An Empirical Analysis of Big Data Killing Phenomenon in Ride-Hailing and Food Delivery Platforms

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Abstract: This study examines the phenomenon of "Big Data Killing," analyzing its occurrence, user behavioral responses, and reputational impacts based on questionnaire survey data. The survey reveals that 74.8% of valid respondents have encountered different prices for the same product. After experiencing price discrimination, users primarily discover price discrepancies by browsing at different times (84.8%), using different devices (52.3%), and accessing different accounts (52.3%). In response, 39.5% of users switched devices or accounts to place orders, 33.7% continued price comparison and observation, while only 10.4% made immediate purchases. 74.4% of users compared prices across different platforms, and 60.4% identified this phenomenon as "Big Data Killing" based on user profiling. Although only 12.7% of users significantly reduced platform usage as a result, 90.6% demanded that platforms clearly disclose their pricing rules. The study indicates that "big data price discrimination" is widespread and has drawn strong user concern. A systematic response is needed through government regulation, platform self-discipline, technological governance, enhanced user awareness, and collaborative industry-society governance to promote fairness and sustainable development in the platform economy.
Keywords: Big Data Killing; Price Discrimination; Platform Algorithm

1.Introduction

With the continuous advancement of internet technology, online platforms such as ride-hailing and food delivery services have become deeply integrated into residents' daily lives, emerging as one of the most vital "infrastructures" of modern urban living. By December 2024, China's ride-hailing user base reached 539 million, while online food delivery users hit 592 million. Leveraging algorithms, big data, and artificial intelligence, these platforms deliver personalized, efficient, and convenient matching services that address residents' daily transportation and dining needs. Simultaneously, they have created substantial employment opportunities for the public.

However, while technology enhances efficiency, it has also given rise to a controversial pricing strategy known as "Big Data Killing." For users who frequently purchase goods or services on platforms and are less price-sensitive, platforms set higher product prices or charge higher service fees to extract greater revenue and profits. This phenomenon has grown increasingly severe, continuously drawing public attention and debate, with consumers expressing strong dissatisfaction with such platform practices in various settings. Among the 123,000 online pricing complaints received by the China Consumers Association in 2024, 38% were labeled as "suspected Big Data Killing," marking a 12-percentage-point increase

from the previous year. "Big Data Killing" not only directly infringes upon consumers' fundamental rights and challenges the principle of fair trade, but also poses a potential threat to market competition order and the sustainable development of the platform economy. Despite the rising public outcry, questions regarding whether price discrimination is widespread, its specific mechanisms and impacts, and how to protect consumer rights largely remain confined to case studies and theoretical discussions, lacking in-depth analysis.

2.Conceptual Definitions

2.1 Concept and Causes

"Big Data Killing" typically refers to internet platforms leveraging user data they collect to charge relatively higher prices to consumers with high spending power, low price sensitivity, or strong loyalty when purchasing identical goods or services. At its core, this phenomenon stems from platforms engaging in price discrimination against consumers. Price discrimination is a common economic phenomenon where businesses set different prices for the same product among different consumers. Platforms leverage big data and algorithms to implement differential pricing, aligning product prices as closely as possible with consumers' willingness to pay to maximize profits[1]. Simply put, consumers who purchase frequently and demonstrate high loyalty are willing to pay more than those who shop infrequently or show low loyalty. This means the former exhibit stronger payment willingness and accept higher prices for the same goods. As the primary gatherers of big data, platforms readily identify variations in consumer willingness to pay. They then employ algorithms to implement differential pricing—setting higher prices for loyal customers and lower prices for less loyal ones.

This phenomenon typically emerges during the developmental phase of internet platform economies. During this period, platforms possess absolute data advantages, algorithmic power, and strong profit-seeking motives within digital markets, effectively acting as data aggregators and controllers[2]. By tracking, collecting, and analyzing vast datasets—including consumer histories, device information, browsing habits, location, and even social connections—platforms construct granular user profiles. This enables precise assessment of price sensitivity and willingness to pay across different user segments. The prevalence of "Big Data Killing" stems primarily from three factors: First, platforms wield informational superiority and algorithmic control, rendering the pricing process entirely opaque, making it difficult for users to detect or prove. Second, regulatory oversight and legal accountability face significant challenges. There is lag in defining algorithmic collusion, identifying technical violations through evidence collection, and enforcing penalties, resulting in extremely low costs for non-compliance. Third, the profit-driven nature of platforms tilts business decisions toward maximizing profits, relegating consumer rights and fair transaction principles to secondary importance.

2.2 Mechanism

Figure 1: The Mechanism Behind "Big Data Price Discrimination"
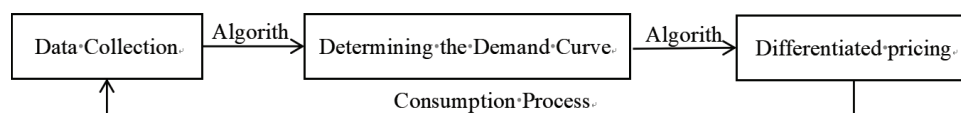
As shown in Figure 1, Platforms can engage in price discrimination through three essential steps: collecting consumer data, identifying consumer demand curves, and implementing differential pricing based on these curves. First, as lifestyles and consumption habits evolve, most consumers rely on platform apps for activities like dining, transportation, and shopping. While this offers convenience, it also makes it easier for platforms to gather behavioral information. Platforms can effortlessly obtain valuable data such as consumer locations, search histories, purchase records, frequency of use, and browsing duration, building robust foundational databases. This foundational data undergoes screening, classification, cleansing, and transformation to yield actionable insights. Next, platforms leverage big data technologies to detect consumer demand curves. Two primary online methods exist: sellers display identical products at varying prices across different time slots to observe consumer reactions and gather data; alternatively, e-commerce platforms implement short-interval (e.g., 15-minute) price fluctuations for all consumers, monitoring their responses to these changes [3]. Upon successful detection, the platform gains a general understanding of the product's consumer demand curve. Finally, and most crucially, the platform implements differentiated pricing for distinct consumers and consumer groups based on this demand curve—referred to as personalized

pricing and group discrimination pricing, respectively. The more data the platform collects and processes, the more accurately it can determine the maximum price consumers are willing to pay, enabling pricing strategies that increasingly align with this threshold when interacting with customers.

2.3 Impacts

The phenomenon of "Big Data Killing" severely undermines consumer interests. Platforms were originally established to provide consumers with more convenient purchasing methods, facilitate transactions between buyers and sellers, and appropriately address information asymmetry. However, when platforms discover that transaction-generated data holds exploitable value—such as for user profiling, differential pricing, and other profit-maximizing strategies—they implement price discrimination tactics, creating conflicts with consumers. Driven by profit motives, platforms exploit their informational advantage—or rather, the newly created information asymmetry—to intensify the exploitation of loyal customers' consumer surplus.

3.Typical Cases

3.1 The "Apple Tax" on Ride-Hailing Apps

Professor Sun Jinyun and his team from the School of Management at Fudan University released a report on ride-hailing apps in March 2021, revealing the phenomenon of "Apple tax" occurring during rides. Through research in five cities—Beijing, Shanghai, Shenzhen, Chengdu, and Chongqing—the team found that iPhone users were more likely than Android users to be matched with pricier vehicle types (such as comfort or business class) when using ride-hailing apps. The number of such vehicles assigned to iPhone users was nearly three times that assigned to Android users. Additionally, iPhone users faced higher average fares and received fewer discounts. This clearly constitutes discriminatory pricing by ride-hailing platforms. They perceive iPhone users as having higher price acceptance and lower price sensitivity, justifying higher fares and reduced discounts. Following the report's release, multiple authoritative media outlets covered the story, sparking widespread debate about "Big Data Killing." Consequently, relevant ride-hailing companies were summoned by the Shanghai Consumer Council and required to clarify pricing rules while ensuring consumers' right to know.

3.2 The devaluation of membership on food delivery platforms

In September 2020, an online post by a food delivery platform user about the platform charging higher delivery fees to members sparked widespread public attention. The user discovered that as a super member of the platform, not only did they fail to enjoy the membership benefit of free delivery when ordering from the same restaurant, but their delivery fee was actually higher than that of non-members. Furthermore, since 2022, the platform has consistently charged members higher prices than non-members for meals from the same merchant and for the same items, with the price difference typically ranging from 2 to 5 yuan. Simultaneously, members receive smaller discount coupons and less generous promotions. For instance, new users and non-members frequently obtain substantial coupons like "7 yuan off orders over 35 yuan," while members are often pushed coupons like "5 yuan off orders over 50 yuan" or "6 yuan off orders over 60 yuan." This creates a poor purchasing experience for members, contradicts the traditional economic definition of membership benefits, and undermines their interests. The frequent occurrence of such practices has drawn significant public and regulatory scrutiny. However, market authorities have not imposed any punitive measures, instead focusing on strengthening regulations for algorithmic recommendations and requiring platforms to enhance transparency in their algorithmic applications.

4.Research

4.1 Research Methods

This study employs a questionnaire method to investigate the phenomenon of "Big Data Killing," focusing on three key aspects: whether netizens have encountered price discrimination, their responses upon encountering it, and their level of trust in platforms. The questionnaire comprised 10 questions (see Appendix 1). Questions 1-2 gathered respondents' basic information. Questions 3-5 investigated whether users encountered price discrimination and how they discovered it. Questions 6-8 examined users' responses and their perceived reasons for such actions. Questions 9-10 assessed the impact on users' trust in the platform. All questionnaires were distributed online with anonymous responses. The collected data is solely

used for aggregate analysis.

4.2 Data Source

As of September 15, this survey collected a total of 124 questionnaires, including 119 via WeChat and 5 through other channels. After excluding 9 respondents who never shop online, the study retained 115 valid questionnaires. Among the valid respondents, 74.7% were female and only 25.3% were male, aligning with the gender characteristics of online shoppers. Adults comprised 96.6% of the sample, while 3.4% were minors who typically shop online using their parents' accounts.

4.3 Analysis and Conclusions

A total of 86 respondents encountered instances of the same product being priced differently, accounting for 74.8% of valid survey responses. Only 12.1% of respondents had never encountered such situations, while 13.1% had not noticed such occurrences. Respondents encountered price discrepancies through various means: browsing at different times accounted for 84.8% of cases, using different devices accounted for 52.3%, using different accounts accounted for 52.3%, price changes after claiming hidden coupons accounted for 43.3%, and checkout prices differing from cart displays accounted for 25.5%.

When encountering price discrepancies, user behavior varies significantly. Among those affected, 39.5% switch devices or accounts to place orders at lower prices; 33.7% add items to carts or wishlists to monitor prices over time; while 10.4% opt for immediate purchase and an equal 10.4% abandon the purchase altogether. To address price discrepancies, users typically adopt comparison strategies: 74.4% compare prices across different platforms, 43.0% use comparison software or websites, and 29% clear cache, switch accounts, or use incognito mode to view prices. Users attribute these price discrepancies to various factors. Among those encountering price differences, 60.4% believe it stems from platforms employing big data to charge loyal customers higher prices based on user profiles. Of course, other factors may also play a role, such as promotional strategies, operational cost impacts, technical display errors, or delays.

Among those who encountered price discrepancies, only 52 individuals felt affected by this phenomenon. Of these, 11 reported significant impact and expressed a tendency to reduce shopping on the platform, accounting for 12.7% of respondents. This indicates that the remaining 87.3% were unaffected in their platform usage. While most users would not choose to use the platform less due to price differences, they expressed high expectations for clear communication regarding the platform's pricing adjustment policies. Among those encountering price discrepancies, 47.6% believe platforms must explicitly notify users and obtain their consent. Additionally, 43.0% of users feel platforms should clearly outline such practices in their user agreements or privacy policies.

This survey reveals that differentiated pricing based on user profiling—commonly known as "Big Data Killing"—has become highly prevalent and widely recognized among e-commerce platforms. In response, most users demonstrate strong price comparison awareness and technical avoidance behaviors, highlighting a consumer trait where price sensitivity coexists with a willingness to resist algorithms. Although most users are aware that platforms are exploiting their surplus value, their usage levels remain unchanged, indicating a degree of usage stickiness. This may seem counterintuitive given the significant decline in trust levels, suggesting that most users are willing to accept such exploitation as long as it does not exceed their maximum tolerance threshold. Naturally, users hold high expectations for platforms' big data-driven pricing practices, with explicit notification and clear explanations being two key areas of concern. Research suggests that while big data price discrimination hasn't triggered massive user churn or credit erosion, it fundamentally erodes loyal consumers' trust and creates transactional unfairness. Platforms must establish more transparent pricing mechanisms and compliant data usage ethics to balance commercial efficiency with user rights protection.

5.Recommendations

5.1 Government

The government should take the lead in establishing a comprehensive governance system encompassing legislation, law enforcement, and the judiciary. The current legal framework is fundamentally incapable of restraining platform companies from identifying individual consumers and determining each consumer's maximum affordable price, thereby gaining pricing power and freely using data to inflate prices[4]. While such practices may enhance economic efficiency, they fundamentally undermine the fairness of transactions. The government urgently needs to build upon the E-Commerce Law, Personal

Information Protection Law, and Anti-Monopoly Law by introducing more targeted administrative regulations or judicial interpretations. These should precisely define "Big Data Killing" as "unreasonable differential treatment implemented through automated decision-making without user consent," establishing clear penalty standards. Simultaneously, regulatory bodies must upgrade oversight methods, shifting from passive complaint handling to proactive technological supervision. The most effective approach involves adopting "reg-tech"—leveraging big data monitoring technologies for routine inspections of platform pricing to identify anomalous pricing patterns.

5.2 Platform

Platforms must recognize that while "Big Data Killing" may yield greater short-term profits for businesses, it fundamentally undermines transactional fairness and betrays the trust of loyal users—especially given that some platforms monopolize[5] and abuse[6] data. The principle of fair trading must be integrated into platforms' operational decision-making frameworks, establishing ethical guidelines to constrain profit-driven behaviors. Regarding transparency, platforms should reduce hidden clauses, clearly disclose factors influencing price fluctuations to consumers, and commit to refraining from using big data for price discrimination. Additionally, platforms may establish "price dispute channels" where users can submit appeals when questioning pricing, with human customer service providing reasonable explanations.

5.3 Technology

Technology is both the tool for price discrimination and the antidote to its abuse. Platform technology teams should integrate fairness constraints throughout the entire algorithm development lifecycle—design, training, deployment, and monitoring. During the model design phase, "fair machine learning" techniques can be employed, such as adjusting training data distributions through preprocessing to eliminate reliance on sensitive attributes like user activity levels or spending power. During modeling, introduce fairness loss functions that incorporate "group fairness" and "individual fairness" as optimization objectives to constrain models from generating excessive price disparities. Post-deployment, establish continuous monitoring systems to track model outputs across user groups in real time and set fairness alert thresholds. By embedding technical constraints, discriminatory pricing can be minimized at its source, enabling algorithms to better serve humanity.

5.4 Users

In the face of complex algorithmic environments, consumers must enhance their digital literacy and shift from passive to active engagement. First, strengthen awareness of personal information protection. Exercise caution when granting apps permissions to collect personal data, regularly clear cache and cookies, and reduce the dimensions available for precise profiling at the data source. Second, master and effectively use price comparison tools. Develop shopping habits that involve cross-platform, cross-device, and cross-account price comparisons. Actively utilize third-party price comparison websites, browser price comparison plugins, and other tools to obtain more comprehensive price references and uncover the traps of personalized pricing. Finally, when suspecting "Big Data Killing," consumers should boldly exercise their legal rights. This includes demanding explanations for pricing decisions under Article 44 of the Personal Information Protection Law and filing complaints with market regulators. Only through proactive consumer advocacy can a powerful grassroots oversight force emerge, compelling platforms to standardize their practices.

5.5 Industry and Society

To eradicate the persistent problem of "big data price discrimination," it is essential to pool the collective efforts of industry, media, academic institutions, and other societal stakeholders to establish a multi-stakeholder governance framework. Industry associations should take a leading role by establishing blacklist systems and joint disciplinary mechanisms, setting ethical standards for the industry that exceed legal requirements. Third-party academic and research institutions should strengthen cutting-edge research, thoroughly uncover the mechanisms and societal harms of algorithmic discrimination, and provide independent, professional academic support for legislation and regulation. Media outlets must fulfill their duty of public oversight by exposing typical cases through in-depth investigative reporting, disseminating relevant legal knowledge, and raising public awareness. Consumer rights protection organizations can regularly publish evaluation reports to provide shopping guides for consumers and initiate public interest litigation on their behalf. Only by building this collaborative governance ecosystem—characterized by industry self-regulation, social oversight, and public participation—can we

continuously reduce the space for "big data price discrimination" to thrive and jointly foster an honest, fair, and healthy digital market environment.

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Conflict of Interests

The authors declare that there is no conflict of interest regarding the publication of this paper.

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Appendix

Survey: Research on Experiences with Price Differences in Online Shopping

Dear Internet User, We are conducting an academic study on online shopping experiences to understand whether you have encountered price discrepancies during your shopping process and their impact. This questionnaire is anonymous, and all data will be used solely for aggregate analysis. We will strictly protect your personal information. The survey takes approximately 1-2 minutes to complete. Thank you for your participation!

1. What is your gender? [Single-choice question] *

( ) A. Male

( ) B. Female

2. What is your age group? [Single-choice question] *

( ) A. 18 years old and under

( ) B. 19-25 years old

( ) C. 26-35 years old

( ) D. 36-45 years old

( ) E. 46 years old and over

3. How often do you shop online (including platforms for food delivery, ride-hailing, etc.) on average each month? [Single-choice question] *

( ) A. Never shop online

( ) B. 1–6 times

( ) C. 7–12 times

( ) D. 12 times or more

4. In your past online shopping experiences, have you ever encountered situations where "the same product displayed different prices at different times or on different devices (e.g., mobile/computer)"? [Single-choice

question] *

( ) A. Frequently encountered

( ) B. Occasionally encountered

( ) C. Never encountered

( ) D. Not sure/didn't notice

5. If you have encountered this, under what circumstances did you typically discover it? [Multiple Choice] *(Answer if you selected A or B in the previous question)

( ) A. Browsing at different times (e.g., morning/evening or before/after major promotions)

( ) B. Using different devices (e.g., mobile app vs. desktop web version)

( ) C. Using different accounts (e.g., member vs. non-member accounts)

( ) D. Price changes after claiming hidden coupons

( ) E. Price discrepancies between checkout and shopping cart display

6. Upon discovering this price discrepancy, what would you typically do? [Single Choice] *

( ) A. Purchase immediately (fearing further price increases or missing the current offer)

( ) B. Switch devices/accounts to place the order at a lower price

( ) C. Add to cart or bookmarks and continue monitoring prices

( ) D. Feel deceived and abandon the purchase

( ) E. Other

7. Do you employ price comparison strategies due to price differences? [Multiple Choice] *

( ) A. Yes, I frequently use price comparison software/websites

( ) B. Yes, I habitually compare across different platforms (e.g., Taobao, JD.com, Pinduoduo)

( ) C. Yes, I clear cache, switch accounts, or use incognito mode to view prices

( ) D. Never compare prices—it's too much hassle

( ) E. Depends on the item's value; I compare prices for high-priced items

8. What do you believe are the primary reasons for this price discrepancy? [Multiple Choice] *

( ) A. Platforms engaging in "big data price discrimination" based on user profiles

( ) B. Promotional strategies by platforms or merchants (e.g., new user discounts, random instant rebates)

( ) C. Variations in operational costs across different channels (e.g., higher subsidies on the app platform)

( ) D. Technical display errors or delays

( ) E. I am unaware of the specific reasons

9. Would this experience affect your trust in e-commerce platforms? [Single-choice question] *

( ) A. Severely affected; feel deceived and will shop less on this platform

( ) B. Somewhat affected, but will continue using it while being more vigilant and comparing prices

( ) C. Not affected at all; consider this normal business practice

( ) D. Unsure/Can't say

10. Do you believe the platform has a responsibility to clearly disclose its pricing adjustment rules (such as Big Data Killing)? [Single Choice] *

( ) A. Absolutely necessary; explicit disclosure and user consent are required

( ) B. Necessary; should be clearly stated in the user agreement or privacy policy

( ) C. Doesn't matter; I'm not concerned about these rules

( ) D. Unnecessary; this falls under the platform's commercial freedom