles de cette thèse étudient les effets inconscients des stimuli de prix accidentels dans les environnements en ligne.

Le premier article s'intitule « Price in Online Display ads: An Eye-Tracking Study ». Les résultats d'une étude par *eye-tracking* montrent que l'ampleur des stimuli de prix affecte l'attention des consommateurs sur les annonces publicitaires en ligne auxquelles ils sont exposés. Autrement dit, la durée de fixation des consommateurs (i.e. taille de la pupille) est plus longue (i.e. taille de la pupille plus élargie) pour les annonces qui contiennent des stimuli de prix de valeur élevée, comparativement à des annonces qui contiennent des stimuli de prix de faible valeur. De plus, lorsque les annonces sont affichées à plusieurs reprises sur la même page Web, la durée de fixation augmente en fonction de son emplacement sur cette page, uniquement dans le cas d'annonces avec un prix de valeur élevée. Pour les annonces avec un prix de valeur faible, le comportement lié au regard ne change pas. Nous suggérons que ces différences de comportement observé dans le regard sont dues à un mécanisme de traitement des prix différent pour les stimuli de prix accidentels. Lorsque les annonces contiennent des stimuli de prix de valeur élevée, les consommateurs traitent les annonces par le biais du mécanisme de *selective accessibility* qui est plus élaboré. En revanche, lorsque les publicités contiennent des stimuli de prix de faible valeur, les consommateurs les traitent selon le mécanisme de *anchoring-and-adjustment* qui est plus direct.

Le deuxième article s'intitule « Can Advertising Repetition Reduce Consumers' Internal Reference Price in Online Environments? ». Trois expérimentations ont été menées dans un contexte de publicité en ligne, afin d'étudier les effets de la répétition de la publicité sur la propension à payer du client et sur son prix de référence (PR). Les résultats de la première expérimentation montrent que le PR du consommateur est affecté par les stimuli de prix présents dans les annonces, même s'il ne se rappelle pas les avoir vus. La seconde expérimentation montre que l'augmentation du nombre d'expositions à la publicité intensifie les effets des stimuli de prix présents dans ces annonces, uniquement lorsque le prix de l'annonce est inférieur au PR du consommateur. À l'inverse, lorsque les stimuli de prix sont supérieurs au PR du consommateur, l'augmentation du nombre d'expositions publicitaires ne modifie pas l'effet d'assimilation des stimuli de prix. Nous suggérons que cet effet asymétrique de la répétition des annonces est dû au fait que les stimuli de prix (indépendamment de leur valeur) exercent leur influence sur le PR des consommateurs via deux mécanismes cognitifs différents. La troisième expérimentation étudie l'effet de la répétition des annonces promotionnelles auxquelles les consommateurs sont exposés accidentellement. Les résultats montrent que les participants sont plus affectés par l'effet d'un prix de valeur élevée, comparativement à un prix de faible valeur. Par conséquent, la répétition des annonces ne modifie pas le consentement à payer des participants. Les implications théoriques et managériales des résultats sont présentées par la suite.

Mots-clés : publicité en ligne, ancrage des prix, répétition de l'annonce, ancrages de prix inconscients

Méthodes de recherche : *eye-tracking*, expérience en ligne.

Abstract

The two papers of my thesis explore the non-conscious effects of incidental price anchors in online environments.

The first paper entitled "Price in Online Display ads: An Eye-Tracking Study". Results of an eye-tracking study show that the magnitude of price stimuli can affect consumers' attention toward online display ads that consumers are exposed to incidentally. That is, consumers' fixation duration (pupil size) is longer (larger) for ads which contain high-value price stimuli than ads which contain low-value price stimuli. Moreover, when ads are displayed repeatedly on the same Web page, the fixation duration is increased as a function of the order of placement only when ads contain high-value price stimuli. For ads containing low-value price stimuli, the gaze behavior did not change. We suggest that the observed different gaze behavior is due to a different price processing mechanism for incidental price stimuli: When ads contain high-magnitude price stimuli, consumers process the ads through the elaborative selective accessibility mechanism; but when ads contain low-magnitude price stimuli, consumers process the ads through the more direct priming mechanism of anchoring and adjustment.

In the second essay entitled "Can Advertising Repetition Reduce Consumers' Willingness to Pay in Online Environments?", we did three experiments to investigate the effects of ad repetition on consumers' willingness-to-pay as well as their internal reference price (IRP), in particular when consumers are exposed to the ads incidentally. Experiment 1 demonstrates that consumers' IRP is affected by price stimuli in the ads even when they do not recall seeing them. Experiment 2 examines the ad repetition effect and shows that

increasing the number of ad exposures intensifies the effect of price stimulus in the ads only when the price in the ad is lower than consumers' IRP. When the price stimuli are higher than consumers' IRP, increasing the number of ad exposures does not change the assimilation effect of price stimuli. We suggest that this asymmetric effect of ad repetition is due to the fact that high-price stimuli and low-price stimuli exert their influence on consumers' IRP through two different cognitive mechanisms. In Experiment 3, we examine the ad repetition effect for price comparing ads to which consumers are incidentally exposed. The results show that the effect of high-value advertised reference price was the dominant effect and participants were less affected by low-value selling price. Consequently, ad repetition did not change participants' willingness-to-pay. Theoretical and practical implications of the results are explained.

Keywords : online display ads, ad repetition, price anchoring, non-conscious price processing.

Research methods : Eye-tracking, online experiment.

Table of Contents

List of tables and figures

List of tables

List of figures

List of acronyms

ARP: Advertised Reference Price

e.g.: for example

EP: Expected Market Price

i.e.: that is

IRP: Internal Reference Price

SP: Selling Price

WTP: Willingness to Pay

To my parents, whom I inherited the passion for knowledge and learning.

To my wife, Naghmeh, for her endless love and support.

Acknowledgements

This thesis is due, and I am indebted, to the help and support of many people. First, I would like to express my sincere gratitude to my thesis advisors, Professor Sihem Taboubi and Professor Sylvain Sénécal, for their continuous support of my PhD and research, and for their patience, motivation, enthusiasm. I will remain always grateful for their genuine mentorship and support. Thank you, Sihem. Thank you, Sylvain.

I would like to express my special appreciation and thanks to Professor Yany Grégoire, my internal committee member and my academic "big brother", for encouraging my research and supporting me through these years. The opportunity to work closely with Yany has been priceless, and I will always be grateful for his sincere efforts to help me evolve as a researcher. I would like to thank the members of my thesis committee, Professor Charles Hofacker and Dr. Marcelo Nepomuceno, for their constructive comments. My warm regards to Professor François Bellavance for his valuable advice and continuous support.

I would like to convey my thanks to my good friends and colleagues at HEC Montreal. Their friendship made graduate school a wonderful experience. Thanks to Mina Rohani, Nasser Shahrasbi and Mostafa Purmehdi for being warm-hearted friends who never double-checked their schedule for helping me. This thesis benefitted greatly from countless discussions and arguments with them. I would like to thank Tara, Renato, Adriano, Shahin, Farid, Görkem, Éve, Nicole, Lise, Élaine, Julie and Nathalie, whose friendship made graduate school a wonderful experience.

Finally, I would like to thank my family. My heartfelt thanks to my best friend and my wife, Naghmeh. Words cannot express how grateful I am to her for all her love, patience, kindness, support, and respect. With her, this journey has been special and memorable. Last but foremost, I would like to express my deepest gratitude to my parents who were my first mentors and biggest supporters in my whole life. This thesis is dedicated to my parents, *Nahid* and *Ali*, who gives me the world.

Introduction

As an element of the marketing mix, price is a critical antecedent of consumers' decisions and of firms' profits (Kotler and Keller 2006). For the last four decades, behavioral price research has been examining issues such as "how consumers judge prices" or "how they perceive price" (Cheng and Monroe 2013). During this period, the advent of the Internet and the soaring growth of connected devices have changed the way consumers interact with marketing messages (Goldfarb 2014). However, very little research has been done on how consumers process price information in online environments.

Every day, online consumers encounter myriads of ads on the Internet, yet they pay little if any attention to them (Drèze and Hussherr 2003; Yoo 2008). While it is not unusual for online ads to contain price information, there appear to be no guideline about communicating price information through them. Previous research has revealed that contextual price information impacts consumers' responses even (i) when they are not paying attention to the this information or (ii) when they are not aware of its potential effect on their judgments (Adaval and Monroe 2002; Nunes and Boatwright 2004; Thomas and Morwitz 2009).

The aim of the present thesis is to investigate the effects of price information in online display ads as they are seen in real world situations. My work examines the non-conscious effect of price stimuli on consumer responses, and it explores the cognitive mechanisms through which price stimuli in display ads exert an influence on consumers even when they do not pay attention to these ads, try to avoid them, or claim to be

unable to recall them. Besides, previous studies link the price magnitude and willingness-to-pay. However, they assume that consumers process high- and low-magnitude price stimuli through the same cognitive mechanism. This study also set out to assess this implicit assumption. Finally, the effect of ad repetition on willingness-to-pay has not been investigated in online environments. Therefore, three specific questions are addressed: (1) To what extent can online consumers elaborate the price stimuli in online display ads? (2) What is the effect of price magnitude on consumers' attention and on their response to ads? and (3) What is the effect of ad repetition?

To address these questions, the first essay investigates the effects of price magnitude and ad repetition on consumers' attention to display ads that they are incidentally exposed to. The term incidental exposure refers to situations when consumers are exposed to a stimulus that they do not pay attention to because they do not find it relevant to the main task they are doing at the time of exposure. While price anchoring researchers have examined the non-conscious effects of price stimuli on consumers' judgment (see Thomas and Morwitz 2009), this essay argues that price stimuli in online display ads deserve special attention because consumers' exposure to online display ads is different from the operationalization of price anchors examined in previous studies. While prior research displays the price anchors either subliminally (e.g., Adaval and Monroe 2002) or separately from the main task (e.g., Herr 1989), online consumers are exposed to display ads incidentally, not in a separate task nor without their awareness of ads' existence.

Moreover, behavioral price research makes the implicit assumption that consumers process high- and low-magnitude price anchors similarly, but several recent

studies have shown that consumers' perception of price information is not necessarily determined by rule-based arithmetic computations of numerical values (e.g., Thomas and Morwitz 2009). In other words, to understand consumers' responses to price stimuli, it is important to consider the influences of heuristics such as prospect theory (Kahneman and Tversky 1979). This essay therefore explores the non-conscious price processing by comparing the level of cognitive processing that occurs when there are high- magnitude price stimuli with the level of cognitive processing that occurs when there are low-magnitude price stimuli in online display ads.

Building on the price-priming literature, the effect of incidental price stimuli on consumers' price judgment could be explained by two mechanisms (Adaval and Wyer 2011): (1) the input mechanism in the selective-accessibility process (Strack and Mussweiler 1997), and (2) the output mechanism identified in the anchoring-and-adjustment theory (Tversky and Kahneman 1974). While both mechanisms contribute to the price-priming effect, the input mechanism requires more elaboration at the time of exposure (Adaval and Wyer 2011; Blankenship et al. 2008; Wegener et al. 2010). This essay argues that because consumers are more sensitive to high value prices than low value ones (e.g., Kahneman and Tversky 1979; Kalyanaram and Winer 1995; Winer 1986), the probability that they process high-magnitude price stimuli in incidental ads through the more elaborative input mechanism is higher. To test these hypotheses, an eye-tracking study was used. This methodology is mainly justified by the fact that it provides an unintrusive, real-time proxy for the measurement of attention and cognitive processing (Laeng, Sirois, and Gredebäck 2012; Wedel and Pieters 2008). The results

show that participants had longer fixation duration and larger pupil size for high-price ads than for low-price ads, a result that is supportive of my first set of predictions.

The second essay explores the non-conscious effects of incidental price stimuli by examining the effect of ad repetition on consumers' willingness-to-pay. It also examines the effect of ad repetition in the context of price-comparing ads. It is linked to the first essay because it investigates the effect of these ads when consumers are exposed to them incidentally and because price-comparing ads feature both high-value and low-value price information (i.e., both the advertised reference price and the selling price) simultaneously. Prior research does not examine the effect of ad repetition on the effectiveness of consumers' willingness-to-pay. Indeed, although this strategy is abundantly used by marketers to increase ad effectiveness in online environments (Yaveroglu and Donthu 2008), its impact on price processing has received limited attention from researchers. Through the second essay, I posit that to address this gap, it is imperative to consider the non-conscious price processing of high- and low-magnitude price stimuli.

In addition, marketers use price comparing ads to increase consumers' willingness-to-pay (Urbany, Bearden, and Weilbaker 1988). Previous studies have revealed that both the low-value selling price and high-value advertised reference price exert influences on consumers' willingness-to-pay; however, the process at play is still unclear. A particular feature of past research (Compeau and Grewal 1998) is that the price comparing ads were the focal point of participants' attention. To the best of my knowledge, the effect of price comparing ads has not been examined in an online, incidental context, which is

more representative of the ad exposures occurring in real life. This examination constitutes the second contribution of Essay 2.

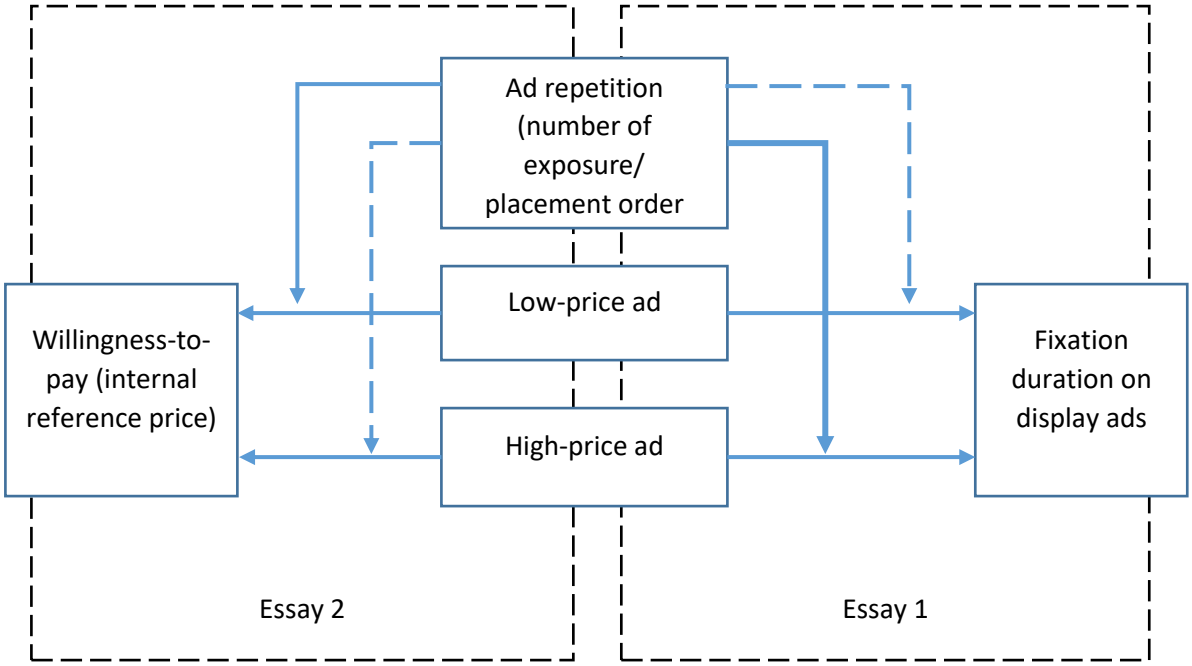
Three online experiments are used to test the hypotheses of the second essay. In these experiments, participants were exposed to online dipslay ads in exactly the same way that online consumers are exposed to them in the real world. The results support the findings of previous studies showing that incidental price stimuli can affect consumers' willingness-to-pay, even if they are not aware of this effect (Nunes and Boatwright 2004). This essay maintains that the effect of ad repetition on consumers' willingness-to-pay depends on the type of cognitive price processing. That is, when the output mechanism dominates the anchoring effect, ad repetition improves the effect of incidental price stimuli on consumers' willingness-to-pay because each repeated exposure increases the probability that the incidental price stimulus will act as an anchor in subsequent price judgments. However, if the dominant price anchoring mechanism is the more elaborate input one, ad repetition does not have any effect on willingness-to-pay. The input mechanism is a semantic priming and has a more lasting effect than the output mechanism (Blankenship et al. 2008). Therefore, repeated exposure to the same price information does not improve the anchoring effect. As Essay 1 find, the results show that when ads feature low-magnitude price stimuli, the output mechanism dominates the overall anchoring effect, and when ads feature high-magnitude price stimuli, the input mechanism contributes more to the anchoring effect. Finally, the results demonstrate that consumers' willingness-to-pay is not affected by ad repetition when they are exposed to price comparing ads. This result could be driven by the

dominant effect of the high-value advertised reference price when ads are displayed incidentally.

Theoretical framework

Figure 1 shows the conceptual model of my thesis. While the exposures to the online display ads affect consumers' attention and their willingness-to-pay, the aim of this thesis is to compare the effects when ads feature high-magnitude or low-magnitude price stimuli (i.e., high-price and low-price ads). These effects are also investigated when consumers repeatedly but incidentally are exposed to the ads.

Figure i-1: The theoretical framework



These two essays get the big picture of how consumers process price information in display ads when they are exposed to them incidentally and of how their willingness-to-pay can be affected by the type of price processing in this context. Essay 1 examines the non-conscious price processing by comparing the gaze behavior between low-price and high-price ads. In particular, it studies how consumers' gaze behavior changes when consumers are exposed to the same ad repeatedly but incidentally. Essay 2 examines

whether the type of non-conscious price processing lead to different effects of ad repetition on willingness-to-pay when consumers are exposed to online ads incidentally.

Chapter 1: Price in Online Display ads: An Eye-Tracking Study

Abstract

Results of an eye-tracking study show that the magnitude of price stimuli can affect consumers' attention toward online display ads that consumers are exposed to incidentally. That is, consumers' fixation duration (pupil size) is longer (larger) for ads which contain high-value price stimuli than ads which contain low-value price stimuli. Moreover, when ads are displayed repeatedly on the same Web page, the fixation duration is increased as a function of the order of placement only when ads contain high-value price stimuli. For ads containing low-value price stimuli, the gaze behavior did not change. We suggest that the observed different gaze behavior is due to a different price processing mechanism for incidental price stimuli: When ads contain high-magnitude price stimuli, consumers process the ads through the elaborative selective accessibility mechanism; but when ads contain low-magnitude price stimuli, consumers process the ads through the more direct priming mechanism of anchoring and adjustment.

1.1 Introduction

Every day, online consumers encounter a myriad of ads on the Internet. According to a recent estimate, an average user sees 11,150 online display ads per month (Elliott 2017). Consumers cannot pay attention to all ads and most of them go unnoticed (Yoo 2008). However, soaring spending on online ads suggests that marketers find them effective; in 2018, more than 21 billion dollars were spent on banner and display ads in the United States only (eMarketer, 2019). Although some studies (e.g., Drèze and Hussherr 2003; Yoo 2008) reveal that online ads can affect consumers even when they are trying to avoid them, they do not formally examine the cognitive processes through which ads exert their influence. This research gap becomes even wider for the issue of

price information in online ads. To the best of our knowledge, there are no guidelines about communicating price information in online display ads.

Previous research reveals that contextual price anchors impact consumers responses even when either they are not paying attention to the price anchor, or they are not aware of its potential effect on their judgments (Adaval and Monroe 2002; Nunes and Boatwright 2004; Thomas and Morwitz 2009). To investigate the effects of price anchors, two types of contextual anchors have been mostly employed in previous studies: (1) explicit anchors and (2) subliminal ones. Explicit anchors are usually displayed as part of a standard anchoring paradigm in which participants are asked to evaluate an anchor; and then in a second task, they provide an estimate for the product's price. For example, Adaval and Wyer (2011) asked participants to evaluate the average price of a camera against a price anchor. Then, in a separate task, they asked participants to report the price they would pay for such a camera. Subliminal anchors are usually displayed repeatedly below participants' perceptual threshold while they are doing an unrelated task. For example, Adaval and Wyer (2011, Experiment 2) exposed their participants repeatedly to the price anchors for as short as 15 milliseconds, which is too fast for participants to detect them. After they repeated this task 46 times, they asked participants to report the price they were willing to pay to purchase a camera.

The current research uses a contextual anchor which differs from the two typical operationalisations just described. Indeed, price anchors in online ads are displayed neither explicitly nor subliminally. In real life, consumers mostly ignore or avoid online display ads, although they may remain aware of their existence (Drèze and Hussherr 2003; Shankar and Hollinger 2007; Yoo 2008). We refer to price stimuli that are

displayed in online ads as *incidental* price anchors. They are contextual price stimuli of which consumers are aware; however, they avoid paying attention to these stimuli because they do not regard them as being relevant to achieve their goal at the moment of exposure (Nunes and Boatwright 2004). Price anchors in online ads are not subliminal anchors because consumers are aware of them. They are not explicit anchors either because consumers do not process them with full attention.

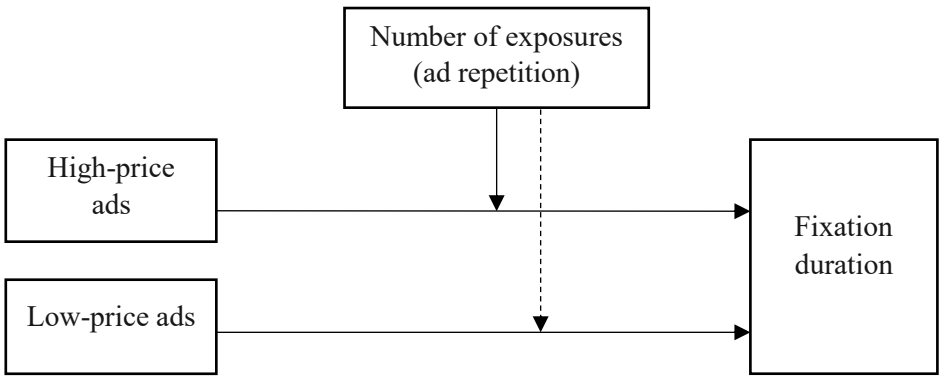
Consistent with this view, eye-tracking studies show that consumers fixate on online display ads at least once for each page visit (Hervet et al. 2011) even though they avoid looking at the ads (Drèze and Hussherr 2003; Shankar and Hollinger 2007; Yoo 2008). In these cases, fixation durations on ads typically vary from 100 to 300 milliseconds (Holmqvist et al. 2011). Although this duration is short, it is long enough for consumers to process the content of the ads (Pieters and Wedel 2012). Therefore, we argue that online consumers can process the price stimuli in web ads even if they fail to recall them or only partially recall them (Yoo 2008; Drèze and Hussherr 2003). Despite the prevalence of incidental price exposure in real life and in online environments, we remain unaware of any research that has systematically investigated price anchoring in this "natural" context. This is the general context in which this research takes place.

Along with our interest in studying the effects of price anchor in incidental ad exposure, we also study the effects of ad repetition. We focus on this attribute because ad repetition is one of the common strategies used to increase the effectiveness of online advertisement (Malaviya, Meyers-Levy, and Sternthal 1999; Yaveroglu and Donthu 2008). Again, to the best of our knowledge, the effects of ad repetition on price

anchoring has not been studied in the context of incidental ad exposure in online environments.

Against this backdrop, the current research aims to document the processing of incidental ads in an online environment when the magnitude of price stimuli differs and the number of exposures varies (one versus three). Figure 1.1 provides an overview of our conceptual framework. In this study, we use the attention given to a marketing stimulus—measured in terms of fixation duration—as a proxy to capture the presence of "incidental" processing. Attention to a marketing stimulus can be a proxy to measure the non-conscious processing of that stimulus, and eye-tracking has been widely used to measure consumers' attention to a visual stimulus. Therefore, given the general purpose of this research, eye-tracking becomes the method of choice because it measures in a non-intrusive manner the fixation duration on a visual stimulus with a high level of precision (Orquin and Mueller Loose 2013). When consumers pay more attention to the stimuli, we argue, they engage in more elaborate cognitive processing.

Figure 1-2: Conceptual framework



As a first contribution, we examine the effects of price magnitude on fixation duration, which reflects the level of cognitive price processing. Behavioral price

research makes the implicit assumption that consumers process high-magnitude and low-magnitude price anchors similarly. Nevertheless, several studies have highlighted the role of price as a form of numerical stimuli in price cognition (Thomas and Morwitz 2009). Consumers evaluate a product's price against an internal standard called internal reference price (Cheng and Monroe, 2003). We refer to price stimuli lower (higher) than internal reference price as low-magnitude (high-magnitude) price stimuli, and to ads featuring them as low-price (high-price) ads.

Two anchoring mechanisms are frequently used to explain price anchoring effect: 1) an output mechanism that relates to Tversky and Kahneman's (1974) anchoring-and-adjustment theory and 2) an input mechanism that relates to Strack and Mussweiler's (1997) selective accessibility model (Adaval and Wyer 2011; Blankenship et al. 2008; Wegener et al. 2010). Briefly—these two mechanisms are explained in detail in the literature review—the main difference between them relates to the amount of cognitive elaboration. The *input mechanism* is a direct anchoring, while the *output mechanism* is a semantic one that relies on product knowledge that becomes accessible in memory (Strack and Mussweiler 1997). We show that price magnitude can determine which mechanism dominates the overall price anchoring effect. Overall, we argue that low price (high price) ad is processed through an output mechanism (an input mechanism)—which requires less (more) cognitive processing. As a result, the fixation duration should be shorter for low-price ads than high-price ones.

As our second contribution, we find that the effect of ad repetition depends on the type of price processing. On the one hand, we hypothesize that when incidental ads feature high-price anchors, ad repeating increases fixation duration on repeated

exposures. We expect this result because at the first exposure, the high-price ad fuels the more elaborate output mechanism, and the participants keep relying on the same mechanism through subsequent exposures (Blankenship et al. 2008). On the other hand, we argue that when incidental ads feature low price anchors, the repeated exposures do not affect fixation duration. In this case, the low-price anchor is processed through the output mechanism, which does not stimulate any lasting effect, and each repeated exposure is processed similarly to the first incidental exposure.

From the managerial perspective, this study will help managers to design their online display ads and ad repetition strategy more effectively. We show that including price stimuli increases the probability that consumers will elaborate the ad more intensively. Moreover, when designing an ad repetition strategy, we suggest that marketers should consider both the product and its price.

This paper proceeds as follows. First, the price anchoring literature is reviewed to explain the two price anchoring mechanisms. Then, integrating the eye-tracking literature, we propose the hypothesis. Next, the eye-tracking study and its results are explained. Finally, we present both managerial and theoretical implications of the findings.

1.2 Literature Review

In this section, we provide a review of price anchoring research to highlight two main types of anchoring operationalization as well as the key differences between them and incidental price anchors. Next, we explain the two mechanisms of price anchoring and their relationships to attention.

1.2.1 Incidental Price Anchors

Previous research on price anchoring, for the most part, considers two types contextual price anchors: (1) explicit anchors that are presented on the basis of the standard anchoring paradigm (Tversky and Kahneman 1974) and (2) subliminal anchors that are displayed below consumers' perceptual thresholds (e.g., 15 ms). Experiments that employed the standard anchoring paradigm (e.g., Herr 1989; Meyers-Levy and Sternthal 1993) for the most part comprise two steps. In the first step, participants explicitly make a magnitude judgment about a price anchor (e.g., "Is the price of product X higher or lower than $Y?"). Then in the second step, which is the absolute judgment task, participants provide a price estimate for the target product (e.g., "What do you think is the price of the product X on the market?"). In these studies, while participants are aware of the anchor, they are not aware of its potential effect on their subsequent judgment.

In the subliminal anchoring studies (e.g., Adaval and Monroe 2002; Adaval and Wyer 2011), however, price anchors are presented without participants being awareness of them. In these studies, participants are asked to do a completely unrelated task that requires them to fixate on a specific point on a screen. While they are performing that task, some price anchors are displayed repeatedly at their fixation point for a fraction of a second (e.g., 15 milliseconds). Therefore, since anchor exposures are below participants' perceptual threshold, they are not able to recognize the existence of these anchors when they are asked about them later.

Consumers' exposure to *incidental price anchors* in online display ads—the context of this research—is unlike any of the above-mentioned operationalizations of

price anchoring. It is different from the standard anchoring procedure because consumers usually do not consciously evaluate the price anchor. In online environments, consumers are thought to be more goal- and task-oriented (Yoo 2008). Therefore, when they are exposed to display ads embedded in web pages, they remain chiefly preoccupied with the primary task for which they are visiting that particular web page. Thus, they mostly ignore display ads or avoid looking at them (Drèze and Hussherr 2003); they do not process the price stimuli as deeply as they process price anchors in standard anchoring paradigms.

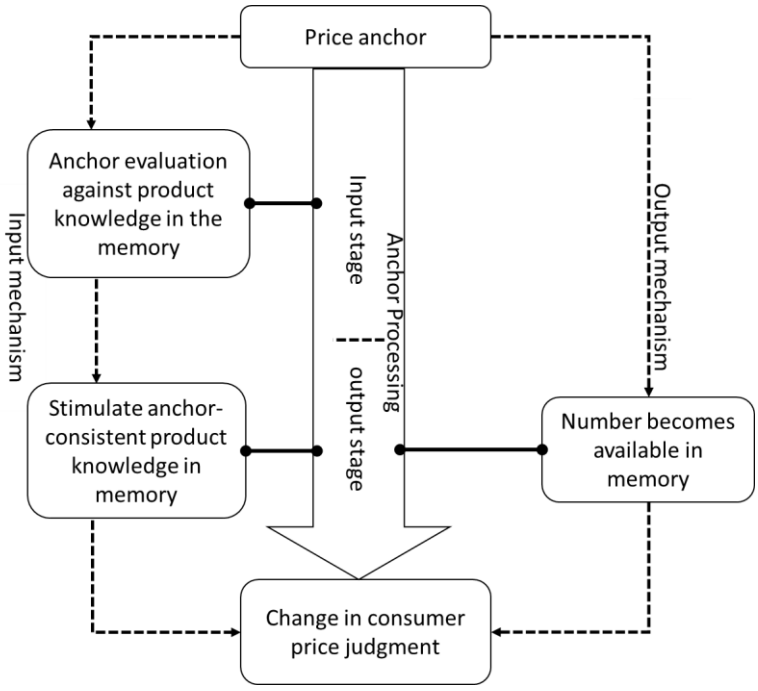
In addition, exposure to incidental price anchors in online display ads is different from subliminal priming. In the latter, participants are repeatedly exposed to price anchors below their perceptual threshold, but in the former, consumers usually fixate on ads for a longer duration than their perceptual threshold (Hervet et al. 2011; Pieters and Wedel 2012). In their review of eye-tracking studies, Holmqvist et al. (2011) mention that eye fixations are mostly around 200-300 ms, although they can be as short as 30-40 ms. The fixation duration is important not only because it is an indicator of attention, but also because, according to the eye-mind hypothesis (Just and Carpenter 1980), it is an indicator of the amount of cognitive processing. The eye-mind hypothesis postulates that consumers process what they look at for the total fixation time (Nielsen and Pernice 2010), and that a longer fixation is associated with deeper cognitive processing (Holmqvist et al. 2011). Given that the exposure time is less than 30 ms in subliminal priming, whereas the fixation duration for online display ads is usually longer than 100 ms, consumers should process online display ads more deeply than price anchors in subliminal priming.

In summary, consumers process information in incidental online ads differently than they assess explicit or subliminal anchors. To investigate how different factors—such as the magnitude of price anchors and the effect of ad repetition—impact consumer responses, it is imperative to consider the cognitive mechanism of price anchoring.

1.2.2 Price Anchoring Mechanisms

To explain the price anchoring effect, previous studies have frequently used two cognitive mechanisms: (1) an output mechanism based on Tversky and Kahneman's (1974) anchoring-and-adjustment theory, and (2) an input mechanism based on Strack and Mussweiler's (1997) selective accessibility model (Adaval and Wyer 2011; Blankenship et al. 2008; Wegener et al. 2010). Figure 1.2 provides an overview of these mechanisms.

Figure 1-3: Cognitive price processing and anchoring mechanism



The output mechanism is a numerical priming in which exposure to a price anchor increases the likelihood that the price anchor is arbitrarily used as a numerical anchor in subsequent price judgments (Mussweiler and Englich 2005). For example, in an experiment by Nunes and Boatwright (2004), participants' willingness to pay for a music CD was affected by the price of a sweatshirt displayed next to the music CD. Since the sweatshirt is not relevant to the music CD, the observed anchoring effect cannot be explained through a conscious anchoring effect, but through a non-conscious effect in which the price of the sweatshirt acted as a form of numerical anchor. That is, the exposure to the sweatshirt increased the accessibility of the price of the sweatshirt and, in turn, that price acted as an arbitrary anchor when participants reported their willingness to pay for the music CD. Adaval and Wyer (2011) refer to this as an output mechanism because its effect typically occurs at the output stage of processing.

On the other hand, the input mechanism is a semantic priming through which exposure to the price of a product increases the accessibility of anchor-consistent product knowledge in the consumer's memory so that, subsequently, the more accessible product knowledge affects price judgments (Kan et al. 2014). For example, Mussweiler and Englich (2005) had their participants first evaluate the average price of a car against a price anchor (high vs. low). In the next step, they had participants perform a series of lexical decision tasks. In each task, a string, which consisted of a series of alphabetical characters, was displayed on the monitor and participants had to decide whether the string formed a meaningful word or was meaningless. Among the words displayed, some were associated with either expensive or inexpensive cars (e.g., BMW and Golf respectively). Their results show that when participants were evaluating

the price of a car against the high-price (low-price) anchor, they were faster in selecting the words associated with expensive (inexpensive) cars. Mussweiler and Englich (2005) concluded that anchor-consistent car knowledge becomes more accessible in the consumer's memory because of anchor evaluation tasks.

Input and output anchoring mechanisms can both occur as a result of explicit or subliminal exposure to the anchor. The input process requires more elaboration than the output one (Adaval and Wyer 2011) because it requires consumers to link the price anchor and the product knowledge in their memory. However, both mechanisms can contribute to the overall effect of anchors on consumers' judgment (Adaval and Wyer 2011; Blankenship et al. 2008; Turner and Schley 2016). When consumers are capable of more cognitive elaboration of a price anchor and are motivated to do so, they are more likely to use an input mechanism. When consumers process the price anchors with less cognitive effort, they are more likely to use an output mechanism.

To vary the type of anchoring mechanisms (i.e., input vs. output), previous studies have manipulated the cognitive load or type of cognitive activity that participants experienced during price exposure. Blankenship et al. (2008) found that when the cognitive load is high, the less elaborate output mechanism becomes dominant. On the contrary, the more elaborate input mechanism becomes dominant when the cognitive load is low. Consistent with this view, Adaval and Wyer (2011) manipulated the level of cognitive activity before exposing participants to price anchors. They asked a group of participants to write down something about the target product (i.e., the cognitive load manipulation), then they exposed the other group to the price anchors. They found that the anchoring effect was attenuated when participants wrote about the product before

being exposed to the anchor stimuli. They postulated that writing about the product activates general knowledge of the product in participants' memory. In this case, the anchoring effect is limited to the output mechanism of anchor and adjustment. For the other group, both mechanisms contribute to the overall effect.

1.3 Hypotheses Development

We suggest that the price, as numerical information, can manipulate whether the input or output mechanism dominates the overall price processing. Some scholars (e.g., Thomas 2013; Thomas and Morwitz 2009) posit that price can also be treated as a physical stimulus because its influence on consumers' responses is not limited to deliberative rule-based processes. For example, several studies document the left digit effect (e.g., Manning and Sprott 2009; Thomas and Morwitz 2005). They show that consumers perceived estimation of distance between two prices—differing by only 1 cent—is not a true reflection of their numerical distance when there is a change in the left digit (e.g., $3.99 and $4.00). These studies and other evidence in the literature (see Thomas and Morwitz 2009 for a detailed review) highlight the role of heuristics in price cognition. Nevertheless, behavioral price research makes the implicit assumption that consumers process high-magnitude and low-magnitude price stimuli similarly. In this section, we will explain why consumers may process incidental high-magnitude and low-magnitude prices through different anchoring mechanisms.

1.3.1 Price Cognition

According to the prospect theory (Kahneman and Tversky 1979), consumers' reaction to price decreases (i.e., their gain) is different from their reaction to price increases (i.e., their loss), and losses have a greater effect than gains (Chandrashekaran

and Grewal 2006; Guadagni and Little 1983; Kalwani et al. 1990). Strack and Mussweiler (1997) also observe that while both plausible and implausible anchors can affect judgments, they have their effect via different mechanisms. This idea is in accordance with Adaval and Monroe's (2002) view; they find that associating subliminal anchors with either high- or low-magnitude number (e.g., weight in Kg) is sufficient to influence their processing mechanisms.

Accordingly, we postulate that the amount of cognitive resources devoted to price processing is affected by the magnitude of price stimuli. That is, when consumers are exposed to incidental price anchors in online display ads, they are less motivated to elaborate a low-magnitude price stimulus than a high-magnitude price stimulus. On the one hand, when the ads contain high-magnitude price anchors—because consumers are loss averse—they are more motivated to process the price information. Thus, it is more likely that the price processing mechanism is the input mechanism. On the other hand, when incidental ads contain low-magnitude prices, it is more likely that the main price processing mechanism is the output mechanism.

1.3.2 The Effect of Price Magnitude on Fixation Duration

As mentioned, consumers' dominant price processing mechanism (input vs. output) can be influenced by manipulating consumers' cognitive load at the time of price exposure. Drèze and Hussherr (2003) show that the size of a banner ad, its orientation, or its background color can affect the amount of attention consumers pay to the ad. Therefore, by manipulating the saliency of a display ad, the amount of attention devoted to the ad and in turn its elaboration could be manipulated. The relationship between price anchors in online display ads and fixation duration is less clear. The only

exception is an eye-tracking study by Menon et al. (2016) which found a U-shape relation between fixation duration and price magnitude when several prices were displayed on a company's Facebook page. Their results highlight the potential effect of price magnitude in attracting consumers' attention to incidental price anchors.

As mentioned, we posit that consumers' dominant price processing mechanism, the input or output mechanism, can be manipulated by the magnitude of price stimuli in the ads, which in turn affects consumers' cognitive load at the time of exposure. Accordingly, we hypothesize that when consumers are exposed to online display ads that are incidental to the main task of visiting a web page, the fixation duration is affected by the magnitude of price stimuli in the ads. If the ad contains low magnitude prices, it is more likely that the price anchoring mechanism is the output one which requires less elaboration; but if the ad contains high-magnitude prices, it is more likely that the input process which requires more elaboration will dominate the price anchoring mechanism. Since the input mechanism requires more elaboration than the output one, and the fixation duration has a direct relation with the cognitive elaboration of the fixated stimuli, the fixation duration should be longer for the online display ads that have high-magnitude prices than for the others. Therefore:

H1a: When consumers encounter an online display ad incidentally, their fixation duration is longer when the ad contains a high-magnitude price than when the ad contains a low-magnitude price.

Several eye-tracking studies also measure diameter of pupil as a proxy for cognitive load (Just and Carpenter 1980) and/or changes in attentional

capacity (see Laeng, Sirois, and Gredebäck 2012 for a detailed review). More importantly, researchers posit that pupillometry may provide an index for non-conscious cognitive processes before the awareness of the existence of the stimulus (Chapman et al. 1999). Therefore, in accordance with H1a, we expect that pupil size will be wider when consumers are exposed to high-price ads than when they are exposed to low-price ads if the high-price ads force a higher cognitive load at the time of exposure even if consumers do not notice the existence of price stimuli in the ads. Therefore,

> *H1b: When consumers encounter an online display ad incidentally, their pupil diameter is larger when the ad contains a high-magnitude price than when the ad contains a low-magnitude price.*

1.3.3 Ad Repetition and Fixation Duration

When consumers are exposed to the same display ad repeatedly on the same web page, we hypothesize that consumers' fixation duration is not affected when they are not elaborating the price magnitude at a minimum level. Previous eye-tracking studies had investigated the ad repetition effect when it occurs sequentially on different web pages. Lapa (2007) studied subjects' fixation duration on banner ads when they are displayed at the bottom of web pages. He preserved the same page structure over successive web pages, and his results showed that the fixation duration decreased as a function of the number of pages. In another study, Hervet et al. (2011) displayed two ads on two pages sequentially. They found that their participants fixated on the first ad longer. A potential explanation for the observed results is that the participants learned the structure of the web pages and ads' placement and used this knowledge to avoid looking at banner ads

(Hervet et al. 2011). However, when ads are displayed repeatedly on the same page, spatial memory does not help consumers to predict the existence of the ad and to avoid it.

Malaviya, Meyers-Levy, and Sternthal (1999) point out that the effectiveness of ad repetition in a cluttered environment, such as a flyer, depends on how consumers process the target ad. They argue that consumers process an ad in two ways: item-specific and relational. In item-specific processing, when consumers see an ad, they make the association between the brand name and product features explained in the ad. On the other hand, in relational processing, when consumers are exposed to several ads from various categories, they emphasize commonalities that unite the content of ads between and within the ads. Malaviya et al. argue that when both kinds of processing do not occur because of limited cognitive resources available for ad processing, ad repetition does not result in increased preferences for the target product. The difference between these two types of processing and their role in the effectiveness of ad repetition is beyond the scope of this current study. However, their main idea that consumers' cognitive resources available for processing the target ad moderate the effectiveness of ad repetition aligns with this study's hypotheses.

Moreover, following Malaviya et al. (1999), Yaveroglu and Donthu (2008) compared the effectiveness of single ad exposure and varied ad repetition on content-relevant and content-non-relevant web pages. They argue that consumers' peripheral attention to the ad decreases when they are exposed to the same ad repeatedly. They posit that in content-relevant web pages, similar pieces of information are competing for the limited cognitive resources available to process the ads. Therefore, a single ad

repetition execution might generate better outcomes because it enhances the probability that consumers' limited cognitive resources are being used to process the target ad. On the contrary, in content-non-relevant web pages, varied ad repetition can generate better outcomes because the same information is being processed through different routes. On the basis of their findings, we can conclude that the cognitive resources which are devoted to ad processing can moderate the effect of ad repetition. Therefore, if the magnitude of price stimulus in the ad moderates the price anchoring mechanism (input vs output) and the amount of cognitive resources devoted to process the ad, it can moderate ad repetition effect as well.

As we suggested in Hypothesis 1, low-price ads, i.e., ads that contain low-magnitude price stimuli, do not stimulate elaborative price processing. Therefore, when online consumers are exposed to low-price ads repeatedly on a web page since they allocate fewer cognitive resources, they process the ad in a way similar to what they did on their first exposure. Therefore,

> *H2: When consumers are exposed to an online display ad repeatedly in a web page, their fixation duration does not change as a function of the order of ad exposure if the ad contains low magnitude prices.*

On the contrary, when consumers are exposed to high-price ads on the same web page, i.e., ads that contain high-magnitude price stimuli, the price anchor stimulates some price-consistent product knowledge in the consumers' memory. That product knowledge remains in their memory for the time of their session (Blankenship et al. 2008). When consumers are exposed to the same ad repeatedly, price anchor is not

evaluated against some product knowledge now accessible in their memory due to previous exposures (Adaval and Wyer 2011). The extra process requires more time. Therefore:

> *H3: When consumers are exposed to an online display ad repeatedly on a web page, their fixation duration increases as a function of the order of ad exposure if the ad contains high-magnitude price stimuli.*

1.4 Methodology

To test the hypotheses, we employed an eye-tracking study to examine the effects of price magnitude and repeated exposures to the ad on consumers' fixation duration. To examine the effect of ad repetition, we displayed an ad on a web page three times and compared consumers' fixation duration on the first, second, and third exposures. Therefore, this study is a 2 (magnitude of price anchor: low, high) × 3 (order of exposure: first, second, third) mixed design in which order of ad exposure is the within-subject factor. We recruited 65 participants for a compensation of $20CAD in the form of a gift card and we randomly assigned them to one of the treatment conditions. Participants arrived individually at the lab for their appointment. On their arrival, a research assistant explained the procedure of eye-tracking and its calibration to them and helped them to get seated in front of the PC's monitor. After conducting the calibration, the research assistant explained the instructions and started the data recording. At the end of the task, the research assistant debriefed them. The instructions explained that participants would see several web pages and asked them to read those pages carefully because they would be asked to answer some questions regarding the general content of

the web pages. No information about the object of the study or display ads was in the instructions.

The study contained four sections. The first section was a webpage that introduced a new tax-policy implemented by a governmental agency. On that page, a filler ad about a freelancer job opportunity was displayed three times (top, middle, and bottom sections of the page) and center-aligned among the paragraphs. The ad contained no numerical data like price. There were some other ads on the sidebar, header, and footer of the page that were not related the filler ad. In the second section, participants were asked to describe the general content of the previous web page. The goal of including these two initial sections was to prevent participants from guessing the main objective of the study while pushing them to read the target page as naturally as possible. The third section was the target web page whose content was a purchase guide for headphones, and its structure was based on a real web page from Cnet.com. As on the first web page, the target ad was displayed three times (top, middle, and bottom sections of the page).

We designed two versions of the target display ad. While both versions displayed the same model of headphone, the same brand, and gave the same verbal information, they contained different prices. The price was $45 and $325 for the low-price and high-price conditions, respectively. The fourth section of this study was the questionnaire in which we measured the subjects' willingness to pay as well as their ad recall and price recall.

1.4.1 Apparatus

This experiment was controlled by a PC computer with a screen resolution of 1280 × 1024 pixels. Eye movements were recorded with SMI iView X Eye-Tracker version

2.4 (SMI GmbH, 2009). The system resolution rate is 60 Hz and eye movements were captured by an infrared camera at the bottom of a 19" computer screen that was located at about 65 cm from the participants.

1.4.2 Measurements

Total dwell time. Eye-tracking tools record several types of fixation durations. In this study, we are interested in the average fixation duration on an ad from the moment subjects go onto the web page until they leave it. We define three areas of interest (AOI) as three target ads and measure the average fixation duration for each AOI as the sum of all fixations inside each AOI divided by the total number of fixations.

Pupil size. SMI software provides pupil size in millimeters for each fixation. One major argument against the use of pupil size is that the effect of cognitive processing is small compared to the effect of light (Holmqvist et al. 2011). However, in this experiment, we controlled for the light changes in the lab as well as for luminous stimuli. In the lab, all participants performed the task in the lab's constant light. For the stimuli, the web pages' contrast and brightness were constant. Also, before the participants saw the first ad, they spent at least 15 seconds on the web page, which is above the 2-5 seconds threshold recommended for baseline formation (Holmqvist et al. 2011).

Willingness-to-pay. We also measured willingness-to-pay. We asked the subjects what price they would be willing to pay to purchase a wireless headphone if they were going to purchase one. This measure is in accordance with the scale used by Kan et al. (2014).

Ad recall. We measured participants' ad recall by asking whether they recalled any ad advertising headphones. Also, we asked them whether the ads contained a price. If participants mentioned that they did not recall any ad, we mentioned before asking if they recalled any price that there were some headphone ads and asked them to answer the following questions with a well-informed guess. After that question, we asked all the participants to mention what the price in the ads was.

1.4.3 Results

1.4.3.1 Hypothesis Testing

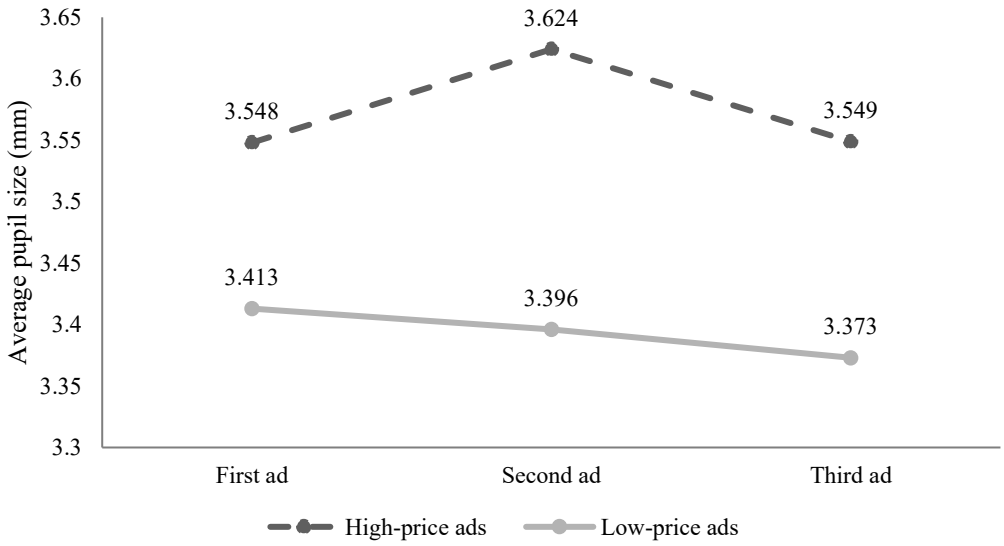
Pupil Dilation. According to Hypothesis 1, we expect that for high-price ads participants would have larger pupil diameter than subjects who are exposed to low price ads. Table 1-1 shows the mean and standard deviation for each cell. In order to analyze the results, we ran a linear mixed-effect model (MIXED), which can handle correlated data with unequal variances and allows an unequal number of repetitions (Gelman and Hill 2006). In our experiment, the eye-tracker did not report any fixation on some target ads for some participants. This zero-fixation issue could be due to either consumers' fixation duration of less than 80 ms or their complete avoidance of the display ad. In either case, the missing data are random and do not violate our assumption of incidental exposure of ads to the eyes of participants. Therefore, employing the MIXED model helped us not to discard participants with missing data from the analysis. The results of the MIXED analysis show a significant effect of price magnitude on the pupil sizes of the fixations ($F_{(1, 85.384)}$=4.979, p=.028). That is, as we predicted in H1, participants who were exposed to high-price ads had a larger pupil size during their

fixations than participants who were exposed to low-price ads (Mean $_{(\text{high-price ads})}$ = 3.573 mm; Mean $_{(\text{low-price ads})}$ = 3.394mm). Figure 1-4 shows the mean on each ad.

Table 1-1: Mean and standard deviation and size of each cell for participants' pupil diameter size (mm)

Order of exposure	**High-price ads**			**Low-price ads**		
	Mean	Std. Error	N	Mean	Std. Error	N
First ad	3.548	.404	27	3.413	.342	29
Second ad	3.624	.364	24	3.396	.361	31
Third ad	3.549	.423	24	3.373	.339	24

Figure 1-4: Average pupil size (mm) on each ad



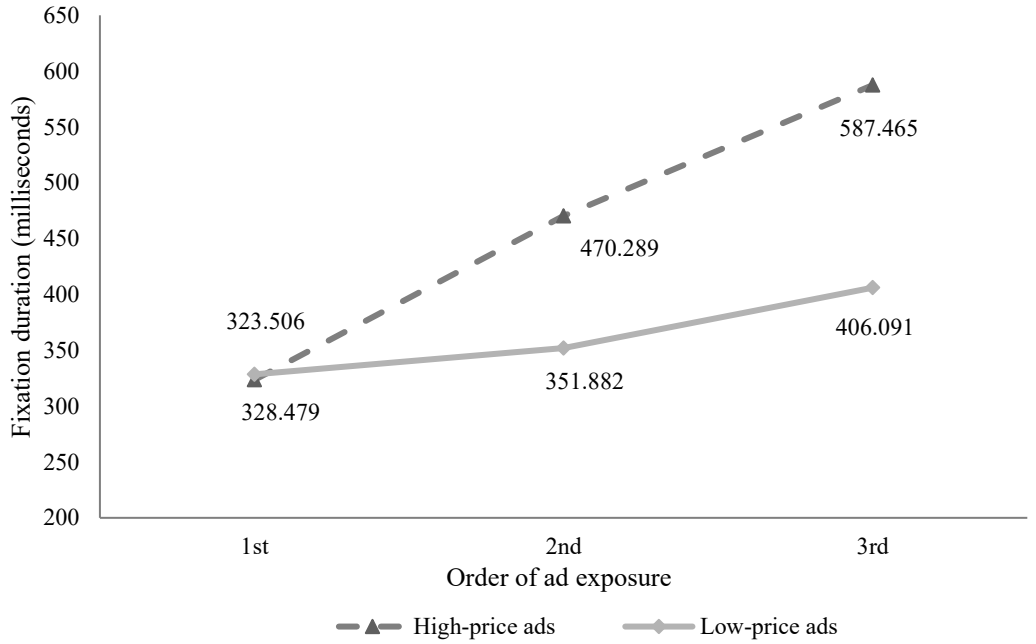
Fixation Duration. According to H1, we expected that participants would fixate longer on high-price ads than on low-price ads. Also, we expected that fixation duration would increase as a function of the number of exposures to the ads when the ads contained high-magnitude price stimuli (H2). For the low-price ads, we predicted that fixation duration would remain constant (H3). Table 1-2 shows the mean and standard deviation for each cell. The results of the linear MIXED model show that the main effect

of price magnitude is significant. That is, participants had a higher fixation duration for high-price ads than for low-price ads ($F_{(1, 55,123)}$=8.990, p=.004), supporting H1. Also, the results show that for the high-price ads, the fixation duration increased after each repeated exposure to the ad ($F_{(2, 104.630)}$=9.473, p<.005); but for the low-price ads, the average fixation duration did not change when subjects were repeatedly exposed to the same ad (F(2, 108.265)<1). These results support H2 and H3 respectively. Figure 1-5 shows the mean and standard deviation for the average fixation duration for each condition.

Table 1-2: Mean, Standard Deviation and size in each cell for participants'' fixation duration

Order of ad exposure	**High-price ads**			**Low-price ads**		
	Mean	Std. Deviation	N	Mean	Std. Deviation	N
First ad	323.506	140.916	27	328.479	121.453	29
Second ad	470.289	277.376	24	351.882	124.919	31
Third ad	587.465	342.399	24	406.091	218.234	24

Figure 1-5: Mean (standard error) for the average fixation duration on each ad



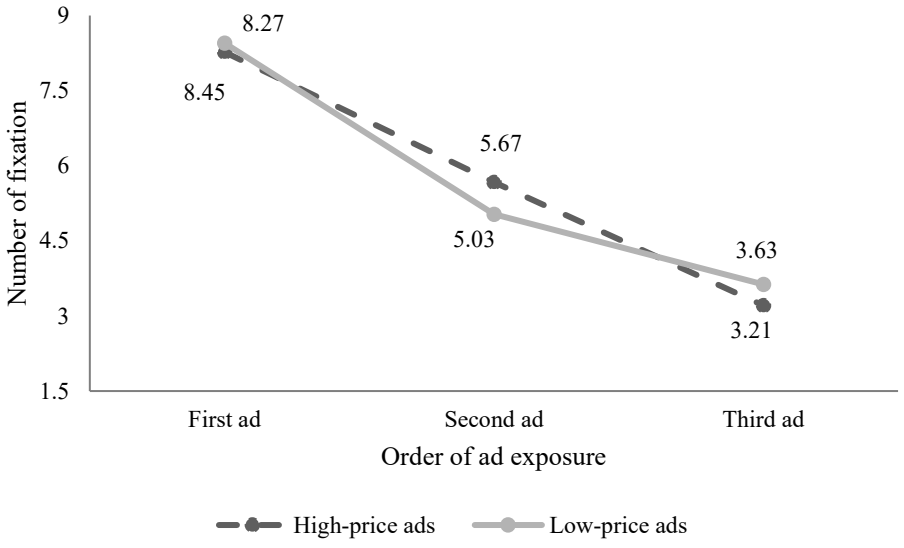
1.4.3.2 Other Results

Number of Fixations. We measured the number of fixations on each ad and compared it between the participants who were exposed to the high-price ads and those who were exposed to the low-price ads. Table 1-3 shows the average number of fixation in each cell. The main effect of price magnitude was not significant ($F_{(1, 60.557)}$<.005). But the results show that the order of placement has a significant effect on the fixation counts; the number of fixations drops significantly on each of following repeated exposures to the ads ($F_{(2, 105.523)}$=14.357, p<.005).

Table 1-3: Mean, standard deviation and size of each cell for participants' number of fixations

Order of ad exposure	High-price ads			Low-price ads		
	Mean	Std. Deviation	N	Mean	Std. Deviation	N
First ad	8.27	7.152	27	8.45	6.544	29
Second ad	5.67	4.361	24	5.03	3.554	31
Third ad	3.21	1.179	24	3.63	2.06	24

Figure 1-6: Average number of fixation on each ad



Ad recall. Although we displayed the target ad three times on the web page, 30% of participants failed to recall seeing any ad promoting headphones; this figure did not differ between the two price conditions ($\chi 2(1) = 1.120$, $p = .290$). Moreover, 61.5% of participants mentioned that they did not see any price in the ads. We also asked all the participants to state what the price in the ad was, but only 21.1 % of them mentioned the correct price. These results are in accordance with our assumption that the procedure prevents participants from focusing their attention on the target ads.

Willingness-to-pay. We measured willingness-to-pay by asking subjects to indicate the price they would pay for a set of wireless headphone if they were going to buy one. Subjects who were exposed to high-price ads had a higher willingness to pay (M=124.129 SD=14.88) than those who were exposed to low-price ads (M=107.353 SD=14.208), although it was not statistically significant ($F_{(1,63)}<1$). However, for those who recalled seeing a price in the ads, there was a marginally significant difference for subjects' willingness to pay between the two conditions ($F_{(1, 23)} = 2.312$, $p_{\text{one-tailed}}= .071$). These results do not statistically support the view that consumers' willingness to pay can be affected by incidental price stimuli. However, they do support our assumption that our manipulation is similar to real online environments in which consumers are not paying attention to the price stimuli.

1.5 General Discussion

The results of the eye-tracking study support the three hypotheses of this study. That there were significant main effects of price magnitude on fixation duration and on pupil size supports H1. This suggests that participants processed the high-price ads differently from the low-price ads. Furthermore, the results show that the number of fixations dropped on repeated exposure of the same ad. While this finding is not directly related to price magnitude and price processing, it reveals that participants were consciously avoiding display ads. However, in line with H3, participants' fixation duration increased for the repeated exposures when they were exposed to high-price ads. One conclusion is that while participants were consciously avoiding the ads, as the number of fixations dropped, their fixation duration changed in the direction opposite to their conscious behavior. In other words, while participants were consciously avoiding

the incidental ads, they elaborated the high-price ad more deeply in the repeated exposures. On the contrary, in line with H2, repeated exposure to the low-price ads did not change the fixation duration. That is, unlike high-price ads, the low-price ads did not motivate consumers to pay more attention to them. It could be argued that not all the fixations were incidental; some of them might be intentional. But all the above-mentioned differences in fixation behaviors, fixation time, and pupil sizes of fixations were intensified when we considered only the first fixation on each target ad instead of the average of all fixations (results are available upon request).

1.5.1 Theoretical Contribution

There has recently been a call for neuroscientific research on price cognition (e.g., Coulter 2013; Rao 2013), and eye-tracking is a simple but effective physiological measure that has been employed by marketing researchers for decades (Wedel and Pieters 2008). However, eye-tracking has not been widely employed in pricing research. Nonetheless, it gives real-time unintrusive measures of cognitive load and attention (Laeng, Sirois, and Gredebäck 2012; Menon et al. 2016). In this study we employed both the eye-fixation and pupil size measures to compare the price cognition between high- and low-magnitude price stimuli that consumers are incidentally exposed to. Eye-fixation has been employed in marketing studies to analyze the effects of both bottom-up and top-down factors on consumers' attention (Wedel and Pieters 2008). Pupillometry also provides a spontaneous measure that participants have no control over it (Laeng, Sirois, and Gredebäck 2012). Therefore, one important contribution of this study is the use of the eye-tracking method to investigate non-conscious price processing.

In terms of its theoretical contribution, this study extends behavioral price research as well as research on online display ads, as it helps to investigate the mechanisms of price anchoring for incidental prices and to examine the effect of repeated exposures to incidental price anchors. The results support the previous research studies (Adaval and Wyer 2011; Blankenship et al. 2008) that posit that two mechanisms of price processing contribute to the overall effect of price anchoring and that the level of elaboration determines which mechanism dominates the overall price anchoring effect. We find a novel factor—price magnitude—that impacts the level of price elaboration and, thus, the dominant price anchoring mechanism. Also, we show that the effect of ad repetition on fixation duration, a proxy for non-conscious price processing, depends on the mechanism of price priming. That is, if the input mechanism, the more elaborative priming mechanism, becomes the dominant one, its carryover effect results in longer fixation duration on repeated exposures. However, if consumers process the price stimulus through the output mechanism, which is the less elaborate mechanism, repeated exposures to an ad do not affect their fixation duration.

In line with previous eye-tracking studies (e.g. Drèze and Hussherr 2003; Hervet et al. 2011), the results show that even though participants did not recall the target ads, they fixated on the ads several times. When participants were repeatedly exposed to the same ad, the number of fixations dropped but they still fixated at the ads one time. This fact that participants had fewer fixations for the repeated exposures supports the idea that online consumers intentionally avoid display ads, but it shows that they failed to avoid the ads completely. Moreover, in favor of our claim that the price stimuli in the ads can affect consumers' gaze behavior, participants had longer fixation duration and

larger pupil size for the ads that contained high-magnitude prices. Therefore, price can be considered a bottom-up factor that affects consumers' attention to incidental display ads.

1.5.2 Practical Contribution

Our findings should help marketers to better design their online display ads. This study shows even though consumers cannot recall an online display ad, they fixate on it at least once for a fraction of a second. This short fixation is enough for consumers to process the content of the ads. Moreover, marketers can influence the level of attention to the ads by controlling the content of the ads, in particular by the magnitude of the price information presented in the ad. In a few words, the price of the advertised product can have impact on the amount of attention consumers pay to the ad and the level of elaboration. Therefore, while marketers have a range of choices of products in various categories to advertise in online environments, it may be better to select a high-priced product if the ad is targeted for mass consumers. That is, given the tendency of consumers to avoid paying attention to ads, it is better to select premium products to be promoted in online display ads to increase consumers' attention to them.

Moreover, our findings suggest that ad repetition can be effective because, although consumers may intentionally avoid ads when they are being exposed to them repeatedly, they elaborate them at least once and at the same level (i.e. for low-price ads) or at a deeper level (i.e. for high-price ads) than the first time.

1.5.3 Limitations and Further Research

There are also several avenues for further research. First, this study shows that consumers may process high-price ads differently from low-price ads. One important

area for further investigation is to examine how the different types of price processing can lead to different behaviors such as the ad conversion rate, consumers' intention to click or their willingness-to-pay. Moreover, this study suggests that when ads are displayed repeatedly on the same page, consumers elaborate the high-price ads more deeply for each repeated exposure while this is not the case for the low-price ads. In addition, consumers deliberately avoid repeated exposures of ads. In future investigations, it would be interesting to examine whether the overall effect of ad repetition is different for high-price ads and low-price ads. Finally, the Internet provides a great opportunity for customizing ad repetition strategies, and marketers can decide to employ the same ad repetition execution or varied ad repetition executions (Yaveroglu and Donthu 2008). Another potential research question is whether there is an interaction between type of ad repetition execution (same or varied) and price magnitude when it comes to the relationship between ad repetition and fixation duration. Similar to this, while we examine the ad repetition when ads are displayed in the same web page, it is of practical importance to examine ads repetition when consumers are exposed to the ads in several web pages.

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Chapter 2
Can Advertising Repetition Reduce Consumers' Willingness to Pay in Online Environments?

Abstract

We did three experiments to investigate the effects of ad repetition on consumers' willingness-to-pay as well as their internal reference price (IRP), in particular when consumers are exposed to the ads incidentally. Experiment 1 demonstrates that consumers' IRP is affected by price stimuli in the ads even when they do not recall seeing them. Experiment 2 examines the ad repetition effect and shows that increasing the number of ad exposures intensifies the effect of price stimulus in the ads only when the price in the ad is lower than consumers' IRP. When the price stimuli are higher than consumers' IRP, increasing the number of ad exposures does not change the assimilation effect of price stimuli. We suggest that this asymmetric effect of ad repetition is due to the fact that high-price stimuli and low-price stimuli exert their influence on consumers' IRP through two different cognitive mechanisms. In Experiment 3, we examine the ad repetition effect for price comapring ads to which consumers are incidentally exposed. The results show that the effect of high-value advertised reference price was the dominant effect and pariticpants were less affected by low-value selling price. Consequently, ad repeptition did not change pariticpants' willingness-to-pay. Theoretical and practical implications of the reuslts are explained.

2.1 Introduction

Ad repetition is one of the strategies that marketers employ to improve advertising effectiveness, especially in a cluttered environment like the Internet (Yaveroglu and Donthu 2008). Despite the prevalence of such a practice, our understanding of the effectiveness of ad repetition when ads contain price information is limited, particularly in online environements. Investigating the effects of ad repetition when ads contain

price information in an online context deserves further attention for two main reasons. On the one hand, online ads sometimes include price information, and the latter affects consumers' responses such as their willingness-to-pay, that is, the maximum price that consumers are willing to pay to acquire a product (Urbany, Bearden, and Weilbaker 1988; Horowitz and McConnell 2003). On the other hand, in online environments, consumers are mainly concerned with their main goals in visiting a web page (e.g., finding information on a given product), and they typically avoid looking at ads that are *incidental*[1] to their goals (Drèze and Hussherr 2003; Yoo 2008). Previous studies that examined the effect of ad repetition or price information in ads either did not consider the impact of displaying price information in an ad or ignored the fact that consumers could be exposed to ads incidentally.

In order to investigate the effect of ad repetition when ads are displayed online and when they contain price information, it is imperative to consider the cognitive processing of incidental price information. The first goal of the current research is to examine the effect of incidental price stimuli on consumers' willingness-to-pay. Behavioral price research has shown that contextual price information changes consumers' price evaluation even when they are not aware of its existence or effect (Adaval and Monroe 2002; Nunes and Boatwright 2004; Thomas and Morwitz 2009). However, to the best of our knowledge, researchers have not formally examined the effects of price stimuli when they are presented in online display ads to which

[1] In this study, *incidental* refers to any contextual stimuli that consumers do not find relevant and, thus, ignore or do not pay attention to them (Adaval and Monroe 2002; Nunes and Boatwright 2004).

consumers are incidentally exposed. The examination of this phenomenon is the general purpose of the current research.

With this general purpose in mind, Essay 1 shows that consumers process incidental price information differently depending on price magnitude. Results indicate that consumers process high-magnitude price stimuli more deeply than low-magnitude price stimuli. In this study, we further explore the non-conscious price processing by studying the interaction between the magnitude of price stimuli and ad repetition on consumers' willingness-to-pay and internal reference price (IRP). Our results reveal that the effectiveness of ad repetition on willingness-to-pay depends on which price mechanism dominates the price anchoring effect. Specifically, two anchoring mechanisms contribute to the overall effect: (1) an input mechanism that is more elaborative, and (2) an output mechanism that requires fewer cognitive resources (Adaval and Wyer 2011; Blankenship et al. 2008; Strack and Mussweiler 1997; Wegener et al. 2010). We argue that, when ads are presented incidentally, if they contain low-magnitude price stimuli, the probability that the anchoring mechanism is the output one is higher. In this case, repeated exposure to the ad increases the effect of price stimuli on consumers' willingness-to-pay. On the contrary, if the ads contain high-magnitude price stimuli, the probability that the input mechanism contributes more to the anchoring effect is higher because its effect is more durable. Because of this, the repeated exposure of the ad does not improve the effect of price on consumers' price responses. These two contrasting effects are experimentally tested in Studies 1 and 2.

We also extend the aforementioned findings by examining the effectiveness of ad repetition in relation to *price-comparing ads*. Price-comparing ads are a form of

advertising that retailers regularly employ to favorably affect consumers' perceived transaction value and thus their willingness-to-pay (Grewal, Monroe, and Krishnan 1998; Urbany, Bearden, and Weilbaker 1988). These ads feature two pieces of price information: (1) a selling price (SP) at which the retailer is currently selling the product, and (2) an advertised reference price (ARP) that is higher than the selling price. The latter could be the regular price or a competitor's price (Kan et al. 2014). For example, an ad for a wireless headphone indicates that its price was $175 (ARP) but now is $95 (SP). Previous studies show that both the selling price and the advertised reference price affect, in different ways, consumers' willingness-to-pay. That is, if consumers are exposed to an ad that contains only a low-value selling price, their willingness to pay decreases as a result of this kind of exposure. Therefore, retailers tend to add a high-value advertised reference price to increase consumers' willingness-to-pay and, to compensate for the negative impact of the selling price on the same response. We argue that it is important to study the effect of ad repetition in this context; such a presentation strategy will have the desired outcome if it improves the impact of the advertised reference price more than that of the selling price. In other words, if the effect of the selling price is greater than that of the advertised reference price, each repeated exposure of the price comparing ads pushes the willingness to pay downward, thus resulting in an undesired outcome for the firm.

Price comparing ads fit the purpose of this research because they provide a unique context in which both a low-magnitude (i.e., the low-value selling price) and a high-magnitude price stimulus (i.e., the high-value advertised reference price) are simultaneously presented in the same ad. Previous studies have for the most part

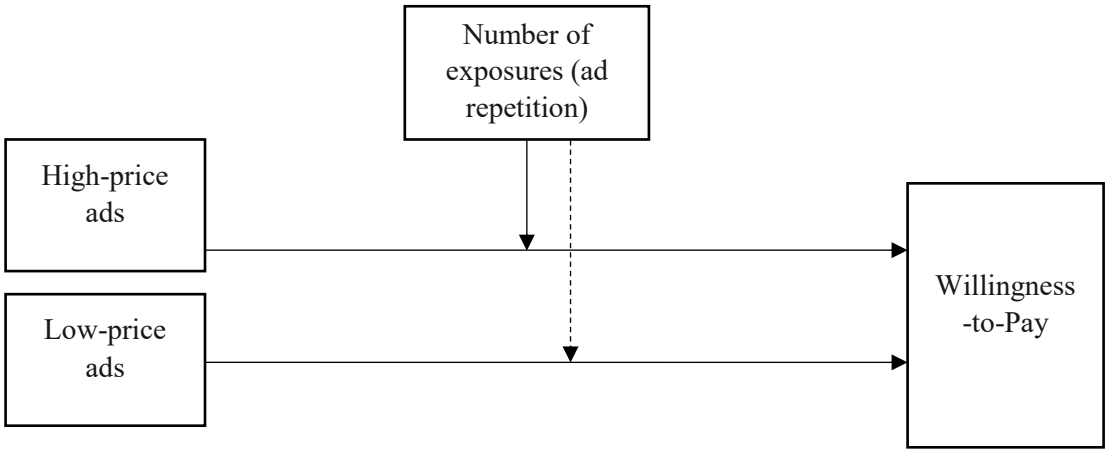
considered price-comparing ads as the focal attention of participants. However, as mentioned, in online environments, consumers are exposed to the ads incidentally. Despite the frequency of price comparing ads and the popularity of ad repetition in online environments, we remain unaware of any research that has formally examined the effectiveness of ad repetition when ads are displayed incidentally and contain both high- and low-magnitude price stimuli. The main purpose of Experiment 3 is to fill this gap in the literature by explaining the simultaneous effects of price magnitude and ad repetition.

Given the prevalence of online ads (cf. Goldfarb 2014), we maintain that the examination of 1) the non-conscious effects of price stimuli in incidental ads and 2) the effects of ad repetition could help marketers design more effective online ads. Previous research suggests that consumers' skepticism about exaggerated advertised reference price (ARP) might protect them from false comparisons because they tend to discount exaggerated ARP (Chandrashekaran and Grewal 2003; Compeau and Grewal 1998; Urbany, Bearden, and Weilbaker 1988). However, it remains unclear whether such a strategy could still influence consumers when they are exposed to the online ads incidentally and are paying limited attention to them. Furthermore, investigating the effect of price information in incidental online display ads could help public policy makers understand certain new consumers' vulnerability when they are exposed to online ads.

This paper is structured as follows. First, we review the literature related to our conceptual model (see Figure 2-1) and three hypotheses. Then we present three experiments and their results. Finally, we discuss the theoretical contributions and the

managerial implications of the findings. We conclude by addressing the limitations of our experiments and avenues for further research.

Figure 2-1: Conceptual framework



2.2 Research Background and Hypothesis Development

In this section, we explain the price anchoring effect and review the nonconscious effects of contextual price stimuli when they are presented in online display ads. To link the effect of ad repetition and that of incidental exposure to ads, we review different price anchoring mechanisms mentioned in the behavioral pricing literature and argue that the magnitude of price stimuli determines which anchoring mechanism dominates the overall anchoring effect. This, in turn, has impacts on the effectiveness of ad repetition. Then, we explain the effect of repeated exposure to price comparing ads (i.e., ad repetition) on consumers' willingness to pay when they are exposed to them incidentally.

2.2.1 Effects of Incidental Price Stimuli

The behavioral price research states that consumers evaluate the price of a product or service by comparing it to an internal dynamic standard called internal reference price

(IRP) (Cheng and Monroe 2013a). According to the adaptation-level theory (Helson 1964), whenever consumers encounter a new price stimulus for a product, their IRP moves towards it. That is, exposure to a product's price that is lower (higher) than the consumer's IRP decreases (increases) the IRP (Cheng and Monroe 2013a). There is a direct relation between IRP and willingness-to-pay, so the higher the price stimulus, the higher the willingness-to-pay (Grewal, Monroe, and Krishnan 1998; Urbany, Bearden, and Weilbaker 1988).

To the best of our knowledge, no study has directly investigated the effect of price information on IRP or willingness-to-pay when price information is presented in online display ads to which consumers are not paying attention. In online environments, consumers are assumed to be more task oriented (Yoo 2008); thus, they do not pay conscious attention to display ads that are incidental to their primary goal of visiting a web page (Drèze and Hussherr 2003; Yoo 2008). However, if a price stimulus goes unnoticed, this does not mean that it has no effect on consumers' IRP or willingness to pay (Thomas and Morwitz 2009). In an experiment by Adaval and Monroe (2002), participants evaluated the expensiveness of the a product's price after they had been exposed to either high- or low-magnitude prices 46 times for 15 milliseconds. Although the exposure time was so short that participants could not detect the prices, the authors found that the participants' perceived price expensiveness was affected by the subliminal presentations. This nonconscious price effect can also happen when consumers see a price but are not aware of its effects on their judgment because they think the price is not relavant (Adaval and Monroe 2002; Nunes and Boatwright 2004). For example, Nunes and Boatwright (2004) used an experiment to show that the price of

an unrelated product (a sweatshirt) placed next to a target product (a CD) could affect consumers' willingness to pay for the target product.

From another point of view, Yoo (2008) demonstrated that online consumers are primed by semantic information such as the brand name and words appearing in online display ads even when they are not paying attention to the ads. Therefore, that facts that consumers can process semantic information that they are exposed to incidentally and that they nonconsciously process price stimuli that they are exposed to subliminally (e.g., Adaval and Monroe 2002) or incidentally (Nunes and Boatwright 2004) allow us to postulate that price information in online display ads can affect consumers' IRP even when consumers are not paying attention to them. Therefore, according to the adaptation-level theory (Helson 1964), we expect that consumers IRP and willingness-to-pay will be affected by the price stimuli in online display ads; formally:

> *H1: When consumers are incidentally exposed to online ads, those who are exposed to high-price ads have a higher internal reference price (H1a) and willingness-to-pay (H1b) for the advertised product than those who are exposed to low-price ads.*

2.2.2 Cognitive Mechanisms of Nonconscious Price Processing

Hypothesis 1 is in line with previous studies (cf. Thomas and Morwitz 2009) that state that both high- and low-value prices can change consumers' IRP without their paying attention. However, the findings of Essay 1 reveal that consumers may process high- and low-magnitude price stimuli differently. The result of the eye-tracking experiment reveals that when participants were exposed to high-value prices in online ads, they fixated longer and had larger pupil sizes. This is contrary to previous studies

that made the implicit assumption that consumers process high- and low-magnitude price stimuli similarly. To compare their effect when they are displayed repeatedly, it is important to consider the cognitive mechanism through which price stimuli exert their nonconscious effect. Previous studies have suggested two types of cognitive mechanisms that explain the nonconscious effects of price stimuli: (1) an output mechanism based on Tversky and Kahneman's (1974) anchoring-and-adjustment process and (2) an input mechanism based on Strack and Mussweiler's (1997) selective accessibility process (Adaval and Wyer 2011; Mussweiler and Englich 2005). Both mechanisms are priming effects, so their effects are unintended and occur without awareness (Janiszewski and Wyer 2014). However, the output mechanism is a direct priming that requires less cognitive processing, whereas the input mechanism is semantic priming characterized by a more elaborative processing of information. Both mechanisms are explained in detail in the next two paragraphs.

The output process. In the anchoring-and-adjustment process, when an individual is exposed to a numerical stimulus, the accessibility of that numerical stimulus in her memory is increased. Therefore, the higher accessibility results in an increased likelihood that the individual will use this value as an arbitrary judgmental anchor when she is asked to judge a numerical stimulus along an attribute dimension (Adaval and Wyer 2011). As mentioned, Adaval and Monroe (2002) show that these numerical stimuli (price in the case of their experiment) do not have to be explicit, and that even subliminal exposure (e.g., 15 ms) to numerical stimuli can affect subjects' price magnitude judgment. They also found that magnitude judgment of the target dimension

(e.g., price) can be affected by numerical stimuli in an unrelated attribute dimension (e.g., grams).

The input process. According to Strack and Mussweiler (1997), the effects of contextual price stimuli can be produced by the selective accessibility mechanism. They suggest that a numerical anchor can selectively increase the accessibility of anchor-consistent product knowledge in memory. For example, when a consumer is asked to evaluate whether a midsize car is more expensive or cheaper than $10k, any knowledge that is consistent with the assumption that a midsize car is $10k will be selectively retrieved from her memory (no GPS navigation, no A/C, etc.). Then, the anchor-consistent knowledge that is now more accessible affects the consumer's subsequent judgments. In other words, in the input mechanism, price exposure initiates a mechanism of semantic priming in which a price stimulus primes a set of product-consistent knowledge that, in turn, affects the standards the consumer uses for her price judgments. By contrast, in the output mechanism, the price stimulus merely increases the accessibility of numerical information in the memory, and this increases the probability that the consumer will use that numerical information as an arbitrary anchor without associating it with any product-related knowledge. For example, Adaval and Monroe (2002) find that numerical stimuli can be presented in any unrelated dimension and still affect price magnitude judgment.

A recent perspective on price priming contends that both the input (selective accessibility) and the output (anchoring-and-adjustment) priming mechanisms can contribute to the overall effect of price stimulus although each mechanism is active at different stages of the price processing (Adaval and Wyer 2011; Wegener et al. 2010).

Consistent with the elaboration likelihood model (Petty and Cacioppo 1986), Wegener et al. (2010) posit that in a standard anchoring procedure, if consumers elaborate more on the judgment task, the selective accessibility accounts for the overall priming process; but if consumers do not elaborate on the judgment task, then the numeric priming accounts for the overall effect. Similarly, Adaval and Wyer (2011) maintain that the level of cognitive activity at the time of exposure to the incidental price information can manipulate the dominant priming mechanism. Their results demonstrate that if subjects encounter a price stimulus while they are deliberately thinking about a particular product category, the effect of subliminal priming is restricted to that category. However, when subjects do not deliberately think of any product at the time of exposure, the effect of subliminal price priming can be extended to other categories. In other words, when consumers have the capability to elaborate on a price anchor and are motivated to do so, it is more likely that price exposure activates price-consistent product knowledge, which in turn affects consumers' subsequent price judgments. But when consumers do not elaborate the price stimulus, the mere numerical information affects their price judgment. Yet, it is not clear whether the type of price information or magnitude of price information can determine which mechanism dominates the overall anchoring effect. Furthermore, investigations should be done in order to understand how increasing the number of ad exposures can influence the nonconscious effects of either ARP or selling price.

2.2.3 The Role of Price Magnitude

Prospect Theory (Kahneman and Tversky 1979) is one of the pillars of behavioral price research. Several studies support the view that consumers' reaction to price

decreases (perceived as gain) is different from their reaction to price increases (perceived as loss), and that losses have a greater negative effect than the positive effect of gains (Chandrashekaran and Grewal 2006; Guadagni and Little 1983; Kalwani et al. 1990). Winer (1986) reveals that the difference between consumers' IRP and the selling price is more predictable of consumers' brand choice and their willingness to pay when the offered price is higher than their IRP (loss) compared to when the offered price is lower than their IRP (gain). These studies show that consumers' perception of a low-price can be different from a high-price, but they implicitly assume that consumers consciously process price information.

In a review of heuristics in price cognition, Thomas and Morwitz (2009a) argue that numerical cognition is not always a simple rule-based process but rather an interaction of a fast and associative process and a slow and rule-based process. In other words, not all mathematical problems are computed consciously, but some might use associative knowledge stored in the memory. Several studies document instances that a rational numerical rule cannot explain the effects of numerical or price stimuli. For example, Coulter and Roggeveen (2014) show that if the selling price, the regular price, and the absolute discount are multiples of one another, consumers will like that particular deal more than a deal that does not have this feature. They explain this result by the deal processing fluency effect. The left-digit effect in price cognition is another example. It states that consumers' perception of the distance between two prices whose values differ by only one cent but their left digit varies (e.g., $3.99 vs. $4.00) does not reflect a rule-based mathematical distance (Manning and Sprott 2009; Monroe 2003; Stiving and Winer 1997). That is consumers perceive the nine-ending prices as being

significantly smaller than a price that is only one cent higher. Manning and Sprott (2009) find that this left-digit effect can change consumers' brand choice.

These studies, as well as other evidence reviewed by Thomas and Morvits (2009a), suggest that consumers might process one price stimulus in a different manner than another one, especially when the price stimulus is presented to them incidentally so that they do not process them with full attention. In the context of this study, in Essay 1, we find that the magnitude of price information can determine how consumers process the incidental price stimuli in online ads. When ads feature a price stimulus higher than consumers' IRP, the incidental exposure stimulates consumers to process the ads using more elaborative price processing, the input mechanism; but when ads feature a low-magnitude price stimulus, the latter is processed through a less elaborative mechanism, the output one.

As we argue in regard to Hypothesis 1, both high- and low-magnitude price stimuli exert their influence on consumers' IRP and willingness-to-pay. In this section, we state that their effects, however, occur through two different mechanisms. The low-price ads lead to the output process, requiring less cognitive elaboration; but the high-price ads stimulate more product knowledge and their effect occurs through the input process. Blankenship et al. (2008) explain that the effects of the input process last longer than those of the output process. We content that this long-term effect can change the effectiveness of ad repetition when ads are displayed incidentally.

2.2.4 Effects of Ad Repetition

Several studies point out that the effectiveness of ad repetition depends on the cognitive resources available to process the ads (Malaviya 2007; Malaviya, Meyers-

Levy, and Sternthal 1999; Yaveroglu and Donthu 2008). For example, Yaverogly and Donthu (2008) examine the effectiveness of repeating varied execution versus single execution of online ads; and they show that if there is a higher cognitive load, a single execution is better because it increases the likelihood that consumers process the ad; but if there is lower cognitive load, the varied execution results in better results because consumers process the same information from different routes. They manipulated the cognitive load through the presence of competitive ads on a cluttered web page. Their results suggest that the price magnitude may change the effect of ad repetition if it can alter the dominant priming mechanism, either the input or the output. Consistent with this idea, in Essay 1, we found that there is an interaction between price magnitude in online ads and the number of exposures to the ads. That is, participants' fixation duration on incidental online ads increases as a function of the number of exposures only when ads contain high-magnitude price stimuli, but it remains constant when ads contain low-magnitude price stimuli.

Therefore, we maintain that price magnitude can affect the effectiveness of ad repetition on willingness-to-pay and on IRP in online environments. On the one hand, we hypothesize that if consumers process the ads through the lesser elaborative process, the output process, ad repetition improves the assimilation effect of the price stimulus. In this situation, the priming effect is due to the anchoring-and-adjustment process, and each repeated exposure increases the likelihood that the price stimulus will act as a standard for the judgment, thus increasing the priming effect. On the other hand, we posit that ad repetition does not have any effect on willingness-to-pay and IRP if the dominant priming mechanism is the input one. That is, if the more elaborative price

mechanism stimulates an anchor-consistent product knowledge in consumers' memory, it remains accessible in their memory; therefore, increasing a few extra exposures will not increase the priming effect of price stimuli.

As explained in Essay 1, we argue that when the price stimulus is significantly higher than consumers' IRP, the probability that consumers process it through the more elaborative priming mechanism is higher because they are more sensitive to high prices than to low prices (Chandrashekaran and Grewal 2006). Therefore, it is more likely that ad repetition will not be effective in changing consumers' IRP and willingness-to-pay. On the contrary, when the price stimulus is low, it is more likely that the output mechanism will become the dominant one; hence, ad repetition can increase the assimilation effect. Thus,

H2a: When consumers are exposed incidentally to online display ads, if the magnitude of price in the ad is lower than consumers' IRP, increasing the number of ad repetitions by a few will increase the assimilation effect of price information in the ads. As a consequence, consumers' IRP and willingness-to-pay will move down as a function of the number of ad repetitions.

H2b: When consumers are exposed incidentally to online display ads, if the magnitude of price in the ad is higher than consumers' IRP, increasing the number of ad repetitions by a few will not change the assimilation effect of price information in the ads. As a consequence, consumers' IRP and willingness-to-pay will not change as a function of the number of ad repetitions.

2.2.5 Effects of Ad Repetition on Price Comparing Ads

Price-comparing ads are a type of advertisement in which both a low-value price stimulus (i.e., the selling price) and a high-value price stimulus (i.e., the advertised reference price) are presented. Previous studies reveal that both the selling price and the advertised reference price affect consumers' IRP and, thus, their willingness to pay (Compeau and Grewal 1998). The selling price is often set lower than consumers' IRP. If the ad only contains a selling price that is lower than consumers' IRP, it will reduce the latter. Since this is an undesired effect, marketers try to compensate for this outcome by providing the advertised reference price, which is significantly higher than consumers' IRP (Chandrashekaran and Grewal 2003, 2006; Urbany, Bearden, and Weilbaker 1988).

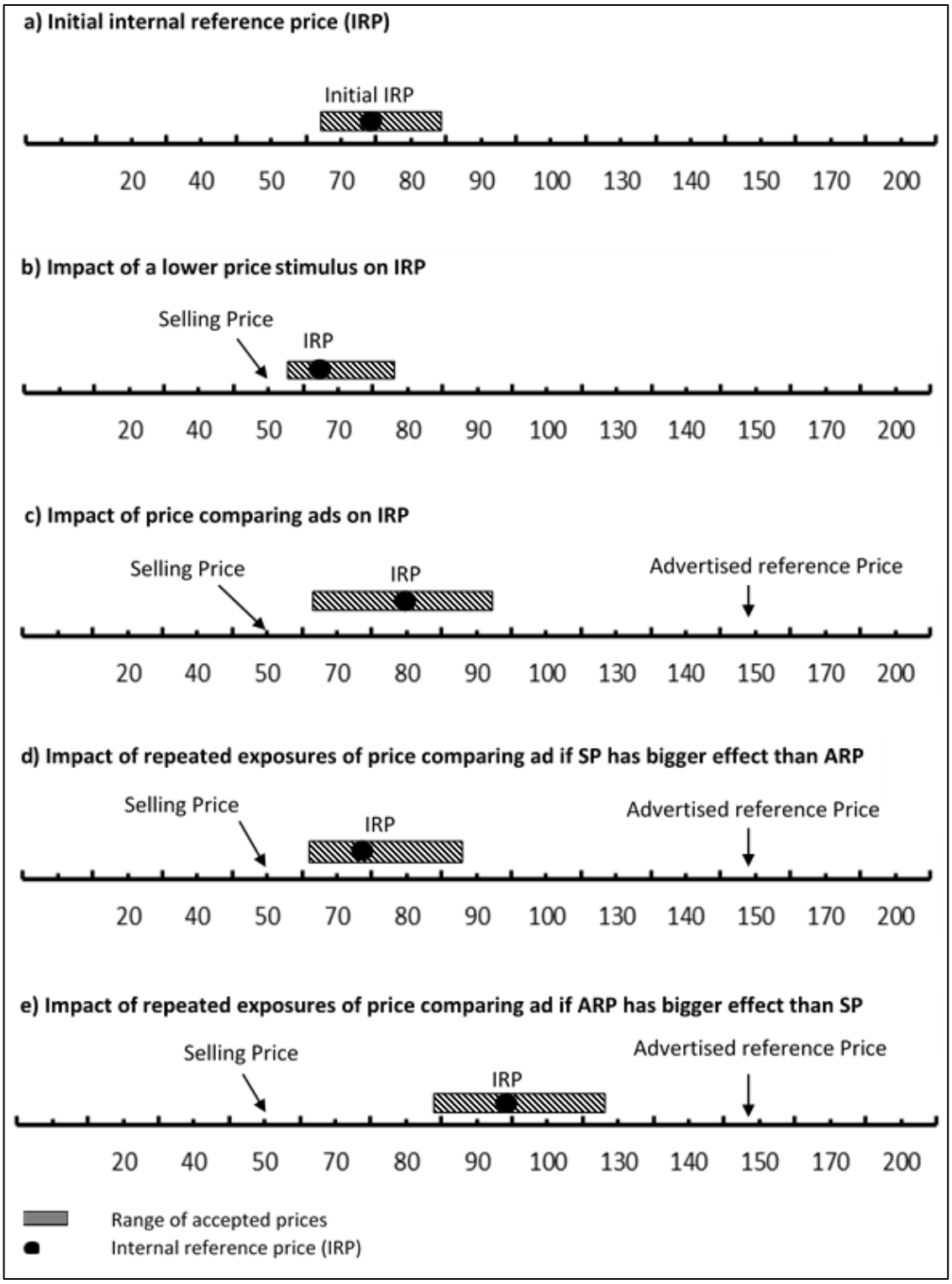
To develop a better explanation of the effects of price comparing ads, we use a hypothetical example illustrated in Figure 2-2. Imagine a consumer whose initial IRP for a headphone is $75. While she is surfing the Internet, she comes across an ad that promotes a headphone available for purchase at $49.99. According to the adaptation-level theory (Helson 1964), her IRP should decrease due to ad exposure; for example, it can go down to $60. Figure 1a and 1b show her IRP along an objective price line before and after her exposure to the ad. To increase her IRP, marketers could add an advertised reference price, for example "Original Price $149.99", next to the selling price of $49.99. If they did so, her new IRP would likely be higher (e.g., $80[2]) than if the ad

[2] Theoretically, her new IRP could be any price between $60 and $149.99.

contained only the selling price (Figure 2-2c) (Chandrashekaran and Grewal 2003, 2006; Urbany, Bearden, and Weilbaker 1988).

But how does consumers' IRP change if the incidental exposure to the price-comparing ad occurs repeatedly? Just as in the case of the first exposure to the selling price and the advertised reference price, each repeated exposure to the selling price and the advertised reference price may exert influence on consumers' IRP. Therefore, the final IRP should depend on the relative impact of the ad repetition on the effects that each of these two price stimuli exerts on her IRP. If the advertised reference price and the selling price are being processed similarly, the ad repetition should not have a considerable impact on the IRP (Figure 2-2c). However, repeated exposure of price comparing ads may improve the effects either of the selling price or of the advertised reference price against each other. For example, if the ad repetition improves the effect of the selling price more (less) than that of the advertised reference price, the IRP moves toward lower (higher) prices after each repeated exposure (Figures 2-2d and 2-2e). This potential effect of repeated exposure to price comparing ads in online environments has not been addressed in previous research.

Figure 2-2: A hypothetical consumer's IRP for a headphone along an objective price line under different scenarios



When price comparing ads are displayed incidentally, consumers may not be able to link the price stimuli and the semantic cues. Hence, they cannot perceive any difference between two price stimuli in terms of informative value. Nevertheless, as mentioned earlier, both price stimuli exert their influences on consumers through the priming mechanisms. According to Hypothesis 2, if the online incidental ad contains only the advertised reference price, which is a high value price stimulus, it is processed through the input mechanism; but if the incidental ad contains only the selling price, which is a low value price stimulus, it is processed through the output mechanism. But when both the selling price and the advertised reference price are displayed together in one ad, we postulate that the advertised reference price motivates consumers to process both price stimuli, the advertised reference price and the selling price, through the more elaborative input mechanism. In Essay 1, we show that consumers process the high-price stimuli longer than the low-price stimuli when they are displayed in an online incidental ad. Therefore, in conjunction with our Hypothesis 2, we argue that because of this higher attention to the ad, consumers can process the selling price through the same input process as they process the advertised reference price. Hence, as a result of this higher elaboration of the price stimuli, a subset of product knowledge which is consistent with the selling price is stimulated in consumers' memory along with the subset of knowledge which is aligned with the advertised reference price at the first exposure, and the following exposures cannot improve the assimilation effect. Formally:

H3: When consumers are exposed to price comparing ads incidentally, increasing the number of ad exposures (i.e. ad repetition) from one to a few does not affect consumers' IRP or willingness-to-pay.

2.3 Methodology

To test our hypotheses, three online experiments were conducted. The first experiment examined whether the existence of price stimuli in incidental display ads in online environments affects consumers' internal reference price (H1). In the second experiment, we investigated the effects of price magnitude on price processing by comparing the ad repetition effects for high- and low-price ads (H2). The third experiment examined the effect of ad repetition on price comparing ads that contain both the advertised reference price and the selling price (H3).

2.4 Experiment 1

2.4.1 Design and Stimuli

One hundred and eighty-six (186) residents of the United States were recruited from a Qualtrics panel and paid a small incentive to participate in this experiment. The experiment is a one-factor between-subject design in which participants were randomly assigned to one of the three conditions corresponding to the three levels of price magnitude: low-price ad ($45), high-price ad ($325), and no-price ad. In order to test H1, we put participants in a situation similar to a real-life context by exposing them to a web page and asking them to read it carefully. While they were reading the web page, they were exposed to the target ads and a filler ad embedded in the web page. After they finished the task, they answered a series of questions. In order to prevent participants from focusing their attention on the display ads, we asked them to read carefully the content of the web page because they would have to answer some questions about its content. Several marketing studies have employed this strategy to examine non-

conscious effects of ads in online and offline contexts (e.g., Janiszewsky 1993; Shapiro 1999; Yoo 2008).

2.4.2 Stimuli Development

Target product in the ad. To test our hypotheses, we designed a set of online display ads promoting a product. For the target product in the ads, we opted for wireless headphones for several reasons. The wireless headphone is a *search* product (rather than an *experience* product, cf. Klein, 1998); hence, the relation between price and quality would be more objective. Also, on the basis of our potential sample of respondents, participants of every age and with different levels of technical knowledge should be familiar with this product. Finally, in the market, this product category includes a wide range of prices from well-known to less famous brands, to prevent any price bias. Table 2-1 shows the number of different products available on bestbuy.com on a single mid-season day in this product category.[3] From the products available on Amazon.com and bestbuy.com, we selected a headphone model. To prevent any bias, the model we selected was not among the most popular types of headphones, and it has very standard features that can be found in both low-priced headphones and high-priced ones.

We administered a pretest to 24 subjects recruited from an online sample of US residents to measure their acceptable price range for a wireless headphone. Using these results, we selected two price points: $45 as the low-price stimulus and $325 as the high-price stimulus. The low-price (high-price) stimulus was lower (higher) than the average of the lowest (highest) acceptable price of the respondents.

[3] Accessed on 23 October 2016.

Table 2-1: Number of available models of wireless headphones on bestbuy.com in a single visit

Price range	Number of available products
Less than $25	20
$25 to $49.99	51
$50 to $99.99	82
$100 to $199.99	86
$200 to $299.99	45
above $300	18

Web page development. A professional-looking web page was developed. Its content was shaped by an article published on cnet.com about three important headphones features. There was not any mention of a price or brand name in the content (see Appendix D).

Target ad development. Using the target headphone model, we designed a 250-by-300-pixel display ad containing an image of the headphone and its brand name. The brand was a real one offering various headphones at a large range of prices. To allow for variance in associations with the price, no product descriptions were included in the advertisements. Three versions of the target ad were also designed: a high-price ad with a $325 price stimulus; a low-price ad with a $45 price stimulus; and an ad with no price stimulus (i.e., no-price ad). A filler ad completely unrelated to the headphone was also designed. This filler ad has no price-related information and promotes a service rather than a product. There were three places (top, middle and bottom of the page) and center-aligned between the paragraphs that were designated to display the target ads and the filler ad. The filler ad was displayed in the first upper location, and the target ads were

displayed twice in the two other spaces (see Appendix C for the web page and the display ads).

2.4.3 Sample and Procedure

After removing those who failed either to finish the questionnaire or to answer the attention-test questions correctly, 157 participants remained (median age = 45 to 54 years old, 28.7% male). After they had agreed to participate in the study, on the next page they were instructed to read a web page and to answer some questions about it. After that, we measured the subjects' expectation of the market prices and their ad recall.

2.4.4 Measurements

Internal reference price (IRP) is an internal dynamic standard (Mazumdar, Raj, and Sinha 2005) and there is not any validated scale to measure it directly. Thomas and Menon (2007) show that IRP is correlated with expected price (EP), although IRP is more malleable than expected price. That is, when consumers are exposed to a new price stimulus, the probability that IRP will change is higher than EP because the latter requires confidence in price knowledge. Hence, instead of measuring IRP directly, we measured participants' expected average market price as a proxy for IRP. Since H1 predicts changes to IRP due to exposure to incidental price stimuli, we contend that measuring EP is a more robust way of testing H1. The expected price measure is based on the scale used by Thomas and Menon (2007). Participants were asked to mention their estimates of the average price of headphones on the market.

To measure participants' willingness-to-pay, previous studies usually had participants indicate a price estimate in an open-ended question (e.g., Kan et al. 2014;

Nunes and Boatwright 2004; Valle et al. 2017). Asking two open-ended questions in a row with similar formats and wording when both require giving a price estimate can lead to ambiguity. Therefore, instead of directly measuring participants' willingness-to-pay, we measured their perceived price expensiveness (PPE) at different price points. Although PPE and willingness-to-pay are different variables, both have been widely used in behavioral price research, and both are directly related to perceived value (Grewal, Monroe, and Krishnan 1998). To measure PPE, we selected five headphones at five different price points: $79, $150, $220, $300, and $400. All headphones, except the $400 one, were real market models displayed at their real market price. By real market price, we mean their regular selling prices on Amazon.com and bestbuy.com. If there was a discrepancy between the prices of a model at these retailers, we put the average price. For the $400 headphone, we used an inflated price for the selected model because the available models at this price were not comparable to typical headphones that are purchased by regular consumers. These five models of headphones were presented in five separate pages in a random order. Participants were instructed to indicate how they "evaluate the expensiveness of the depicted model of headphone" at the mentioned price. The question was scaled from -5 (extremely inexpensive) to +5 (extremely expensive). This scale is borrowed from Adaval and Monroe (2002) to assess perceived expensiveness.

We also measured target ad recall and price recall. Ad recall was measured by asking participants to mention whether they recalled any ad while they were reading the Web page. Price recall was measured in two stages. First, we asked all participants if they recall any price in the ads. Those who had indicated that they did not recall any ad in the

ad-recall question first saw a message that indicated there were some ads on the display page and asked them to answer the next question according to the best of their knowledge. At the end, those who mentioned that they saw a price were asked to write the price.

To measure ad recognition, we displayed six ads: the target ad and 5 filler ads. All the filler ads were slightly different from the target ad.[4] Participants were asked to identify, among the six ads, the display ad that they were exposed to during the experiment. The ad-recognition rate was used as a manipulation check measure as well as an indicator of their conscious attention to the ads.

2.4.5. Results and Discussion

Estimate of expected market price. According to H1a, we predict that participants' estimates of expected average market price for headphones (EP_h) and for the target headphone model (EP_T) are affected by the price stimuli in the ads. Put differently, we predict that if participants are exposed to incidental ads that feature high-magnitude (low-magnitude) price stimuli, their expected average market price is higher (lower) than that of the other two groups. Cell sizes, means and standard deviations for the estimates of the expected market price of both the product category and the target headphone model are shown in Table 2-2.

A one-way ANOVA was conducted to compare the results of price stimuli in the ads on estimates of the expected market price of both the headphones' product category and the target model of headphone. The results show a significant effect of incidental price stimuli on estimates of average expected price for a set of wireless headphones (F

[4] Only the brand name or the price in the ads were different with respect to the target ad.

$_{(154,2)}$ =25.616; p<0.001) as well as the average market price of the target model of headphone (F=53.959; p<0.001).

Table 2-2: Mean and Standard Deviation and cell size for participants' price expectation (Experiment 1)

	Low-price ($45) ads			High-price ($325) ad			No price ad		
Expected price	N	Mean	Std. Dev.	N	Mean	Std. Dev.	N	Mean	Std. Dev.
Headphones (product category)	53	66.44	28.21	50	158.94	111.34	54	83.00	43.10
The target model of headphone		80.09	38.67		224.74	113.82		109.54	52.40

To do further analysis, since the results for the expected average price of the target model of headphone and the expected average price of headphones (as a product category) were similar, we report only results for the latter for the sake of brevity. Subsequent analysis of planned contrast revealed that participants in the high-price condition had a higher expected price for a set of headphones than those in the low-price condition (M_{Diff} = 92.502; t(54.923)= 5.704, p<0.005). For participants in the control condition, their estimates of expected price were higher than those in the low-price condition (M_{Diff} = -16.561, t(91.574)= 2.356, p<0.021) but lower than the estimates of expected price of subjects in the high-price anchor condition (M_{Diff} = 75.940, t(62.430)= 4.519, p<0.005). These results support H1a.

Perceived Price Expensiveness. According to H1b, participants' perceived price expensiveness is affected by the magnitude of price stimuli in the ads. Table 3 shows the means and standard deviations of participants' perceived price expensiveness for the 5 models of headphones. We conducted a MANOVA to analyze the data. The results,

displayed in Table 2-3, were as expected. Both the main effect of price in the ad ($F_{(2, 153)}$ = 4.941 p = 0.008) and the main effect of judged price, the price participants evaluated in the judgment task, are statistically significant ($F_{(2, 153)}$ = 3.07; p=0.049). That is, the higher the price in the judgment task, the higher the perceived expensiveness. Also, subjects who were exposed to high-price (low-price) ads reported a lower (higher) perceived expensiveness than the other two groups of participants. There is no significant interaction between the two factors.

Table 2-3: Mean, Standard Deviation and cell size for participants' perceived price expensiveness (Experiment 1)

Evaluated Price		$79		$150		$220		$300		$400	
Treatments	N	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Low-Price ($45) ads	52	1.15	2.39	3.44	1.76	4.29	1.62	4.21	1.86	4.62	1.497
High-price ads ($325)	50	-0.2	2.77	2.18	2.61	3.24	1.99	3.52	2.50	4.38	1.398
No-price ads	54	0.63	2.14	2.78	2.36	3.87	1.84	4.46	1.12	4.67	0.824

To analyze the results more deeply, we did five separate tests of ANOVA and analyzed participants' perceived price expensiveness at each of the five judged prices. For judged prices $79, $150, $220, and $300, the results were similar and support H1b. For brevity, we report here only the results for the $79 judged price. Perceived expensiveness (PE) among the three conditions (high-price ads, low price ads, and no-price ads) were significantly different. ($F_{\$79}(2, 153)$ =3.75; p=0.021). Additional analysis of contrast showed that at this judged price, PE was statistically higher for the high-price ad condition compared to the low-price condition ($F_{\$79}(1,153)$ =7.826;

p=0.006). For the headphones with the inflated price tag of $400, however, there was no significant difference among the three ad conditions ($F_{\$400}$ (2,154) =0.764; p=0.468), which is contrary to H1b. One possible explanation of this unexpected finding is that the $400 price is too expensive and inhibits any priming effect. Overall, H1b is supported.

The results above do not consider whether ad exposures were incidental to participants. Among all participants, 47.43% recalled seeing an ad. Ad-recognition results also showed that only 49.2% of participants correctly recognized the ads they were exposed to. These figures are in accordance with the reported figures in Drèze and Hussherr (2003) and Yoo (2008); they investigated web ads and assumed incidental ad exposure, and their results are similar to those of the present study. Moreover, participants' expected price was not different among those who recalled the ads correctly and those who did not ($F_{(1,154)}$=1.036, p=0.310).As well, the probability of ad recall was not different among the three conditions ($\chi^2_{(2,\ N=156)}$=2.453 p=0.29). These two results show that there is no relationship between either the price stimuli in the ads and participants' explicit price memory (used as a proxy of their conscious attention) or their explicit ad recall and their expected market price. Therefore, the observed effects cannot be due to participants' conscious price attention.

To reassess the above conclusion, we replicated the ANOVA by controlling the ad recall as a binary variable. The results were in agreement with the findings mentioned above. The effect of price stimuli on participants' expected market price for a set of headphone is affected by the price stimuli (low-price, high-price and no-price ads) ($F_{(2,152)}$ = 26.366, p<.001), while ad recall does not have a significant effect ($F_{(1,152)}$=1.926,

p=.167). Therefore, the results of experiment one not only support H1, but they also confirm that our manipulation prevented the participants form paying attention to the ads.

2.5 Experiment 2

The main objective of this experiment is to test Hypotheses 2a and 2b. According to the second hypothesis, increasing the number of ad exposures (i.e., ad repetition) increases the assimilation effect of the low-price ads (H2a), but does not change the effect of high-price ads (H2b). In this experiment, we manipulated ad repetition by varying the number of target-ad exposures so that the web page displayed the target ad one, two or three times. Target ads contained either the low-price stimulus or the high-price stimulus. Hence, there were 6 conditions (three-by-two) in this experiment.

Participants and Procedure. An effective sample of three hundred and twenty (320) US residents (median age 45-54 years old, 38.5% female) were recruited through a Qualtrics panel to participate in an online study for a small compensation. Three participants were excluded because they did not answer the main questions. The participants were randomly assigned to one of six conditions of a 3 × 2 between-subject design. The two factors used in this study were (1) ad repetition (single exposure, two or three exposures) and (2) the magnitude of price stimulus (low-price [$45] ad vs high-price [$325] ad).

As in Experiment 1, participants were told that they were going to see a real web page and that their task was to read the web page carefully and answer some questions about it afterwards. The structure of the web page was based on a real cnet.com page, and it contained several images, including banners, headers, footers, peripheral images

(see Appendix D). Its content and the placement of ads were the same as in Experiment 1. For the single-exposure condition, the target ad was displayed in the middle of the web page, while two additional filler ads were displayed at the top and bottom of the web page. For the two-repetition condition, the filler ad was displayed in the upper space and the target ad was displayed twice in the two other spaces. For the three-repetition condition, the target ad was displayed three times in the designated spaces. According to the price-magnitude condition, the target ad was either the low-price ad or the high-price ad (See Appendix D).

Measurement. Expected price for the product category as well as the expected price for the target model of headphones were measured through the same measures used in Experiment 1. We also measured pariticipants' confidence in their price knowledge in a question that asked them whether they were confident that their price estimates were close to the real market price. We used a 7-point Likert scale with values ranging from "strongly agree" to "strongly disagree". We measured confidence in price knowledge in order to rule out an alternative explanation that ad repetition results in higher confidence in price knowledge, which, in turn, would affect price expectation.

Ad- and price-recall as well as ad recognition were measured in a way similar to that in Experiment 1. To prevent any bias, instead of directly asking participants if they recalled any headphones ads, they were asked whether they recalled any ads containing price information, as only the target ads contained price information.

2.5.1 Results

Hypothesis 1 predicts that estimates of expected market price of participants who are exposed to high-price ads are higher than those who are exposed to low-price ads.

Hypothesis 2 predicts that increasing the number of exposures improves this effect only for low-price ads. A two-way ANOVA was conducted to compare the main effects of ad repetition and the interaction between this factor and the price magnitude on participants' estimate of expected market price for the product category and the target model of headphones. Since the results from both expected market price for the target model of headphone and for headphones as a product-category were similar, we report here only the results for the EP of the product category. Table 2-4 shows the size of each cell as well as the mean and standard deviation for the expected price (EP) in each cell. In accordance with H1, participants' estimates of EP was significantly higher when they were exposed to high-price ads as opposed to when they were exposed to low-price ads ($F_{(1,311)} = 46.250$, $p<.0005$).

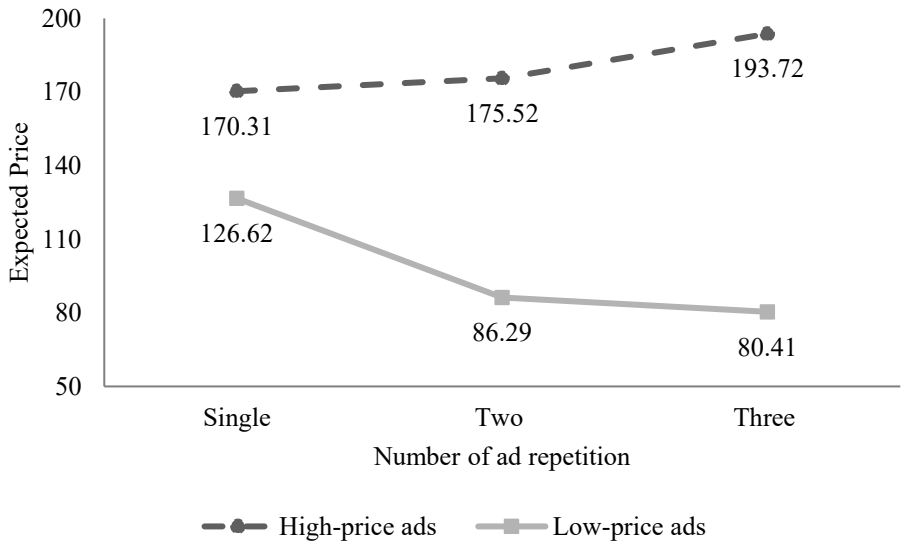
Table 2-4: Mean and Standard Deviation and cell size for expected market price (Experiment 2)

Dependent Variable	# of ad repetitions	High-price ads			Low-price ads		
		N	Mean	SD	N	Mean	SD
Estimates of expected market price	Single-Rep.	62	170.31	110.34	60	126.62	122.24
	Two-Rep.	44	175.52	106.39	45	86.29	64.38
	Three-Rep.	57	193.72	138.04	49	80.41	58.37

The results also reveal that there was a significant interaction between the number of ad repetitions and price magnitude ($F_{(2,311)}=3.147$, $p=0.044$, see Figure 2-3), in such a way that the difference between the high- and low-price conditions was greater when participants were in the three-repetition condition ($M_{diff}=113.311$; $F= 29.856$, *p-value* < 0.005) than when they were exposed to the target ad only once ($M_{diff}=43.690$; $F=5.137$, *p-value*=0.024). Analysis of planned contrasts revealed that increasing the number of ad

exposures from one to three significantly increased the assimilation effect when participants were exposed to low-price ads (F=5.879, p=0.025), supporting H2a. However, for participants who were exposed to high-price ads, increasing the number of ad repetitions did not change their EP (F=1.437, p=0.232). This result is in line with H2b.

Figure 2-3: Average of participants' expected price in each condition (Experiment 1)



As in Experiment 1, we contend that the observed results are due to nonconscious price processing as a result of incidental ad exposure. To support our claim, we performed three additional analyses. First, as mentioned earlier, Thomas and Menon (2007) show that repetition can increase consumers' confidence in their price knowledge, which in turn affects internal reference price. In their experiments, participants who were exposed repeatedly to high-magnitude price stimuli, which were at their focal attention, had higher confidence in their price knowledge and higher IRP than those who were exposed to price only once. However, in Experiment 2, participants' confidence in their price knowledge was affected by neither the price

magnitude nor the ad repetition (all p-values > .5). This result is in line with our hypothesis because it confirms that the observed effect of ad repetition on low-price ads is not due to the changes in consumers' confidence in price knowledge. Moreover, that ad repetition does not affect participants' confidence in price knowledge is in line with our assumption that the participants were not paying attention to the ads because, otherwise, those who were exposed to target ads repeatedly would have reported higher confidence.

Second, the result of price recall and ad recall, which are a measure of explicit memory and a proxy of conscious processing of an ad (Yoo 2008), cannot explain all the observed effects. Of all the participants, 82.60% reported that they recalled seeing an ad (as compared to 47.73% in Experiment 1). That there were several images in the header, footer and sidebars and that there were three ads in all conditions can explain this higher ad recall. As mentioned, to correctly measure participants' recall of the target ads, we asked whether they recalled any price information in any of the ads. This is a better measure of ad recall of the target ads because the target ads were the only ads that contained price stimuli. Among all the participants, 50.80% recalled an ad containing price information. This result is in agreement with the ad-recall result reported in Experiment 1. Among those who mentioned that they recalled seeing a price in the ad, 59.6% correctly recalled the price. These two results are comparable to those in Experiment 1 and those in other studies such as Yoo's (2008) and Drèze and Hussherr's (2003); and they support our assumption that the procedure of Experiment 2 prevented participants from paying attention to the ads (for deeper analyzes of price recall see Appendix F).

Third, we reassessed the ANOVA analysis and controlled for price recall. The interaction between magnitude of price stimuli and ad repetition factors on expected average market price of headphones remained significant ($F_{(2,310)}$=4.243, p=.015, η^2=.027). Since the main effect of price recall is significant ($F_{(1,310)}$=9.574, p=.002, η^2=.030) though the effect of ad repetition is not ($F_{(2,310)=}$1.011, p=.365, η^2=.006), we analyzed the simple effect of ad repetition at the two levels of price magnitude while we controlled for price recall. We found that when participants were exposed to low-price ads, the effect of ad repetition was statistically significant ($F_{(2,150)}$=3.200, p=.044, η^2=.041), but the price recall was not ($F_{(1,150)}$=2.186, p=.141, η^2=.014). However, when participants were exposed to high-price ads, the effect of ad repetition was no longer statistically significant (F(2,150)=3.679, p=.508, η^2=.008), but the effect of price recall was significant (F(2,150)=26.950, p<.001, η^2=.145). This result shows that the observed effects on their expected market price did not depend on whether or not participants recalled price stimuli in the target ads; therefore, it supports our assumption that observed effects are due to nonconscious price processing of incidental price stimuli.

2.5.2 Discussion

These results extend the findings of Experiment 1 because the EPs of the participants were assimilated to the incidental price stimulus in the target ad even when the latter was displayed only once in a cluttered environment. Moreover, this experiment shows that when participants were exposed to the high-price ad repeatedly, they recalled the ad better than when they were exposed to it only once. However, that their price expectation did not change supports our hypotheses because it shows that participants' explicit memory cannot explain the observed effects. On the contrary, when participants

were exposed to low-price ads repeatedly, their explicit memory of the ads did not change but the effect of price stimulus improved. These results reveal that the effect of conscious price processing, i.e., the explicit memory, and nonconscious price processing do not necessarily act in the same direction.

2.6 Experiment 3

In Experiment 2, ads contained only the price information (either high-price or low-price stimuli). However, the price comparing ads contained two pieces of price information: a high-magnitude price stimulus, referred to as the advertised reference price, and a low-magnitude price stimulus, referred to as the selling price (Urbany, Bearden, and Weilbaker 1988). In Experiment 3, we examine the effect of ad repetition when the target ad contains both the advertised reference price and the selling price. According to H3, increasing the number of exposures to the target ad (i.e., ad repetition) from one to a few does not change consumers' IRP. In this experiment, in contrast to to the Experiments 1 and 2, in which we used real brands, we selected a fake brand for the target ad to prevent any association between price and the brand and to prevent any other bias that might be due to familiarity with the product or the brands. Moreover, to increase the generalizability of the findings, we selected a different product.

In Experiments 1 and 2, the content of the web page and the product category in the target ads were about the same product (headphones). Therefore, it can be argued that participants might find the content of the ads relevant and start paying attention to them. To increase the generalizability of the results, we selected a different product category for the target ads while keeping the same page content. By selecting a different

product category in the ads, we aimed to reduce the likelihood that the participants might find the target ads relevant and pay more attention to them.

2.6.1 Stimuli Development

We administered a pretest to an online panel of 57 consumers in the United States, and collected their product involvement, product knowledge, and price knowledge for 15 different product categories that we had previously selected on the basis of a focus group discussion. All the products are gender-neutral and search products. According to the pretest results, we found that for wireless speakers, participants have a moderate level of product knowledge (M=4.13, SD=1.961), a moderate level of price knowledge (M=3.81, SD=1.869), and a moderate level of product involvement (M=4.13, SD=1.920). Therefore, we selected wireless speakers for Experiment 3 because potential participants are neither extremely familiar nor extremely unfamiliar with this category. The average expected market price is US$117.98 (SD=80.887). On the basis of the range of accepted price range for the wireless speakers, we selected $45.99 and $325.99 as the low- and high-magnitude price stimuli respectively.

Three versions of 250-by-300 ads were designed for three experimental conditions. The low-price or high-price ads contain low-magnitude and high-magnitude price stimuli respectively. A third version of the ad was designed for the price-comparing condition, and it contained the selling price (the low-price stimulus) and advertised reference price (the high-price stimulus) presented in the format of "Was $XX, Now $YY" (see Appendix E).

Measurements. In Experiments 1 and 2, we measured the expected market price of the target products (EP) as a proxy of their internal reference price, and perceived expensiveness as a proxy of willingness-to-pay. In this study, we measured willingness-to-pay directly by asking participants to mention what would be the maximum price they were willing to pay for the target product if they were going to buy the product. This single-item measure is in accordance with previous studies (e.g., Nunes and Boatwright 2004; Kan et al. 2014). We also measured confidence in price knowledge and ad-recall in a way similar to that in Experiment 2.

2.6.2 Procedure and Design

An effective sample of one hundred and fifty-one (151) consumers in the United States was recruited using Qualtrics' online panel in the exchange of small monetary compensation. They were randomly assigned to one of six conditions of a 2 (number of ad repetitions: single vs three repetitions) × 3 (type of ad: low-price only, high-price only and price comparing ad) between-subject design (median age 45 to 54 years old, female 62.3%). As in Experiments 1 and 2, the participants were told to read a web page in order later to answer some questions about its content, and the page design was the same as the page we used in Experiment 2. There was no mention of any price information or display ads in the instructions. After exposure to the ads, we measured participants' willingness-to-pay (WTP) as well as other related variables.

2.6.3 Results

According to Hypothesis 1, we expected that participants' WTP should be lower when they were exposed to low-price ads than when they were exposed to high-price ads. Also, on the basis of the Hypothesis 2, participants' WTP should not be affected by

the number of ad exposures if participants are exposed high-price ads. Conversely, if they are exposed to low-price ads, their WTP should be lower when the target ad is displayed three times instead of one time. Finally, according to Hypothesis 3, for the price comparing ads, we expected that increasing the number of exposures would not increase participants' WTP.

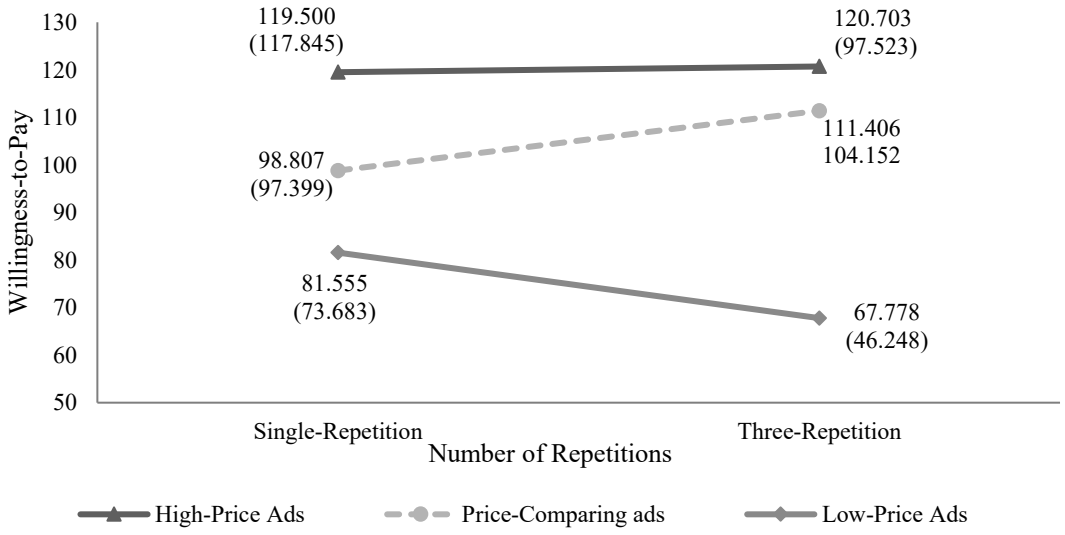
Table 2-5 shows the mean and standard deviations of participants' WTP for a wireless speaker. We conducted a two-way ANOVA and planned contrasts to analyze the results and test the hypotheses. In accordance with Hypothesis 1b, participants who were exposed to high-price ads had higher WTP than those who were exposed to low-price ads ($F_{(1,94)}$=5.982, p=0.016, η^2=.060). The results support H2b as there was not a significant effect of ad repetition on WTP for participants who were exposed to high-price ads (M_{diff} = 1.204; $F_{(1,51)}$<.005, p=.962). Contrary to H2a, for participants who were exposed to low-price ads, the effect of ad repetition on WTP was not significant (M_{diff} = 13.377; $F_{(1,43)}$=.497, p=.485). To shed more light on the effects of ad repetition for low-price ads, we examined the simple effect of price magnitude for participants who were in the single-repetition condition and those who were in the three-repetition condition. Among participants who were exposed to the target ad once, WTP was not statistically different between those who were exposed to high-price ads and those who were exposed to low-price ads (M_{diff}= 37.944, $F_{(1,51)}$=1.992, p=.164, η^2=.038). But among participants who were exposed to the target ads three times, those who were exposed to high-price ads had statistically higher WTP than those who were exposed to low-price ads (M_{diff}= 52.926, $F_{(1,43)}$=4.458, p=.038, η^2=.096). This result conforms to H2a because, while the simple effect of price magnitude on WTP was not statistically

significant when participants were exposed to the target ad once, ad repetition resulted in a significant difference between the two groups. This result supports H2b because it shows that participants who were exposed to low-price ads repeatedly had a lower WTP compared to the other participants.

Table 2-5: Mean, standard deviation and cell size for participants' willingness-to-pay (Experiment 3)

Dependent Variable	# of ad repetitions	Single Exposure			Three Exposures		
		N	Mean	SD	N	Mean	SD
Estimates of Willingness-to-Pay	High-price ads	26	119.50	117.85	27	120.70	97.52
	Price comparing ads	26	98.81	97.40	27	111.41	104.15
	Low-price ads	27	81.56	73.68	18	67.77	46.24

Figure 2-4: Mean (standard deviation) of participants' estimates of willingness-to-pay



To test Hypothesis 3, we compared participants' WTP between those who were exposed to the price comparing ad once and those who were exposed to it three times. In accordance with H3, ad repetition did not affect participants' WTP between the former

and the latter (M_{diff}= 12.60 $t_{(51)}$=.454, p=.651). Moreover, participants' WTP when they were exposed to the low-price ads was lower than the WTP for those who were exposed to the price comparing ads (F(1, 94)=2.975, one-sided p-value=.044, η^2=.031), but the latter were not statistically different from those who were exposed to the high-price ads (F(1, 102)=.546, p=.462, , η^2=.003). These results are in accordance with H3 as they show that when participants were exposed to price comparing ads incidentally, the high-price stimuli in the ads had a greater prevalence effect on WTP than the selling price (i.e., the low-price stimuli), and that ad repetition did not improve the effect.

Ad recall. In addition to the target ad, the web page contains several filler ads as well as some images (e.g., footers and headers). We explicitly asked participants whether they recalled seeing any speaker ad, and 69.9% of them answered positively. There was not any significant association between ad recall and the type of target ad ($\chi2(2) = 3.858$, $p = .145$) nor between ad recall and the number of ad repetitions ($\chi2(1) = 0.043$, $p = .836$).[5] Thus, this result supports our assumption that participants did not pay much attention to the ads.[6]

As only the target ads contained price stimuli, price recall is a better measure of participants' explicit memory of the ads. Of all the participants, 44.40 % recalled seeing a price stimulus in the ads. As we expected, there was not any association between ad type (i.e., price magnitude in the target ad) and ad recall ($\chi2(1) = 3.575$, $p = .167$). However, participants who were exposed to the target ad three times recalled seeing a

[5] We analyzed the association between ad recall and ad type as well as between ad recall and the number of repetitions at different levels of ad repetition and ad type respectively, and we did not find any association.

[6] Otherwise, the number of exposures or the type of ad would affect participants' ad recall

price more frequently than those were are exposed to the target ad only once (55.6% vs. 34.2% respectively for the ads; $\chi2(1) = 6.975$, $p = .008$). However, for participants who were exposed to the price comparing ads, there was no such association ($\chi2(1) = .565$, $p = .465$); but there were associations for participants who were exposed to the high-price ads and those who were exposed to the low-price ads (high-price ads: $\chi2(1) = 5.443$, one-tailed *p*-value= .010; low-price ads: $\chi2(1) = 1.907$, one-tailed *p-value* = .067). The price- and ad-recall results are comparable to those in the previous experiments and support the manipulation, which was intended to prevent the participants from focusing their attention on the target ads.[7]

2.6.4 Discussion

Experiment 3 replicates the findings of Experiments 1 and 2. It also extends the generalizability of the findings from the previous experiments, as it shows that this effect is not constrained by the ads in which the advertised product is congruent with the content of the web page. More importantly, in accordance with H3, we found that ad repetition does not improve the impact of price comparing ads when they are displayed incidentally. Two potential explanations may account for this effect. First, because of the high-value advertised reference price, participants processed both the selling price and the advertised reference price through the same input mechanism; therefore, as we found in Experiment 2, ad repetition did not improve the assimilation effect of price anchors, since they were processed through the more elaborative input mechanism. A second reason could be that participants only processed the high-value advertised reference price through the input process and did not process the low-value selling price.

[7] Adding price recall as a control variable does not change any of the results.

Experiment 3 did not explicitly test which of the above explanations is more likely. However, the facts that the participants who were exposed to the price comparing ads had higher WTP than those who were exposed to the low-price ads, and that there is no such difference between the high-price ads and the price comparing ads lend support to the idea that when online consumers are exposed to incidental price comparing ads they elaborate the high-value advertised reference price more than the low-value selling price. This explanation is not in line with previous studies, such as Grewal et al. (1998), that posit consumers' WTP is more affected by the selling price than the advertised reference price because the former is more informative. As we pointed out in the beginning of this essay, the main difference between previous studies and the current experiments is that in the latter, price comparing ads were not the focus of attention of the participants.

2.7 General Discussion

This paper is based on three experiments designed to (1) test the effect of price stimuli in online display ads that are displayed incidentally to the consumers, (2) give a better explanation of the nonconscious mechanisms of price processing by examining the effect of ad repetition for online display ads that contain either high- or low-magnitude price stimuli and to which consumers are incidentally exposed to, and (3) investigate the effect of ad repetition for price comparing ads in real online environments. In accordance with previous studies which find that price stimuli can affect price perception without the conscious attention of consumers (Adaval and Monroe 2002; Nunes and Boatwright 2004), this study replicates and extends their findings by showing that consumers' IRP, as well as their willingness-to-pay, can be

affected by the price information in online display ads to which they are incidentally exposed (H1). The experiments show that consumers' explicit memory of the ads cannot explain the effect of incidental price stimuli on their WTP: both participants who recalled the ads and those who did not recall them were affected by the price stimuli in the ads. Moreover, we found that ad repetition improved the effects of price stimuli only when the ads contained low-magnitude price stimuli (H2a). When the ads contained high-magnitude price stimuli, ad repetition did not affect participants' IRP or WTP (H2b).

Experiment 3 extends the results of Experiment 2 by examining the effectiveness of the ad repetition strategy when ads contain both a high-value advertised reference price and a low-value selling price. As we expected, increasing the number of repetitions does not significantly increase willingness-to-pay. Our logic is that exposure to the high-value advertised reference price leads to consumers' elaboration of that price stimulus, and this elaboration limits consumers' resources to elaborate the low-magnitude price stimulus in an online environment when consumers are exposed to ads incidentally. Therefore, the effect of ad repetition for price comparing ads is similar to the effect of repetition for the high-price ads (H3). The results of Experiment 3 support this hypothesis.

2.7.1. Theoretical Implications

The first important theoretical implication of our study pertains to our explanation of ad repetition effects for high- and low- price ads. It follows the recent approach (Adaval and Wyer 2011; Blankenship et al. 2008; Wegener et al. 2010) in price anchoring research which posits that price anchors affect consumers' judgment through

both the anchoring-and-adjustment mechanism (Tversky and Kahneman 1974) and the selective accessibility mechanism (Strack and Mussweiler 1997). We provide new evidence for this approach by comparing the effect of the ad repetition strategy for low- and high-magnitude price stimuli. This study supports our claim that the magnitude of incidental price stimuli might determine which price-processing mechanism (anchoring-and-adjustment or selective accessibility) dominates the overall priming effect of price stimuli. Following Essay 1, we suggest that when incidental ads contain high-magnitude price stimuli, it is more likely that consumers will process the ads through the selective accessibility mechanism, but when ads contain low-magnitude price stimuli, the probability that the anchoring-and-adjustment will dominate the price processing mechanism is higher. This is because consumers are more sensitive to high-magnitude prices than to low-magnitude prices; therefore, it is more likely that exposure to high-magnitude prices facilitates the more elaborative selective accessibility mechanism. The evidence from the Experiments 2 and 3 reveals that employing the ad repetition strategy changes consumers' IRP and willingness-to-pay only if the ads contain low-magnitude price stimuli. If the ads contain high-magnitude price stimuli, increasing the number of repetitions from one to few does not change consumers' IRP and willingness-to-pay. That the effect of ad repetition extends previous studies (e.g., Malaviya, Meyers-Levy, and Sternthal 1999) that highlight the mediation role of type of processing.

2.7.2. Managerial Implications

Our findings have several managerial implications. Particularly, this study suggests that employing the ad repetition strategy in an online environment should be based on the magnitude of price stimuli displayed in the ad. According to the results, if

the price information is going to be communicated in online display ads, we suggest that marketers should consider advertising products that are priced above average in the particular category. This is of special importance if they are not targeting a consumer niche and intend to advertise the product to consumers in general. Selecting a low-priced product from that category, in this scenario, could have a negative impact on consumers' willingness-to-pay. Besides, if a high-priced product from that category is used in the ad, consumers not only pay more attention to the ad and recall it better, but they also have a higher willingness-to-pay for any product in that category.

Furthermore, managers should not pay a premium to display their ads repeatedly on a web page if they are advertised a low-priced product. If the goal of an advertising campaign, however, is to communicate a price promotion through either price comparing ads or ads promoting a reduced price of the offerings, it is better to target consumers who might pay more attention to the ads. Nowadays, marketers can use remarketing strategies by targeting consumers after they leave websites to display the ads on external websites (Goldfarb 2014). Therefore, consumers who have visited a product on the marketer's website are more likely to process the price stimuli in the ads through the selective accessibility mechanism; and as a consequence, ad repetition will not have a negative effect on their willingness-to-pay. About price comparing ads, we suggest that employing this type of ads do not have a negative effect on consumers' price judgment when consumers are exposed to them incidentally. When consumers are not paying attention to the ads, the advertised reference price dominates the overall effect of the ads. This is important from public policy point of view because it shows that consumers are vulnerable to exaggerated price information in price comparing ads.

2.7.3. Limitations and Future Research

There are some limitations to this research. First, by analyzing the effect of ad repetitions in Experiment 2, we conclude that the observed effects for the high-price and low-price ads can be explained by linking them to two different price anchoring mechanisms. However, we have not directly examined nonconscious price processing at each level of price magnitude. For example, conducting an experiment that compares participants' implicit memory of product knowledge can help to examine whether exposure to high-price ads can lead to the selective-accessibility price processing (e.g., Adaval and Wyer 2011). Second, the low-magnitude and high-magnitude price stimuli used in our experiments are subjective definitions. For example, we define the low-price stimuli as any price lower than IRP. Nevertheless, the internal reference price is an internal standard, and it is better to operationalize it as a range of accepted prices than as a point (Cheng and Monroe 2013a; Janiszewski and Lichtenstein 1999). Therefore, our argument that consumers process low-price stimuli less deliberately might not reflect the whole story. One alternative argument could be that consumers do not deliberately process any price stimuli that are in their accepted price range. Therefore, before generalizing these findings, we suggest that the model be tested at several price levels at an equal and an unequal distance from the IRP. Third, Experiment 3 examined the effect of ad repetition on price comparing ads. Kan et al. (2014) posit that the effect of price comparing ads on consumers' willingness-to-pay depends on the overlap between the product features that are stimulated by the selling price and by the advertised reference price. In a series of experiments, they show that the higher the overlap between the features activated by two price stimuli, the higher the effect of the advertised reference price on consumers' willingness-to-pay. Therefore, to extend the findings of Experiment

3, the overlap between the features that would be activated in participants' memory after exposure to the advertised reference price and the selling price should be considered.

Finally, at the era of Big Data, online retailers can now track the search activates of their consumers and record products they search for or product that they exclude from their considerations sets (Hofacker, Malthouse, and Sultan 2016). In this study, we assume that the target ads are displayed to consumers who are not involved in a product search for the promoted product. However, consumers prior search activity or the decision-making stage in which they are can exert influence how they process price stimuli (Bronnenberg and Vanhonacker 1996) or the level of their attention to the ads (Chandrashekaran and Grewal 2003). While our results underline that the effectiveness of display ads depends on how consumers process the ads at the time of exposure, it can be of practical interest to investigate the relationship between consumers' processing of price stimuli in online display ads and their browsing history, including their search activity or the stage of decision-making they are in.

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Conclusion

Based on an eye-tracking study and a series of online experiments, this thesis investigates the effects of price stimuli in online display ads as they are seen by consumers in real life settings. In particular, it examines the cognitive processing through which price information affects consumers' attention and willingness-to-pay when price is presented in online display ads to which consumers are incidentally exposed. This thesis also examines effects of factors like ad repetition and price magnitude on consumer responses. Finally, this thesis is among few studies that use eye-tracking analysis in price related issues.

Theoretical Implications

This thesis supports previous findings showing that consumers' willingness-to-pay and internal reference price are affected by price information to which they are incidentally exposed. It also provides new evidence for the recent approach in price anchoring research (e.g., Blankenship et al. 2008; Wegener et al. 2010) that both the anchoring-and-adjustment mechanism (Tversky and Kahneman 1974) and the selective accessibility mechanism (Strack and Mussweiler 1997) affect price judgment. Moreover, it suggests a new factor—price magnitude—that determines which anchoring mechanism dominates the overall effect.

Using the results of the eye-tracking study, the first essay shows that the magnitude of incidental price stimuli can affect consumers' attention to online ads that contain price information. In a few words, participants had longer fixation duration for high-price ads than for low-price ads. Furthermore, the analysis of participants' pupil

size revealed that high-price ads were processed more deeply than low-price ads. These results are in line with our propositions that when consumers are incidentally exposed to high-price ads, it is more likely that the more elaborative selective accessibility contributes more to the overall anchoring effect, and that when consumers are exposed to low-price ads, it is more likely that the less elaborative anchoring-and-adjustment anchoring mechanism becomes the dominant anchoring mechanism.

This thesis also shows that the effectiveness of ad repetition depends on the anchoring mechanisms through which consumers process price stimuli in ads. In particular, the second essay examines the interaction between ad repetition and magnitude of price stimuli on consumers' willingness-to-pay. The online experiments show that when participants were exposed to low-price ads, ad repetition increased the effect of price stimulus on willingness-to-pay. Conversely, when participants were exposed to high-price ads, ad repetition did not change the effect of price stimuli on their willingness-to-pay. Therefore, while previous studies find that role of type of processing in the effectiveness of ad repetition (Malaviya, Meyers-Levy, and Sternthal 1999; Yaveroglu and Donthu 2008), this study examines the role of price magnitude and also shows the effect of ad repetition on consumers' willingness-to-pay.

Finally, this study examines the effect of ad repetition in the case of price-comparing ads to which consumers are incidentally exposed. This type of ads contain both a low-value selling price and a high-value advertised reference price. Previous research show that both price information affect consumers' willingness-to-pay (Grewal, Monroe, and Krishnan 1998; Kan et al. 2014; Urbany, Bearden, and Weilbaker 1988). However, researchers fail to examine these effects when consumers are incidentally

exposed to the ads, and they do not examine the effect of repeated exposures to the ads. Results indicate that when this type of ad is displayed incidentally, the high-value advertised reference price dominate the overall effect of price-comparing ads on willingness-to-pay. Therefore, ad repetition does not change the effect of price-comparing ads on willingness-to-pay.

Practical Implications

From a practical point of view, the results suggest that the price of advertised products matters if consumers are exposed to them incidentally. On the basis of these results, it is recommended that marketers advertise high-priced products to general consumers because doing so motivates more elaborative processing of online ads. They should advertise low-priced products when consumers are in the later stages of decision-making. Also, employing ad repetition strategy can result in lower willingness-to-pay if the advertised product priced below average. However, marketers can prevent this negative effect by including a high-value advertised reference price in the ads.

Limitations and further research

Several limitations to this thesis need to be acknowledged. For instance, in all experiments, only two price levels were compared. Thus, before generalizing the findings, we suggest that the model is tested at several price levels with equal and unequal distance from consumers' internal reference price. Besides, this thesis did not directly examine the price processing mechanism at each price level. It did not either examine at what conditions the high-value price is processed through the output mechanism or the low-value price through the input mechanism.

The Internet provides an ultimate opportunity for marketers to track consumers and target them to display their ads (Goldfarb 2014; Hofacker, Malthouse, and Sultan 2016). In this study, we assume that the target ads are displayed to consumers who are not involved in a product search for the promoted product. However, consumers' product involvement, which itself could be the outcome of the decision-making stage in which they are, can exert influence on the level of attention to ads (Chandrashekaran and Grewal 2003). Therefore, extending our research question by taking into account the relationship between the advertised product and consumers' browsing history and product search could have theoretical and managerial implications as well. The Internet also delivers a great opportunity to customize ad repetition strategies, and marketers can decide to employ the same ad repetition execution or varied ad repetition executions (Yaveroglu and Donthu 2008). Another potential research question is whether there is an interaction between type of ad repetition execution (same or varied) and price magnitude when it comes to the relationship between ad repetition and fixation duration.

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Appendix

Appendix A: The structure of the target Web page in Essay 1

Sections of the web page:

① The header

② The content

③ The Side bar

④ Target ads

⑤ The Footer

Appendix B: Target ads used in Essay 1

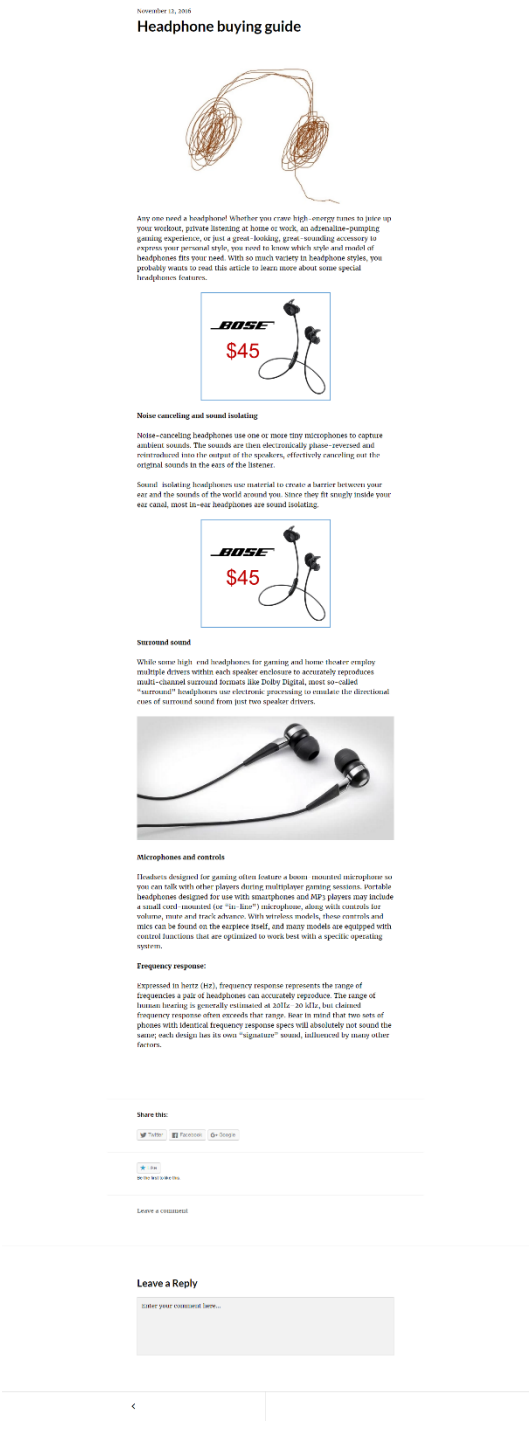
Figure B-1: The high-price ad

Figure B-2: The low-price ad

Appendix C: Material used in Experiment 1, Essay 2

Figure C-1: Target ad (high-price ad)

Figure C-2: Web page and target ad placement



Appendix D: Material used in Experiment 2, Essay 2

Figure D-1: Web page, filler ad and low-price ad

Appendix E: Material used in Experiment 3, Essay 2

Figure E-1: Price comparing ad

Appendix F: Binomial logistic regression results for Experiment 2, Essay 2

For a deeper analysis of participants' price recall, we did a binomial logistic regression with price recall as the outcome variable, and two experiment conditions as the two categorical predictors. Table F-1 shows the regression results. Results show that manipulating the price magnitude in the ads as well as manipulating the number of repetitions affect subjects' explicit memory of the ads. The results reveal that the subjects who were in the high-price conditions recalled the target ads 3.231 (95% CI = (1.529, 6.825)) more than did the subjects in the low-price condition. Also, increasing the number of repetitions from a single repetition to multiple repetitions increases the probability of recall almost two times.

Table F-1
Experiment 2: Logistic regression prediction likelihood of recalling an ad with price information

							95% C.I.for EXP(B)	
	B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
High-price ($325) [a]	1.173	0.382	9.445	1	0.002	3.231	1.529	6.825
Ad repetition [b]			9.076	2	0.011			
Two repetitions [b]	0.624	0.412	2.300	1	0.129	1.867	0.833	4.182
Three repetitions [b]	1.219	0.405	9.067	1	0.003	3.383	1.530	7.480
Price magnitude X Ad repetition [c]			6.630	2	0.036			
$325 by two repetitions [c]	-1.005	0.553	3.308	1	0.069	0.366	0.124	1.081
$325 by three repetitions [c]	-1.412	0.576	6.017	1	0.014	0.244	0.079	0.753
Constant	-0.847	0.282	9.046	1	0.003	0.429		

a: In comparison with the low price ($45) condition

b: In comparison with the single repetition condition

c: In comparison with the single-repetition, low-price condition

However, the negative significant interaction between the price factor and the repetition factor shows that the effect of ad repetition decreases when ads contain high-magnitude

prices. Note that hypothesis 2 is about the non-conscious price process, but ad recall is an indicator of explicit memory (Yoo 2008). Nevertheless, even for explicit memory, the magnitude of price stimulus in the ads also moderates the effect of ad repetition, and ad repetition has less effect when the incidental ads contain low-magnitude prices. All things considered, it can be concluded that ads were not at the focal attention of consumers and our manipulation to display the ads incidentally worked.