

Research on OTA Platform Supervision and Management Based on Game Theory Background

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Abstract: In the era of big data, the OTA platform uses information advantages to abuse data to seek more "big data price discrimination" behaviors of consumers' more benefits. The low information on the market has become a profitable tool for "price discrimination" on the OTA platform. Under the circumstances of this kind of information, it is difficult for consumers to not only be "price discrimination", but also it is difficult to protect their rights after being aware. At this time, the government's active intervention is required to regulate the "big data price discrimination" behavior of the OTA platform. In order to curb the further flooding of "price discrimination", this article has established a game tree model to analyze from the dynamic game perspective of the government and the OTA platform, and the impact of changes in the transparency of information on the stability of the evolution game system. In addition, the relevant suggestions on the OTA platform of government supervision and governance are explained from different levels of information transparency.

Keywords: OTA platform, big data price discrimination, transparency of information, game tree

1. Introduction

With the relaxation of the epidemic prevention and control policy, travel has become convenient and simple, and more and more people will release themselves or enjoy life through travel. From the "family travel" in early 2023 to the "special forces tourism"(a kind of high-intensity, low-cost, and short time to punch a number of scenic spots) that burst into fire in spring, it is the general trend. According to Xinhua News Agency, in 2023, the "May 1st" holiday domestic tourism travels total 274 million people [1], domestic tourism revenue is 148.056 billion yuan [2].

Behind huge profits, the profit behavior of merchants has become uncontrollable. Big data price discrimination has become increasingly increasing since its list of ten consumer infringement incidents in 2018. The "price discrimination" incident has repeatedly appeared in social hot news. Among them, the "big data price discrimination" behavior of online tourism companies (OTA) is more prominent [3]. With the help of algorithm tools, the network platform customizes "personalized prices" for different users, which constitutes a cooked phenomenon of big data to a certain extent. Big data price discrimination is also known as algorithm conspiracy, algorithm discrimination, algorithm consumer price discrimination [4]. Of course, the case of big data killing is not unique in

China. As early as 2000, the difference in price pricing test implemented by Amazon's website was an early practice of big data price discrimination.

The first reason why the behavior of price discrimination can become the unsatisfactory rules of the platform is the huge profit behind the behavior and the simplicity of making this behavior. When consumers consume on the OTA platform, as a disadvantage, they receive a single information channel, and it is difficult to notice the targeted "personalized pricing" of the platform. The platform has a huge user data support, which can launch different solutions according to different consumer habits. Under the great information poor, it is difficult for consumers to find problems, and even if problems are found, it is difficult to obtain evidence and cannot protect their rights. In such cases, government intervention is required. Therefore, in order to solve the problem of killing in the development of the tourism industry in the era of big data, this article has established a game tree model. From the government and the OTA platform, the two subjects of the government and the OTA platform have explored the role of increasing information transparency and reduced information. Provide countermeasures for supervision and governance of the OTA network platform.

2. Literature Review

In terms of tourism scholars, most of them focus on pricing areas such as hotel rooms and aviation tickets, and focus on issues such as maximum income, satisfaction and loyalty [5-7]. Compared with the long-term price discrimination of traditional tourism companies (such as hostels), the big data of the OTA platform is more difficult to find. Therefore, most of the results mainly study the difficulty of defending rights and related laws under the legal framework of big data and improvement of relevant laws [8].

Studies on "big data price discrimination" abroad have begun to see as early as the Amazon incident in 2002[9]. However, these studies are mainly concerned: how should enterprises and consumers deal with price discrimination [10], whether they should discriminate against prices between companies [11,12], and games between upstream and downstream companies [13]. Domestic research on this is mainly concentrated in qualitative analysis. For example, the legal nature of the OTA platform "big data price discrimination"[14,15]; research on consumer rights protection in "big data price discrimination"[16].

Although the research on "big data price discrimination" at home and abroad is not just starting, it is currently not related to how to curb "big data price discrimination" and how the government should regulate and manage. Big data is convenient, but the company's exploitation of consumers with big data should be tried to curb. The government should actively insert a regulatory and governance role when consumers and platforms are extremely irregular. In addition to research on supervision and punishment [17], detailed research on how to supervise can also provide a feasible path for governance. Therefore, this article proposes one of the methods to refine supervision and governance: increase information transparency and use this to study the role of government supervision and governance on the "price discrimination" phenomenon of the OTA platform.

3. Basic Assumptions and Model Establishment

3.1. Basic Assumptions about the Game

Participants of the game model include two government supervision departments (A) and OTA platform (B). Suppose the actions of the two sides in the game are the main body of a completely rational. According to the theory of game, the strategic choices of all parties are to pursue maximizing game income, that is, the government regulatory department pursues the maximum social interests, and the OTA platform pursues the maximum interest of the enterprise.

The OTA platform is selected in the two strategies of "big data price discrimination" (K) and not "price discrimination" (NK). The ratio of the OTA platform is not "price discrimination" X, ($0 \leq X \leq 1$). At this time, the platform cost is C1 and the income is R1. The proportion of "big data price discrimination" is 1-X, and the cost of the platform is C2 (using big data can achieve precision marketing, precision logistics, ect. [17] which make $C2 < C1$), and also includes the cost C3 of the platform applying big data to derive "personalized pricing" for consumers. And at this time the platform income is R2, $R1 < R2$.

When the government supervision department supervises, the two strategies of increasing information transparency (I) and not increasing information transparency (NI) are selected. The proportion of information transparency in the government is Y ($0 \leq Y \leq 1$). At this time for CA. The government does not increase the proportion of information transparency to 1-y. At this time, the cost of the government for supervision is CB. The government regulatory authorities have additional cost CCs when they continue to supervise.

After the government increased the transparency of information and adopted a series of measures, the losses caused by the OTA platform due to "big data price discrimination" were F1. Losses caused by the loss of corporate image and the loss of consumer refund fines are F2. At this time, the government can obtain income F1.

When the government chooses continuous supervision (C), the probability of successful supervision of "price discrimination" enterprises is γ , and the probability of success when choosing not continuous supervision (NC) is β ($0 \leq \beta < \gamma \leq 1$).

3.2. Game Tree Model

The construction of the game tree model is shown in Figure 1 below:

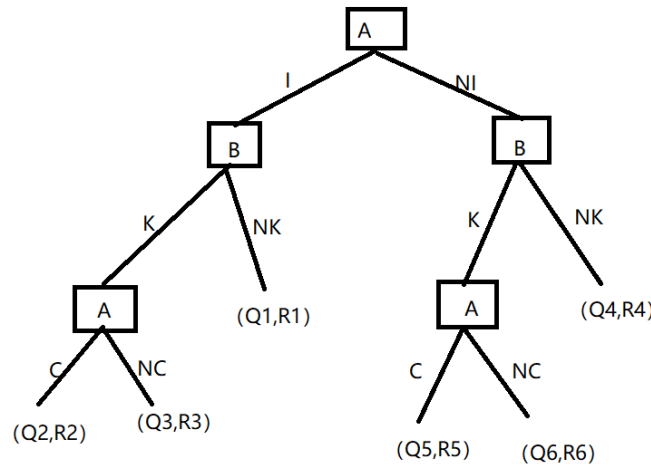


Figure 1: The dynamic game between the government regulatory department and the OTA platform.

As shown in Figure 1, there will be six possibilities in this game tree:

When the government regulatory department increases information transparency and OTA platform chooses not to "price discrimination", government income:

$$Q1 = -CA \tag{1}$$

OTA platform income:

$$W1 = R1 - C1 \tag{2}$$

When the government regulatory authorities increase the transparency of information, the OTA platform selects "big data price discrimination". At this time, the government continues to supervise the successful supervision of γ probability, then government income:

$$Q2 = -CA - CC + \gamma F1 \quad (3)$$

OTA platform income:

$$W2 = R2 - C2 - C3 - \gamma F1 - \gamma F2 \quad (4)$$

When the government regulatory department increases information transparency, the OTA platform selects "big data price discrimination". At this time, the government does not continue to supervise the successful supervision of β probability, then government income:

$$Q3 = -CA + \beta F1 \quad (5)$$

OTA platform income:

$$W3 = R2 - C2 - C3 - \beta F1 - \beta F2 \quad (6)$$

When the government regulatory authorities do not increase information transparency, the OTA platform chooses not to "price discrimination", government income:

$$Q4 = -CB \quad (7)$$

OTA platform income:

$$W4 = R1 - C1 \quad (8)$$

When the government regulatory authorities do not increase information transparency, the OTA platform selects "big data price discrimination". At this time, the government continues to supervise the successful supervision of γ probability, then government income:

$$Q5 = -CB - CC + \gamma F1 \quad (9)$$

OTA platform income:

$$W5 = R2 - C2 - C3 - \gamma F1 - \gamma F2 \quad (10)$$

When the government regulatory department does not increase information transparency, the OTA platform chooses "big data price discrimination". At this time, the government does not continue to supervise the successful supervision of β probability, then government income:

$$Q6 = -CB + \beta F1 \quad (11)$$

OTA platform income:

$$W6 = R2 - C2 - C3 - \beta F1 - \beta F2 \quad (12)$$

3.3. Game Tree Model Solution

This article will use the solution of the above -mentioned dynamic game problems with reverse induction method.

3.3.1. Solve

Comparing Q2 and Q3, Q5 and Q6, we can see that the size of $\beta F1$ and $-CC + \gamma F1$ is the key.

$-CC + \gamma F1 > \beta F1$, then $Q2 > Q3$, $Q5 > Q6$ (Figure 2: The government's game on whether to choose a continuous supervision strategy, Figure 3: The government chooses continuous supervision strategy), the government should choose continuous supervision strategy at this time.

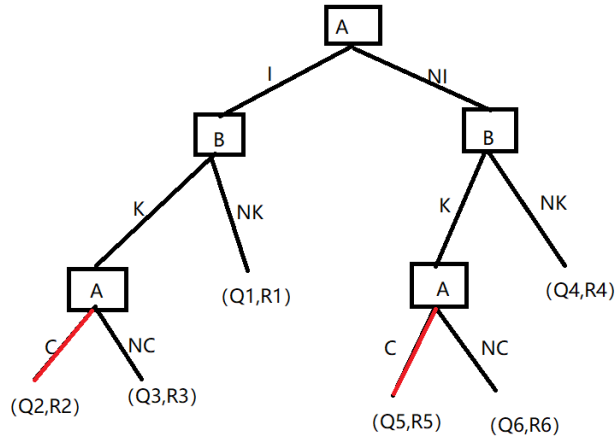


Figure 2: The government's game on whether to choose a continuous supervision strategy.

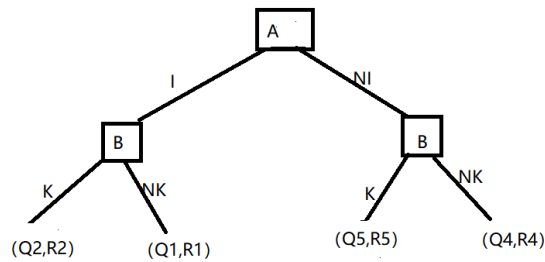


Figure 3: The government chooses continuous supervision strategy.

$R1 > R2, R4 > R5$ (Figure 4: Whether the OTA platform chooses price discrimination strategies the first situation, Figure 5: The government's continuous supervision and the game after the OTA platform chooses not price discrimination)

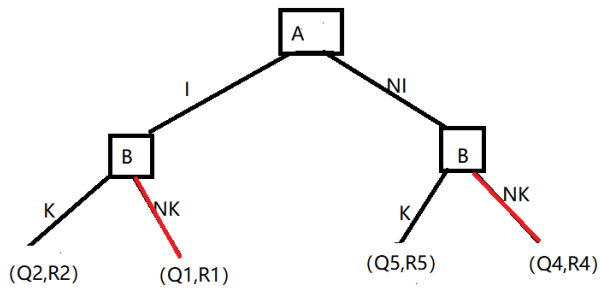


Figure 4: Whether the OTA platform chooses price discrimination strategies the first situation.

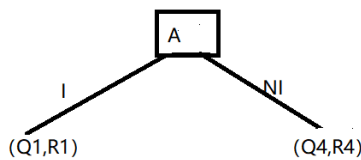


Figure 5: The government's continuous supervision and the game after the OTA platform chooses not price discrimination.

$R1 < R2, R4 < R5$ (Figure 6: Whether the OTA platform chooses price discrimination strategies the second situation, Figure 7: The government's continuous supervision and the game after the OTA platform chooses price discrimination)

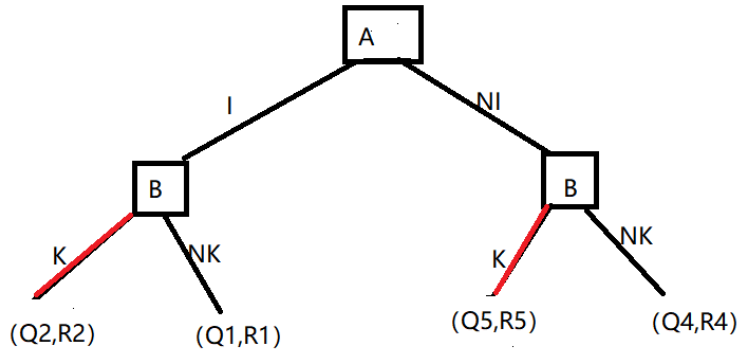


Figure 6: Whether the OTA platform chooses price discrimination strategies the second situation.

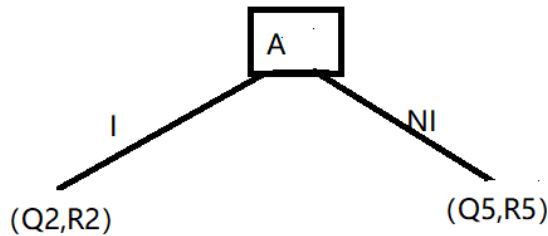


Figure 7: The government's continuous supervision and the game after the OTA platform chooses price discrimination.

$\beta F1 > -CC + \gamma F1$, then $Q3 > Q2, Q6 > Q5$ (Figure 8: The government's game on whether to choose a continuous supervision strategy, Figure 9: The government chooses not continuous supervision strategies), at this time the government should choose not to continue the supervision strategy.

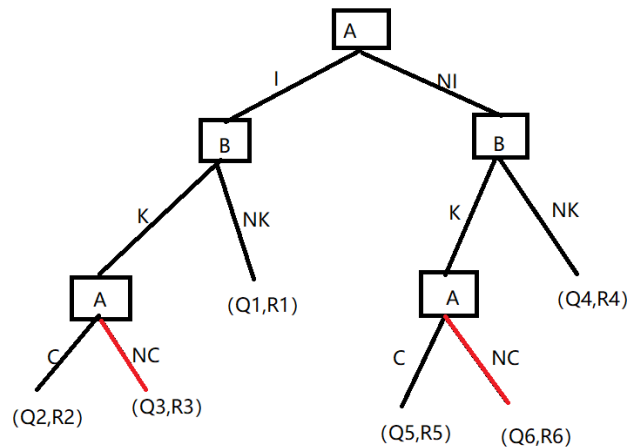


Figure 8: The government's game on whether to choose a continuous supervision strategy.

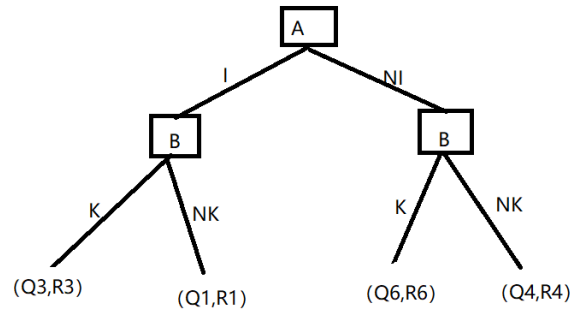


Figure 9: The government chooses not continuous supervision strategies.

$R1 > R3, R4 > R6$ (Figure 10: Whether the OTA platform chooses price discrimination strategies the first situation, Figure 11: The government chooses not continuous supervision strategies and the game after the OTA platform chooses not price discrimination)

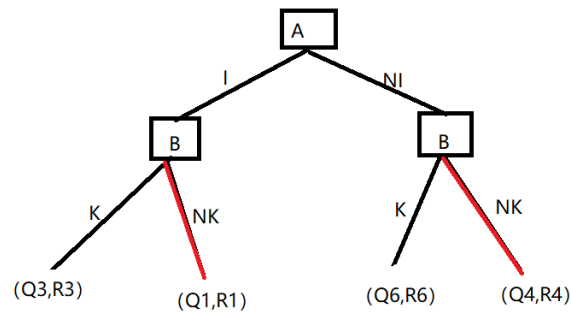


Figure 10: Whether the OTA platform chooses price discrimination strategies the first situation

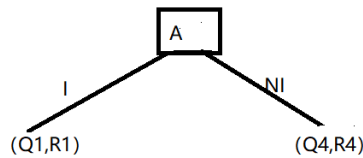


Figure 11: The government chooses not continuous supervision strategies and the game after the OTA platform chooses not price discrimination.

$R1 < R3, R4 < R6$ (Figure 12: Whether the OTA platform chooses price discrimination strategies the second situation, Figure 13: The government chooses not continuous supervision strategies and the game after the OTA platform chooses price discrimination)

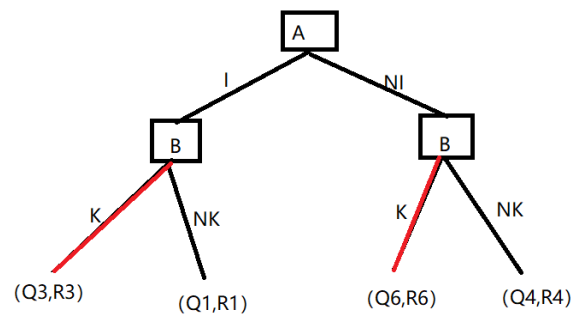


Figure 12: Whether the OTA platform chooses price discrimination strategies the second situation.

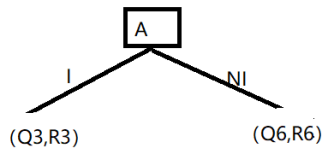


Figure 13: The government chooses not continuous supervision strategies and the game after the OTA platform chooses price discrimination.

3.3.2. Analysis

Q4, Q2, Q5, Q3 and Q6 are related to the size of CA and CB.

If $CA < CB$, then $Q4 < Q1$ (Figure 5, Figure 11), $Q5 < Q2$ (Figure 7), $Q6 < Q3$ (Figure 13). According to the inverse induction method, in the optimal combination strategy of government supervision departments and OTA platforms, government supervision departments should choose to increase information transparency during supervision. The OTA platform $R1-C1 > R2-C2-C3 - \beta F1 - \beta F2$ (because $\beta < \gamma$, so this must satisfy $R1-C1 > R2-C2 -C3 - \gamma F1 - \gamma F2$), choose not to "price discrimination", otherwise choose "Big data price discrimination".

If $CA > CB$, then $Q4 > Q1$ (Figure 5, Figure 11), $Q5 > Q2$ (Figure 2.6), $Q6 > Q3$ (Figure 13). According to the inverse induction method, in the optimal combination strategy of government supervision departments and OTA platforms, government supervision departments should choose not to increase information transparency during supervision. The OTA platform $R1-C1 > R2-C2-C3 - \beta F1 - \beta F2$ (because $\beta < \gamma$, so this must satisfy $R1-C1 > R2-C2 -C3 - \gamma F1 - \gamma F2$), choose not to "price discrimination", otherwise choose "Big data price discrimination".

4. Conclusions and Suggestions

4.1. Conclusions

When the government regulatory authorities make supervision, the supervision cost is a very critical factor. For this subsequent research, we should focus on cost issues when proposing a detailed supervision method.

When the OTA platform should "price discrimination", the income brought by "price discrimination" can exceed the unreasonable losses faced after being discovered by "price discrimination". In order to curb the OTA platform "price discrimination" to force it to choose not to "price discrimination", it can increase the losses of monetary penalties caused by "big data price discrimination", losses caused by corporate image losses, and consumer refund fines. Losses such as loss of corporate image. The losses caused by the OTA platform due to "big data price discrimination" are mainly related to the "price discrimination" degree of "price discrimination" of the platform to consumers. The impact of corporate image is an operable part of government supervision.

In addition to improving the loss after the discovery of "price discrimination", increasing the probability of "price discrimination" being found, that is, the probability of success of government regulation, can also effectively make OTA platforms discouraged from "price discrimination". The ota platform is able to do "large Numbers", which are difficult to find, and the other is that the government has a leak of regulation of the market. When the OTA platform clearly knows that the probability of being found and the cost of being found after choosing "big data price discrimination" is greatly increased, they are more likely to choose not to "price discrimination" when making decisions.

4.2. Suggestions

Choose low-cost supervision methods. For example, let the OTA platform be managed by the government uniformly, and partially shared the task to the platform to self-inspect and self-inspect or use big data technologies to reduce expenditure in manpower when regulatory governance.

The government's regular announcement of the OTA platform and related information that the "price discrimination" operation that has been checked within a certain period of time will spread the information of bad merchants with "big data price discrimination" behavior. On the one hand, consumers can understand the situation and try to avoid as much as possible in subsequent consumption, so as to have a negative impact on the reputation and turnover of the OTA platform. On the other hand, more consumers can alert the "big data price discrimination" behavior of the OTA platform, and realize the feasibility of rights protection, and can also play a positive role in active complaints and reports of consumers. The immediate strike effect of "price discrimination" OTA platform.

Open a number of complaint channels for killing or visiting the OTA platform. In addition to the government's active supervision to increase the chance of being discovered after the OTA platform "big data price discrimination", links between the government and consumers are equally important. The discovery of consumers' "big data price discrimination" phenomenon and difficulty in protecting their rights make them have almost no link between the government. Therefore, the government needs to fully publicize the importance of active rights protection, open up and publicize more complaint channels to encourage consumers to protect their rights.

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