

The Effects of Widespread Application of Personalized Pricing Technology

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Abstract. With the advancement of digital and artificial intelligence technology, personalized pricing has gradually moved from theoretical price discrimination to large-scale practical application in market transactions. This study comprehensively explores the multi-dimensional impacts of widespread personalized pricing by integrating microeconomic and socioeconomic analytical frameworks. It analyzes the uncertain effects of this pricing model on corporate profits and economic welfare under different market structures, and further discusses consumers' differentiated attitudes, ethical dilemmas and regulatory challenges brought by personalized pricing. The research finds that the actual influence of personalized pricing depends on multiple core factors including market competitiveness, economic effect proportion, public fairness perception and institutional supervision conditions. This pricing model fails to bring absolutely positive economic and social benefits, and will reshape the balance between economic efficiency and social equity in digital markets.

Keywords: personalized pricing, price discrimination, economic welfare, social equity, digital market

1. Introduction

Due to developments in artificial intelligence (AI) algorithms, dynamic and highly differentiated pricing is increasingly possible by obtaining sufficient customer information [1]. Personalized pricing is increasingly regarded by scholars as a form of perfect price discrimination, that is, first-degree price discrimination, which is difficult to realize in traditional markets. But now, due to the technological advancements, the widespread use of personalized pricing is possible [2]. In order to more accurately reflect the impact of personalized pricing in the digital era, which has defined personalized pricing in the digital age as a combination of both first-degree price discrimination and third-degree price discrimination [3].

The effects of personalized pricing should be analyzed in terms of their impacts on firms' profits and economic welfare across different market structures. Beyond the microeconomic perspective, governments should analyze the social impacts of personalized pricing from a socioeconomic perspective, such as customer reactions, ethical considerations, and regulatory implications.

Therefore, to thoroughly predict the effect of personalized pricing in the digital era, this paper combines the OECD's microeconomic analysis framework and IMCO Committee's socioeconomic

analysis framework and uses updated real studies and cases as evidence to explore the personalized pricing effects on five dimensions: a firm's profits, economic welfare, customer reactions, ethical considerations, and regulation implications [4].

2. Effects on microeconomic perspective

2.1. Firm's profits

In most instances, monopolistic enterprises can increase a firm's profits through personalized pricing, whereas in a competitive market, the relationship between personalized pricing and a firm's profits remains uncertain. First, according to economic principles, monopolistic enterprises have price power. If customers are myopic, or if enterprises provide both high-priced and personalized services when tracking customer information, then some monopolies can increase profits by obtaining precise customer information. For example, compared with an unoptimized uniform price, a personalized price can help enterprises increase profits by 86% [5].

Second, compared to a monopoly market structure, in a competitive market, whether enterprises can improve their profits depends on whether only a limited number of enterprises have access to customer data and can adopt personalized pricing. Enterprises with sufficient customer information achieve higher profits, while those without achieve lower profits. For instance, when market coverage is high (i.e., low production costs or many enterprises), personalized pricing may reduce enterprises' profits [6].

However, personalized pricing can affect enterprise profit across market structures by interacting with other variables. For example, with horizontally differentiated distribution channels, regardless of the market structure, industry profits may be highest under a mixed pricing strategy [7]. Additionally, the personalized pricing and product differentiation may bring a combined effect on companies' profits, and if a company cannot produce differentiated products, personalized pricing may not help the company increase profits [8].

Uber's surge pricing is one example of an algorithm used to achieve personalized pricing and boost profits: real-time price adjustments based on demand, time, and location can increase the industry's gross revenue by 2.15% [9].

However, many companies have lost their market shares because competitors in the same industry used more advanced algorithms. For example, Amazon's dynamic pricing brought fluctuations in supply prices in many industries and a significant loss of market share to traditional independent small suppliers [10].

Therefore, if personalized pricing is widely adopted, the impact on a single company's profits is difficult to predict because the profits are determined by the firm's relative competitiveness in the market and the opportunity costs of using a personalized pricing strategy.

3. Economic welfare

The relative magnitudes of the appropriation and market expansion effects play a critical role in determining the impact of personalized pricing on consumer surplus and total economic welfare. When the appropriation effect is less than the market expansion effect, consumer surplus will increase. In contrast, when the appropriation effect exceeds the market expansion effect, consumer surplus will decrease. Therefore, total economic welfare is uncertain [11].

For example, when an online car-hailing service uses personalized pricing, consumer surplus decreases by 2.5% while total economic welfare increases by 5.2%, indicating that although

consumer surplus decreases, total economic welfare can increase due to higher producer surplus [12]. Similarly, in a duopolistic two-sided market (such as Uber Taxi and Uber Eats), platforms will extract consumer benefits through personalized pricing, leading to higher benefits for platforms [13].

However, sometimes consumers can benefit from personalized pricing. For example, if competing firms all adopt personalized pricing, this will encourage product quality to converge across both firms, thereby reducing product differentiation. Specifically, under first-degree price discrimination, personalized pricing can increase market coverage, thereby raising consumer surplus. For example, after airlines adopted personalized pricing, some low-willingness-to-pay customers paid ticket prices below the uniform price, and overall consumer surplus increased by 3.57%.

Therefore, the relative scale of the appropriation effect and the market expansion effect is an essential determining factor of the impact of personalized pricing on economic welfare.

4. Effects on socioeconomical perspective

4.1. Customer reactions

Whether personalized pricing can persist largely depends on customer reaction. First, customers' attitudes toward personalized pricing depend on the type of price discrimination. For third-degree price discrimination, customers usually hold a favorable attitude, as this form of personalized pricing has relatively high price transparency, such as student and senior-citizen discounts. However, a huge number of customers have a negative attitude toward first-degree discrimination. For example, approximately 80%–90% of consumers in the Netherlands and the United States consider personalized pricing unacceptable and unfair because consumers believe that when they share information with businesses online, an implicit social contract has formed and personalized pricing breaks this contract. Similarly, whether they receive benefits or loss from personalized pricing, generally have a negative attitude towards adjusted prices, and this aversion mainly stems from consumers' perceptions of unfair pricing [14]. "Price Transparency" is more beneficial for companies to increase profits [15]. Compared with price transparency, when prices are hidden, although companies usually charge higher prices, higher prices are insufficient to offset the decline in sales [16].

Moreover, in the digital area, if customers have a negative emotion to personalized pricing, it will easily slander the enterprise through negative word of mouth (NWOM), then lead to a decrease in brand reputation. With the rapid development of online social media, the speed and wide reach of word-of-mouth dissemination may lead to serious reputational and economic losses [17]. Posts shared by social media users have exacerbated the negative impact when companies face social media crises. For example, in 2024, Wendy's attempted to implement dynamic pricing, but as soon as the news was exposed, it faced widespread backlash online [18]. The unfavorable press decreased only after CEO Kirk Tanner intervened and promised that the company would not use dynamic pricing.

5. Ethical considerations

Ethical legitimacy is an important prerequisite for implementing personalized pricing [19].

Although consumers are granted informed consent to decide whether to allow firms to use their data, they cannot benefit from the expressed consent [20]. Also, increased price transparency in

personalized pricing triggers moral outrage and reduces user consent, implying a negative relationship between transparency and customer consent [21].

Additionally, the legality of personalized pricing cannot present the public perceptions of fairness. Consumers' acceptance of price discrimination primarily depends on the alignment with social norms. And the level of acceptance can be influenced by different information used in personalized pricing, such as income, behaviour, and geographic location [22]. Also revealed the cognitive and emotional mechanisms that mediate personalized pricing. Whether customers benefit or not, personalized pricing will reduce perceived price fairness because it violates customers' social norms [23].

For example, Orbitz sorted and priced different offers by using device (Mac vs. PC) information, prioritizing pricier hotels for Mac users. Although this strategy is regarded as a legal and common behavior-based pricing, the practice triggered ethical drawbacks and public criticism due to a norm-alignment failure [24].

6. Regulation implications

The widespread use of personalized pricing could create a regulatory gap, making it more difficult for governments to regulate and increasing businesses' compliance costs. For example, the existing related business laws in the EU (such as the Consumer Protection Law and the Competition Law) are not designed specifically for personalized pricing; they cannot directly supervise algorithms and big data pricing. Some highly personalized price-discrimination behaviors fall into a gray area: legal but not fully regulated [25].

Similarly, the current EU legal framework can address only some cases triggered by personalized pricing but cannot fully cover all scenarios [26]. By analyzing new laws, such as the General Data Protection Regulation (GDPR) and the California Consumer Privacy Act (CCPA), algorithm-driven price discrimination brings extra compliance costs to enterprises [27].

Algorithmic pricing mechanisms may disrupt traditional market competition order [28]. Some companies expressed concerns about the potential anti-competitive violation risks posed by algorithm-based pricing. This will create new difficulties for the government in determining which predatory price cut-offs constitute illegal behavior.

7. Conclusion

Table 1. Summary of the influences of personalized pricing from five dimensions

Negative/Positive/Uncertain		Main Determined Factors	Real Examples
Microeconomic Perspective			
Firm's Profits	Uncertain	1) The relative pricing power and the capability of the algorithm and tracing customers' information; 2) Cost-benefit trade-off of using personalized pricing	Airlines Industry Online Retail Ride-Hailing

Table 1. (continued)

Economic Welfare	Uncertain	1) The relative scale of appropriation effect and market expansion effect; 2) Cost of information search for customers; 3) Price transparency	duopolistic two-sided market: Uber Taxi and Uber Eats
Socioeconomical Perspective			
Customer Reactions	Negative on first-degree price discrimination Acceptable on third-degree price discrimination.	Price Transparency and The Viral Effect of Social Media	Wendy's attempted to implement dynamic pricing. But later it faced widespread backlash online.
Ethical Considerations	Negative	Perceived Fairness and Social Norms	Orbitz sorted and priced different offers for Mac and PC users.
Law Implications	Negative or Positive	Regulatory Cost	Competition Bureau Canada: "Algorithms" may change existing competitive mechanisms.

Source: compiled by the author

Table 1 shows that when technology makes personalized pricing broadly available, its influence spreads from the micro-level to the macro-level. From a microeconomic standpoint, it does not merely benefit businesses at the expense of consumers; its eventual impact depends on the firm's relative competitiveness and the relative magnitudes of the appropriation and market expansion effects. From a socioeconomical perspective, the effect manifests as a dynamic interaction among business strategy, consumer psychology, and government responses. Businesses intend to make more money with personalized pricing, but consumers often perceive it as unfair, and governments must find new ways to oversee it. In the end, there will be a new equilibrium between equity and efficiency in the economy.

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