



The Influence of Social Crowding on Consumer Brand Choices in the E-Commerce Market

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Abstract. With the widespread adoption of smartphones and IP geolocation technology, many enterprises offering e-commerce services are seeking to leverage offline environmental information to gain insight into consumer preferences and improve online operations. Among the various environmental variables, crowd density is a key factor that influences consumer behavior. This paper conducted three studies to explore how social crowding affects consumers' brand preferences in online consumption scenarios, utilizing secondary data, ANOVA, regression, and bootstrapping analysis. The results demonstrate that high social crowding has a significant positive impact on consumers' preferences for brands with logos that have clear boundaries. Furthermore, this effect is moderated by consumers' regulatory focus. In the context of e-commerce, the findings suggest that enterprises can benefit from leveraging offline environmental information to optimize online operations and improve brand recognition.

Keywords: Social crowding · E-commerce · Logo boundary · Regulatory focus

1 Introduction

In recent years, the digital economy has experienced a period of rapid growth, with e-commerce becoming its primary driving force. The mobile e-commerce market in China reached a transaction scale of 6 trillion yuan and has maintained high-speed growth momentum. Compared with traditional shopping environments, the e-commerce landscape offers more diverse and varied shopping experiences, leading to a more complex external environment for consumers. There are significant differences between offline and online purchasing behaviors.

Therefore, it is essential to conduct an in-depth analysis of the impact of external factors on online purchasing decisions. Among the critical environmental variables, crowd density is a key factor that influences consumer behavior. The widespread use of smartphones and IP geolocation technology enable businesses to locate consumers accurately, providing a technological foundation for combination of online and offline information. Furthermore, the development of e-commerce has expanded the research scope beyond offline consumption scenarios into online ones. Therefore, studying how social crowding affects consumers' online purchasing is critical in the context of e-commerce. This paper aims to conduct three studies to explore how social crowding affects consumer decision-making in online purchases, such as brand preference.

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Brand logos are the most important visual symbols of a brand, playing a vital role in spreading brand image and creating brand assets. Compared with text information, the graphical features of a brand logo are more easily remembered by consumers, which is more worthy of investment than other marketing campaign [1]. In the design of a brand logo, an important spatial element is the “boundary”. Companies can transfer brand information to target customers by adjusting the boundary of the brand logo. On this basis, this paper hopes to explore how consumers’ preference for brand logo would be affected by social crowding in the context of e-commerce.

2 Theoretical Framework

2.1 Social Crowding and Brand Logo Boundary Preference

This study adopts Stokols’ [2] conceptualization and defines social crowding as a psychological state that occurs when the individual’s demand for space exceeds the supply due to the excessive number of people or goods in a unit area. Previous literature found that social crowding may affect people’s cognition and decision-making processes [3]. For example, crowding is perceived as an unpleasant, stressful emotional experience, which is associated with a negative emotional evaluation of a given dense environment [4]. Furthermore, social crowding also influences consumers’ perceptions and behaviors by affecting their emotions [5]. Specifically, consumers in highly crowded environments are more likely to experience negative emotions [2], such as tension and confusion, while those in uncrowded environments experience a feeling of relaxation and pleasure. According to the compensation perspective, the high social crowding environment leads to negative emotions among consumers, which encourages them to choose products with boundary or structured features to compensate for the negative emotions [6].

Therefore, we speculate that when consumers who are situated in crowded social settings face online consumption, such as making purchase choices among multiple brands, they may have certain preferences for brand logos. Boundary, as a design element, is very common in brand logo design. The boundary of brand logo refers to the visual boundary of dividing space and taking brand identity as the focused object, which is a representation of structure and order [7]. Thus, when social crowding leads to negative emotions among consumers, it motivates individuals to compensate for their negative emotions, so they prefer the brand logo with boundary. Stated formally,

H1: With high (vs. low) social crowding, consumers prefer to choose brands with logos that have clear boundaries in online consumption scenarios.

2.2 Regulatory Focus Theory

Regulatory Focus Theory [8] is a theory of self-regulation proposing that people have two self-regulatory orientations: the promotion and the prevention focus orientations. When self-regulation focuses on promotion, individuals regard their goals as ideals or desires, and thus focus on progress and achievement, and choose positive goal-pursuing strategies, paying more attention to acquiring information. When self-regulation focus on prevention, individuals regard their goals as responsibilities and obligations, pay more

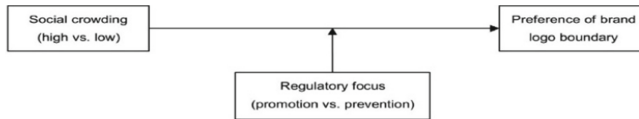


Fig. 1. Research Model

attention to safety and self-preservation, tend to choose prudent goal pursuit strategies, and are more sensitive to information about loss.

Specific to the online brand choices scenario, the influence of social crowding on preference of brand logo boundary may also be changed by consumers' orientation of regulation. For consumers with promotion-focused self-regulation, they may consider that the brand logo without boundary means challenges to the existing order, which accords with their pursuit of adventure and achievement [8], thus decreasing their preferences for logo boundary in the lower social crowding scenarios. In comparison, for consumers with prevention-focused self-regulation, they are sensitive to uncertainty and risk [8], so they may believe that the brand logo without boundary means losing protection of existing rules and order, and thus promoting their preferences to logo boundary in lower social crowding scenario. Based on the analysis above, this paper presents the hypothesis that:

H2: Regulatory focus moderates the effect of social crowding on consumers' preference for brand logo boundary.

H2a: For consumers with promotion-focused self-regulation, there is a greater significant difference in brand logo boundary preferences between different social crowding scenarios.

H2b: For consumers with prevention-focused self-regulation, there is no significant difference in brand logo boundary preferences between different social crowding scenarios.

The hypotheses raised in this paper are summarized by the following research model in Fig. 1.

3 Study 1

3.1 Data

This study tested H1 by using IP geolocation technology and collecting consumers' Google search data over the past year. We took the population density in each U.S. state as an index of social crowding. We used data from the U.S. Census Bureau [12], which represents consumers' perception of social crowding in their daily lives (As shown in Fig. 2). We gathered Google's search data in past one year on the terms with "boundary" in each U.S. state as a reverse measure of consumers' preference of boundary, suggesting people's concerns about eliminate boundaries by search terms such as "breaking boundaries" (As shown in Fig. 3).

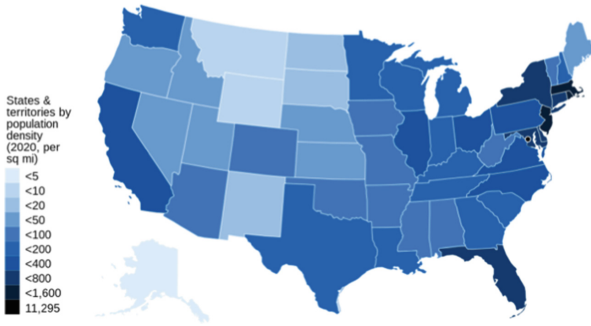


Fig. 2. U.S. states and territories by population density

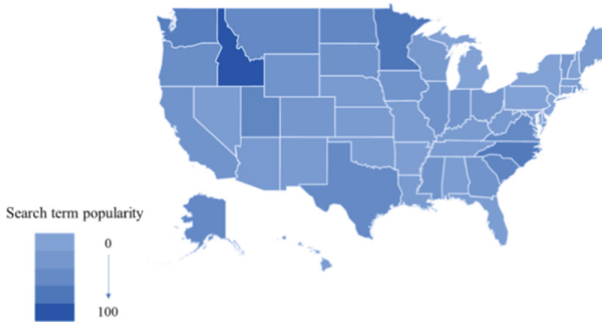


Fig. 3. U.S. states and territories by search term popularity of “boundary”

3.2 Results and Discussion

We matched population density and Google’s search index about boundary in each U.S. state, conducting a regression analysis. As predicted, the results revealed a significant positive association ($B = 0.034$, $SE = 0.02$, $t(48) = 0.29$, $p = .042$). After including personal income, GDP and education level (United States Census Bureau, 2020) as covariates, the effect of social capital remained marginally significant, $B = 0.04$, $SE = 0.02$, $t(45) = 1.96$, $p = .056$ (see Table 1). H1 was basically supported.

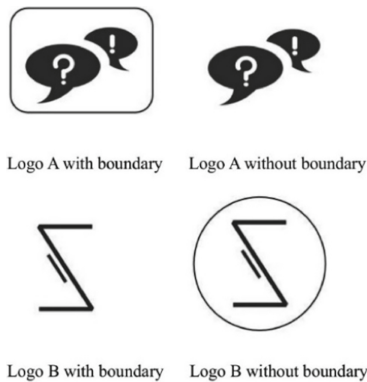
4 Study 2

4.1 Method

Study 2 aimed to explore the effect of social crowding on brand logo boundary preference (H1). A total of 102 students (54.9% female) from a university in Shanghai participated in Study 2. The study adopted a one-way between-group design (Social crowding: high vs. low social crowding) and all participants were randomly assigned into two groups. Participants were asked to imagine that they had entered a space with different levels of crowding and needed to make online purchasing decisions. According to Calhoun’s experiment [9], the high social crowding group was set in a high-density environment,

Table 1. Regression analysis for Study 1

Variable	Coef. (SE)	<i>p</i> value	<i>t</i> value
Population density	0.04 (0.02)	0.056	1.96
Education level	0.29 (0.41)	0.484	-0.71
Personal income	<0.01 (<0.01)	0.472	0.73
GDP	<0.01 (<0.01)	0.483	-0.71
_cons.	33.33 (12.67)	0.012	2.63
N (obs.)	50		

**Fig. 4.** Materials of brand logo boundary preference measurement

i.e., eight strangers in a 10 m² space, while the low social crowding group was assumed to be in a low-density environment.

Next, participants were then told that they were making online purchasing decisions and needed to choose preferred brands from four groups of brand logos, which measured their preferences for brand logo boundary (1 = strongly dislike, 7 = strongly like). According to Cutright's method [11], two groups of logos were designed to measure their preferences for brand logo boundary (two logos with boundary and two logos without boundary; see examples in Fig. 4), and the other two groups of logos were designed as unrelated control options in case participants found the real purpose of this experiment. Finally, participants responded to demographic questions.

4.2 Results and Discussion

An ANOVA was conducted to assess the effect of social crowding on brand logo boundary preference. As predicted, a significant difference emerged in brand logo boundary preference between the two groups, $F(1, 100) = 297.38, p < .001, \eta^2 = .75$. Compared with participants in the low social crowding group, those participants in the high social crowding group were more likely to choose the brand logo with boundary (M low social

Table 2. Linear regression analysis for Study1

Type	H1
X → Y	3.529*** (0.205)
Constant	2.164*** (0.134)
R^2	0.746
F	297.379

Note: Standard errors are in brackets, *** denote $p < 0.001$

crowding = 2.16, SD = 0.86; M high social crowding = 5.69, SD = 1.21) (see Table 2), supported H1.

5 Study 3

5.1 Method

Study 3 further explored the moderating role of consumers' regulatory focus (H2, H2a, H2b). A total of 102 participants (50.5% female) from a university in Shanghai participated in Study 3. Firstly, participants were told that they were making online purchasing decisions and randomly assigned to one of two groups (Social crowding: high vs. low social crowding). On the basis of Study 1 and 2, Study 3 used similar materials to manipulate perceived social crowding of participants [9]. Next, participants were asked to complete a scale of regulatory focus ($\alpha = 0.781$) [10] including 8 items (e.g., promotion focus: "I see myself as someone who will prioritize working towards my ideal self; prevention-focus: "I see myself as someone who prioritizes being the person that committed to fulfilling my duties"). We scored promotion focus inversely. Participants were then asked to answer questions about their preferences for brand logo boundary, which are the same questions as in Study 1. Finally, participants responded to demographic information.

5.2 Results and Discussion

Before verifying our hypothesis, we conducted KMO and Bartlett's test which shown that the scale of regulatory focus qualified for further analysis (KMO = 0.757; see Table 3), and also had good reliability ($\alpha = 0.781$).

Next, an ANOVA was conducted to assess the effect of social crowding on brand logo boundary preference again. As predicted, a significant difference emerged in brand logo boundary preference between two groups, $F(1, 100) = 65.90, p < .001, \eta^2 = .40$. Compared with participants in low social crowding group, those participants in high social crowding group were more likely to choose the brand logo with boundary (M low

Table 3. Results of KMO and Bartlett's test for regulatory focus scale

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.757
Bartlett's Test of Sphericity	Approx. Chi-Square	112.407
	df	28
	Sig.	$p < 0.001$

social crowding = 2.90, SD = 1.25; M high social crowding = 4.92, SD = 1.27), also supported H1.

To further test the moderating role of consumers' regulatory focus, we used Model 1 of the SPSS PROCESS Macro. A 5,000-sample bootstrapping analysis revealed that consumers' regulatory focus significantly moderated the relationship between social crowding on brand logo boundary preference ($\beta = 1.9863$, SE = 0.1688, 95% CI = [1.6514, 2.3212]) (see details in Table 4). For consumers with promotion-focused self-regulation, there is a greater significant difference in brand logo boundary preferences between different social crowding scenarios ($\beta = 3.8882$, SE = 0.2378, 95% CI = [3.4164, 4.3601]). In contrast, for consumers with prevention-focused self-regulation, there is no significant difference in brand logo boundary preferences between different social crowding scenarios ($\beta = 0.0843$, SE = 0.2425, 95% CI = [-0.3969, 0.5656]). Therefore, the results of Study 3 supported H2, H2a, and H2b.

Since consumers' regulatory focus was a continuous variable, we used the Johnson-Neyman "floodlight" approach. As shown in Fig. 5, the effect of social crowding on brand logo boundary preference was significant for participants with a prevention-focused self-regulation index lower than 5.3010 ($\beta_{JN} = 0.44$, SE = 0.22, $t = 1.98$, $p = 0.050$).

Table 4. Linear regression analysis of Study 2

Type	H1	H2
Social crowding	2.027 ^{***}	5.830 ^{***}
	(0.250)	(0.381)
Regulatory focus		0.582 ^{***}
		(0.069)
Social crowding \times Regulatory focus		-1.017 ^{***}
		(0.091)
Constant	2.898 ^{***}	0.828 ^{**}
	(0.180)	(0.273)
R^2	0.391	0.734
F	65.895	90.048

Note: Standard errors are in brackets, ^{***} denote $p < 0.001$, ^{**} denote $p < 0.01$

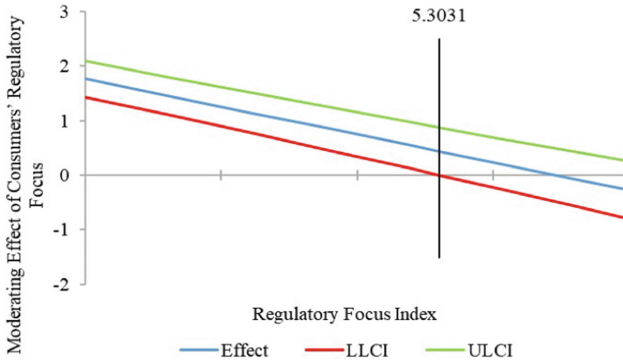


Fig. 5. Moderating role of regulatory focus

Results of the floodlight analysis confirmed that participants who have relatively higher prevention-focused self-regulation were less influenced by the effect of social crowding.

6 Conclusions

6.1 Discussion

Based on the results of three studies conducted by researchers, it can be concluded that social crowding has a significant influence on consumers' brand logo boundary preference. Our findings reveal that when consumers make an online purchasing decision in a high social crowding situation, they will perceive more negative emotions. In this way, they will prefer the brand logo with boundary, which is a representation of structure and order [7] and can satisfy consumers' increasing need to compensate themselves. Furthermore, this paper also explores the moderating factor of the main hypothesis. Specifically, for consumers with promotion-focused self-regulation, they prefer adventure and achievement [8], and thus are less likely to choose a brand logo with boundary in the lower social crowding scenario. In this way, there is a greater significant difference in brand logo boundary preferences between different social crowding scenarios. In comparison, for consumers with prevention-focused self-regulation, they will consider that the brand logo without boundary means losing protection of existing rules that is inconsistent with their thoughts. Therefore, they are more likely to choose a brand logo with boundary in the lower social crowding scenario, which attenuates the main effect of social crowding.

For marketing practice in e-commerce, our conclusion of empirical research can guide companies further in combining offline location information and online brand logo display to promote consumers' purchases. According to the results of this paper, it is suggested that enterprises need to make full use of real-time offline information collecting, such as location information, when offering services or products online. For example, when detecting that consumers are in a crowded location, such as a railway station, more supportive services or products about safety should be provided to help compensate consumers psychologically. Combing online and offline information will be

highlighted in the development of e-commerce, which will help e-commerce enterprises better manage consumers' psychological needs and thus further improve the performance of enterprises.

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