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Short Paper

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Abstract

One-to-many services with public nature make online responses to one consumer visible to other consumers, which facilitates services to consumers but brings social comparison that can introduce unfairness and affect consumer attitudes. This study aims to explore the influence of online responses on consumer satisfaction from the perspective of fairness in online one-to-many services. This study proposes a theoretical model with unfairness as the mediator and examines the U-shaped relationship between online responses and aggregate consumer satisfaction and its mechanism. The findings show that online responses affect aggregate consumer satisfaction both directly and indirectly by changing the level of unfairness. The results provide theoretical insights on online responses and fairness literature and contribute to managerial implications for practitioners by reminding the negative impact of unfairness brought by online responses in the one-to-many scenario.

Keywords: One-to-many Services, Online Response, Consumer Satisfaction, Fairness

Introduction

The digital age with lots of emerging information systems has greatly facilitated the way and efficiency of people's online engagement, communication, and interaction with others, which enables a large number of services to be delivered online. Consumers are empowered to put forward demands, ask questions, and express views to online service providers in a direct way, meanwhile, service providers can respond directly to consumers. As an important part of online service, the online response is considered to be one of the significant ways to interact with consumers (Gu & Ye, 2014), which plays a key role in the formation of consumer satisfaction.

While recently, online services have evolved to a new stage that can simultaneously involve a large number of customers participating due to the prosperity of information technology (Wu et al., 2023). Online service

providers serve customers in a more efficient way, called "one-to-many" services that a service provider simultaneously deals with multiple customers in the same accessible cyberspace (Bründl et al., 2022). For instance, in live e-commerce, sellers can explain products to a large number of consumers at the same time and interact with them in real-time. Being a new tendency, one-to-many services are different from the call center, shopping guide in private dialogue, and other forms of one-to-one services. By the end of 2020, the number of live streaming users in China had reached 617 million[a], and the market of online one-to-many services has also reached a large scale in the whole world.

In this study, we focus on online response in one-to-many services, specifically, the behavior of service providers responding to consumers online during one-to-many service delivery. It is real-time, synchronous, and facing large-scale consumers(Bründl et al., 2022; Wu et al., 2023), and brings great challenges for service providers. On the one hand, due to the limited ability of service providers, they cannot adopt the full response strategy (L. Wang et al., 2020) and respond to everyone in a short time. What's worse, the limited response to customers is visible to others who do not receive direct responses yet. This public nature inevitably throws consumers into judging whether they have been treated fairly and then affects their attitudes to the provided services. Although previous studies have proved that online responses can effectively improve consumer satisfaction, in the condition of one-to-many services, online responses are likely to make a negative impact on consumer satisfaction based on the consideration of fairness.

On the other hand, when responding selectively, service providers in the past used to respond to online reviews with an emotion-based response strategy, focusing on responding to negative emotions (L. Wang et al., 2020). But this strategy is inefficient since interactions in one-to-many services generally occur before consumers form definite attitudes. Such a response strategy is likely to ignore consumers who care about fairness, which may also reduce consumer satisfaction.

In sum, it is necessary to empirically explore the influence of online responses on consumer satisfaction from the perspective of fairness in one-to-many services. There is also a clear research gap in the literature on two related streams, i.e., online responses and fairness. The research efforts of online responses mainly focus on one-to-one interactions (Barger et al., 2016; Peppers et al., 1999) or asynchronous responses to online reviews (Gu & Ye, 2014; Huang et al., 2021; Ravichandran & Deng, 2022), and they ignore the one-to-many service context. As for the studies of fairness, they rarely explore the impact of unfairness in the online environment, let alone the environment with one-to-many services. By dialoguing with existing literature, this study aims to answer the two research questions: 1) In one-to-many services, how do online responses affect consumer satisfaction? 2) From the theoretical perspective of fairness, what is the mechanism by which online responses affect consumer satisfaction? This study will make contributions to the online response literature and fairness literature by deepening the knowledge about responses in one-to-many services by introducing unfairness into the relationship between online responses and consumer satisfaction. These findings provide implications for practitioners on one-to-many occasions by reminding the negative impact of unfairness brought by online responses, pointing out the opportunities to improve consumer satisfaction, and guiding future interaction design.

Literature Review

Online Responses

How to interact with consumers has always been the concern of managers (Williams & Spiro, 1985). Various efforts have been made in responding to consumers, especially in traditional offline situations or online services with one-to-one interactions (Barger et al., 2016; Li et al., 2019; Peppers et al., 1999). As for online services, the focus of most research efforts is the response to consumer reviews (Word of Mouth, WOM) in e-commerce which is regarded as an effective management intervention strategy (Huang et al., 2021; Proserpio & Zervas, 2017). A typical purpose of managerial responses to online reviews is service recovery (Gu & Ye, 2014; Huang & Ha, 2020), such as dealing with online complaints (Gu & Ye, 2014) and word-of-mouth crises (Crijns et al., 2017). Importantly, there are more benefits of online responses both for consumers, such as reducing uncertainty and increasing consumer trust (Hajli, 2015; Sparks et al., 2016), promoting consumer repurchase intention (Chen et al., 2020; Huang & Ha, 2020), and for firms, such as improving product rating and organizational reputation (Banerjee et al., 2021; Crijns et al., 2017; Proserpio

[a] https://report.iresearch.cn/report_pdf.aspx?id=3841

& Zervas, 2017). Most of these studies believe that online responses of managers have a linear positive impact on consumer satisfaction(Chen et al., 2019; Chung et al., 2020; Proserpio & Zervas, 2017). However, these studies have not paid enough attention to the online responses in one-to-many services.

Meanwhile, the form of responses to online reviews is different from online responses in one-to-many services. First, it involves multiple consumers asynchronously rather than in real-time and synchronously. Existing studies have observed the spillover effect of online responses on bystanders due to the public nature of the online environment (Chen et al., 2019). That is, the way and content of online responses affect the inference and attitude of those observers toward the provider (Sparks et al., 2016). The second difference lies in the timeliness of the response to consumers. Online reviews and responses to them occur after services, thus the impact of responses on observers is indirect and delayed. As a result, what existing studies focus on is how online responses can remedy existing dissatisfaction or improve word-of-mouth to gain benefits in the future. Such interactions are usually impossible to remedy the harm caused by negative reviews (Banerjee et al., 2021), and too late for some products with low purchase frequency whose current consumption satisfaction is more important. What online responses during one-to-many services will impact is the current one, such as consumer satisfaction with current products/services, but we still know little about it.

Fairness

Fairness is a vital issue that has been a concern for a long time (Adams, 1965; Ho & Su, 2009). The definitions, dimensions, antecedents, and consequences of fairness were initially studied in the organizational environment (Ambrose et al., 2007; Masterson et al., 2000; Roch & Shanock, 2006). According to Adams's definition of inequality, “inequity exists for a person whenever he perceives that the ratio of his outcomes to inputs and the ratio of other's outcomes to other's inputs are unequal” (Adams, 1965). Based on Adams (1965), perceived fairness refers to an individual's judgment on whether the exchange events he or she faces are fair (Turel & Connelly, 2013). This unfairness may happen either (a) when s/he and others are in a direct exchange relationship or (b) when both are in an exchange relationship with a third party and a person compares himself/herself to others (Adams, 1965). The formation of the perception of fairness or unfairness is due to the existence of social comparison (Festinger, 1954) that will induce peer-induced fairness when individuals look at their peers as a reference (Ho & Su, 2009). Their satisfaction decreases when individuals perceive themselves as being treated worse than their peers (Gu & Ye, 2014). At this time, peer-induced fairness influence is more salient than distributional fairness (Ho et al., 2014).

The unfairness that leads to people's dissatisfaction and unpleasantness (Adams, 1965) no doubt cause negative effects. However, the research on fairness in the online context is insufficient in the IS discipline. Some studies have discussed the fairness of online interactive doctor-patient relationships, in which doctors and patients have different relative social statuses (X. Zhang et al., 2019), without discussing the impact of comparison of peers with the same social status. In one-to-many online services, fairness needs to be more considered, especially peer-induced fairness between consumers. Previous studies have preliminarily found that in the online review situation, online responses will introduce peer-induced fairness, which makes a different impact on the service recovery satisfaction of consumers who are responded to and not responded to (Gu & Ye, 2014). Although we still cannot answer the impact of online responses on different consumers in one-to-many services, it provides a valuable reference for our study.

Research Model and Hypotheses

The online response in one-to-many services, as well as the one-to-one service response and online review response in previous studies (Chen et al., 2019; Chung et al., 2020; Proserpio & Zervas, 2017), are both interactive efforts of service providers to improve the consumer experience. Previous research has preliminarily seen the positive significance of service providers in responding to consumers in one-to-many services (Cai et al., 2020). Thus, we expect that online responses in one-to-many services will also bring positive effects on individual consumers (Gu & Ye, 2014). But the linear positive relationship is not sufficient to describe the complex environment of one-to-many services. From the overall perspective, responses to a small number of consumers rather than treating everyone equally will induce a sense of unfairness towards providers and services among the remaining consumers. At this time, the negative impact of online responses to minorities could prevail. When online responses gradually cover most

interactive requests, the positive role will gradually appear and improve. Considering the positive impact of partial response on individuals and the potential negative impact on other individuals, at an aggregate level, online responses and consumer satisfaction will form a U-shaped relationship. The aggregate consumer satisfaction represents service satisfaction. Therefore, we propose the following in one-to-many interactions:

H1: There is a U-shaped relationship between online responses and aggregate consumer satisfaction.

To further confirm this curvilinear relationship and unlock the black box, we take fairness theory into account and construct a theoretical model with a mediator of unfairness. When the provider does not reply to anyone or only a few people, almost all consumers will be treated equally. At this time, few people will feel unfair. With the increase in the part of consumer messages being responded to, online responses are more easily exposed to more consumers due to the public nature. When the provider replies to a small part of messages, most messages are not responded to but tend to compare with others and think they should be responded to. Then the perception of unfairness will appear in the minds of these consumers. When such consumers account for the majority, the overall unfairness perception will be higher. With the further increase in responses, most consumers are satisfied, only a small part of them still feel unfair, and the overall unfairness decreases. Overall, in the continuum from no response to full response, we expect that the unfairness of interactive services increases first and then decreases, and hypothesize that:

H2a: With the increase of online responses, unfairness first increases and then decreases, that is, there is an inverted U-shaped relationship between them.

According to previous research, unfairness will affect consumers' evaluation of products and services and reduce their satisfaction rating (Olson & Ro, 2020; X. Zhang et al., 2019). Online responses affect aggregate consumer satisfaction through the partial mediator, unfairness. Consistent with previous studies, we expect that if unfairness is controlled, the relationship between online responses and aggregate consumer satisfaction is still positive. We hypothesize that:

H2b: Unfairness is negatively associated with aggregate consumer satisfaction.

H2c: After controlling the impact of unfairness, online responses are positively associated with aggregate consumer satisfaction.

There is an inverted U-shaped relationship between online responses and unfairness. Then, unfairness is negatively associated with aggregate satisfaction. In addition, online responses will also positively affect consumer satisfaction. These two paths combine to form the U-shaped relationship between online responses and aggregate consumer satisfaction. Figure 1 (Left) shows the theoretical model of this study.

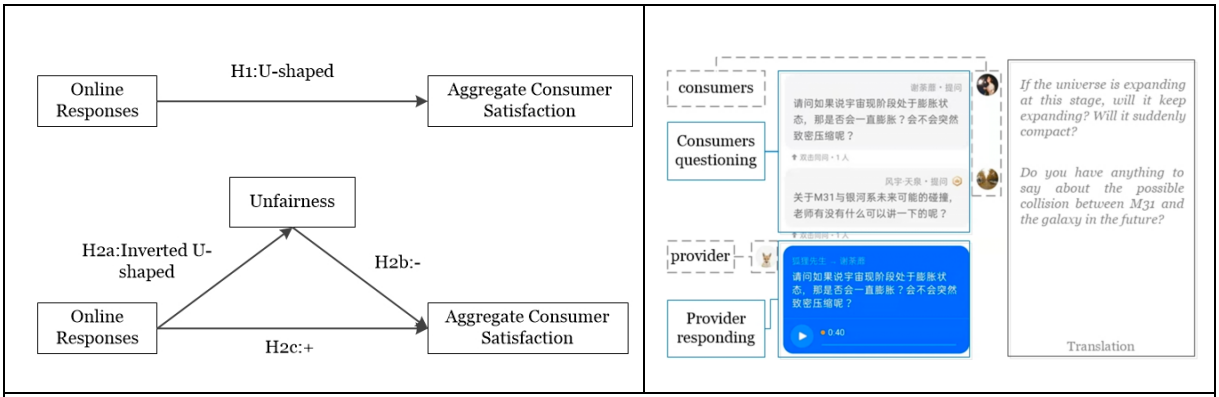

Figure 1. Research Model (Left) and An Example of Live-chat Window (Right)

Methodology

This study was conducted on Zhihu Live (www.zhihu.com/lives), one of the biggest knowledge service platforms in China. Live is an online service through multimedia, such as texts, images, audio, and videos. There are two distinguishing roles on the Zhihu Live platform, namely, speakers (knowledge service

providers) and consumers (knowledge consumers). Providers provide knowledge services (Lives), for example, "Introduction to cloud computing", "Ten common questions for Piano Beginners", and "How to pass the securities qualification examination ". To access these Lives, consumers should pay entrance fees, and then can leave comments with scores (1 to 5 stars), which are regarded as an explicit indicator of individual consumer satisfaction (Engler et al., 2015; J. Zhang et al., 2019). There is a specific interactive window in Zhihu Live in which consumers who buy the Live can send messages or ask questions to the provider within a certain time, and the provider can choose any message to reply to (like the @ symbol). Allowing multiple consumers to send messages at the same time, this interactive live-chat window can well describe one-to-many interactions between product providers and consumers, and provides an ideal opportunity for our study. Figure 2 (Right) shows the live-chat window in Zhihu Live. The responses to consumers provide more information and deepen consumers' understanding of knowledge. Thus, most consumers who ask questions naturally want to be answered. And the provider's response is usually in voice format, making consumers more concerned about responses to themselves rather than clicking on voice messages to others.

	Variables	Definition
Dependent Variable	ServiceRating	The average of numerical ratings on a Live that reflects the consumers' aggregate satisfaction with the Live.
Independent Variable	ReplyRatio	The provider's reply ratio to all the consumer messages.
Mediator Variable	Std	$Std = \sqrt{\frac{\sum_{i=1}^{n}(replyratio_i - \overline{replyratio})^2}{n}}$, where $replyratio_i$ is the provider's reply ratios to consumer i and $\overline{replyratio}$ is the provider's average reply ratio. This formula represents the standard deviation of the provider's reply ratios to each consumer, which reflects the degree of unfairness.
Control Variables	OthersMeanScore	The average score of other Lives issued by the provider to reflect the potential quality of a Live.
	Followers	The number of followers to represent the popularity of the provider.
	LiveQuantity	The number of Live issued in the provider's history to represent the provider's experience.
	SpeakerGender	The gender of the provider.
	Price	The price of a Live.
	Seats	The purchase volume of a Live.
	AudioDuration	The duration of a Live.
	QuestionProportion	A Bert model results to mark whether a consumer's message is a question or a chat, which measure consumers' understanding of a Live.

Table 1. Variable Definitions

The knowledge service provided by Zhihu Live is a kind of information service with a low probability of repurchase. Once consumers form a negative attitude toward the knowledge service, it is difficult to change and the harm to this service cannot be remedied (Banerjee et al., 2021). Therefore, we need to study the relationship between interactions during service consumption and consumer satisfaction. This is significant not only for how to better provide knowledge services but also for how to improve consumer satisfaction. For the research on knowledge services, most focus on the traditional transaction factors or e-commerce features (Cai et al., 2020; Shi et al., 2020; C. Wang et al., 2020) and provider characteristics on knowledge service consumption (C. Wang et al., 2020; Zhao et al., 2018) This study will discuss the impact of provider-consumer interactions that few have studied before (Cai et al., 2020). Compared to other one-to-many services such as entertainment software such as Douyin and TikTok, as well as e-commerce software such as Taobao, knowledge services such as Zhihu Live are less affected by entertainment and product sales, which provides a relatively clear empirical environment.

As of July 2018, there had been 4010 Lives on Zhihu Live. These Lives attracted millions of purchases and 129205 users to participate in interactive sessions, leaving 125712 users after excluding anonymous ones in each Live. To ensure that the dataset could answer the proposed research questions accurately and

reasonably, we performed several preprocessing steps to remove "noisy" records. By excluding Lives without product scores and consumer engagement, there are 3361 Lives left. These Lives generated 337811 messages sent by consumers and 334133 messages sent by providers, forming a total of 84335 groups of interactions. After removing records with missing values, 3121 Lives records are reserved in the analysis.

Variable definitions are given in Table 1. We calculated and measured variables from secondary data. The proxy for unfairness is achieved by calculating the standard deviation of the provider's response, as it is difficult to obtain through self-reporting. To test the relationship between online responses and product satisfaction, we followed guidelines from prior literature on testing curvilinear relationships (Haans et al., 2016; Karhade & Dong, 2021; Lind & Mehlum, 2010). Equation (1) presents our main empirical model.

$$ServiceRating_i = \beta_0 + \beta_1 * ReplyRatio + \beta_2 * (ReplyRatio)^2 + B^T * Controls + \varepsilon_i \quad (1)$$

If the hypothesized U-shaped relationship does exist, three criteria need to be fulfilled: (1)$\beta_1<0$ and $\beta_2>0$; (2) the slope must be steep on both sides, before and after the turning point, and (3) the turning point needs to be within a feasible data range(Haans et al., 2016; Lind & Mehlum, 2010). To examine the first criterion, we estimated the OLS regression model as shown in Equation (1). To examine the second criterion, we conducted the U test (Lind & Mehlum, 2010). To examine the third criterion, we calculated the turning point to ascertain whether it lies within a reasonable data range (Haans et al., 2016).

The theoretical model of this study is a partial mediation model. To verify this model, we followed the mediation analytic procedures (Baron & Kenny, 1986) According to Baron and Kenny (1986), variable functions as a mediator when it meets the following conditions: (a) variations in levels of the independent variable significantly account for variations in the presumed mediator (i.e., Path *ReplyRatio* to *Std* in our case), (b) variations in the mediator significantly account for variations in the dependent variable (i.e., Path *Std* to *ServiceRating* in our case), and (c) when Paths a and b are controlled, the relationship between independent and dependent variables remains significant (i.e., partial mediation) or becomes insignificant (full mediation). We did the sequential test and used the same method as Equation (1) to examine the inverted U-shaped relationship between online responses and unfairness. At this time, criterion 1 should be $\beta_1>0$ and $\beta_2>0$. Then we examined the other paths.

Preliminary Results

The results of the OLS regressions are exhibited in Table 2 which shows the coefficient and a standard error for each variable. Model 1 includes all the control variables and suggests that most previous conclusions still make sense with our data. Even if some variables lack significant effects, we still leave them in the model to be consistent with previous studies. Model 2 adds *ReplyRatio* and its square term, both of which have a significant impact—the variable's impact is negative but that of its square is positive ($\beta_1 = -0.124$, $p \leq 0.05$; $\beta_2 = 0.272$, $p \leq 0.01$). These findings meet the first criterion of testing a U-shaped relationship. And the likelihood ratio of model 2 is significantly better. We then conducted the U test (Lind & Mehlum, 2010), to evaluate whether the slope is steep on both sides, before and after the turning point. This test confirmed that, on both sides, the negative and positive slopes are statistically significant ($t = 2.38$, $p = 0.0088$), meeting the second criterion for validating a U-shaped relationship. Finally, we found that the turning point appears when *ReplyRatio* is about 0.2282 within the allowed range, meeting the third criterion. We use the variance inflation factor (VIF) to detect and measure the amount of collinearity in the multiple regression model and find no potential multicollinearity problem (Mean VIF=2.83). All these results support a U-shaped relationship between *ReplyRatio* and *ServiceRating* (Haans et al., 2016), supporting Hypothesis 1.

We then take a step-wise approach to test the mediation role of unfairness (*Std*) in the theoretical mechanism. Model 3 shows the regression results of *ReplyRatio* and its square term with *Std*. *ReplyRatio* has a significant positive effect ($\beta_1 = 1.691$, $p \leq 0.01$) and its square term has a significant negative effect ($\beta_1 = -1.866$, $p \leq 0.01$). The positive and negative slopes are statistically significant ($t = 58.7$, $p < 0.001$), and the turning point appears when *ReplyRatio* is about 0.4531 within the allowed range, meeting all three criteria. And there is no potential multicollinearity problem (Mean VIF=2.84). These findings verify the inverted U-shaped relationship between *ReplyRatio* and *Std* and support Hypothesis 2a. Model 4 contains both *ReplyRatio* and *Std* to test the relationship between these two variables and *ServiceRating*. The results show that after controlling *ReplyRatio*, *Std* has a significant negative impact on *ServiceRating*. That is, unfairness will damage product satisfaction, supporting Hypothesis 2b. When *Std* is controlled, the effect

of *ReplyRatio* on *ServiceRating* is significantly positive, supporting Hypothesis 2c. All these results validate our mediation theoretical model in Figure 1.

	Model 1: controls	Model 2: curvilinear	Model 3: unfairness	Model 4:service rating
ReplyRatio		-0.124**(-2.375)	1.691***(92.931)	0.131***(5.382)
ReplyRatio2		0.272***(3.729)	-1.866***(-73.651)	
Std				-0.157***(-5.011)
OthersMeanScore	0.542***(23.958)	0.540***(23.944)	-0.034***(-4.310)	0.533***(23.578)
Followers	0.000(0.267)	0.000(0.689)	0.000(1.373)	0.000(0.834)
LiveQuantity	0.002***(3.247)	0.002***(3.306)	0.000(1.119)	0.002***(3.326)
SpeakerGender	0.001(0.151)	-0.001(-0.131)	-0.001(-0.265)	-0.001(-0.096)
Price	0.000(0.689)	0.000(0.920)	-0.000***(-3.929)	0.000(0.735)
Seats	-0.000***(-4.680)	-0.000***(-4.330)	0.000***(3.715)	-0.000***(-4.081)
AudioDuration	0.000***(7.758)	0.000***(7.378)	0.000***(3.001)	0.000***(7.563)
QuestionProportion	-0.006**(-2.195)	-0.013***(-3.940)	0.005***(4.238)	-0.012***(-3.875)
_cons	2.041***(19.767)	2.058***(19.916)	0.188***(5.256)	2.093***(20.166)
N	3121	3121	3098	3098
R2	0.205	0.210	0.781	0.213
Adjusted R2	0.203	0.208	0.781	0.211

Table 2. Results of Regression Analysis

Discussion and Future Work

In this study, we propose a theoretical model with unfairness as the mediator and preliminarily examine the relationship between online responses and consumer satisfaction in online one-to-many services. The preliminary results show that there is a U-shaped relationship between online responses and aggregate consumer satisfaction, which is different from previous studies(Gu & Ye, 2014; Proserpio & Zervas, 2017) due to the unique nature of one-to-many services. This mechanism is that although online responses will have a positive impact on consumers' attitudes, the level of (un)fairness is meanwhile changing. As the coverage of provider response increases, the level of unfairness and online responses show an inverted U-shaped relationship, and unfairness makes a negative impact on consumer satisfaction. These two paths are integrated to form a U-shaped relationship between online responses and aggregate consumer satisfaction.

As this is an ongoing study, we will further extend this study in the coming time. First, we are planning to conduct several robustness checks to validate the robustness of our analysis from aspects of the type of responses, the proxy of unfairness such as the Gini coefficient, and changing samples. The preliminary robustness check shows that the result is robust. Second, we consider there is a social comparison between peer consumers in terms of being responded to by providers and will further examine the impact of peer-induced fairness with the individual-level data to further verify the mechanism. We also plan to replace the mediation analysis approaches and the method of causal testing(Hayes, 2012; Imai et al., 2010).

Conclusion

Our findings reveal the role of (un)fairness and contribute to online responses literature, equity theory, and consumer satisfaction research. First, our study extends prior research on fairness to the context of online services. The trendy interactions in one-to-many services with public nature bring peer-induced fairness that is different from most previous literature. Second, our study contributes to extant research on the impacts of online interactions and online responses. by combining the two theoretical perspectives of online responses and fairness. In addition, we focus on online responses that can directly affect consumer attitudes during consumption rather than for the purpose of service recovery. This study is also a supplement to consumer satisfaction studies and can deepen our understanding of this research field. For practitioners,

we remind them to pay more attention to fairness when using increasingly abundant online tools, so as to prevent the negative impact of unfairness on consumer satisfaction. We also have guidance on how to respond effectively to consumers in one-to-many services that more and more appear on business occasions. In terms of platforms, our findings bear meaningful implications for the design of e-commerce platforms with one-to-many interactions.

This study represents several opportunities for future work. First, it would be more convincing and interesting to extend this study to different IS platforms with one-to-many services. Second, there may be more ways of interactions in the future, allowing us to explore whether it is meaningful to distinguish the fairness of different dimensions. In terms of analysis methods, the opportunity exists to further investigate the mechanism through other methods. From the perspective of perception, future studies may complement our findings by using surveys or lab studies to gain a better understanding.

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