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A Review of the Phenomenon of Algorithm-facilitated Systematic Price Discrimination

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Abstract: As the Internet environment has rapidly developed, algorithms and programs have contributed to an ever-increasing level of convenience in day-to-day life. However, it is of the utmost importance to put an end to discriminatory pricing practices that are brought about by improper application of algorithms. Some retailers employ a strategy known as algorithmic price discrimination in order to boost their profits; nevertheless, this strategy has unfavorable effects on both the consumers' right to privacy and the reputation of the Internet. In order to achieve social and economic justice, it is essential and urgent to do away with algorithmic price discrimination. The purpose of this study is to have a better understanding of the current situation of algorithmic price discrimination by analyzing its history and discussing it. In addition, the research offers actions that authorities can take and measures that might be implemented in order to combat algorithmic price discrimination.

Keywords: algorithmic price discrimination, consumer rights, Internet regulation

1. Introduction

With the proliferation of online trade, data has become crucial to the success of modern businesses. Many online businesses collect user information and perform individual analyses to better serve their clientele. The investigation provided insight into how businesses should tailor their marketing to appeal to a variety of consumers. It boosts the success rate of transactions and delivers enormous benefits to the growth of businesses by catering to clients' unique wants and demands. The improved conversion rate has had a significant impact on the growth of the companies. Some businesses unlawfully examine and use customer data for profit, motivated by their own self-interest. This phenomenon gives rise to algorithmic pricing discrimination, in which buyers' buying habits are meticulously tracked. When a company uses price discrimination, they charge different prices for the same product to different customers based on their individual consumption patterns and budgets. The result is higher prices for customers and a less equitable online environment. In order to ensure the continued growth of a sustainable Internet ecosystem, it is crucial that algorithmic price discrimination be eliminated. This paper employs a literature review and an analysis of the existing literature to illustrate the nature, causes, and effects of algorithmic price discrimination. In addition, it offers regulatory recommendations and other approaches for combating algorithmic price discrimination.

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2. Overview of Algorithmic Price Discrimination

2.1. Definitions of Algorithmic Price Discrimination

The term "algorithmic price discrimination" refers to a practice in which prices are set using an algorithm rather than manually. The term "algorithm" is used to describe the process of analyzing preexisting data using predetermined steps to produce the desired result. Some academics define algorithmic pricing discrimination as the practice of charging varying prices to groups of people who purchase the same good or service. While some see algorithmic price discrimination as a form of individualized pricing, others argue that it is simply a method by which retailers can set prices above and below what customers are willing to pay [1]. To sum up, price discrimination is a pricing strategy that involves charging different customers different prices for the same product at the same time. Thus, it is possible to define algorithmic pricing discrimination as a trend in which retailers, holding all else constant, employ algorithms to process data in order to set prices for identical goods that vary based on the characteristics of individual buyers. There are distinct differences between traditional pricing discrimination and algorithmic price discrimination. The first distinguishing feature of algorithmic pricing discrimination is its obscurity; this technique is primarily employed in the realm of online retail at the present time. Customers are less likely to learn about price discrimination in online markets since it is difficult to have relationships between various consumers. Second, unlike other forms of price discrimination, algorithmic pricing discrimination tends to have far-reaching effects. The number of people hurt by price discrimination has risen in tandem with the explosion of e-commerce. In the event that consumers suffer losses as a result of algorithmic price discrimination, they may find it challenging to provide evidence of such discrimination [2].

2.2. Demonstraion of Algorithmic Price Discrimination

Several methods exist for demonstrating the existence of algorithmic price discrimination. New customers of a product typically pay a substantially lower entry price than long-time users do for that product. This is because the site has been collecting and analyzing data on past customers' browsing habits and purchases. The data will certainly suggest that long-time customers have a larger reliance on the product and a greater propensity to buy, thus they are willing to pay a higher price. Since new users haven't demonstrated a need for these products yet, the reduced price will entice them to buy [3]. Consumers use the term "big data discrimination" to describe this trend. Customers are more attuned to this form of algorithmic price discrimination and commonly associate the term "big data discrimination" with unfair pricing practices. However, "big data discrimination" is merely a subset of pricing discrimination if you go by the dictionary's definition. "Big data discrimination" is just one of many possible forms of price differentiation. For instance, many retailers will offer many links to the same product's checkout page. These several entry points are utilized in various contexts, each of which sets a unique price for the same product. Therefore, retailers can optimize profits by targeting consumers with tailored links based on their individual shopping preferences. There are objective factors that contribute to the phenomenon of price discrimination. When a customer provides a shipping address that is close to the distribution center, for instance, the price of shipping is reduced. Therefore, the ultimate selling price may be less than the consumer's transportation costs if they live far from the warehouse. The pricing may also vary depending on the total number of units purchased. When you buy more of something, the price per item typically goes down. A store on the platform, for instance, might use the "higher quantity, lower unit price" pricing model. Table 1 displays the total number of clothing purchased together with their total cost.

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Table 1: Buck purchasing and corresponding price [3].

Quantity	1	2	3	4
Total price	100	180	279	312
Price per item	100	90	83	78

3. Causes of Algorithmic Price Discrimination

There are a number of sources for algorithmic price discrimination. From the perspective of the customer, price discrimination occurs frequently because consumers are not well-versed in their rights and rarely take the initiative to defend their rights. The major reason for algorithmic price discrimination, from the standpoint of merchants, is that some merchants are profit-oriented. However, the imprecise nature of the law and the information gap between customers and retailers are also major contributors to the development of price algorithms and price discrimination [4].

The first problem is consumers' weak awareness of their rights. Although there may be slight variations in pricing for different customers when retailers engage in algorithmic price discrimination, these variations are typically inconsequential. This results in many consumers not standing up for themselves when they learn they have been the victim of price discrimination. The rationale for this is that the harm is not severe, and defending their rights would require an excessive amount of time and money. Because of this, algorithmic price discrimination has a greater chance of spreading over time. What is happening. The second problem consists of businesspeople that prioritize making a profit. Algorithms are used by businesses to analyze customers' purchasing power and preferences in order to increase revenue. In this way, they can determine the maximum amount a customer is willing to spend, which facilitates the use of price discrimination and, ultimately, profit. Algorithmic price discrimination has its roots and primary impetus in merchants' initial, unjustified objective. Thirdly, the algorithm has a low implementation cost. There is a significant asymmetry in knowledge between shoppers and store owners. It is difficult for consumers to know the platform's listing prices, personalized recommendations for different consumers, and other information since the platform can gather and analyze consumers' buying behaviors, spending power, and other types of personal data in such a thorough way. Certainly, the gravity of the pricing discrimination is exacerbated by the problem of knowledge asymmetry between retailers and consumers. And there are no hard and fast rules against pricing discrimination in the law as it is. Even if these businesses engage in price discrimination, enforcing laws against them through sanctions like fines and prosecutions can be challenging at times [5]. This makes it less likely that stores will be accused of discriminatory pricing, which in turn encourages them to use the tactic.

Finally, imperfect computers are a factor. Numerous pieces of software and hardware must all be in sync for the merchants' platform to function properly. Humans are responsible for programming the system; hence it is not infallible. Therefore, it is not possible to solely rely on subjective human intervention, as the objective factors resulting from program errors must also be taken into account. Algorithmic price discrimination can occur as a result of flaws in the underlying algorithm or in the way that data is modeled, collected, extracted, or implemented. There is also a huge demand for server resources because of the Internet economy and the fact that the most important platforms have to deal with a growing number of requests simultaneously. Consequently, it is inevitable to experience delayed response, systematic extraction deviation, and untimely updating of pertinent page information, which is also one of the causes of price discrimination.

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4. Consequences of Algorithmic Price Discrimination

4.1. Consumers' Rights Jeopardization and Internet Trade Order Destabilization

Consumers' right to free and fair trade is severely compromised when algorithms cause identical products to be sold at vastly different prices to different customers. The practice of charging different prices to different customers might be seen as a form of consumer fraud. It unquestionably results in higher prices for the identical goods. Since algorithmic price discrimination relies on the comprehensive collection and analysis of numerous sorts of information about consumers, it also poses a severe threat to their right to privacy. Meanwhile, several services are secretly gathering personal data on their users. Sometimes, the data they gather is put to unethical use. Some algorithms can be programmed to charge various prices to different customers. Despite the fact that in the short term, retailers can increase market transaction rates, market profits, and overall income. Algorithmic price discrimination, on the other hand, causes identical goods to be priced differently, which in the long term leads to market chaos and increases the likelihood of muddled marking and pricing [6]. In sum, the goal of algorithmic pricing discrimination is to gain an unfair advantage through dishonest tactics and so disrupt the normal functioning of the market.

4.2. Big-data Internet Ecosystem Disturbance and Destruction of Fairness Principle

Consumers' confidence in the Internet economy was earned after a rocky start. Consumers' faith in the digital economy suffers as a result of practices like algorithmic price discrimination, which will lead to higher prices for identical goods. Algorithmic price discrimination has also expanded to encompass several channels. Furthermore, "big data discrimination" is often experienced. Without oversight, this has the potential to incite consumer backlash against the entire Internet ecosystem, which might lead to the destabilization of the online economy. The concept of fairness is fundamental to the legal system. Fairness is a cornerstone principle in the study of social morality. Therefore, all members of society should adhere to the principle of sustaining fairness. However, pairing identical products with different costs violates the idea of fairness among consumers due to algorithmic pricing discrimination. Although businesses are permitted by law to set prices in response to market forces, discriminatory pricing is not permitted. Disparities in pricing are unethical and should be avoided. While in theory both buyers and sellers have equal standing in the online economy, sellers really have a significant edge over customers due to a significant information gap. Consumers in today's online marketplace only see what retailers want them to see, and the platform's underlying algorithm is hidden from view. For the sole purpose of making a profit, businesses use algorithmic price discrimination because of the presence of this unfair practice.

4.3. Violation of Integrity Principle

One definition of "integrity" is the practice of not deceiving to other people and keeping one's word. Algorithmic price discrimination is obviously unethical because of these two factors. In algorithmic price discrimination, shops avoid telling customers how much an item actually costs. On the other hand, it is in everyone's best interest if stores voluntarily inform customers of any price drops or increases. Customers have little information to go on while shopping online. On the contrary, the platform is privy to extensive consumer data. As a result, buyers are constantly at a disadvantage in the virtual marketplace. This asymmetry of information allows algorithmic price discrimination to be practiced, which in turn damages the legitimate interests of consumers and creates injustice in buying and selling. Moreover, it runs counter to the concept of honesty and integrity.

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5. Regulation Dilemmas of Algorithmic Price Discrimination

5.1. Inadequate Practicality of Existing Laws

It can be seen from the above that algorithmic price discrimination has great harm to both consumers and the whole Internet business sector. Then, the algorithmic price discrimination behavior should be explicitly restrained by the law. However, the reality is not always synchronized with thoughts. On one hand, the applicability of the current law on algorithmic price discrimination is not strong; on the other hand, there are many difficulties in determining the algorithmic price discrimination in the legal process. In addition, the lack of a comprehensive management system for algorithmic price discrimination regulation makes the price discrimination unabated. Although there are three major legislations in the field of commerce and trade in the United States: the Sherman Antitrust Act of 1890, the Clayton Antitrust Act of 1914, and the Robinson-Patman Act of 1936, they all have certain provisions on price discrimination. However, the content of the provisions is relatively vague, and the definition of price discrimination is not clear. This is mainly due to the fact that the original laws did not comprehensively consider the algorithmic price discrimination formed in the Internet era. For Internet trade, although the use of recommendation algorithms by merchants in Internet trade is regulated accordingly, it does not explicitly prohibit it. Intelligent recommendations formed by platform through algorithms have, to a certain extent, increased the transaction rate of purchases. However, at the same time, consumers do not have the right to explicitly reject the recommendation, so the majority of consumers are often plagued by intelligent recommendations. In addition, although the existing privacy acts stipulate that consumers can delete their own personal information, it is relatively difficult for consumers to recognize and delete the information attached to their personal information. This means that even if a consumer deletes information directly related to him/her, consumer's corresponding footprint on the Internet can be easily captured, collected, and analyzed by merchants. Moreover, the applicability of algorithmic price discrimination in the Robinson-Patman Act is also somewhat controversial. It is clearly stated in the statue that merchants should always label the price of items [7]. In the case of price discrimination, although different consumers get different prices for the items, for every consumer, the price is clearly labeled when they make the purchase. So it is difficult for the Federal Trade Commission to effectively regulate the behavior of price discrimination. At the same time, algorithmic price discrimination makes price inconsistent for each consumer. Although it is contrary to the principle of fairness of the transaction, but the merchants can interpret this as the highest price is the normal price of the goods, and all other lower prices are for discount. As a result, merchants can insist that although consumers purchased items at different prices with no actual loss occurred [8]. Therefore, the regulators cannot fine the merchants.

5.2. Difficulty of Legal Confirmation of Algorithmic Price Discrimination

Despite the fact that the preceding paragraphs have clearly explained the phenomenon of price discrimination, it is still easy for ordinary readers to comprehend and identify price discrimination. However, from a legal standpoint, it is difficult to confirm algorithmic price discrimination objectively, as the affirmation of algorithmic price discrimination typically involves subjective factors. In addition, the requirement for time uniformity is extremely difficult to confirm. It is nearly unthinkable for multiple consumers to purchase the same product at the same time. Even if only a few seconds separate the events, they cannot be considered simultaneous. Moreover, price discrimination can only be confirmed under identical transaction conditions, which makes it difficult to recognize objectively. Since it is difficult to attain complete uniformity in the various transaction processes involving multiple variables such as the place of transaction, the number of transactions, the method of transaction, and the quality of service [9]. In determining the existence of price

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discrimination, therefore, the subjective judgment of law enforcement officers is also required. In addition, situations such as uncontrolled algorithms or system malfunctions can also result in price discrimination among products.

5.3. Lack of Comprehensive Regulation System

The relevant departments must not only regulate the algorithm, but also the price discrimination, in the case of algorithmic price discrimination. To combat algorithmic price discrimination, it is necessary to safeguard consumers' personal information. The current legislation does not propose a clear regulatory agency for this type of multidimensional regulation, so algorithmic price discrimination lacks a distinct regulator. Legislation is urgently required to elucidate algorithmic price discrimination's regulatory authority. In addition to the lack of clarity surrounding the regulatory body, the regulatory approach to algorithmic price discrimination is also ambiguous. Effective algorithmic price discrimination regulation requires a high level of technical expertise [10]. In the meantime, it is difficult to effectively regulate algorithmic price discrimination in the Internet economy using conventional regulatory methods.

6. Countermeasures of Algorithmic Price Discrimination

6.1. Perfecting Current Laws and Regulations

Increasing numbers of consumers are becoming aware of algorithmic price discrimination as the phenomenon of "big data discrimination" continues to emerge. However, due to the inadequacy of current laws, it is extremely difficult for consumers to defend their rights and provide assistance through the legal system. Therefore, the first step in combating algorithmic price discrimination is to effectively regulate the phenomenon through legislation. The Robinson-Patman Act, for instance, can be amended to prohibit algorithmic price discrimination. Moreover, the definition of price discrimination can be precisely specified by antitrust laws and consumer protection statutes, which can help regulate price discrimination. In addition, the federal government can leverage the California Consumer Privacy Act of 2018 (CCPA) to expand the scope of the consumer's right to know and the preservation of personal privacy, effectively limiting the collection of consumers' personal information by platform.

6.2. Clarifying Definitions and Boundaries of Algorithmic Price Discrimination

Due to the diverse causes of algorithmic price discrimination, the manifestations of algorithmic price discrimination vary. This is the most influential factor on the definition and limits of algorithmic price discrimination. To combat algorithmic price discrimination, regulators must determine whether the behavior is generated by humans or machines in order to identify the perpetrators. When defining the boundaries of algorithmic price discrimination, it is important to bear in mind the following three evaluation criteria: same time, same transaction conditions, and reasonableness of fees. It is also necessary to combine laws and regulations with subjective judgment, due to the previously mentioned confirmation difficulty. In this way, the definitions and boundaries of algorithmic price discrimination can be elucidated in a manner that effectively curbs algorithmic price discrimination and affords greater protection to consumers' legitimate rights and interests.

6.3. Intensifying Punishment for Algorithmic Price Discrimination

The primary objective of preventing algorithmic price discrimination is to safeguard consumers effectively. The relatively low implementation cost of algorithmic price discrimination is a significant factor in its prevalence. Even if algorithmic price discrimination is eventually discovered by

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regulators, the cost to merchants is negligible compared to the benefits derived from algorithmic price discrimination. Therefore, it is imperative to clarify the responsibility of implementers of algorithmic price discrimination, to institute harsher penalties, and to increase the compensation standard for consumers [11]. It can effectively enhance consumer motivation to combat price discrimination. In addition, it should encourage the relevant legal professionals and Internet engineers to join the fight against algorithmic price discrimination.

7. Conclusion

The Internet environment evolves with Internet technologies. Technology's use in AI is growing. The Internet has enhanced people's lives. Algorithms also threaten them. Algorithms acquire users' personal data and allow unscrupulous businesses to profit from it. Algorithmic price discrimination is becoming more widespread due to customer apathy, outdated rules and regulations, and merchant impunity. Short-term, algorithmic price discrimination can boost merchant revenue, market share, and profits. However, it harms a healthy and fair Internet ecology. The study discusses algorithmic price discrimination's causes, examples, and viable countermeasures. Internet technologies will conceal algorithmic price discrimination. Technically and legally, algorithmic price discrimination should be limited. Consumer privacy and algorithmic price discrimination laws will protect consumers' rights and interests. The Internet ecosystem may eventually grow steadily.

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