

Antitrust Legal Regulation of Algorithmic Personalized Pricing Behavior

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Abstract: With the development of information technology, big data and algorithms are promoting the development of the digital economy on the one hand, but on the other hand, they are also more insidious to damage the rights and interests of consumers. In the era of big data, some Internet operators continue to use algorithm technology to unreasonably collect and summarize user information, use this information to "profile" platform users, and conduct differentiated pricing for consumers with different usage needs. Users of different mobile phone brands use the same app to search, but the prices are completely different. Specifically, the higher the brand awareness of the mobile phone, the higher the search price, and the search price is also related to the frequency of users using the software. Starting from the basic theory of algorithmic personalized pricing, this paper analyzes the basic theory of algorithmic personalized pricing, studies the impact of this behavior on the market and consumers, analyzes the anti-monopoly regulation of algorithmic personalized behavior from the existing legal framework in China, and finally discusses the regulatory path of algorithmic personalized pricing from the Anti-Monopoly Law in view of the difficulties in determining market dominance, imperfect supervision and consumer rights remedies.

Keywords: Algorithmic Personalized Pricing; Identification Criteria; Antitrust; Consumer Rights; Legal Regulat.

1. Introduction

In the era of the rapid development of Internet technology, platform operators fully collect and analyze a large amount of consumer information. By utilizing the "user profile" constructed for each consumer, they implement differentiated pricing strategies for consumers with different usage needs. In conventional thinking, "the same product should have the same price," or consumers who frequently shop at the same store tend to enjoy relatively more favorable prices. [1]However, in the digital economy era, with the advancement of the Internet and the increasing frequency of online shopping among consumers, platform operators implement personalized pricing for consumers based on the collected information about consumers' spending preferences and personal data. Among various forms of personalized pricing, the most common and well-known one is "big data price discrimination against regular customers" (a practice where platforms charge higher prices to frequent or loyal users based on big data analysis). Platform operators leverage the collected consumer information—such as mobile phone model, gender, age, app usage preferences, and the maximum price a consumer is willing to pay for a product—and use algorithms to offer the same product at different prices to different consumers. Specifically, they often set relatively higher prices for consumers with higher usage frequency.

In real life, an increasing number of consumers report experiencing algorithmic personalized pricing. For instance, on the same ride-hailing platform, orders for the same route usually cost more when placed via an iOS client than an Android client. Another example is that when a user repeatedly searches for or purchases a certain type of product on an e-commerce platform, the price for subsequent purchases will often be higher than that of the first purchase. Additionally, if a user frequently uses a food delivery platform and has subscribed to its membership service, the unit price of items or delivery fees they encounter may be

higher than those for regular users.

Against the backdrop of the rapid development of the modern Internet, big data and algorithm technologies are widely applied, and people's consumption behaviors are gradually shaped by lines of code. Algorithmic price discrimination exists in various areas of life. To better address the harms caused by algorithmic pricing in the context of the digital economy, it is essential to study its formation mechanism, clarify the damage it inflicts on the market and consumers' rights and interests, strengthen supervision over such practices, and avoid rigidity in law enforcement.

2. Theoretical Interpretation of Algorithmic Personalized Pricing

2.1. Technical Logic of Algorithmic Personalized Pricing

Relying on big data and intelligent algorithms, algorithmic personalized pricing demonstrates distinct technical characteristics in online shopping. In digital transaction scenarios, consumers are endowed with dual identities: they are not only consumers of products but also producers of data, providing platform operators with user attribute information and consumption trajectory data. The former mainly includes age, gender, marital and childbearing status, and asset credit, while the latter is continuously updated with each consumption behavior of consumers, such as geographical location, consumption preferences, and access and search records. The above-mentioned data provide the basic support for algorithmic personalized pricing, and the quality and integrity of the data determine the accuracy of the personalized pricing offered by platform operators to consumers. Given the scarcity and mobility of data elements, the competition for data resources related to pricing algorithms has become a new focus of competition in the digital market. The efficiency of value transformation of data assets directly affects an enterprise's competitive advantage

and profitability in price games.

In essence, algorithmic personalized pricing is no different from price discrimination in economics. In economics, price discrimination is a rational strategy adopted by monopolistic enterprises to maximize profits. [2]By charging different prices for the same product to different consumers, monopolistic enterprises can increase their profits. For example, if a publishing company buys the copyright of a novel, the loyal fans of the novel are willing to pay five times the price that less enthusiastic readers are willing to pay. If a high price is set, only loyal fans may be willing to pay, and the publishing house may still make a profit. If geographical factors are taken into account at this time, assuming all loyal fans are in City A and other less enthusiastic readers are in City B, the publishing company can set a high price for City A and a lower price for City B. In this case, the company's profits will be much higher than if a unified high price is set. Driven by profit maximization, the company will definitely choose to implement such price discrimination. A common form of price discrimination in daily life is "group purchase price". Although it seems that consumers can obtain products at a lower price, not every consumer is willing to compare prices across different platforms to make a choice.

Both algorithmic personalized pricing and algorithmic price discrimination involve summarizing consumers' transaction habits and consumption willingness (and other personal information) collected by the platform during their use of the platform, identifying the unique consumption characteristics of each platform user, and then using algorithms to automatically adjust prices, thereby enabling the platform to maximize its profits.

2.2. Types of Algorithmic Personalized Pricing

In the digital economy era, the purpose of operators implementing personalized pricing is to achieve more accurate user classification and market segmentation. By using algorithm technology to divide the market and implement differentiated pricing for consumers with different willingness to pay, operators can maximize the platform's interests. In this way, platform operators can not only attract new customers with preferential prices but also retain old customers who have high brand preference and loyalty with regular prices. Based on the collected information, operators can use algorithms to comprehensively consider factors such as consumers' consumption willingness and provide them with accurate recommendations, thereby maximizing profits.

Algorithmic personalized pricing generally includes ultra-high pricing, ultra-low pricing, and regular pricing. Firstly, ultra-high pricing (higher than the market price) will greatly harm consumers' interests and disrupt fair market transactions. Secondly, ultra-low pricing (lower than the market price) allows consumers to obtain the same products and services at a lower price, but it may lead consumers to constantly compare prices across different platforms, resulting in reduced consumption efficiency. For platform operators, ultra-low pricing may bring the risk of occupying market dominance as stipulated in the Anti-Monopoly Law, and it may also restrict competition among platform operators and disrupt the market order.[3]Finally, regular pricing is the benchmark, and most algorithmic personalized pricing fluctuates slightly around the regular price. Moreover, due to the opacity of algorithms and the high professionalism of algorithm design, consumers can hardly detect that they are subject to algorithmic personalized pricing. They often need

to verify this by comparing prices across platforms, asking people around them for price information, and other methods. As a result, algorithmic personalized pricing, which should have served as an intelligent pricing mechanism to lubricate the market, has instead become a source of transaction frictions due to the lack of trust. In this case, it is necessary to rebuild consumers' trust in platform operators. Platform operators can build a transparent data governance system and rights protection mechanism, proactively eliminate algorithmic biases, and establish a trust framework based on algorithm interpretability, so that the dynamic pricing mechanism can truly release its potential value in promoting market efficiency.[4]

3. Harms of Algorithmic Personalized Pricing

In short, algorithmic personalized pricing is the so-called "one thousand prices for one thousand people", where different prices are set for the same product for different consumers. Due to the concealment and professionalism of data algorithms, consumers can hardly detect that they are subject to algorithmic personalized pricing. However, in recent years, more and more media have exposed cases where platforms use their dominant position to implement algorithmic personalized pricing. This behavior has caused a series of negative impacts on the market order and endangered consumers' legitimate rights and interests.

3.1. Damaging Consumers' Legitimate Rights and Interests

The behavior of operators using data analysis to implement differential pricing for consumers makes consumers believe that they should enjoy the same price as other consumers. The concealment of algorithm technology covers up the actual pricing mechanism, resulting in the lack of consumers' right to know. However, the pricing model of platforms based on algorithm technology exacerbates the information asymmetry between the two parties. [5] The "official price" seen by consumers on Internet platforms is not actually a clear price under the same transaction conditions, but the maximum price that consumers may pay for the product, which is accurately recommended after analyzing and summarizing users' personal information and consumption characteristics. In essence, this "precision marketing" strategy also seriously infringes on consumers' right to know.

Secondly, it infringes on consumers' right to privacy. The collection of user information by big data algorithms is concealed. When users use an APP, their information may be leaked unknowingly, which infringes on their personal privacy and personal information rights. Chapter 6 of China's Civil Code clearly defines and specifies the protection of the right to privacy and personal information again.[6]The improper collection, analysis, and processing of various data that can identify the victim individually or in combination with other information by algorithms constitutes an infringement of the victim's right to personal information and may cause mental or property damage to the victim. China's Anti-Monopoly Law also stipulates that operators with market dominance shall not use data, algorithms, technology, or platform rules to engage in behaviors such as transaction restriction, tying, and price discrimination. In the traditional transaction process, consumers do not need to provide their relevant information to merchants, but in online transaction

activities, platform operators can easily obtain various types of user information.[7]Due to the high concealment of algorithm technology, users are not aware of the methods used by platform operators to collect data and information, nor how they will use this information. Therefore, consumers' rights to conceal, control, and utilize their privacy are infringed.

3.2. Endangering Data and Information Security

The user data collected by platforms and used for algorithmic personalized pricing covers various aspects of consumers' lives. This data not only includes transaction-related data generated when using the platform but also some non-essential information, such as the number of times consumers search for or browse a product, travel information, and personal biometric information. It even happens that after a consumer searches for a product on Platform A, the same product will immediately appear on Platform B. When platforms collect consumers' data and information, consumers have no right to choose independently. [8]In general, consumers can only use the full functions of the platform after agreeing to the platform's information collection rules. Based on this, platform operators will collect and utilize consumers' information without boundaries. Such data may even be shared between Platform A and Platform B, which endangers consumers' trust in the platform and also infringes on the protection of consumers' personal information.[9]

3.3. Undermining the Fair Competition Market Order

In the traditional transaction model, consumers only need to "pay money and receive goods" with operators, without providing other information, and the information collected by operators is scattered and difficult to use. However, in the digital economy era, operators' ability to collect and utilize consumers' data and information has been enhanced, and driven by the extreme pursuit of profit maximization, algorithmic personalized pricing has become increasingly prevalent.[10] In the digital economy era, operators have more advanced technical means compared with the traditional business model. Operators should use these big data technologies to better serve consumers and improve the quality of products and services, rather than making profits by taking advantage of the information asymmetry between the platform and consumers. In addition, in practice, some platform operators use big data algorithm technology and their monopolistic position to obtain such data and information from competitors, which constitutes an unfair competition behavior, harms consumers' legitimate rights and interests, and undermines the fair competition market order.

4. Analysis of Problems in Anti-Monopoly Regulation of Algorithmic Personalized Pricing Behavior in China

Due to the wide scope of application and the complexity of algorithmic personalized pricing, the regulation of algorithmic personalized pricing behavior not only involves the field of anti-monopoly law but also relates to relevant provisions in civil law, administrative law, and other fields. However, some existing legal regulations on algorithmic personalized pricing behavior seem unable to better address the new problems emerging in the digital economy era, and

the applicability of these laws has been greatly reduced. Compared with other existing laws, the Anti-Monopoly Law has a broader scope of protection and can protect the relevant rights and interests of operators, consumers, and other market participants more directly and effectively. At the macro-control level, the Anti-Monopoly Law provides maximum protection for market entities and consumers. It not only regulates traditional monopoly situations but also sets new provisions to address problems in the digital economy era.[11]

4.1. Difficulties in Identifying the Illegality of Algorithmic Personalized Pricing

In the real economy, the most important factor in determining market dominance is the market share occupied by an enterprise in the relevant market. In the field of Internet platform economy, data is the basis for platform operators to implement algorithmic personalized pricing. The traditional criteria for determining market dominance are closely related to the core elements of the real economy, but it is biased to apply the same identification criteria in the digital economy.

As collectors and controllers of user data, platform operators often sell products at free or more preferential prices to obtain a large amount of user data and information, thereby attracting more and more consumers to choose the platform and enabling the platform to form a dominant position in the network market. [12]In this case, operators use their advantages in algorithm technology and data resources within their business scope to occupy market dominance, thereby implementing personalized pricing for consumers. There is also another possibility: an enterprise may have a low traditional market share but possess extremely rich data resources. At this time, it is obviously unreasonable to evaluate an operator's market dominance solely based on market share, as this approach fails to consider all relevant aspects and may lead to the omission of operators that actually have a dominant position, violating the original intention of law enforcement under the Anti-Monopoly Law.

4.2. Lack of a Sound Supervision and Management System

At present, the supervision of the behavior of Internet platforms using big data for algorithmic personalized pricing involves multiple regulatory authorities. Therefore, regulating algorithmic personalized pricing behavior requires the joint supervision of multiple departments. If the supervisory functions of multiple regulatory authorities related to algorithmic personalized pricing overlap and there is no specific and clear division of responsibilities, problems such as inadequate supervision or mutual shirking of responsibilities among departments may arise. Faced with the concealment and professionalism of big data algorithm technology, it is difficult to supervise and manage it in accordance with the traditional supervision mechanism.[13]

From the perspective of the current regulatory system for algorithmic personalized pricing, China lacks an effective supervision system for algorithmic personalized pricing behavior. This is mainly reflected in the following aspects:

Firstly, the subject responsible for supervising algorithmic personalized pricing behavior is not clear. The supervision of algorithmic personalized pricing integrates technical supervision, consumer rights protection, market order supervision, and other aspects, requiring the joint participation of several government departments. Each department has corresponding supervisory responsibilities for

algorithmic personalized pricing behavior, but these responsibilities are not clearly defined. Under the multi-management model, the powers and functions of different departments overlap, which may easily lead to problems such as supervision conflicts. These phenomena have invisibly increased the difficulty of supervising algorithmic personalized pricing behavior. [14]

Secondly, the supervision model for the platform economy in the context of the big data era is relatively backward. Although the government has continuously used digital technical means to assist law enforcement in the law enforcement process, generally speaking, the existing effective supervision model still has problems such as delayed supervision, high difficulty for consumers to collect evidence, and high supervision costs, which lags far behind the development of the platform economy in the Internet era.

4.3. Insufficient Remedies for Consumers' Rights

According to the provisions of China's Civil Procedure Law, based on the principle of "who claims, who provides evidence", consumers must provide strong evidence to prove the fact that they have been infringed by platform operators and the causal relationship between the infringement and the platform operator's behavior. In addition, due to the particularity of virtual transactions, it is the Internet platform operators that actually store all transaction-related data and information, while the evidence held by consumers is only their own past consumption records. Therefore, it is very difficult for consumers to provide sufficient evidence to prove the infringement they have suffered.[15]

Due to information asymmetry, consumers are often in a disadvantaged position. They usually cannot become aware that their rights have been infringed upon in a timely manner. Even if consumers can clearly recognize that they have encountered price discrimination and seek remedies for their rights, the time and monetary costs they incur are relatively high, which are disproportionate to the amount of damages they can obtain. As a result, most consumers, even when harmed by price discrimination, choose to give up due to the high cost of safeguarding their rights, leaving their legitimate rights and interests without genuine protection.

5. Antitrust Regulation Paths for Algorithmic Personalized Pricing

5.1. Reasonable Selection of Market Dominance Determination Standards

In the era of digital economy, shopping methods have gradually shifted from physical shopping to online shopping. Online shopping products can be divided into physical goods that rely on transportation and virtual products that do not rely on transportation. Therefore, when defining whether the relevant operators of these two types of products have dominant market positions, we cannot solely consider market share, but should also take into account whether transportation costs affect market dominance.

Compared with traditional operators, in online shopping, the two-sided market characteristic of platform operators determines that their market position cannot be considered only from the supply side, but must also be analyzed from the demand side, which can more directly protect the legitimate rights and interests of consumers. Consumers may choose to use a certain platform operator due to various factors such as

usage habits, page design and function design. In the standards for determining market dominance, only considering the supply side of platform operators may easily overlook the legitimate rights and interests of consumers. Of course, the implementation of algorithm-based personalized pricing behavior is based on platform operators' possession of massive amounts of user data and information. Therefore, data is also an indispensable factor to consider when determining market dominance. The manuscript should include a conclusion. In this section, summarize what was described in your paper. Future directions may also be included in this section. Authors are strongly encouraged not to reference multiple figures or tables in the conclusion; these should be referenced in the body of the paper.

5.2. Improving the Supervision and Management System for Algorithmic Personalized Pricing

With the rapid development of big data technology, relying solely on traditional regulatory models is not only inefficient but also results in delayed detection of problems. Relevant regulatory authorities need to keep pace with the times and innovate their regulatory approaches.

First, regulatory departments must continuously enhance their governance capabilities and adopt more timely and accurate response measures to protect consumers' rights and interests in the new era. Second, various departments should collaborate with one another. On the premise of clarifying responsibility allocation, they should achieve information sharing and timely communication regarding the progress of law enforcement. Finally, to more effectively address issues related to consumer rights protection in internet transactions, a dedicated national agency for consumer protection can be established, staffed with professional legal personnel.

Meanwhile, considering the nature of new issues emerging in the big data era, law enforcement agencies can also utilize big data technology in their supervision processes. By leveraging advanced algorithmic technologies to analyze and predict potential illegal behaviors of platform operators, they can implement dynamic monitoring—thereby protecting consumers' legitimate rights and interests in a timely manner.

5.3. Strengthening Remedies for Consumers' Rights

In lawsuits related to algorithmic personalized pricing, we can adopt the method of reversing the burden of proof, shifting the burden of proof from consumers to internet platform operators. Operators shall provide evidence to prove whether they have used algorithmic technology to improperly collect and use consumers' data and information to achieve differential pricing, and whether such behaviors have legitimate reasons.

Compared with consumers, platform operators have a relatively significant advantageous position in terms of economic strength, information analysis and processing capabilities, and market dominance. Therefore, it is more reasonable for platform operators to bear the corresponding burden of proof.

When individual consumers face algorithmic personalized pricing behaviors, initiating an antitrust lawsuit takes too much time, and different consumers may file repeated lawsuits against the same platform, resulting in a waste of judicial resources. Establishing an antitrust class action system led by procuratorates or antitrust law enforcement

agencies can not only avoid repeated litigations but also resolve multi-party disputes at one time.

This system is not only conducive to protecting the individual interests of consumers but also can effectively supplement the implementation of the antitrust law and play a role in safeguarding public interests. In addition, the class action system has the functions of safeguarding public interests and a large number of small-value private interests, and is consistent with the purpose of the antitrust law. Therefore, it is very important to improve China's joint litigation system and litigation representative system to ensure reasonable compensation for individual consumers.

6. Conclusion

Algorithmic personalized pricing is an unavoidable practical issue that has emerged alongside the rapid development of the internet. Currently, big data technology is present in all areas of our social life. However, internet platform operators' improper pursuit of profits during transactions has crossed the boundaries of law and business ethics, leaving consumers' legitimate rights and interests without comprehensive protection.

If platform operators only pursue technological innovation and high profits blindly while neglecting the protection of consumers' rights and interests, such behavior will inevitably put the cart before the horse. If the state allows such behaviors to go unregulated by law, over time, operators will only become more unscrupulous, algorithmic personalized pricing will intensify, and it will be difficult for consumers' legitimate rights and interests to receive genuine protection.

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