

Research on the Impact of Bullet Emotion on the Sales Volume of E-commerce Broadcast Room

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ABSTRACT

E-commerce live streaming has become a major retail channel in China. Its defining feature is the interactive environment within live rooms, encompassing not only anchor-viewer communication but also viewer-to-viewer interactions. Despite bullet screens being a key form of such interaction, their influence on consumer behavior remains underexplored. This study constructs an empirical model using sales data to examine how bullet screen sentiment affects sales performance. Furthermore, it investigates the moderating role of product type on this relationship. The findings reveal that positive bullet screen sentiment significantly boosts sales. Moreover, this positive effect is particularly pronounced in live rooms selling search-type goods. These insights contribute to understanding the emotional dynamics in e-commerce live streaming and offer practical implications for optimizing engagement strategies.

KEYWORDS

E-commerce live streaming; Bullet screen sentiment; Live room sale

1 Introduction

In recent years, China's e-commerce live broadcast has quickly become one of the important retail sales channels. According to the 53rd Statistical Report on the Development of the Internet in China released by the China Internet Network Information Center, as of December 2023, the number of live e-commerce users in China reached 597 million, accounting for 54.7% of the total number of Internet users, an increase of more than 80 million people. It is precisely because of its interactive shopping experience that e-commerce live shopping has become one of the shopping scenes favored by consumers (Zhou et al., 2021) ^[1]. In the process of e-commerce live shopping, the audience can instantly interact and communicate with the anchor through the bullet-screen information in the live broadcast room. At the same time, the audience can also see the bullet screen, so the interaction between the audience can be timely. Consumers can pass the product use experience to other viewers through the bullet screen information, so as to help other viewers make consumption decisions (Guo et al., 2021) ^[2]. Therefore, in the live broadcast of e-commerce, bullet screen, as a high-frequency interaction mode, will have an important impact on consumers.

Existing research on e-commerce live streaming has largely focused on product information, discounts, and anchor characteristics, with limited attention to bullet screen interactions. To address this gap, this study constructs an empirical model using bullet screen sentiment to analyze its impact on live room sales. Additionally, given product type variations, this paper examines the heterogeneous effects of bullet screen sentiment across different commodity categories.

2 Literature Review and Research Hypothesis

2.1 E-commerce Live Streaming

Previous research literature on e-commerce live broadcast rooms mostly took SOR theoretical model (Guo et al., 2021) ^[2] and Hovland persuasion theory (Luo et al., 2021) ^[3] as the theoretical basis to discuss the impact of anchors in e-commerce live broadcast rooms and live broadcast characteristics on consumers' decision-making. In these theoretical studies, e-commerce live streaming forms a typical stimulus-perception-decision process. Potential consumers make decisions about consumption or not after receiving various sensory stimuli from e-commerce live broadcasts. Chen et al. (2024) ^[4] studied the impact of the interaction between anchors and audiences on consumers' decision making, emphasizing that real-time interaction of anchors is one of the main factors affecting the audience's shopping decision in the broadcast room. Li et al. (2024) ^[5] studied the influence of the characteristics of anchors themselves on consumers' decision making. The good visibility and reputation of anchors can significantly improve the audience's consumption tendency.

However, e-commerce live broadcast that is different from traditional shopping channels is that its environment itself is interactive. There is not only interaction between the anchor and the audience, but also real-time interaction between the audience through bullet screen and other forms (Zhao et al., 2024) ^[6]. Therefore, the impact of bullet screen, which is the product of multi-information source crossing, on the consumption decision of audience in direct broadcast room is

worth further discussion.

2.2 Elaboration Likelihood Model

Elaboration likelihood Model (ELM) divides individual response mechanisms to external stimuli into central and marginal pathways. Individuals process information-related content through the central path and information-related clues through the edge path (Petty & Brinol., 2011) ^[7]. The essence of consumer influence in the e-commerce live broadcast environment is also the processing process of e-commerce live broadcast viewers for bullet screen information. Bullet screen information itself has a distinction between positive and negative emotions. This paper focuses on the impact of the characteristics of bullet screen emotion on consumer decision-making. Bullet screen emotion is a typical edge path stimulus factor, so the first hypothesis is proposed as follows:

H1: Barrage sentiment has an impact on studio sales.

2.3 Barrage Emotion and Perceived Trust

Research in the field of social commerce shows that social interaction can enhance consumers' trust in products (Green, 2007) ^[8]. In e-commerce live broadcasting, consumers judge the quality of products and the credibility of anchors through bullet screen information (that is, edge path). When the barrage expresses positive emotions, the perceived risk that consumers can experience will decrease significantly (Dunn & Schweitzer., 2005) ^[9]. When the barrage expresses negative emotions, consumers' distrust of anchors and products will increase. Therefore, considering the consumer decision under the ELM edge path, this paper proposes the second hypothesis:

H2: Positive sentiment can increase the sales of broadcast room.

2.4 Experiential Goods and Search Goods

There is a big difference between the quality cognition of experiential goods and that of search goods (Klein, 1998) ^[10]. The quality cognition of experiential goods depends more on personal experience, such as things, clothes, hotels, skin care products, etc., are experiential goods. The search type of goods refers to the category of goods that consumers can learn important information about the product through the seller's introduction before purchasing. The parameters and attributes of these goods can be clearly defined. For example, mobile phones, computers, digital cameras and other digital products are searchable goods. Therefore, different commodity types also have an impact on edge path decision-making (Yang & Mai., 2010) ^[11].

Most of the live broadcast rooms of e-commerce live broadcast revolve around a certain product category, so in the live broadcast rooms that mainly sell experiential products, the emotion of the bullet screen as a stimulus factor on the edge path is often difficult to play its effect. In the live broadcast room of searchable goods, the audience can judge the quality of the goods by the emotion of the bullet screen and the introduction of the anchor. Therefore, this paper proposes a third hypothesis:

H3: Bullet-screen sentiment can have a positive impact on the sales of search-type commodity broadcast room.

3 Empirical model

3.1 Data Source

To examine the impact of bullet screen sentiment on live room sales, this study collected data from Douyin live streaming rooms, one of China's largest e-commerce live streaming platforms. Data were extracted from Cicada Mama (www.chanmama.com), a professional Douyin data analytics platform. The selected product categories include beauty products, snacks, and digital goods. These categories were chosen for two reasons. First, they generate substantial live room data and are among the most common on Douyin. Second, they encompass both experiential and search-type goods, enabling a nuanced analysis of product-level heterogeneity in the effect of bullet screen sentiment.

3.2 Introduction of Variables

3.2.1 Explained Variables

The explained variable of this paper is Sale: this data represents the sales level of the direct broadcast room. The larger the value, the larger the sales volume of the live broadcast in the direct broadcast room. Since the sales volume of the broadcast room involves business secrets, the monitoring platform can only give the turnover range of the broadcast room, such as "2.5~5w", and the middle value is taken as its sales level in this paper.

3.2.2 Core Explanatory Variables

Senti_score: This paper firstly divides the bullet screen text information into words, classifies and counts the words according to their parts of speech, and obtains the number of positive and negative emotion words. The difference between the two can get the bullet screen emotion score. The larger the value, the more positive the emotion of the barrage.

3.2.3 Control Variables

Number of viewers (Spec_cnt): The number of viewers is the basis for generating sales in the broadcast room, and the more viewers, the more transactions can be generated.

Number of fans (Fans_cnt) : There is such a transaction form in the Douyin broadcast room, because the anchor has a group of loyal fans, so most of the products sold by the fans will actively buy.

Sending Bullet_cnt: One of the main differences between Tiktok live broadcast rooms and traditional e-commerce is that not only can the anchor and the audience interact, but also the audience can communicate with each other in real time through the bullet.

Average Price of goods: The sale of Tiktok live products is also inseparable from the basic principle of commodity supply and demand. For normal goods, the lower the unit price, the more sales, but the turnover may also decline because the unit price is too low.

Weekend or not (Is_weekend_flag) : In fact, people will have more time to shop on weekends, so the broadcast room that starts on weekends tends to have more turnover.

Commodity_type: It is difficult to directly compare the sales volume of different types of commodities in the Douyin-broadcast room.

The statistical description of the variables used in this paper is shown in the following table:

Table 1 The statistical description

Variable	Obs	Mean	Std.Dev.	Min	Max
Sale	3,197	142,254	309,151	8,750	6,250,000
Senti_score	3,197	2,167	1,619	-5,912	11,780
Spec_cnt	3,197	58,592	134,033	166	3,217,940
Fans_cnt	3,197	307,112	729,043	437	8,831,721
Bullet_cnt	3,197	3,262	5,588	14	99,214
Price	3,194	1224.815	2062.934	0.01	29328.73
Is_weekend_flag	3,197	0.2111354	0.4081781	0	1
Makeup_flag	3,197	0.3121677	0.4634503	0	1
Snack_flag	3,197	0.257116	0.4371123	0	1

3.3 Baseline Regression

The benchmark measurement model of this paper is as follows:

$$Sale = \beta_0 + \beta_1 Senti_score + \beta_k control_k$$

Where, β_k represents the estimated coefficient before the control variable, and the subscript k refers to each control variable.

The benchmark regression results of this paper are shown in the following table:

Table 2 The benchmark regression results

	(1)
Explained variable	Sale
Senti_score	14.283*** (4.722)
Control Variables	YES
_cons	2.0e+04 (0.983)
N	3194

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

From model (1), it can be seen that the core explanatory variable of this paper, namely the sentiment of the barrage text, significantly increases the turnover of the broadcast room. As explained in the theory section above, positive bullet screen emotions can stimulate the audience's desire to buy, stimulate the transaction, and thus increase the sales of the broadcast room.

3.4 Robustness Test

3.4.1 Change Explanatory Variables

In this paper, the core explanatory variables are re-generated, and the live broadcast room with the emotion score ≥ 0 is assigned 1, and the live broadcast room with the emotion score < 0 is assigned 0, and the Senti_flag is constructed to represent the qualitative performance of the emotion of the live broadcast room. The result of re-performing benchmark regression by replacing core explanatory variables with this marker is shown in model (2), and its significance level and influence direction do not change, indicating that the conclusion of hypothesis 1 is robust.

Table 3 The results of robustness test

	(2)
Explained variable	Sale
Senti_flag	7.6e+04*** (3.525)
Control Variables	YES
_cons	-2.5e+04 (-0.783)
N	3194

Robust standard errors in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

3.4.2 Match with the Same Broadcast Room

The number of direct broadcast rooms obtained in this paper reaches 3197, so there are multiple live broadcast data in the same direct broadcast room. In this paper, the data of the highest emotion and the lowest emotion score of the bullet screen text in the same broadcast room were matched and combined, and a total of 206 records were obtained. The sales difference between the two was used to regression the difference between the two sentiment scores (socre_diff). In the above subsample regression, the partial regression effect of the barrage emotion score in the broadcast room with positive emotions is attenuated to a certain extent. Therefore, in this paper, the quadratic term (socre_diff2) of emotion score difference is introduced into the model, and the influence of nonlinearity is considered. The results are shown in the following table:

Table 4 Regression results after matching

	(3)
Explained variable	Sale_diff
socre_diff	23.082** (2.152)
socre_diff2	-0.003** (-1.991)
Control Variables	YES
_cons	6.5e+04*** (6.390)
N	206

Robust standard errors in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

According to model (3), it can be found that even in the same direct broadcast room, the emotion score of barrage can have a significant nonlinear impact on the sales of direct broadcast room, and the overall impact presents an "inverted U-shape" of "first increase and then decrease". This shows that when the sentiment of bullet screen text is relatively negative, the effect of improving the positive degree of bullet screen text is greater, while when the sentiment of bullet screen text is relatively high, the impact of further improving the sentiment of bullet screen text on the sales of direct broadcast room will be attenuated.

3.5 Heterogeneity Among Commodity Types

This article divides commodities into experiential commodities and search commodities. In experiential goods, consumers' personal experience is the most important factor in their decision to consume, while in search-type goods, consumers' consumption decisions are influenced more by the introduction of other customers or sellers. Therefore, this paper takes digital products as searchable products, and beauty and snacks as experience-oriented products, and introduces the cross-terms of various types of products and bullet-screen text emotions into the model. The results are shown in the table below:

Table 5 Regression results by commodity category

	(4)	(5)	(6)
Explained variable	Sale	Sale	Sale
Cross term	snack	Beauty makeup	Digital code
Senti_score	20.798*** (4.966)	16.146*** (4.302)	6.840** (2.340)
Senti_score*Sanck	-22.243*** (-4.487)		
Senti_score*Makeup		-4.000 (-0.673)	
Senti_score*3c			30.853*** (4.045)
Control Variables	YES	YES	YES
_cons	4477.354 (0.201)	1.5e+04 (0.806)	-3.4e+04 (-1.321)
N	3194	3194	3194

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

It can be found that in the direct space of searchable goods, the impact of bullet screen text sentiment and the cross item of commodity category on the turnover of live broadcast room is significantly positive. Therefore, in the direct space of searchable goods, text sentiment can effectively boost the audience's consumption decision. In the experience-type commodity broadcast room (Model 4), the cross term between the sentiment of bullet screen text and the type of commodity is significantly negative. Since experiential products rely on audience experience for marketing, the sentiment of bullet screen text has a serious decline in the marketing of live broadcast sales. Therefore, for different kinds of commodities, the emotion of bullet screen text will have different effects, and it is difficult for the emotion of bullet screen text to promote consumption in the direct broadcast room of experiential commodities.

4 Conclusion

Starting from the e-commerce live shopping form that has been popular all over the world in recent years, this paper discusses the impact of bullet screen, one of the most important interactive channels in e-commerce live shopping, on consumers' decision-making behavior. Barrage sentiment is an important edge path stimulus factor in the ELM model, and positive barrage sentiment can effectively increase the sales of direct broadcast rooms. This paper further considers the property of the commodity itself on the adjustment of the emotion of the barrage. Experiential products mainly rely on consumers' personal experience of the products to produce quality cognition, so in the form of e-commerce live shopping, it is difficult to play the bullet screen emotion to promote the sales of direct broadcast room. In the search commodity broadcast room, the emotion of the barrage can effectively help the audience judge the quality of the commodity, which can effectively promote the sales of the broadcast room.

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