The Perception of Lower and Higher Price Thresholds: Implications From Consumer Neuroscience

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Pricing research shows the existence of lower- and upper-price-thresholds. However, the reason why these thresholds exist and how they are processed in the brain remains mainly unclear. We applied functional-magnetic-resonance-imaging to investigate neural activation-patterns that correspond to a lower-, optimal-, and upper-price-threshold. Our results showed the existence of an upper but not a lower threshold and give some evidence for research on price perception.

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The Perception of lower and higher Price-Thresholds: 
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The investigation of optimal pricing has a long tradition in marketing and already yielded important contributions to our understanding of consumer behavior (Lowe and Alpert 2010; Mazumdar, Raj and Sinha 2005; Ofr 2004). Behavioral pricing research and theories (e.g., adaption-level theory, assimilation-contrast theory) have shown consumers to have lower and upper price-thresholds, represented by an inverted U-shaped price-acceptability-function (Helson 1964; Monroe 1973, 1990; Rao and Sieben 1992; Sherif and Hovland 1961; Winer 1988). Whereas prices below a lower price-threshold may signal suspect product quality, prices above an upper threshold may be considered as too expensive (Monroe 1973). The idea of lower and upper price-thresholds and, in between, an acceptable price range, are widely accepted and integrated in most theoretical accounts in pricing research (e.g., Kalwani and Yim 1992; Kalyanaram and Winer 1995, Lichtenstein, Bloch and Black 1988; Mazumdar and Jun 1992). Moreover, recent neuroscientific studies show the effect of different price levels on brain activation and decision-making (Knutson et al. 2007; Plassmann, O’Doherty and Rangel 2007).

However, the reason why consumers tend to have lower and upper price-thresholds and how the acceptable price range is processed in the consumers’ brain remains mainly unclear. Against this background, we applied functional magnetic resonance imaging (fMRI) in order to investigate if there are neural activation patterns that correspond to a lower-, optimal-, and upper-price-threshold. Based on the theories we assumed, that people will not only accept prices from the optimal price range more often compared to prices below or above the price-thresholds, but that they will also exhibit different neural activation patterns during the perception of optimal versus low/high prices.

In a preliminary study, 127 participants were asked for their individual price-settings (too cheap, cheap, expensive or too expensive) for different variations of one FMCG. According to van Westendorp (1976) we extracted a lower- (.88 monetary units (MU)) and upper price-threshold (.99 MU) as well as a (fictive) optimal price (.96 MU). In order to have more variance in the fMRI-study, we took the lower-price-threshold and subtracted 5%, 10%, and 25%. Accordingly we added 5%, 10% and 25% to the upper-price-threshold. Therefore we got a lower threshold-range from .66 to .84 MU, an optimal range from .88 to .96 MU and an upper threshold-range from 1.04 to 1.24 MU. In our fMRI-study, we measured the brain activity of 29 subjects (\(M_{age}=42.24\) years; SD=4.22) during the perception of the price-product combinations extracted from our preliminary study. The task-design followed Knutson et al. (2007). Thus, we first showed participants a picture of a product (4 seconds), followed by the price information (4 seconds), and a decision-phase where they had to indicate their purchase intention (1="yes",0="no"). In total, participants evaluated 90 product-price combinations. The study was executed on a 3T scanner (Magnetom Trio, SIEMENS). The data set consisted of 36 transversal slices of 3.6 mm thickness without a gap, FOV 230 mm x 230 mm, acquired matrix 64 x 64, that is, isotropic voxels with 3.6 mm edge length. Contrast parameters were TR=3000 ms, TE=50 ms, flip angle=90°. Within the group analysis a one-sample t-test was applied based on the individual contrasts of the lower price-thresholds versus the optimal prices as well as upper-price-thresholds versus the optimal prices.

Preliminary results confirmed our assumption of an upper-price-threshold. Only 2.4% of prices within the upper-price-threshold-range were accepted by our participants compared to 31.5% accepted prices within the optimal range (\(\chi^2 = 261, 277; p<.001\)). Also, the fMRI-data confirmed these results. The contrasting of high prices versus the optimal price range exhibited higher activity changes in the insula, the DLPFC (BA46), the superior frontal cortex (BA8), the anterior and posterior cingulate cortex (ACC/PCC). Activity in the insula has often been associated with the “price pain” and negative emotions (e.g., uncertainty, pain, anger) (Eisenberger and Lieberman, 2004; Knutson et al., 2007; Sanfey et al., 2003). Furthermore, our results indicate that the decision becomes more complex for prices above the upper-price-threshold, because the prefrontal areas (BA46, BA8) as well as the ACC/PCC are frequently associated with reflective processes, decision-making and conflict monitoring (Bechara 2005; Ridderinkhof et al. 2004; Sanfey et al. 2003). Furthermore, prices below the lower-price-threshold did not lead to activity changes in regions associated with negative emotions such as the insula. Rather they lead higher activity changes in the middle temporal gyrus (BA 22), and the caudate nucleus. These results provide some evidence that lower prices are perceived as more rewarding than optimal prices (Delgado et al. 2003; Haruno and Kawato 2006). However, there is also no linear relationship between higher prices and activity changes in the insula. We only found higher activity changes in the insula for prices above the upper-price-threshold. Contrasting the optimal price range versus the lower prices did not reveal activity changes in this brain region.

Our results provide some evidence and are in line with research on a revision of the inverted U-shaped price-acceptence-function. Based on the stimulus material from the FMCG-segment in this study, it might be that the price-quality relationship is stronger when higher-priced products are used (Vöckner and Hofmann 2007). Therefore, a lower price threshold might come into play when the price-perceived quality relationship is stronger. But indeed, there already exists some theoretical evidence against a lower-price-threshold: first, economic theory presumes a decreasing demand function implying that, in general, consumers find lower price more acceptable (Monroe and Lee 1999). Second, observation of consumer behavior in the marketplace shows that some consumers actively seek out lower prices. In fact, the discount-retail formats addressing these needs are often very successful. Third, the commonly used direct-questioning-method (Monroe 1990) may be inherently biased, potentially directing consumers to indicate a lower price threshold when, in fact, it may not exist. The prevalent usage of this methodology in academic and applied research may have contributed to overlooking the possibility of the existence of only one threshold for some consumers or products.
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The Effects of Mastery on Subjective Utility

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Motivation to achieve and to improve skills is an important characteristic of mankind and a strong driver of behavior, even if it is not related to any immediate physical reward. Human beings engage and put enormous amounts of effort in a wide variety of activities just to prove themselves they are capable of doing them and of improving their performance. In such activities, the mastery of the task appears to be a reward in itself, since it reflects one’s control over the environment (White 1959). Mastery motivation has been defined as a psychological