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# COGNITIVE AND BEHAVIORAL REACTIONS OF CONSUMERS TO HUMAN DENSITY: THE MODERATING ROLE OF SOCIAL FACTORS

**Settore Scientifico Disciplinare SECS-P/08**

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## ABSTRACT

Human density is a crucial factor in several market contexts and in the last forty years marketing researchers have investigated its effects on various consumer reactions, such as satisfaction and choices. However, consumer behavior researchers disagree upon whether human density affects negatively or positively consumer reactions. At the current state-of-art, the roles of social factors (the relationship with the other customers in the crowd) received little attention. Previous research indeed ignored, in most of the cases, the multifaceted nature of the crowding phenomenon. Across three essays, I investigated the moderating role of social factors in the relationships between human density and cognitive and behavioral ractions, such as willingness to stay and vice-virtue choices (essay 1), repurchase behavior (essay 2), and calories intake (essay 3). This research contributes to the crowding literature by demonstrating that it is necessary to consider social factors in the analysis of the effects of human density. In all the proposed studies, the emerged pattern suggests that the composition of the crowd, considering social group identity or similarity, leads to different effects of human density on consumer reactions.

## ABSTRACT

La densità umana è un fattore cruciale in numerosi contesti di mercato e negli ultimi quaranta anni numerosi ricercatori di marketing hanno investigato i suoi effetti su varie reazioni dei consumatori, quali soddisfazioni e scelte. Tuttavia, i ricercatori di consumer behavior non concordano se la densità umana influenzi negativamente o positivamente le reazioni dei consumatori. Allo stato dell'arte attuale, il ruolo dei fattori sociali (la relazione con gli altri consumatori nella folla) ha ricevuto scarsa attenzione. La ricerca precedente infatti ha ignorato, in molti casi, la natura multiforme del fenomeno affollamento. Attraverso tre essay, ho analizzato il ruolo di moderazione dei fattori sociali nella relazione tra densità umana e reazioni cognitive e comportamentali, come la willingness to stay e le scelte tra prodotti vice-virtue (essay 1), i comportamenti di riacquisto (essay 2), e il consumo calorico (essay 3). Questa ricerca contribuisce alla letteratura sull'affollamento dimostrando che è necessario consideratore i fattori sociali nell'analisi degli effetti della densità umana. In tutti gli studi proposti, emerge un pattern indicante che la composizione della folla, considerando i gruppi sociali di appartenenza o la similarità con gli altri, porta a effetti differenti della densità umana sulle reazioni dei consumatori.

# Contents

# INTRODUCTION

Human density is a crucial factor in several market contexts and in the last forty years marketing researchers have investigated its effects on various consumer reactions, such as satisfaction and choices (Langer and Saegert, 1977), perceived control (Hui and Bateson, 1991), shopping value (Eroglu, Machleit, and Barr, 2005), attitude (Pan and Siemens, 2011), willingness to spend (Van Rompay et al., 2012), elicited emotions (Uhrich, 2011), and calories consumption (Hoch and Bagchi, 2017).

In everyday language, the terms crowding and human density are mostly used as synonyms, but they represent two distinct phenomena. Crowding refers to the negative perception that emerges when the demand of personal space exceeds that available. Instead, human density refers to the objective number of people present in a certain place at a certain moment. Stokols (1972) underlined that human density is a necessary but not sufficient condition to perceive crowding and that it is necessary to consider also personal (e.g., consumer personality traits) and social factors (e.g., the relationship with the other customers in the crowd) in order to understand the effects of crowding on consumer behavior.

Consumer behavior researchers disagree upon whether human density affects negatively or positively consumer reactions (Mehta et al., 2013). For example, Langer and Saegert (1977) proposed the existence of a negative correlation between human density and consumer satisfaction. Other scholars, instead, demonstrated positive (Pons et al. 2006) and quadratic (Pan and Siemens, 2011) effects of human density on satisfaction and related outcomes.

At the current state-of-art, the roles of social factors received little attention. Previous research indeed ignored, in most of the cases, the multifaceted nature of the crowding phenomenon. In the three essays of this dissertation, I investigated the roles of social factors in influencing the effect of human density on consumer reactions. My research aims to consider not only the number of customers but also elements related to their identity. The inclusion of social factors in human density studies is relevant because social factors impact directly on the demand of personal space (Schultz-Gambard, 1979) and, consequently, on crowding perception (Novelli et al., 2013). According to this view, considering only the effect of human density, without including in the model the social elements characterizing the crowd, does not allow to predict consumer reactions correctly.

In the first essay, I investigated the moderating role of social groups in the relationships between human density and willingness to stay and vice-virtue choices. The aim of the essay was to demonstrate that is is necessary to consider also the composition of the crowd, in terms of social identity, to correctly identify both cognitive and behavioral reactions to human density. I conducted an experimental study in which I manipulated the levels of human density and the identity of the customers of a café. Results confirmed the idea that consumers' reactions to different levels of density are conditional to the social groups that compose the crowd. In detail, I demonstrate that human density increases the willingness to stay in the café only when the crowd is composed of positive social groups (in-group and aspirational group). In presence of dissociative group members and the control condition, human density did not affect willingness to stay. Moreover, I observed that in presence of aspirational group members, consumers tend to choose more virtue products. On the

contrary, in presence of dissociative group members, human density make preference for vice alternatives increase.

In the second essay, I analyzed four years of behavioral data of the customers of a sporting center. The study aimed to test if different levels of similarity among the customers influence the effect of human density on repurchase behavior. Results confirmed that it is crucial to consider social factors in the analysis of such relationship. In detail, I demonstrate that in presence of similar customers, human density positively influences repurchase behavior. On the opposite, in presence of dissimilar customers, I observed an adverse effect of human density on repurchase behavior.

In the third essay, I investigated the effect of human density on calories intake. I considered two moderators that can influence such relationship. First, I hypothesized that perceived similarity with other consumers positively moderates the effect of human density on calories intake. Second, I inserted in the model also a personal factor, consumer self-construal, assuming that differences in perceived similarity influence only consumers with an interdependent self-construal. I tested these hypotheses in field and laboratory investigations. Both the studies suggested that, as hypothesized, as perceived similarity increases the effect of human density on calories intake increases. Also, while consumers with an interdependent self-construal, adapt their behavior to different levels of similarity, individuals with an independent self-construal show similar calories intake regardless of perceived similarity conditions.

This research contributes to the crowding literature by demonstrating that it is necessary to consider social factors in the analysis of the effects of human density. In all the proposed studies, the emerged pattern suggests that the composition of the

crowd, considering social group identity or similarity, leads to different effects of human density on cognitive and behavioral reactions. This research may help to settle the disagrement in the literature on crowding concerning the consequences related to human density (Mehta et al., 2013), by demonstrating the crucial roles of social factors.

# ESSAY 1

## Stay in the virtue, go in the vice: social groups moderate the effects of human density on willingness to stay and vice-virtue choices

### 1.1 Introduction

Several researchers in the last forty years have studied how crowding perception can impact on affective, cognitive, and behavioral reactions of consumers (Lam, 2001). Despite such an effort, there is still disagreement in the literature regarding the effects of perceived crowding and human density on consumers' reactions and the question whether the shopping outcomes are negatively or positively affected by crowding-related perceptions is still open (Mehta et al., 2013). Earlier research on this topic underlined a negative relationship between human density and consumer satisfaction (Langer and Saegert, 1977). In contrast, Pons et al. (2006) demonstrated that when consumption has a hedonistic value (e.g., when it is not directly task-oriented), the relationship could be positive. Recent works have tried to delve into this contrast and proposed a U-shaped relationship between the number of people in a certain place and consumer satisfaction (Pan and Siemens, 2011).

In order to reconcile these conflicting results in the literature, it is important to recall the definition of crowding provided by Stokols (1972). While crowding refers to a perception, which emerges when there is a disparity between the demanded and available space, human density refers to the objective number of people in a certain place in a certain time. According to the author, the density is a necessary but not sufficient condition for the crowding perception. In detail, crowding perception varies regarding three main variables: density, personal factors, and social factors. Ignoring

personal factors (e.g., specific individual's personality traits) and social factors (e.g., the relationship with the other customers in the crowd), we are not able to completely understand why the same objective level of density can produce negative or positive effects on consumers' outcomes. Previous research considered a series of possible personality traits able to moderate the relationship between density and customers' reactions, such as tolerance to crowding (Eroglu et al., 2005) and need for control (Van Rompay et al., 2008). Instead, social factors were almost ignored in previous theorizations, with only a few contributions on the possible role of the social-identification with the crowd (Schultz-Gambard, 1979; Novelli et al., 2013).

This research aims to understand the role of social factors, providing evidence on how the nature of people in the crowd is able to moderate the relationship between human density and consumers' attitude and choices. In summary, we should consider not only how many customers compose the crowd, but also how they relate with consumer's identity. More in detail, using an experimental study, I demonstrate that the relationship between density and intention to stay in a store is positive in the presence of in-group and aspirational group members, while it is negative when the crowd is composed of dissociative out-group members. Moreover, I demonstrate that high level of aspirational group members density leads to choose more virtue products, while an increase in the number of dissociative group members is associated with the selection of more vice alternatives. This research contributes to crowding literature demonstrating that social factors are a relevant variable in the relationship between human density and consumers' outcomes. From the results of the experimental study it is possible to obtain a series of managerial implications regarding the dimension of

stores targeted to specific market cluster and advantages to provide a virtue-based offer.

## 1.2 Theoretical background.

### *1.2.1 Effects of density*

The concept of density concerns two separate aspects: spatial density and human density (Harrell et al., 1980). Spatial density refers to the dimension of the physical space (e.g., in square meters) and the amount of objects present. Instead, human density relates to the number of people present in a certain place at a particular time. This basic premise is necessary because if the aim is to isolate the effects of the human density, any analysis should keep spatial density constant. Early contributions in crowding literature demonstrated a negative effect of human density on consumer experience. When human density is high, consumers tend to make less optimal choices (regarding the selection of most convenient products), show lower store evaluation, comfort, capability to find the desired product and to choose between alternatives (Langer and Saegert, 1977). Human density generates feelings of closure and restricted movements, implying for the consumer a deviation from the original shopping plan and then a worse overall evaluation of the experience (Harrell et al., 1980). An increase in human density reduces the perceived control of the situation and increase perceived risk associated with the purchases, causing, then, lower satisfaction (Hui and Bateson, 1991; Eroglu and Machleit, 1990). Moreover, density is positively correlated with negative (anger, disgust, contempt, shyness, guilt, sadness, fear) and neutral emotions (surprise), and negatively correlated with positive emotions (pleasure). Such emotions

partially mediate the relationship between density and satisfaction (Machleit et al., 2000).

Despite this evidence, it could be too simplistic to affirm with certainty that the presence of other people generates only negative outcomes. For examples, Holt (1995) emphasizes that one of the elements that can generate value for the consumer is the sense of communion with others during sports events. According to this view, Pons et al. (2006) demonstrated that in leisure situations, it exists a positive relationship between human density and satisfaction. By definition, crowding feeling emerges when there is a discrepancy between the available space and desired space (Stokols, 1972). Then, if a particular situation does not directly involve the desire of personal space, we observe a lack of connection between human density and negative outcomes. On the contrary, we can observe contexts in which the lack of personal space is considered an added value to the overall experience (e.g., sports, bar, disco, rock concert, markets). More generally, the demand for personal space is not infinite, and then the mere presence of other customers does not necessarily involve negative feelings.

According to the concept of optimal social stimulation (Altman, 1975), individuals maximize their satisfaction in the presence of a certain number of other people. Altman (1975) argues that both low and high levels of social stimulation generate discomfort because individuals face a situation with isolation and too little privacy, respectively. Based on these observations, several authors propose the presence of a U-shaped relationship between human density and satisfaction. Pan and Siemens (2011) demonstrate through a controlled laboratory experiment that consumers are more willing to enter and to explore a retailer store in the average-

crowded condition. Moreover, the authors find that attitude and willingness to purchase decrease only in a high-density condition. Similar results were also shown by Mehta et al. (2013), who demonstrate, through a field study, that an average level of human density is the one associated with the higher level of willing to patronage. Empirical evidence suggest the presence of a U-shape relationship between human density and positive emotions and a U relationship with the negative emotions, which contribute to explain why the average level is preferable (Uhrich and Luck, 2012; Mehta et al., 2013).

Moreover, a medium level of density is associated with the minimization of self-awareness (Uhrich and Tombs, 2014). Public self-awareness is a state in which one individual focuses mainly on the impressions s/he makes on others, causing emotional discomfort and inhibition (Buss, 1980). This state emerges in the presence of few other consumers, but also in high-density conditions in which the situation provide anonymity and sense of de-individuation (Diener, 1980). Obviously, specific contextual factors can cause a right or left shift of the optimal point in the U-shape relationship between human density and consumers' outcomes (Uhrich, 2011). For example, in stores that offer services, there is not the perceived scarcity of stocks, and then there is a higher tolerance to density (Pons and Siemens, 2011). Similarly, a crowded outlet discount can communicate a good quality/price ratio and then lead to a positive overall evaluation (Machleit et al. 2000). On the opposite, in situations in which the social interaction with other customers has no value (e.g., a bank) the preference would be shifted to the lower level of density (Hui and Bateson, 1991).

Also, specific time pressure situations could lead to a lower tolerance to higher levels of human density (Eroglu and Machleit, 1990; Pan and Siemens, 2011).

Similarly, task-oriented consumers tend to perceive higher crowding feelings at parity of human density (Eroglu and Machleit, 1990). Finally, a possible moderation role can be played by the expectations regarding the level of crowding that will be faced during the shopping experience. In general, consumers' satisfaction is influenced by the confirmation/disconfirmation of the previous expectations (Oliver, 1993). In retail settings, the expectation of a certain level of human density level can influence evaluations. More in detail, when consumers confirm their expectation or face a positive disconfirmation (the actual level of density is lower than expected), there is a positive effect on satisfaction. Differently, if the expectation is negatively disconfirmed (the actual level of density is higher than expected), there is a negative effect on satisfaction (Machleit et al., 1994; Machleit et al. 2000).

### *1.2.2 Personal factors*

The second series of elements that should be considered consists of all the personal and dispositional factors that can influence the relationship between density and consumers' outcomes. First of all, individuals can have a lower or higher innate tolerance for crowding. Some consumers tend to enjoy and seek crowded stores, while others prefer to chronically avoid the crowd (Machleit et al. 2000). In fact, as subjects react in different ways to emotional arousal and uncertainty (Krohne et al., 1992), consumers are more or less able to adapt their behavior in high-density situations. Then, high tolerant subjects have a lower probability to manifest the negative perceived crowding feelings. On the opposite, a low level of tolerance causes intransigence to crowded situations. For consumers low in tolerance, increases in human density are negatively correlated with hedonic and utilitarian shopping value

(Eroglu et al., 2005). Similar consequences are observed on individuals with a low *vs*. high desire for control (Van Rompay et al., 2008). People with a higher desire for control are more influenced by the presence of others and tend to react with negative emotions to the perceived inability to control events (Burger and Cooper, 1979). For example, people who score high in this personality trait tend to demonstrate more discomfort when they have to coordinate the movements with others (Burger et al. 1983). Human density implies restricted movements and adaptation of in-store plans (Harrell et al., 1980). Then, the inability to full control events will generate higher negative feelings for subjects with a higher need for control. The role of this personality trait was empirically tested by Van Rompay et al. (2008), who demonstrate that the negative relationship between human density and satisfaction emerges only for subjects with high need for control. According to this view, the optimal stimulation level (Altman, 1975) and the optimal number of other customers should be considered more as a specific personality trait than a context-specific element (Mehta et al., 2013). In fact, people differ regarding the amount of arousal-seeking disposition, and we can observe subjects with a higher optimal stimulation level who prefer environment rich in stimuli and variety (Grossbart et al., 1975). Mehta et al. (2013) demonstrate in a field study a U-shaped relationship between perceived crowding and pleasure, arousal, store evaluation, and merchandise evaluation for individuals with a high level of optimal social stimulation. Reverse, the relationship with these constructs is mostly negative for subjects with a low level of optimal social stimulation.

Finally, consumers' reactions can vary with the chronicle need for affiliation of individuals (Rompay et al. 2012), which involve seeking and enjoying human interaction with other people (Hill, 1987). Individuals with a high need for affiliation

tend to do not be negatively influenced by high-density contexts, and, on the contrary, the desire to convey a desired image can boost purchases and spending in high-density situations (Rompay et al. 2012).

### *1.2.3 Social factors*

The final elements to consider are social factors, which concern the relationship with the other customers in the crowd. The influence of these factors is based on the concept that the interaction with other customers can be rewarding or not rewarding (Rompay et al. 2012). According to self-categorization theory (Turner et al., 1987; Turner et al. 1994), individuals have a series of social identities which diverge in salience based on the context. For some specific social groups, we can desire psychological proximity, while for others to which we want to be dissociated we desire distance. When the wish for psychological proximity is coherent with the physical closeness with others, the experience can turn out to be enjoyable. On the contrary, if we consider our identity distant from the one of the others, the physical proximity can lead to adverse outcomes (Novelli et al. 2012). In the consumer behavior literature, it is possible to individuate three main categories of social groups (Escalas and Bettman, 2003; Escalas and Bettman, 2005; White and Dahl, 2007). In-groups are defined as the social groups which we belong and are a part of. Aspirational groups are defined as the social groups which we do not belong but we desire to do be affiliated with. Dissociative groups are defined as the social groups which we do not belong and do not desire to be affiliated with. In-groups and aspirational groups share a positive valence, while dissociative and aspirational groups represent two different forms of out-groups.

Several studies suggest that consumers' social groups can have a strong impact on the evaluations and choices. For example, the brands used by other in-group and aspirational group members influence the strength of the individual self-brand connections, for accomplishing self-verification and self-enhancement goals, respectively (Escalas and Bettman, 2003). Converse, products associated with a dissociative group have a negative impact on self-brand connections (White and Dahl, 2007). Until now, the impact of self-identification with other people in the crowd had received little attention. For example, Schultz-Gambard (1979) observed that an increase in the number of in-group members is experienced positively and do not lead to adverse outcomes, such as anxiety and insecurity, usually observed in crowded conditions. Moreover, Novelli et al. (2012) demonstrated that sharing a common identity with other participants to outdoor events (music concert and marathon) has a negative effect on the crowding perception, leading, then, to a more enjoyable evaluation. On the opposite, Glish et al. (1988) observed that proximity to a dissociative out-group member, generate higher anxiety compared to an in-group member.

### *1.2.4 Intention to stay and human density*

Willingness to stay is considered one the most critical and important variable in retailing since it is able to capture consumers' intentions and satisfaction (Hedrick et al., 2005). The desire to stay is considered an approach and positive behavior, while the desire to do not stay is viewed as an avoidance one (Mehrabian and Russell, 1974). In crowding literature, Pan and Siemens (2011) demonstrated that consumers desire to stay in the store and browse in presence of an average level of crowding. Actually,

none of the previous research considered the interaction of human density with social factors on the willingness to stay in the store. It is possible to extend the concept of social-identification, hypothesizing different effects of human density depending on the social groups of other customers. Specifically, in presence of in-group and aspirational group members, human density can have a positive effect respectively due to accomplishing self-verification and self-enhancement goals. Individuals who fail to fulfill self-verification goals face dissatisfaction, discomfort, distress (Burke, 1991), and a reduction of self-esteem (Cast and Burke, 2002). Similarly, failure in self-enhancement goals leads to anxiety and lower self-esteem (Marcussen, 2006). A higher density of members of in-group and aspirational group can act as a proxy of satisfying the two goals, and then to higher satisfaction in the crowded context. On the opposite, in the presence of dissociative group members, human density can have a negative effect due to the higher demand for personal space and to the desire to avoid associations with the other customers, which threatens the self-verification goal. Finally, when we exclude the effect of social-identification, the average level of human density should be preferred due preference for an optimal social stimulation level. On the basis of these arguments, it is possible to formulate a series of hypothesis regarding the relationship between human density and intention to stay in the store. Formally:

H1: *The effect of human density on willingness to stay is moderated by the type of social group to which other customers in the store belong to.*

*Specifically:*

*a) when the consumer is not involved on inferences regarding the social identity of the others in the crowd, the relationship between human density and willingness to stay in the store assumes a U-shaped form.*

*b) when the crowd is composed of in-group or aspirational group members, the relationship between human density and willingness to stay in the store is positive.*

*c) when the crowd is composed of dissociative group members, the relationship between human density and willingness to stay in the store is negative.*

### *1.2.5 Vice vs. Virtue choices and human density*

Besides the decision to stay and patronage a certain place, it is also relevant to analyze how human density can influence consumers' choices. In particular, considering the importance of eating habits on consumers' health, most recent marketing research focused on what elements can influence individual's food choices (Parker and Lehman, 2014). When we decide to reduce the calories intake, we tend to sacrifice a short-term benefit, like tastiness, in exchange for a long-term benefit, like healthiness. The vice-virtue definition provided by Wertenbroch (1998) well underlines this trade-off. A particular product X is defined a vice compared to Y, and Y is defined a virtue compared to X, if and only if, X leads to higher short-term benefits (immediate pleasure), and Y maximizes the long-term ones (delayed utility). This definition applies to all that choices in which a consumer has to compare an unhealthy, tastier option with a healthy, less tasty alternative. It is possible to individuate three possible drivers on these kinds of choices. According to the overload hypothesis, all

situational factors which increase the complexity of the environment, including high human density, decrease the ability of the consumer to process resources (Hock and Bagchi, 2017). A reduction of the available resources reduces the self-control capability, leading to a higher impulse purchase (Vohs and Faber, 2007) and calorie consumption (Hock and Bagchi, 2017). An increase in human density should obstacle the choice of virtue food and facilitate the consumption of vice items. According to the impression-management hypothesis, individuals tend to vary the consumption (e.g., the amount consumed) in relation to the desired impression that they want to convey to others (Herman et al. 2003). Then, if it is particularly relevant to communicate a positive self-image, in the presence of members of a specific social group (e.g., aspirational group), there is an incentive to choose virtue options. Finally, the emotional-states hypothesis suggests that the vice options are preferred in the presence of psychological distress situations (Macht, 2008; Kandiah et al., 2006). Previous research demonstrated that stressful conditions are associated with high cortisol reactivity and consumption of vice food (Epel et al., 2001). Moreover, subjects lower in self-esteem tend to easily conduct unhealthy eating behavior (Martyn-Nemeth et al., 2009). As argued before, failure in self-verification and self- enhancement goals can lead to psychological distress, stress, and lower self-esteem, leading then to vice food choices. Similarly, increased anxiety caused by the proximity to dissociative group members can cause comparable outcomes. In summary, when overload and negative emotional states are high, consumption should shift towards vice consumption. When impression-management motives are high, more virtues products should be preferred. Taken together, the influence of these three drivers can be different regarding the social groups which compose the crowd in low and high-density

situations. On average, in low and high-density scenarios we should observe respectively low and high impact of overload and impression-management factors. Then, when the emotional status have a more moderate incidence (e.g., in the presence of in-group members and when no inferences regarding identity are made), we should not observe differences in vice *vs*. virtue consumption increasing the density. For the aspirational group, in low density the self-enhancement goal is threatened, while a high-density condition can satisfy this need. Then, in a high-density scenario, the impression-management hypothesis should drive the consumption to virtue product. On the opposite, for the dissociative group, high overload and negative emotional states should maximize the vice consumption in high-density scenarios. Formally:

H2: *The effect of human density on vice vs. virtue choices is moderated by the type of social group to which other customers in the store belong to. Specifically:*

*a) when the crowd is composed of aspirational group members, the relationship between human density and virtue product consumption is positive.*

*b) when the crowd is composed of dissociative group members, the relationship between human density and virtue product consumption is negative.*

### 1.3 Study 1

Four hundred and ten UK participants ($M_{age}$ = 36.65, $SD_{age}$ = 9.26, Female = 67.9%) were recruited from Prolific Academic in exchange of a small compensation. Respondents were randomly assigned to one condition of a 3 (human density: low *vs*. medium *vs*. high) x 4 (group: in-group *vs*. dissociative *vs*. aspirational *vs*. control) between-subjects design. After a brief definition of the concept of social groups and few examples, participants indicated their personal and most relevant in-group/dissociative group/aspirational group and provided its description. Participants in the control condition were not involved in this first task. Human density was manipulated designing a café by means of the software ArchiCAD 19 (Figure 1.1), in order to be able to use stimuli that were perfectly equal, but for the number of customers. In the low, medium, and high-density conditions were present 3, 9, and 27 customers, respectively. After the indication of the social group, participants were exposed for a fixed amount of time (15 seconds) to the café, with the indication that other customers were members of the chosen group. After the exposition to the image, respondents were invited to guess how many customers there were in the café. Then, they indicated their willingness to stay in the café ("I would like to enter in and stay for the evening in this café"). Next, they participated in the vice-virtue task, in which respondents had to choose between a tastier, less healthy *vs*. less tasty, healthier alternative for five pairs of products. To arrange the five pairs, I conducted a pre-test study with a different set of participants. 78 undergraduate students ($M_{age}$ = 19.55, $SD_{age}$ = 1.43, Female = 42.3%) at a Dutch university participated in the pre-test in exchange of partial course credits. They evaluated 21 products typically offered in a café regarding tastiness (1 = Not at all tasty, 7 = Very tasty), healthiness (1 = Very

unhealthy, 7 = Very healthy), and association with impulse/deliberate choices (0 = Impulsive purchase, 10 = Deliberate purchase). The products were coupled to present a tastier and impulse-related product versus a healthier and deliberate-related alternative. The five couples used in Study 1 are: hot chocolate *vs*. herb tea, pizza slice *vs*. Greek salad, chocolate cake *vs*. frozen yogurt, beef burger *vs*. turkey sandwich, chocolate bar *vs*. muesli bar. After that task, five personality traits scales have been administered: need for affiliation (Hill, 1987), self-monitoring (Lennox and Wolfe, 1984), need for uniqueness (Tian et al., 2001), dietary self-constraints (Van Strien et al., 1986), and tolerance for crowding (Machleit et al., 2000). In the final part of the survey, participants indicated, as manipulation check, how much they like the chosen social group (1 = Strongly dislike, 9 = Strongly like). Participants in the control condition indicated if they considered the other customers in the café similar or dissimilar from them (1 = Very different from me, 9 = Very similar to me). Finally, they reported if they have any dietary constraints (e.g., vegetarian, vegan, gluten intolerant, etc.) and socio-demographic information.

**Figure 1.1 3D Rendering of the café in the high-density condition**

*Manipulation check*. A one-way ANOVA confirmed the success of the manipulation of the social groups ($M_{in}$ = 7.67, $M_{diss}$ = 2.88, $M_{asp}$ = 7.46, $F_{2,286}$ = 215.72, $p < .001$). Participants indicated that they like more the chosen in-group *vs*. the dissociative group ($t(155) = 16.98$, $p < .001$) and aspirational group *vs*. the dissociative group ($t(159) = 16.05$, $p < .000$), but the means of the two positive groups did not differ statistically ($t(189) = 1.00$, $p = .318$). Also, respondents in the control condition did not associate the other customers in the café neither similar nor dissimilar to them (test value = 5, $t_{100}$ = 0.866, $p$ = 0.388). Mahalanobis distance was used to check the presence of potential outliers and indicated that all the scores are well below the threshold value (max score = 3.47).

*Willingness to Stay (WtS)*. To test if the type of social group moderates the relationship between human density and willingness to stay (H1a, H1b, H1c), I conducted a two-way ANOVA. Results indicate a significant main effect of human

density ($F(2,398) = 6.915$, $p = .001$) and group ($F(3,398) = 10.01$, $p < .001$). More interesting, also the interaction effect between the two variables is statistically different from zero ($F(6,398) = 2.725$, $p = .013$). Means and standard deviations are reported in Table 1.1.

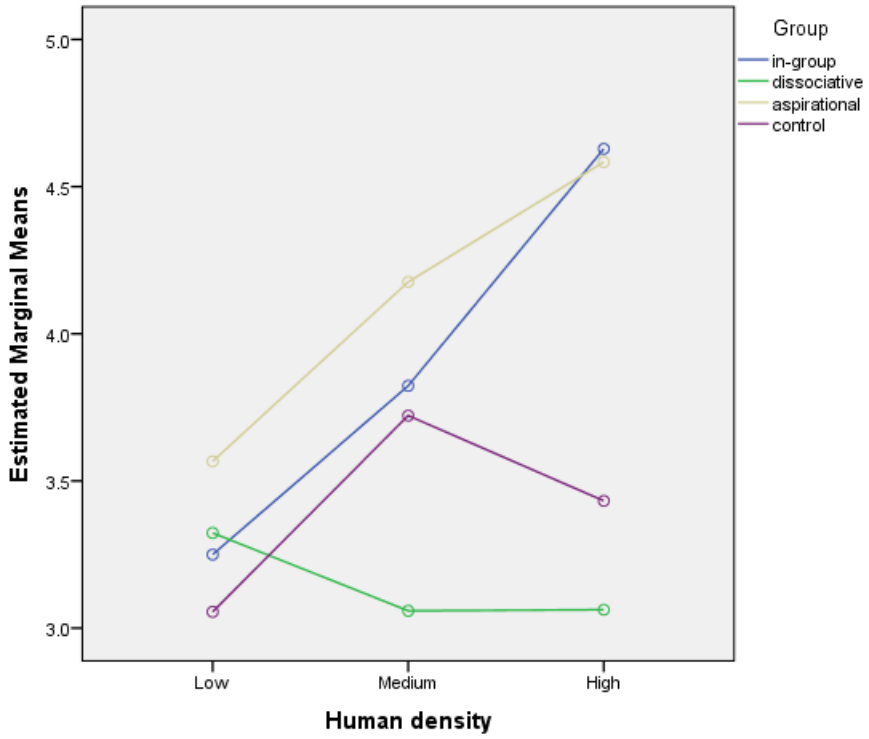
**Table 1.1 Means and standard deviations of willingness to stay in the experimental conditions.**

| Group | Human Density | | |
|---|---|---|---|
| | Low | Medium | High |
| in-group | 3.25 | 3.82 | 4.63 |
| | (1.344) | (1.381) | (1.308) |
| dissociative | 3.32 | 3.06 | 3.06 |
| | (1.224) | (1.413) | (1.544) |
| aspirational | 3.57 | 4.18 | 4.58 |
| | (1.382) | (1.527) | (1.251) |
| control | 3.06 | 3.72 | 3.43 |
| | (1.241) | (1.493) | (1.586) |

Simple-effects analysis reveal that for the control group (no inference regarding identity), in the low-density condition WtS was lower than in the medium-density condition ($t(398) = -2.019$, $p = .044$). Despite this, the medium-density condition did not significantly differ from the high-density condition ($t(398) = .883$, $p = .378$). Then, since the proposed U-shaped relationship is not observable, H1a is rejected. When the crowd was composed of in-group members, higher level of density led to a higher WtS ($t(398) = 4.023$, $p < .001$). We can observe the same positive relationship for the aspirational group ($t(398) = 2.936$, $p = .004$). The results confirm that in presence of positive group members the relationship between human density and WtS is positive and then H1b is confirmed. Finally, for the dissociative group, we can observe a slight

decrease of the WtS with the increase of human density. Despite this, the mean difference was not different from zero ($t(398) = .756$, $p = .45$) and then H1c is rejected.

**Figure 1.2 Estimated marginal means of Willingness to Stay**




*Vice-Virtue*. To test if the relationship between human density and vice-virtue choices is moderated by the type of social group (H2a, H2b), I conducted a two-way ANOVA. For this analysis, 22 participants who indicated to have dietary restrictions (e.g., vegetarian, vegan, gluten intolerant) were excluded, since their choice would be strongly influenced by personal factors rather than the manipulations. Thus, the final sample includes 388 individuals. As dependent variable, I used the sum of the virtue products (coded as 1) chosen by each participant ($M_{virtue} = 1.46$, $SD_{virtue} = 1.31$). Results of the ANOVA indicate that the main effects of human density ($F(2,376) = 1.39$, $p = .25$) and group ($F(3,376) = 1.096$, $p = .351$) were not significant. However,

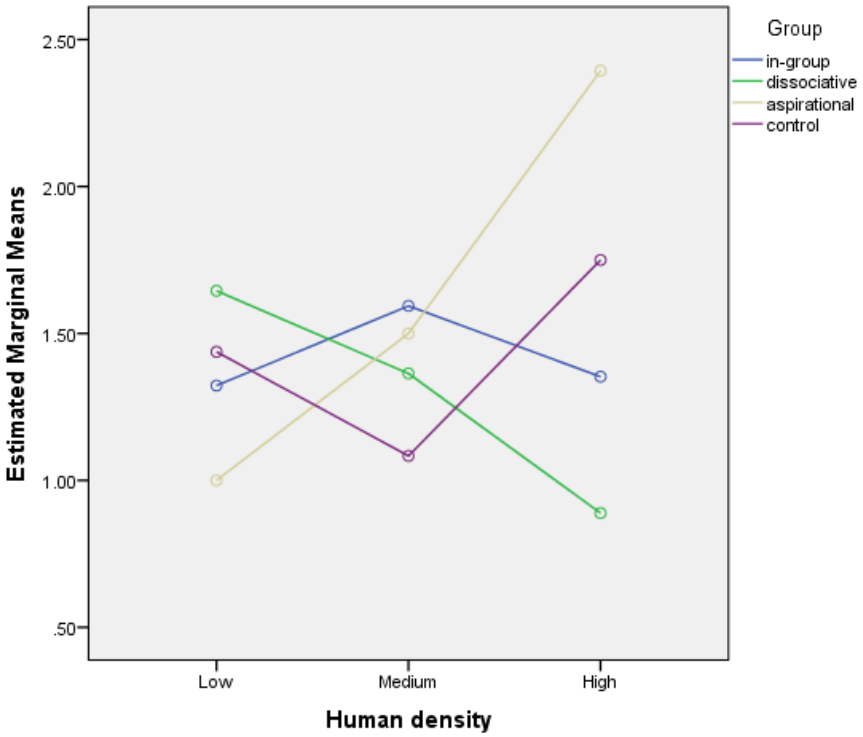
the interaction density × group was significant ($F(6,376) = 4.459$, $p < .001$). Means and standard deviations are reported in Table 1.2.

**Table 1.2 Means and standard deviations of virtue choices in the experimental conditions.**

| Group | Human Density | | |
|---|---|---|---|
| | Low | Medium | High |
| in-group | 1.32 | 1.59 | 1.35 |
| | (1.323) | (1.073) | (1.475) |
| dissociative | 1.65 | 1.36 | 0.89 |
| | (1.226) | (1.295) | (1.121) |
| aspirational | 1.00 | 1.50 | 2.39 |
| | (1.00) | (1.308) | (1.78) |
| control | 1.44 | 1.08 | 1.75 |
| | (1.318) | (0.906) | (1.18) |

Simple-effects analysis reveal that for the aspirational group, an increase in human density led to choose a higher number of virtue products ($t(376) = 4.302$, $p < .001$), confirming the positive relationship hypothesized in H2a. Instead, in presence of a dissociative group members, higher human density led to decrease the choice of virtue alternatives ($t(376) = 2.256$, $p = .025$), confirming, than, H2b. For in-group and control conditions, human density did not affect vice-virtue choice ($ps > .31$). Additionally, we can observe that in the high-density condition, participants choose more healthy products in presence of aspirational members than of dissociative ones ($t(376) = 4.556$, $p < .001$) or control condition ($t(376) = 2.099$, $p = .037$). Also the difference between dissociative and control condition was statistically significant ($t(376) = -2.656$, $p = .008$).

**Figure 1.3 Estimated marginal means of Virtue products choice**




Results of Study 1 confirm that the type of social group is a relevant moderator in the relationship between human density and consumers' willingness to stay in stay in the store. Two of the research hypothesis are not supported since we observe a non-significant effect of human density when no inference regarding the identity of the customers is made (H1a) and in presence of dissociative group members (H1c). However, findings support the idea that in presence of positive social group members (H1b), human density can generate positive outcomes. As argued before, the inclusion of social factors in crowding research allows to better understand consumers' reactions and results demonstrate that, varying the nature of the crowd, reactions to human density are different.

The analysis of consumers' vice *vs.* virtue choices confirmed this idea, demonstrating that the effects of human density can be diametrically opposite depending on the presence of aspirational (H2a) and dissociative group members (H2b). A summary of the results is reported in Table 1.3.

**Table 1.3 Summary of the results of Study 1**

| Dependent variable | Group | Hypothesis | Result |
|---|---|---|---|
| Willingness to Stay | no inference (control) | H1a<br>∩ | Rejected |
| | in-group and aspirational | H1b<br>+ | Accepted |
| | dissociative | H1c<br>- | Rejected |
| Vice *vs*. Virtue | aspirational | H2a<br>+ | Accepted |
| | dissociative | H2b<br>- | Accepted |

## 1.4 General discussion

This research aims to establish if particular social factors, such as the type of group who compose the crowd, are able to moderate the relationship between human density and consumers' willingness to stay and vice *vs*. virtue choices. Considering the state of the art, there is disagreement in literature regarding the effect of human density on consumers' outcome (Mehta et al., 2013). Coherently with the definition of crowding perception (Stokols, 1972), human density can be considered only a necessary but not sufficient condition for the manifestation of the negative effects on consumers' reactions. Despite previous research focalized the attention to individuals' personal factors able to moderate the effect of human density (Machleit et al. 2000, Van Rompay et al., 2008, Van Rompay et al., 2012; Mehta et al., 2013), social factors received little or null attention (Novelli et al., 2012). This research aims to fill this gap

in the literature, demonstrating that the study of the effects of human density has to consider also the relationship of the consumers with the other people in the crowd. Results on the consumers' willingness to stay in the store show that the impact of human density is significant (and positive) only in presence of a positive social group members. Moreover, the analysis on the vice *vs*. virtue choices revealed a positive and negative effect of human density, in presence of aspirational and dissociative group members, respectively.

This research suffers from some limitations. First, I considered only one context, a café, typically associated with leisure situations. It is not possible to exclude that changing the type of store we would observe a lower tendency to tolerate the crowd. Despite this, it is possible to hypothesize that in low leisure situations (e.g., shopping in a supermarket) will just decrease the positive effects of the in-group and aspirational group members and increase the adverse reaction to the dissociative group. Furthermore, the present research proposes only a theoretical explanation on the reason why human density should affect the vice *vs*. virtue choices in presence of different type of social groups. The three drivers individuated in the literature are the overload factor (Hock and Bagchi, 2017), the impression-management relevance (Herman et al. 2003), and the emotional-states hypothesis (Macht, 2008).

From this research, it is possible to identify some managerial implications. In our societies, spaces have economic value (O'Guinn et al., 2015). According to the prior research on crowding (Langer and Saegert, 1977; Harrell et al., 1980; Hui and Bateson, 1991; Eroglu and Machleit, 1990), human density has a negative influence on consumer satisfaction. Then, to avoid this negative consequence, we should design stores aiming to obtain a ratio square meters/person as high as possible. The present

research demonstrates that there are cases in which more elevated levels of density do not destroy consumers' value, but, contrarily, can lead to more positive outcomes. Then, stores that are positioned to serve specific market clusters can create consumers' value choosing a lower dimension of the space of the store. Moreover, stores positioned to serve some consumers' aspirations (e.g., luxury retailers, high-end café, etc.) should offer a wider range of healthy alternatives, since consumers' demand can be oriented through these products.

In conclusion, human density is a ubiquitous factor in all the market contexts, and this study suggests to researchers and practitioners that the analysis of its relationship with consumers' outcomes cannot exclude the relevance of social factors.

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## Appendix

1. Human density manipulation stimuli

2. Vice *vs*. Virtue products

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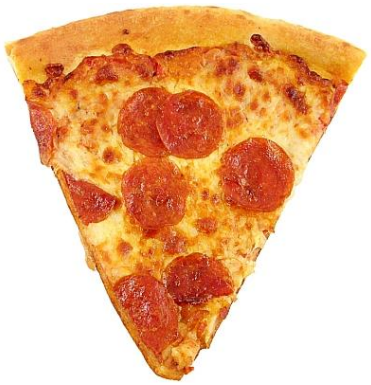
|  |  |
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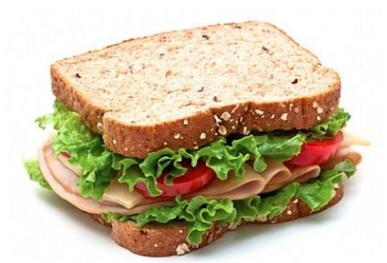
|  |  |

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# ESSAY 2

## Human density and repurchase behavior: the moderating role of similarity with other customers

### 2.1 Introduction

This second essay aims to investigate the relationship between human density and consumer loyalty. Prior research on crowding perception disagrees on whether human density produces negative or positive effects on main consumer outcomes, such as satisfaction (Mehta, Sharma, and Swami, 2013). While early research on the topic proposed an adverse effect of human density on satisfaction (e.g., Langer and Saegert, 1977), other scholar underlined that in specific contexts (e.g., discotheques, sport events, etc.) consumers appreciate the presence of other customers (Pons et al., 2006). Stokols (1972) defined crowding perception as the negative status which emerges when space demanded exceeds that available. Stokols (1972) underlined that the mere consideration of human density (*the objective number of people in a certain period*) may be not sufficient to fully understand consumer reactions to crowding. In the present theorization, I include in the analysis a specific social factor, the similarity with other customers in the crowd. Similarity-attraction theory (Byrne, 1971) and Social identity theory (Tajfel, 1972) suggest that closeness with similar customers can be more enjoyable and lead to higher satisfaction. Based on these elements, I predict a positive effect of human density on loyalty when the crowd is composed of similar consumers.

This hypothesis is tested by means of an analysis of four years of secondary data on the repurchase behaviors of customers of a sporting center. Results confirm that

when similarity with other customers (regarding expertise in the service) is sufficiently high, human density is positively correlated with repurchase behavior. On the contrary, when consumers face dissimilarity with other customers, the effect of human density on repurchase is negative.

This research contributes to the literature on crowding by investigating the role of social factors and demonstrating their relevance in the analysis of human density. From the results of this study, it is possible to derive a series of managerial implications and to gain insight on how to create customer value from high-density situations on specific market segments.

## 2.2 Theoretical background

Stokols (1972) defines crowding perception as the negative feeling which emerges in presence of a discrepancy between the demanded and available space. According to the author, the mere consideration of the human density (the objective number of people in a certain place) provides only limited indications on the effects on consumer behavior. In fact, it is necessary to consider also personal factors (individual's personality traits), and social factors (the relationship with the other customers in the crowd). During the last decades, several researchers investigated the relationship between human density and various consumers outcomes, such as choices (Langer and Saegert, 1977), perceived control (Hui and Bateson, 1991), shopping value (Eroglu, Machleit, and Barr, 2005), attitude (Pan and Siemens, 2011), willingness to spend (Van Rompay et al., 2012), elicited emotions (Uhrich, 2011), and calories consumption (Hoch and Bagchi, 2017). However, the consumer behavior literature lacks investigations on the effect of human density on repurchase behavior

to the store. Previous research has instead investigated the relationship between density and satisfaction, the latter being considered a primary antecedent of loyalty (Hallowell, 1996).

*Effects of density*. In one of the early researches on the topic, Langer and Saegert (1977) monitored the number of people in a grocery store in different times of the day and interviewed the participants to understand the effects on their behaviors and attitudes. The results of a field study showed that human density was negatively correlated with consumer satisfaction and perceived comfort. In addition, the authors observed that when the store was crowded, consumers were less able to perform optimal choices and purchase all the products on their list, reporting a higher perceived difficulty in evaluating alternatives. Similar results were obtained by Harrell and colleagues (1980), who performed a field study in a grocery store. In this case, human density resulted to be negatively correlated with the satisfaction toward the store and with the general judgment of time spent during the shopping. High human density forced consumers to adapt their shopping plan, leading to a sense of closure and movements restriction. The negative influence of human density on satisfaction would then imply that the preferred scenario for a consumer would be a store in which he is the only customer. Other scholars state that it is not possible to consider the demand of personal space as infinite and that the relationship between density and satisfaction cannot be considered as purely negative. First, the Optimal social stimulation theory (Altman, 1975) underlines that individuals perceive discomfort when the number of people around is too limited, because of the emerging sense of isolation. A high level of social stimulation is not considered optimal as well, because the consumer is

exposed to a reduction of his privacy. Thus, satisfaction is maximized in presence of a certain number of other customers. The laboratory experiments conducted by Pan and Siemens (2011) demonstrated that is more appropriate to consider a reverse U-shaped relationship between human density and satisfaction. In fact, the authors proved that consumers are more willing to enter and to explore a retailer store in the average-crowded condition. Other empirical evidence confirmed the intuition of Altman (1975), suggesting the existence of a reverse U-shape relationship between human density and positive emotions, and of a U-shaped relationship between human density and negative emotions (Uhrich and Luck, 2012). These results contributed to explain why the average level of human density is preferable compared to low and high levels.

A second element to consider is that in many consumption situations the presence of other individuals is a core part of the experience. For example, Holt (1995) reported that during sports events the feeling of communion with other attendees is one of the elements that generates value for the consumer. In these kinds of situations, the demand for personal space is more limited, and then the effect of human density on satisfaction can be positive (Pons et al., 2006). In situations such as sports events, concerts, dancing at discotheques, etc., the lack of personal space characterizes the type of consumption, and lower levels of human density are correlated with a lower level of satisfaction. The research of Pons and colleagues (2006) tested this hypothesis with a laboratory experiment, in which human density was manipulated within a leisure situation (a disco club). As expected, participants reported being more satisfied with the presence of the highest level of other customers.

Finally, human density can affect satisfaction positively due to heuristics employed by consumers to address general quality, or quality/price ratio, of the store.

If we imagine entering in a grocery store in which there is a limited number of other customers, we may infer that the absence of other individuals is due to low store quality. On the contrary, higher levels of human density communicate that other customers have chosen the store, signaling good levels of quality. These considerations are particularly salient for stores for which the quality/price ratio is relevant. Thus, in outlets and discounts, human density can be positively correlated to satisfaction due to the social confirmation of the worth of the chosen store (Machleit, Kellaris, and Eroglu, 1994; Machleit, Eroglu, and Mantel, 2000).

*Situational and personal factors*. Several scholars have tried to individuate the specific contexts in which human density affects consumer satisfaction negatively, assuming that the presence of other customers does not produce systematically negative effects. Eroglu and Machleit (1990) proposed that task-oriented consumers are less satisfied with the shopping experience in crowded conditions. Thus, crowding is related to negative outcomes because it interferes with shopping motives. In situations in which the consumer is exploring the store or in leisure situations (e.g., in a bar), it is observed a higher tolerance to human density (Hui and Bateson, 1991). Also, time pressure leads consumers to lower tolerance to human density due to the increased difficulty in goal achievement (Eroglu and Machleit, 1990; Pan and Siemens, 2011).

Moreover, consumer personality traits determine preferences for higher or lower levels of human density. For example, consumers with elevated need for control can perceive as uncomfortable the presence of a high number of other individuals. Van Rompay et al. (2008) argue that consumers with chronic desire for control show

adverse emotional reactions because originally planned shopping trips become dependent on the behavior of other individuals. Thus, conditions of low human density result in a feeling of control over the events, leading to higher satisfaction. On the other side, consumers with a high need for affiliation tolerate situations of elevated human density because the possible negative effects of crowding are compensated by the accomplishment of social needs (Van Rompay et al., 2012). As a mix of these elements, individuals can have a lower or higher innate tolerance to human density due to different reactions to emotional arousal and uncertainty (Krohne et al., 1992; Machleit et al. 2000). Highly tolerant subjects have a lower probability to manifest negative feelings due to perceived crowding. Differently, a low level of tolerance causes intransigence to crowded situations. For consumers low in tolerance, increases in human density are negatively correlated with hedonic and utilitarian shopping value (Eroglu et al., 2005).

*Social factors*. The relationship between density and satisfaction can also be moderated by social factors, such as the relationship with the other customers in the crowd (Novelli et al., 2013). Prior research demonstrated that the delimitation of consumer comfort zone depends on the nature of fellow individuals. Physical proximity with individuals who are considered similar to one own identity does not lead to adverse outcomes (Schultz-Gambard, 1979). Instead, psychical proximity generates anxiety if others are considered members of a dissociative out-group (Glish et al., 1988). At the current state-of-art, the crowding literature offers little contributions on the effects of social factors, despite their crucial role in influencing the demand of personal space. In the next section, I will describe in more detail the

concept of similarity with other customers in the crowd and its potential interaction with human density.

### *2.2.2 Similarity literature*

In group or dyadic relationships, similarity refers to sharing a certain amount of personality attributes or sociodemographic characteristics with other individuals (Smith, 1998). Similarity in terms of sociodemographic elements refers to objective characteristics such as sex, age, race, and level of education (Tsui and O'Reilly, 1989). The combination of age, marital status, and family situation refers to similarity in life stage, which concerns a common advance in human experience (Smith, 1998). Other forms of similarity considers cultural and personality traits, such as culture (ethnic background), work attitude (beliefs related to work life), and personality (specific intellectual, emotional, and psychological traits; Smith, 1998).

Similarity-attraction theory (Byrne, 1971) states that individuals are more attracted by others who share similar personal characteristics. In particular, subjects tend to rank these characteristics in terms of personal importance and to be attracted by people possessing relevant attributes. For example, similar attitudes toward ideologies or lifestyles will generate more attraction than similar attitudes toward a shampoo or a conditioner. Berscheid and Walster (1969) and Byrne (1971) have individuated a series of reasons for the similarity-attraction mechanism.

- The presence of another person who shares a similar characteristic communicates to the individual a sense of social inclusion, thus maximizing the belief that it is correct to hold that specific characteristic or attitude.

- The behavior of similar individuals is considered more predictable than one of dissimilar people leading to a lower level of uncertainty of the relationship.
- People consider that is more probable to be liked from another person who shares similar attitude or characteristics. Then, the attraction is driven by the feeling that the individual, in turn, will generate attraction.

In another view, the similarity-attraction effect is caused by the desire to avoid dissimilarity (Rosenbaum, 1986). In some cases, the liking of similar individuals is generated by the negative attitude toward dissimilar subjects with a consequential attraction of the former. Similarity-attraction theory was used in marketing studies to demonstrate that individuals are more attracted and seek membership in groups having members with similar characteristics, thus obtaining more cooperation and satisfaction from the relationship (Homburg, Schneider, and Fassnacht, 2002).

Social identity theory (Tajfel, 1972) and self-categorization theory (Turner, 1982) also support the concept that individuals are attracted by similar subjects due to the need to strengthen self-esteem and self-identity. People tend to categorize themselves using a series of variables, such as age, gender, personality, and to create in-group and out-group classification of others (Turner, 1982). The process of social categorization acts as a cognitive instrument for the segmentation of the social environment, and allows individuals to evaluate alternative forms of social actions (Tajfel, 1972). The proximity and cooperation with similar individuals allow meeting self-verification and self-enhancement needs, determining greater relationship satisfaction (Tsui & O'Reilly, 1989).

*2.2.3 Human density and similarity.*

Similarity can influence the effect of human density on consumer reactions for two main reasons. First, Similarity-attraction theory (Byrne, 1971) and Social identity theory (Tajfel, 1972) underline that subjects perceive greater satisfaction when they interact with people who share similar attitudes or characteristics. Thus, a crowd composed of similar people can lead the consumer to consider the experience as more enjoyable. Second, crowding perception can be associated with high human density due to the increased difficulty in controlling the environment (Hui and Bateson, 1991). When the crowd is composed a by similar subjects, consumer perceive the action of the other customers as more predictable, because of the assumption that similar individuals will have similar behaviors (Berscheid and Elaine, 1969). Thus, the experience can be more satisfactory because the level of uncertainty of the environment is reduced.

Considering the increasing value of the relationship with other customers in the crowd, and the increased sense of control of the environment, it is possible to hypothesize that human density is positively related with consumer satisfaction, and therefore repurchase intention (Hallowell, 1996), when similar customers compose the crowd. Prior research underlined that individuals decrease the size of their comfort zone in presence of other in-group members (Schultz-Gambard, 1979), while they report increased discomfort in proximity of out-group individuals (Glish et al., 1988). Considering the concept of similarity in the analysis of the effect of human density on consumer behavior, it is possible to individuate situations in which human density leads to higher satisfaction and repurchase behavior. In detail, when the crowd is composed of similar customers, human density affects positively repurchase behavior,

due to the positive experience associated with the proximity with others. On the contrary, when the crowd is composed of dissimilar customers, human density negatively affects repurchase behavior, because the proximity with others is associated woth discomfort and negative feelings. Formally:

*H1: The effect of human density on repurchase behavior is moderated by similarity with other customers. Specifically:*

*a) When the crowd is composed of similar customers, the effect of human density on repurchase behavior is positive.*

*b) When the crowd is composed of dissimilar customers, the effect of human density on repurchase behavior is negative.*

**2.3 Empirical study**

To test the research hypothesis, I analyzed four years of behavioral data, from 2010 to 2013, of a sporting center located in Italy. Data include a maximum of 12 quarterly periods per customer in which I could observe the customer decision to repurchase or not the service. I calculated human density and a similarity index (based on customer expertise) to test the proposed hypothesis.

*Service description*. The available data are related to a service of water aerobics. This service is ideal for the aims of this research for three reasons. First, it represents a leisure activity (the target is amateur users) but connoted with task-orientation (fitness and body care). This mixed nature of the service provides a scenario in which is more difficult to determinate apriori the effect of human density (Hui and Bateson, 1991). Second, the service was always provided in the same

location, keeping constant the number of square meters available to the customers and spatial density. Thus, it is possible to consider the effect of human density without the need for controlling the people/dimension ratio. Finally, the purchase procedure of this service is characterized by a single modality, with a three-month subscription. This means that all the customers use the service for the same amount of months and are exposed to various levels of human density with no variability regarding subscription duration. In detail, the sporting center offers subscriptions for three different quarters during the year:

- Quarter 1, January – February – March
- Quarter 2, April – May – June
- Quarter 3, October – November – December

In each period, the service was provided from Monday to Friday, in three sessions per day.

*Data description*. The original dataset provided by the company included 1312 subscriptions of 693 customers to the water aerobics course. One hundred and forty-nine subscriptions, related to 84 subjects, referred to customers who participated in the water aerobics course as a part-time activity. These customers enrolled in the sporting center for others aims, such as swimming learning, and then were excluded from the analysis because the repurchase behavior can be influenced by external factors, such as the completion of their main course. Finally, 65 subscriptions referred to customers who enrolled for the first time during the last period of the available data (Quarter 3 2013) and were excluded due to the impossibility to evaluate their repurchase

behavior. Thus, the final dataset included 1098 subscriptions of 544 customers. Considering the nature of the service, the majority of the customers in the data (97%) are female. The average age is 33.10 years, with a standard deviation of 11.36. As shown in Table 2.1, the distribution of age is fairly balanced, with a more significant presence of customers between 20 and 30 years (42.6%).

**Table 2.1. Age distribution**

| Age class | Frequency | Percent |
|---|---|---|
| < 20 | 41 | 7.5 |
| 20 - 25 | 115 | 21.1 |
| 25 - 30 | 117 | 21.5 |
| 30 - 35 | 76 | 14.0 |
| 35 - 40 | 59 | 10.8 |
| 40 - 45 | 39 | 7.2 |
| 45 - 50 | 31 | 5.7 |
| 50 - 55 | 34 | 6.3 |
| > 55 | 32 | 5.9 |
| Total | 544 | 100.0 |

Except for the first quarter of 2010 and the third quarter of 2013, the subscriptions in the data are homogeneously distributed along the twelve quarters (Table 2.2). Twenty-four point five percent of the data refers to 2010, 28.7% to 2011, 29.7% to 2012, and 17.1% to 2013.

**Table 2.2. Quarters distribution**

| Period | Frequency | Percent |
|---|---|---|
| Q1 2010 | 23 | 2.1 |
| Q2 2010 | 131 | 11.9 |
| Q3 2010 | 115 | 10.5 |
| Q1 2011 | 92 | 8.4 |
| Q2 2011 | 103 | 9.4 |
| Q3 2011 | 120 | 10.9 |
| Q1 2012 | 98 | 8.9 |
| Q2 2012 | 114 | 10.4 |
| Q3 2012 | 114 | 10.4 |
| Q1 2013 | 67 | 6.1 |
| Q2 2013 | 85 | 7.7 |
| Q3 2013 | 36 | 3.3 |
| Total | 1098 | 100.0 |

Customers attended the course either one, two, or three days per week.

On average, each customer purchased 2.01 subscriptions (SD = 1.85), with a minimum value of 1 and a maximum of 11. Table 2.3 reports the frequency distribution of the purchased subscriptions.

**Table 2.3. Subscriptions per customer**

| Subscriptions per customer | Frequency | Percent |
|---|---|---|
| 1 | 325 | 59.7 |
| 2 | 97 | 17.8 |
| 3 | 52 | 9.6 |
| 4 | 21 | 3.9 |
| 5 | 17 | 3.1 |
| 6 | 9 | 1.7 |
| 7 | 8 | 1.5 |
| 8 | 5 | .9 |
| 9 | 2 | .4 |
| 10 | 2 | .4 |
| 11 | 6 | 1.1 |
| Total | 544 | 100.0 |

*Human density calculation*. The available data provided information on which specific sessions and days were attended by the customers in each quarter. Thus, it was possible to calculate the exact number of customers for each specific session. Then, for each subscription, I calculated the average level of human density encountered. If a customer participated in the course for three days a week, it is possible that he/she faced different levels of human density in the three days, such as 28 people on Monday, 30 on Wednesday, and 29 on Friday. In this example, the average level of density for the quarter is equal to 29. Table 2.4 shows an extended example of human density calculation.

**Table 2.4. Calculation of human density per subscription (example)**

| Customer | Period | Day 1 | Day 2 | Day 3 | Average Density |
|---|---|---|---|---|---|
| 1 | Q1 2010 | 28 | 30 | 29 | 29 |
| 1 | Q2 2010 | 30 | 30 | 30 | 30 |
| 2 | Q1 2010 | 28 | 26 | | 27 |
| 3 | Q3 2010 | 29 | 27 | 28 | 28 |
| 3 | Q1 2011 | 30 | | | 30 |

It is relevant to underline that in the calculation of the human density I considered 1312 observations, corresponding to the original dataset before the exclusions described above. In this way, the human density data represents the real value faced by customers during service attendance. The descriptive statistics of the human density by subscription are reported in Table 2.5.

**Table 2.5. Descriptive statistics of human density**

| | |
|---|---|
| Mean | 23.603 |
| Standard Deviation | 6.253 |
| Minimum | 1 |
| Maximum | 32.50 |

*Similarity calculation*. To measure similarity, I considered the customer expertise in the service[1]. This approach is coherent with previous research, which proposed a series of indicators to calculate a similarity index based on experience and knowledge (Harrison and Klein, 2007).

First, I calculated expertise of each customer in each period, which was equal to the number of previous subscriptions purchased. For example, if at the period t, a customer had previously bought five subscriptions, his/her expertise is equal to 5. With this procedure, I was able to calculate expertise for each customer at each period in the data.

Since this research aims to consider the similarity between a single customer and the other customers in the same session, I calculated the average absolute distance in expertise (AED). In detail, the summation of the absolute differences between customer's expertise ($x_i$) and other customers' expertise ($x_j$) is divided by the number of other customers in the session (n – 1).

$$AED_i = \frac{\sum_{i,j=1}^{n} |x_i - x_j|}{n-1}, i \neq j$$

[1] It was not possible to use gender to calculate similarity due to absence of enough variability. A similarity index based on age did not interact significantly with human density.

Then the result was normalized to constrain the values of the distribution between 0 and 1. Finally, the resulting value is subtracted from 1 to obtain an index in which 0 is equal to low similarity and 1 to high similarity.

$$similarity_i = 1 - \frac{AED_i - \min(AED)}{\max(AED) - \min(AED)}$$

As for the human density variable, in cases of subscriptions for multiple sessions in the same period, I considered the average similarity faced by the customer in the quarter. Table 2.6 shows descriptive statistics of the similarity index.

**Table 2.6. Descriptive statistics of the similarity index**

| | |
|---|---|
| Mean | 0.865 |
| Standard Deviation | 0.127 |
| Minimum | 0 |
| Maximum | 1 |

*Data structuration*. Before proceeding with the analysis, the 1098 subscriptions have been organized to recreate the purchase pattern of the 544 customers along the observed time interval. First, I created an extended dataset of 6528 rows (544 customers x 12 time periods), filled with the subscription information in the periods in which the customer was active in the structure. An example is reported in Table 2.7.

**Table 2.7. Extended data structure creation**

| Customer | Period | Subscription | Human density | Similarity Index |
|---|---|---|---|---|
| 1 | Q1 2010 | No | | |
| 1 | Q2 2010 | No | | |
| 1 | Q3 2010 | No | | |
| 1 | Q1 2011 | No | | |
| 1 | Q2 2011 | No | | |
| 1 | Q3 2011 | Yes | 30 | 0.8 |
| 1 | Q1 2012 | Yes | 28 | 0.7 |
| 1 | Q2 2012 | Yes | 29 | 0.9 |
| 1 | Q3 2012 | Yes | 31 | 0.85 |
| 1 | Q1 2013 | Yes | 32 | 0.8 |
| 1 | Q2 2013 | No | | |
| 1 | Q3 2013 | No | | |

Next, all the cases antecedents to the first subscription of the customer were deleted, since they are not informative regarding on his/her purchase behavior. This step leads to obtaining a dataset of 4159 rows.

Finally, to evaluate customers' decisions to repurchase or not I modeled the expectations regarding density and similarity. The marketing literature proposes different approaches to calculate expectations, such as considering only the last value encountered (Gabor, 1977) or averaging the last two values (Winer, 1986). In this research, I prudently opted to model expectations regarding density and similarity calculating the simple moving average per customer considering all the previous periods of subscriptions. As emphasized in the subsequent section on robustness checks, changing the approach to calculate expectations, the results remain consistent. Table 2.8 reports an example of the calculations of human density and similarity employing the simple moving average approach.

**Table 2.8. Extended data structure (example)**

| Customer | Period | Subs. | Human density | Similarity Index | Human density expectation | Similarity expectation |
|---|---|---|---|---|---|---|
| 1 | Q3 2011 | Yes | 30 | 0.8 | | |
| 1 | Q1 2012 | Yes | 28 | 0.7 | 30 | 0.8 |
| 1 | Q2 2012 | Yes | 29 | 0.9 | 29 | 0.75 |
| 1 | Q3 2012 | Yes | 31 | 0.85 | 29 | 0.8 |
| 1 | Q1 2013 | Yes | 32 | 0.75 | 29.5 | 0.8125 |
| 1 | Q2 2013 | No | | | 30 | 0.8 |
| 1 | Q3 2013 | No | | | 30 | 0.8 |

The final dataset has 544 rows containing missing values on the human density and similarity expectation variables since during for the first subscription of the time series these data are not available. Moreover, 6 rows refer to 2 customers who were in sessions without other customers (human density = 1). For these subjects it was not possible to calculate the similarity index. All these rows of data were therefore excluded. Thus, the final dataset contains 3615 valid cases for the analysis.

*Models and results*

The research hypothesis was tested estimating two logistic regression models with clustered standard errors (by subject). Clustered standard errors were estimated to control for the presence of the same customer in multiple observations. In the two models, I included a set of available control variables. Temporal variables were inserted to control for trends in years and seasonality in quarters. In fact, it is plausible to expect a higher propensity to attend a sporting center in proximity of spring and summer than in the winter. Quarter 1 and Year 2013 are used as baselines and are not included in the model to avoid perfect multicollinearity. Finally, gender (male coded as 1) and age are inserted to control for socio-demographic characteristics. Model 1

considers only the direct effects of human density, similarity, and control variables. In Model 2, I added the interaction between human density and similarity. Table 2.9 shows the descriptive statistics and the correlations among the variables inserted in the models.

In detail, the estimated models were:

Model 1

$$Purchase_{it} = \alpha + \beta_1 Purchase_{it-1} + \beta_2 Human\ density_{it-\#} + \beta_3 Similarity_{it-\#} + \beta_4 Dummy\ 2010_t + \beta_5 Dummy\ 2011_t + \beta_6 Dummy\ 2013_t + \beta_7 Dummy\ Quarter\ 2_t + \beta_8 Dummy\ Quarter\ 3_t + \beta_9 Gender_i + \beta_{10} Age_i + \varepsilon_{it}$$

Model 2

$$Purchase_{it} = \alpha + \beta_1 Purchase_{it-1} + \beta_2 Human\ density_{it-\#} + \beta_3 Similarity_{it-\#} + \beta_4 (Human\ density * Similarity)_{it-\#} + \beta_5 Dummy\ 2010_t + \beta_6 Dummy\ 2011_t + \beta_7 Dummy\ 2012_t + \beta_8 Dummy\ Quarter\ 2_t + \beta_9 Dummy\ Quarter\ 3_t + \beta_{10} Gender_i + \beta_{11} Age_i + \varepsilon_{it}$$

Note: *t-#* indicates the computation of a simple moving average based on all the previous customer *i* subscriptions.

Subscription in the previous period was inserted to control for carry-over effects. As specified in the previous section, expectations at time *t* for human density and similarity were modeled calculating the simple moving average on scores for all the previous periods.

All the variables were mean-centered to simplify results interpretations. Results are reported in Table 2.10.

**Table 2.9. Descriptive statistics and correlations among the variables in the models**

| | Mean | SD | $Purchase_t$ | $Purchase_{t-1}$ | Human density $_{t-\#}$ | Similarity $_{t-\#}$ | 2010 | 2011 | 2012 | Quarter2 | Quarter3 | Gender | Age |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $Purchase_t$ | 0.153 | 0.360 | 1 | | | | | | | | | | |
| $Purchase_{t-1}$ | 0.293 | 0.455 | 0.473 | 1 | | | | | | | | | |
| Human density $_{t-\#}$ | 22.566 | 5.789 | 0.078 | 0.090 | 1 | | | | | | | | |
| Similarity $_{t-\#}$ | 0.904 | 0.076 | -0.231 | -0.203 | -0.356 | 1 | | | | | | | |
| 2010 | 0.05 | 0.21 | 0.088 | 0.298 | -0.131 | 0.113 | 1 | | | | | | |
| 2011 | 0.207 | 0.405 | 0.115 | 0.136 | -0.023 | 0.072 | -0.113 | 1 | | | | | |
| 2012 | 0.322 | 0.467 | 0.038 | -0.013 | 0.021 | -0.005 | -0.153 | -0.352 | 1 | | | | |
| Quarter2 | 0.322 | 0.467 | 0.040 | -0.080 | -0.031 | 0.053 | -0.091 | 0.007 | 0.016 | 1 | | | |
| Quarter3 | 0.385 | 0.487 | -0.060 | 0.029 | 0.014 | 0.033 | 0.221 | -0.005 | -0.037 | -0.545 | 1 | | |
| Gender | 0.025 | 0.156 | -0.048 | -0.033 | 0.018 | -0.017 | -0.027 | -0.012 | 0.008 | 0.004 | -0.002 | 1 | |
| Age | 34.314 | 11.426 | 0.150 | 0.088 | 0.205 | -0.151 | -0.017 | -0.029 | -0.014 | -0.010 | 0.021 | 0.012 | 1 |

**Table 2.10. Models results – Dependent variable = $Purchase_t$**

| *Independent Variable* | **Model 1** | **Model 2** |
|---|---|---|
| | **Estimates** | **Estimates** |
| Constant | -2.497 ** | -2.431 ** |
| $Purchase_{t-1}$ | 2.606 ** | 2.609 ** |
| Human density $_{t-\#}$ | -0.011 | -0.020 |
| Similarity $_{t-\#}$ | -6.715 ** | -8.740 ** |
| 2010 | 0.783 ** | 0.930 ** |
| 2011 | 0.965 ** | 0.858 ** |
| 2012 | 0.758 ** | 0.715 ** |
| Quarter2 | 0.740 ** | 0.777 ** |
| Quarter3 | -0.197 | -0.268 ° |
| Gender | -1.369 * | -1.419 * |
| Age | 0.029 ** | 0.030 ** |
| Human density $_{t-\#}$ × Similarity $_{t-\#}$ | | 0.695 ** |
| McFadden Pseudo $R^2$ | 0.31 | 0.32 |
| LR test $\chi^2$ | --- | 26.53 ** |

Unstandardized estimates are reported. ° $p < .10$, * $p < .05$, ** $p < .01$

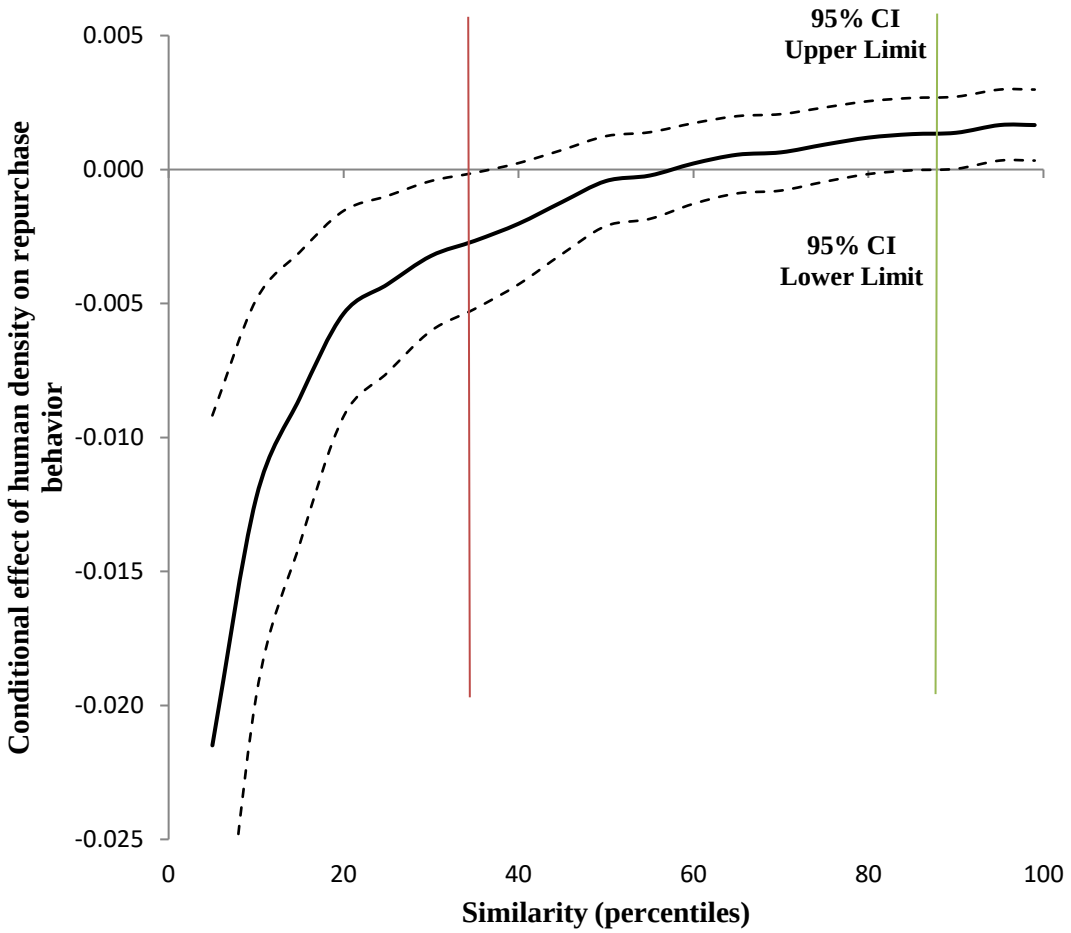
Results of Model 1 imply that similarity ($b$ = - 6.72, $p < 0.001$), purchase at the previous period ($b$ = 2.61, $p < 0.001$), year 2010 ($b$ = - 0.78, $p = 0.001$), year 2011 ($b$ = 0.97, $p < 0.001$), year 2012 ($b$ = 0.76, $p < 0.001$), quarter 2 ($b$ = 0.74, $p < 0.001$), gender ($b$ = - 1.37, $p = 0.035$), and age ($b$ = 0.03, $p < 0.001$) have significant effects on repurchase behavior. In Model 2, I added the interaction effect between human density and similarity, which proved to be positive and significant ($b$ = 0.695, $p <$ 0.001). To evaluate how similarity influences the effect of human density on subscription renewal, I applied the procedure suggested by Wiersema and Bowen (2009). In summary, I estimated the average marginal effect of the independent variable at various level of the moderator. At low levels of similarity (Mean value minus 1 SD) the marginal effect of human density on repurchase behavior was negative and significant ($b$ = - 0.0091, $p = 0.002$). At average levels of similarity, the

marginal effect of human density on repurchase behavior was not significant ($b$ = -0.0015, $p$ = 162). Finally, at high levels of similarity (mean plus 1 SD) the marginal effect of human density on repurchase behavior was positive and significant ($b$ = 0.0014, $p$ < 0.044). Thus, it is possible to confirm the research hypothesis that the effect of human density on repurchase behavior is positive when the crowd is composed of similar individuals and negative in presence of dissimilar customers.

Figure 2.1 reports the conditional marginal effect of human density at various percentiles of similarity. It is possible to observe that below the 35th percentile of the similarity distribution, the marginal effect of human density on repurchase behavior is negative and significant. On the contrary, above the 87th percentile of the distribution, human density is positively and significantly correlated to repurchase behavior.

Regarding the control variables included in the model, as expected, purchase at the previous period has a positive and significant effect ($b$ = 2.61, $p$ < 0.001) and an odds ratio higher than 13. Also, the second quarter (spring/summer months), relative to the first quarter, has a positive effect ($b$ = 0.78, $p$ < 0.001). In this period, the probability of subscription was more than 2.17 higher compared to the baseline (winter quarter). The dummies related to years 2010 ($b$ = 0.93, $p$ < 0.001), 2011 ($b$ = 0.86, $p$ < 0.001), and 2012 ($b$ = 0.71, $p$ < 0.001) were all positive and significant compared to 2013. Finally, male customers had a lower probability to repurchase the service ($b$ = -1.42, $b$ = 0.043), while age was positively and significantly correlated with repurchase behavior ($b$ = 0.03, $p$ < 0.001).

**Figure 2.1. Conditional marginal effect of human density on repurchase behavior**




Note: straight line represents the conditional marginal effect of human density on repurchase behavior, dotted lines represent the 95% confidence interval of the same effect.

To test for the stability of the presented results, I checked for the presence of multicollinearity. As observable in Table 2.11, all the VIFs were well below critical thresholds (Stock and Watson, 2003). Moreover, it is possible to exclude risks of reverse causality since the main independent variables (human density, similarity, and $purchase_{t-1}$) are measured at antecedent time periods compared to the dependent variable. Such evidence increases the confidence in the results.

**Table 2.11. Models VIFs**

| *Variable* | **Model 1** | **Model 2** |
|---|---|---|
| | **VIFs** | **VIFs** |
| $Purchase_{t-1}$ | 1.27 | 1.27 |
| Human $density_{t-\#}$ | 1.19 | 1.59 |
| $Similarity_{t-\#}$ | 1.24 | 1.46 |
| 2010 | 1.34 | 1.34 |
| 2011 | 1.27 | 1.28 |
| 2012 | 1.22 | 1.22 |
| Quarter2 | 1.44 | 1.44 |
| Quarter3 | 1.50 | 1.50 |
| Gender | 1.00 | 1.00 |
| Age | 1.06 | 1.06 |
| Human $density_{t-\#}$ × $Similarity_{t-\#}$ | | 1.42 |
| Mean VIF | 1.25 | 1.33 |

*Robustness checks*

I checked the robustness of the results estimating three other models.

- Model 3: same as Model 2 but I excluded the customers who experienced extreme levels of similarity or dissimilarity. Thus, all the cases corresponding to similarity = 1 or similarity = 0 were excluded from the analysis.
- Model 4: same as Model 2 but the expectations regarding human density and similarity are modeled considering only the last period (Gabor, 1977) instead of the simple moving average of all the previous values.
- Model 5: same as Model 2 but the expectations regarding human density and similarity are modeled considering the average between the last two periods (Winer, 1986) instead of the simple moving average.

The interaction effect between human density and similarity on repurchase behavior is still significant and positive in Model 3 ($b$ = 0.92, $p$ < 0.001), Model 4 ($b$ = 0.23, $p$ = 0.043), and Model 5 ($b$ = 0.55, $p$ = 0.001). In Table 2.12, I report simple slope analyses of the conditional marginal effect of human density at very low (mean minus 2 SD), low (mean minus 1 SD), average, high (mean plus 1 SD), and very high (mean plus 2 SD) levels of similarity.

**Table 2.12. Simple slops analysis – Robustness check**

| | Model 2 | Model 3 | Model 4 | Model 5 |
|---|---|---|---|---|
| Very low similarity | -0.024 ** | -0.029 ** | -0.011 * | -0.020 ** |
| Low similarity | -0.009 ** | -0.010 ** | -0.005 * | -0.008 ** |
| Mean similarity | -0.001 | -0.0004 | -0.002 * | -0.001 |
| High similarity | 0.001 * | 0.003 ** | 0.0001 | 0.001 ° |
| Very high similarity | 0.002 ** | 0.003 ** | 0.0006 | 0.002 ** |

Unstandardized estimates are reported. ° $p$ < .10, * $p$ < .05, ** $p$ < .01

Overall, in all the models I observe the same pattern obtained in the main analysis: a significant moderation effect of similarity on the influence of human density on repurchase behavior. The results of the study confirmed the hypothesis that in presence of similar customers, the effect of human density on repurchase behavior is positive. On the contrary, when the crowd is populated by dissimilar customers, the effect of human density on repurchase behavior is negative.

## 2.4 General discussion

This research aims to analyze the impact of similarity with other customers in the relationship between human density and repurchase behavior. The results of the empirical study demonstrated, as hypothesized, that at high levels of similarity with

other customers, human density increases the likelihood to repurchase the service, while the opposite occurs at low levels of similarity.

This research contributes to the literature crowding in several ways. First, to the best of my knowledge, it represents the first analysis of the effect of human density on repurchase behavior. Second, the inclusion of social factors tries to solve the disagreement regarding the direction of the effect of human density on consumer's outcomes (Mehta, Sharma, and Swami, 2013).

This study suffers from a series of limitations. First, it is based on a single domain. Replications in different contexts would allow extending the external validity of the results. The analyzed service, a course of water aerobics, is characterized by both connotations of task and leisure orientation. Future studies can analyze if the interaction between similarity and human density affect repurchase behavior in other contexts, such as supermarkets (more task-orientated) or pubs/cafés (more leisure-orientated). While it is possible to expect a positive effect of density in the second case (Pons et al. 2006), it would be interesting to test if similarity can reduce the possible adverse effect of human density in the former (Langer and Saegert, 1977; Harrell, Hutt and, Anderson, 1980). A second limitation is represented by the lack of evidence regarding the process driving the documented effect. Self-categorization theory (Turner, 1982) underlines that the proximity with similar individuals allows satisfying self-verification and self-enhancement needs, leading to higher satisfaction (Tsui & O'Reilly, 1989). In my secondary data analysis, this kind of measures was not available, and it was not possible to test a moderated mediation model to demonstrate the hypothesized process via satisfaction. Finally, it is relevant to underline that a secondary data analysis does not allow to establish with certainty causal effects. Future

research can solve the underlined limitations with a laboratory study in which the levels of human density and similarity are manipulated. In such a context, repurchase behavior could be measured as the willingness to return to the store. In this way, it would be possible to measure data regarding the accomplishment of self-verification and self-enhancement goals to test the processes. Moreover, scenarios can be designed in different types of store, varying the level of task-orientation.

It is possible to identify a series of managerial implications from this research. First, managers in sport industry can try to create homogeneous groups to increase repurchase behavior. For example, if a new customer is willing to join the class and he/she is flexible regarding days and timetable, it would be more profitable to orient him/her toward a session with similar customers in terms of experise. Second, results indicate that human density can contribute to generate consumer's value when similarity is high. Retailers and services oriented to serve a specific cluster of the market can evaluate to choose smaller surfaces and spaces. In this scenario, managers can reduce costs relating to store dimensions and, at the same time, increase repurchase behavior.

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# ESSAY 3

## The moderating roles of similarity and consumer self-construal in the relationship between human density and calories intake

### 3.1 Introduction

In this third essay, I analyzed the relationship between human density and calories consumption. A recent contribution has underlined that in high density scenarios consumers tend to select more caloric food and increase food intake (Hock and Bagchi, 2017). Following the indications provided by Stokols (1972), I investigated the impact of human density on calories intake conditional with social and personal factors.

The literature on social facilitation (positive effect of the presence of others on food intake) and impression management (negative effect of the presence of others on food intake) does not clarify how the presence of others influences consumers' calories intake (Herman, Roth, and Polivy, 2003). Previous research has tried to solve this contradiction individuating cases in which social facilitation occurs or not. For example, when co-actors are friends or family members, consumers tend to increase caloric intake compared to when in presence of strangers (de Castro, 1994; Clendenen, Herman, and Polivy, 1994). In the second case, consumers adopt a precautionary approach and they reduce calories intake to avoid possible negative judgments (Herman, Roth, and Polivy, 2003). In my theorization, I analyze the social facilitation *vs.* impression management reactions in terms of similarity *vs.* dissimilarity with the other customers in the crowd. In detail, perceived similarity with others communicates a sense of social inclusion and the belief to be liked from the other (Berscheid and

Walster, 1969; Byrne, 1971). Thus, perceived similarity reduces the fear of negative evaluations, leading to a positive effect of human density on calories consumption. On the opposite, perceived dissimilarity can activate impression management reasons. In conditions of low similarity with other customers, the appropriate social norm is unknown. Thus, the willingness to positively impress others leads to a negative impact of human density on calories intake.

Additionally, I consider the role of consumer's self-construal (Markus and Kitayama, 1991) in activating or de-activating impression management motivations. While interdependent-construal subjects are more sensitive to low *vs.* high similarity conditions, independent-construal consumers do not adapt their behavior to avoid negative evaluations.

I tested my theorization in two empirical studies. In Study 1, I analyzed caloric consumption of customers of a bar, in which the levels of density, perceived similarity, and self-construal were measured. In Study 2, I manipulated the levels of human density and similarity and measured consumer self-construal. The results of the two studies, based on field and lab designs, provide general support to the research hypotheses and to the idea that the effects of human density on caloric consumption can vary across similarity *vs.* dissimilarity scenarios and based on consumer' self-construal.

This research contributes to the literature on crowding demonstrating how the relation between human density and calories consumption is influenced by the level of perceived similarity with the other customers in the crowd. Also, the present theorization represents the first contribution considering simultaneously the effect of density together with social and personal factors. The results of the studies suggest

practical implications for managers of companies of the food industry. In stores designed to serve specific market clusters, human density can orient consumers' demand toward more hedonic food, thus stores that are usually crowded can take advantage from such effect by offering caloric alternatives.

### 3.2 Theoretical background[2]

Within the consumer behavior literature, Hock and Bagchi (2017) proposed the first contribution on the analysis of the relationship between human density and calories consumption. Using a mix of laboratory experiments and field data, the authors demonstrated that high (*vs.* less) density leads consumers to increase calories intake, through augmented meal size or preference for more caloric food. According to the authors, human density is a factor that introduces complexity in the consumer environment, thus reducing the ability to use cognitive resources to avoid caloric options. In other words, density works as a distractor, and the resulted cognitive overload does not allow to pursue the long-term benefits guaranteed by healthier food. Hock and Bagchi (2017) ruled out also other possible explanations. A crowded place might have been associated with a better quality of the food and this aspect leads to opt for larger meal sizes. However, both the results of the laboratory and field studies allowed to exclude the quality-based mechanism. Similarly, human density did not affect positive and negative emotions, privacy concerns, perceptions of hunger, and scarcity-related believes.

The results presented by Hock and Bagchi (2017) are consistent with part of the literature on food consumption, which emphasizes how the presence of other

[2] A complete review of the studies on crowding and similarity is reported in the previous chapters.

individuals leads to increase meal sizes and calories consumption (de Castro and Brewer, 1992). However, Herman, Roth, and Polivy (2003) underlined how social factors can both encourage or suppress the desire for eating. On the one hand, social facilitation refers to all the situations in which an individual eats a larger amount of food when s/he is with others than when s/he is alone. On the other hand, impression management studies argue that the presence of other individuals produces to a reduction in food intake to convey a positive image. The negative impact on calories intake was demonstrated both in the presence of non-eater others (Conger et al., 1980) than co-actors (Mori, Chaiken and Pliner, 1987). Herman, Roth, and Polivy (2003) hypothesized that the reduction in food consumption is caused by the willingness to avoid judgments of others. In the majority of the situations, conveying a positive impression involves eating smaller amounts, and a violation of this social norm can lead to the feeling of being judged.

In a tentative to verge the contrasts between social facilitation and impression management theories, Herman, Roth, and Polivy (2003) proposed a unified view of social effects on food intake. According to the authors, in presence of desirable food, the consumer would eat until satiety and the presence of other individuals acts as a brake to the intake. In different situations and in presence of different co-actors, this brake can be triggered or not.

Similar considerations are valid also considering the relationship between human density and calories consumption. The research of Hock and Bagchi (2017) correctly underlined how density can increase food intake due to the lower capability to satisfy more complex goals (such as eating healthy) in crowded environments. However, it is necessary to consider also how the relationship with other customers in

the crowd can influence the effect of density on calories. Prior research on social facilitation stated that the presence of other individuals eases food intake, especially in presence of friends or family members (de Castro, 1994). Also, individuals tend to eat more desserts in companion of friends than in presence of strangers (Clendenen, Herman, and Polivy, 1994). In detail, social facilitation appeared to be stronger in presence of well-known individuals and the desire of making a good impression through food consumption is stronger in front of strangers. The main reason resides in the inability to predict the appropriate social norm of somebody whom one is not familiar with. Thus, to avoid the possible negative judgments of the others, individuals cautiously reduce food intake. Referring to the example of Herman, Roth, and Polivy (2003), the presence of strangers is able to trigger a brake to food intake.

The different effects generated by the presence of friends or strangers can be conceptualized in terms of similarity and dissimilarity. Similarity literature underlines that the presence of similar individuals communicates a sense of social inclusion and the belief to be liked from the other (Berscheid and Walster, 1969; Byrne, 1971). Thus, if the perceived risk to be negatively judged by the co-actors decreases, impression management motives are reduced. In other words, it is possible to hypothesize that the effect of human density on calories consumption depends on the extent to which other customers in the crowd are perceived to be similar *vs*. dissimilar. With high similarity, social facilitation should lead to increasing calories consumption. On the contrary, the presence of dissimilar consumers should activate impression management motivations and, as a consequence, reduce calories intake. Formally:

H1: *The relationship between human density and calories intake is moderated by perceived similarity with the other customers in the crowd. Specifically, the effect of human density on calories intake increases as similarity increases.*

I predict that in presence of similar consumers, the effect of human density on calories consumption is positive. When the crowd is composed of individuals perceived as dissimilar, impression management motives compensate the distraction effect of density (Hock and Bagchi, 2017).

As suggested by Stokols (1972), crowding studies should consider three elements: human density, social factors (e.g., similarity with others), and personal factors (consumer's personality traits). Therefore, it is relevant to individuate personal characteristics that can influence consumer's apprehension of failure to observe social norms.

Markus and Kitayama (1991) defined independent and interdependent self-construals based on the belief of being separated or connected with others. Individuals with an independent self-construal see themselves as an autonomous and idiocentric person. The responsiveness of such subjects to the social environment is limited to strategic forms of self-expression. Others act as means for affirmation and verification of the inner core of the self. Internal opinions, evaluations, and judgments represent the prevalent drivers of behaviors. Individuals with an interdependent self-construal are motivated to fit with others and to fulfill specific social obligations. The significant characteristics of the self are to be found in the interdependence with the others, or, in other words, in the public components of the identity. Internal evaluations and opinions

are considered more elusive, and therefore the main determinant of behaviors is the need for fitting with the social environment.

As argued before, low perceived similarity with other consumers can influence negatively calories intake due to impression management reasons. Considering also consumer self-construal, this kind of process may occur only for interdependent subjects. Individuals with interdependent self-construals exploit others as a source of information to adapt their behaviors. On the contrary, individuals with independent self-construals use internal evaluations as the main driver of the behaviors. Thus, for interdependent-construal individuals, differences in perceived similarity determine a positive (with high similarity) or negative (with low similarity) effect of human density on calories intake. Instead, the impact of density for independent-construal consumers is not influenced by the level of similarity with other consumers. Consumers with an interdependent self-construal adapt their behavior based on the levels of perceived similarity with other individuals. When they perceive high similarity, social facilitation leads to a positive effect of human density on calories intake. When they perceive low similarity, the need to satisfy impression management motivations leads to a negative effect of human density on calories intake. Consumers with an independent self-construal do not perceive the need to adapt their behavior according to the social environment. Therefore, I do not expect to observe differences in the effect of human density on calories intake at different levels of perceived similarity with others. Formally:

H2: *Human density, perceived similarity, and consumer self-construal interact in determining calories intake. Specifically, for consumers with an interdependent self-construal calories intake increases as human density and perceived similarity increase and decreases as human density increases and perceived similarity decreases. For consumers with an independent self-construal the effect disappears.*

### 3.3 Study 1 - Field study

One hundred eighty-four customers ($M_{age}$ = 27.03, Female = 55.43%) of a bar located in a medium-sized town in Southern Italy completed the study in exchange for a small gift. Data were collected with the aid of two research assistants (RA). A first RA used a people counter and took note of the level of human density at the entrance of each consumer in the bar. When consumers exited the bar, a second RA asked them to complete a small questionnaire containing, among the others, the items to measure perceived similarity and self-construal. For the customers entered in group, the RAs took care to allow the compilation of questionnaires separately to avoid any form of interpersonal influence.

Consumers who agreed to participate in the study were required to list all the ordered products. The bar management helped to retrieve calories information about the available products. Therefore, it was possible to calculate the amount of calories intook by each consumer, which was used as dependent variable in the analyses.

Because of the context of data collection, the questionnaire was kept as short as possible. Whenever possible, I adopted short versions of measurement scales of the relevant constructs. Perceived similarity was measured with two 7-point Likert items

("I feel similar to the other people in this bar"; "The customers in the bar look like similar to me"). The reliability of the scale was satisfactory (Cronbach's $\alpha = .855$), and the two items were averaged to form a perceived similarity index. Self-construal was measured with a 7-point semantic differential item ("I feel better being unique/part of a group"), adapted from the interdependence with sociability scale proposed by Lu and Gilmour (2007). Higher score on this item describe interdependent self-construals, and lower scores reflect independent self-construals. Then, participants answered a series of questions that produced data on relevant control variables:

- Planned purchase: yes, if the customer knew what to order before entering the bar, no otherwise.
- Years as customer of the bar: number of years the customers patronize the bar.
- Socio-demographic information: gender, age, level of education, job, income, place of residence.

For each questionnaire, the RAs registered the time and the day of administration. After the completion of the questionnaire, the RAs thanked the participants and handed the small gift. The RAs took note of whether the consumer was alone or in group, and signed with an identification number the questionnaire of the consumers belonging to the same group.

### *3.3.1 Sample description*

The sample was composed of 55.43% female consumers. Age ranged from 15 to 61 years, and 52.72% of the sample was below 26 years. The average age was 27.03

years, with a standard deviation of 8.17. The most common level of education in the sample was high schools (52.17%). Table 3.1 reports the full distribution of education.

**Table 3.1 Level of education – descriptive statistics**

| Level of education | Frequency | Percentage |
|---|---|---|
| Intermediary school | 31 | 16.85 |
| High school | 96 | 52.17 |
| Graduate | 46 | 25 |
| Post-graduate | 11 | 5.98 |

Ninety-one percent of the sample was living in the same city of the bar, 7.67% in the same province. The vast majority of the participants (90.22%), declared to visit the bar frequently. Table 3.2 reports the distribution of the number of years since they were visiting the bar.

**Table 3.2 Number of years of visiting the bar**

| Number of Years | Frequency | Percentage |
|---|---|---|
| 0 | 18 | 9.78 |
| 1 | 2 | 1.09 |
| 2 | 21 | 11.41 |
| 3 | 22 | 11.96 |
| 4 | 16 | 8.7 |
| 5 | 43 | 23.37 |
| 6 | 13 | 7.07 |
| 7 | 49 | 26.63 |

Seventy-one percent of the respondents declared to have a rough idea of what to order before entering the bar. Eight percent of the respondents entered the bar alone, while the remaining part was in companion of friends, co-workers, or family members.

The data collection was completed in different days and in different time slots, in order to have enough variation regarding human density. Table 3.3 reports the distribution of the time slots.

**Table 3.3 Time slots distribution**

| Time slots | Frequency | Percentage |
|---|---|---|
| Morning | 12 | 6.52 |
| Afternoon | 76 | 41.3 |
| Evening | 81 | 44.02 |
| Night | 15 | 8.15 |

Specifically, data were collected in seven days, from 2nd to 14th of March 2018.

*3.3.2 Models and results*

To test the research hypotheses, I estimated three models. Model 1 considers only the direct effects of human density, similarity, self-construal, and control variables. In Model 2, I added the interaction between human density and similarity to test H1. In Model 3, I added the three-way interaction between human density, similarity, and self-construal to the test H2. In all the models, I included as control variables, time-slot dummies (afternoon was considered as base level), a planned purchase dummy, the years since the participant was a customer of the bar, the number of people of the participant's group visiting the bar, gender (female = 1), and age. Table 3.4 shows the descriptive statistics and the correlations among the variables.

**Table 3.4 Correlations among the variables in the models**

| | Mean | SD | Calories | Human density | Similarity | Self Construal | Years as customer | People in the group | Age | Gender | Morning | Evening | Night | Planned Purchase |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Calories | 266.67 | 272.60 | 1 | | | | | | | | | | | |
| Human density | 28.18 | 9.67 | 0.343 | 1 | | | | | | | | | | |
| Similarity | 3.90 | 1.68 | -0.041 | -0.110 | 1 | | | | | | | | | |
| Self-Construal | 5.26 | 2.08 | -0.009 | -0.056 | 0.189 | 1 | | | | | | | | |
| Years as customer | 4.40 | 2.24 | -0.088 | -0.159 | 0.140 | -0.034 | 1 | | | | | | | |
| People in the group | 2.79 | 1.33 | 0.134 | 0.030 | -0.023 | 0.095 | 0.025 | 1 | | | | | | |
| Age | 27.03 | 8.17 | -0.205 | -0.164 | 0.097 | -0.140 | 0.050 | -0.296 | 1 | | | | | |
| Gender | 0.55 | 0.50 | 0.031 | -0.125 | -0.103 | 0.116 | -0.064 | 0.203 | -0.155 | 1 | | | | |
| Morning | 0.06 | 0.25 | -0.049 | 0.150 | 0.023 | 0.063 | -0.077 | -0.107 | 0.015 | -0.118 | 1 | | | |
| Evening | 0.44 | 0.50 | 0.278 | 0.378 | -0.045 | -0.093 | -0.170 | -0.222 | -0.034 | -0.152 | -0.234 | 1 | | |
| Night | 0.08 | 0.27 | -0.131 | -0.236 | -0.036 | -0.037 | 0.098 | 0.243 | -0.016 | 0.147 | -0.079 | -0.264 | 1 | |
| Planned purchase | 0.71 | 0.45 | -0.041 | 0.038 | -0.056 | -0.043 | -0.117 | 0.043 | 0.107 | -0.039 | -0.026 | -0.137 | 0.102 | 1 |

I estimated three hierarchical linear regression models to take into account the fact that some of the customers arrived in the bar in groups. Hierarchical linear models allow to control for non-independence of observations by setting a random intercept per group. All the independent variables were mean centered to facilitate the interpretation of results.

Model 1

$$\begin{aligned} Calories_{ij} = {} & \alpha_{ij} + \beta_1 Human\ density_{ij} + \beta_2 Similarity_{ij} + \beta_3 Self\ Construal_{ij} \\ & + \beta_4 Morning_j + \beta_5 Evening_j + \beta_6 Night_j + \beta_7 Planned\ Purchase_{ij} \\ & + \beta_8 Years\ as\ customer_{ij} + \beta_9 Number\ of\ People\ in\ the\ Group_j \\ & + \beta_{10} Gender_{ij} + \beta_{11} Age_{ij} + \varepsilon_{ij} \end{aligned}$$

Model 2

$$\begin{aligned} Calories_{ij} = {} & \alpha_{ij} + \beta_1 Human\ density_{ij} + \beta_2 Similarity_{ij} + \beta_3 Self\ Construal_{ij} \\ & + \beta_4 (Human\ density \times Similarity)_{ij} + \beta_5 Morning_j + \beta_6 Evening_j \\ & + \beta_7 Night_j + \beta_8 Planned\ Purchase_{ij} + \beta_9 Years\ as\ customer_{ij} \\ & + \beta_{10} Number\ of\ People\ in\ the\ Group_j + \beta_{11} Gender_{ij} + \beta_{12} Age_{ij} + \varepsilon_{ij} \end{aligned}$$

Model 3

$$\begin{aligned} Calories_{ij} = {} & \alpha_{ij} + \beta_1 Human\ density_{ij} + \beta_2 Similarity_{ij} + \beta_3 Self\ Construal_{ij} \\ & + \beta_4 (Human\ density \times Similarity)_{ij} \\ & + \beta_5 (Human\ density \times Self\ Construal)_{ij} \\ & + \beta_6 (Similarity \times Self\ Construal)_{ij} \\ & + \beta_7 (Human\ density \times Similarity \times Self\ Construal)_{ij} + \beta_8 Morning_j \\ & + \beta_9 Evening_j + \beta_{10} Night_j + \beta_{11} Planned\ Purchase_{ij} \\ & + \beta_{12} Years\ as\ customer_{ij} + \beta_{13} Number\ of\ People\ in\ the\ Group_j \\ & + \beta_{14} Gender_{ij} + \beta_{15} Age_{ij} + \varepsilon_{ij} \end{aligned}$$

For all the models:

$\alpha_{ij} = \alpha_0 + \mu_{0j}$

$i$ = individual

$j$ = group

Human density is considered as the maximum value of other people present in the bar during the purchase. Human density can vary across people belonging the same group since during the purchase the number of people inside the bar can vary.

Results are reported in Table 3.5.

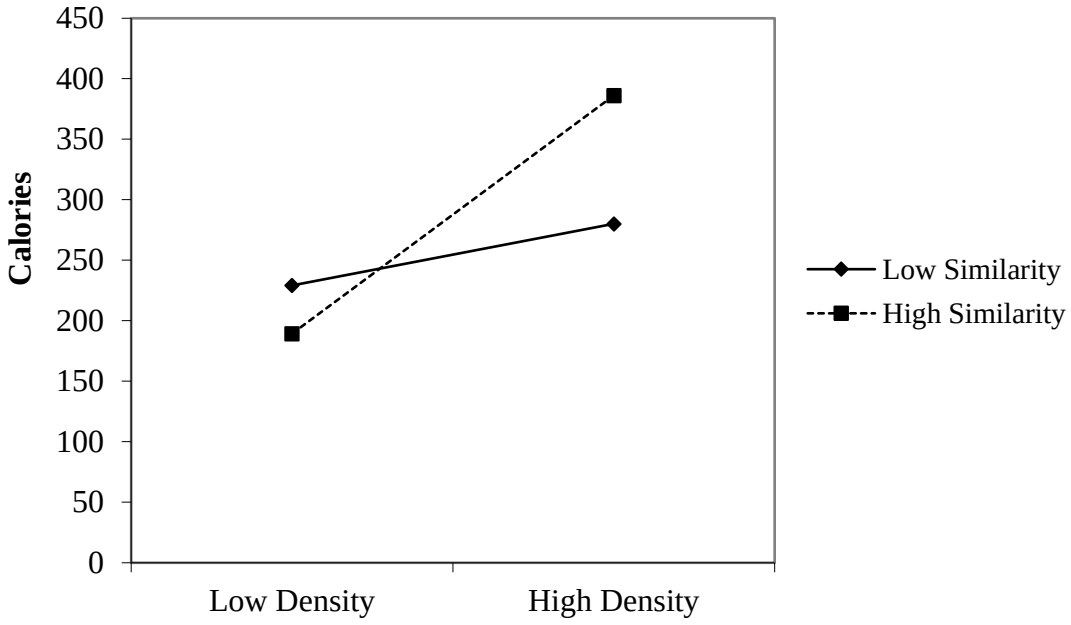
**Table 3.5 Models results – DV = Calories**

| *Independent Variable* | **Model 1** | **Model 2** | **Model 3** |
|---|---|---|---|
| | **Estimates** | **Estimates** | **Estimates** |
| Human density | 6.51 * | 6.39 * | 6.02 * |
| Similarity | 10.42 | 9.77 | 6.23 |
| Self-Construal | -8.18 | -7.66 | 1.04 |
| Morning | -30.78 | -38.75 | -50.12 |
| Evening | 78.64 | 82.44 | 77.03 |
| Night | -78.30 | -71.79 | -55.04 |
| Planned Purchase | -16.68 | -16.08 | -29.00 |
| Years as customer | 4.40 | 4.79 | 7.16 |
| People in the group | 45.86 * | 42.30 * | 31.96 |
| Gender | 7.43 | 3.06 | 7.78 |
| Age | -2.22 | -2.40 | -2.23 |
| Density × Similarity | | 2.25 * | 2.87 ** |
| Density × Self-Construal | | | -1.96 ** |
| Similarity × Self-Construal | | | 5.18 |
| Human density × Similarity × Self-Construal | | | 1.13 ** |
| Bryk/Raudenbush $R^2$ (individual level) | 0.04 | 0.07 | 0.24 |
| LR test $\chi^2$ *vs*. null model | 23.43 ** | 28.18 ** | 54.32 ** |
| LR test $\chi^2$ *vs*. previous model | --- | 4.24 * | 21.92 ** |

Unstandardized estimates are reported. ° $p < .10$, * $p < .05$, ** $p < .01$

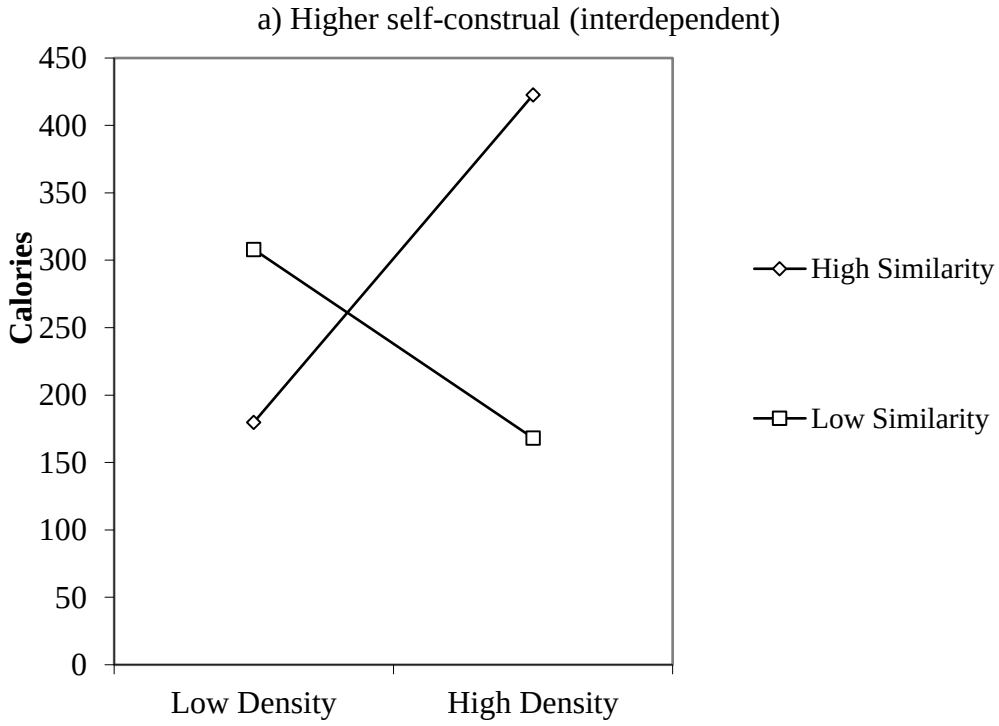
Results of Model 1 imply that only human density ($b$ = 6.51, $p$ = .025) and the number of people in the group ($b$ = 45.86, $p$ = .032) have significant effects on calories. Thus, on average higher human density and larger groups led to higher calories intake. In Model 2, I added the interaction effect between human density and similarity, which proved to be positive and significant ($b$ = 2.25, $p$ = .038), in line with the first research hypothesis. Simple slopes analysis revealed that at low levels of similarity (mean minus 1 SD) the conditional effect of human density on calories intake was not significant ($b$ = 2.62, $p$ = .447). As expected, at high levels of similarity (mean plus 1 SD) the conditional effect of density on calories intake was positive and significant ($b$ = 10.17, $p$ = .003). These results provide support for H1. Figure 3.1 describes the conditional effect of human density on calories intake at low and high levels of similarity.

**Figure 3.1 The interaction between human density and similarity on calories intake**

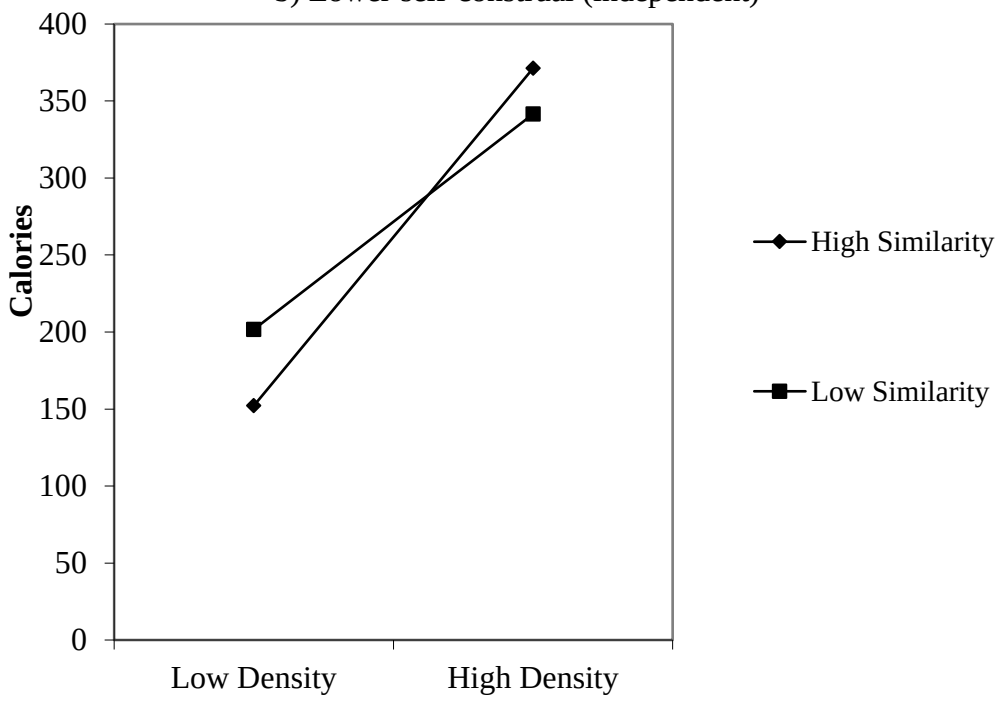


Results of Model 3 show that the three-way interaction among human density, similarity, and self-construal is significant ($b$ = 1.13, $p$ = .005). Simple slopes analysis revealed that for consumers with more interdependent self-construals (mean plus 1 SD) who perceived low similarity with other customers, the effect of human density on calories intake was negative and marginally significant ($b$ = - 6.78, $p$ = .086), while the same effect was significant and positive in the cases of high similarity ($b$ = 10.66, $p$ = .009). As expected, for consumers with more independent self-construals (mean minus 1 SD), the presence of similar or dissimilar customers did not influence the effect of human density on calories intake. In fact, with both low ($b$ = 9.21, $p$ = .011) and high ($b$ = 10.98, $p$ = .003) perceived similarity, the effect of human density on calories intake was positive and significant. These results provide general support to H2. Figure 3.2 depicts the three-way interaction effect of human density, perceived similarity, and self-construal on calories intake.

**Figure 3.2 Three-way interaction – Simple slopes**



b) Lower self-construal (independent)




To test for the stability of the presented results, I checked for the presence of multicollinearity. I calculated the VIFs in the three models (Table 3.6). The highest VIF was related to the Evening dummy (1.58) and was well below critical thresholds (Stock and Watson, 2003). Such evidence increases the confidence in the presented results.

**Table 3.6 Models VIFs**

| *Variable* | **Model 1** | **Model 2** | **Model 3** |
|---|---|---|---|
| | **VIFs** | **VIFs** | **VIFs** |
| Human density | 1.4 | 1.4 | 1.44 |
| Similarity | 1.1 | 1.1 | 1.10 |
| Self-Construal | 1.1 | 1.11 | 1.18 |
| Morning | 1.25 | 1.25 | 1.26 |
| Evening | 1.58 | 1.58 | 1.58 |
| Night | 1.19 | 1.19 | 1.20 |
| Planned Purchase | 1.1 | 1.10 | 1.11 |
| Years as customer | 1.11 | 1.12 | 1.12 |
| People in the group | 1.29 | 1.30 | 1.34 |
| Gender | 1.14 | 1.15 | 1.15 |
| Age | 1.19 | 1.19 | 1.23 |
| Human density × Similarity | | 1.03 | 1.06 |
| Human density × Self-Construal | | | 1.12 |
| Similarity × Self-Construal | | | 1.10 |
| Human density × Similarity × Self-Construal | | | 1.10 |
| Mean VIF | 1.12 | 1.21 | 1.21 |

The results of Study 1 confirmed both the research hypotheses. First, from Model 2 it was possible to establish that perceived similarity with other customers in the crowd moderated the relationship between human density and calories intake, providing support to H1. In particular, it emerged that human density influences significantly and positively calories intake only in presence of similar customers. The results of Model 3 provided support to H2, demonstrating that consumer independent *vs.* interdependent self-construal further affects the analyzed relationship. In detail, consumers with an interdependent self-construal in proximity to many dissimilar individuals tend to decrease calories consumption. For consumer with an interdependent self-construal perceiving high similarity toward other customers in the crowd, human density led to an increase in the amount of calories assumed. For

consumers with an independent self-construal, instead, perceived similarity does not moderate the effect of human density on calories intake. Overall, the results confirmed that in studying the effects of human density on consumer behavior it is necessary to consider also social and personal factors.

### 3.4 Study 2 – Experimental Study

Two hundred and ninety-eight US participants ($M_{age}$ = 29.91, Female = 44.6%) were recruited from Prolific Academic in exchange for small compensation. Respondents were randomly assigned to one condition of a 2 (human density: low *vs.* high) x 2 (similarity: low *vs.* high) between-subjects design.

Participants were invited to imagine entering a café-restaurant to order something and that they started looking around at other customers. Manipulation of similarity was administered stating: "You take a seat and looking around you feel that the other customers inside the café-restaurant are very similar to (very different from) you regarding age, habits, personality, lifestyle, and interests". Next, it was displayed for a fixed amount of time (15 seconds) the image of a bar designed and rendered with the software ArchiCAD 19. In the low and high density conditions, there were 3 and 27 customers, respectively.

Then, it was required to imagine ordering a dessert and to choose the preferred option among five alternatives, presented in random order. The five desserts and the relative calories, used as dependent variable, were obtained from the BBC Good Food depository[3] and reported in Table 3.7.

[3] https://www.bbcgoodfood.com

**Table 3.7 Dessert options and calories**

| Dessert | Calories |
|---|---|
| Lemon curd & yogurt fool  | 299 |
| Chocolate raspberry brownies  | 389 |
| White chocolate crème brûlée  | 451 |
| New York cheesecake  | 549 |
| Double chocolate & Cream trifle  | 723 |

Next, participants answered the interdependence with sociability 3-item scale ("I believe that people close to me are important parts of my self"; "I believe that intimate relationships could reflect one's self-identity"; "I have a strong identification with people close to me"; 7-point Likert scales) proposed by Lu and Gilmour (2007), used to measure self-construal, and reported socio-demographic information.

Results of a two-way ANOVA[4] indicated non-significant direct effects of human density and similarity ($Fs < 0.837$, $ps > .361$) and a marginally significant interaction effect ($F(1,294) = 2.966$, $p = .086$). Simple slopes analysis indicated that in the low similarity scenario, the effect of human density was marginally significant and negative ($F(1,294) = 3.250$, $p = .072$), while in the high similarity condition was not significant ($F(1,294) = .409$, $p = .523$). Means and standard deviations are reported in Table 3.8.

**Table 3.8 Mean and standard deviations of calories in the four experimental conditions**

| Similarity | Human Density | |
|---|---|---|
| | Low | High |
| Low | 546.23 | 534.07 |
| | (119.08) | (131.07) |
| High | 508.06 | 547.76 |
| | (131.86) | (135.09) |

As hypothesized, similarity with the other customers in the crowd positively moderated the relationship between human density and calories consumption. The effect of human density on calories increases as similarity increases. However, the

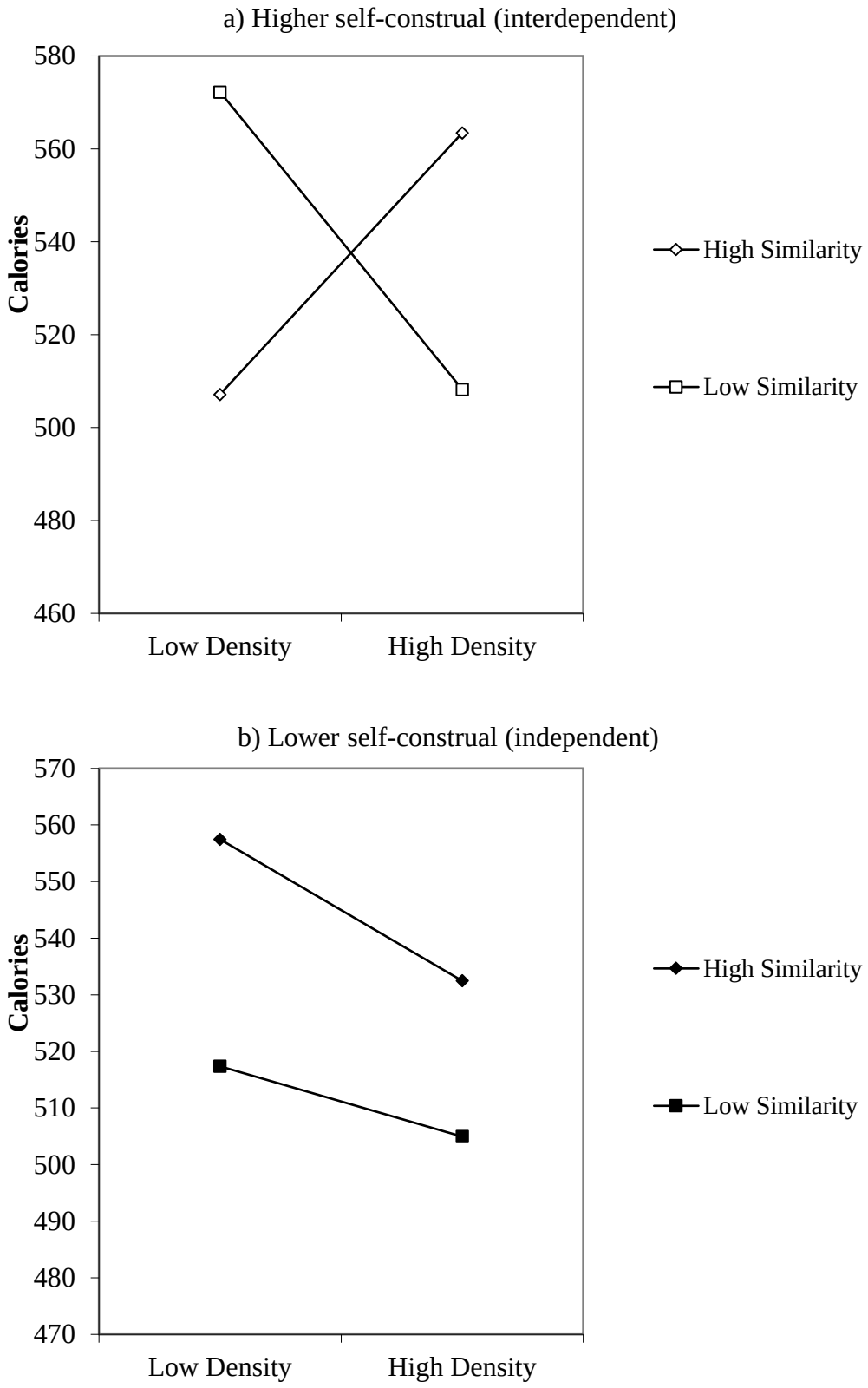
[4] Using an ordinal logit model, the results remain consistent and almost equivalent.

pattern seems less clear compared to the one obtained in Study 1. Thus, H1 can be confirmed only partially.

To test the second research hypothesis, I conducted an ANCOVA[5], including in the model the measure of consumer self-construal. The three items of the scale (Cronbach's α = .769) were averaged to form a self-construal index (highest scores depict an interdependent self-construal). Moreover, all the two-way interactions and the three-way interaction were added as predictors. Results indicated that the direct effects of human density, similarity, and self-construal were not significant (*Fs* < 2.322, *ps* > .129), as well as the human density × self-construal and similarity × self-construal two-way interactions (*Fs* < 1.913, *ps* > .168). The interaction between human density and similarity was marginally significant ($F(1,290) = 3.222$, $p = .074$). More relevant, for the aims of this analysis, the three-way interaction proved to be significant ($F(1,290) = 4.711$, $p = .031$). Simple slopes analysis indicated that for consumer with more interdependent self-construal (mean plus 1 SD) in low similarity condition, the effect of human density was negative and significant ($b = -63.01$, $p = .031$). On the contrary, in the case of high similarity, the same effect was positive and marginally significant ($b = 56.96$, $p = .072$). For consumers with more independent self-construal (mean minus 1 SD), the effect of human density was not significant in the low similarity conditions ($b = -12.51$, $p = .679$), as well as the cases of high similarity conditions ($b = -25.05$, $p = .407$). Figure 3.3 represents graphically results of ANCOVA.

[5] Using an ordinal logit model, the results remain consistent and almost equivalent.

**Figure 3.3 Three-way interaction – Simple slopes**



Results of the ANCOVA replicated the pattern emerged from Study 1. For consumers with an interdependent self-construal, the presence of similar or dissimilar individuals influences the direction of the effect of human density on calories, that was positive and negative respectively. For consumers with an independent self-construal, the perception of being similar to or dissimilar from other customers does not influence the effect of human density on calories. Thus, it is possible to confirm the second research hypothesis.

### 3.5 General discussion

The present research provided demonstration of how social and personal factors can diametrically change the relationship between human density and calories consumption. The first research hypothesis predicted that the presence of similar customers positively moderated the effect human of density on calories intake. Study 1 demonstrated that in contexts with high perceived similarity, human density leads to consuming more calories. Instead, when dissimilar customers compose the crowd the relationship is not significant. The results of Study 2 partially confirmed this evidence. In the second study, in presence of similar customers, human density did not produce a significant effect on calories, which becomes negative and significant in presence of dissimilar consumes. In both the studies, similarity positively moderated the relationship, but it is fair to underline the differences which emerged from simple slopes analysis. While in Study 1 similarity activates the positive effect of density on calories, in Study 2 it defines a boundary condition. Then, the overall idea proposed in H1 was supported from the result, but it emerges the necessity to conduct further studies to clarify the differences in the results of the two studies.

According to the second research hypothesis, only consumers with an interdependent self-construal show differences in the effects of human density on calories intake depending on perceived similarity. In both studies, consumers with an interdependent self-construal increased caloric consumption in presence of high density and high similarity situations, while reduced the intake when dissimilar subjects composed the crowd. For consumers with an independent self-construal, the presence of similar or dissimilar customers does not influence the effect of human density on calories intake. Also in this case, it was possible to obtain overall support for the research hypothesis, but some differences between the results of Studies 1 and 2 did emerge. In fact, while for consumers with an interdependent self-construal, results were consistent across studies, for consumers with an independent self-construal, I found a positive effect of human density on calories intake in Study 1 (with low and high similarity) and a null effect of human density on calories intake in Study 2 (with low and high similarity). One possible explanation for these different results between the two studies is related to the dependent variable adopted in Study 2. While in Study 1, the variability in calories is more pronounced, in Study 2 the dependent variable assumes only five values, lowering the power of the analysis to detect the relationship between human density and calories intake. Despite this difference, as hypothesized, consumers with an interdependent self-construal demonstrated to be sensitive to variations in similarity, whereas consumers with an independent self-construal did not. In summary, the two research hypotheses received overall support, but it is necessary to conduct replication studies to further analyze the impact of density, similarity, and self-construal on calories consumption.

This research contributes to the crowding literature in several ways. First, it provides evidence on how the effect of human density on calories intake depends on social and personal factors. Prior research in consumer behavior emphasized that human density leads to an overall increase in calories consumption due to the augmented complexity of the environment (Hoch and Bagchi, 2017). The present theorization included elements from social facilitation and impression management theories, which underline how the presence of other individuals can increase or decrease food intake (Herman, Roth, and Polivy, 2003). From the presented results, it emerged that is not possible to ignore the relationship with the other customers in the crowd (similarity) and specific personality traits (self-construal). More in general, this research emphasizes how social factors are crucial elements to consider in the analysis of any effect of human density on consumers' outcomes (Stokols, 1972).

Future research is necessary to better understand how the interaction between human density and similarity affects calories consumption. This research provides evidence for a positive moderation effect of similarity. However, it is crucial to determinate if low levels of similarity determine a negative impact of human density on calories or acts as a boundary condition. Also, it is necessary to provide an empirical demonstration of the hypothesized processes. For example, a laboratory study can try to replicate the findings including a measure of fear of negative evaluations. In this way, it would be clear if the reduction of calories intake in low similarity scenarios is due to avoidance of possible negative judgments.

Finally, the present research offers some managerial implications. In the modern market contexts, stores can be positioned to serve specific clusters. In these situations, it is more likely that the consumers perceive high similarity with the other subjects.

The present research suggests that in high density scenarios consumer's demand can be oriented toward more hedonistic and caloric food. From the policy-maker point of view, with the aim to reduce calories and unhealthy consumptions the reported findings suggest to increase common areas to mitigate the effects of human density. In a concrete example, food courts in universities, where the perceived similarity with others is high, should be designed in larger surfaces to reduce the demand for caloric food.

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# CONCLUSIONS

This dissertation aimed to demonstrate that in the analysis of the effects of human density on consumer responses it is necessary to consider also social factors. The results described in the three essays demonstrate that consumer behavior models should consider not only the number of people present in a certain place at a certain time but also the nature of the components of the crowd. In fact, the proposed studies clearly show that the effects of human density on consumer reactions can change, even diametrically, when the composition of the crowd, in terms of social group identity or similarity, varies.

In the first essay, I demonstrated by means of an experimental study that social groups moderate the relationships between human density and willingness to stay and vice *vs.* virtue choices. It emerged that when the crowd is composed of positive social groups (in-group and aspirational group), human density increases the willingness to stay. Also, the results of the study demonstrated that it is not possible to identify a universal effect of human density on vice *vs.* virtue choices, as hypothesizing by a recent contribution (Hock and Bagchi, 2017). In detail, human density is positively correlated to vice consumption only when the crowd is composed of dissociative group members. On the contrary, the presence of aspirational individuals leads human density to increase the preference for the consumption of virtue products. This first essay demonstrated how social factors can change and influence the effects of human density on consumer cognitive and behavioral reactions.

In the second and third essays, I further explored the interaction between human density and social factors, analyzing other related consumers outcomes, such as

repurchase behavior and calories intake. In detail, in the second essay, I analyzed how the presence of similar vs. dissimilar customers modifies the relationship between human density and repurchase behavior. I analyzed four years of behavioral data of the customers of a sporting center, by calculating the levels of human density and similarity (based on expertise in the service) encountered by the customers. The results of this study provided clear indications on the crucial role of social factors. In fact, it emerged that in presence of similar customers, human density affects repurchase behavior positively. On the contrary, the same effect is negative in presence of dissimilar customers.

In the third essay, I investigated the effect of human density on calories intake. By means of field and laboratory studies, I demonstrated that as perceived similarity with other customers increases, the effect of human density on calories intake increases. Moreover, I included in the model also a personal factor, consumer self-construal, demonstrating that only interdependent consumers adjust their calories intake in presence of similar or dissimilar individuals.

The presented results were obtained analyzing the phenomenon in different contexts, such as a café-restaurant (essays 1 and 3), a sport center (essay 2), and a bar (essay 3). Even considering the variability in contexts of analysis, the pattern that emerged always indicated a significant role of social factors in influencing the outcomes of human density. Moreover, I employed a variety of research techniques, such as laboratory experiments (essays 1 and 3), secondary data analysis (essay 2), and field studies (essay 3). Regardless of the research technique, the results indicated that it is not possible to predict consumer reactions to human density correctly without considering social factors.

The main contribution of the three essays to the literature on crowding was to provide evidence on the crucial role of social factors in the analysis of human density and consumer outcomes. Both considering social group identity (essay 1) and similarity with other customers (essays 2 and 3), the results demonstrated the moderating role of social factors. In the literature on crowding there is still disagreement concerning the consequences related to human density (Mehta et al., 2013). This research may help to better understand why in some cases human density leads to positive outcomes, while in other contexts it determines adverse reactions. Moreover, the second essay provides, to the best of my knowledge, the first contribution on the analysis of the relationship between human density and repurchase behavior. Finally, the third essay includes all the elements, cited by Stokols (1972), able to influence crowding perception: human density, social factors, and personal factors.

The studies presented in this dissertation suffer from a series of limitation. Although I considered a variety of contexts, it would be important to conduct a study testing my conceptualization in a purely utilitarian setting, such a supermarket. It would be relevant to analyze if the moderation effect of social factors emerged in my studies is still observable in a task-oriented scenario. It is possible to hypothesize that in such situation, similarity with other customers would act as a boundary condition, reducing the adverse effect of human density demonstrated by other scholars (Langer and Saegert, 1977; Harrell, Hutt and, Anderson, 1980). Future research should also provide evidence of the hypothesized mechanisms. This would require conducting moderated-mediation analyses, in which the roles of the processes are demonstrated empirically. As evidenced in the theoretical background of each essay, it is possible to

hypothesize different mechanisms related to the various dependent variables investigated in this dissertation. For example, the analysis of the moderation effect of social groups on the relationship between human density and willingness to stay would require measuring the level of satisfaction of self-verification and self-enhancement needs. The analysis of vice *vs.* virtue choices would require measuring cognitive load, impression management motivations and emotional states. As argued in the second essay, the moderating role of similarity in the relationship between human density and repurchase behavior would require evidence on customer satisfaction. Finally, the relationships demonstrated in the third essay would require measuring the fear of negative evaluations.

This research offers a series of managerial implications. I provided evidence of cases in which human density contribute to creating consumer value. Firms serving specific market segments, assuming therefore high similarity between consumers, can evaluate to employ smaller surfaces. This would create a double advantage: consumer value creation and costs reduction. On the opposite, firms serving a more general audience, assuming therefore low similarity between consumers, should consider the possible adverse reactions to human density and then opt for larger surfaces. Additionally, the current research provides indications to policymakers. As demonstrated in the third essay, when consumers perceive high similarity with other individuals, human density produces larger calories intake. Thus, it is possible to drive consumers to healthier food augmenting surfaces. For example, food courts in which is known apriori that the similarity between consumers is high (e.g., in universities) should be designed in larger spaces.

Human density is a crucial factor in many market contexts, and this research suggests to scholars and practitioners that it is necessary to study this phenomenon considering the role of social factors.