Research on Competition Strategy of Webcast Platform Based on Game Theory

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Abstract. The unique business mode of webcast enables the live webcasting platform and the anchor to have a special way of income distribution. This paper, taking the direct seeding business model as the breakthrough point, analyzes the existing mode of income distribution, and studies the income distribution relationship between the network webcast platform and the anchor. According to the network externality analysis, the formation process of the income distribution relationship is explained by building a game model, and the competition strategy of the webcast platform based on the contract gold model is put forward, and the empirical analysis is carried out in combination with the reality.

Introduction
With the rise of the concept of Web2.0 and the optimization of mobile internet environment, webcast has been popularized in China. However, the research results of webcast management are few, mainly focused on the development mode and mechanism, and lack of in-depth research on the distribution of live webcast.

This paper studies the distribution mode of net live income, combined with the actual problems of webcast industry, according to the network externality characteristics of webcast platforms, analyzes the distribution pattern of webcast income by game theory, and studies the regular pattern of income distribution in the webcast industry, combining with the existing webcast platform. The optimal allocation strategy of the anchor and live webcast platform is proposed.

Business Mode and Income Distribution Mode of Webcast Platform

The essence of webcast platform is to provide real-time live video sites, and take the webcast platform as the core to form an industrial chain. The upstream of the webcast platform is a broadband telecom operator, the downstream is the user watching live webcast, and the object of cooperation is to provide the original content of the anchor, advertisers to pay advertising costs and the need to promote the game developers.

A webcast platform has many live rooms, and each live webcast needs an anchor to provide live content. The broadband cost of live webcasting is provided by live webcasting platform, and the advertising expenses of users between live rooms and advertisers are also directly obtained by webcast platforms. Live webcast platforms and anchors regularly allocate income for live webcast. Users can see that live webcast is free, and other related purchases are entirely based on users' willingness. The platform can get the cost of buying virtual gifts from small users. Most of the free live users can bring a better user experience to the former, and can also make the game direct webcast platform indirect advertising costs, game promotion costs, commercial advertising costs, and so on.

The process of establishing the cooperative relationship between the webcast platform and the anchor: the anchor first enters a webcast platform, and then the live webcast platform chooses the anchor to cooperate. If the cooperation is distributed, the webcast platform will be paid to the anchors based on the income distribution of the live webcasting platform; otherwise, the anchor will not get any income.

The relationship between webcast and its anchor is mainly based on loose cooperative relationship. The two sides have coordinated direct webcast to get the common interests of income, and there is
also a competition relationship between interests distribution. Before the cooperation begins, the anchor and the webcast platform make a two-way selection: the anchor chooses a live webcast platform between the live webcasting platforms of different income distribution modes, and the webcast platform will choose to cooperate with the anchor in financial aspects while the conditions are reached. The cooperation and profit distribution of webcast platform and anchor are in a live room. After obtaining the proceeds, the two sides allocate the proceeds. Therefore, there is a cooperative game relationship between the live webcasting platform and the anchor.

In additional, the cooperative relationship between the webcast platform and the anchor is based on the interest-related, and their cooperation is win-win, but the relationship is loose and has the characteristics of the network externality.

At present, there are two kinds of income methods for large scale webcast platform: one is to distribute a certain proportion according to the reward of the pepper direct seeding, and the other is to allocate “Douyu” as an example, and to distribute it according to other factors. The income distribution of “Huya” and “Zhanqi” can be regarded as a total distribution according to reward and a larger part is equivalent to a part of the signing bonus of well-known anchors.

**Game Model of Webcast Platform Based on Signing Bonus**

**Model Description**

The game model of contract allocation is based on game theory to establish a well-known anchor's contract fee calculation model. The well-known anchor has the resources needed by the webcast platform. For the well-known anchor, there are many and competing webcast platforms, but there are only two webcast platforms to simplify the game. In the competition, the webcast platform has been anchoring from other platforms to its own webcast, not only has the anchor also attracted the fans of the anchor.

The game background is the intention to cooperate with the original platform and the new platform when a well-known anchor and the original platform contract is about to expire. At this time, the two webcast platforms and the anchor play the game as the people in the Bureau. The anchor can choose to live on its own, go to the original platform A and go to the new platform B. In order not to make the anchor live on its own, the lowest price given by the platform is greater than or equal to the remuneration of the anchor's own webcast. On the market, the total number of live audience is unchanged, and spectators choose between platforms A and B.

The strategy of anchor is "platform A" and "platform B". The strategies of platform A and platform B are "low price", "original price" and "high price". The low price strategy is the audience that the webcast platform thinks the anchor provides is not enough to attract the webcast platform. According to the income brought by the main fans, the price of the conservative contract is drawn up. The original price strategy is to attract a certain audience of the platform, and the direct seeding platform makes rational signing of the gold price according to the total income brought by the main fans and the webcast platform audience. The high price strategy is the webcast platform, which brings the audience changes income as the competitor's loss, and sets the price of the competitive contract price. The game process is platform A and platform B first, then the anchor chooses its strategy according to the strategy given by the platform.

Because of the network externality features of the webcast platform, the cooperation of webcast platform and the well-known anchors will increase the benefits: (1) the interaction between the main fans and the audience from the webcast platform, gain a better experience and increase the income ratio; (2) the main fans are transformed into the webcast platform audience to increase the income of other direct seeding rooms; (3) The name of the anchor left a part of the webcast platform audience. In addition, due to the total number of viewers, another platform has lost some viewers.

The model assumes: (1) the webcast platform A, B except the number of other conditions are the same, A, B cannot cooperate, and the utility of A and B are their own profits to reduce the loss of the other side; (2) the anchor is rational, complete information, the maximum reward is the goal; the webcast platform information is incomplete, not completely rational, two. There are two objectives:
to increase the remuneration and to make the competitors lose; (3) the number of platform changes caused by the two platforms is the same (4) the correlation is linear.

The section headings are in boldface capital and lowercase letters. Second level headings are typed as part of the succeeding paragraph (like the subsection heading of this paragraph).

Parameters Setting

The number of webcast platforms A and B entering the live webcast is m and n respectively, and the ratio of total number to live is m: n. The number of fans of the anchor H is x. Under the network externality, a is the conversion rate, and the income of live rooms is a*the number of audiences*the number of audiences. The relative variation ratio of the number of platforms caused by the anchors' departure is l, and the conversion ratio of fans is i

If the anchor chooses the original platform, the direct value for the live webcast is \((m+x)^2\) and the value of retaining the audience is \(lm\). Similarly, the direct value of the new platform is \((n+x)^2\), and the value of retaining the audience is \(ln\).

There are three strategies for webcast platform payment to well-known anchor contract:

1. low price strategy: pay the signing fee according to the direct income brought by the well-known anchor's fans, \(ax^2\);

2. the original price strategy: in accordance with the total income of the well-known anchor's fans and live audience, payment is signed, taking platform A as an example, \(ax^2+amx+lm\);

3. high price strategy: in accordance with the total income of the fans of well-known anchors and the audience of webcast, the value of paying the anchor to retain the audience is increased with the example of the platform A, \(ax^2+amx+2lm\).

The value of \(am^2\) is created by every anchor, and does not fall within the scope of this model.

<table>
<thead>
<tr>
<th></th>
<th>Low Price</th>
<th>Original Price</th>
<th>High Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>(ax^2)</td>
<td>(ax^2+amx+lm)</td>
<td>(ax^2+amx+2lm)</td>
</tr>
<tr>
<td>B</td>
<td>(ax^2)</td>
<td>(ax^2+anx+ln)</td>
<td>(ax^2+anx+2ln)</td>
</tr>
</tbody>
</table>

Analysis of Game Relationship

The game models can be described as \(G\) \([SA, SB, SH, UA (a, B, H), UB (a, B, H), and (a, b)]\). A, B, H, SA and SB represent the set of strategies that A and B can adopt respectively. UA (a, B, H), UB, and B are used to represent the utility of people in the time of choosing a specific strategy. Since H's strategy is selected after A and B policy selection, SH is determined by SA, SB and the range of values.

\(SA = \{a1, A2, a3\}, A1, A2, A3\) are A low price strategy, original price strategy and high price strategy respectively. \(SB= \{b1, B2, b3\}, B1, B2, B3\) are B, low price strategy, original price strategy and high price strategy respectively. \(SH= \{ h0, ha, hb \}, h0, ha\) and hb are anchor H choosing their own live strategy, platform A strategy and platform B respectively. The emergence of h0 appears to be no cooperation, ha is regarded as a cooperation between H and A, and hb appears to be a cooperation between H and B. In any range of values, ia>ib→ha, ia<ib→hb, m>n, m>n and ia=ib→ha, m<n and ia=ib→hb (i=1, 2, 3). If H chooses its own live strategy UA=UB=0, UH= ax2. Because UH(ha)≥ax2, UH(hb) ≥jx, H will not choose h0. Indicates that A and B choose the benefits from the three parties under different strategies:

While m>n, the payoff matrix is as follows:

<table>
<thead>
<tr>
<th>(U_B \setminus U_A)</th>
<th>a1</th>
<th>a2</th>
<th>a3</th>
</tr>
</thead>
<tbody>
<tr>
<td>b1</td>
<td>-lm; amx+2lm+imx</td>
<td>-lm; lm+imx</td>
<td>-lm; +imx</td>
</tr>
<tr>
<td>b2</td>
<td>ln+imx; -ln</td>
<td>-lm; lm+imx</td>
<td>-lm; +imx</td>
</tr>
<tr>
<td>b3</td>
<td>lnx; -ln</td>
<td>lnx; -ln</td>
<td>-lm; +imx</td>
</tr>
</tbody>
</table>
Because the effect of network externality is less than that of the number of platforms, it is larger than the difference of platform effect, so \( \text{ln} > \text{lm} > (k-j) \text{imx} > l \) (m-n). Set 1.5, 4, 5 three values to simplify the size relationship, so that ln is 5, lm is 4, imx is 1.5, inx is 1.2, and the benefit matrix is reduced to:

**Table 3. m>n, Reduced Payoff Matrix.**

<table>
<thead>
<tr>
<th>UB \ UA</th>
<th>a1</th>
<th>a2</th>
<th>a3</th>
</tr>
</thead>
<tbody>
<tr>
<td>b1</td>
<td>-5; amx+11.5</td>
<td>-5; 6.5</td>
<td>-5; 1.5</td>
</tr>
<tr>
<td>b2</td>
<td>5.2; -4</td>
<td>-5; 6.5</td>
<td>-5; 1.5</td>
</tr>
<tr>
<td>b3</td>
<td>1.2; -4</td>
<td>1.2; -4</td>
<td>-5; 1.5</td>
</tr>
</tbody>
</table>

If the new platform chooses low price, the benefit will be the lowest, so the new platform will not choose low price. Under these conditions, if the original platform chooses low price, the benefit will be the lowest, so the original platform will not choose low price. Similarly, under these conditions, the original platform and the new platform will not choose the original price strategy, and they will choose the high price strategy. The game stops on both sides to choose the high price strategy.

While m<n, the payoff matrix is as follows:

**Table 4. m<n, Payoff Matrix.**

<table>
<thead>
<tr>
<th>UB \ UA</th>
<th>a1</th>
<th>a2</th>
<th>a3</th>
</tr>
</thead>
<tbody>
<tr>
<td>b1</td>
<td>anx+2ln+inx; -ln</td>
<td>-ln; lm+imx</td>
<td>-ln; +imx</td>
</tr>
<tr>
<td>b2</td>
<td>ln+inx; -ln</td>
<td>ln+inx; -ln</td>
<td>-ln; +imx</td>
</tr>
<tr>
<td>b3</td>
<td>Inx; -ln</td>
<td>Inx; -ln</td>
<td>Inx; -ln</td>
</tr>
</tbody>
</table>

Because the effect of network externality is less than that of the number of platforms, it is larger than the difference of platform effect, so \( \text{ln} > \text{lm} > (k-j) \text{imx} > l \) (n-m). Set 1.5, 4, 5 three values to simplify the size relationship, so that ln is 5, lm is 4, imx is 1.5, inx is 1.2, and the benefit matrix is reduced to:

**Table 5. m>n, Reduced Payoff Matrix.**

<table>
<thead>
<tr>
<th>UB \ UA</th>
<th>a1</th>
<th>a2</th>
<th>a3</th>
</tr>
</thead>
<tbody>
<tr>
<td>b1</td>
<td>anx+11.5; -5</td>
<td>-4; 5.2</td>
<td>-4; 1.2</td>
</tr>
<tr>
<td>b2</td>
<td>6.5; -5</td>
<td>6.5; -5</td>
<td>-4; 1.2</td>
</tr>
<tr>
<td>b3</td>
<td>1.5; -5</td>
<td>1.5; -5</td>
<td>1.5; -5</td>
</tr>
</tbody>
</table>

The original platform does not select low price, the new platform does not choose low price, the original platform does not choose the original price strategy, and the new platform does not choose the original price strategy. Therefore, the platform has chosen the high price strategy.

In two cases, the two platforms use a high price strategy, the benefit of the anchor is \( ax^2+amx+2lm \) and the higher in the \( ax^2+anx+2ln \). The signing fee of the anchor is equal to the direct income from the fans, the income caused by the externality of the direct seeding, and the indirect benefit of the number of people with the relative increase of the webcast platform.

**Result Analysis**

The model reflects the competition between platforms and anchors and simplifies the process of platform price increase. In the model, the network externality is embodied in two aspects: the anx between the live webcast and the INX between direct seeding rooms, which can increase the benefit of the anchor and the benefit of the webcast platform. At the same time, a quantitative result is obtained: when the market competition is intense, the reasonable contract gold function of the anchor is \( ax^2+amx+2lm \).
**Case Analysis**

Since the second half of 2014, facing more intense competition, each webcast platform has raised the signer of the anchor to stabilize the army, and at the same time uses high prices to attract the outstanding anchor of other platforms. The signing of "Caomei" and "Ande Roni" is very representative.

In June 2016, the official news release of tiger tooth was released: "tiger tooth 100 million signed Ander Roni's husband and wife", the annual salary in three years is one hundred million. Ander Roni and his wife are the well-known anchor of the long live hearth legend. The number of fans is close to 100 thousand. Almost all the audience in tiger tooth rock area went to see Ande's live webcast, but the base number was limited, the number was 100 thousand.

The anchor's reasonable salary is $ax^2 + amx + 2lm$, $a$ is the income ratio, $l$ is the income ratio to attract the audience, $x$ is the number of fans, and $m$ is the number of live seeding from webcast platform. Because all games are live webcast, the $A$ and $L$ values of each anchor can be shared. Among them, because Caomei signing takes place earliest, therefore take its income proportion and the income ratio as the standard.

If the signing fee of strawberry is reasonable, then Ande's signing money is higher than the reasonable signing money. According to the calculation, Vincent's reasonable contract amount is the highest 2 million / year, and the reasonable contract amount of Ander Roni and Vincent is the highest 20 million / year. It is unreasonable to make a preliminary judgement of their signing amount. If there are other restrictions on the value of $a$ and $l$, their maximum contract amount will decrease correspondingly.

**Summary**

This paper constructs a model of the profit distribution contract, and studies the income distribution in the short live webcast market. In the study of the allocation of subscription funds, the game model is built against the background of the live webcast market competition in accordance with the current live webcast market environment. After the strategy of the live webcast platform is given, the anchor will be selected, and the three parties will gain utility in the short term. Four conclusions are drawn from the model: (1) because of the existence of network externality, the value that the anchor can bring is far more than the value of the vermicelli directly. (2) under the assumption that the webcast platform is not completely rational and the anchor information is complete, the anchor can always get the highest signing money; (3) the additional contribution of the well-known anchor is able to make the table. It shows that the income distribution is reasonable according to the contribution made by the direct seeding platform. $ax^2 + amx + 2lm$ can be used to estimate the signer of the well-known anchor.

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**References**

