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FORMATION AND EFFECT OF SOCIAL INTERACTIONS IN ONLINE BRAND COMMUNITY: AN EMPIRICAL INVESTIGATION

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Abstract

Online brand communities, enabled by social media technology, are being utilized by companies to improve marketing and sales. However, little is known about how to encourage customer interactions in an online brand community and whether the interactions can affect purchase behavior. To address these research questions, we explore factors that influence the formation of social interactions in an online brand community and assess the impact of different types of social interactions on customer purchase behavior, resulting in a set of theoretical hypotheses about social interactions for e-commerce. We test our hypotheses using a data set that includes customer social interactions and purchases in an online brand community. Our results show that homophily in certain customer characteristics (e.g., member age, location, deal sensitivity) positively impacts the formation of social interaction while homophily in other customer characteristics (e.g., share premium products) does not. We also find that social interactions with people who have purchased strongly influence customer purchase behavior. Furthermore, the effect of such social interactions is strengthened by geographical proximity. We discuss theoretical implications of our results and also offer practical guidelines for managers on how to manage customer relationships in online brand communities.

Keywords: Social interaction, Online brand community, E-commerce

1 INTRODUCTION

An online brand community (OBC) is a consistent collection of customers with common interests in a particular brand whose primary method of communication is the Internet. It offers a new channel for organizations to connect with customers (Brodie et al. 2013; Dellarocas 2006; Ogawa et al. 2006). For customers, an online brand community enables them to communicate with firms and share product information with others. Previous studies found that OBCs help firms maintain customer relationships (Szmigin et al. 2005) and provide a supportive context to breed customer loyalty (Jang et al. 2008).

The success of an OBC depends on continuous customer participation. However, research has found that most customers who visit an OBC contribute little and leave quickly (Ducheneaut 2005; Nonnecke et al. 2001). Firms face the challenges of encouraging customers to participate in the OBC and improving customer value through their participation. The literature on online communities suggests that member participation and retention depends on social interactions (connect members with like-minded others and interact on/about topics of interest) (Preece et al. 2009); and facilitating mass interactions among customers. Shen et al. (2010) showed that social interaction is a key determinant of members' continual patronage of an OBC, and frequent member interaction enhances customer loyalty. Wang et al. (2009) studied the relationship between social interaction and continuance intention in online auctions, and they found that social interactions increased continuous intention by creating social capital. Moreover, studies also found that social interaction in online community can shape customers' perceptions regarding the product (Nambisan et al. 2011) and improve customers' consumption intention of products (Ng 2013; Phang et al. 2013).

Despite the importance of social interaction as a vehicle for customers' continuous participation and improving customer value, to date the bulk of this research mainly focused on exploring the mechanism under which social interaction impacts customer behavior. There remains a lack of research on what factors may influence forming social interactions in OBCs and how different types of social interactions in OBCs are related to actual purchase behavior. Most of existing studies on social interaction conduct their research by survey or experiments (Ng 2013; Wang et al. 2009). Our study complements and extends the extant research in two important ways. First, we extend the theory of homophily into the context of OBCs identifying the positive and negative impacts of certain customer characteristics. Second, to the best of our knowledge, this paper is the first attempt to study the relationship between different types of social interactions and actual purchase behavior. We test our hypotheses by combining data sources on customer personal information, their social network data in an OBC, and their actual purchase records.

The remainder of this paper is organized as follows. Section 2 presents our theoretical background and empirical hypotheses. Section 3 describes the data we collected for this study. Section 4 explores the formation mechanisms of social interactions in OBC, and Section 5 examines the relationships between different types of social interactions and customer purchase frequency. Section 6 discusses the potential implications of this research. Section 7 concludes this paper.

2 THEORY AND HYPOTHESES

2.1 Social Interactions

Social interaction captures the relationships among people in social networks. Specifically, social interaction in an OBC can be represented by mutual friend relationships among people. Social interactions among customers in an OBC influence customer behavior; research found that social interaction enabled by the social network is a significant predictor of customer behavioral intentions (Wu et al. 2011). Participants in social media do not interact with others evenly but do follow specific interaction mechanisms (Huang et al. 2013; Takhteyev et al. 2012). For example, the higher a person's

reputation, the more members there are interacting with them. In this study, we examine how homophily of customer attributes influences forming social interactions in an OBC.

Furthermore, individuals interact with others in social networks and different patterns of interaction among the actors may lead to various outcomes, both at the individual level (e.g., customer loyalty (Shen et al. 2010) and purchase intention (Phang et al. 2013)) and at the collective level (e.g., supplier brand sales performance (Rapp et al. 2013)). Our study also explores how different types of interactions in a social network are related to customer purchase frequency.

2.2 The Formation of Social Interactions

In a virtual community, such as an OBC, the formation of social interactions is non-random. One observation is that individuals tend to interact with people who are similar to them (Carley 1991; Huston et al. 1978). Sociologists have long noted that homophily in ascribed attributes, such as age and gender, leads individuals to interact with each other (Blau 1977; McPherson et al. 2001) and geographic propinquity creates a context in which homophilous relations form. Previous studies found that the homophily principle plays a critical role in the formation of friendship networks at school (Goodreau 2007; Goodreau et al. 2009; Mayer et al. 2008). In addition to similarity based on ascribed attributes, Lazarsfeld et al. (1954) also distinguished a specific type of homophily - value homophily (i.e. similarity based on achieved attributes), which is based on values, attitudes, and beliefs.

Similarity on location, age, and member age makes customers tend to interact with each other. Previous studies show that people are more likely to have contact with those who are closer to them in geographic distance (Gans 1968). People from the same location are similar in culture, race, and beliefs, and people tend to interact and help people who come from the same place (Kalnins et al. 2006). Although Information Technology (IT) enables people to interact with others without the limitation of distance, researchers still found that spatial proximity exerts a significant and positive impact on individuals' interactions even in computer-mediated contexts (Kraut et al. 1988). Moreover, similarity on age also leads customers to interact with each other. Customers, who are similar on age, are more likely to have the same opinions on products, and thus leading to better communication among these customers. Huang et al. (2013) found that homophily in age have strong impacts on individuals' behavior in creating online relations in the virtual world. Finally, similarity on member age also matters for the formation of social interaction. Member age indicates the length of membership of customers. Customers with similar member age are likely to have shared community experience and similar interest in the brand. Individuals are more likely to interact with people who have similar community experience and interest (Huang et al. 2013). Although theory predicts similarity of location, age, and member age affects interaction formation in online brand community, there is no systematic evidence that supports these effects. Therefore, we propose:

H1. Homophily in location, age, and member age (length of membership) have positive impact on the formation of social interaction in an OBC.

An OBC is a specific social network, which consists of consumers of a brand. In addition to sociodemographic attributes of customers, their attitudes, abilities, and aspirations will also influence the formation of social interactions (Huston et al. 1978). Drawing on customer relationship management literature (Quelch 1987; Schneider et al. 1991), we identify two key customer characteristics (i.e., deal sensitivity and share of premium products) and explore how these characteristics are related to the processes of forming social interactions.

The first customer characteristic is deal sensitivity, which is defined as the extent to which a focal customer looks to buy items on promotion. Customers with high deal sensitivity tend to search more for products from competing sellers and are more likely to buy products from the sellers who offer the lowest price (Ailawadi 2001). These customers tend to be lurkers in an OBC and they participate only to search for promotions. Deal-prone consumers invest less time in social interactions in the OBC and are likely less committed to others (Rishika et al. 2013). Thus, we assume that:

H2. Deal sensitivity of customers has a negative impact on the formation of social interaction in an OBC.

The second customer characteristic is share of premium products. Premium products are priced much higher than other products. Consumers with a large proportion of premium products are more inclined to engage in social interactions in brand communities (Rishika et al. 2013). Premium products always lead to high involvement purchases (Pavlou et al. 2007), and customers who buy premium products are more likely to receive information or suggestions from other experienced customers. In addition, customers with a great share of premium product purchases have high switching costs and this makes them more likely to be involved in activities in order to get better service from the firms. Thus:

H3. Share of premium products has a positive impact on the formation of social interaction in an OBC.

Both customers' characteristics of deal sensitivity and share of premium products are not shown on customers' profile pages. However, members can perceive others' purchase characteristics by observing. The unobserved individual attitudes and beliefs play more important roles than shared social characteristics in such online brand community (Brown et al. 2007; McPherson et al. 2001). Extensive social psychology experiments established that attitude, ability, and aspiration similarity lead to attraction and interaction (Huston et al. 1978). Customers with similar deal sensitivity have similar interest in promotions and their topics of communication are about attractive offers of products. Further, members with similar share of premium products focus on the same category of products. For example, for customers with high share of premium products, they concern with expensive products and pay attention to the quality and design of products. Aiello et al. (2012) showed that users with similar interests are more likely to build social interaction. Despite rich emphasis on the importance of customers' achieved attitudes on the formation of social ties in online community, there is no systematic evidence to these effects. Hence, we propose the following:

H4(a). Homophily in deal sensitivity has a positive impact on the formation of social interaction in an OBC.

H4(b). Homophily in share of premium product purchases has a positive impact on the formation of social interaction in an OBC.

2.3 The Impacts of Social Interactions

Social interactions enabled by social networks in social media enhance customers' purchase intention (Phang et al. 2013). Social interactions in an OBC permit users to ask for help from others, share information with others, and talk with sellers, thus developing a supportive social environment. According to Oliver's study, this supportive social environment will breed customer loyalty (Oliver 1999). Moreover, social influence derived from friends' interactions in a social network will also lead to purchase. Internalization, which is one type of social influence related to online social networking, indicates that persons accept and agree with others' beliefs and behavior because the influential content is intrinsically rewarding (Kelman 1958). Participants in an online brand community share product information with their friends and receive recommendations from others. These types of interactions have been shown to increase social networking users' purchase intention (Shin et al. 2011). Therefore, the high involvement in social interactions in an OBC seems to increase customers' purchase frequency.

Previous studies have found the structural dimensions of social interactions affect customer behavior significantly (Wang et al. 2009). In this study, we also focus on the structure of social interaction and adopt two measurements - degree centrality and betweenness centrality. Degree centrality measures an actor's direct ties with others and is calculated by the number of nodes connected to a particular actor (Nieminen 1974). The number of contacts a customer has (degree centrality) reflects the level of involvement in a social media network (Moody et al. 2003). Betweenness centrality measures the fraction of the shortest paths between pairs of nodes that pass through the focal node (Freeman 1979; Otte et al. 2002). High betweenness indicates customers' immediacy with others. Based on social

impact theory, two factors seem to determine the impact of any information source: one is the number of people who make up that source (degree centrality), and the other is the source's closeness with the receiver (betweenness centrality). Therefore, we presume that:

H5(a). One's social interaction with customers measured by degree centrality is positively associated with customer purchase behavior.

H5(b). One's social interaction with customers measured by betweenness centrality is positively associated with customer purchase behavior.

In addition, based on the attributes of customers, we also explore the relationships between different types of social interaction and customer purchase frequency. The degree of interaction with different types of people seems to moderate the relationship between social interaction and purchase frequency. Ng found that the interaction with close or familiar users leads to a greater influence on the intention to purchase in a social network community (Ng 2013). Previous buyers are more likely to recommend products to others and impact their purchase behavior. And the interactions with customers who have purchased are more likely to lead customers to share their behavior patterns (peer effect). Thus, we expect the following:

H6. One's social interaction in an OBC with people who have purchased will have a stronger effect on his/her purchase behavior than the social interaction with people who have not purchased.

Studies assert that geography plays a key role in influencing people's behavior via social interaction (Agarwal et al. 2009; Warschauer 2003). Individuals in social networks tend to trust people who are from the same place and are more likely to build strong ties with them. Individuals tend to take people who are living nearby as a reference group (Agarwal et al. 2009) and local network externalities also lead people to behave analogously (Niles et al. 2001). Therefore, we hypothesize that:

H7. The relationship between social interaction with purchase customers and customer behavior is positively moderated by geographic propinquity.

3 DATA

The data set for this study comes from an e-commerce company that designs, produces, and sells little girls' apparel in China. The focal company is one of the leading companies in this industry in China, with sales reaching \$50 million in 2011. In addition to setting up an e-commerce website to sell its products, the firm created an OBC to enable interaction among customers. Consumers can create a personal profile page (similar to profile pages on other social networking websites), link to friends' pages, post information on the forum, and reply to others' postings. Customers use their e-commerce website account to register in the OBC. This advantage enables us to link customer behavior in the OBC to their real purchase behavior.

Our data set consists of two parts. First, we used a specifically programmed web crawler to gather information on customers' friendship and registration records in the OBC. Our web crawler collected this information from a sample of more than 1,300 customers who participated in the OBC and made friends in December 2012. Second, the focal firm provided us with (1) the customer reward program database with information for more than 10,000 customers, and (2) the transactional data of customers from May 2011 to December 2012. This data set provides us rich information on customers' demographics, address, and purchase characteristics. We calculate deal sensitivity and share of premium products by following the methods provided by Rishika et al. (2013). Finally, we matched customers' purchase behavior with community friendship via user IDs. We omit customers who registered in the community before May 2011. We also omit customers who have any missing variables. There are about 1,200 customers in our final data set. This data set allows us to explore the impact of customer attributes on the formation of social ties in an OBC and the relationship between a social network and customer purchase behavior. Table 1 shows the descriptive statistics of variables.

		Mean	Std. dev	Min	Max
Purchase behavior	Purchase frequency	7.77	7.50	1.00	37.00
Customer purchase characteristics	Deal sensitivity	0.32	0.30	0.00	1.00
	Share of premium products	0.08	0.17	0.00	1.00
	Payment methods	1.80	1.00	1.00	4.00
Location	Province	17.44	9.17	2.00	32.00
	Is rural	0.17	0.37	0.00	1.00
	Location economy	1.64	0.84	1.00	3.00
	Freight	2.48	3.23	0	20
Demographics	Age	32.70	2.50	23.00	42.00
	Member age (days)	529.80	156.88	8.00	938.00
Social network statistics	Degree	16.42	34.02	1.00	372.00
	Betweenness	563.24	825.53	0.00	2153.85

Table 1. Descriptive statistics

4 THE FORMATION OF SOCIAL INTERACTIONS IN AN ONLINE BRAND COMMUNITY

In this section, we examine the influence of customers' age, location, and purchase characteristics on the formation of social ties in an OBC. The formation of relational ties in a virtual community depends on both endogenous structural tendencies and exogenous factors. We use Exponential Random Graph Models (p*/ERGM) to conduct our analysis. ERGM explicitly incorporate the dependence of the relations within a network by considering the observed network as one realization of a network generation process and estimate the likelihood that the/an observed structure would emerge (Robins et al. 2007). We consider both exogenous factors, such as age, and endogenous structural tendencies, such as triad closure, in our model.

In our analysis, we draw inferences of exogenous factors that could be associated with the likelihood of a friendship tie existing between two customers: age of customers (e.g., age and member age), location (e.g., where they are from, rural location, and the economy of location), and their purchase characteristics (e.g., deal sensitivity and share of premium products). Age (Member age) and Age difference (Member age difference) are used to examine how age and homophily in age influence the forming friendship in the OBC, respectively. Moreover, how the location environment (Is city and location economy) and homophily (same province, same location economy, and Both in rural) influence the formation of social ties is examined. Finally, Deal sensitivity, Share premium, and the differences between them are used to explore the impact of customer purchase characteristics (homophily in purchase characteristics) on building relational ties in the OBC, respectively.

While examining the impacts of the exogenous factors on forming online relations, ERG models control for the endogenous factors that enable and constrain the formation. Research on social networks of friendship found that endogenous structural tendencies influence the structure of virtual world networks. In reality, individual degrees in social networks always follow the power law distribution. Individuals tend to connect to others who already have many ties because of preferential attachment; therefore the popular individuals will gain even more ties. As a consequence of balance theory, researchers have found that two individuals who are both tied to a third person are also tied to

each other, which is called a tendency toward transitivity. To control for endogenous structural tendencies, we included two network statistics in the ERGM: the number of edges (Edges) that indicate the network density and geometrically weighted edgewise shared partners (GWESP) that measure the number of players connecting two other players in a network.

Three models are estimated to reveal the marginal contributions of the explanatory variables. Model 1 estimates the impacts of age as well as homophily in age; Model 2 combines attributes of location to estimate the impact of distance, rural area, and location economy on the formation of social ties in online brand community. In addition to age information and location attributes, Model 3 also explores how customer purchase characteristics influence the formation of friendships. All three models are controlled by endogenous structural tendencies (i.e., Edges and GWESP). Table 2 shows the results of the ERG models.

	Model 1	Model 2	Model 3
Age	-0.0264 (0.0031)***	-0.0183 (0.0031)***	-0.0211 (0.0041)***
Member age	0.0021 (0.0001)***	0.0019 (0.0001)***	0.0018 (0.0001)***
Age difference	-0.0056 (0.0051)	-0.0068 (0.0043)	0.0082 (0.0068)
Member age difference	-0.00094(0.00011)***	-0.0010 (0.0002)***	-0.0012 (0.0002)***
Same province		0.2452 (0.0441)***	0.2302 (0.0542)***
Is city		0.1694 (0.0468)***	0.2326 (0.0681)***
Both in rural		0.0694 (0.0597)	-0.0144 (0.0743)
Location economy		0.0524 (0.0214)**	0.0849 (0.0236)***
Same location economy		0.0045 (0.0289)	0.0449 (0.0359)
Deal sensitivity			0.5034 (0.0331)***
Share premium			-0.1759 (0.1727)
Deal sensitivity difference			-0.1688 (0.0720)**
Share premium difference			-0.0564 (0.1850)
Edges	-7.283 (0.2627)***	-7.972 (0.2628)***	-7.987 (0.3210)***
Shared partners	1.5405(0.0493)***	1.4909 (0.0031)***	1.4855 (0.0528)***
AIC	32065	32020	31582
BIC	32123	32114	31776
Log likelihood	-16026.41	-16002.86	-15770.93

Note-*** Significant at 0.01 level; ** Significant at 0.05 level; * Significant at 0.1 level

Table 2. ERGM estimation results

Two structural control variables in models are significant and reveal inherent structures in the friendship network. The edge variable controls the density of a network. The significant and negative coefficients suggest that consumers are not likely to engage in random interaction in an OBC. The positive coefficients of geometrically weighted edgewise shared partners (GWESP) indicate that social relations in the OBC are transitive, which suggests that if two customers have common friends they are more likely to become friends with each other.

Model 1 shows the impacts of age and proximity in age. The significant and negative coefficient of age indicates that young customers are more likely to interact with others than old customers in an OBC, and the positive coefficients of member age indicate that consumers who engage in an OBC for

a long time are more likely to interact than consumers who have small member age. Customers tend to interact with people who take part in the OBC during a similar time ($p < 0.001$). However, the impact of age proximity is not significant. H1 is partly supported.

Model 2 examines the impact of location, controlling for age. The positive and significant coefficient of same province shows that living in the same province increases the likelihood of interaction; the odds ratio of forming interactions between consumers living in the same province is 1.28 times more than that of consumers living in different provinces. Individuals who live in a city are more likely to interact with others than people they do not. The coefficient of Both in rural is not significant, indicating that consumers interact with people no matter whether he/she is rural or urban. The economy of location also has an impact on forming social interactions, and individuals who are in a developed area are more likely to interact with others in an OBC ($\beta_{\text{location economy}} > 0, p < 0.01$).

Model 3 shows that deal-prone consumers are more likely to create social ties in an OBC ($\beta_{\text{deal sensitivity}} > 0, p < 0.001$), and consumers tend to interact with people who have similar deal sensitivity ($\beta_{\text{deal sensitivity difference}} < 0, p < 0.05$). Thus, H3 is not supported. On the other hand, consumers with a larger proportion of premium purchases do not build more social interactions in OBCs than others. Therefore, H4 is not supported. Homophily in share of premium products also does not impact the formation of social ties in OBCs. H2 is partly supported.

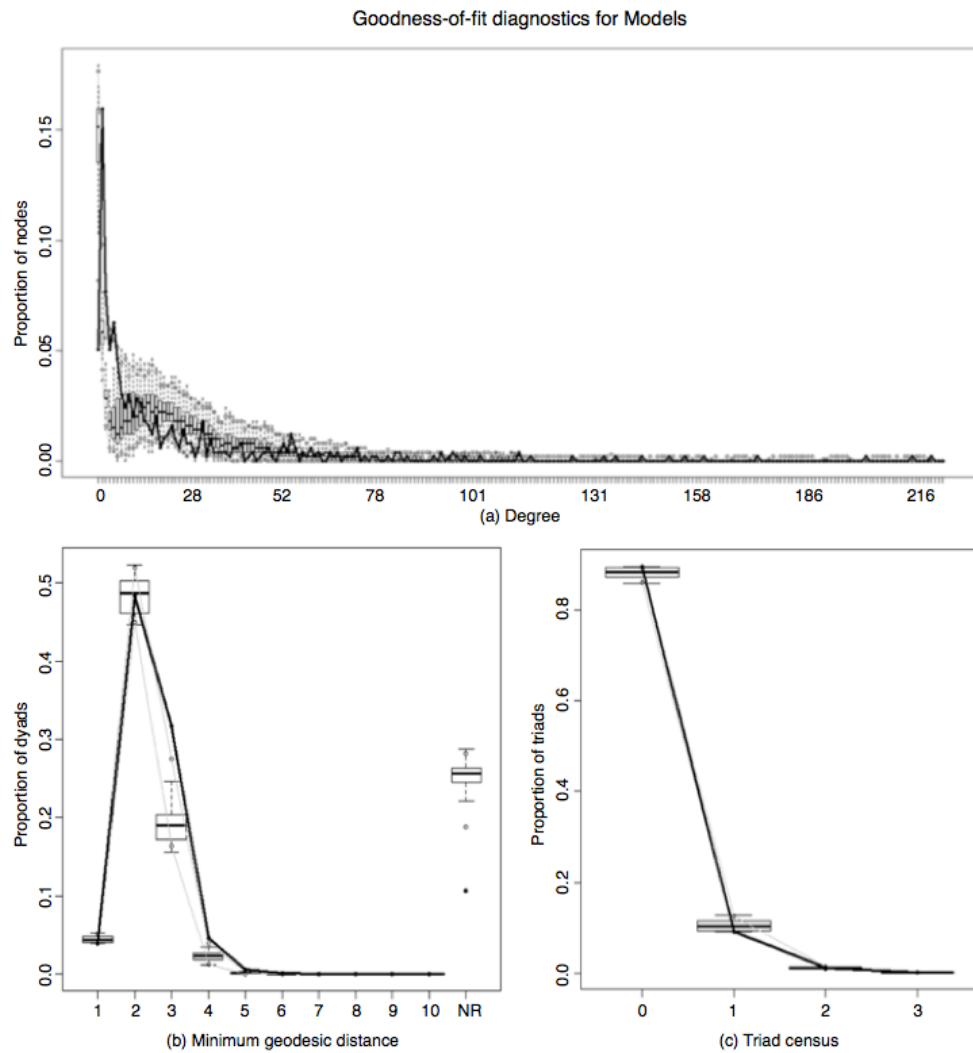


Figure 1. Goodness-of-fit diagnostics for Models

The goodness-of-fit diagnostics for Model 3 are illustrated in Figure 1. Figure 1(a) plots the degree distribution predicted by Model 3 (gray lines) and the observed degree distribution (the solid line). The model captures the overall shape of the observed degree distribution, although our model underestimates amount of low degree distribution. Figure 1(b) and (c) show the geodesic distance distribution and triad census distribution generated by Model 3 and the observed network, respectively. Both of them show that our estimated model fit the observed network well.

5 IMPACTS OF SOCIAL INTERACTIONS ON PURCHASE

In this section, we analyze the relationships between different types of social interactions and customer purchase behavior in terms of purchase frequency. Previous studies utilize experimental data or survey data to explore how social interactions in a social network influence customers' purchase intentions. We collect actual behavior data from an e-commerce company and its OBC, and examine the relationships between social interactions in the social network and purchase frequency. Furthermore, we study how different types of social interactions are associated with customer purchase frequency. Based on social interactions in the brand community and the attributes of customers, we build different types of social networks. Table 3 shows the results of our OLS regression.

In Model 1, the positive and significant coefficients of degree centrality and betweenness centrality indicate that social interactions among customers in an OBC are associated with customer purchase frequency. Consumers who are highly involved in social interactions are more likely to purchase than those who less involved. Consumers who are central in a social network are more likely to purchase than customers who are peripheral in the network. Other models also support these results. H5 is supported.

Moreover, the results of Model 2 and Model 3 show that social interaction with customers who purchase (Degree = 0.07, $p < 0.01$; *betweenness* = 0.007, $p < 0.01$) is more associated with purchase frequency (Degree = 0.04, $p < 0.01$; *betweenness* = 0.002, $p < 0.01$). The differences of degree centrality and betweenness centrality between Model 2 and Model 3 are also significant (for Degree, $\text{Chi}^2 = 4.49$, $p < 0.05$; for Betweenness, $\text{Chi}^2 = 5.41$, $p < 0.05$). Social influence received from customers who purchase has a bigger impact on customer purchase behavior than social influence received from customers who do not purchase. H6 is supported.

Model 4 and Model 5 show that social influence that derives from geographic proximity is more significant than social influence that emanates from a long distance (for Degree, $\text{Chi}^2 = 3.2$, $p < 0.1$; for Betweenness, $\text{Chi}^2 = 3.75$, $p < 0.1$). Model 5 shows that social interaction with customers who purchase and come from the same place is strongly associated with customer purchase behavior. H7 is also supported.

6 DISCUSSION

Table 4 shows our results. Our analysis of the formation of social interactions reveals evidence that both status homophily and value homophily still structure the process of mutual interactions formation in a virtual community. These processes interact, generating a complex set of effects. Homophily in sociodemographic attributes (i.e., member age) and customer characteristics (deal sensitivity) have positive and significant impact on the formation of social ties in OBCs. Participants tend to interact with others who are similar in member age. Deal-prone customers are more likely to communicate with those who are also deal prone. Distance still matters in a virtual context, and customers tend to build social interactions with those who are in the same location in an OBC.

	Model 1 (Social interaction with customers)		Model 2 (Social interaction with customers who don't purchase)		Model 3 (Social interaction with customers who purchase)		Model 4 (Social interaction with customers who purchase but come from different places)		Model 5 (Social interaction with customers who purchase can come from same place)	
Degree	.05*** (6.51)		.04*** (4.92)		.07*** (4.15)		.07*** (4.03)		.319*** (3.71)	
Betweenness		.001*** (3.56)		.002*** (3.84)		.007*** (3.41)		.011*** (3.58)		.087*** (3.43)
Is rural	-1.2 (-0.14)	-2.1 (-0.25)	-0.7 (-0.08)	-2.2 (-0.26)	-1.5 (-0.18)	-2.5 (-0.29)	-1.4 (-0.17)	-1.7 (-0.20)	-2.6 (-0.31)	-3.0 (-0.36)
Deal sensitivity	4.2*** (4.19)	4.5*** (4.53)	4.1*** (4.11)	4.4*** (4.41)	4.3*** (4.27)	4.6*** (4.63)	4.4*** (4.41)	4.61*** (4.60)	4.37*** (4.31)	4.51*** (4.47)
Share	-2.96 (-1.59)	-3.08 (-1.64)	-2.93 (-1.58)	-3.02 (-1.61)	-3.01 (-1.61)	-3.21* (-1.71)	-3.04 (-1.63)	-3.11* (-1.66)	-3.08 (-1.64)	-3.23* (-1.72)
Premium	-4.3*** (-3.92)	-4.3*** (-3.91)	-4.2*** (-3.89)	-4.3*** (-3.89)	-4.3*** (-3.91)	-4.1*** (-3.70)	-4.4*** (-4.03)	-4.3*** (-3.88)	-3.5*** (-3.19)	-3.8*** (-3.17)
Ln (Member age)	-6.8 (-0.91)	-3.3 (-0.44)	-6.5 (-0.89)	-4.5 (-0.16)	-6.5 (-0.87)	-4.5 (-0.18)	-6.1 (-0.80)	-1.4 (-0.19)	-4.4 (-0.60)	-1.9 (-0.26)
Age	.24* (1.89)	.23* (1.79)	.23* (1.79)	.24* (1.94)	.24* (1.84)	.22* (1.77)	.23* (1.83)	.23* (1.79)	.25** (1.97)	.24* (1.90)
Cons	2.81 (0.45)	1.18 (0.19)	2.25 (0.36)	1.41 (0.22)	2.85 (0.45)	-3.3 (-0.05)	2.71 (0.43)	.117 (0.02)	.85 (0.13)	-0.71 (-0.01)
R-square	.166	.153	.162	.157	.161	.151	.159	.153	.162	.155

Note-*** significant at 0.01 level; ** significant at 0.05 level; *significant at 0.1 level

Table 3. The results of OLS regression

Moreover, customers who are young and from the city are more likely to be active members. The reason may be that young, urban customers are more familiar with the Internet and have more opportunities to access it. Instead of just reading and searching promotion information, deal-prone customers also interact with other deal-prone customers to acquire promotion information. Our results also show that customers with a high proportion of premium product purchases do not tend to engage in social interaction. Although these customers purchase high-value products, their purchase frequency is less. This may explain why they are less engaged.

Our results provide insights for organizations on how to sustain and improve social interactions in an OBC. Organizations should provide opportunities for participants to interact with others who are similar to them. One solution is to encourage members to expose more personal information, such as education and hobbies. Firms can also release timely/regular promotion information in the OBC, encouraging the continuing participation of deal-prone customers. Furthermore, firms can organize subgroups in the OBC according to the location of members. These subgroups provide a context for members to create strong social interactions.

Our results also provide evidence on the relationships between types of social interaction and customer purchase behavior. Social interaction with customers in an OBC is positively related to customer purchase frequency. Social interaction with customers who share purchase and location characteristics will have a stronger association with purchase frequency than other types of social interactions. Our results also show that social influence (peer effect) that emanates from geographic proximity has a big influence on customer behavior, which is consistent with previous findings (Agarwal et al. 2009).

Our findings show that organizations should manage their OBC more specifically. Encouraging and facilitating specific types of social interactions seems to improve customer value more significantly. In an OBC, organizations should facilitate the interaction among customers who purchase, especially for those who have geographic proximity. Creating subgroups of members from the same location would be a good strategy for improving customer purchase frequency.

Support		Support	
H1	Partially – homophily in age is not sig.	H2	Not supported
H3	Not supported	H4 (a)	Supported
H4 (b)	Not supported	H5 (a)	Supported
H5 (b)	Supported	H6	Supported
H7	Supported		

Table 4. The results of our study

7 CONCLUSION

In this study, we explored the formation mechanism of social interactions in an OBC and examined the relationships between different types of social interactions and customer purchase behavior. First, we analyzed the impact of age, member age, location, and customer characteristics on the process of relation building in an OBC given the endogenous network structures of online interactions. Our results show that the theories of proximity and homophily are partially valid in an online brand community because customers with different attributes tend to have different propensities to engage in social interaction. The formation mechanisms of social interaction provide new insights for firms on how to improve customer engagement in OBCs. Second, we also examine the relationships between different types of social interactions and customer purchase frequency. Our results show that one's social interactions with existing customers of physical proximity have a bigger impact on the purchase behaviour of the person in question. It may be an effective strategy for firms to create subgroups,

consisting of customers from the same place in the community. These subgroups will facilitate the formation of social interactions among customers and ultimately influence their purchase behavior.

This study suffers from several limitations. First, we used two structural dimensions of social networks to measure social interactions of customers. Although previous studies have defined social interaction as ties and adopted structural network dimensions in its presentation, the measurement of social interaction can be extended with more dimensions. Future study can collect more data to analyze and measure social interactions. Second, we only examine correlated effects of different types of social interactions on customer purchase frequency because of the limitations of our data. Econometric methods for causality inference and panel data on social interactions can be utilized to explore causal relationships between different types of social interactions and customer purchase behavior. Finally, we conducted our study in an online brand community where most of the participants are female. Because women tend to be less active in virtual communities, studies may be needed in more general contexts to generalize our findings.

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