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Research on Strategies of Advertising and Revenue Sharing on Webcast Platform

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Full Research Paper

Research on Strategies of Advertising and Revenue Sharing on Webcast Platform

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Abstract: The webcast advertising market exhibits two unique features: the webcast platform and the anchor jointly provide webcast advertising; and the webcast platform determines the share of advertising revenue, the anchor decides whether to publish ads. We develop a two-sided market model including webcast platform, anchor, fan users and advertisers to analyze the role of these two unique features in determining the webcast platform's optimal advertising revenue-sharing decision. The research results reveal an interesting inverted-V-shaped dynamic structure, that is, the optimal advertising revenue sharing strategy of the webcast platform changes with the overall advertisers' valuation of the webcast ads. When the valuation of advertising is at a medium level, the webcast platform is motivated to give up more revenue share to subsidize the anchor via the advertising channel, leading to greater profits for both of them. In all regions, the optimal profits of the webcast platform and the anchor increase as the switching cost of fan increases. The anchor can increase fan stickiness by providing high-quality content, thereby increasing fan loyalty and expanding the fan user base.

Keywords: webcast advertising; two-sided market; advertising; revenue sharing

1. INTRODUCTION

With the popularity of the Internet and the rapid development of online video, webcast platforms have shown explosive growth. According to CNNIC (China Internet Network Information Center), as of June 2020, the scale of webcasting users in China has reached 562 million, accounting for 59.8% of the total netizens. The great success of the webcast has built a huge fan base of users and attracted potential advertisers. In order to develop itself and benefit from the market, the webcast platform began to provide advertising services. That is, the anchor implants ads into the webcasting process so that the anchor and the platform can obtain income from two channels, namely, fan rewards and webcast advertising. Correspondingly, along with fan reward income, webcast advertising has become another important source of income for both the platform and the anchor.

Different from traditional media ads, webcast ads are provided by the platform and the anchor, and the platform and the anchor belong to a cooperative relationship. Traditional media channels, such as newspapers and TV, have control over advertising, while the control over webcast advertising is separate. The webcast platform needs to motivate anchors to publish ads during the webcasting process, thus being able to profit from the advertising channel. According to the principal-agent incentive theory, if the anchor chooses to publish ads, the webcast platform will share part of the advertising revenue with the anchor to increase the anchor's motivation. For example, the Huya webcast platform and the anchor jointly provide ads, and the Huya platform decides virtual gift price and advertising price, and the Huya platform (30%) and anchors (70%) share revenue from fan reward and advertising channels. In fact, if the anchor chooses to place ads, the platform and the anchor can obtain advertising revenue, thereby increasing the revenue from the advertising channel. But at the same time, the increase of ads placed by the anchor in the webcast content will arouse the nuisance of the fans, which will lower the revenue that the platform and the anchor obtain from the fans' reward. It can be seen that the advertising strategy decided by the anchor has a certain impact on the revenue of both the platform and the

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anchor. Relatively, the level of the advertising revenue share of the webcast platform decision also has a decisive role in the choice of advertising strategy of the anchor. In other words, whether the ad revenue sharing contract can increase the anchor's revenue is an important issue for the anchor's participation in advertising activities. Therefore, how to make the optimal advertising revenue sharing contract to coordinate the interests between the webcast platform and the anchor is an urgent problem in the field of webcasting.

Based on the above background, this paper focuses on the problem of webcast ad delivery and the resulting ad pricing and ad revenue sharing contract strategies. In the webcast advertising market, the platform decides the ad price and ad revenue share, while the anchor decides whether to publish the ads or not (Godes et al. 2009) [1].

Taking into account the separation structure of the platform and the anchor in the webcast advertising, in this paper, we try to answer the following question:

Q1. How does the optimal ad revenue share of the webcast platform affect the anchor decisions?

Q2. Considering the anchor's advertising strategy, how does the webcast platform set the optimal advertising price and ad revenue share?

Q3. Whether the advertising revenue sharing decided by the platform can coordinate the interest conflict between the webcast platform and the anchor?

2. LITERATURE REVIEW

2.1. Two-sided market for traditional advertising.

In recent years, researchers have used two-sided market models to analyze the traditional advertising market, such as newspaper and television advertising. Gabszewicz et al. (2005) [2]investigated whether advertising subsidized the price of consumers purchasing newspapers by constructing a two-sided market model between the newsprint media and the advertising industry. Using a similar two-sided market model framework, Godes et al. (2009) [1]demonstrated that when a media company earns revenue from both content sales and advertising channels, and when the competition in market content intensifies, the media company will focus on monetizing the advertising channel. Bagwell (2007) [3]provides a comprehensive overview of the advertising economy, stating that advertising revenue is the main revenue source for media companies and that they have some control over advertising prices. The above literature shows that studies on traditional advertising two-sided markets are based on the premise that the media platform has the right to publish ads, and that the media is able to profit from the dual channels of content and advertising.

Different from the existing literature, this paper considers the advertising strategy between the webcast platform and the anchor in the case of separation of advertising control rights, where the webcast platform and the anchor jointly participate in making the advertising and revenue strategies, which enriches the existing two-sided market theory of advertising.

2.2. Online advertising

Current research has examined multiple aspects of online advertising strategies and their interactions with other corporate strategies, such as advertising volume, advertising pricing, and distribution of spending and revenue.

Regarding the advertising volume, the existing literature mainly studies the trade-off between content and advertising (Prasad et al. 2003) [4], dynamic advertising (Kumar et al. 2009) [5], and the optimal combination of advertising (Dana et al. 2016) [6]. On the issue of ad pricing strategies, researchers have studied and compared various pricing models for advertising. For instance, Asdemir et al. (2012) [7]examined the optimal advertising decisions under two pricing models: cost-per-thousand-impressions (CPM) and cost-per-click (CPC). Maillé et al. (2018) [8]compared the changes in the advertiser's revenue under the pure CPC, CPM, and the combined CPC

and CPM model.

In terms of advertising spending and revenue allocation, the researchers studied the interaction of advertising spending and revenue allocation strategies with other strategies of the firms. For example, Tan et al. (2005) [9]explored the coordination of the advertising and IT capability spending allocations in the e-tailing industry. Lin et al. (2012) [10]used game theory to study the advertising strategies of online service providers in a monopolistic and duopoly market environment and found that higher advertising revenue rates may lead to lower service prices. Hao et al. (2017) [11]studied the optimal allocation strategies of the platform for content and advertising revenue under the separation mode of mobile platform and APP provider, and obtained the applicable conditions under different profit models of the platform. Guo et al. (2019) [12]first conducted an economic analysis of reward advertising and found that high reward rates may reduce the number of reward ads.

The research results of the above literature provide important theoretical approaches and research perspectives for comprehension of webcast advertising and revenue allocation decisions. However, it is not difficult to find that the above literature has two shortcomings: (1) Although the existing research results on online advertising decisions involve the optimal combination strategy of webcast advertising, they do not mention the issue of anchors' participation in advertising decisions in the field of webcasting. In fact, the anchor has control over the advertising publishing in the process of webcast advertising, and the anchor's decisions have a direct impact on whether the webcast platform can obtain revenue from the advertising channel. (2) Existing studies do not segment consumers when considering the nuisance cost brought by advertising to consumers (Prasad et al. 2003) [4]. With the diversified development of online advertising, the characteristics of consumer groups on different online platforms are very different, and this study constructs a two-sided market model for webcast advertising that considers the transfer costs of fan users, which is more realistic.

2.3. Webcast platform

Regarding on the webcast platform, researchers have discussed the revenue distribution and the economic effects of the anchor. Zheng et al. (2020) [13]used a principal-agent theory model to study the optimal reward revenue sharing problem of the webcast platform under the non-contracted and contracted models. Chen et al. (2020) [14]empirically analyzed the mechanism of the role of personal traits of the anchor in webcast platforms on fans' purchase intentions, found that the stronger the personal traits of anchors, the higher the perceived value of their recommended products and the stronger the purchase intentions of fans. The current research on webcast platforms has revealed the interest correlation between the platform, the anchor, and the fans, as well as the problem of revenue sharing between the platform and the anchor. However, existing studies have mainly explored the revenue-sharing decision of platforms under a single fan reward channel (Zheng et al. 2020) [13], and there is not much literature on how platforms formulate ad revenue share contracts under the case of anchor participation in advertising. Therefore, we investigate the optimal ad revenue sharing strategy of the webcast platform in two scenarios: the anchor chooses to place ads or not, in order to differentiate from existing studies.

In summary, the marginal contributions of this study are as follows: first, unlike the two-sided market of traditional advertising, traditional media platform has full control over advertising, and this paper considers the platform and the anchor as two independent entities for webcast advertising. The platform decides advertising pricing and advertising revenue sharing, while the anchor decides whether to publish ads. Second, based on the revenue model of the fan reward channel, this paper discusses the optimal advertising pricing and advertising revenue sharing of the platform under the strategy of the anchor publishing and not publishing ads. It is found that the webcast platform can subsidize the anchor through advertising revenue sharing, and then encourage the anchor to participate in the advertising, so that both the platform and the anchor can obtain greater benefits from the dual channels. Third, with the rapid development of webcast platforms, the anchor can place ads during the webcast. Since the fans watching the webcast have certain stickiness and loyalty to the anchor, it is more

practical to consider the impact of the switching cost of fan users in the modeling of advertising decisions.

3. MODEL DEVELOPMENT

In this section, we present a two-sided market model for the webcast advertising which includes a webcast platform, an anchor who provides content services, a mass of fan users who watch the webcast and participate in rewards, and a mass of advertisers as shown in Figure 1.

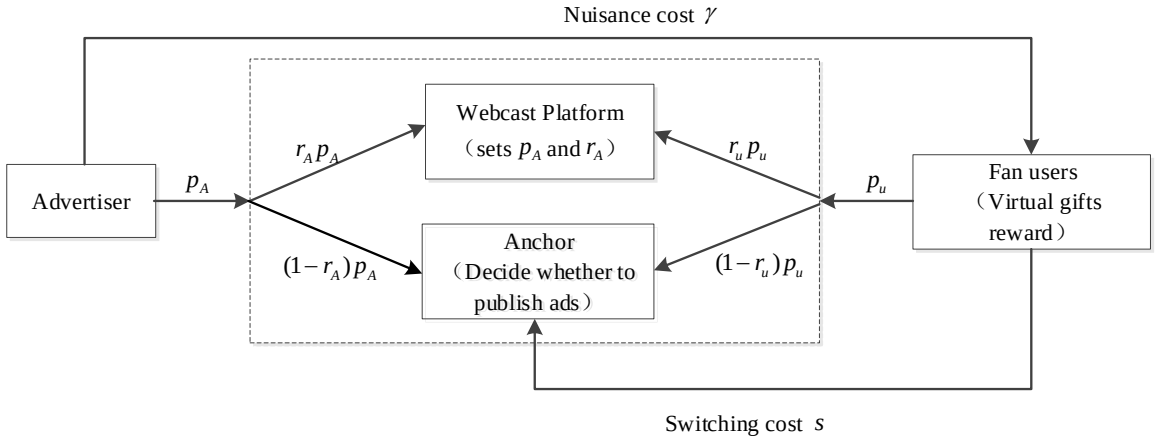

Figure 1. The two-sided market model of webcast advertising

3.1. Webcast platform and anchor

First of all, in the fans' reward channel, fans will buy virtual gifts on the webcast platform to reward their favorite anchor. The platform sets the virtual gift price p_u. The platform's virtual gift revenue share r_u, which is an exogenous variable. The platform will transfer the remaining reward revenue share $1-r_u$ to the anchor according to the contract. Without loss of generality, assuming $p_u > 0$, the platform and the anchor can always get the fans' reward share.

In the decision of webcast advertising channel, the webcast platform decides: (i) the ad price p_A charged to the advertiser (pay per user view), and (ii) the platform's ad revenue share r_A. If the anchor agrees to this ad revenue sharing contract, he will publish the ad during his webcast and receive the remaining $1-r_A$ share of the ad revenue.

If the anchor chooses to advertise, he will display the advertiser's product ad during the webcast. We use n_A to denote the number of participating advertisers and m to denote the total number of potential advertisers. According to existing literature (Godes et al. 2009) [1], we assume that each advertiser publishes one ad, so n_A can be interpreted as the number of ads in the platform's ad inventory, that is, the ad demand. We use η to denote fill rate, which represents the probability that the platform's ad space will be filled with an ad from the ad inventory upon an ad request. We assume fill rate has the form $\eta = \beta n_A$, so β denotes the probability of each ad being displayed, then $\beta m = 1$.

3.2. Fan Users

We assume that the nuisance cost when the webcast process is filled with ads is γ. Therefore, the expected nuisance cost of displaying webcast ads is $\gamma\eta = \gamma\beta n_A$. Assuming that the fan users of the anchor have watched the webcast for a long time and invested a certain amount of time, emotion, etc., there is a stickiness between fan users and the anchor, resulting in a non-negative switching cost of s. We consider a single representative anchor, and take fan users to be heterogeneous in their valuation for the webcast content v_u which is uniformly distributed on $[0, V_u]$. The total size of the webcast user market is normalized to 1.

Thus, for fan user v_u, the utility for the user, (1) if the anchor chooses to publish advertising, is as follows: $U(v_u)=v_u-\gamma\beta n_A+s-p_u$. The corresponding number of fan users who have rewarded the anchor is as follows: $n_u=\Pr(U(v_u)\geq 0)=1-\frac{\gamma\beta n_A}{V_u}+\frac{s}{V_u}-\frac{p_u}{V_u}$.

(2) If the anchor decides against publishing ads, the utility of the fan user v_u is $U(v_u)=v_u+s-p_u$. The corresponding number of fan users who have rewarded the anchor is as follows: $n_u=\Pr(U(v_u)\geq 0)=1+\frac{s}{V_u}-\frac{p_u}{V_u}$.

3.3. Advertisers

We take advertisers to be heterogeneous in their valuation for advertising v_A, the value the advertiser can obtain through publishing his ad. Assume v_A is uniformly distributed on $[0,V_A]$ (Rochet and Tirole 2006) [15], then, the profit function for an advertiser with valuation for advertising v_A is as follows:

$\pi_A(v_A)=\beta(v_A-p_A)n_u$

Where n_u is the number of fan users and p_A is the ad price. An advertiser would participate if and only if $\pi_A(v_A)\geq 0$. Thus, the ad demand n_A is as follows:

$n_A=m\Pr(\pi_A(v_A)\geq 0)=m(1-\frac{p_A}{V_A})$.

3.4. Profit

We can now determine that when the anchor chooses to publish ads, the platform's profit is the sum of the revenue share from the fan user's reward and the advertising, so the platform's profit is as follows: $\pi_O^1=r_u p_u n_u+r_A\beta p_A n_u n_A$, and the anchor's is as follows: $\pi_R^1=(1-r_u)p_u n_u+(1-r_A)\beta p_A n_u n_A$.

Conversely, if the anchor chooses not to publish ads, the profit of the webcast platform is: $\pi_O^0=r_u p_u n_u$, and the profit function of the anchor become $\pi_R^0=(1-r_u)p_u n_u$.

We assume that when the anchor obtains a fan user's reward revenue share 1-r_u, he is willing to participate in the webcast activities of the platform. The timing of the game is as follows. In stage 1, the platform announces the ad price p_A, the ad revenue share r_A and the virtual gift price p_u. In stage 2, the anchor decides whether to publish ads. In stage 3, the fan user decides whether to reward the anchor and advertisers decide whether to participate.

4. EQUILIBRIUM ANALYSIS

Since this study mainly discusses the issue of the anchor's advertising and platform revenue sharing decisions, the following analysis will focus on exploring the impact of changes in platform advertising pricing and advertising revenue sharing on the anchor participating in advertising activities. In this section, we use backward induction to first analyze the anchor's strategy and then derive the platform's equilibrium advertising revenue-sharing contract.

4.1. Anchor equilibrium decision

Lemma 1 Given the platform's decisions on ad price p_A and ad revenue share r_A, the anchor will

(a) (**Not publish ads**) become a pure deliver webcast content, that is, decline to publish ads, and all revenue comes from fan rewarding. At this time, the webcast platform decides the virtual gift price as follows:

$p_u^*=\frac{V_u+s}{2}$, if $1-\frac{(1-r_u)\gamma}{p_A}<r_A\leq 1$;

(b) (**Publish ads**) become an ad publisher and charge a positive price for the webcast content, so her

revenue comes from ads and fan rewarding. At this time, the webcast platform decides the virtual gift price as follows:

$$p_u^* = \frac{V_u + s}{2} - \frac{\beta m(V_A - p_A)(\gamma r_u + r_A p_A)}{2 r_u V_A}, \quad \text{if} \quad 0 \le r_A \le 1 - \frac{(1-r_u)\gamma}{p_A}.$$

According to the parameter constraints, setting $r_u = 0.3$, $V_A = 5$, $V_u = 1$, $s = 0.5$, $\gamma = 0.2$, $\beta = 1$, $m = 1$, $0 \le p_A \le V_A$, $0 \le r_A \le 1$.

The regions corresponding to case a, and b are illustrated in Figure 2. Figure 2 illustrates the anchor's best responses to the platform's decisions on ad price p_A and her ad revenue share r_A.

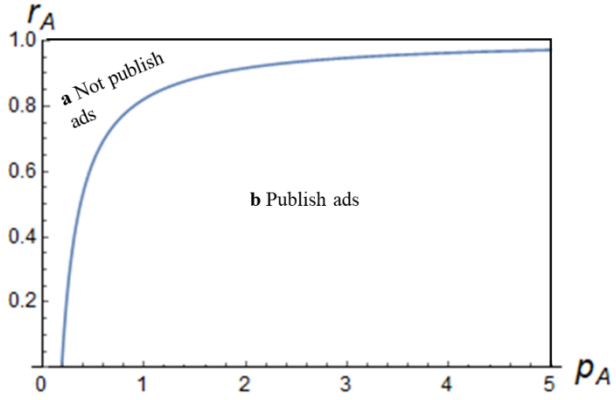

Figure 2. The anchor's strategy

From Figure 2, in region a, a low ad price p_A, a high platform's ad revenue share r_A, or a combination of both limits the anchor's ad revenue per fan user, that is, the anchor's ad revenue per fan user $(1-r_A)\beta p_A n_A$ is low; and thus the anchor does not have sufficient incentive to publish ads. When the anchor's ad revenue per user $(1-r_A)\beta p_A n_A$ is higher than a threshold (in region b), the anchor chooses to publish ads and generates revenue from both advertising and fan rewarding. From Lemma 1, we can see that the revenue from the fan reward in region a is higher than that in region b, which indicates that the anchor will lose the fan reward revenue when switching from the not publish ads strategy to the publish ads strategy. In other words, the fan nuisance cost of advertising is reflected by the revenue reduction from the webcast rewarding. When the anchor agrees to publish ads, she will gain an additional revenue source from the advertising channel in the amount of $(1-r_A)\beta p_A n_u n_A$. This shows that a reasonable share of advertising revenue will motivate the anchor to participate in advertising, that is, the anchor has additional incentives to reduce her profit from fan reward in order to gain revenue from the advertising channel.

4.2. Webcast platform equilibrium decision

Anticipating the anchor's responses, the platform sets the ad price p_A and her ad revenue share r_A to maximize her profit. Lemma 2 summarizes the equilibrium strategy for the platform and the corresponding equilibrium ad price and ad revenue share.

Lemma 2 Depending on market conditions, the platform adopts one of the following three sets of ad price p_A and her ad revenue share r_A in equilibrium:

(a) (Not publish ads) If $V_A \le \gamma$, then set the ad price p_A and ad revenue share r_A to satisfy $1 - \frac{(1-r_u)\gamma}{p_A} < r_A^a \le 1$. The corresponding equilibrium virtual gift price is $p_u^* = \frac{V_u + s}{2}$.

(b1) (Publish ads: Reward-dominant) If $\gamma < V_A \le V_A^{ab1}$, the anchor decides to advertise, when $\partial \pi_O^1 / \partial p_A = 0$, then set the ad price p_A and ad revenue share r_A to satisfy $p_A^{b1*} = \frac{V_A + \gamma}{2}$, $r_A^{b1*} = 1 - \frac{2(1-r_u)\gamma}{V_A + \gamma}$.

The corresponding equilibrium virtual gift price is $p_u^{b1*}=\frac{V_u+s}{2}-\frac{\beta m(V_A-\gamma)(4\gamma r_u+V_A-\gamma)}{8r_uV_A}$.

(b2) (Publish ads: Ad-dominant) If $V_A>V_A^{ab1}$, when $\partial\pi_O^1/\partial p_A=0$, then set the ad price p_A and ad revenue share r_A to satisfy $p_A^{b2*}=\frac{V_A+\gamma}{2}$, $r_A^{b2*}=\frac{2r_u\gamma}{V_A+\gamma}+\frac{V_A-\gamma}{(2-r_u)(V_A+\gamma)}+\frac{4V_AV_u(1-r_u)^2}{\beta m(2-r_u)(V_A^2-\gamma^2)}$. The corresponding equilibrium virtual gift price is $p_u^{b2*}=\frac{V_u+s}{2}-\frac{\beta m(V_A-p_A^{b2})(\gamma r_u+r_A^{b2}p_A^{b2})}{2r_uV_A}$.

The anchor agrees to publish advertising. When the platform obtaining the fan reward share is greater than the ad revenue share, the fan reward is a dominant revenue for the webcast platform. When $r_up_un_u>r_A\beta p_An_un_A$, $p_A^{b1}=\frac{V_A+\gamma}{2}$, $r_A^{b1}=1-\frac{2(1-r_u)\gamma}{V_A+\gamma}$, we solve the threshold for V_A is $V_A^{ab1}=\gamma+\frac{2r_u(s-2\beta m\gamma+V_u)+2\sqrt{r_u[3\beta m\gamma(s+V_u)+r_u(s-2\beta m\gamma+V_u)^2]}}{\beta m}$.

According to the parameter constraints, setting $r_u=0.3$, $V_u=1$, $s=0.5$, $\gamma=0.2$, $\beta=1$, $m=1$. Figure 3 illustrates the equilibrium strategies for the webcast platform under different parameters of ad value V_A.

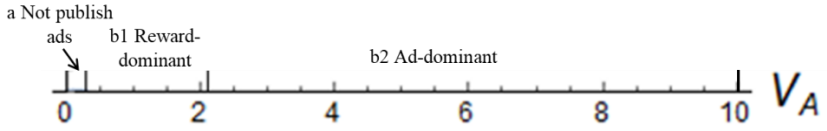

Figure 3. The webcast platform's strategy

Figure 3 shows that, the platform declines to publish advertising when ad value V_A is less than the nuisance cost γ. When V_A is greater than the nuisance cost γ, in both cases b1 and b2, the platform sets the ad price p_A and her ad revenue share r_A to induce the anchor to publish ads, so her revenue comes from both advertising and fan reward. We call regions b1 and b2 hybrid regions, with b1 being the reward-dominant hybrid region in which the ad value V_A is relatively low, such that the advertising revenue is mainly powered by the number of fan users; and b2 being the ad-dominant hybrid region in which the ad value V_A is relatively high, such that the advertising revenue is mainly powered by the number of advertisers.

The ad value V_A is an important market condition parameter in determining the advertising revenue-sharing contract in our model, which represents the overall advertisers' valuation of advertising at the market level. We find that the equilibrium ad price p_A increases in ad value V_A in all regions. When advertisers are able to generate higher value from reaching fan users through ads (higher V_A), more advertisers will join and the platform will charge a higher ad price p_A to take advantage of such improvements.

4.3. Equilibrium analysis

Lemma 3 The platform's ad revenue share r_A has the following properties:

① r_A increases in the reward-dominant region, that is, $\frac{\partial r_A^{b1}}{\partial V_A}=\frac{2\gamma(1-r_u)}{(V_A+\gamma)^2}>0$;

② r_A increases in the ad-dominant region, that is, $\frac{\partial r_A^{b2}}{\partial V_A}=-\frac{2(r_u-1)^2(m\beta(V_A-\gamma)^2\gamma-2(V_A^2+\gamma^2)V_u)}{m\beta(V_A-\gamma)^2(V_A+\gamma)^2(r_u-2)}<0$。

According to the parameter constraints, setting $r_u=0.3$, $V_u=1$, $\gamma=0.2$, $\beta=1$, $m=1$. Lemma 3 and Figure 4 reveal an interesting inverted-V-shaped dynamic of the platform's ad revenue-sharing strategy with respect to the ad value V_A.

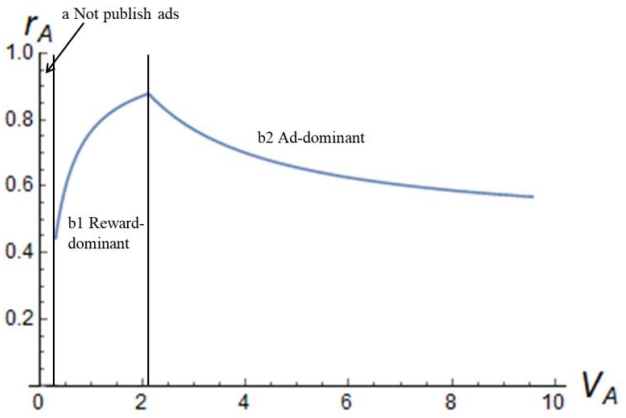

Figure 4. Platform's Ad Revenue Share r_A

Figure 4 shows that, when ad value V_A is low in the reward-dominant region, as V_A increases, the webcast platform keeps a higher share of the ad revenue. However, in the downward sloping section of the inverted-V-shaped, where ad value V_A is moderate in the ad-dominant region, the webcast platform is willing to subsidize the anchor by forgoing more ad revenue share, even though each share is worth more as ad value V_A increases.

To explain this inverted-V-shaped dynamic, we introduce the webcast platform's maximum ad revenue share $\bar{r}_A$. When inducing the anchor to publish ads, the webcast platform cannot withhold an ad revenue share higher than $\bar{r}_A$ since she needs to provide the anchor a sufficiently high share to guarantee that the anchor's profit from being an ad publisher is at least equal to his profit from staying with the a region (not publish ads). Intuitively, given any ad value V_A, the webcast platform could set $r_A = \overline{r_A}$ to maximize her ad revenue share and meanwhile induce the anchor to publish ads. However, this is not always optimal for the webcast platform. While the platform's optimal ad revenue share r_A is equal to $\bar{r}_A$ in the reward-dominant region ($r_A^{b1} = \overline{r_A}$), it becomes less than $\bar{r}_A$ once the ad value V_A increases into the ad-dominant region ($r_A^{b2} < \overline{r_A}$). Essentially, in the reward-dominant region (b1) the webcast platform extracts the anchor's additional surplus from ad publishing beyond the a region, thus making the anchor's total profit under publishing ads equal to that under pure fan reward. Yet in the ad-dominant region (b2), with the increase of advertising value, more and more advertisers are willing to participate, which induces the webcast platform to forgo part of ad revenue share to encourage the anchor to publish more ads, thereby increasing the profit of the webcast platform.

Lemma 4 In all regions (publish ads or not publish ads), the optimal profit of the webcast platform and the anchor will increase with the increase of the fan users switching cost s, and decrease with the increase of the advertising nuisance cost γ, that is,

$$\frac{\partial \pi_O^0}{\partial s} = \frac{r_u p_u}{V_u} > 0, \quad \frac{\partial \pi_R^0}{\partial s} = \frac{(1-r_u) p_u}{V_u} > 0;$$

$$\frac{\partial \pi_O^1}{\partial s} = \frac{r_u p_u + r_A \beta p_A n_A}{V_u} > 0, \quad \frac{\partial \pi_R^1}{\partial s} = \frac{(1-r_u) p_u + (1-r_A) \beta p_A n_A}{V_u} > 0,$$

$$\frac{\partial \pi_O^1}{\partial \gamma} = -\beta n_A \frac{r_u p_u + r_A \beta p_A n_A}{V_u} < 0, \quad \frac{\partial \pi_R^1}{\partial \gamma} = -\beta n_A \frac{(1-r_u) p_u + (1-r_A) \beta p_A n_A}{V_u} < 0.$$

Proposition 4 reveals the impact of fan switching cost and advertising nuisance cost on the profits of the webcast platform and the anchor. In all regions, the optimal profit of the webcast platform and the anchor

increases with the increase of switching cost and decreases with the increase of advertising nuisance cost. In the case of not publishing ads, the profit of the platform and the anchor comes only from fan reward, and the level of fan switching cost indirectly reflects the level of their rewards. Intuitively, those with higher switching cost pay more in terms of emotion, effort, etc., and their reward amounts will be greater in response. In the case of publishing ads, both the platform and the anchor obtain revenue from the dual channels of fan reward and advertising respectively, but the anchor's decision to publish ads will inevitably increase the aversion of fans. The revelation is that the anchor can provide quality webcast content to reduce fans' aversion to advertising. This will incur some expenditure, but both the platform and the anchor will be able to gain extra profit from the advertising.

5. CONCLUSIONS

In this study, we construct the two-sided market model of the webcast advertising to capture the unique characteristics of the webcast advertising market. Specifically we incorporate two entities in the webcast advertising—the anchor, who has the right to decide whether to publish ads, and the webcast platform, who determines the advertising price for advertisers and the platform’s and the anchor’s respective shares of advertising revenue. The results show that:

(1) In mixed regions with mainly reward-dominant and ad-dominant, the ad equilibrium price increases as the ad valuation increases. In other words, when advertisers can reach more consumers by publishing ads, expanding the potential market demand, and generating higher advertising value, more advertisers will be willing to join the webcast market, and the webcast platform can take advantage of the high advertising valuation to charge higher advertising fees.

(2) As advertisers' ad values increase, the level of ad revenue sharing of webcast platform decisions rises and then falls. Intuitively, as ad value increases the webcast platform will increase its ad revenue share, as each ad share brings higher value. Interestingly, the ad revenue share appears to be downwardly sloping in part. When the ad value is moderate, the webcast platform is willing to forego part of the ad revenue share to subsidize the anchor and motivate him/her to participate in advertising activities actively. On the one hand, the anchor choosing to publish ads incurs certain nuisance costs and thus loses a portion of its profits. The webcast platform subsidizes anchors through advertising channels, increasing the advertising revenue share to a level that exceeds the minimum level required for an anchor to be willing to publish ads. On the other hand, the platform's subsidy strategy provides additional incentives for the anchor to create better quality webcast content and increase the stickiness with fans, bringing a win-win for both the platform and the anchor. The management insight is that when the webcast platform can get revenue from both fan reward and advertising, the platform should actively coordinate the interest conflict with the anchor by adjusting the ad revenue share, and then to compensate the anchor for the loss of fan reward revenue due to publishing ads.

(3) In all regions, the optimal profit of the webcast platform and the anchor increases with the switching cost of fan increases and decreases with the increase of the advertising nuisance cost. The anchor provides high-quality webcast content, which increases the stickiness with fan users. When the positive effect of the fan switching cost is enough to offset the negative effect of the advertising nuisance cost, the anchor may choose to publish ads, and then obtain benefits from both the advertising channel and the fan reward channel.

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