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Abstract

This paper studies the effect of social-role identity salience in social networks on user participation in an online community that facilitates user rating, reviewing and discussing of cultural products. Drawing on previous literature on social preference, we develop a model demonstrating how the salience of friendship identity changes equilibrium participation behaviour. Predictions are tested with a differences-in-differences model using data from an online social network community. Results show evidence of positive effect of salience of friendship identity on user participation.

Keywords: online social network function, identity, differences-in-differences, Web 2.0, social preference

1   INTRODUCTION

Modern Internet technology fundamentally changes the way consumers gather information, make purchasing decisions, enjoy products, and interact with each other. Among others, collaborative filtering algorithms and recommendation systems based on online user ratings and reviews enhance the power of user-generated content in helping consumers getting product related information and reducing consumption risk. One critical condition for such systems to work is the accumulation of user preference data, such as ratings and reviews. While it seems that various online communities aiming at generating product-related reviews are expending fast, many communities suffer from the under-contribution problem. According to Cosley et al. (2003) and Chen et al. (2009), on MovieLens (http://www.movielens.org), an online movie recommendation website, more than 22 percent of the titles receive less than 40 ratings. Similarly, on Douban (http://www.douban.com), a Chinese website dedicated to user rating, review, and discussion about cultural products, most of the movies only receive a handful of ratings (the median number of ratings for a typical movie is 2), and less than 10 percent of the movies have ever obtained any user review (16,264 out of 200,207). Under-participation is detrimental to the development of sites that depend on user-generated content. Without a decent level of user participation, it is hard for the collaborative filtering and recommendation algorithms to work properly.

In online communities, it is often impractical to use traditional economic mechanisms to alter participation levels (Chen et al. 2009). User participation is typically voluntary and the interactions involve, in most cases, no monetary transactions. Conversely, in online contexts, users value social interactions. For example, Wellman et al. (1996) treat the Internet as an electronic extension to physical social networks. Koh et al. (2007) suggest that web vendors should actively facilitate online social interactions and bring offline social connections online. In a recent study, Zhang and Zhu (forthcoming) find that Wikipedia users who value online social interactions contribute significantly more than those who do not, and the effect is large enough to reverse the free-riding outcome commonly found in both theoretical models and lab experiments about public goods provision.

In this paper, we examine how perceived social-role identity influences users' online participation. Social-role identity is a key component of how individuals make sense of their roles in the complex web of social interactions. We demonstrate that merely changing the name of an online relationship, thus manipulating perceived social-role identity, has a significant impact on user participation in online activities. We first develop a theoretical framework and consider two types of online community participants: a high type that derives higher value for social-role identity and a lower type who has lower value for social-role identity. Our results suggest that (1) the high type has higher level of participation than the low type before social-role identity is made salient, (2) the absolute level of participation of the low type increases after social-role identity is made salient, and (3) once the social-role identity is made salient, the gap between participation levels between the two types widens. We obtain data from a popular online community and empirically evaluate these theoretical predictions. Our empirical approach leverages a natural experiment as a result of the online community introducing a new function that makes the social-role identity of friendship salient. The "add as a friend" function (henceforth, "friend function") allows the users to add another user to be a friend, and a pair of friends can view each other's ratings, reviews and comments on music, books and movies. Before the introduction of the friend function, the online community actually support it through a function called "follow this person" (henceforth, "follow function"). If two users follow each other, they can also view each other's ratings, reviews and comments. The introduction of the friend function therefore only makes the social-role of friendship more salient than before. With a differences-in-differences model, we are able to identify the impact of social-role identity saliency on user participation.

These findings contribute to a growing literature that examines the relationship between social mechanisms and participation and contribution to communities. Ludford et al. (2004) find that while group similarity reduces average user participation in the community, perceived uniqueness significantly increases participation. Beenen et al. (2006) test the effects of contribution uniqueness

and stated goals on community participation based on social psychological theories about social loafing and goal setting. Chen et al. (2009), in a field experiment, show that activating a social comparison process can increase the contribution of the less active participants. These studies emphasize the individual effects of perceived uniqueness, perceived competence and social comparison on community participation. Different from these studies, we focus on the perceived inter-relationships between community participants, and therefore directly examine the value of introducing social networks in online communities.

In their study on a knowledge sharing community, Wasko et al. (2009) propose that social network structure has important implications on users' participation in electronic network of practice. They show that a generalized social exchange process governs the process of collective knowledge contribution. However, most previous studies in information systems use survey to test the implication of social interactions (social psychological factors) on users' participation in online communities (e.g. Dholakia et al. 2004; Wasko and Faraj 2005). Few extant studies use observational data to examine the causal effect of social network functions in online communities. We fill this gap.

The rest of the paper is organized as follows. Section 2 first reviews the literature on social-role identity and then establishes a framework to derive our theoretical arguments. Section 3 discusses the institutional background and conducts empirical analysis. Section 4 concludes.

2   BACKGROUND AND THEORETICAL FRAMEWORK

2.1   Tie Type, Identity and Identity-Role Salience

The effects of social interaction on individual behavior embed deeply in economics and socio-psychological theories. There are multiple routes through which online social relationship may influence user participation. For example, Chen et al. (2009) motivate their discussion based on the social comparison theory (Festinger 1954). In another study, Chen and Li (2009) show, consistent with previous experimental study, that induced group identification alters the behavior of the subjects. Based on the theory about social loafing and goal setting, Beenan et al. (2006) design an experiment which shows that uniqueness and stated goal significantly increase user participation. In our study, we consider the effect of social-role identity salience.

Sociologists denote social connections as a network of inter-connected nodes. They differentiate between strong and weak social relationships. In his classical work, Granovetter (1973) defines the strength of a tie as "a combination of the amount of time, the emotional intensity, the intimacy (mutual confiding) and the reciprocal services which characterize the tie". As Krackhardt (1992) states, the four dimensions of tie strength have extensive focus on psychological factors, equivalently, the affect level of strong ties cannot be ignored. While weak tie provide people with access to information and resources beyond their social circle, strong ties have greater motivation to be of assistance and are typically more easily available (Granovetter 1982). Thus, strong ties play an important role in generating identity-related motivation and social capital.

Organization studies also characterize interpersonal links into two general categories, instrumental ties and expressive (primary) ties (Lincoln and Miller 1979, Ibarra and Andrews 1993). Instrumental ties tend to be weaker, information- or performance-oriented relationship created by task driven behaviors. Expressive ties, in contrast, are characterized by intimate links that connect people with similarity in different attributes. Extant empirical studies suggest that network types could affect the nature of the social influences (e.g., Ibarra and Andrews 1993; Umphress et al. 2003). Lin (Chapter 1, Li et al. 2001) argues that instrumental and expressive social interactions generate different kinds of social capitals. While instrumental actions are typically rewarded with economic and social (such as reputation) returns, expressive actions are used to consolidate the existing resources (such as norms)

Although online social ties are arguably weak connections, they may nevertheless be characterized into different groups based on the types of social relationships those ties represent. This is especially true when people are given the opportunity to choose from more than one types of relationship. With

the development of Internet technology, online social communications are becoming richer in both the range of activity covered and the social cues carried. As a result, online social connections are becoming increasingly intensive in both interaction frequency and affective content. Specifically, the ability to make friends online increases the perceive strength (expressiveness) of online social connections and increases the cohesiveness of a user's online social networks, therefore triggering higher identification, creating a sense of belonging, facilitating role taking behavior, and eventually altering the user's social participation. Porter and Donthu (2008) find that fostering member embeddedness and encouraging social interaction positively influence the value creation in firm sponsored virtual communities.

Identities, a person's sense of self, refer to individuals' conceptions of themselves in terms of the social roles (e.g., spouse, parent, churchgoer, friend, etc.) that they enact, (Thoits 1991). People with a certain identity adopt the value and behavior that identity represents, and act favorably to those with the same identity (Tajfel and Turner 1979). Identity affects, in a critical way, the (economic) decisions that people make (Akerlof and Kranton 2000). In their study of identity change, Ethier and Deaux (1994) find that friend identity is routinely ranked as highly important for social relationship among the subjects. Although there are some debates over what constitutes, theoretically, a friend relationship, friends are commonly perceived as being responsive, trustworthy, intimate, and emotionally supportive.

Role identity is embedded and trigger by social context (Montgomery 1998). As a result, website vendors can trigger different role through altering the social context embedded. In laboratory experimental studies carried out by psychologists and experimental economists, priming is one of the widely adopted ways to manipulate identity by making the relevant (wanted) identity salient (Chen et al. 2009; Bargh and Chartrand 2000). Similarly, in our context of the online community, the label of "friend" reminds a user as being a "friend" in the community. Whenever someone in his friend network takes an action, he would receive an update. In addition to content of the information, there is a priming effect about the friend identity with the message. This triggered friend role identity will change the participation of the users.

2.2   An Illustrative Model - The Effect of Friend Identity

Identity and social preference have been shown to influence individual economic decision making. For example, Akerlof and Kranton (2000) illustrate how identity-based preference could solve economic puzzles such as gender discrimination, poverty and social exclusion, and household division of labor. They later apply this framework to analyze economics of education (Akerlof and Kranton 2002) and contract theory (Akerlof and Kranton 2005). Identity-based preference has been confirmed in laboratory settings (e.g. Benjamin et al. 2007; Chen and Li 2009). To illustrate how the social role of friend identity induces higher participation in the online community context, we build a model based on the general framework proposed by Akerlof and Kranton (2000).

Consider the case where there are two types of users in the online community characterized by $\theta \in \{\theta_L, \theta_H\}$, where $\theta_H > \theta_L \geq 0$. A user's utility function is denoted by $U_\theta(p_i, \sum_i p_i)$, where p_i is the participation level of user i. We assume that $U_\theta(p_i, \sum_i p_i)$ is increasing in both arguments and the

cross derivative $\dfrac{\partial^2 U_\theta(p_i, \sum_j p_j)}{\partial p_i \partial (\sum_j p_j)} = \theta$. This formulation takes into consideration both the direct

benefit from participation and the network effect generated by others' participation. Intuitively, online community participants get two types of values. First, they get enjoyment from their own participation (use value). Second, they benefit from social interactions and collaborative knowledge creation that depend on the overall network participation (social value). For example, personalized recommendation system based on collaborative filtering algorithm generates a benefit that depends on

both the user's own participation and the aggregate participation of all users. In our formulation, the network effect is less significant for low-type users. These users benefit less from social value. Rather, they focus on the use value. We assume the cost of participation is characterized by a convex increasing function $c(p_i)$ that is twice differentiable. We interpret this cost as the time cost of participation that is common to both types of users.

Without the friend network, the equilibrium participation is denoted by $\left(p_L^0, p_H^0\right)$ which follows the results from economic literature on public goods provision (e.g. Andreoni 1990; Fries et al. 1991). After the friend identity is made salient, the focal user internalizes part of the externality. In other words, when a user identifies herself as being a friend, she values her participation more because she knows that her participation possesses positive externality to other users (i.e., her friends). We assume that the user's utility with friend identity can be represented by $U_\theta(p_i, \sum_i p_i) + s_i \cdot f(p_i)$, where s_i is the level of identification and $f(p_i)$ is a positive and increasing function of p_i. Similarly, we assume that $f(p_i)$ is twice differentiable. At any level of site aggregate participation, users with friend identity enjoy more from their participation. After the introduction of the friend function, users can choose whether they want to make online friends or not. If they choose to make online friends, this decision triggers a different social-role identity in the users' preference for participation.

Intuitively, there are four strategy profiles, in the first stage game where each type of users chooses whether or not to make online friends. Using backward induction, we can derive the payoff for each strategy profile based on the equilibrium of the second stage participation game. It can be shown that under certain conditions, there is a dominant strategy Nash equilibrium in the first stage that the low-type users choose not to make friends online while the high type users identify themselves with friend identity. We can make the following observations.

Observation 1: Before the implementation of the friend network function, low-type users participate less than high type users.

Observation 2: After the implementation of the friend network, in the separating equilibrium, both types of users increase their participation.

Observation 3: In the separating equilibrium, high type users' participation increases more than that of the low-type users', whereas the difference is positively related to the level of user identification.

Remark: Unlike in Benjamin et al. (2007) where private optimal and norm action levels are assumed exogenously, we allow the decision of participation in the friend network and the participation level to be endogenously determined. In other words, we do not assume a stereotypical action. In addition, we allow for network externality in user participation. The two types of users in our model differ in their marginal gains from others' participation. That is, they differ in their social orientations. We assume that the friend identity enhances the incentive of participation through a higher value of the user's own participation.

3   EMPIRICAL ANALYSES

3.1   Background

Our research context is Douban, the most influential website for user generated rating, review, and discussion about cultural products (books, movies and music, which we collectively call as item in this paper) in China.[1] Established in March of 2005 by Bo Yang, a Berkeley PhD in physics, Douban has more than 3.3 million registered users and attracts 600 million pageviews per month. These pageviews can be from either the registered users or unregistered users. Similar to other Web 2.0

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[1] According to alexa.com, Douban is ranked number 160 in the world and number 25 in China among the most visited websites.

websites, almost all the contents about the products on Douban are contributed by its registered users through user participation.

There are several types of online activities on Douban for its registered users. Through search or the browse function, a registered user can collect an item in his virtual profile. Those collected items were then used as inputs for Douban's collaborative-filtering algorithms to generate personalized suggestion about new items that may interest the focal user as well as to calculate how close the interests of any two users are. Users can also rate and review items. All ratings and reviews are public. When rating an item, a Douban user can write a short, one-sentence description of his opinion (with limited length), add user tags to the item, and choose a star rating from one to five. Alternatively, the user can accompany the star rating with a longer text review commenting in more detail about her evaluation and feelings about the item. Other users who read a user review are able to write comments for the review and mark the review as either useful or not (review vote). Soon after its inception, in addition to offering functions to leave ratings and reviews, Douban allowed its users to create and join various interest groups to discuss a diverse spectrum of topics related to arts and entertainment. The format of user discussion is very similar to the user discussion in Usenet groups (Godes and Mayzlin 2004). Today there are more than 6000 active discussion groups.

Besides these online activities, there are two types of social network functions on Douban, the follow network and the friend network. From the very beginning of Douban, a user can follow the activities of another user in a similar manner as on Twitter.com. The relationship is single-directional without need for consent from the targeted user. If a user gets interested in hearing about the update of another user, she could go to that user's page and click the "follow her" button to establish a follow relationship. However, once followed, the targeted user will get a notice about who is following her. She may than choose to follow back. As a result, before being enabled to make online friends, Douban users who are interested in each other may form mutual follow relationship which functions very similar to friend relationship. Starting from January 31, 2008, Douban further allowed users to become friends. Unlike follow relationship, friend relationship is a two-way relationship and needs consents from both parties. Friendship requests on Douban can be easily initiated with click of the "friend request" button on users' pages. However, to become online friends, both parties need to consent. After two users become online friends, both appear in the others' user page under the name of friend. Similar to follow relationship, users are updated about their friend's activities (rating, review, and social networking activities).

With these social networking functions, Douban is transformed from an online ratings platform to a social community focusing on the communication related to cultural products (books, movies and music). Unlike on Facebook, where users may search their email lists to connect to others they knew elsewhere, friends on Douban typically do not know each other offline. Rather than expending users base by leveraging on the existing social network of the current users, Douban encourages users to make friends based on the common interests in the items they collect. The site provides information about common interest when a user visits the page of other users.

3.2   Data

Our data is from Douban's archive. It contains the entire history of the users' ratings for items (including books, movies and music), as well as the social network topology. For privacy protection, user name and the title of the content were coded. A drawback of this is that we cannot obtain user demographical characteristics as well as the characteristics of the contents being rated and reviewed. However, for the purpose of this study, it is not a big concern.

Our observation covers the period from March 2005 (when Douban became online) to August 2008. The complete dataset has about 50 million ratings for over half million items (including books, movies, and music) from about 890,000 users. Regarding social network structure (follow relationship and friend relationship), we observe the formation time of each tie connecting two users. The follow network in our data set contain contains over 1.8 million links of a networks of 244,464 users

following 253,508 others. The friend network in our data set contains over 1.2 million links between 286,140 users.

For each user, we calculated, by month, the numbers of books, music, and movies collected ($book_{it}$, $music_{it}$, $movie_{it}$) the number of text review wrote ($review_{it}$), the number of review comments wrote ($comment_{it}$), and the number of review votes ($vote_{it}$) made for 10 months from November 2007 (three month before the introduction of friend network function) to August 2008. To further eliminate inactive users from our data set, we only consider those users who were active in participation in November 2007 (the first period). This procedure left us with a panel data set of 64,430 users for ten months. Among these users in our final data set, 50,763 users (78.8%) use the friend network function after its implementation to become friends with other users. This high proportion suggests a high level of penetration of the additional social network function confirming its attractiveness. We measure user aggregate activity ($activity_{it}$) as the summation of the activity variables we calculated. Table 1 reports the summary statistics of our major variables across periods. In the table, all the activities measures are significantly positively correlated, indicating the existence of some individual level characteristics that drives participation, which is also reflected by the large standard deviations. Comparing to collecting activities, review activities are less frequent reflecting the fact that writing reviews requires more effort from the users. The users in our final data set on average have an age of 426 days (more than a year experience with Douban).

		Mean	1	2	3	4	5	6	7	8
1	$book_{it}$	3.85	15.86							
2	$music_{it}$	4.36	0.207	18.92						
3	$movie_{it}$	9.03	0.276	0.295	27.29					
4	$review_{it}$	0.13	0.113	0.077	0.122	0.80				
5	$comment_{it}$	0.32	0.130	0.105	0.136	0.282	1.62			
6	$vote_{it}$	0.57	0.184	0.107	0.134	0.131	0.339	3.18		
7	$activity_{it}$	18.26	0.612	0.668	0.823	0.179	0.231	0.269	46.14	
8	age_{it}	426	0.021	0.008	-0.009	0.015	0.023	0.029	0.008	238.83

Table 1 Summary Statistics

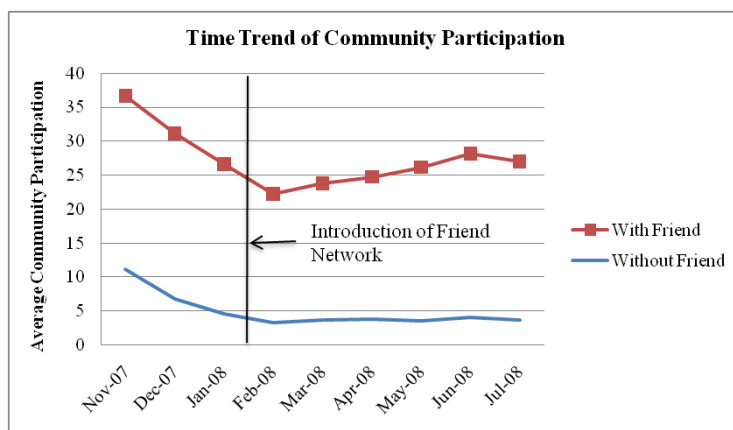### 3.3 Mean Contribution across Time

Figure 1. Average Community Participation

Figure 1 shows the time pattern of average user participation. Since we select our sample based on the activity level in the first period, we can see a descending trend in the early periods. After the introduction of the friend network, it is obvious that the descending trend stops for both users who use friend network and those who do not use friend network. More importantly, for those uses who actively engage in the friend network, their average participation begins to rise. This observation strongly supports our proposed theory. In addition, users who do not participate in the friend network

benefit from the indirect network effect brought by the increasing participation of other users. For users with friends, their participation increases as a result of the enhanced friend identity salience and the network effect.

3.4 Regression Analysis

To test our prediction about the effects of the friend network feature on user participation, we leverage the exogenous introduction of friend network in February 2008 and use the differences-in-differences approach to tease out the true effect while controlling for individual heterogeneity with a fixed-effect model. Since the saliency effect of information exists before the introduction of the friend function, our differences-in-differences analysis can tease out the priming effect about social-role identity of friendship.

Our empirical formulation is represented by the following model:

$$P_{it} = \beta_0 After_t + \beta_1 Friend_i + \beta_2 After_t \times Friend_i + \sum_j \gamma_j X_{it,j} + \alpha_i + u_t + \varepsilon_{it},$$

where i indexes the users and t indexes the periods, and P_{it} is the measures for activities. $After_t$ is a dummy variable indicating whether the period is before (=0) or after (=1) the introduction of the friend network function. $Friend_i$ is the indicator of whether the user gets involved in the friend network (i.e., establishing online friendship with others or not).

	(1)	(2)	(3)
$After_t*Friend_i$	1.02 (0.245)***	6.50 (0.246)***	6.47 (0.246)***
$After_t$	-3.98 (0.217)***	-7.86 (0.256)***	omitted
Controls	No	Yes	Yes
Time Fixed Effect	No	No	Yes
R-Square	0.003	0.150	0.137
Note: * significant at 0.1; ** significant at 0.05; *** significant at 0.01.			

Table 2 Regression Analysis

Table 2 reports the results of our regression analysis. Model 1 considers only the individual level fixed-effect to reflect the repeated-measure design. In model 2, we include the cumulative participation level and user age as controls to address individual heterogeneity and the momentum in user participation. User age is measured as the number of days since the user's first recorded participation on Douban. The square of age is also included to control for potential non-linear effect. In model 3, we further control for time fixed-effect by including period dummies into the model. This specification helps to address potential seasonal patterns in user participation. Across the three specifications, the coefficient for the interaction term is significantly positive which indicates a positive effect of the friend function on user participation. With respect to model 3, the involvement in the friend network increases user participation by 6.47 after the function is implemented. Compared to the average activity of 18.26 in our sample, this translates to a 35.4% increase in user participation. Coefficients estimation for control variables (user age and cumulative participation) is omitted from the table for exposition purpose. In all three model specifications, age exhibits a negative effect suggesting that users lose their interest when they become more experienced with the site. This may also be caused by the fact that new users tend to rate many items that they experienced before they join Douban. The cumulative participation level has a positive effect on later participation. It suggests the existence of a positive momentum in user participation after the introduction of the friend function.

Based on the last specification (model 3), we implement separate regression analyses with respect to different types of user activities. Table 3 reports the results. Participation in all kinds of activities increases as a result of the introduction of friend network function. Movie collection activity

experiences the largest increase (58.4%). It seems that review activities are less sensitive to the friend network function.

	Book	Movie	Music	Review	Comment	Vote
$After_t*Friend_i$	1.19	5.27	1.30	0.033	0.084	0.17
	(0.079)***	(0.156)***	(0.099)***	(0.004)***	(0.008)***	(0.015)***
R-Square	0.203	0.072	0.177	0.145	0.168	0.112
Note: Fixed effect model with time dummies and controls is used for all the reported analyses. For each analysis, control variables include the users' cumulative participation in that activity, user age, and the square of user age. * significant at 0.1; ** significant at 0.05; *** significant at 0.01.						

Table 3 Separate Regression Analyses

3.5 Additional Analyses and Robustness Checks

We now examine the effect of users' social activities in the friend network on their participation level. To measure users' involvement in the friend network, we calculate the total number of friends a user gets by the end of our observation period (September 2008). If identity salience motivates user participation, we expect the users who get more friends online to be affected more. We thus extend our baseline differences-in-differences model by adding a three-way interaction term:

$$P_{it} = \beta_2 After_t \times Friend_i + \beta_3 After_t \times Friend_i \times Degree_i + \sum_j \gamma_j X_{it,j} + \alpha_i + u_t + \varepsilon_{it} .$$

Note that the coefficient for the first order terms $After_t$ and $Friend_i$ are not identifiable from the formulation of model 3 since we explicitly controlled for time and individual fixed effect.

Table 4 reports the estimation results for our three model specifications after adding the moderating effect of user degree. Across the models, coefficient estimates for the three-way interaction term are positive and significant. It confirms our expectation that the more involved a user is in the friend network, the more she will increase her participation as a result of friend identity salience.

	(1)	(2)	(3)
$After_t*Friend_i*Degree_i$	0.06	0.18	0.18
	(0.003)***	(0.003)***	(0.003)***
$After_t*Friend_i$	-0.04	4.00	3.98
	(0.252)	(0.250)***	(0.250)***
$After_t$	-3.98	-8.42	omitted
	(0.217)***	(0.256)***	
Controls	No	Yes	Yes
Time Fixed Effect	No	No	Yes
R-Square	0.033	0.136	0.126
Note: * significant at 0.1; ** significant at 0.05; *** significant at 0.01.			

Table 4 Effect of User Degree

One concern about our study is that users in the treatment group may increase their participation as a result of their decision to stay with the website, while those who drop out stop their activities and do not involve in the friend network. To address this concern, we control for user experience (time passed since her registration) in our models. Further, we re-run model 3 on a subset where the users registered to the website at least six months before the beginning of the sampling period (November 2007). In other word, the users considered in this subsample registered before May 2007 and were actively participating in November 2007, which makes it very likely that they had already stabilized

their participation. Estimation result for this analysis is reported in table 5, column (a). The coefficient of the interaction term is statistically significant and very similar to the result reported in table. This confirms the robustness of our analysis with respect to user experience. In another study, we extend the observation period from the current 3 months before implementation to 9 months before. We get very similar results.

Our way to identify the effect of friend-role identity relies on the fact that the friend network is functionally equivalent to the follow network. However, the introduction of friend network also makes the social networking functions more salience in general. The effect we observed may also be caused by the fact the user in our treatment group began to use social networking function while the control group did not. To address this concern, we implement model 3 specification on a subset of users who are active in the follow network (following other users). Result for this analysis is reported in table 5, column (b). Surprisingly, we find stronger treatment effect in this group. This suggests that users that are socially active are more sensitive to the difference in role identities framed by the networking function (follow versus friend).

	(a)	(b)	(c)	(d)
$After_t*Friend_i$	6.08 (0.340)***	7.29 (0.350)***	6.43 (0.246)***	0.033 (0.004)***
R-Square	0.160	0.131	0.133	0.144
Num. of Users	38,706	51,331	64,430	64,430
Note: Fixed effect model with time dummies and controls is used for all the reported analyses. In model (a), we consider a subsample where users in the sample joined at least half year before the beginning of our sample period. In model (b), we consider a subsample where users in the sample follow positive numbers of other users. In model (c) and (d), we consider additional control as the feedbacks the user get from other users. Model c considers the general activity level, while model d consider review activities in specific. * significant at 0.1; ** significant at 0.05; *** significant at 0.01.				

Table 5 Robustness Check

One may also argue that the difference we observed may be caused by the fact that users who are actively making friend online also receive more feedbacks from others. If this is true, generalized social exchange theory (Wasko et al. 2009) predicts that participation will increase as a result of reciprocity. We believe that this is a reasonable mechanism that motivates user participation. However, as we discussed, this view cannot explain the *jump* we observed in user participation as a response to the introduction of friend network function. Further, this mechanism does not help to distinguish between the functionally equivalent networking functions supported simultaneously by the website (friend versus follow). To add support to our explanation, we include additional controls as the feedbacks that the focal user received on her review contributions and re-run the analysis for both aggregate activity and review activity in specific. We reports the results in column (c) and (d) of table 5, Again, our previous results in table 2 are retained.

4 CONCLUSION

We investigate the effect of social-role identity salience on user participation in online communities. Leveraging on the introduction of a feature in an online community, we use differences-in-differences approach to identify the effects of making friendship salient. We build our theory on psychological and economic theories on social identity and social-role salience. Specifically, we propose that online friend network enhances the friend identity salience, which then increases participation motivation. We also show that even those who do not involve in making online friends increase their contribution as a result of the indirect network effect of user participation. Our empirical results support these predictions. Further, we find that the effect is different with respect to different types of community activities.

Our research adds to the economic literature on social preference. Specifically, based on our model prediction, we find empirical evidence of identity-based preference. We also extend our understanding about user participation behavior in online communities. The wisdom of the crowd and the prominence of modern technology in facilitating user participation make it important to understand how firms and the society as a whole can better harness the power of the crowd.

This research is not without limitations. First, our research context is a website for user communication about cultural product. We are less confident about the empirical observation when generalizing the results to other contexts such as open source communities and company wiki platforms. However, we believe our theory based on identity and social preference is of general applicability. Second, although we talked about the difference between the two types of online social relationships. Our model does not identify this difference in social influence, and we do not directly study the social influence between online users connected by different ties. Third, our data set does not allow us to consider individual-level characteristics in our empirical models. We believe all these directions deserve future studies.

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