Application of Segmented Pricing Strategy in Digital Economy

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Abstract: The rapid development of Internet technology in the digital economy era provides conditions for enterprises to adopt a more accurate segmented pricing strategy. Information collection technology will lead enterprises to adopt discriminatory pricing strategies, which may make enterprises lack the power to improve product quality, and more adopt discriminatory pricing to gain competitive advantages and consumer surplus. Based on combing the existing literature, this paper mainly analyzes the application of segmented pricing strategy in enterprises and its impact on consumer surplus in the digital economy era. The analysis results show that enterprises cannot fully obtain consumer surplus through segmented pricing but can more accurately provide customized prices for different groups of customers. The use of segmented pricing by enterprises is conducive to the increase of the overall welfare of consumer groups.

Keywords: segmented pricing, price discrimination, legal provisions, consumers' responses

1. Introduction

With the development of technology, the digital economy presents a series of characteristics different from the traditional economy. For example, the market structure in the equilibrium of market competition has a natural oligopoly tendency [1], the attention of consumers has become a new resource for manufacturers to compete for [2], and enterprises carry out a variety of new business activities based on consumer personal information [3].

Segmented pricing refers to "A firm sells the "same" product or service at more than one price." This is a form of discriminatory pricing. With the rapid development of Internet technology in the era of digital economy, it is common for enterprises to provide customized prices for consumers. In the digital economy era, Internet enterprises rapidly collect and accumulate various kinds of information of consumers, including shopping, searching and browsing web records. The ability of data collection and analysis has become increasingly important in the market competition. There are various ways for enterprises to obtain consumer personal information for price discrimination. In the traditional economy, enterprises can only identify the characteristics of consumers by using the information spontaneously disclosed by consumers, designing different price contracts such as quantity discounts, or providing value-added services, and discriminate against consumers by classification. However, in the digital economy, based on data mining and other technologies, enterprises can obtain consumer characteristic data by analyzing consumer purchase behavior, providing pre-sale discounts, integrating consumer search records across platforms in order to label consumers. Based on these portraits,

it is gradually possible for enterprises to charge consumers a customized price of "one person, one price" in the digital economy era. This big data processing technology and the resulting customized price reflect the improvement of the discriminatory pricing accuracy of enterprises, which is an important feature of the digital economy different from the traditional economy. For enterprises that provide products based on digital economy technology, segmented pricing strategy will have different effects on their profit and quality. On the one hand, discriminatory pricing can provide rich profits for enterprises and provide financial support for improving product quality. However, on the other hand, discriminatory pricing enables enterprises to obtain higher income without improving quality, thus inhibiting their enthusiasm to improve product quality.

Based on the above analysis, this paper hopes to study two questions: What segmentation pricing strategy will information collection technology guide enterprises to adopt? What is the impact of segment pricing on consumer surplus?

2.   Literature Review

In order to maximize profits, monopoly manufacturers charge different prices for consumers in different markets or consumers who buy different quantities of goods in the same market. This pricing method is also called segmented pricing. Scholars have defined price discrimination according to the purpose of discriminatory pricing: products with the same characteristics are sold at different prices to obtain consumer surplus. Segmented pricing is a classical problem in the study of economic theory. Different standards for segmentation of consumers will lead to different forms of price discrimination.

2.1.   Different Criteria of Segmented Pricing

First-degree price discrimination is that enterprises set the price as the highest price that consumers are willing to pay and sell products at this price. Through this price discrimination, enterprises can maximize producer surplus. There are few examples of such price discrimination in real life, such as auctions and exclusive customized services.

Second-degree price discrimination refers to that enterprises set different prices for consumers who buy different quantities of products. Under such price discrimination conditions, the enterprises can obtain parts of consumer surplus, which is less than the profit obtained in the case of first-class price discrimination. There are relatively many price discrimination in life, such as preferential treatment and discount sales in supermarkets or shopping malls. Typical examples are "buy one get one free" and "half price for the second".

Third-degree price discrimination is that producers with monopoly positions customize different prices for consumers who buy the same products in different markets. This pricing method is widely used. For example, producers charge higher fees to consumers with small demand price elasticity and adopt low price strategy to consumers with large demand price elasticity, in order to obtain more consumer surplus. Common examples include park charges by age group, differential charges for businessmen and students for flights, and so on.

2.2.   The Impact of Segmented Pricing

The existing literature focuses on the impact of the price discrimination of enterprises on the surplus of enterprises and consumers, mainly from the form of price discrimination. Consumer surplus refers to the difference between the maximum price that consumers are willing to pay for a certain amount of goods and the actual market price of these goods. It is an important evaluation indicator of social welfare and is widely used as an analysis tool.

The research on price discrimination in the classical literature focuses on the segmented pricing represented by quantity discount [4], and segment pricing represented by customer classification [5].

These classic studies believe that the price discrimination of monopoly enterprises will lead to the decline of product output, thus reducing consumer surplus and social welfare. After introducing the market competition factor, Corts [6] found when the products have horizontal differences, the third-degree price discrimination of enterprises will intensify the market competition, thus promoting the improvement of consumer surplus and social welfare. On this basis, further research is based on the accuracy of consumer preference information held by enterprises. When the products of enterprises have vertical differences, Liu & Serfes [7] found that only high-quality enterprises will actively obtain consumer characteristic information, while low-quality enterprises will choose a fixed price. Social welfare and consumer surplus will increase with the improvement of the accuracy of consumer information held by enterprises. Bergemann [8] based on the perspective of information economics, found that when the total number of consumers is fixed, there will be a variety of combinations of consumer surplus and enterprise profits corresponding to the market equilibrium. When enterprises can choose whether to make discriminatory pricing, the existing conclusions tend to be that discriminatory pricing is better for enterprises. Discriminatory pricing can weaken the impact of competitors' strategies on their own profits, reduce the information asymmetry between enterprises and consumers, and help enterprises improve their profits [9].

2.3. Segmented Pricing in Digital Economy

In the era of digital economy, with the development of technology and the innovation of economic model, the ability of enterprises to collect, analyze and use information is constantly improving, which creates conditions for enterprises to reduce production and operation costs including innovation costs and transaction costs including labor and commodity matching costs.

First degree price discrimination is also called perfect price discrimination. The conditions for the implementation of first-degree price discrimination are very harsh. In essence, it means that each unit of product has different prices. Therefore, it is hard to realize under the traditional sales mode. Only if manufacturers know the demand curve of each consumer and obtain the highest price that consumers are willing to pay, they can earn all the residual value of consumers. Online consumers are independent and closed individuals. It is not easy to find different bids for the same commodity. There are many businesses and platforms, and it is easier to hoodwink consumers. A large number of consumption records can be used for data analysis. Besides grasping personal preferences, enterprises also grasp consumption characteristics as an important data source, creating an environment for accurate implementation of first-degree price discrimination.

In the digital economy era, the methods of price discrimination by enterprises based on consumer information are constantly enriched, such as tracing back the purchase history of consumers [10], providing pre-sale discounts for consumers [11] or customized product combinations [12]. Cohen and Hahn [13] demonstrated a new demand curve estimation method by using the rich data of Uber. The key points are: 1) Uber has not only concluded orders, but also the data of uncompleted orders; 2) Uber's premium algorithm originally generated a continuous price, but only one decimal place remained after the decimal point, resulting in discontinuity, but it can also help estimate. Based on this, the author estimates that the consumer surplus generated by Uber alone for American consumers in 2015 is as high as US $6.8 billion. The impact of consumers' avoidance of price discrimination on enterprise decision-making and social welfare has also been widely discussed, such as hiding personal information [10], or using price comparison websites [14]. Some studies believe that when consumers hide their personal information to avoid price discrimination, enterprises may charge higher prices to consumers with high brand loyalty and give up services to consumers who hide their personal information, resulting in damage to social welfare [10]. Rayna [15] showed through theoretical modeling that enterprises can promote the improvement of social welfare by providing subsidies to consumers

and encouraging consumers to disclose their personal information, in order to conduct price discrimination.

3. Current Legal Provisions for Segment Pricing in the Digital Economy Era

Existing studies have not determined the competitive attribute of discriminatory pricing behavior of Internet enterprises based on big data technology. In the traditional economy, discriminatory pricing is mostly achieved by roughly grouping customers, such as distinguishing consumers by horizontal product differences or quantity discounts.

Most of the current anti-monopoly laws and competition policies in various countries allow crude discriminatory pricing, and only prohibit enterprises in the traditional economy from offering different prices to different consumers in the same type of transactions. Such as the Robinson Pateman law of the United States, Article 65 of the Treaty of Rome of the European Union, Article 33 of the antimonopoly law of China and Article 14 of the price law. In the era of digital economy, although there is competition in the market, enterprises cannot obtain all consumer surplus through "big data" due to competitive pressure, they can still damage the interests of consumers by providing discriminatory high prices to consumers with high stickiness. At the same time, discriminatory low prices are provided to users with low stickiness, which interferes with the market competition order. As for the behavior of enterprises collecting user information for refined and discriminatory pricing, the EU general data protection regulation only regulates the behavior of enterprises collecting data from the field of privacy protection and does not limit discriminatory pricing behavior. In the era of digital economy, the grouping of consumers by enterprises is more detailed, and the degree of customization of products and product prices is higher. The consistency of anti-monopoly laws and regulations against discriminatory pricing with the practice of digital economy needs to be tested.

4. Application and Economic Analysis

4.1. Application of Segmented Pricing in Digital Economy

In the era of digital economy, in order to obtain the highest profit, operators conduct a pricing behavior by collecting, data mining, analyzing consumers' consumption records, price tolerance, consumption behavior habits, etc., profiling users, using big data analysis technology and taking advantage of the asymmetric advantage of customer information to classify consumers on the same quality or the same type of services and products. Specifically, for the same commodity or service, "regular customers" pay higher prices than "strangers". In essence, it is a hidden price discrimination conducted by Internet platform operators using big data and algorithms. The price of new users of the same commodity is higher than that of regular users; For the same address and the same operator, the distribution fee of members is higher than that of non-members; For the same type of air ticket, the price of Apple's mobile phone is higher than that of Android's cheap machine. Under the digital economy, segment pricing has a variety of forms, which can be divided into the following five types: differential pricing due to different devices used by users; The price of regular users is higher than that of new users or the price of members is higher than that of non-members; Consumers with high consumption power have high prices; High price after many searches; Consumer prices in developed regions are high, as shown in the Table 1.

Table 1: The forms of segmented pricing.

Type	Case display
Different pricing due to different equipment used by users	When taking a taxi from the same place to another same place, Apple phone users charge more than Android phone users.
The price of regular users is higher than that of new users, or the price of members is higher than that of non-members	New users often receive more red envelopes than regular users; If the same operator distributes to the same location, the distribution fee of "Meituan" members is higher than that of non-members.
Consumers with high spending power have high prices	For users who often buy luxury goods, Taobao often pushes high-priced goods, and the price of the same goods is higher than that of users who rarely consume.
High price after many searches	For the same type of goods, after frequent search, the goods with high price will be displayed. Other users will search for the same type of goods, and the goods with low price will be displayed.
Consumer prices in developed areas are high	The price of the same commodity in developed areas is higher than that in less developed areas.

4.2. Economic Analysis of Segmented Pricing in Digital Economy

There are many forms of segmented pricing, but the ultimate goal is the same - to seize consumer surplus. However, the impact of segmented pricing on consumer surplus and social welfare in the era of big data seems to be different from the past.

In economics, social welfare is usually measured by the sum of consumer surplus and producer surplus. Among them, consumer surplus refers to the difference between the willing price and the actual price. For example, a person willing to bid 10 yuan for a ballpoint pen, but he bought this pen for 6 yuan, so his consumer surplus generated by buying this pen is 10-6=4 yuan. Producer surplus refers to the difference between the actual price in the market and the lowest price of goods that the producers are willing to sell. Take this ballpoint pen as an example, if the business thinks there will not be a lose if the pen is sold for 2 yuan, then when it is sold for 6 yuan, the business thinks that it has earned 6-2=4 yuan, which is producer surplus. From the perspective of the whole society, if a person who is willing to pay 10 yuan spends 6 yuan to buy a ballpoint pen from a businessman who is willing to sell at 2 yuan, the value of the total social welfare in the transaction process is 8 yuan.

Consumers in real life are different, and their willingness to bid for ballpoint pens is various. For simplicity, this paper assumes that there are three consumers in society: consumer a is willing to bid 10 yuan, consumer B is willing to bid 8 yuan, and consumer C is willing to bid 4 yuan. If the price of the ball point pen is 5 yuan, then consumers a and B will purchase the ball point pen and obtain the consumer surplus of 5 yuan and 3 yuan respectively. Consumer C will not buy the ball point pen, and the producer will obtain the producer surplus of 6 yuan from the two transactions. Thus, the total value of social welfare generated by the two transactions is 14 yuan.

However, if the producers can adopt first degree price discrimination, they will ask different consumers for the highest willing payment price. Then, he will charge consumers A, B and C 10 yuan, 8 yuan and 4 yuan respectively. In this process, consumer surplus for three consumers is 0, while the

producer surplus is 16 yuan. The value of the total social welfare generated by the transaction is 16 yuan.

On the premise of not violating the mandatory legal norms, market segmentation is generally not illegal. The pricing strategy of the algorithm is generally completed through market segmentation. The traditional killing behavior divides the market into two submarkets: strangers and regular customers, while the killing of big data relies on the power of information to subdivide consumers into individual units to the extreme.

A considerable number of opinions in the academic circles believe that if the seller does not have the market dominance in the legal sense, the legality of discriminatory pricing will not be denied in the case of voluntary transactions according to the principle of autonomy in private law. In fact, market segmentation is an important means for scientific and technological progress and commercial innovation to realize profits in the price mechanism. The reason why the algorithm can achieve discrimination lies in the market segmentation ability of the algorithm. All consumer surplus obtained by big data is the result of market segmentation supported by information technology.

In the transaction process, consumer surplus are completely taken by producers. However, this cannot directly deduce that first degree price discrimination will cause great losses to the welfare of consumers. It is true that for some consumers, this type of price discrimination is detrimental to them. However, this disadvantage is built on the basis that one party is willing to buy and the other party is willing to sell. If compared with no transaction, consumers are still the beneficiaries, but the benefits are less, but there is no harm. At the same time, another part of consumers may conclude the transactions that have not been concluded, thus enjoying the benefits of the transaction. If the two types of consumers are considered comprehensively, it is difficult to say whether the implementation of first-degree price discrimination will be more favorable or more unfavorable to the overall consumer population.

In reality, after the rise of the platform economy, an important phenomenon is that the "long tail demand" which is difficult to be met has been stimulated. For example, out of print old books were difficult to buy due to the restrictions of search conditions. Now, with the help of online shopping platforms, people can easily find a large number of books. Many of these books need to be auctioned, which is totally one price for one person. According to the traditional theory, the producers have grabbed buyers' consumer surplus to the maximum extent. Even though, buyers still enjoy it.

4.3. Consumer's Respond to Segmented Pricing in Digital Economy

I have only talked about the possible choices of platforms or businesses above, without considering the Countermeasures of consumers. In fact, the platform economy provides consumers with more choices. As long as they are willing to, they can completely keep their own consumer surplus.

On the one hand, consumers will have their own bargaining chips. The fact that consumers do not have the right to choose is a precondition that consumers' surplus will be completely deprived. In other words, when enterprises implement this price discrimination strategy, consumers can only passively accept the monopolist's quotation. In fact, with the development of the digital economy, consumers also have more abundant information sources and channels, which greatly enhances their right to choose. Even if the platform can clearly identify the preferences of all consumers and know their reserved prices, it does not dare to completely plunder their consumer surplus in order to retain consumers.

On the other hand, some enterprises provide price comparison services to provide consumers with the ability to avoid price traps. It is generally believed that consumers have an information disadvantage compared with platforms and enterprises. However, with the rise of professional price comparison platforms and shopping guide platforms, this disadvantage is gradually disappearing. Now,

as long as the consumer inputs commodity information on the price comparison platform, he can see the prices of all relevant commodities on the network and can choose the cheapest commodity to buy.

5. Conclusion

Through the previous analysis, this paper analyzes from the perspective of social welfare or from the perspective of fairness, it is justifiable for the platform to adopt personalized pricing and conduct first degree price discrimination. In fact, when people enjoy personalized customized services, they are also discriminated against by price.

This kind of price discrimination will attract some voices of opposition because it is not known by people - those platforms that use big data for segmented pricing do not fully tell consumers what they are doing, so consumers' acceptance of price discrimination is completely passive. In this way, they are deprived of their potential right of choice, which may harm their interests. This kind of price discrimination that takes advantage of information asymmetry should not be encouraged. From the perspective of the platform, consumers should be given the right to know and more choices. However, if consumers deny personalized pricing for this reason, they may overreact.

For the same commodity, the consumer sees two quotations on the same platform and at the same time. As a rational economic person, he will not choose the higher one. But if there is no higher price as the consideration, the platform and producers will not have the motivation to find and recommend more desirable products for consumers. The result may be harmful to consumers.

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