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Study of Video Platform Pricing Strategies under Different Distribution

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Abstract

This paper develops a two-stage game model containing a monopolistic independent video provider and two free video platforms, and explores the distribution choices of the video provider as well as the advertising pricing strategies of the two platforms in different distribution choices. We found the following: (i) When video quality is high, the video provider offers its video exclusively to one platform; when video quality is low, the video provider offers its video non-exclusively to both platforms. (ii) In exclusive distribution, the platform with the exclusive video has an advantage in advertising price, viewer share, and advertiser share over its competitor, and this advantage increases with video quality. (iii) In non-exclusive distribution, the advertising prices, viewer market shares, and advertiser shares of the two platforms are equal and independent of video quality.

Keywords

Video Provider, Video Distribution, Media Platform Pricing Strategy, Video Quality

1. Introduction

With the development and wide application of Internet technology in the era of digitalization, various platforms have grown rapidly worldwide in recent years (Yang, Diao, & Kang, 2020; Cozzolino, Corbo, & Aversa, 2021). In particular, online video platforms have boomed dramatically (Wang & Lobato, 2019; Rong, Xiao, Zhang, & Wang, 2019; Song, Xu, & Jiang, 2020), with many big video platforms currently competing. In this era where content is king, only by obtaining premium video resources can video platforms have certain competitive advantages. In order to obtain premium video resources, video platforms are scrambling to buy videos from video providers at great expense. Video providers

may offer their video exclusively to one platform, i.e., exclusive distribution, or non-exclusively to two platforms, i.e., non-exclusive distribution. For example, Zhejiang Satellite TV has provided "Ace to Ace Season 6" exclusively to the iQIYI video platform; Jiangsu Satellite TV has provided "You Are the One" non-exclusively to YOUKU video platform and MIGU video platform. "When should a video provider choose exclusive distribution, and when should they choose non-exclusive distribution? Does video quality affect the distribution choices? How do the two platforms set advertising prices in different video distribution?" These questions are worth exploring.

The arrangement of this paper is as follows. Section 2 reviews the literature related to content distribution as well as media platform pricing strategies. Section 3 constructs the model and presents the assumptions. Section 4 provides an equilibrium analysis. Section 5 summarizes conclusions, puts forward the management enlightenment, and points out the future research directions.

2. Literature Review

There are two streams of literature related to our study. The first is associated with content distribution, and the second is related to media platform pricing strategies.

The first stream of literature is related to content distribution. Armstrong (Armstrong, 1999) studied the content distribution of a monopoly content provider to two paid platforms. The study found that if the content provider just levied a lump-sum charge for copyrights, the content provider chose to offer its content exclusively to one platform, i.e., the content provider chose exclusive distribution. Hagiu and Lee (Hagiu & Lee, 2011) analyzed the relationship between a video provider's control over content retail price and its content distribution. They showed that if the content provider could not control the retail price, it chose to provide its content to one paid platform, i.e., it chose exclusive distribution. Ganuza & Viecens (Ganuza & Viecens, 2013) investigated the impact of viewers' evaluation of content on content distribution. Stennek (Stennek, 2014) studied the relationship between exclusive distribution and investment in program quality. He found that exclusive distribution motivated content providers to invest in higher quality.

The second stream of literature is related to media platform pricing strategies. Kodera (Kodera, 2015) investigated media platform pricing strategies in two models, namely, the uniform price model, in which each platform offered a uniform price for advertisers, and the price discrimination model, in which each platform can price discriminate among advertisers. They showed that subscription prices were relatively higher, but ad prices were relatively lower in the price discrimination model than in the uniform price model. Carroni (Carroni, 2018) considered two scenarios, namely, subscription price discrimination and uniform subscription price, and analyzed the difference in platform pricing strategies in two scenarios. He found that when the negative cross-network effects

brought by advertisers were high, the advertising prices of media platforms were lower in the uniform subscription price than in the subscription price discrimination. Lin (Lin, 2020) investigated monopolistic platform pricing strategies by distinguishing the difference in subscription prices for high-type and low-type viewers. The study found that the difference in subscription prices for the two types of viewers was related to the negative cross-network effects brought by advertisers. Lin et al. (Lin, Hou, & Zhou, 2020) developed a duopoly model and examined the effect of negative cross-network effects brought by advertisers on subscription prices. Chi et al. (Chi, Fan, & Wang, 2021) developed a monopoly model and examined the impact of negative cross-network effects brought by advertisers on platform pricing strategies. Cheng et al. (Cheng, Mu, Sun, & Bian, 2018) investigated monopolistic platform pricing strategies in a freemium model.

In the literature on content distribution, most studies have analyzed the content distribution of a content provider to two paid platforms (Armstrong, 1999; Hagiu & Lee, 2011). However, few scholars have addressed the content distribution of a content provider to two free platforms. In the literature on media platform pricing strategies, most studies have focused on the factors that affect pricing strategies, such as price discriminations (Kodera, 2015; Carroni, 2018), cross-network effects (Lin, 2020; Lin, Hou, & Zhou, 2020; Chi, Fan, & Wang, 2021). However, few scholars have investigated the impact of content distribution on media platform pricing strategies. Complementing both literature streams, we explore the content distribution of a content provider to two free media platforms as well as media platform pricing strategies in different distributions.

This study makes two main contributions. 1) It contributes to the literature on content distribution by analyzing the content distribution of a content provider to two free platforms. 2) It contributes to the literature on media platform pricing strategies by exploring the impact of content distribution on such strategies.

3. Models

This section presents a duopoly model consisting of an independent video provider, two free platforms, and two groups of users, i.e., viewers and advertisers. The video provider either offers its video exclusively to one platform, i.e., exclusive distribution, or non-exclusively to two platforms, i.e., non-exclusive distribution. The two video platforms provide viewers with free content and provide advertisers with paid advertising space. It is worth noting that the content that the platforms can offer to viewers differs in exclusive distribution and non-exclusive distribution. Specifically, in exclusive distribution, the platform with exclusive video can offer two parts of content, namely, basic videos and the exclusive video, to its viewers. However, the platform that cannot obtain that video can only provide basic videos to viewers. In non-exclusive distribution, both platforms can provide two parts of content to their viewers.

3.1. Viewers

There are a mass 1 of viewers. Viewers are uniformly distributed along with a unit interval of $[0,1]$ (Reggiani & Valletti, 2016). Each viewer indexed by $x \in [0,1]$ chooses to get content from only one platform, i.e., viewers are single-homing [13]. The utility that a viewer gets from basic content of platform i is v_i, $i=1,2$, we assume $v_1 = v_2 = v$. If a viewer joins a platform that can obtain the video from the video provider, then the viewer can also gain a benefit of q from this platform. A viewer is disturbed by advertisements before watching the video; therefore, the utility that he gets from platform i is reduced by aM_i^D. a is the disutility that a viewer suffers from each advertisement (Chen & Liu, 2022), and M_i^D is the advertiser market share of platform i in distribution scenario D, where $D = e, ne$ represents exclusive distribution and non-exclusive distribution, respectively. A viewer incurs a transportation cost $t|x - x_i|$ when joining platform i, where x_i is the position of platform i, and t is the transportation cost per distance. For ease of calculation and without loss of generality, we assume that $t=1$ (Li, Nan, & Li, 2018).

3.2. Advertisers

There are a mass 1 of advertisers. An advertiser can benefit from the positive cross-network effects brought by viewers, rN_{ij}, where r represents the benefit that an advertiser gets from each viewer (Greiner & Sahm, 2018). An advertiser needs to pay a lump-sum fee P_i^D to platform i. An advertiser incurs a cost of f for producing one advertisement, and advertisers are heterogeneous regarding f. We assume that f is uniformly distributed in the interval $[0,1]$ (Rasch & Wenzel, 2014).

3.3. Video Platforms

There are two free video platforms, which are denoted as platform 1 and platform 2. Platform 1 and platform 2 are located at the 0 and 1 ends of a unit interval. Each platform connects two groups of users, namely, viewers and advertisers, and provides viewers with free basic videos and provides advertisers with advertising space. If platform i can get the video from the video provider, then he can also provide this video to its viewers. Since basic videos are not the focus of this paper, it is assumed that the cost of purchasing basic videos for platform i is zero. However, platform i need to pay a lump-sum fee R_i^D when purchasing the video from the provider, where $D = e, ne$ represents exclusive distribution and non-exclusive distribution, respectively.

3.4. Video Provider

Following Stennek (Stennek, 2014), we assume that the video provider produces only one video and offers its video to platforms. The provider can offer its video exclusively to one platform, i.e., exclusive distribution, or non-exclusively to both platforms, i.e., non-exclusive distribution. In both distributions, the pro-

vider not only receives copyright revenue, but also sponsorship revenue for embedding the sponsors' advertisements in its video. For ease of calculation, it is assumed that the sponsorship revenue is proportional to the number of viewers watching the video, where the sponsorship revenue per viewer is *w*.

3.5. Timing

The timing of the game is as follows. In the first stage, the video provider chooses exclusive distribution or non-exclusive distribution. In the second stage, the two platforms compete for viewers and advertisers in exclusive or non-exclusive distribution. We solve the game by backward induction (Dietl, Lang, & Lin, 2013).

4. Equilibrium Analysis

4.1. Stage 2

4.1.1. Exclusive Distribution

There are two cases of exclusive distribution. One is that the video provider offers its video exclusively to platform 1, and the other is that the video provider offers its video exclusively to platform 2. Since platform 1 and platform 2 are symmetric, the conclusions obtained in both cases are similar. Thus, this paper examines exclusive distribution based on the first case only.

Based on the assumptions in Section 3, the utility that a viewer located at x receives from joining platform i is given by $u_i^e = v + d_i^e q - aM_1^e - |x - x_i|$; $d_1^e = 1$ represents that platform 1 can obtain the exclusive video, and $d_2^e = 0$ represents that platform 2 cannot obtain that video. The utility that an advertiser receives from joining platform i is given by $U_i^e = rN_i^e - P_i^e - f$. The profit of platform i is given by $\pi_i^e = P_i^e M_i^e$.

By solving $u_1^e = u_2^e$, we can obtain that the marginal viewer, who is indifferent between joining platform 1 and platform 2, is located at $\overline{x} = \dfrac{1 + aM_2^e - aM_1^e + q}{2}$. The viewers on the left and right of $\overline{x}$ join platform 1 and platform 2, respectively. As a result, the demands of viewers for platform 1 and platform 2 are given by

$$N_1^e = \overline{x} = \frac{1 + aM_2^e - aM_1^e + q}{2}, \quad N_2^e = 1 - \overline{x} = \frac{1 - aM_2^e + aM_1^e - q}{2}. \tag{1}$$

Solving $U_i^e \geq 0$, we find that the marginal advertiser, who is indifferent between joining and not joining platform 1, is located at $f_i = rN_i^e - P_i^e$. Therefore, the demands of advertisers for platform 1 and platform 2 are given by

$$M_1^e = \frac{r + arM_2^e - arM_1^e + qr}{2} - P_1^e, \quad M_2^e = \frac{r - arM_2^e + arM_1^e - qr}{2} - P_2^e. \tag{2}$$

Substituting N_1^e and N_2^e in Equation (1) into M_1^e and M_2^e in Equation (2), respectively, M_1^e and M_2^e can be rewritten as

$$M_1^e = \frac{r + arM_2^e - arM_1^e + qr}{2} - P_1^e, \quad M_2^e = \frac{r - arM_2^e + arM_1^e - qr}{2} - P_2^e. \tag{3}$$

Solving Equation (3), M_1^e and M_2^e can be further expressed as

$$M_1^e = \frac{-arP_1^e - arP_2^e + qr - 2P_1^e}{2ar+2} + \frac{r}{2},\quad M_2^e = -\frac{arP_1^e + arP_2^e + qr + 2P_2^e}{2ar+2} + \frac{r}{2}. \tag{4}$$

Substituting M_1^e and M_2^e in Equation (4) into N_1^e and N_2^e in Equation (1), respectively, N_1^e and N_2^e can be rewritten as

$$N_1^e = \frac{q + aP_1^e - aP_2^e}{2ar+2} + \frac{1}{2},\quad N_2^e = \frac{1}{2} - \frac{q + aP_1^e - aP_2^e}{2ar+2}. \tag{5}$$

The optimization problem for platform 1 and platform 2 can be expressed as

$$\max \pi_1^e\left(P_1^e\right) = P_1^e M_1^e,\quad \max \pi_2^e\left(P_2^e\right) = P_2^e M_2^e \tag{6}$$

Substituting M_1^e and M_2^e in Equation (4) into Equation (5), the optimization problem for the two platforms are rewritten as

$$\begin{aligned} \max \pi_1^e\left(P_1^e\right) &= P_1^e\left(\frac{-arP_1^e - arP_2^e + qr - 2P_1^e}{2ar+2} + \frac{r}{2}\right), \\ \max \pi_2^e\left(P_2^e\right) &= P_2^e\left(-\frac{arP_1^e + arP_2^e + qr + 2P_2^e}{2ar+2} + \frac{r}{2}\right). \end{aligned} \tag{7}$$

Solving Equation (7), P_1^{e*} and P_2^{e*} are given by

$$P_1^{e*} = \frac{r\left((ar+1)(ar+4) + (3ar+4)q\right)}{(3ar+4)(ar+4)},\quad P_2^{e*} = \frac{r\left((ar+1)(ar+4) - (3ar+4)q\right)}{(3ar+4)(ar+4)}. \tag{8}$$

Substituting P_1^{e*} and P_2^{e*} in Equation (8) into M_1^e and M_2^e in Equation (4), we can obtain M_1^{e*} and M_2^{e*} as

$$\begin{aligned} M_1^{e*} &= \frac{r(ar+2)\left((ar+1)(ar+4) + (3ar+4)q\right)}{2(ar+1)(ar+4)(3ar+4)}, \\ M_2^{e*} &= \frac{r(ar+2)\left((ar+1)(ar+4) - (3ar+4)q\right)}{2(ar+1)(ar+4)(3ar+4)}. \end{aligned} \tag{9}$$

Furthermore, we obtain N_1^{e*}, N_2^{e*}, π_1^{e*}, and π_2^{e*} as

$$\begin{aligned} N_1^{e*} &= \frac{(ar+1)(ar+4) + (3ar+4)q}{2(ar+1)(ar+4)}, \\ N_2^{e*} &= \frac{(ar+1)(ar+4) - (3ar+4)q}{2(ar+1)(ar+4)}, \\ \pi_1^{e*} &= \frac{r^2(ar+2)\left((ar+1)(ar+4) + (3ar+4)q\right)^2}{2(ar+1)(ar+4)^2(3ar+4)^2}, \\ \pi_2^{e*} &= \frac{r^2(ar+2)\left((ar+1)(ar+4) - (3ar+4)q\right)^2}{2(ar+1)(ar+4)^2(3ar+4)^2}. \end{aligned} \tag{10}$$

Through the above analysis, we can obtain Proposition 1.

Proposition 1 In exclusive distribution, in equilibrium, the advertising prices, viewer market shares, advertiser market shares, and profits are as follows:

$$P_1^{e*}=\frac{r\left((ar+1)(ar+4)+(3ar+4)q\right)}{(3ar+4)(ar+4)},\quad P_2^{e*}=\frac{r\left((ar+1)(ar+4)-(3ar+4)q\right)}{(3ar+4)(ar+4)},$$

$$N_1^{e*}=\frac{(ar+1)(ar+4)+(3ar+4)q}{2(ar+1)(ar+4)},\quad N_2^{e*}=\frac{(ar+1)(ar+4)-(3ar+4)q}{2(ar+1)(ar+4)},$$

$$M_1^{e*}=\frac{r(ar+2)\left((ar+1)(ar+4)+(3ar+4)q\right)}{2(ar+1)(ar+4)(3ar+4)},$$

$$M_2^{e*}=\frac{r(ar+2)\left((ar+1)(ar+4)-(3ar+4)q\right)}{2(ar+1)(ar+4)(3ar+4)},$$

$$\pi_1^{e*}=\frac{r^2(ar+2)\left((ar+1)(ar+4)+(3ar+4)q\right)^2}{2(ar+1)(ar+4)^2(3ar+4)^2},$$

$$\pi_2^{e*}=\frac{r^2(ar+2)\left((ar+1)(ar+4)-(3ar+4)q\right)^2}{2(ar+1)(ar+4)^2(3ar+4)^2}.$$

Based on Proposition 1, we analyze the effect of video quality q on the equilibrium outcomes in exclusive distribution and obtain Corollary 1.

Corollary 1 In exclusive distribution, the impacts of video quality q on the advertising price, viewer market share, advertiser market share of platform 1 are as follows:

$$\frac{\partial P_1^{e*}}{\partial q}>0,\quad \frac{\partial N_1^{e*}}{\partial q}>0,\quad \frac{\partial M_1^{e*}}{\partial q}>0.$$

Proof: $\frac{\partial P_1^{e*}}{\partial q}=\frac{r}{ar+4}>0$, $\frac{\partial N_1^{e*}}{\partial q}=\frac{3ar+4}{2(ar+1)(ar+4)}>0$, $\frac{\partial M_1^{e*}}{\partial q}=\frac{r(ar+2)}{(ar+4)(2ar+2)}>0$. It follows that Corollary 1 holds. □

According to Corollary 1, in exclusive distribution, the advertising price, viewer market share, and advertiser market share of platform 1 increase with video quality q. The intuitive reason for this result is straightforward: In exclusive distribution, viewers have access to the exclusive video through platform 1; therefore, their utility from platform 1 is enhanced by q. As q increases, the utility that viewers derive from platform 1 and their demand for platform 1 increase. Indirectly, due to the negative cross-network effects brought by advertisers, the utility that advertisers get from platform 1 and their demand for platform 1 gradually increase, and at the same time, the advertising price of platform 1 gradually increases.

To further illustrate Corollary 1, we perform the following simulation analysis. The values of the parameters are set to be $a=0.80$, $r=0.90$. The impacts of video quality q on the advertising price, viewer market share, and advertiser market share of platform 1 are simulated and analyzed, as shown in **Figure 1**. **Figure 1** shows that, in exclusive distribution, the advertising price, viewer market share, and advertiser market share of platform 1 increase with video quality q.

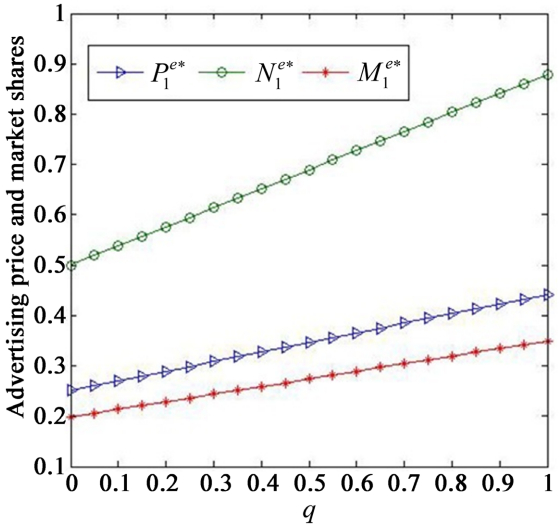

Figure 1. The impacts of video quality on the advertising price and market shares of platform 1 in exclusive distribution.

Based on Proposition 1, we also compare the advertising prices, viewer market shares, and advertiser market shares between platform 1 and platform 2, and get Corollary 2.

Corollary 2 In exclusive distribution, the comparison between the two platforms in terms of advertising prices, viewer market shares, and advertiser market shares is as follows:

$$P_1^{e*} > P_2^{e*},\ N_1^{e*} > N_2^{e*},\ M_1^{e*} > M_2^{e*}.$$

Proof: $P_1^{e*} - P_2^{e*} = \frac{2rq}{ar+4} > 0$, $N_1^{e*} - N_2^{e*} = \frac{(3ar+4)q}{(ar+1)(ar+4)} > 0$,

$M_1^{e*} - M_2^{e*} = \frac{r(ar+2)q}{(ar+1)(ar+4)} > 0$. It follows that Corollary 2 holds. □

It can be seen from Corollary 2 that, in exclusive distribution, the advertising price, viewer market share, and advertiser market share of platform 1 are higher than those of platform 2, which means that the platform with exclusive video has an advantage in terms of advertising price and market shares compared to its competitor. The intuition is as follows. The platform with the exclusive video can bring more utility to the viewer than its competitors, and therefore, its viewer share is higher than that of its competitor. Indirectly, the platform can also gain a higher advertiser share and set higher advertising prices than its competitor due to the positive cross-networking effects brought by viewers.

4.1.2. Non-Exclusive Distribution

In non-exclusive distribution, the utility that a viewer located at x receives from joining platform i is given by $u_i^{ne} = v + q - aM_i^e - |x - x_i|$, $i = 1,2$ The utility that an advertiser receives from joining platform i is given by $U_i^{ne} = rN_i^{ne} - P_i^{ne} - f$. The profit of platform i is given by $\pi_i^{ne} = P_i^{ne} M_i^{ne}$.

Similar to the analysis under exclusive distribution in Section 4.1.1, we can

express viewer market shares and advertiser market shares under non-exclusive distribution as

$$N_1^{ne} = \frac{aP_1^{ne} - aP_2^{ne} + ar + 1}{2(ar+1)},\quad N_2^{ne} = \frac{-\left(aP_1^{ne} - aP_2^{ne} - ar - 1\right)}{2(ar+1)}, \tag{11}$$

$$\begin{aligned} M_1^{ne} &= \frac{-\left(2P_1^{ne} - r - ar^2 + aP_1^{ne}r + aP_2^{ne}r\right)}{2(ar+1)}, \\ M_2^{ne} &= \frac{-\left(2P_2^{ne} - r - ar^2 + aP_1^{ne}r + aP_2^{ne}r\right)}{2(ar+1)}. \end{aligned} \tag{12}$$

The optimization problem for platform 1 and platform 2 can be expressed as

$$\max \pi_1^{ne}\left(P_1^{ne}\right) = P_1^{ne}M_1^{ne},\quad \max \pi_2^{ne}\left(P_2^{ne}\right) = P_2^{ne}M_2^{ne} \tag{13}$$

Substituting M_1^{ne} and M_2^{ne} in Equation (12) into Equation (13), the optimization problem for both platforms can be rewritten as

$$\begin{aligned} \max \pi_1^{ne}\left(P_1^{ne}\right) &= \frac{-P_1^{ne}\left(2P_1^{ne} - r - ar^2 + aP_1^{ne}r + aP_2^{ne}r\right)}{2(ar+1)}, \\ \max \pi_2^{ne}\left(P_2^{ne}\right) &= \frac{-P_2^{ne}\left(2P_2^{ne} - r - ar^2 + aP_1^{ne}r + aP_2^{ne}r\right)}{2(ar+1)}. \end{aligned} \tag{14}$$

Solving Equation (14), we can obtain P_1^{ne*} and P_2^{ne*} as

$$P_1^{ne*} = \frac{r(ar+1)}{3ar+4},\quad P_2^{ne*} = \frac{r(ar+1)}{3ar+4}. \tag{15}$$

Furthermore, we obtain N_1^{ne*}, N_2^{ne*}, M_1^{ne*}, M_2^{ne*}, π_1^{ne*}, and π_2^{ne*} as

$$\begin{aligned} &N_1^{ne*} = \frac{1}{2}, N_2^{ne*} = \frac{1}{2}, \\ &M_1^{ne*} = \frac{r(ar+2)}{2(3ar+4)}, M_2^{ne*} = \frac{r(ar+2)}{2(3ar+4)}, \\ &\pi_1^{ne*} = \frac{r^2(ar+1)(ar+2)}{2(3ar+4)^2}, \pi_2^{ne*} = \frac{r^2(ar+1)(ar+2)}{2(3ar+4)^2}. \end{aligned} \tag{16}$$

Through the above analysis, we can obtain Proposition 2.

Proposition 2 In non-exclusive distribution, in equilibrium, the advertising prices, viewer market shares, advertiser market shares, and profits are as follows:

$$P_1^{ne*} = \frac{r(ar+1)}{3ar+4},\quad P_2^{ne*} = \frac{r(ar+1)}{3ar+4},\quad N_1^{ne*} = \frac{1}{2},\quad N_2^{ne*} = \frac{1}{2},$$

$$M_1^{ne*} = \frac{r(ar+2)}{2(3ar+4)},\quad M_2^{ne*} = \frac{r(ar+2)}{2(3ar+4)},\quad \pi_1^{ne*} = \frac{r^2(ar+1)(ar+2)}{2(3ar+4)^2},$$

$$\pi_2^{ne*} = \frac{r^2(ar+1)(ar+2)}{2(3ar+4)^2}.$$

Based on Proposition 2, we can obtain Corollary 3.

Corollary 3. In non-exclusive distribution, the advertising prices, viewer market

shares, and advertiser market shares of the two platforms are equal and not affected by video quality q.

In non-exclusive distribution, viewers have access to the non-exclusive video through both platforms; thus, the utilities that viewers derive from both platforms and their demands for both platforms are equal, respectively. Indirectly, due to the positive cross-network effects brought by viewers, the demands of advertisers for both platforms are equal.

To further illustrate Corollary 3, we carry out the following simulation analysis. The key parameter is set to $a = 0.80$, $r = 0.90$. The advertising prices, viewer market shares, and advertiser market shares in non-exclusive distribution are simulated and analyzed, as shown in Figure 2. Figure 2 shows that, in non-exclusive distribution, the advertising prices, viewer market shares, and advertiser market shares of the two platforms are equal, respectively, and are independent of video quality q.

4.2. Stage 1

In the first stage, the provider chooses whether to offer the video exclusively to one platform or non-exclusively to two platforms, i.e., whether to choose exclusive distribution or non-exclusive distribution.

From the analysis of Stage 2 in section 4.1, for any platform, when it obtains the exclusive video, its profit is π_1^{e*}, and when it cannot obtain the video, its profit is π_2^{e*}, which means that the maximum the platform is willing to pay for the exclusive copyright is $\pi_1^{e*} - \pi_2^{e*}$. Thus, the copyright revenue that the provider can receive in exclusive distribution is $\pi_1^{e*} - \pi_2^{e*}$. The video provider can also receive sponsorship revenue wN_1^{e*} for embedding sponsors' advertisements in its video. Based on the above description, the profit the video provider earns in exclusive distribution is $\Pi^{e*} = \pi_1^{e*} - \pi_2^{e*} + wN_1^{e*}$.

In non-exclusive distribution, the maximum each platform is willing to pay

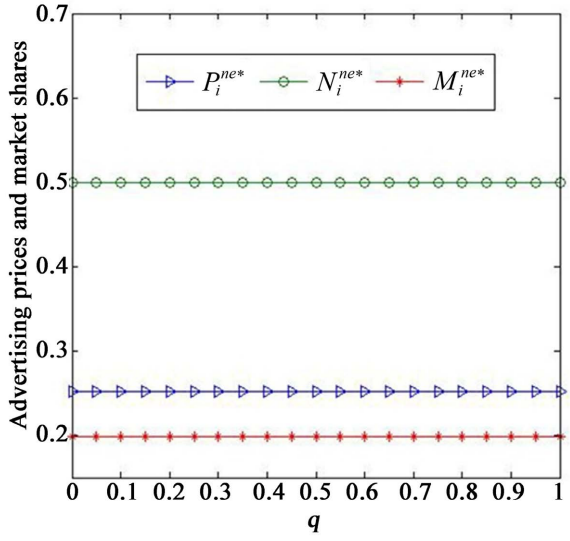

Figure 2. The advertising prices and market shares in non-exclusive distribution.

for the non-exclusive copyright is $\pi_1^{ne*} - \pi_2^{e*}$. Therefore, the copyright revenue that the video provider can receive in non-exclusive distribution is $2\left(\pi_1^{ne*} - \pi_2^{e*}\right)$. The video provider can also receive sponsorship revenue $w\left(N_1^{ne*} + N_2^{ne*}\right)$. Based on the above description, the profit the video provider earns in non-exclusive distribution is $\Pi^{ne*} = 2\left(\pi_1^{ne*} - \pi_2^{e*}\right) + w\left(N_1^{ne*} + N_2^{ne*}\right)$.

Comparing the profits difference of the video provider in exclusive and non-exclusive distribution, we obtain Corollary 4.

Corollary 4 When video quality q is high, i.e., $q \geq Q_1$, then the video provider chooses exclusive distribution, and when video quality q is low, i.e., $q < Q_1$, then the video provider chooses non-exclusive distribution, where

$$Q_1 = \frac{-B + \sqrt{B^2 - 4AC}}{2A}, \quad A = \frac{r^2(ar+2)}{(ar+1)(ar+4)^2},$$

$$B = \frac{qw(3ar+4)}{2(ar+1)(ar+4)}, \quad C = \frac{-w}{2}.$$

Proof: The profits difference of the video provider in exclusive and non-exclusive distribution is $F = \pi_1^{e*} + \pi_2^{e*} - 2\pi_1^{ne*} - wN_2^{e*}$. Substituting π_1^{e*}, π_2^{e*}, N_2^{e*}, and π_1^{ne*} into F, we can obtain $F = Aq^2 + Bq + C = A(q - Q_1)\cdot(q - Q_2)$, where $Q_1 = \frac{-B + \sqrt{B^2 - 4AC}}{2A}$, $Q_2 = \frac{-B - \sqrt{B^2 - 4AC}}{2A}$. Since $q - Q_2$ is positive, $F \geq 0$ when $q \geq Q_1$, and $F < 0$ when $q < Q_1$. It follows that Corollary 4 holds. □

The distribution choices of the video provider depend on the comparison of its profits in different distributions. Compared to non-exclusive distribution, the video provider receives higher copyright revenue and less sponsorship revenue in exclusive distribution. When video quality q is high, in exclusive distribution, the video provider can gain more copyright revenue and lose less sponsorship revenue; thus, the provider chooses exclusive distribution. When video quality q is low, in exclusive distribution, the video provider cannot gain too much copyright revenue but lose more sponsorship revenue; thus, the video provider chooses non-exclusive distribution.

5. Conclusion

This paper develops a model consisting of a video provider, two competing video platforms, and their two groups of users, and explores the video distribution of the video provider to the two platforms, as well as the advertising pricing strategies of the two platforms given the different distributions. The conclusions of this paper are as follows: 1) When video quality is high, the video provider chooses exclusive distribution; when video quality is low, the video provider chooses non-exclusive distribution. 2) In exclusive distribution, the advertising price, viewer market share, and advertiser market share of the platform with the exclusive video increase with video quality and are higher than those of its competitor. 3) In non-exclusive distribution, the advertising prices, viewer market

shares, and advertiser market shares of the two platforms are equal and independent of video quality.

The conclusions of this study have important management implications for a video provider regarding video distribution. When video quality is high, the video provider should distribute its video non-exclusively. When video quality is low, the video provider should distribute its video exclusively. This study also has important management implications for a video platform regarding setting advertising pricing strategies. The video platform should set different advertising pricing strategies in different video distributions. Specifically, in exclusive distribution, it should reduce the advertising price with the increase in video quality; in non-exclusive distribution, he doesn't need to consider the influence of video quality when setting the advertising price.

Our study has two limitations that could serve as potential future research directions. Firstly, this paper assumes that viewers are single-homing; however, in reality, viewers may watch content on multiple platforms, i.e., viewers are multi-homing. Therefore, future research will explore media platform pricing strategies under different distributions based on the assumption that viewers are multi-homing. Secondly, this paper assumes that the sponsorship revenue obtained by the video provider is positively proportional to the number of viewers watching the video. However, the sponsorship revenue function is more complex and affected by more factors. Therefore, future research will further study media platform pricing strategies under different distributions by considering a more complex sponsorship revenue function.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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