Affective Images, Emotion Regulation and Bidding Behavior: An Experiment on the Influence of Competition and Community Emotions in Internet Auctions

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Abstract
Internet auction sites frequently employ images as design elements on their websites in order to either induce a sense of community or competition among the bidders. In this paper, we investigate the impact of such affective images on bidding behavior in a controlled laboratory experiment during which participants’ emotional processes are assessed through psychophysiological measurements. Immediately before placing a bid in a first-price sealed-bid auction, bidders are presented a) pictures of competitive sports scenes, b) pictures of families or children, or c) a blank screen. Participants place significantly lower bids when they were exposed to pictures that induce competition emotions as opposed to pictures that induce community emotions. This relationship is moderated by the bidders’ emotion regulation strategy. In particular, we find that the more participants try to suppress their emotional responses to the presented images, the more they are affected in their bidding behavior. Our results entail valuable insights about the coherence of emotional stimuli on Internet auction marketplaces and customers’ decisions. They also question recent marketing strategies by the market leader.

Keywords: affective images, Internet auctions, decision making, emotion regulation, psychophysiology

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1. Introduction

“It’s better when you win it!” advertised eBay in its commercial campaign “Shop Victoriously” (eBay.com, 2007). In the campaign, bidding in an eBay auction was compared to sports events such as football matches and dog races. Thereby, the world’s largest consumer Internet retail auction site directly addressed the competition emotions the bidders experience on their platform by the use of exciting images. Other Internet auction platforms, such as HappyBidDay.com, use images and videos of smiling bidders, a smiley face logo, and even run an accompanying Facebook page in order to increase the warmth and social presence, i.e., a sense of belonging to a community during users’ shopping experience. In a latter campaign, also eBay has addressed such community emotions in a commercial that aired in December 2011, where a family was shown next to their Christmas tree while doing some last minute shopping on eBay. These examples hint at a strategy of auction and fixed-price retail platforms, which embed affective images in their websites to induce competition or community emotions to maximize revenues. While there is evidence that the display of affective images in fact alters consumers’ emotional processing and perception (Hassanein & Head, 2007; Cyr et al., 2009), little is known about how the users’ individual economic decision-making process in such scenarios is affected by different types of emotions.

In this article, we investigate how the competition and community emotions induced by displaying affective images on Internet auction sites affect bidding behavior. In a controlled laboratory experiment, we show affective images to auction participants prior to the auction start. These images are not related to the bidding task or any other economic activity and selected from the International Affective Picture System (IAPS), a database of pictures to which the respective emotional response is known with high validity (Bradley & Lang, 2007; Bradley et al., 2008). Treatments differ only with respect to the type of emotion (competition or community) induced by the pictures that are shown to the bidders before the auction
begins. Bidders either see pictures depicting sportmen (which induce emotions related to competition), or pictures depicting families and children (which induce emotions related to community), or, as a control, a blank screen.

We find remarkable differences in bidding behavior between the treatments. In particular, we make three key contributions: First, we can show that the emotions induced by the affective pictures have a significant impact on (pay-off relevant) bidding behavior. Second, we find that the type of the induced emotion plays an important role. While emotions related to competition have a negative influence on bids, emotions related to community have a positive impact. Third, we find that bidders’ individual strategies for regulating their emotions mitigate or amplify their affectedness to the images. In fact, the more bidders suppress their emotions in response to the affective images (i.e., try to inhibit their responsive reactions) the stronger their bidding behavior is affected.

The remainder of this article is organized as follows: In Section 2 we provide the theoretical background of our study and develop the hypotheses. In Section 3, we describe the design of our laboratory experiment. The results of the experiment are presented in Section 4. Finally, Section 5 concludes with a discussion on the theoretical and managerial implications of our results as well as potential limitations of our study.

2. Theoretical Framework and Hypotheses

2.1 Emotions and Affective Images in Consumer Decisions

Emotions play a central role in consumer decisions (Bagozzi et al., 1999; Shiv & Fedorikhin, 1999; Bechara & Damasio, 2005). In a dynamic interplay with analytical processes, emotions guide consumer behavior by influencing information processing and judgement based on affective evaluation of environmental stimuli (Andrade, 2005). In a simplified conceptualization, emotional processing can be characterized on two dimensions: valence and
arousal (Russel, 1980). While the valence dimension refers to whether an affective state is positive or negative, arousal refers to the overall intensity of this emotional state. In order to capture the influence of emotional arousal on consumer behavior, it is thus critical to also take into account the valence dimension (Andrade, 2005; Fedorikhin & Patrick, 2000). Under the influence of pleasant emotions, for instance, consumers tend to make decisions that maintain their positive mood (Di Muro & Murray, 2012). When experiencing unpleasant emotions, however, consumers have a stronger tendency to lose self-control and succumb to temptations (Fedorikhin & Patrick, 2010). It can be concluded that the valence of emotional experience “is ultimately what gets attributed to the target” (Noseworthy et al., 2010, p. 1110).

An important environmental stimulus of emotional processing in electronic commerce are the images embedded in the user interfaces of shopping websites (Hassanein & Head, 2006). The design and visual complexity of a webpage induces affective processes that have an influence on consumers’ approach tendencies and shopping behavior (Deng & Poole, 2010; Menon & Kahn, 2002). Li and colleagues found that a user’s willingness to disclose personal information to an online retailer is subject to the emotions elicited by the overall webpage impression (Li et al., 2011). In combination with other design elements, images are an important medium for users when they form attitudes and expectations about the platform as a whole or a specific product they consider buying (Pieters & Warlop, 1999; Song et al., 2012). Hence, images form an integral part of a consumer’s cognitive and emotional product assessment process. Moreover, images can even then trigger emotional processes, when they are seemingly unrelated to the product (Noseworthy et al., 2010). For instance, Winkielman and colleagues showed that the presentation of images with frowning or happy faces changes consumers’ behavior on pouring and consumption of drinks (Winkielman et al., 2005). Trujillo and colleagues found that subjects took riskier financial decisions when seeing images with happy faces, while they took less risky decisions when looking at angry or fearful faces (Trujillo et al., 2012).
Evidently, online retailers have to carefully consider the influence of different types of emotions when designing a platform. In the following, we focus particularly on two specific emotions, namely emotions related to competition and community, which are frequently addressed in the user interface design of online retailers because of their association with social interactions. On the one hand, community emotions are induced to address consumers’ natural longing for the psychological presence of other humans. Building on the theory of social presence (Fulk et al., 1987), online retailers induce community emotions by displaying socially rich images which reveal human warmth and sociability, with positive effects on customers’ perceived trust and enjoyment during shopping (Hassanein & Head, 2006; Cyr et al., 2009). On the other hand, competition emotions are induced to exert feelings related to uniqueness and outperforming other humans in the social competition. Such emotions are often used by retailers to entice consumers into succumbing to a temptation. In terms of valence, community emotions are experienced more pleasant than competition emotions (Lang, 1995).

2.2 Emotional Bidding

In the following, we focus particularly on the role of emotions in electronic auctions, a domain of electronic commerce where affective processes related to social interactions have been found to play an important role in consumer behavior (Ariely & Simonson, 2003; Ding et al., 2005; Ku et al., 2005; Steinhart et al., 2013). In particular, emotions have been found to be “an integral component of a bidder’s decision state and bidding strategy” (Ding et al., 2005, p. 363). Based on a literature review, Adam and colleagues derived a conceptual framework for emotional bidding (Adam et al., 2011). The authors argued that a bidder’s emotional state is affected by specific emotions that are integral to the task and triggered by the auction environment and the bidding process. The induced emotional state can in turn have an influence on bidding behavior. As an example for the influence of integral emotions, i.e., emotions elicited by the auction mechanism, Ku and colleagues (2005) found that auction
dynamics can induce high levels of emotional arousal in bidders, which in turn fuel their bidding. Based on psychophysiological experiments, Adam and colleagues showed that in descending as well as ascending clock auctions the bidders’ arousal levels are affected by the clock speed (Adam et al., 2012, ; Adam et al., 2015). Moreover, the authors found that the level of arousal mediates the influence of clock speed on bidding behavior. Hence, the auction format can induce emotional arousals in consumers with definite influence on decision making.

In addition to integral emotions, also incidental emotions, i.e., emotions not directly related to the auction, can have an impact on bidding behavior. Steinhart et al. (2013) demonstrated that textual priming has a significant impact on bidding behavior. When bidders’ affective system was primed, bidders were more concerned with losing the auction and thus placed higher bids. By contrast, if bidders’ cognitive system was primed, the reason for placing higher bids was bidders’ desire to win the auction. Capra and colleagues examined the influence of induced incidental positive and negative emotional states on bidding behavior in auctions (Capra et al., 2010). It was found that participants in the positive mood treatment generated an upward bidding bias and overbid more often than participants in a no- or negative-mood treatment. This result is supported by a field study based on data from auction houses in London, where prices of low-priced paintings were positively correlated with good mood (Silva et al., 2012).

2.3 The Influence of Competition and Community Emotions on Bidding

In most auctions, the determination of product allocation and final prices necessarily involves the interaction of at least two bidders. Hence, auctions have an inherent social nature that stems from the social interaction of bidders and that differentiates them from other online retailing channels (Dholakia et al., 2002; Rafaeli & Noy, 2005; van den Bos et al., 2008). Bidding in an auction can thus essentially be understood as a form of “socially constructed behavior” (Palmer & Forsyth, 2007).
Building on this social nature of auctions, the user interfaces of Internet auction sites, and, as highlighted above, the images on these sites, are often designed to induce competition and community emotions. Providing evidence for the competitive atmosphere of auctions, Ariely and Simonson (2003) conducted a survey among Internet auction participants and found that 76.8% of the respondents perceived the other bidders as “competitors.” Similarly, Heyman, et al. (2005) describe the competitive nature of online auctions as the “opponent effect” and provide two observations to motivate it. First, they note that bidders refer to the outcome of auctions as “winning” and “losing”, as in a competition, and second they highlight that sniping behavior (i.e., bidding in the very last seconds of an auction) is frequently observed in real online auctions, which is due to bidders’ sensitivity to the presence of other bidders and the “competitive nature of online auctions” (p. 12). The authors also provide survey and experimental data to support the existence of the opponent effect. Kamins and colleagues showed that social factors influence sniping in auctions, and can foster “the competition among bidders” but also “the sense of intimacy” (Kamins et al., 2011). Internet auctions focusing on community emotions primarily addresses feelings of a cozy, safe familiar atmosphere, in order to boosting their consumers’ sense of human warmth and sociability (Hassanein & Head, 2007). In this context, Menon and Kahn concluded that “marketers should carefully consider the emotional impact of the initial encounter with a website since it can affect their subsequent behavior” (Menon & Kahn, 2002, p. 38).

Due to the different nature of competition and community emotions, there is reason to believe that they influence bidding behavior in different ways. Community emotions are more pleasant than competition emotions, and are associated with human warmth and sociability. Under the influence of positive emotions, consumers tend to make decisions that maintain their positive mood (Andrade, 2005; Di Muro & Murray, 2012). In the context of auctions, winning an auction is associated with a rewarding joy of winning. Hence, we expect that bidders who experience community emotions place higher bids in order to increase their chances of winning.
the auction and maintaining their positive mood. By contrast, competition emotions are believed to increase decision makers’ susceptibility to temptations and willingness to take risks (Ku et al., 2005); similar to other emotions that score low in valence (Loewenstein et al., 2001; Fedorikhin & Patrick, 2010). Taking higher levels of risk is, already from a mere theoretical perspective, immediately associated with submitting lower bids, because lower bids increase the potential profit (value of the good minus price paid), and concurrently entail a lower probability of winning the auction (McAfee & McMillan, 1987). Consequently, above and beyond a bidder’s general, perpetual risk attitude, competition emotions may transitorily alter a bidder’s risk attitude such that he or she is temporarily willing to accept higher levels of risk and thus place lower bids. In summary, we therefore hypothesize that:

**Hypothesis 1 (H1):** Bidders place lower bids when they experience competition emotions than they do when they experience community emotions.

### 2.4 Emotion Regulation

The way consumers experience and respond to emotional arousal depends on how they individually regulate their emotional processes. The psychological concept of emotion regulation (ER) (Gross, 1998b) stems from the assumption that emotions unfold over time in an evolving process and that humans constantly, consciously or unconsciously, regulate this process. ER interferes with how consumers experience and express emotions (Gross, 1998a; Lerner et al., 2004) and how their behavior is affected by emotional processes (Menon & Dubé, 2007; Sultan et al., 2012).

Gross identified reappraisal and suppression as the two main strategies that subjects apply for regulating their emotions (Gross, 1998b). *Reappraisal* is an antecedent-focused ER strategy

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1. This holds particularly for first-price auctions, where winning bidders have to pay exactly what they bid. This is also the type of auction which we will consider here (cf. Section 3).
that applies while the emotion is still unfolding and has not reached its peak. When applying reappraisal, consumers change the way they think about the situation in order to influence how emotions are generated over time (e.g., avoiding to become overly excited). As our study focuses on emotions that have already unfolded, we do not expect a moderating influence of reappraisal on behavior. In fact, previous research found that reappraisal either does not influence or even decreases the impact of affective images and films on emotional arousal (see Gross, 1998a, Gross, 2002, Urry, 2009).

By contrast, suppression is a response-focused ER strategy that aims at altering and controlling the experiential, behavioral, and neurophysiological response when the emotion has already unfolded. When applying suppression, consumers aim at not expressing their emotion by inhibiting their responsive reactions. In our study, we are particularly interested in how suppression affects the impact of competition and community images on behavior. Only few studies so far have directly compared the effects of suppression on decision-making. In previous studies—contrary to the belief that decision makers should suppress or at best, avoid strong emotions in order to take “unbiased” decisions (Seo & Barrett, 2007)—suppression was not found to mitigate effects of negative emotional responses (Gross, 2002; Heilman et al., 2010). Kemp and Kopp found that consumers’ general ability to regulate their emotions can moderate the influence of emotions on hedonic consumption (Kemp & Kopp, 2011). Also Wierenga suspected ER of high importance for managerial decision making (Wierenga, 2011). Still, with respect to behavior, the results are not fully conclusive and context depending.

Previous research indicated that suppression can perform poorly in its effectiveness to mitigate emotional arousal (Gross, 1998a). While this is considered the “emotional side,” suppression is also presumed to have an “unemotional side.” Suppression demands more cognitive load than reappraisal, since the emotion interference occurs at a later stage of the emotion generative process and therefore requires constant self-corrective action and self-
monitoring (Gross, 2002; Heilman et al., 2010). In the context of our first research hypothesis, if there is a relationship between the emotional stimuli and bids, then there is also reason to believe that emotion suppression can moderate the influence that these emotions exert on bidding behavior. More precisely, emotion suppression—even though it is defined as the inhibition of expressive reactions—was shown to result in stronger emotional responses (Gross, 1998a, Gross, 2002). For instance, previous research found that subjects who apply suppression strategies are physiologically more susceptible to watching visual stimuli than other subjects (Gross, 1998a). This influence has frequently been explained in the sense that the process of suppressing emotions is (cognitively) more demanding (Gross, 1998a, Gross, 2002). Hence, our second research hypothesis stipulates:

**Hypothesis 2 (H2):** *The use of suppression strategies increases the influence of competition and community emotions on bidding behavior.*

Our research hypotheses are summarized in the research model in Figure 1.

[Insert Figure 1 about here]

### 3. Experiment

In order to investigate the impact of (incidental) competition and community emotions on bidding behavior, we conduct a controlled laboratory experiment with psychophysiological measurements. In the experiment, each participant takes part in several auctions and thereby accumulates so-called monetary units (MU), which are later individually paid out in cash. Thus, in line with the induced value theory (Smith, 1976), decision-making in this experiment is directly related to real monetary payoffs. Thereby, 1 MU is equivalent to €0.04.

#### 3.1 Treatment Structure

Our experiment constitutes a between-subjects design with three treatments. In two of the three treatments participants are exposed to affective images immediately before an auction
starts. In line with the two picture categories that are employed by Internet auction sites in practice (see Section 2.1), in the *competition emotions treatment* (*CMP*), the bidders are shown images of sports events (e.g., runners passing the finishing line, boxers hitting each other, tumult on a rugby field) before the bid mask appears. By contrast, in the *community emotions treatment* (*COM*), the bidders are shown images that illustrate cozy family scenes (e.g., grandmother and grandchildren laughing, children playing with each other, father with his daughter on the beach). In the third, *control treatment* (*NO*), participants are not exposed to images and merely see a blank screen instead. Otherwise, there are no differences between the treatments.

We focus specifically on incidental emotions and therefore use images that do not convey any relevant information about the auction or the good being auctioned. The images were retrieved from the IAPS repository (Lang, 1995). IAPS is a database with a large set of emotionally evocative images, which are rated and standardized in terms of valence and arousal. Previous research has shown that the IAPS images can elicit psychophysiological responses (Bradley & Lang, 2007; Bradley et al., 2008; Noseworthy et al., 2010). Moreover, these images can easily be edited, distributed, and catalogued. Due to these characteristics, IAPS is highly validated and widely used in experimental studies. In our experiment, the images were selected to have comparable levels of arousal across the two treatments COM and CMP ($M=4.695$ vs. $M=5.330$). With respect to valence, COM images are inherently perceived as more positive in comparison to CMP images ($M=7.559$ vs. $M=5.666$).

### 3.2 Auction Process

Each bidder participates in 15 first-price sealed-bid (FPSB) auctions with independent private values (IPV). In an IPV auction each bidder knows his or her value for the good with certainty. In case the bidder placed the highest bid on the auctioned off good, the bidder wins the auction and earns his or her value minus the placed bid. Otherwise the profit is zero. As
we are interested in how the single incidental emotional stimulus that results from the images prior to the auction affects auction behavior, a static FPSB auction was chosen, because it is the auction format that mitigates the confounding effects that other integral emotions, which we are not interested in, may have on bidding behavior the most. Although we cannot exclude integral emotions completely (e.g., anxiety or excitement of anticipating the result), we adopt the following design characteristics of the experiment in order to minimize the possible impact of additional confounding emotional stimuli, other than the images:

(i) The auction result is not revealed at the end of a single auction round, but only at the very end of all auctions. This mitigates the effect of immediate emotions, such as joy of winning or frustration of losing in response to the auction outcome (cf. Astor et al., 2013; Goeree & Offerman, 2003) which might also influence bidding behavior. Note that this also restricts the set of possible auction formats to static (sealed-bid) auctions, since the Dutch or the English auction cannot be conducted without announcing the winner instantly, which again might trigger integral emotions (Adam et al., 2012; Adam et al., 2015).

(ii) The current profit is not displayed to the bidders and hence potential cash-balance effects are mitigated. These design decisions also control for potential learning effects or belief updates that might otherwise occur during the course of auctions. In order to exclude final stage effects, participants do not know exactly in how many auctions they will actually participate in. However, they were informed that the main part of the experiment would last about 45 minutes.

(iii) To further assure a high level of control, participants compete with computerized agents. This eliminates further auction dynamics such as rivalry. Also, participants know that the computers follow an earlier determined bidding strategy which is not influenced by the human participants’ bidding decisions. This design decision restricts participants’
anticipation of how their opponents might be affected in the respective treatment sessions.

[Insert Figure 2 about here]

The auction process of a single auction is illustrated in Figure 2. At the beginning of each auction, the bidder is informed about the round number. Then, a black waiting screen follows for 33 seconds. After that, depending on the treatment condition, a community image, a competition image, or a black screen is displayed for 10 seconds to the bidder. Then, the bidder is informed about his or her private value for the commodity in this auction, which is described in detail below. Three seconds later the bidding screen appears. Now, the bidder has up to 10 seconds to place a bid. This ensures that the bids are made shortly after the bidder has seen the images. The bids are restricted to integers from 1 to 80, indicated by 80 buttons on the screen. Each button also contains a small bar which indicates the winning probability related to the bid. As participants get no result information after each auction round and the bar assures that the bidder gets an intuitive sense of how risky his or her bid actually is (see Engelbrecht-Wiggans & Katok, 2008 for a similar approach). After the bidder placed a bid, the next auction starts with the display of the round information. Finally, after all 15 auctions ended, each bidder is individually informed about his or her cumulated final profits.

Each participant received three times private values drawn from the set \{60, 65, 70, 75, 80\} MU in random order. In line with the extant experimental literature (e.g., Cox et al., 1988, Astor et al., 2013 and Engelbrecht-Wiggans & Katok, 2008), this set of private values was chosen in order to avoid extreme values close to the lower or upper bound, which would only increase the dispersion of bids. The computerized agents bid according to the risk-neutral Nash equilibrium strategy and their value is drawn from a uniform distribution [0,100]. The participants are informed that the computerized agents place bids that maximize their expected profit if they participate against two identically programmed agents (see Astor et al.,
2013; Engelbrecht-Wiggans & Katok, 2008 for a similar procedure). In an auction with three risk neutral bidders the equilibrium bidding strategy \( b(v_i)^* \) for bidder \( i \) with value \( v_i \) and is given by: \( b(v_i)^* = (2/3) * v_i \) (Vickrey, 1961).

3.3 Measures

Next to the participants’ bids, measured in monetary units (MU), there are a number of further measures used in this study. Questionnaires were used at the end of the experiment in order to assess participants’ perceptions during the auction phase and during the image induction phase. Therein, bidders were first asked to assess their (conscious) emotional state during the auctions by means of the Affect Grid (Russel et al., 1989), that is, a two dimensional 9x9 matrix (pleasure-displeasure and arousal-sleepiness). Second, participants were asked whether they thought that the images influenced their bidding behavior on a seven-point interval scale (1=not at all, 7=very much). Third, demographic factors such as age, sex, and auction experience were assessed. Fourth, in order to identify participants’ individually applied ER strategies, the ER questionnaire (ERQ) by Gross and John (2003) was used. The ERQ can be completed within five to ten minutes and consists of ten questions (6 for reappraisal and 4 for suppression). Each question is encoded on a seven-point interval scale. It is characterized by high reliability, high discriminate validity, and only little correlation with the dimensions of other commonly used personality questionnaires (Gross & John, 2003). Finally, we used the risk aversion questionnaire by Holt and Laury (2002) to assess participants’ general individual risk preference. In this questionnaire, subjects have to make 10 choices between two lotteries with different levels of risk and expected payoffs. Based on the number of safe choices a subject chooses, the experimenter can approximate the subject’s individual risk attitude.

Furthermore, we use psychophysiological measures to unobtrusively assess the influence of images on the bidders’ emotional responses. In particular, we measure subjects’ skin conductance (SC) and heart rate (HR). Both measures reflect activity of the autonomous
nervous system (ANS) and therefore cannot be directly influenced by conscious control. They are frequently used as proxies for emotional correlates in psychophysiology (Bradley et al., 2008; Dawson et al., 2011) and have been suggested as appropriate means to assess emotions in electronic marketplaces (Riedl et al., 2010). We focus specifically on phasic changes in SC and HR in response to seeing the affective images.

On the one hand, SC response amplitude (SCR.amp) is a well-known measure for the arousal that is elicited by an emotional stimulus, i.e., the intensity of immediate sympathetic reactions (Dawson et al., 2011). In the present context, SCR.amp is a proxy for the arousal (intensity) of emotions induced by the images. In line with the recommendations of Fowles and colleagues (Fowles et al., 1981), only those SCR amplitudes are taken into account that occurred 1 to 3 seconds after the image was initially displayed and amplitudes had to be greater or equal to .01 μS. All SCR.amp values are then transformed according to $\log(x+1)$ in order to reduce the inherent left skewness. In order to reduce the between-subjects variability in the subsequent regression analysis, all SCR.amp values were referenced to a subjects’ average response to the value information (see Astor et al., 2013 for a similar approach).

On the other hand, we investigate deceleratory responses in HR ($AHR$) in response to an emotionally-competent stimulus as a measure of parasympathetic activity. This is a well-known measure for the valence of an emotional stimulus (Bradley et al., 2008; Ravaja et al., 2006). In the present context, $AHR$ is a proxy for the valence (pleasantness) of emotions induced by the images (see Palomba et al., 1997 for a similar approach). More specifically, external stimuli with a negative valence usually elicit stronger $AHR$ responses than stimuli with a positive valence. Prior research has especially focused on the cardiac phasic response upon 6 seconds past the visual stimulus (Lang et al., 1993). Analogously, we focus on the electrocardiogram (ECG) within that particular time frame. In particular, we assess the magnitude of $AHR$ by identifying first the maximum HR that occurred within the first 4 seconds after the stimulus, and subsequently the minimum HR that occurred up to 6 seconds
after the stimulus. $\Delta HR$ is then calculated as the difference between the identified maximum and minimum HR within the relevant time frame.

### 3.4 Procedure

The experiment was conducted at [anonymized for review] and in accordance with the university’s ethics guidelines. At the beginning of each session, the instructions were read to the participants, providing them with general information and details about the auctions. In order to ensure that the participants understood the procedure, they then had to successfully complete an online questionnaire consisting of 8 questions. After the experiment was over, participants were asked to complete additional questionnaires. One complete experimental session took about one hour. In total 108 participants took part in the experiment (mean age=22.80; 75 male; 33 female). The participants were recruited from a pool of students using the ORSEE software environment (Greiner, 2004). Almost all participants were of central European origin. The experiment consisted of 18 sessions with six participants each. Participants received a show-up fee of €4 and earned on average €19.94. The z-Tree software environment was used to implement the experiment (Fischbacher, 2007). Each session started with an initial five minute rest period, which is needed for a proper calibration of the psychophysiological signals. The average room temperature in the laboratory was 25.1°C (77.2°F), which is within the methodological recommendations of the Society for Psychophysiological Research (Fowles et al., 1981). Seven participants had to be excluded from the analysis because no adequate physiological measures could be assessed, resulting from measurement appliances that failed to operate (two subjects) or participants being non-responders (five subjects). Additionally, we had to exclude seven single responses in response

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2 We identified four economic outliers in the overall sample. A closer look reveals that those subjects also had comprehension problems, stated risk preferences that were opposite to their revealed bidding behavior or, for example, did not even manage to place a bid within the time limit. These outliers were removed from the dataset.
to the image induction, because the ECG signal could not be properly assessed due to motion artifacts. These problems are common when assessing SC and HR. The reported results on bidding behavior are invariably robust against inclusion of these participants.

4. Results

4.1 Manipulation Checks

To test whether the emotion induction manipulation was successful, we compare differences in SCR.amp and ΔHR across the three treatments. An ANOVA confirms that the treatment condition had a significant influence on bidders’ arousal, as measured by SCR.amp ($F(2,96)=4.768, p=.011$). A post-hoc Tukey HSD test shows that the differences in SCR.amp between NO and COM (.069 vs. .117, se=.019, $p=.030$), and NO and CMP (.069 vs. .120, se=.019, $p=.020$) are significant, respectively. By contrast, the SCR.amp values in COM and CMP are comparable (.117 vs. .120, se=.019, $p=.986$), which is in line with the arousal rating in IAPS (see Section 3.1). Having confirmed that the images induced an emotion of significant intensity, we now test the difference in valence in response to the two image conditions. Note that the sole purpose of the NO treatment is to serve as a manipulation check for the image stimulus, as employed above. However, subjects’ ΔHR cannot be properly assessed in the NO treatment, as there was no affective stimulus for which the valence of the resulting emotion could have been measured. Thus, the subsequent analysis focuses on the comparison of the emotional response to the pictures in the COM and CMP treatments. A $t$-test confirms that the difference in ΔHR between the CMP and the COM treatment is significant ($3.572$ vs. $2.680$, $t(62)=2.124$, $p=.038$).

Based on the physiological data, we conclude that the emotion induction manipulation was successful. It is noteworthy, however, that the questionnaire data does not reveal significant differences in perception between the three treatments in terms of perceived valence ($F(2,101)=.335, p=.716$) and arousal ($F(2,101)=.765, p=.468$). On average, participants
reported (on the Affect Grid) a valence score of \( M=6.114 \) (SD=1.602) and an arousal score of \( M=3.300 \) (SD=1.680), indicating that they were in a positive and relaxed mood during the image induction. We will return to this point in the limitations and future research section.

4.2 The Influence of Competition and Community Emotions on Bidding Behavior (H1)

An ANOVA reveals that the treatment manipulation had a significant impact on bids \( (F(2,101)=4.069, p=.020) \). Figure 3 provides an overview of the average bids in the different treatments. In line with our research hypothesis H1, a post-hoc Tukey HSD test confirms that the bids in the COM treatment are significantly higher than the bids in the CMP treatment \( (54.537 \text{ vs. } 51.730, \text{se}=1.026, p=.020) \). On average, the bids in the COM treatment are 2.703 MU higher than those in the CMP treatment. We also note that, as further evidence of a successful manipulation, average bids in the benchmark treatment (NO) are in between the two treatment conditions. However, the differences between NO and COM \( (53.814 \text{ vs. } 54.537, \text{se}=1.040, p=.767) \), and NO and CMP \( (53.814 \text{ vs. } 51.730, \text{se}=1.026, p=.110) \) are not statistically significant, respectively. Overall, and in line with previous research, the bidders persistently place higher bids than the risk neutral Nash equilibrium suggests \( b^*=46.66 \) (Engelbrecht-Wiggans & Katok, 2008; Kagel, 1995).

Regression I in Table 1 confirms that there is a significant difference in bids between the COM and the CMP treatments \( (b=-2.962, \text{se}=1.019, t=-2.906, p=.005) \). Expectedly, participants’ private value and risk attitude (i.e., the number of safe choices) enter the regression with high significance. Higher values and higher risk aversion increases bids. This is in line with previous research on FPSB auctions (cf. Kagel, 1995). We did not observe a significant impact of a bidder’s sex on bids.

[Insert Figure 3 about here]  [Insert Table 1 about here]
4.3 The Influence of Suppression (H2)

Finally, we examine whether the use of suppression amplifies users’ affectedness to emotions related to competition and community (H2). In order to control for this moderating influence, we regressed the bids additionally on the suppression score (mean-centered, M=3.68, SD=.94, min=1.25, max=6.25), as well as the corresponding interaction term (CMP x suppression). For completeness, we also controlled for the reappraisal score (mean-centered, M=4.74, SD=.83, min=3.00, max=6.83) and the corresponding interaction (CMP x reappraisal) in the regression. As can be seen in regression II in Table 1, the effect of competition and community emotions on bids is conditional on the extent to which a subject applies suppression (b=-2.854, se=.881, t=-3.241, p=.002).

As proposed by Spiller et al. (2013), we conducted a Johnson-Neyman floodlight analysis in order to gain a deeper understanding of this moderating influence of suppression at values of the suppression score other than the mean. The analysis revealed that there is a significant negative effect of the CMP treatment on bids for any value of the suppression score greater than 3.353 (b=-1.952, se=.977, t=-2.00, p=.05), but not for any suppression score smaller than 3.353. Moreover, we note that we did not find a significant positive effect of the CMP treatment on bids for any feasible value of the suppression score. To illustrate this, Figure 4a depicts the moderating relationship of suppression on bids for the COM and CMP treatment separately, at the mean value of all other variables. Moreover, Figure 4b shows the moderating influence of suppression on the difference in bids between the two treatments.

[Insert Figure 4a and 4b about here]

Thus, participants with a low score of suppression (i.e., smaller than 3.353) seem to be unaffected by the induced emotions, while participants with high suppression score (i.e., greater than 3.353) are affected significantly, which leads to lower bids in the CMP treatment relative to the COM treatment. In summary, we can therefore reject the null hypothesis in
favor of our research hypothesis H2. The effect of competitive and community emotions on bids is amplified by the use of suppression.

5. Discussion and Conclusions

5.1 Summary of Results and Theoretical Implications

Internet auction platforms often use affective images as design elements of their websites to induce competition and community emotions in the bidders. In this study, we investigated the effect of these emotions on bidding behavior. In a laboratory experiment with psychophysiological measurements, participants were shown images that induce community emotions, images that induce competition emotions, or no images before they could place a bid in a FPSB auction. Whereas previous studies focused particularly on the impact of using facial features in product images (Cyr et al., 2009; Hassanein & Head, 2006), our study focused on images which are unrelated to the task. As a product image is an important medium for forming attitudes and expectations about the product for sale, it can be regarded as a stimulus that triggers an integral emotion. By contrast we show that also incidental emotions can have an impact on economic decision-making in online auctions.

Bidders place significantly lower bids when they experience competition emotions than they do when they experience community emotions (H1). This result seems somewhat counter-intuitive as previous research found that competition emotions can fuel higher final prices (Ariely & Simonson, 2003; Heyman et al., 2004; Ku et al., 2005), but can be explained by the fact that there is a structural difference between the FPSB auction investigated in our study and the ascending, second-price auctions investigated in previous research. More specifically, submitting lower bids in first-price auctions (where bidders can only place a single bid) is associated with taking higher levels of risk, because lower bids entail a lower probability of winning the auction. By contrast, ascending auctions allow bidders to observe the auction process and increase their bids over time. Hence, bidders do not face a risk of losing the
auction. Moreover, the studies that focused on competition emotions in ascending auctions involved some degree of uncertainty for the bidders in terms of how much the item is actually worth. Hence, in these settings, placing higher bids is associated with higher degrees of risk—the risk of paying more than the item is worth. Taken together, both of these results can be explained by momentary changes in risk preference due to competition emotions. Our results are also in line with Capra et al. (2010) in that positive emotions yield higher bids. However, Capra et al. (2010) speculated in their discussion that this effect might be driven, among other possible pathways, by a possible link between positive moods and competition. Our results do not support this conjecture but rather point at a negative relationship between competition and bids.

Moreover, we find that a bidder’s ER strategy has a significant influence on how competition and community emotions impact bidding behavior (H2). In particular, we find somewhat counter-intuitively that the more bidders aim at suppressing their emotions in response to seeing affective images, the more they are influenced in their bidding behavior. Whereas the bids of participants with a low suppression score seem to be unaffected by the affective images, participants with a medium or high suppression score are found to be affected significantly. On the contrary, applying reappraisal as an ER strategy does not seem to moderate the influence of affective images on bids and only has a marginal influence on bids overall. It does, however, have a mitigating influence on the intensity of the experienced emotions in response to seeing community images. Even though previous literature provided evidence that suppression has emotional and non-emotional costs, which are reflected in psychophysiology (Gross, 2002; Heilman et al., 2010), subsequent economic behavior in electronic auctions has not been considered under controlled laboratory conditions so far. Our results show that suppression not only struggles at mitigating the psychophysiological but also the behavioral response. Consequently, this insight suggests that the users’ ER capabilities
should be taken into account when investigating the impact of emotions on economic behavior.

5.2 Managerial Implications

From the perspective of Internet auction platforms, our study shows that even seemingly unrelated design elements can cause emotional processes in the users which eventually influence their behavior. Changes in the bidders’ emotional states, whether derived from participation in an Internet auction or induced by an environmental stimulus, are thus relevant for the auction outcome (Adam et al., 2011). This insight bears implications for the design of “exciting” marketplaces, as excitement that is derived outside actual auction participation, e.g., through graphic and acoustic elements on the website such as videos, sounds and images, can have a systematic influence on bidding behavior.

In particular, auction sites seem to either address community emotions, which are meant to induce a sense of social intimacy and warmth, or competition emotions, which are meant to induce a competitive spirit in the bidders. Our study shows that bidders place higher bids when community images are displayed than when competition images are displayed. Evidently, the designers of such Internet auction platforms need to be aware of how such emotions impact auction outcome. Our results suggest that in order to maximize revenues, the website should rather induce a sense of social warmth than a sense of competition. In reverse, this questions a recent marketing strategy of ebay.com, for example, which suggested to its customers in advertisement campaigns as well as through images on its website that “it’s better when you win it.”

Our results also show that operators of Internet auction websites should be well aware of the ER strategies employed by their users. In our study, those users who employ suppression are found to bid significantly higher under the influence of community emotions, but also significantly less under the influence of competition emotions. Taken as a whole, users who
apply suppression are more affected in their behavior. Auctions inherently pick those bidders as winners who have a systematic tendency to place higher bids than the other bidders (Lee & Malmendier, 2011). Profit-maximizing sellers should thus account for individual behavioral aspects of their consumers, e.g., the influence of interpersonal differences in ER. Consequently, it is important for auctioneers to identify the ER strategy of their users (e.g., through a questionnaire during registration) in order to individually adapt the interface for each user accordingly. In addition to maximizing profit in single auctions, adjusting the interface according to the ER strategies of the users may also improve user experience and thus the success of the platform in the long run. For instance, supplementary analysis shows that bidders with a high suppression score experience weaker emotions in response to community images than in response to competition images (see Appendix A). Taken together, this stresses the importance of websites to further focus on individual rather than aggregate consumer habits within e-business (cf. Mahajan & Venkatesh, 2000).

Finally, from the perspective of auction participants, it is important to highlight that—subject to interpersonal differences in ER—affective images can have an impact on their behavior. However, applying suppression is not disadvantageous per se. While the bidders place higher bids in response to seeing community images, their bids are lower and thus their profits higher when seeing competition images. Furthermore, the use of psychophysiological measurements during auction participation may also be to the benefit of bidders. In this context, Menon and Kahn concluded: “rather than designing static websites, a retailer could design a website to interact with the consumer and adjust to his or her emotional state” (Menon & Kahn, 2002, p. 39).

5.3 Limitations and Future Research

Evidently, there are several limitations in this study. First, as it is often the case with observational studies, it is difficult to disentangle causality from correlation. Therefore we
cannot definitely answer whether suppression is the reason for participants’ reactions to the images shown or whether it is another trait that drives the pattern—which then would be correlated with suppression. However, taking into account the coherence of the results and that our participants belong to a relatively homogenous group (i.e., all students with similar age), suppression can be suspected to play a moderating role in consumer behavior. In general, more research is needed to examine the role of ER on the consumers’ emotional processing and behavior. Although our findings are consistent with recent research showing that poor ER can be detrimental to trading performance (Fenton-O’Creevy et al., 2012; Sokol-Hessner et al., 2008), the relationship between ER and behavior deserves more attention. For instance, it might be interesting for future studies to manipulate participants’ usage of suppression strategies via certain tasks that stimulate suppression (Heilman et al., 2010). However, researchers should be aware that subjects who generally apply reappraisal techniques might struggle to use suppression and vice versa (Volokhov & Demaree, 2010).

Further, field studies could examine to what extent the connection between suppression and behavior might be extendable to other contexts of consumer choice and ultimately improve our understanding of the coherence about individual habitual ER strategies and consumer behavior.

Second, we considered a FPSB auction with computer opponents in order to attain a high level of control over the environmental conditions and to exclude alternative explanations for the observed effects. However, this may have limited the generalizability of our results as most Internet auction platforms, such as eBay, employ a dynamic auction mechanism. Moreover, recent research has shown that bidders experience higher arousal levels when interacting with other human bidders rather than with computerized bidding agents (Teubner et al., 2015). The impact of competition and community emotions on behavior might therefore be even stronger when bidders interact with other human bidders. Finally, contrary to our experimental design, bidders usually have some uncertainty about their private value of the
good. However, these aspects are likely to rather increase bidders’ emotional arousal (Ariely & Simonson, 2003; Ku et al., 2005), which may also lead to more pronounced results.

Third, it remains an open question whether the effect of competition and community emotions on bids is conscious or unconscious in nature. Previous research has shown that the influence of affective images on emotions, experience, and behavior can take place unconsciously (Winkielman et al., 2005; Trujillo et al., 2012). In line with this research, our psychophysiological measurements confirm an impact of affective images on the bidders’ emotional state, while we do not observe differences in perceived feelings. Moreover, participants reported that they did not think that the images had an influence on their bidding behavior (M=2.290, SD=1.287). However, it is important to highlight that in our experiment there was a considerable delay between the emotion manipulation and the self-report questionnaire. In order not to interfere with the induced emotional state, we assessed participants’ perceived feelings at the end of the experiment when all auctions were finished. Thus, differences between the neurophysiological measurements and the conscious perception may simply be due to this delay in measurement. Moreover, the fact that we did not find significant differences in the perception of valence between the three treatments in the questionnaire data, whereas we did find significant differences in the neurophysiological data is not conclusive evidence of an unconscious process, because arousal and valence were measured simultaneously and indirectly (through the effect grid) in the questionnaire, but independently and directly (through SCR.amp and ΔHR) physiologically. Similarly, as the assessment of risk attitudes was conducted at the very end of the experiment, we cannot provide direct evidence that the impact of competition and community emotions on bids takes place through the pathway of momentary changes in risk attitudes. In fact, we did not find significant differences in bidders’ general risk attitudes as measured through the number of safe choices in the Holt & Laury (2002) test. However, it is noteworthy that conducting a risk attitude test before the auction start would likely have introduced a negative confounding
effect. Future research could provide further insight into the pathways in which competition and community emotions affect risk taking in different scenarios, such as lottery choice, and negotiations.

In general, we believe that using tools from psychophysiology will be able to provide additional insights into the affective processes shaping consumers’ expectations, attitudes and behavior. With the technological progress of wireless assessment and real-time processing of psychophysiological correlates, such data might even be collected in the field (vom Brocke et al., 2012). However, at first more research is needed under controlled environmental conditions in order to gain a robust understanding of how internal and external emotional influences are processed. For instance, which other elements of the website can induce emotional processes in auction participants and change their behavior? To what extent do personality traits and cultural background moderate the users’ conscious and unconscious emotional processes? We believe that answering these questions can contribute to building better market institutions.

**Literature**


Figures

Figure 1. Research model.

Figure 2. Auction process with image being displayed at event “Image.”

Figure 3. Subjects’ mean average bids in the different treatments. (Error bars: 95% confidence intervals)
Figure 4a. Illustration of the moderating influence of suppression on bids.

Figure 4b. Differences in bids between CMP and COM at different levels of suppression.
# Tables

## Table 1. Regression tables.

<table>
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<th>Independent variables</th>
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<th>(II) Bid</th>
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<td></td>
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Note: The regressions are based on robust standard errors clustered by subject. Measures for suppression and reappraisal are mean-centered.
Appendix A – Supplementary Analysis

This appendix provides supplementary analysis for the impact of affective images on participants’ emotional processing. Figures A.1 and A2 depict the skin conductance response amplitude (SCR.amp) and the heart rate drop (ΔHR) in response to the affective image.

**Figure A.1.** Skin Conductance Response amplitudes (SCR.amp) in microsiemens (µS) to the images induction versus a simple flare up on the screen. (Error bars: 95% confidence intervals)

**Figure A.2.** Heart Rate Drop (ΔHR) in beats per minute (bpm) subsequent to the image induction between CMP and COM. (Error bars: 95% confidence intervals)
Table A.1 provides further evidence that the emotion induction manipulation was successful. Regression I shows that bidders’ levels of emotion arousal as measured by SCR.amp are comparable in the CMP and the COM treatment \((b=0.012, se=0.054, t=2.31, p=0.818)\). Regression II confirms that the difference in ΔHR between the CMP and the COM treatment is significant \((b=0.213, se=0.099, t=2.150, p=0.035)\).

In line with previous research, regression I indicates that participants who apply suppression strategies exhibit stronger SCR.amp \((b=0.051, se=0.028, t=1.818, p=0.074)\). However, this effect is only marginally significant. On the other hand, we find that reappraisal significantly decreases average SCR.amp in the COM treatment \((b=-0.135, se=0.050, t=-2.694, p=0.009)\), while this effect is mitigated in the CMP treatment \((b=0.143, se=0.076, t=1.893, p=0.063)\). This provides evidence that—depending on the context—reappraisal can be reflected in smaller SCR.amps. Finally, we find that SCR.amps mitigate over the sequence of the 15 auction rounds.

### Table A.1. Regression tables.

<table>
<thead>
<tr>
<th>Dependent Variables</th>
<th>Independent variables</th>
<th>(I) SCR.amp</th>
<th>(II) ΔHR</th>
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<tr>
<td>constant</td>
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<td>.169</td>
<td>5.316</td>
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</table>

\(* p<0.10, * p<0.05, ** p<0.01, *** p<0.001\)

Note: The regressions are based on robust standard errors clustered by subject. Measures for ΔHR and SCR.amp are transformed according to \(\ln(x+1)\). Measures for suppression and reappraisal are mean-centered.