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Competition, cooperation, and performance: an empirical investigation of Chinese online sellers

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Abstract This study examines the relationship between competition intensity, cooperation network, and performance in the context of electronic commerce. In particular, based on the framework of value net, we study both horizontal and vertical cooperation networks, and test the proposed model empirically. The empirical findings suggest that the more intense the competition, the more willing the sellers are to adopt the strategy of networking. Moreover, both the horizontal and vertical cooperation help to improve performance. The study has interesting theoretical and practical implications.

Keywords Online entrepreneurs · Competition · Horizontal cooperation · Vertical cooperation · Performance

1 Introduction

The electronic market has seen an explosive growth of entrepreneurs in the last decade. The low barrier of entry to the C2C market makes online sellers start and develop their businesses in a way that is significantly different from their brick-and-mortar counterparts. Online sellers have been an important group of entrepreneurs that have attracted much attention from both researchers and practitioners, regarding online trust, reputation mechanism, word of mouth, and so on (Ba et al. 2003; Chen

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and Xie 2008; Gefen et al 2008; Chiu et al 2010). However, there is little understanding of how these individual sellers establish themselves on the platform, especially from the perspective of competition and cooperation.

As an individual seller on a C2C market, gaining some unique and long-lasting competitive advantage is extremely difficult. Therefore, cooperating with other players on the marketplace becomes a much smarter strategy. The rapid development of technology has brought about a decline in communication cost and an increase in cooperation among online sellers. These factors have changed the market tremendously (Rossignoli 2009). As a result, members of the same online community can communicate instantly, share knowledge and collaborate through instant messenger or the internal community created by the C2C marketplace (Liou et al. 2016). Online sellers are more connected to each other than ever before, and are cooperating in various ways. According to a study by Alibaba research center, 58.5% of the sellers have shared their knowledge and experiences with other sellers, including online shop decoration, promotion strategies, and customer service strategies. 33.7% of the sellers have collaborated on consignments. 16.2% of sellers have tried joint promotion at least once and are satisfied with the related sales. 6.7% of the sellers have helped each other financially (Alibaba Research Center 2009). Meanwhile, with platform search engines becoming more and more powerful, the competition among sellers has reached an unprecedented level. In order to attract online traffic, all the online sellers face cut-throat competition on price, service, and reputation. Fierce competition has forced sellers to find new ways to survive and prosper in the marketplace. Cooperating with other players in the marketplace has become a choice that many sellers find beneficial.

Although many studies have investigated the impact of competition and cooperation on the performance of firms offline, there is little research on their relationship in the context of electronic commerce. The purpose of this study is to examine the impact of competition and cooperating on sellers' performance. We test the proposed model by conducting a web survey on sellers from China's largest C2C platform Taobao. We found that the intensified competition stimulate the cooperation, and both horizontal and vertical cooperation helps to improve the performance.

Our study contributes to the existing literature in three ways. First, based on the value net model proposed by Brandenburger and Nalebuff (1996), we divide the cooperators into horizontal cooperators and vertical cooperators. Specifically, complementors in the context of electronic market are not only the entrepreneurs who provide complementary products/service, but also the entrepreneurs on the same platform who complement in the way of adding diversity to the platform and making the platform more attractive. The community-enabled cooperation among all the sellers on the electronic market promotes the prosperity of the electronic market. We took this kind of cooperation into account and demonstrated its positive impact on the sellers' performance.

Second, there have been conflicting arguments on the impact of competition intensity on performance. Some argue that low competition intensity is beneficial to entrepreneurial success (Castrogiovanni 1991; Chandler and Hanks 1994; Schoonhoven et al. 1990) while some others demonstrated that competitive

intensity positively influences productivity growth (Nickell 1996), sales efficiency (Cadogan et al. 2003), and growth of sales (Carlin et al. 2001). In this study, we tested the indirect effect of competition on online entrepreneurs' performance in the online market and found that by stimulating the network orientation and then converting to vertical and horizontal cooperation, competition intensity has a positive indirect impact on sellers' performance.

Third, this study provides a framework explaining the relationship of competition, cooperation, and performance, which enhances our understanding of online entrepreneurs' development in the electronic market. The result of this study will help online entrepreneurs to make the appropriate strategic move, i.e., finding the appropriate cooperator in the online market to survive and expand their businesses.

The rest of the paper is organized as follows. In the next section, we will discuss the related literature which provides the theoretical background for the framework we are going to propose. We will develop the hypotheses and propose the framework in Sect. 3, and introduce the research method and the procedures in Sect. 4. The result of the empirical study will be presented in Sect. 5. And the final section will discuss the major findings and some implications as well as limitations and future direction.

2 Literature review

2.1 Competition and management

Our paper is related to a body of research that study competitive intensity. Competitive intensity is defined as the pressures that an organization's rivals exert on the focal organization, which in turn induces strategic behaviors" (Wu and Pangarkar 2010). Competitive intensity has been revealed to have profound impact on a firm's survival and development, like its chances of survival, price structure, promotion strategy, knowledge management, resource deployment, etc. (Barnett 1997; Auh and Menguc 2005; Cui et al. 2005; Wu and Pangarkar 2010). According to Hermalin (1992), there are four mechanisms driving the influence of competitive intensity on management income effect with reduced profit, risk-adjustment effect with varying risk from changing competitive intensity, change-in-managerial-effort effect which removes the slack of managers, and improved information effect facing more rivals. Castrogiovanni (1991) described competition intensity as environmental munificence, which is the scarcity or abundance of critical resources required by a firm to survive and develop in the market. There are also some research revealing the positive impact of environmental munificence on the number of strategies a firm can adopt (Tushman and Anderson 1986). When environmental munificence decreases, i.e., competition intensifies, the firm's profitability, as well as strategic behaviors will change (Koberg 1987).

Contingent influences of competitive intensity on a firm's performance has also been examined from different levels. He and Nie (2008) studied optoelectronic firms in China and found that positive innovation-performance relationship is improved by competitive intensity. As innovation is an important way to enhance competitive

advantage by making product differentiation, higher competitive intensity makes innovation more urgent, which in turn improves the final performance. Based on an analysis of 670 UK companies, Nickell (1996) found that competitive intensity is associated with a significantly higher rate of productivity growth. Cadogan et al. (2003) studied Hong Kong manufacturing exporters and found that under high competitive intensity, export market-oriented behavior has significant positive impact on the export sales efficiency. And they proposed that "unnecessary drain on resources" decreases the sales efficiency so that under low competitive intensity, export market-oriented behavior has significant negative impact on export sales efficiency performance. Likewise, a moderating influence of competitive intensity is reported on the relationship between firm exploitation and performance, based on research on Australian manufacturing firms (Auh and Menguc 2005). Non-monotonic positive effect of competition on growth of sales, labor productivity, and new product restructuring, much more important than ownership per se, is reported by Carlin et al. (2001) based on a survey of 3300 firms in 25 countries.

2.2 Cooperation and performance

There are different views on how coopetition would affect firm performance. Some studies find that the impact is negative and when is it more likely to fail (Park and Russo 1996; Kim and Parkhe 2009), while others get the opposite result that successful management of cooperation will bring increased innovativeness and profitability in terms of return on equity (Quintana-García and Benavides-Velasco 2004; Luo et al. 2007).

Proposed by Brandenburger and Nalebuff (1996), the Value Net Model (see Fig. 1) helps a company to identify the key players for its business. The four types of player are (1) Customers who buy products or service; (2) Suppliers who provide resources for producing product/service; (3) Competitors who share the same market by providing similar products/services; (4) Complementors who provide related products/services and attract same customers. Base on the above players, the cooperation relationships a firm can develop can be presented by the following "value net."

From the perspective of horizontal cooperation, a firm can cooperate with competitors and complementors. First, cooperation with complementary firms can make all the firms mutually beneficial because of the result of bundling, which makes the bundled products/services more attractive. Bakos and Brynjolfsson
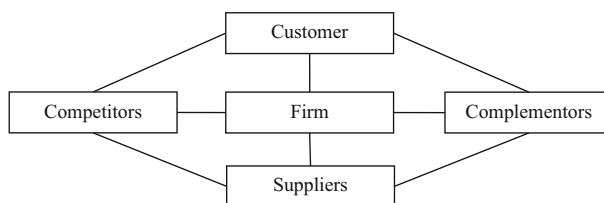

Fig. 1 The value net

(1999) showed that the bundler can attract more consumers, charge a higher price, and achieve higher revenues. Second, Cooperation with competitors, also known as coopetition (Brandenburger and Nalebuff 1996), is also examined in its impact on performance.

From the perspective of vertical cooperation, cooperation with suppliers and customers will help to reduce the risks and uncertainties along the supply chain (Bischoff and Buchwald 2015).

The benefits of cooperation mainly come from three sources:

(1) Lower transaction cost. From the point of view of transaction-cost theory (Williamson 1981), cost-minimization is one of the important sources of competitive advantage. Collaboration with partners on the supply chain improves the position on the chain (Cao and Zhang 2011; Teirlinck and Spithoven 2013), which means lower cost and a more efficient supply chain (Musteen et al. 2010; Olsen et al. 2012). Mutual trust and process integration will increase the profitability of all the partners on the chain (Croom 2001).

(2) Better reputation. The impact of reputation mechanism has been studied extensively both theoretically (Baron 2002; Dellarocas 2003) and empirically (McDonald 2002; Melnik and Alm 2002; Dewan and Hsu 2004; Livingston 2005; Houser and Wooders 2006; Lucking-Reiley et al. 2007). Severe prisoner's dilemma exists in the online market, so building individual reputation is rather difficult especially for new sellers. A seller coalition, taking its collective reputation hostage to undertake credible commitment to buyers, enhances the role of reputation mechanism (Wu and Li 2009). (Lechner et al. 2006) also found that the alliance network provides some untradeable resources like reputation. The participation of the alliance network helps to organize particular resources because of the collective reputation and trust (Gulati and Higgins 2003; Weaver and Dickson 1998).

(3) Convenient knowledge sharing. In the era of the "knowledge economy", knowledge-based theory emphasizes that knowledge is an important asset and resource of the firm. Building a cooperation network both horizontally and vertically facilitates the flow of knowledge. Information and skills are shared (Nelson and Winter 1982), and new knowledge and skills are created and commercialized (Olsen et al. 2012; Sullivan and Marvel 2011; Teirlinck and Spithoven 2013; Thorgren et al. 2009). Sharing knowledge with inter-firm cooperators is found to have significant positive impact on the firm's performance (Tsai 2001; Wiklund and Shepherd 2003; Srivastava et al. 2006).

2.3 Performance measurement

Performance measurement has been a broad topic in business research, and has been measured at different levels. At the individual performance measures level, quality, such as lot sizes, defects, inventory waste, and processing waste (Suzaki 1987) has been a crucial indicator for performance since the 1940 s. Techniques and

procedures such as total quality control and just-in-time have helped Japanese companies to win competitive edge in the global market. In the 1980 s, new dimensions like time (Galloway and Waldron 1988), cost (Johnson 1972), and flexibility (Slack 1983) were also employed to measure performance. Later on, performance measurement system, a set of metrics used to quantify both the efficiency and effectiveness of actions, was proposed as an entity (Kaplan and Norton 1992) and a framework (Keegan et al 1989). And then, the environment the performance measurement system interacts with, both internal and external, was also included.

There is also a stream of independent research focusing on the performance measurement of small and medium enterprises (SME) only. They argue that existing measurements for big companies are not applicable to SMEs because the differences between SMEs and large organizations are fundamental, like shorter-term strategic planning, lack of financial and human resources, and limited managerial capacity (Garengo et al 2005; Hudson-Smith and Smith 2007; Wiesner et al. 2007). The situation is also quite different for internet firms so that we should not adopt traditional financial metrics in performance measurement. For example, a large expenditure at the beginning of a startup is a necessity and will be turned into valuable real options in later periods for internet firms, while according to traditional accounting methodology, the expense will make the financial valuation of this company as negative (Noe and Parker 2005). Therefore, top managers' evaluation of goal achievement is employed as an important way to measure performance (Tang et al. 2010). There are theoretical and practical reasons for this measurement. Theoretically, different managers set different goals based on their own judgement of the market environment. So, performance should be evaluated based on the achievement of their own goals (Rumelt 1991). Practically, it is quite difficult to obtain objective indicators of their profitability, especially for individual sellers who run their businesses in various ways. A subjective performance measure is easier to approach and contains more complete information (Tang and Tang 2012).

3 Theoretical framework and hypothesis development

Based on previous studies of competition and management, cooperation and performance, we propose a theoretical conceptual model in this study (see Fig. 2). We try to identify the impact of competition on the network orientation and the impact of cooperation, both horizontal and vertical, on their performance.
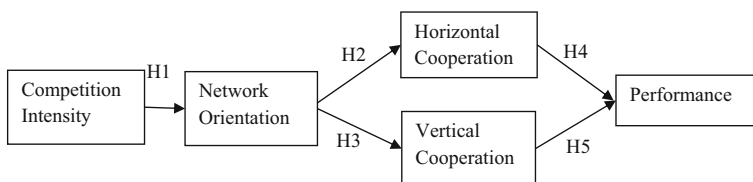

Fig. 2 Conceptual model

Competition intensity refers to the perceived pressure from the rivals. To be more specific, when there are a lot of competitors with similar products at competitive prices or better products at lower prices that attract a lot of potential customers, a seller perceives high competition intensity. Prior research has not agreed on whether competition intensity is high or low in electronic commerce. The scholars who think the degree of competition in e-commerce platform could be high because of homogenous goods, low transaction cost, and high market transparency (Bakos 1997). In addition, powerful search engines lower the search cost significantly, which further increase market transparency (Sinha 2000). And the technology barrier to enter the e-commerce market becomes lower (Ward 2001). On the other hand, competition could be less intense because price discrimination effect still exists and large price dispersion can be observed. (Schmitz and Latzer 2002). Therefore, in this study, competition intensity is measured as perceived competition intensity in the survey.

Similar to the concept of collaborative network orientation (CNO) proposed by Sorenson et al. (2008), *Network Orientation* refers to the attitudes and preparation online sellers take to build cooperation among networks consisting of complementors, competitors, suppliers, and customers. It includes analyzing the industry and the market, figuring out the advantages and disadvantages of potential cooperators, and listing the resources available for development. Only by these network-orientated actions can the online seller choose the right cooperator and find out appropriate ways to gain competitive advantage.

On the e-commerce platform, sellers can change their strategic behavior based on how they comprehend the nature of competition intensity (Koberg 1987). When the competition intensifies, sellers are urged to lower prices to attract price-sensitive customers, improve service to win customers who value the service, and provide differentiated product/service through innovation. To achieve this, sellers have to reallocate their internal resources and seek cooperation with outside parties. Cooperating with competitors to negotiate with common suppliers in order to lower costs is a feasible strategy because of scale effect. Cooperating with suppliers to manage inventory more efficiently will be another option. Also, differentiating product/service can be realized by cooperating with complementors by provide bundling products/services, or by cooperating with customers to provide personalized products.

Therefore, in this study, we infer that the intensity of competition will influence the sellers' network orientation. We propose the following hypothesis:

H1 Competition intensity positively influences the network orientation.

Based on discussion about value net framework in Sect. 2.2, we can divide the sellers' cooperation into two groups, horizontal cooperation and vertical cooperation. *Horizontal cooperation* refers to the cooperation with complementors and competitors.

In previous studies of offline business networks, complementors refer to the businesses that sell products/services that complement the products/services of another company by adding value to mutual customers. Broadly speaking, all the sellers on the same platform could be viewed as another type of complementor that

contributes to the diversity of products on this platform and makes the online market more attractive. Cooperating with complementors can focus efforts on providing bundling products to customers or recommending relevant products/services to customers. On e-commerce platforms, there are more ways to cooperate with complementors, such as adding complementors' links to the webpage of the shop, recommending complementary products to loyal customers, and sharing information and taking joint action among complementors. Facilitated by information technology and community, cooperation among the sellers on the platform becomes very active and plays an important role in sellers' development. In order to survive and develop on the platform, sellers require different kinds of support at different stages. For example, when they start their businesses, they need detailed guidance about the market rules, such as how many items they can post as a beginner, and what the punishment will be if they post items they do not actually have. Later on, as they get started with better knowledge of market rules, they require the skills of running an online business well, such as how to show the product attractively, how to place the keywords for the product, and how to purchase paid search advertisements. Thus, they need to change cooperators dynamically or adjust the frequency of contact with their cooperators who own different skills. Information technology in the online community makes knowledge sharing and various supports possible among sellers on the platform. Therefore, when sellers want to find cooperators in the market, complementors should be an important option.

Cooperating with competitors. Before the concept of co-opetition was introduced, competition-oriented strategy dominated the market. Indeed, competition helps to better locate the rare resource, incubate innovation and lower transaction cost. However, taking the market as a zero-sum game also brings barriers which hurt the market (Powell 2001). In the online marketplace, sellers can cooperate with their rivals to increase the power of negotiation with their common suppliers, to share information and knowledge of the industry, and to expand the market together. More importantly, collaboration with established sellers signals to a third-party that a start-up seller is in a good position to survive and develop, so that resource-holders will not hesitate to provide resources to the start-up seller (Lee et al. 2001). Moreover, seller coalitions are widely observed on Taobao, the leading C2C market in China. Almost each industry owns its sellers' coalition and most of the sellers in this industry voluntarily join the coalition to get information/social support and gain collective reputation from membership in the coalition (Wu and Li 2009). Just like an online strategic alliance, sellers in seller coalitions can complement and strengthen each other in different areas such as introducing new products, launching successful promotions and dealing with malicious buyers, etc. (Bengtsson 2000). Therefore, competitors are also potential cooperators for sellers. We propose the following hypothesis:

H2 Network orientation positively influences horizontal cooperation.

Vertical cooperation refers to cooperation with suppliers and customers. There have been a lot of studies showing that collaboration along the supply chain, i.e. suppliers and customers, could bring greater competitive advantage by leveraging

their resources and knowledge (Fawcett and Magnan 2004; Lejeune and Yakova 2005).

Cooperating with supplier means that sellers and their suppliers work jointly to plan and execute operations toward common goals and their mutual benefit (Simatupang and Sridharan 2002). From the point of view of relationship development, cooperation with suppliers can also be described as working together and sharing information, resources, and risk to accomplish mutual objectives (Bowersox et al. 2003; Golicic et al. 2003). In the online market, sellers and their suppliers can share control of several successive or similar processes formerly carried on independently, like packaging with seller's log, adding customized decorations to the product, and optimizing the inventory together. Also, knowledge of the customers and the whole market are frequently shared between the seller and its suppliers.

Cooperating with customers refers to getting customers involved in improving products and adjusting the business strategy. In the electronic market, customers are invited to provide reviews of products/service which provide an important source of customer knowledge. By applying text mining technologies, sellers can obtain the product/service features which determine the customer satisfaction (You et al. 2012). Meanwhile, instant messenger facilitates pre-purchase and post-purchase communications, and sellers are able to acquire the concerns of customers in a timely fashion and make quick strategic moves accordingly. Moreover, customers are invited to get involved in the phases of design and marketing. For example, several products are presented to and voted on by customers and only the products favored by most will be mass produced. Cooperating with customers, i.e., acquiring customers' knowledge, is very important to gain competitive advantage because it is the foundation of innovation which leads to differentiation from rivals. As successful knowledge management improves the chance of effective innovations (Alegre et al. 2011; Nesta and Saviotti 2005), besides obtaining knowledge from complementors, competitors and suppliers, knowledge from customers becomes a more and more vital source of innovation because customers are the final evaluators of the products/services. By acquiring customer knowledge, firms are able to learn, to meet customer demands, and to improve performance (Prahalad and Ramaswamy 2004). Therefore, we propose:

H3 Network orientation positively influences vertical cooperation.

Different from traditional measures like return on assets, inventory turnover, and net profit (Kaplan 1989; Stuchfield and Weber 1992), which are not available for researchers to capture individual sellers' performance in the electronic market, we measure *seller's performance* by subjective evaluation of the sellers on the targets they achieved. The target could be quite different across sellers on indicators like profitability, market share, growth of sales, and competitiveness as perceived by sellers.

Generally speaking, cooperation helps to increase mutual benefit and improve performance by lowering transaction cost (Cao and Zhang 2011; Teirlinck and Spithoven 2013), facilitating knowledge sharing (Olsen et al. 2012; Sullivan and Marvel 2011), improving the capability of innovation (Quintana-García and

Benavides-Velasco 2004), and gaining the trust of customers through collective reputation (Wu and Li 2009). More specifically, cooperating with complementors, like bundling product, helps the sellers gain greater profit than by selling its own product alone. Recommending relevant products to potential buyers by complementors helps sellers to reach potential customers efficiently and effectively. Cooperating with competitors, like jointly negotiating with suppliers to lower the cost, and building trust with customers from collective reputation by participating in the seller coalition, helps the sellers to expand their businesses quickly, especially for the sellers who have just started their business. Meanwhile, collaboration with suppliers has been revealed to help to obtain complementary resources (Park et al. 2004), generate new product idea (Kalwani and Narayandas 1995), and improve profit performance over time (Mentzer et al. 2000). And cooperating with customers helps to improve innovation, facilitate the detection of new market opportunities, support customer relationship management, and lead to improvement of both long-term and short-term performance (Fidel et al. 2015). Therefore, we propose the following hypotheses:

H4 Horizontal cooperation positively influences sellers' performance.

H5 Vertical cooperation positively influences sellers' performance.

4 Method

Following the three steps proposed by Moore and Benbasat (1991), we first developed items for each construct. Some items are adopted from previous studies and some are modified according to the electronic market scenario. In the second step, scale development, we conducted semi-structured in-depth interviews with 15 online sellers at the annual party of a regional seller coalition. These sellers were asked to check a questionnaire for clarity and readability. Some refinements were made to the terms and order of the questions based on their feedback. Following a suggestion from Bentler and Chou (1987), at least three indicators were designed to measure the construct we created. Multi-item scales were used to operationalize all the constructs. A 7-point Likert scale with endpoints of "strongly disagree" and "strongly agree" was used to measure the items. In Step 3, Instrument Testing, we invited 30 sellers to do a pilot test and got the final questionnaire.

After the questionnaire was developed, we chose the online sellers on Taobao.com to test our hypotheses. Taobao is a leading C2C market in China in terms of market share, number of listed items, active users, and website traffic. Though web-based survey is cheap and fast, disadvantages like self-selection (David 2000) are also a concern. But as individual sellers in electronic market are the focus group of this study, distributing the questionnaires by the Taobao survey department is the best way for us to approach them and make the subjects comfortable with the questionnaire.

As to the concern of social desirability bias, we followed the measures suggested by Fisher (1993) and used more specific and less direct questions. In our cover

guide, we informed the respondents that the survey was designed for research only and that there were no right/wrong answers to our questions. The survey was conducted online posted by the survey department of Taobao.com. We received 421 responses in total, all of which are by active sellers on Taobao.com. Taking the differences between fast-moving consumer goods and durable goods into account, this study focused on sellers of Fast Moving Consumer Goods. After deleting the responses with careless answers and those from sellers of durable goods, there are 335 samples for further analysis.

5 Results

This study employed partial least squares (PLS), a structural equation modeling technique for the data analysis and hypothesis test. PLS owns several advantages over traditional regression analysis in that it evaluates the measurements and structural models simultaneously, taking the measurement errors into account (Chin 1998a, b). Also, fewer restrictions on distribution assumptions and sample size make PLS a superior method widely used in social studies. The empirical test used the software SmartPLS Version 2.0 (Ringle et al. 2005). The model used bootstrapping to calculate the T-statistics for all hypothesis testing.

5.1 Instrument validation

Table 1 presents the result of confirmative factor analysis, including the estimation of internal consistency for reliability (tested by Cronbach's alpha and Fornell's composite reliability), and convergent and discriminant validity (Bollen 1989; Chin and Gopal 1995). All composite reliability measures were greater than 0.8 and all average variance extracted (AVE) measures were above 0.5. These results mean that all constructs have adequate internal consistency and more than 50% of the variance of measurement items have been accounted for by the latent variables (Fornell and Larcker 1981).

As to the construct validity, convergent validity and discriminant validity are two important indicators (Chin et al. 1997). Convergence validity requires the measures of constructs related to each other as much as possible, while discriminant validity requires the correlation between different constructs as little as possible. As Wixom and Watson (2001) suggested, the cumulative percentages of variance explained by each factor are greater than 50%. Table 2 shows the factor loadings of each

Table 1 Reliability and convergent validity

	Composite reliability	Cronbach's alpha	AVE
Competition intensity	0.831760	0.709655	0.635132
Network orientation	0.868795	0.773640	0.688309
Horizontal cooperation	0.907339	0.846839	0.765511
Vertical cooperation	0.880499	0.797022	0.710902
Performance	0.838334	0.743579	0.567204

Table 2 Result of confirmative factor analysis

	Competition	Vertical Cooperation	Network Orientation	Performance	Horizontal Cooperation
Competition1	*0.946606*	0.092881	0.222617	0.015392	0.109386
Competition2	*0.819868*	0.076485	0.107297	0.018605	0.119313
Competition3	*0.571267*	0.042496	0.082575	0.015732	-0.036833
Vertical cooperation1	0.062284	*0.80155*	0.379122	0.202002	0.561524
Vertical cooperation2	0.093366	*0.868322*	0.430945	0.275258	0.558489
Vertical cooperation3	0.078977	*0.858044*	0.42329	0.310697	0.58721
Network orientation1	0.093281	0.434205	*0.836917*	0.30386	0.392431
Network orientation2	0.162509	0.419218	*0.847192*	0.309014	0.311717
Network Orientation3	0.240868	0.359406	*0.804215*	0.176664	0.306288
Performance 1	0.035286	0.275239	0.255448	*0.81674*	0.305514
Performance 2	0.061582	0.266223	0.275502	*0.836967*	0.325887
Performance 3	−0.049953	0.166492	0.257596	*0.678125*	0.229755
Performance 4	−0.015481	0.228836	0.169019	*0.664367*	0.205949
Horizontal cooperation1	0.120658	0.50996	0.32035	0.326183	*0.862753*
Horizontal cooperation2	0.080811	0.654728	0.377224	0.321478	*0.890479*
Horizontal cooperation3	0.058835	0.599196	0.371223	0.300101	*0.871342*

Italic represents the loadings of the variables. It shows that loadings of the variables are greater than 0.65 and greater than the cross-loading

variable. As all the loadings of the variables are greater than 0.65 and greater than the cross-loading, they are effective instruments for measurement. Hence, the variables were reliable and demonstrated good convergent validity.

As (Chin 1998a, b) and (Fornell and Larcker 1981) suggested, the square root of AVE from the construct should be higher than the variance shared between the constructs, so that discriminant validity can be satisfied. So, we compared the correlations between the constructs and the square root of the average variance. Table 3 shows that the square root of each variable's AVE (in bold) was greater than the correlations with other variables, indicating that all the variables in the model demonstrated discriminant validity.

5.2 Structural model assessment

The significance of path coefficient of the structure model was tested by bootstrapping algorithm with 200 samples in SmartPLS. The results of the estimation are presented in Fig. 3. As shown in Fig. 3, competition intensity shows

Table 3 Correlations between variables

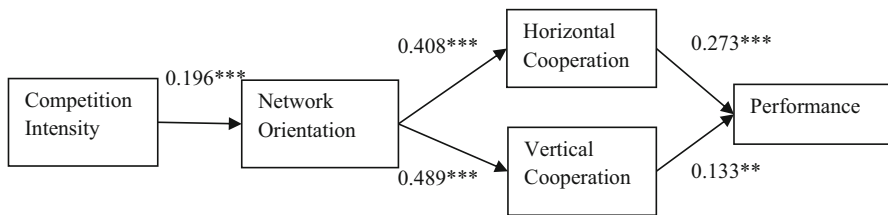|	Competition	Horizontal cooperation	Network orientation	Performance	Vertical cooperation
Competition	**0.796952**				
Horizontal cooperation	0.098483	**0.874935**			
Network orientation	0.196031	0.407961	**0.829644**		
Performance	0.019457	0.360866	0.319795	**0.84315**	
Vertical cooperation	0.093623	0.674068	0.488748	0.31537	**0.753129**

Fig. 3 Estimation result. *Note* *** significant at the 0.001 level; ** significant at the 0.01 level; * significant at the 0.05 level

a positive effect on network orientation ($\beta = 0.196$, $p < 0.001$), supporting H1. The path between network orientation and horizontal cooperation is significant ($\beta = 0.408$) at 0.001 level (supporting H2), and network orientation has positive effect on vertical cooperation ($\beta = 0.489$, $p < 0.001$), supporting H3. As expected, both horizontal cooperation ($\beta = 0.273$, $p < 0.001$) and vertical cooperation (0.133, $p < 0.01$) have positive impact on performance, supporting H4 and H5.

Similar to traditional regression model, R^2 is used to assess the model fit (Chin 1998b). The R^2s for horizontal cooperation, vertical cooperation and performance are 0.17, 0.24 and 0.14 respectively, which indicate that we explained 17, 24 and 14% of the variance of each construct, respectively. Since only one exogenous variable explains each construct in this model, the relative low R^2s are understandable.

6 Discussion and implications

This study examines the impact of competition and cooperation on sellers' performance. The proposed model is empirically tested and all of the hypotheses are supported.

There are two major findings from this study:

First, the result shows that the more intensified the competition is, the more willing the seller is to adopt the strategy of networking. There have been studies demonstrating that cooperation can be a feasible strategy both in markets with numerous rivals (Dussauge, Garrette and Mitchell 2000) and in markets with only a few players (Peng and Bourne 2009; Roy and Yami 2009; Rusko 2011). This study

shows that in a highly competitive online C2C market, the intensified competition promotes the formation of cooperation networks. As Oxley et al. (2009) suggested, the reason might be that cooperation, both horizontal and vertical, helps to "soften the fight" among the competitors. Another explanation might be that the alignment makes the firm engage in "group-versus-group" competition (Gomes-Casseres 1994). In the in-depth interviews to some sellers on Taobao, they express their willingness to join both the regional consortiums and industry associations in order to fight against intense competition.

Second, the result shows that four types of players in the market should be considered as cooperators since both the horizontal and vertical cooperation help to improve performance. Meanwhile, not only the sellers who provide the complementary products/services, but also the sellers who contribute to the online community should be considered as potential cooperators. Consistent with existing studies on relationships between network competence and performance conducted in traditional industries (Levin and Cross 2004; Salman and Saives 2005; Singh and Mitchell 2005; Jenssen and Koenig 2002), this study demonstrated that the positive influence of cooperation network on performance also holds in the setting of e-commerce.

This study provides some implications both theoretically and practically. Theory-wise, this study enriches the studies on performance from the point of view of competition and cooperation in the scenario of e-commerce. The fierce competition stimulates the intention of online sellers' cooperation. They are collaborating in various ways, facilitated by the information technologies (Rossignoli 2009). Meanwhile, the study shows a path of network orientation, cooperation (both horizontal and vertical), and performance. Practically, the result provides some suggestions for online sellers to enhance performance. Instead of fighting alone, sellers should seek all possible ways to cooperate with all kinds of players in the electronic market. By collaborating along the supply chain, seller should share inventory information, control of several successive or similar processes, and risk with the supplier. Also, sharing design and marketing ideas with the customers and obtaining as much feedback as possible are beneficial. Meanwhile, cooperating with competitors, like joining the sellers' coalition, also helps to understand the customer, gain collective reputation, and increase the consumer base. All the players in the market could be cooperators, since for as complementors they could attract more potential buyers to the market.

Our study also has several limitations which could lead to future research. First, the research context is limited to the Chinese online market. As we all agree, different business cultures exist across east and west (Ferraro and Brody 2015). The generalization of the result of this study needs further empirical study. Second, the sellers in this sample are all in the category of "Fast Moving Consumer Goods," it is possible that sellers of "durable goods" have different behaviors and outcomes. It will be an interesting work to compare the sellers of these two fields.

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