Consumer Fairness Concerns and Price Discrimination of Two-Sided Platforms

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Consumer Fairness Concerns and Price Discrimination of Two-Sided Platforms*

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Abstract

This paper studies how consumers' concerns about fairness interact with third-degree price discrimination of a two-sided monopoly platform. We show that the presence of fairness concerns creates a negative demand externality from low-willingness-to-pay to high-willingness-to-pay consumers, that is, charging less to the former reduces the latter's demand. With this novel externality, price-discriminating among consumers triggers fairness concerns, which lowers consumer-side demand and ultimately restricts the platform's profit exploitation from the seller side. Hence, a platform whose profit potential from sellers is larger would take consumers' fairness concerns more seriously and price-discriminate less. The results can explain why some major online platforms—despite the huge profit potential of targeting prices—shy away from price discrimination in response to consumers' fairness concerns, while others care little about unfairness complaints when price-discriminating among consumers.

Keywords: fairness concerns, price discrimination, two-sided markets

JEL Codes: D42, D91, L11, L86

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1 Introduction

In today's digital economy, there are many examples of online platforms' sophisticated price discrimination for consumers. With prolific consumer behavior data such as that collected via website cookies, online platforms can infer consumers' willingness to pay and accordingly tailor their prices. They may use these increasingly precise data to customize prices, charging more to consumers with a larger willingness to pay.[1] The *Investigation of Competition in Digital Markets*[2] in the US, the *Digital Services Act*[3] in the EU, and the *Antitrust Guidelines for the Platform Economy*[4] in China showed that worldwide regulators are concerned that this type of price discrimination can vastly increase profits to the detriment of consumers.

Plenty of data enable online platforms to tailor prices based on consumers' willingness to pay. This may be profitable especially when platforms have market power. For instance, Shiller (2020) estimated that approximating reservation prices based on browsing data can raise the revenues of Netflix by about 13%. However, many online platforms still choose not to do it (see OECD Secretariat, 2018). For example, Takeaway.com is almost monopolistic in some market segments but does not explicitly tailor prices based on consumers' willingness to pay.[5] Compared with the prospective profitability of price discrimination, an interesting puzzle arises: why do some large online platforms choose not to price-discriminate against consumers with a greater willingness to pay?

As emphasized by OECD Secretariat (2018), consumers' feelings about pricing unfairness should have an impact on the attitudes of online platforms toward price discrimination. Researchers such as Ho and Su (2009), Richards et al. (2016), and Cohen et al. (2022) argue that if a firm implements price discrimination, consumers who are price-discriminated

[1] Usually, this implies third-degree price discrimination, while personalized pricing is an extreme case.

[2] https://www.govinfo.gov/app/details/GOVPUB-Y4_J89_1-PURL-gpo145949 [Retrieved: Jan. 4, 2026].

[3] https://www.consilium.europa.eu/en/policies/digital-services-package/ [Retrieved: Apr. 25, 2026].

[4] An English translation is available at https://lawinfochina.com/display.aspx?id=35020&lib=law&EncodingName=gb2312 [Retrieved: Apr. 25, 2026].

[5] This implies that the platform does not explicitly charge different service fees to consumers. In this paper, we do not consider the case where sellers can set prices for consumers.

will suffer additional psychological losses because they have negative concerns about pricing unfairness. Such fairness concerns may drive consumers to not buy from the firm. Hence, the firm should take consumers' fairness concerns about price discrimination seriously. However, online platform giants have diverse attitudes toward consumers' complaints about unfair pricing. For example, there were public complaints about online platforms charging higher prices to regular than infrequent consumers. Online platforms such as Takeaway.com claimed that they would not tailor prices for their guests; in contrast, platforms like Booking.com and Uber kept price-discriminating without providing a substantive and reasonable response (see the cases reported by the *Daily Mail* and *The Guardian*[6]).

This paper is the first to investigate how consumers' fairness concerns shape platforms' discriminatory pricing. In particular, we explore the issue within a two-sided context because the online platforms concerned with tailoring prices mainly serve as intermediaries between the users on two sides (OECD Secretariat, 2018). A particular feature of a two-sided market is the presence of cross-side network effects: the demand on one side affects the demand on the other side (Rochet and Tirole, 2006). As argued by Liu and Serfes (2013), unlike one-sided suppliers, platforms in a competitive two-sided market can exploit profits from price discrimination because of cross-side network effects. We show that the incentive to price discriminate among consumers depends on the link between fairness concerns and cross-side network effects in a non-trivial way.

Our model builds on and significantly extends the framework of Rochet and Tirole (2003) in Section 3. A monopoly platform charges prices for each transaction on a two-sided market. The platform charges both sides, and each consumer or seller can get a fixed benefit from a transaction on the platform. We divide consumers into two types. High-type consumers have a larger willingness to pay for the platform's services than low-type consumers. The

[6] The content is available at https://www.theguardian.com/commentisfree/2018/apr/13/uber-lyft-prices-personalised-data [Retrieved: Oct. 8, 2025] and https://www.dailymail.co.uk/news/article-13928797/holidays-booking-cost-50-cent-laptop-app.html [Retrieved: Jan. 25, 2026].

platform can charge different prices to the two types of consumers. With reference to Fehr and Schmidt (1999), we model fairness concerns by assuming that high-type consumers suffer a disutility if they pay more than low-type consumers. This disutility increases in the markup they pay over low types. It represents a type of psychological loss, resulting from people's aversion to being treated unfairly compared to peers.

Section 4 presents the main analysis. We solve the above model and compare the results in two settings: one with consumers' fairness concerns and one without. First, we find that the presence of consumers' fairness concerns makes the platform trade off the price difference between the two types of consumers against the price for sellers. Second, in equilibrium, the price difference between consumers decreases if the platform can make more profits on the seller side. Intuitively, as the price difference on the consumer side increases, the platform loses some high-type consumers due to fairness concerns. This reduces total transactions, and the platform loses the potential profits it can make from sellers. Hence, if an online platform can earn more profits from the seller side than other platforms, all else equal, it would take consumers' fairness concerns more seriously and avoid price discrimination. Conversely, if an online platform can earn more profits from price discrimination on the consumer side, it would price-discriminate against consumers with a greater willingness to pay without caring about fairness concerns.

We argue that our main mechanism, the interaction between consumers' fairness concerns and cross-side network effects, might be a key factor in explaining why online platforms with significant market power have diverse attitudes toward unfairness complaints—some mitigate price discrimination in response to consumers' fairness concerns, while others do not. For example, Takeaway.com can earn more profits on the seller side because it is more difficult for sellers on these platforms to reach consumers outside the platforms. In line with our predictions, the platform shies away from price-discriminating among consumers. On the other hand, Uber Eats extracts fewer profits from the seller side because its sellers can reach consumers in other ways; thus, the platform exploits more profits from price discrimination among consumers, regardless of their fairness concerns.[7]

We study the robustness of the results in Section 5. First, we introduce consumers' desire for advantageous price discrimination (Leibbrandt, 2020) into our model. Specifically, we establish a bidirectional form of consumers' psychological payoffs: consumers feel unhappy about unfairness when they pay higher prices than others, while they enjoy taking advantage of others when they pay lower prices than others. Under this configuration, the trade-off between the consumer-side price difference and the price for sellers still exists. Nevertheless, it weakens as low-type consumers' desire for advantageous price discrimination increases. The platform gets fewer high-type consumers when implementing price discrimination but attracts more low-type consumers who enjoy their advantaged prices, partially offsetting the loss. Second, we investigate how different proportions of high-type vs. low-type consumers affect our main results. The analysis indicates that the trade-off between the price difference on the consumer side and the price for sellers remains. We highlight that the trade-off may strengthen as the proportion of high-type consumers increases. We argue that this captures why Meituan, the largest food delivery platform worldwide, changed its price-discrimination strategy over time. Third, we study the influence of seller-side price discrimination on our core mechanism. We show that the trade-off between the consumer-side price difference and the (average) seller-side price holds unchanged compared to that derived from the main analysis.

We outline the policy relevance of our model in Section 6. As consumers' fairness concerns can play a special role in restricting online platforms' price discrimination, regulators are able to interact with this mechanism by banning price discrimination or improving the pricing transparency on online platforms (see European Commission, 2018 and OECD Secretariat, 2018 about the regulation concerns). With welfare simulations, we illustrate the potential benefits of the regulatory actions and discuss the controversies.

[7]See Section 4.4 for the details.

2 Related Literature

The literature on price discrimination has paid particular attention to the platform's price discrimination on one side of a two-sided market (Liu and Serfes, 2013; Jullien et al., 2021; Belleflamme and Peitz, 2025). Network effects complicate the profit analysis of a two-sided platform's discriminatory pricing because price discrimination on one side affects both sides' prices and demand. The influence of network effects can lead to perfect price discrimination (e.g., Liu and Serfes, 2013), second-degree price discrimination (e.g., Jeon et al., 2022), two-part tariff (e.g., Reisinger, 2014), and third-degree price discrimination (e.g., de Cornière et al., 2024). The key novelty of our paper is to investigate how two-sided platforms adjust price discrimination in response to consumers' feelings about price discrimination, that is, fairness concerns.

A related branch of research studies how consumers' behavioral regularities affect two-sided platforms' pricing decisions. Johnen and Somogyi (2024) study a platform's choice to design transparent pricing when some consumers underestimate non-transparent features. With a two-period pricing model, Lam (2017) shows that consumers benefit from the indirect bargain effect of switching costs when a platform price-discriminates against its renewing (loyal) consumers. Carroni (2018) and Cabral (2019) study how this behavior-based price discrimination by a two-sided platform depends on consumers' myopic beliefs. These studies confirm that consumers' behavioral biases affect price discrimination in two-sided markets. However, the studies regard behavioral regularities as exogenous to how a platform price-discriminates. We introduce fairness concerns into the determination of two-sided platforms' discriminatory pricing to analyze the effect of consumers' endogenous responses to price differences.

Fairness concerns describe people's aversion to receiving an option that is worse than a reference (e.g., a lower wage relative to past wages or a price higher than peer prices). Akerlof (1982) introduced this concept into economic research. Fehr et al. (1993) provided the first experimental evidence on the impact of fairness concerns on market clearing. Economists have mainly discussed fairness concerns when studying labor market and social equity issues (see Cappelen and Tungodden, 2019 for a review). Recent articles (e.g., Ho and Su, 2009; Rotemberg, 2011; Richards et al., 2016; Ater and Avishay-Rizi, 2022; Cohen et al., 2022) pay some attention to fairness concerns in the analysis of price discrimination in consumer markets. These studies show that if consumers feel more unhappy about receiving a higher price than their peers, monopolistic firms have less incentive to price-discriminate among consumers in one-sided markets. Our paper extends this line of research to two-sided markets and shows that the extent to which fairness concerns deter consumer-side price discrimination depends on seller-side features.

3 Model Setup

The two-sided model includes three categories of agents: consumers, sellers, and a monopoly platform. Similarly to Rochet and Tirole (2003), the platform only charges per-transaction fees to consumers and sellers for any transactions on the platform. This setup reflects the situations on a large number of online platforms, including online travel agencies (OTAs) (e.g., Booking.com), mobile ride-hailing platforms (e.g., Uber), and food delivery platforms (e.g., Takeaway.com). In this type of market, platforms' (third-degree) price discrimination[8] according to consumers' willingness to pay for homogeneous transaction-enabling services is feasible and prevalent (see OECD Secretariat, 2018 for more examples and details). Also, since transaction-enabling services are the same for all consumers, it is reasonable to assume that consumers have a negative response to pricing unfairness.

Consumers. There are high-type (H) and low-type (L) consumers on the market. The mass of each type of consumer is normalized to 1. For each transaction, we set the utility of

[8] For succinctness, we use the term "price discrimination" hereafter in this paper to denote third-degree price discrimination unless specified otherwise.

a high-type consumer as $U_H = v_H - p_H - M(p_H, p_L)$ and the utility of a low-type consumer as $U_L = v_L - p_L$.

In a transaction, each consumer gets an exogenous per-transaction payoff v_i, where $i \in \{H, L\}$, from the transaction on the platform. This follows the classical setting on two-sided platforms that charge only per-transaction fees (Rochet and Tirole, 2003, 2006). Also, we assume that v_i is independently and uniformly distributed over the support $[\beta_i, \beta_i + 1]$ with $\beta_i \geq 0$. Intuitively, β_i represents the profit potential that the platform can make from a type of consumer. The platform charges high-type consumers a unique p_H and low-type consumers a unique p_L for each transaction.

High-type consumers' willingness to pay exceeds that of low-type consumers by a uniform margin, implying $\beta_H > \beta_L$. In addition, they suffer from fairness concerns, $M(p_H, p_L)$, as a function of the prices the platform offers to high-type consumers p_H and to low-type consumers p_L. With reference to the classical setting in Fehr and Schmidt (1999), here we set the term in the following form:

$$M(p_H, p_L) = \begin{cases} \gamma(p_H - p_L), & p_H \geq p_L \\ 0, & \text{else} \end{cases}, \tag{1}$$

where γ is a uniform parameter that describes how unhappy consumers feel about a positive price difference from others. We set $\gamma \in (0, 1)$. $\gamma < 1$ ensures that the psychological disutility of bearing a unit price markup over others is weaker than the material disutility of losing a unit (see Leibbrandt, 2020 for some supportive evidence). $\gamma > 0$ implies that consumers have a negative response to the price gap if they receive the disadvantaged price. In the main analysis, we also analyze under the configuration without fairness concerns that has $M(p_H, p_L) \equiv 0$.[9] For tractability, here we do not consider low-type consumers' feelings about a price gap that is advantageous to them. We perform an analysis taking this case into account in Subsection 5.1 and show that the results are robust.

[9] If $\gamma = 0$, the utility function also reduces to a case of no fairness concerns.

We suppose that consumers transact when their utility is greater than or equal to 0. The demands of high-type and low-type consumers are

$$D_H(p_H, p_L) = \Pr[v_H \geq p_H + M(p_H, p_L)],$$

$$D_L(p_L) = \Pr[v_L \geq p_L].$$

For D_H and D_L on the interior, the demands are given as[10]

$$D_H(p_H, p_L) = 1 + \beta_H - p_H - M(p_H, p_L), \tag{2}$$

$$D_L(p_L) = 1 + \beta_L - p_L. \tag{3}$$

Sellers. The mass 1 of homogeneous sellers is on the market. The net payoff a seller gets from a transaction is $U_S = v_S - f$. We also follow the classical two-sided framework and assume that the sellers' exogenous benefits from a transaction, namely v_S, are independently and uniformly distributed over the support $[\theta, \theta + 1]$ with $\theta \geq 0$. The platform charges all sellers the same f for each transaction. The participation of sellers in a transaction on the platform is

$$N(f) = \Pr[v_S \geq f].$$

For N on the interior, the demand is given as

$$N(f) = 1 + \theta - f. \tag{4}$$

The platform. We take the (perfect many-to-many) matching process between individual consumers and individual sellers as given. Suppose that sellers are indifferent to which consumer they trade with, and vice versa. Since v_H, v_L, and v_S are independent of each other, the volume of transactions between high-type consumers and sellers is $D_H(p_H, p_L)N(f)$, and the volume of transactions between low-type consumers and sellers is $D_L(p_L)N(f)$. For tractability, we assume that the platform has no marginal cost to provide services. It only

[10]Without fairness concerns, the demand of high-type consumers reduces to $D_H(p_H) = 1 + \beta_H - p_H$ on the interior.

earns the per-transaction fees from consumers and sellers, and maximizes its total profit:

$$\Pi(p_H, p_L, f) = (p_H + f)D_H(p_H, p_L)N(f) + (p_L + f)D_L(p_L)N(f). \tag{5}$$

In reality, the pricing on a two-sided platform may involve two parts: fees charged by the platform and commodity prices charged by sellers. In our model, the decisions of agents are subject to the platform's pricing, while the prices received by sellers are not involved. This specification reflects key stylized facts of the market. Competing sellers typically have little power to influence the pricing of a monopolistic platform or to select consumers. Meanwhile, consumers may infer that price differences of the same good, absent demand or supply shocks, arise from platform-imposed fees rather than sellers' pricing (see Ying et al., 2024 for related evidence). Under these conditions, the platform has little incentive to share with sellers the profit of price discrimination. Hence, we can configure the model to be exogenous to the prices received by sellers. This configuration is particularly relevant for online platforms with complex or opaque fee structures. For example, Uber charges all-in-one prices to drivers and customers. Because the two groups are price takers in relation to the platform, they might attribute changes in the all-in-one prices to the commission fees determined by the platform. Uber claims that it extracts a percentage commission fee (i.e., a proportion of the all-in-one price) on each side. However, as commission rates are neither transparent nor fixed, the (superficial) percentage fees are equivalent to per-transaction (add-on) fees.[11]

4 Analysis

4.1 Equilibrium characterization

We start by characterizing the platform's equilibrium pricing. Both for $M(p_H, p_L)$ as in (1) and for $M(p_H, p_L) \equiv 0$, we have the first-order conditions (FOCs) for profit maximization:

[11] Evidence supports that Uber does not transfer the profit from personalized pricing to consumers or drivers (Binns et al., 2025).

$$\frac{\partial \Pi}{\partial p_H} = 0 \Leftrightarrow D_H(p_H, p_L) + (p_H + f)D_{H,1} = 0, \tag{6}$$

$$\frac{\partial \Pi}{\partial p_L} = 0 \Leftrightarrow (p_H + f)D_{H,2} + D_L(p_L) + (p_L + f)D_{L,1} = 0, \tag{7}$$

$$\frac{\partial \Pi}{\partial f} = 0 \Leftrightarrow N(f)[D_H(p_H, p_L) + D_L(p_L)] + N_1[(p_H + f)D_H(p_H, p_L) + (p_L + f)D_L(p_L)] = 0, \tag{8}$$

where $D_{H,1} = \partial D_H(p_H, p_L)/\partial p_H$, $D_{H,2} = \partial D_H(p_H, p_L)/\partial p_L$, $D_{L,1} = \partial D_L(p_L)/\partial p_L$, and $N_1 = \partial N(f)/\partial f$. For $M(p_H, p_L) \equiv 0$, we have $D_H(p_H, p_L) = D_H(p_H)$. With the FOCs, we derive the following result:

Lemma 1. *If a pricing strategy has $p_H < p_L$, then it cannot be an equilibrium for the profit maximization problem.*

The proof is presented in Appendix A.1. Given this lemma and the FOCs, we derive the following result:

Proposition 1. *There is an interior and unique equilibrium at (p_H^*, p_L^*, f^*) in which $p_H^* \geq p_L^*$, if*

$$\beta_H + \beta_L + \theta < \frac{1-\gamma}{1+\gamma} \quad \text{and} \quad \frac{1-\gamma}{2}\beta_H < \beta_L. \tag{I}$$

The proof is presented in Appendix A.2. The two inequalities jointly ensure that the platform must trade off between the prices for the seller side and for each type of consumer. This rules out corner solutions where all or no consumers of a type participate. The condition also secures strict concavity of the profit function on the interior.[12] The first inequality imposes a sum constraint on the profit potential parameters. This constraint is stricter when consumers' aversion to pricing unfairness (i.e., γ) is stronger. The second inequality adds an extra constraint on high-type consumers' willingness-to-pay premium. This constraint is stricter when consumers' aversion to pricing unfairness is weaker.

[12] If a kink pricing strategy such that $p_H = p_L$ can be an interior equilibrium, then the profit function is still concave at the kink though non-differentiable. See Appendix A.2 for the details.

If the profit potential from an agent group is high enough, the demand will be constrained at its upper bound 1, and the demands of other agent groups can also bind to 1. The corner equilibria are detailed in Appendix A.2. They are theoretically possible but very unusual in reality. Rare two-sided platforms serve an entire agent group. Given this, hereafter we take condition (**I**) as given to focus on the interior case.

4.2 Price discrimination

Price discrimination without consumers' fairness concerns. Here we consider the situation where $M(p_H, p_L) \equiv 0$. The FOCs with respect to the consumer-side prices are

$$D_H(p_H) + (p_H + f)D_{H,1} = 0,$$

$$D_L(p_L) + (p_L + f)D_{L,1} = 0,$$

with $D_{H,1} = D_{L,1} = -1$. The equations imply that the equilibrium prices on the consumer side depend on the equilibrium price for sellers as follows:

$$p_H^*(f^*) = \frac{1+\beta_H}{2} - \frac{f^*}{2} \quad \text{and} \quad p_L^*(f^*) = \frac{1+\beta_L}{2} - \frac{f^*}{2}. \tag{9}$$

Using (9), it is easy to see that:

Lemma 2. *The interior equilibrium prices when consumers have no fairness concerns satisfy*

$$p_H^*(f^*) - p_L^*(f^*) = \frac{\beta_H - \beta_L}{2}, \tag{10}$$

which is strictly positive and independent of f^* for constant $\beta_H - \beta_L$.

Price discrimination with consumers' fairness concerns. We now turn to the situation of $M(p_H, p_L)$ as in (1). The FOCs with respect to the consumer-side prices become

$$\boldsymbol{D_H(p_H, p_L)} + (p_H + f)\boldsymbol{D_{H,1}} = 0,$$

$$\boldsymbol{(p_H + f)D_{H,2}} + D_L(p_L) + (p_L + f)D_{L,1} = 0.$$

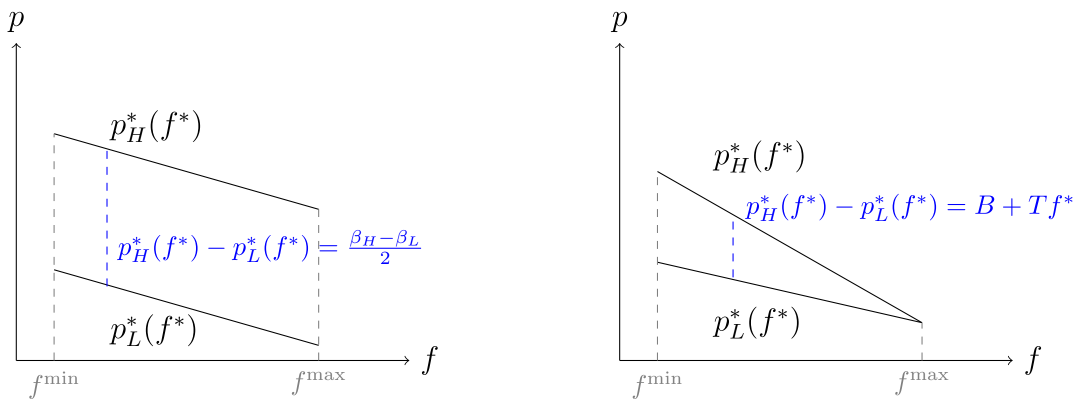
Compared with the situation of no fairness concerns, the FOC with respect to the price for one type of consumer additionally involves the price for the other type of consumer, with $D_{H,1} = -(1+\gamma)$, $D_{L,1} = -1$, and $D_{H,2} = \gamma$. Here, consumers' fairness concerns introduce a new negative demand externality from low-type to high-type consumers. This externality leads to a new connection between the profit-maximizing prices for the two types of consumers, and it interacts with the network effects across consumers and sellers.

Solving the simultaneous equations gives the best responses of the consumer-side prices to the price for sellers in equilibrium:

$$p_H^*(f^*) = \frac{2(1+\beta_H) + \gamma(1+\beta_L)}{4+4\gamma-\gamma^2} - \frac{2+3\gamma-\gamma^2}{4+4\gamma-\gamma^2} f^*, \tag{11}$$

$$p_L^*(f^*) = \frac{\gamma(1+\beta_H) + (2+2\gamma)(1+\beta_L)}{4+4\gamma-\gamma^2} - \frac{2+\gamma-\gamma^2}{4+4\gamma-\gamma^2} f^*. \tag{12}$$

We illustrate the above best response functions vis-à-vis those in the case of no fairness concerns in Figure 1. Generally, the platform needs to reduce the consumer-side prices when increasing the seller-side price, and fairness concerns lead to a larger price reduction for high-type consumers than for low-type consumers. According to our model, when there are no fairness concerns (see the best response functions in (9)), the platform loses sellers once it increases the price for sellers by a unit. Then, the platform charges less to consumers because it needs to have higher consumer participation to compensate for the loss of lower seller participation. This mechanism comes from the cross-side network effects. In this case, the equilibrium prices for high-type consumers $p_H^*(f^*)$ and for low-type consumers $p_L^*(f^*)$ decrease with the same slope (i.e., $\frac{1}{2}$ in (10)). In comparison, with fairness concerns, we find that although both $p_H^*(f^*)$ and $p_L^*(f^*)$ decrease in f^*, the slopes of the functions change. When increasing the price for sellers by a unit, the platform must decrease the price for high-type consumers (see equation (11)) by $\frac{2+3\gamma-\gamma^2}{4+4\gamma-\gamma^2}$ for profit maximization, while the profit-maximizing price for low-type consumers (see equation (12)) decreases by a smaller margin, $\frac{2+\gamma-\gamma^2}{4+4\gamma-\gamma^2}$. The intuition behind this difference is illustrated below.



(a) without fairness concerns (b) with fairness concerns

$f^{\max}$ and $f^{\min}$ are the upper and lower bounds of f^* such that $p_H^* > p_L^*$ on the interior.

Figure 1: Equilibrium prices for the two types of consumers under price discrimination.

In both cases, the prices for consumers must decrease in response to an increase in the price for sellers because of the cross-side network effects. The key difference is that, when there are fairness concerns, the price for high-type consumers must decrease faster in relation to that for low-type consumers. This emerges from the negative demand externality from low-type to high-type consumers. On the one side, lowering low-type consumers' price reinforces high-type consumers' fairness concerns and reduces their participation. As a result, the platform loses seller-side profits due to fewer transactions with high-type consumers. On the other side, lowering high-type consumers' price mitigates their fairness concerns, and this increases their participation. Hence, the platform gains seller-side profits from more transactions with high-type consumers. In general, although the cross-side network effects still motivate the platform to decrease the consumer-side prices when increasing the seller-side price, the price for high-type consumers must decrease more.

Using equations (11) and (12), we derive the following results:

Proposition 2. *The interior equilibrium prices when consumers have fairness concerns satisfy*

$$p_H^*(f^*) - p_L^*(f^*) = \begin{cases} B + Tf^*, & \theta < \theta^{\text{cap}} \\ 0, & \theta \geq \theta^{\text{cap}} \end{cases}, \tag{13}$$

with $B = \frac{(2-\gamma)(1+\beta_H)-(2+\gamma)(1+\beta_L)}{4+4\gamma-\gamma^2} > 0$, $T = -\frac{2\gamma}{4+4\gamma-\gamma^2} < 0$, *and* $\theta^{\text{cap}} = \frac{(3-\gamma)\beta_H-(3+\gamma)\beta_L}{2\gamma} - 2$.

As condition (I) holds, there is a unique interior equilibrium with price discrimination or uniform pricing on the consumer side. The related proof is presented in Appendix A.2. The proposition implies that consumers' fairness concerns induce a trade-off between the consumer-side price difference and the price for sellers, significantly different from the case of no fairness concerns. As discussed previously, this trade-off is rooted in the new demand externality from low-type to high-type consumers.[13]

In addition, the exogenous profit potential on the seller side affects how the trade-off exhibits. When $\theta < \theta^{\text{cap}}$, the platform's exogenous seller-side profit potential is low enough relative to the profitability of price discrimination on the consumer side. In this case, the platform optimally price-discriminates across consumers and trades off the consumer-side price gap against the seller-side price.[14] $\theta \geq \theta^{\text{cap}}$ implies that the platform's exogenous seller-side profit potential is high enough in relation to the profitability of price discrimination among consumers. In this case, the platform charges a high price to sellers and maximizes its transaction base by maintaining uniform pricing on the consumer side, implying that the above trade-off tips fully toward mitigating price discrimination. Here, the platform has no incentive to further reduce the price difference on the consumer side. Because high-type consumers are not happy with a price difference such that $p_H < p_L$ (i.e., $M(p_H, p_L)$ is bounded below by 0), deviating from uniform pricing toward a negative price difference cannot attract additional high-type consumers by alleviating fairness concerns.

[13] $T < 0$ is only subject to the parameter of fairness concerns γ.

[14] Note that there is no way to increase consumer-side prices (but reducing the price difference) in response to a higher price on the seller side. For $\gamma \in (0, 1)$, the negative demand externality from low-type to high-type consumers cannot fully offset the cross-side network effects on the demand of low-type consumers.

4.3 Comparative statics in equilibrium

Following the above analysis, we perform a comparative static analysis with respect to the exogenous seller-side profit potential and derive the following result.

Proposition 3. *For $\theta < \theta^{\text{cap}}$, the interior equilibrium consumer-side prices satisfy $\frac{\partial(p_H^* - p_L^*)}{\partial\theta} = 0$ when consumers have no fairness concerns, while $\frac{\partial(p_H^* - p_L^*)}{\partial\theta} < 0$ when consumers have fairness concerns.*

We present the proof in Appendix A.3. As the seller side becomes more profitable for the platform, fairness concerns induce it to reduce price differences among consumers. This continues until, if the seller side becomes profitable enough ($\theta \geq \theta^{\text{cap}}$), the platform stops to price-discriminate among consumers altogether. Given the cross-side trade-off illustrated in Proposition 2, when the platform can earn more from sellers, both price levels and price difference on the consumer side decrease, reinforcing that the platform wants to boost the consumer-side participation to extract more profits from sellers.

With respect to exogenous features on the consumer side, we derive the following results.

Proposition 4. *For $\theta < \theta^{\text{cap}}$, the interior equilibrium consumer-side prices satisfy $\frac{\partial(p_H^* - p_L^*)}{\partial\beta_H} > 0$ and $\frac{\partial(p_H^* - p_L^*)}{\partial\beta_L} < 0$ regardless of the presence of fairness concerns.*

The proof is presented in Appendix A.4. This proposition implies that the platform price-discriminates more among consumers when the profit potential of charging high-type consumers more is higher (i.e., a higher β_H relative to β_L). For both cases with and without fairness concerns, a higher β_H relative to β_L directly drives the platform to increase the price for high-type consumers in relation to that for low-type consumers (i.e., a higher B). As a relatively high price is charged to high-type consumers, the platform reduces the price for sellers f^* to attract more sellers and to boost more transactions between sellers and high-type consumers. In the presence of fairness concerns, it further increases the consumer-side price difference through the cross-side trade-off (i.e., Tf^* increases as f^* decreases given $T < 0$).

Proposition 5. *For $\theta < \theta^{\text{cap}}$, the interior equilibrium consumer-side prices when consumers have fairness concerns satisfy* $\frac{\partial(p_H^* - p_L^*)}{\partial\gamma} < 0$.

The proof is presented in Appendix A.5. As high-type consumers' aversion to pricing unfairness strengthens (i.e., a greater γ), the demand externality from low-type to high-type consumers increases. This drives the platform to decrease p_H^* and increase p_L^* (i.e., a smaller B), while the decrease in p_H^* is stronger than the increase in p_L^* (see equations (6) and (7)), implying a higher overall participation on the consumer side. This effect is not subject to the seller side. In addition, a greater γ also strengthens the trade-off between the consumer-side price difference and the seller-side price (i.e., a smaller T), and a higher consumer-side demand motivates the platform to charge a higher price to sellers (i.e., a higher f^*). Hence, the consumer-side price difference further reduces.

4.4 Discussion and application

Price discrimination and seller-side features (Propositions 2 and 3). Suppose that there are two online platforms with similar consumer-side features but different attitudes toward fairness concerns. The difference in θ between the two platforms constitutes a key to explaining why one tends to soften price discrimination in response to consumers' fairness concerns, while the other does not.

Food delivery platforms (e.g., Uber Eats and Takeaway.com). Uber Eats is a dominant food delivery platform in many regions. As accused by U.S. lawmakers, Uber Eats tailors prices for consumers regardless of people's complaints.[15] Takeaway.com, also known as Just Eat, is a food delivery platform that mainly operates in some European countries. In contrast to Uber Eats, Takeaway.com charges a flat rate to all consumers. The platforms are similar on the consumer side because they provide similar services to a large number of heterogeneous

[15] See the details at https://www.restaurantbusinessonline.com/technology/senators-question-uber-eats [Retrieved: Apr. 26, 2026].

consumers, but they are different on the seller side. Uber Eats hosts a wide range of restaurants that offer a wide variety of cuisines. Many of the restaurants are already well-known when listed on the platform. Takeaway.com pays more attention to small businesses. These restaurants need to gain exposure through the platform. Therefore, Uber Eats does not extract so much profit as Takeaway.com from the seller side (i.e., Uber Eats' commission rate for restaurants: 6% for pick-up and about 15%–30% for delivery; Takeaway.com's: about 10% for pick-up and 20%–25% for delivery).[16] Thus, our model predicts—in line with their business practices—that Uber Eats benefits more from price discrimination on the consumer side, while Takeaway.com needs to take fairness concerns more seriously into account to boost consumer demand and extract more profits from sellers.

Online travel agencies (e.g., Expedia and Booking.com). Expedia and Booking.com are both famous OTAs through which travelers can book hotels and other travel services. Expedia takes a leading position in the US, while Booking.com dominates the European market. Of the two platforms, Booking.com price-discriminates among consumers much more strongly than Expedia. According to *TravelScrape*'s investigation, prices change approximately 22% faster on Booking.com than on Expedia within a given period. This implies that Booking.com targets prices to consumers more aggressively than Expedia.[17] Also, as reported by the *Daily Mail*, Booking.com is aloof toward consumers' fairness concerns despite long-lasting complaints.[18] The platforms both provide most sorts of OTA services to mass consumers (travelers) with similar user demographic profiles.[19] Thus, they arguably serve similar types of consumers. By contrast, the two platforms may be different in terms of their attractiveness to sellers. Expedia does better in designing and marketing travel bundle packages (e.g.,

[16] Details about the differences between the platforms can be found at https://www.deliverect.com/en/blog/online-food-delivery/takeaway-com-101-the-essential-guide-for-restaurants and https://www.deliverect.com/en/blog/online-food-delivery/uber-eats-101-the-essential-guide-for-restaurants [Retrieved: May. 12, 2026].

[17] https://www.travelscrape.com/booking-vs-expedia-price-scraping-2025.php [Retrieved: Apr. 26, 2026].

[18] See more details at https://www.dailymail.co.uk/news/article-13928797/holidays-booking-50-cent-laptop-app.html [Retrieved: Apr. 26, 2026].

[19] A user profile comparison can be checked via https://www.similarweb.com/website/booking/vs/expedia [Retrieved: Apr. 26, 2026].

"hotel plus flight") than Booking.com. Travel bundling has been Expedia's core business since the beginning of operations and matured in 2007, while Booking.com started this type of service in 2017. This empowers Expedia with more bargaining power than Booking.com toward individual travel service providers (average rate charged by Expedia: 20%; average rate of Booking.com: 15%–18%),[20] suggesting that the platform relies more on sellers as its profit-generating segment (i.e., a high θ). In line with the prediction using our model, Booking.com relies more on extracting profits from the consumer side and also does more price discrimination.

Price discrimination and consumer-side features (Propositions 4 and 5). The propositions indicate that consumer-side features affect the platform's price discrimination among consumers. For example, consumers' stronger aversion to pricing unfairness drives the platform to reduce the consumer-side price difference. The mechanism also occurs in a one-sided model without cross-side network effects. However, a one-sided model cannot explain well the pricing practices of many online platforms. Recall the case of Booking.com vis-à-vis Expedia. The two platforms should be similar on the consumer side, but the former price-discriminates more among consumers than the latter and relatively ignores fairness concerns. The above-mentioned cross-side trade-off between the consumer-side price difference and the price for sellers can help us to understand the diverse attitudes.

5 Robustness and Extensions

5.1 Advantageous price discrimination

In general, consumers' psychological responses to price differences involve not only how consumers feel about being price-discriminated but also how they feel about taking advantage of price discrimination. As an extension, we now assume that low-type consumers also have

[20] https://www.smartorder.ai/resources/blog/expedia-vs-booking-com-which-one-fits-your-hotel-better/ [Retrieved: Apr. 26, 2026].

fairness concerns, and both types of consumers have reactions when they are charged a lower price than the other type. Accordingly, we extend the demand of i-type consumers ($i, -i \in \{H, L\}$) to a generalized form:

$$D_i^G(p_i, p_{-i}) = 1 + \beta_i - p_i - M_i^G(p_i, p_{-i}), \tag{14}$$

where

$$M_i^G(p_i, p_{-i}) = \begin{cases} \gamma(p_i - p_{-i}), & p_i \geq p_{-i} \\ \eta(p_i - p_{-i}), & p_i < p_{-i} \end{cases}$$

$M_i^G(p_i, p_{-i})$ represents consumers' generalized reactions to price differences. According to the evidence presented by Leibbrandt (2020), when two consumers encounter the same price difference, the low-price consumer psychologically benefits from the price gap, while the high-price consumer bears a psychological loss. Furthermore, the high-price consumer's psychological loss is stronger than the low-price consumer's psychological gain. Hence, we set $\gamma > \eta \geq 0$. Under this configuration, the platform's total profit becomes

$$\Pi^G(p_H, p_L, f) = (p_H + f)D_H^G(p_H, p_L)N(f) + (p_L + f)D_L^G(p_H, p_L)N(f).$$

With the profit function, we get:

Proposition 6. *If consumers have the generalized form of psychological responses to price differences:*

(i) *The interior equilibrium prices such that $p_H > p_L$ satisfy*

$$p_H^*(f^*) - p_L^*(f^*) = B^G + T^G f^*, \tag{15}$$

with $B^G = \frac{(2+\eta-\gamma)(1+\beta_H)-(2-\eta+\gamma)(1+\beta_L)}{4+4\gamma+4\eta-2\gamma\eta-\gamma^2-\eta^2} > 0$, *and* $T^G = -\frac{2(\gamma-\eta)}{4+4\gamma+4\eta-2\gamma\eta-\gamma^2-\eta^2} < 0$.

(ii) $T < T^G$.

Supplementary Material S.1 presents the proof. This proposition implies that the trade-off between consumer-side price difference and the price for sellers holds as in Proposition 2 but becomes weaker. With $\gamma > \eta$, the negative demand externality from low-type to high-type consumers still exists but weakens. Increasing the price for sellers still reduces the price difference on the consumer side (i.e., $T^G < 0$), but the effect is smaller (i.e., $T < T^G$).

While we analyze consumers' generalized psychological responses here, it should be noted that there is no common conclusion on whether consumers would enhance their participation on a platform in response to advantageous price discrimination. As indicated by studies such as Wiggin and Yalch (2015), consumers may tend to attribute a favorable service outcome to themselves rather than to service providers (i.e., the fundamental attribution error).

5.2 Consumer composition

Until now, we have assumed that the mass of each type of consumer is 1. This implies that the proportions of high-type and low-type consumers are the same. However, in reality, the proportions may be different. Changing the proportions of the two types can affect the effect of consumers' fairness concerns on the platform's price discrimination.

To analyze the impact of changing consumer composition, we assume mass 2λ of high-type consumers and mass $2(1-\lambda)$ of low-type consumers where $\lambda \in (0,1)$. Hence, the price offers observed by the two types of consumers do not have the same proportion. The platform's total profit is thus given by

$$\widetilde{\Pi}(p_H, p_L, f) = \frac{2\mu}{1+\mu}(p_H + f)\widetilde{D_H}(p_H, p_L)N(f) + \frac{2}{1+\mu}(p_L + f)D_L(p_L)N(f),$$

where $\mu = \frac{\lambda}{1-\lambda} \in (0, +\infty)$ is the proportion of high-type to low-type consumers. With the profit function, we derive the following results:

Proposition 7. *Assuming that the proportions of the two types of consumers can change:*

(i) *The interior equilibrium prices such that $p_H > p_L$ satisfy*

$$p_H^*(f^*) - p_L^*(f^*) = \widetilde{B} + \widetilde{T} f^*, \tag{16}$$

with $\widetilde{B} = \frac{(2-\mu\gamma)(1+\beta_H)-(2+\gamma)(1+\beta_L)}{4+4\gamma-\mu\gamma^2} > 0$ *and* $\widetilde{T} = -\frac{(1+\mu)\gamma}{4+4\gamma-\mu\gamma^2} < 0$.

(ii) $\widetilde{T}$ *decreases in* μ.

The proof is presented in Supplementary Material S.2. This proposition shows that the trade-off between the price difference on the consumer side and the price for sellers is similar to that in Proposition 2. In this case, the trade-off strengthens as the proportion of high-type consumers (μ) increases. A larger weight to high-type rather than low-type consumers makes it more profitable to attract the former. This strengthens the demand externality from low-type to high-type consumers.

The above results are specific to a setup in which γ is exogenous to μ. One may argue that consumers feel more unhappy with a discriminatory price as more peers get a preferential price. Given the theory of fraternal relative deprivation (see Runciman, 1966), γ may still be constant in μ for $\mu < 1$ because high-type consumers' aversion to pricing unfairness should change little as long as they identify themselves as the disadvantaged minority. This implies that Proposition 7 can apply to price-tailoring practices with respect to many typical consumer characteristics, such as loyalty and income. High-willingness-to-pay consumers are usually in the minority for monopoly platforms that exert these practices in a mature market.

When high-type consumers are not in the minority (i.e., $\mu \geq 1$), γ may decrease in μ. In this case, an increase in μ not only adds weight to high-type consumers, but also weakens their aversion to pricing unfairness. This implies both a positive and a negative effect on the demand externality from low-type to high-type consumers. As a result, the cross-side trade-off does not necessarily strengthen with μ when the share of high-type consumers becomes very large. We discuss in detail this special case (i.e., endogenous γ to μ) in Supplementary Material S.3.

Discussion and application. Proposition 7 can explain how a single platform's attitude toward consumers' fairness concerns changes over time.

Food delivery platforms (e.g., Meituan). Meituan is another interesting case in the food delivery market. As the dominant player in China, the platform's attitude toward consumers' fairness concerns when implementing price discrimination has changed over time. Although there were already many complaints before 2020 about unfair pricing for loyal customers, Meituan kept silent in general.[21] In 2020, the size of loyal members of Meituan tripled during the COVID-19 pandemic,[22] and the platform started to respond to customers' unfairness complaints.[23] The Meituan case coincides with the intuition of Proposition 7. As the share of loyal consumers (i.e., consumers with relatively high willingness to pay) increased but remained a minority, the platform was motivated to weigh consumers' fairness concerns more when deciding the consumer-side price difference.

5.3 Seller-side price discrimination

In addition to consumer-side price discrimination, we further study the influence of seller-side price discrimination on our core mechanism in this subsection. Suppose that there are high-type (H) and low-type (L) sellers on the market. We assume that the exogenous per-transaction payoff of the two types of sellers is independently and uniformly distributed over the support $[\theta_i, \theta_i + 1]$, where $i \in \{H, L\}$ and $\theta_H > \theta_L > 0$. Their (interior) demands are

$$N_H(f_H) = \frac{1}{2}(1 + \theta_H - f_H), \tag{17}$$

$$N_L(f_L) = \frac{1}{2}(1 + \theta_L - f_L), \tag{18}$$

[21] See some cases at https://awards.concurrences.com/IMG/pdf/algorithmic-price-discrimination-on-online-platforms-and-antitrust-enforcement-in-china-s-digital-economy.pdf [Retrieved: Apr. 26, 2026].

[22] See the details at https://media-meituan.todayir.com/20210419080003177397222495-tc.pdf [Retrieved: Apr. 26, 2026]. Note that Meituan's loyal members has not exceeded 20% of its total customer base to date.

[23] See the details at https://www.caixinglobal.com/trending-in-china-taking-advantage-of-loyal-customers-the-hinese-concept-of-shashu-goes-viral-101641478.html [Retrieved: Oct. 8, 2025].

where f_H and f_L are the prices for the two types of sellers, and the multiplier $\frac{1}{2}$ is introduced to make this model comparable to the benchmark. We assume no fairness concerns on the seller side. As mentioned at the end of Section 3, sellers decide whether to transact according to predetermined prices and charging rules. Their decisions should not involve psychologies such as fairness concerns. In behavioral economics, it is common to set fairness concerns as a feature of consumers but not sellers (e.g., Ho and Su, 2009).

We still keep the demands of the two types of consumers and take the matching process between individual consumers and individual sellers as given. The platform's total profit is given by

$$\begin{aligned}\widehat{\pi}(p_H, p_L, f_H, f_L) =& \frac{1}{2}[(p_H + f_H)D_H(p_H, p_L) + (p_L + f_H)D_L(p_L)]N_H(f_H) + \\ & \frac{1}{2}[(p_H + f_L)D_H(p_H, p_L) + (p_L + f_L)D_L(p_L)]N_L(f_L).\end{aligned}$$

With the profit function, we derive the following result:

Lemma 3. *If the platform can price-discriminate on the seller side, the interior equilibrium prices such that $f_H > f_L$ satisfy*

$$f_H^*(f^*) - f_L^*(f^*) = \frac{\theta_H - \theta_L}{2}, \tag{19}$$

which is strictly positive and independent of p_H^* and p_L^* for a constant $\theta_H - \theta_L$.

The proof is presented in Supplementary Material S.4. This result implies that the equilibrium seller-side price difference does not depend on the cross-side network effects, and the seller-side prices vary subject to a constant willingness-to-pay premium. With this result, we derive a mechanism the same as in Proposition 2:

Proposition 8. *If the platform can price-discriminate on the seller side, the interior equilibrium prices such that $p_H > p_L$ satisfy*

$$p_H^*(\bar{f}^*) - p_L^*(\bar{f}^*) = \widehat{B} + \widehat{T}\bar{f}^*, \quad (20)$$

with $\bar{f}^* = \frac{(1+\theta_H - f_H^*)f_H^* + (1+\theta_L - f_L^*)f_L^*}{(1+\theta_H - f_H^*) + (1+\theta_L - f_L^*)}$, $\widehat{B} = B = \frac{(2-\gamma)(1+\beta_H)-(2+\gamma)(1+\beta_L)}{4+4\gamma-\gamma^2} > 0$, *and* $\widehat{T} = T = -\frac{2\gamma}{4+4\gamma-\gamma^2} < 0$.

The proof is also presented in Supplementary Material S.4. This proposition implies that the platform trades off the price difference on the consumer side against the average price on the seller side, instead of the single seller-side price in the situation of no seller-side price discrimination. Nevertheless, the intercept and slope of the trade-off relationship are the same as in (13). For constant θ_H and θ_L, seller-side price discrimination makes no difference to the properties regarding the equilibrium consumer-side price difference.

6 Policy Relevance

Mandatory uniform pricing and pricing unfairness aversion. Some policy makers may want to address pricing unfairness complaints by eliminating price tailoring (e.g., the *One Fair Price Package* proposed by several US senators)[24]. Supplementary Figure S1 compares the total surplus and the surplus of each agent group under uniform pricing and price discrimination (with respect to the same γ in both cases). The results show that uniform pricing always performs better on the total surplus than price discrimination with consumers' fairness concerns in our setup. However, this does not imply that banning price discrimination is beneficial to all market participants in all situations. The shift from price discrimination to uniform pricing improves the total surplus by increasing the surplus of high-type consumers in sacrifice of the surplus of other agent groups. In addition, we show that consumers' fairness concerns make a monopoly platform trade off the price difference on the consumer side against the price for sellers. When consumers' aversion to pricing unfairness is strong enough, the platform would choose to maintain uniform pricing without

[24]See https://www.congress.gov/bill/119th-congress/senate-bill/3387/text [Retrieved: May 10, 2026].

external interventions. This implies that banning price discrimination, as an aggressive and controversial non-market regulation (Elegido, 2011), might be unnecessary in some cases.

Transparency. Transparency is a crucial pillar of regulatory practices such as the *Digital Services Act* (Kossow et al., 2023). If non-transparent pricing is allowed, online platforms can tailor prices, but consumers cannot observe price differences. In Supplementary Figure S2, to capture transparent versus non-transparent pricing, we compare the surplus when consumers cannot see $p_H - p_L$ and the surplus when they can see the price difference (with the same γ).[25] If an online platform completely avoids triggering fairness concerns when price-discriminating among consumers, there can be a larger price gap, while the total surplus, as well as total consumer surplus, is higher. In this sense, non-transparent price discrimination can lead to an increase in the total surplus. This coincides with the evidence revealed by Ater and Avishay-Rizi (2022). Their results suggest that making price differences transparent can trigger consumers' fairness concerns and induce platforms to reduce the price difference, but the increase resulting from a smaller price difference may not be large enough to offset the disutility caused by perceived pricing unfairness. Transparency and no deception are often viewed as morally desirable, but we highlight a conflict between transparency and welfare. Regulators should consider carefully whether it is normatively good to allow online platforms to make price differences non-transparent, given the possible economic benefits to consumers.

7 Conclusion

In this paper, we introduce consumers' fairness concerns into a two-sided model, where two types of consumers have different willingness to pay. We study how a monopoly platform responds to consumers' complaints about pricing unfairness. The main result is that

[25] Consumers are unlikely to anticipate pricing unfairness when they have not observed price differences, even if price tailoring practices are already widespread. See the survey by European Commission (2018) for some evidence.

the presence of consumers' fairness concerns causes the monopoly platform to trade off price-discriminating high-type consumers more against raising the price for the sellers. The platform's decision on whether to mitigate price discrimination in response to consumers' fairness concerns depends not only on the consumer-side conditions but also on the profit the platform can earn from the seller side. The results of our model can address the puzzle of whether online platform giants mitigate price discrimination in response to consumers' complaints about pricing unfairness within extensive contexts.

This paper does not discuss the effect of competition. According to OECD Secretariat (2018) and Rott et al. (2022), a huge number of online platforms—no matter whether they are in monopoly or in competing markets—have implemented price discrimination without losing market share. Liu and Serfes (2013) show that price discrimination may weaken competition in the presence of cross-side network effects. This implies that even if a platform exerts price discrimination, consumers may not turn to competing platforms. Also, with the presence of network effects and low marginal costs, it is not surprising that a market is dominated by only a few large players in the platform economy (Rysman, 2009). In this case, the platform giants might have incentives to collude with each other in both a horizontally differentiated market (Lefouili and Pinho, 2020) and a non-differentiated market (Peitz and Samkharadze, 2022). Recent studies like Calvano et al. (2020) even argue that when AI algorithms are separately used to tailor prices in online marketplaces, the algorithms may learn to charge supracompetitive prices and collude without communication. In general, competition may not suffice to explain why online platforms respond differently to consumers' fairness concerns in price discrimination.

Although we can learn several lessons from the model, it still has some limitations. The assumption that consumers can fully observe the difference between the prices for the two types of consumers may be too strong. The invisibility of personalized pricing can be a stumbling block for consumers to react to pricing unfairness (OECD Secretariat, 2018), and online platforms are using obfuscation strategies to hide price discrimination. A direction for future research is thus to investigate how platforms design obfuscation strategies to avoid consumers' fairness concerns. Another limitation is that the model does not account for sophisticated consumers who understand how price discrimination works. Such consumers may strategically conceal their information and behave as if they were more price sensitive when interacting with the platform. Exploring how pricing changes when sophisticated consumers are involved would be another direction for future research.

References

Akerlof, George A. (1982) "Labor contracts as partial gift exchange," *The Quarterly Journal of Economics*, 97 (4), 543–569.

Ater, Itai and Or Avishay-Rizi (2022) "Price saliency and fairness: evidence from regulatory shaming," CEPR Discussion Papers 17156, https://EconPapers.repec.org/RePEc:cpr:ceprdp:17156.

Belleflamme, Paul and Martin Peitz (2025) "Network Goods, Price Discrimination, and Two-Sided Platforms," *Journal of Institutional and Theoretical Economics (JITE)*, 181 (2), 270–297.

Binns, Reuben, Jake Stein, Siddhartha Datta, Max Van Kleek, and Nigel Shadbolt (2025) "Not Even Nice Work If You Can Get It; A Longitudinal Study of Uber's Algorithmic Pay and Pricing," in *Proceedings of the 2025 ACM Conference on Fairness, Accountability, and Transparency*, FAccT '25, 1484–1497, New York, NY, USA: Association for Computing Machinery, 10.1145/3715275.3732099.

Cabral, Luís (2019) "Towards a theory of platform dynamics," *Journal of Economics & Management Strategy*, 28 (1), 60–72.

Calvano, Emilio, Giacomo Calzolari, Vincenzo Denicolo, and Sergio Pastorello (2020) "Artificial intelligence, algorithmic pricing, and collusion," *American Economic Review*, 110 (10), 3267–3297.

Cappelen, Alexander and Bertil Tungodden eds. (2019) *The Economics of Fairness*: Edward Elgar Publishing, https://EconPapers.repec.org/RePEc:elg:eebook:17123.

Carroni, Elias (2018) "Behaviour-based price discrimination with cross-group externalities," *Journal of Economics*, 125 (2), 137–157.

Cohen, Maxime C, Adam N Elmachtoub, and Xiao Lei (2022) "Price discrimination with fairness constraints," *Management Science*, 68 (12), 8536–8552.

de Cornière, Alexandre, Andrea Mantovani, and Shiva Shekhar (2024) "Third-degree price discrimination in two-sided markets," *Management Science*, 10.1287/mnsc.2023.02788.

Elegido, Juan M (2011) "The ethics of price discrimination," *Business Ethics Quarterly*, 21 (4), 633–660.

European Commission (2018) "Consumer market study on online market segmentation through personalised pricing/offers in the European Union," final report, European Commission, https://commission.europa.eu/document/download/f6bae041-4ee7-443c-ad7b-f51f4ac14e10_en?filename=synthesis_report_online_personalisation_study_final.pdf.

Fehr, Ernst, Georg Kirchsteiger, and Arno Riedl (1993) "Does fairness prevent market clearing? An experimental investigation," *The Quarterly Journal of Economics*, 108 (2), 437–459.

Fehr, Ernst and Klaus M Schmidt (1999) "A theory of fairness, competition, and cooperation," *The Quarterly Journal of Economics*, 114 (3), 817–868.

Ho, Teck-Hua and Xuanming Su (2009) "Peer-induced fairness in games," *American Economic Review*, 99 (5), 2022–2049.

Jeon, Doh-Shin, Byung-Cheol Kim, and Domenico Menicucci (2022) "Second-degree price discrimination by a two-sided monopoly platform," *American Economic Journal: Microeconomics*, 14 (2), 322–369.

Johnen, Johannes and Robert Somogyi (2024) "Deceptive features on platforms," *The Economic Journal*, 134 (662), 2470–2493.

Jullien, Bruno, Alessandro Pavan, and Marc Rysman (2021) "Two-sided markets, pricing, and network effects," in Ho, Kate, Ali Hortaçsu, and Alessandro Lizzeri eds. *Handbook of Industrial Organization, Volume 4*, 485–592: Elsevier, 10.1016/bs.hesind.2021.11.007.

Kossow, Niklas, Svea Windwehr, and Matthew Jenkins (2023) *Algorithmic Transparency and Accountability of Digital Services*: European Audiovisual Observatory, https://rm.coe.int/iris-special-2023-02en/1680aeda48.

Lam, Wing Man Wynne (2017) "Switching costs in two-sided markets," *Journal of Industrial Economics*, 65 (1), 136–182.

Lefouili, Yassine and Joana Pinho (2020) "Collusion between two-sided platforms," *International Journal of Industrial Organization*, 72, https://doi.org/10.1016/j.ijindorg.2020.102656.

Leibbrandt, Andreas (2020) "Behavioral constraints on price discrimination: Experimental evidence on pricing and customer antagonism," *European Economic Review*, 121 (C), 10.1016/j.euroecorev.2019.103303.

Liu, Qihong and Konstantinos Serfes (2013) "Price discrimination in two-sided markets," *Journal of Economics & Management Strategy*, 22 (4), 768–786.

OECD Secretariat (2018) "Personalised Pricing in the Digital Era," Background Note by the Secretariat, OECD, https://one.oecd.org/document/DAF/COMP(2018)13.

Peitz, Martin and Lily Samkharadze (2022) "Collusion between non-differentiated two-sided platforms," *Economics Letters*, 215, https://doi.org/10.1016/j.econlet.2022.110506.

Reisinger, Markus (2014) "Two-part tariff competition between two-sided platforms," *European Economic Review*, 68 (C), 168–180.

Richards, Timothy J., Jura Liaukonyte, and Nadia A. Streletskaya (2016) "Personalized pricing and price fairness," *International Journal of Industrial Organization*, 44, 138–153.

Rochet, Jean-Charles and Jean Tirole (2003) "Platform competition in two-sided markets," *Journal of the European Economic Association*, 1 (4), 990–1029.

——— (2006) "Two-sided markets: a progress report," *The RAND Journal of Economics*, 37 (3), 645–667.

Rotemberg, Julio J (2011) "Fair pricing," *Journal of the European Economic Association*, 9 (5), 952–981.

Rott, Peter, Joanna Strycharz, and Frank Alleweldt (2022) "Personalised Pricing," Study Requested by Committee on Internal Market and Consumer Protection, Policy Department for Economic, Scientific and Quality of Life Policies at the European Parliament, https://www.europarl.europa.eu/thinktank/en/document/IPOL_STU(2022)734008.

Runciman, W.G. (1966) *Relative Deprivation and Social Justice: A Study of Attitudes to Social Inequality in Twentieth-century England*, Reports of the Institute of Community Studies: University of California Press, https://books.google.be/books?id=1OfEAAAAIAAJ.

Rysman, Marc (2009) "The economics of two-sided markets," *Journal of Economic Perspectives*, 23 (3), 125–143.

Shiller, Benjamin Reed (2020) "Approximating purchase propensities and reservation prices from broad consumer tracking," *International Economic Review*, 61 (2), 847–870.

Wiggin, Kyra L and Richard F Yalch (2015) "Whose fault is it? Effects of relational self-views and outcome counterfactuals on self-serving attribution biases following brand policy changes," *Journal of Consumer Psychology*, 25 (3), 459–472.

Ying, Tianyu, Biyue Zhou, Shun Ye, Shihan David Ma, and Xiaoyuan Tan (2024) "Oops, the price changed! Examining tourists' attribution patterns and blame towards pricing dynamics," *Tourism Management*, 103, https://doi.org/10.1016/j.tourman.2024.104890.

Appendix A.1 Proof of Lemma 1

For all feasible (p_H, p_L, f) such that $p_H < p_L$, the fairness concerns term M is equal to 0. Given the first-order conditions (6) and (7), the equilibrium prices on the interior must satisfy

$$p_H^* = \frac{1 + \beta_H - f^*}{2} \quad \text{and} \quad p_L^* = \frac{1 + \beta_L - f^*}{2}.$$

Since $\beta_H > \beta_L$, we must have $p_L^* > p_H^*$, which contradicts $p_H < p_L$. Thus, the equilibrium prices must satisfy $p_H^* \geq p_L^*$ on the interior.

For the potential corner solution at $D_L = 1$, we have $p_L = \beta_L$. The derivatives of the profit function with respect to p_L satisfies

$$\frac{\partial \Pi}{\partial p_L} < 0 \Leftrightarrow 1 - \beta_L - f < 0.$$

The first-order derivative of the profit function with respect to p_H is

$$\frac{\partial \pi}{\partial p_H} = 1 + \beta_H - 2p_H - f < 1 - \beta_H - f < 1 - \beta_L - f < 0.$$

This implies that there must be $p_H = \beta_H > \beta_L = p_L$, contradicting $p_H < p_L$. For the potential corner solution at $D_H = 1$, $p_H = \beta_H$. From the first derivative of the profit function with respect to p_H, we get

$$\frac{\partial \pi}{\partial p_H} = 1 - \beta_H - f < 0,$$

which implies $-f < \beta_H - 1$. Plugging the relationship into the first-order derivatives of the profit function with respect to p_L, we get

$$p_L = \frac{1 + \beta_L - f}{2} < \frac{\beta_L + \beta_H}{2} < p_H.$$

In summary, a pricing strategy such that $p_H < p_L$ cannot be an equilibrium.

Appendix A.2 Proof of Propositions 1 and 2

Recall the first-order conditions:

$$\frac{\partial \pi}{\partial p_H} = D_H - (1+\gamma)(p_H + f) = 0,$$

$$\frac{\partial \pi}{\partial p_L} = (1+\gamma)(p_H + f) + D_L - (p_L + f) = 0,$$

$$\frac{\partial \pi}{\partial f} = [N(f) - p_H - f]D_H + [N(f) - p_L - f]D_L = 0.$$

First, it is easy to get $\frac{\partial \pi}{\partial p_H} < 0$ when $D_H = 0$, $\frac{\partial \pi}{\partial p_L} < 0$ when $D_L = 0$, and $\frac{\partial \pi}{\partial f} < 0$ when $N = 0$. Therefore, pricing strategies that exclude all agent groups cannot be an equilibrium.

Second, we prove that $D_H < 1$ is a sufficient condition for $N < 1$ and $D_L < 1$.

If $D_L = 1$, then $p_L = \beta_L$. The first-order derivatives of the profit function with respect to p_L satisfies

$$\frac{\partial \pi}{\partial p_L} = (1+\gamma)(p_H + f) + 1 - (\beta_L + f) < 0$$

for all $f \in [\theta, \theta + 1]$. Because $0 < N(f) \leq 1$, we have

$$N - \beta_L - f \leq 1 - \beta_L - f < (1+\gamma)(p_H + f) + 1 - (\beta_L + f) < 0.$$

As $p_H \geq p_L$, we have

$$N - p_H - f < N - \beta_L - f < 0.$$

Since $D_H > 0$, the first-order derivatives of the profit function with respect to f satisfies

$$\frac{\partial \pi}{\partial f} = [N(f) - p_H - f]D_H + [N(f) - \beta_L - f] < 0$$

for all feasible f. Therefore, $D_L = 1$ is a sufficient condition for $N = 1$. By contrapositive, we have $N < 1$ implies that $D_L < 1$.

If $N = 1$, then $f = \theta$. The first-order derivatives of the profit function with respect to f satisfies

$$\frac{\partial \pi}{\partial f} = (1 - p_H - \theta)D_H + (1 - p_L - \theta)D_L < 0.$$

Together with $p_H \geq p_L$, $D_H \geq 0$, and $D_L \geq 0$, we have $1 - p_H - \theta < 0$ holds for all feasible p_H. Because $D_H \leq 1$, the first-order derivatives of the profit function with respect to p_H satisfies

$$\frac{\partial \pi}{\partial p_H} = D_H - (1 + \gamma)(p_H + f) < 1 - (p_H + f) < 0$$

for all $p_H \in [\beta_H, \beta_H + 1]$. Thus, $N = 1$ is a sufficient condition for $D_H = 1$. By contrapositive, $D_H < 1$ implies $N < 1$. In summary, $D_H < 1$ implies $N < 1$ and $D_L < 1$. In other words, for all feasible pricing strategies, if p_H^* is interior, p_L^* and f^* must be interior.

Third, we prove that the equilibrium pricing strategy must be interior, if condition (I) holds. Recall the condition:

$$\beta_H + \beta_L + \theta < \frac{1-\gamma}{1+\gamma} \quad \text{and} \quad \frac{1-\gamma}{2}\beta_H < \beta_L.$$

The inequalities jointly imply that

$$2\beta_H + (\gamma - 1)\beta_L + (1 + \gamma)\theta < 2 - 2\gamma. \tag{A1}$$

Supposing $D_H = 1$, $p_H = p_H^{\min} = \frac{\beta_H + \gamma p_L}{1+\gamma}$. The first-order derivatives of the profit function with respect to p_H is

$$\frac{\partial \pi}{\partial p_H} = 1 - \beta_H - \gamma p_L - (1 + \gamma) f. \tag{A2}$$

We then prove that for all feasible pricing strategies such that $D_H = 1$, $\frac{\partial \pi}{\partial p_H} > 0$.

Case (i). $D_H = 1$, $D_L < 1$, and $N < 1$.

In this case, $p_L \geq \beta_L$. The FOC with respect to f implies

$$f = \frac{1+\theta}{2} - \frac{p_H^{\min} + p_L D_L}{2(1 + D_L)} < \frac{1 + \theta - p_L}{2}. \tag{A3}$$

Together with (A2), we get

$$\frac{\partial \pi}{\partial p_H} > 1 - \beta_H - (\frac{\gamma - 1}{2})p_L - (1+\gamma)\frac{1+\theta}{2}.$$

Since $D_L < 1$, $p_L \geq \beta_L$. Together with inequality (A1) and $\gamma - 1 < 0$, we have

$$\frac{\partial \pi}{\partial p_H} > 1 - \beta_H - (\frac{\gamma - 1}{2})p_L - (1+\gamma)\frac{1+\theta}{2} > 1 - \beta_H - (\frac{\gamma - 1}{2})\beta_L - (1+\gamma)\frac{1+\theta}{2} > 0.$$

Case (ii). $D_H = 1$, $D_L < 1$, and $N = 1$.

In this case, we have $f = \theta$ and $p_L \geq \beta_L$. From the first-order condition with respect to p_L, we have

$$p_L = \frac{1 + \beta_L - \theta}{2}.$$

Plugging the equation into (A2), we have

$$\frac{\partial \pi}{\partial p_H} = 1 - \beta_H - \frac{\gamma}{2}(1+\beta_L) - (1 + \frac{\gamma}{2})\theta.$$

Together with inequality (A1), we get $\frac{\partial \pi}{\partial p_H} > 0$, when $p_H = p_H^{\min}$.

Case (iii). $D_H = 1$, $D_L = 1$, and $N = 1$.

In this case, $p_L = \beta_L$ and $f = \theta$. Hence, we have

$$\frac{\partial \pi}{\partial p_H} = 1 - \beta_H - \gamma\beta_L - (1+\gamma)\theta.$$

With inequality A1, we get

$$\beta_H + \gamma\beta_L + (1+\gamma)\theta < (1+\gamma)(\beta_H + \beta_L + \theta) < 1 - \gamma.$$

Therefore, $\frac{\partial \pi}{\partial p_H} > 0$ when $p_H = p_H^{\min}$.

Finally, we check the uniqueness of the interior equilibrium.

Case (i). $p_H > p_L$.

For $p_H > p_L$, suppose that an interior stationary point (p_H^*, p_L^*, f^*) exists. The Hessian of π can be written as

$$\nabla^2\pi = \begin{bmatrix} \Omega & \zeta \\ \zeta^\top & \rho \end{bmatrix}, \quad \Omega = N(f)\begin{bmatrix} -2(1+\gamma) & \gamma \\ \gamma & -2 \end{bmatrix}, \quad \zeta = N(f)\begin{bmatrix} -(1+\gamma) \\ -1+\gamma \end{bmatrix}, \quad \rho = -2(p_H+p_L+2f).$$

The matrix

$$\begin{bmatrix} -2(1+\gamma) & \gamma \\ \gamma & -2 \end{bmatrix}$$

has trace $-4-2\gamma < 0$ and determinant $4(1+\gamma)-\gamma^2 > 0$ for all $\gamma \in [0,1)$. Since $N(f) > 0$ interior, $\Omega \prec 0$. The Hessian is negative definite iff the Schur complement satisfies

$$Q_{\text{schur}} = -2(p_H + p_L + 2f) + N(f) \cdot \frac{4(1+\gamma)}{4+4\gamma-\gamma^2} < 0. \tag{A4}$$

Using the two FOCs with respect to the consumer-side prices, we obtain the affine identity

$$p_L + p_H + 2f = \frac{\gamma\beta_H + 3\gamma\beta_L + 2\beta_H + 2\beta_L + 4}{4+4\gamma-\gamma^2} + \frac{4+4\gamma}{4+4\gamma-\gamma^2} f.$$

On the interior seller range $f \in (\theta, \theta+1)$, we have $N(f) = 1+\theta-f$, so Q_{schur} is decreasing in f. Therefore, the maximum value of Q_{schur} occurs at $f = \theta$, where $N(f) = 1$. Substituting Q_{schur} at $f = \theta$,

$$Q_{\text{schur}}(\theta) = -2\left[\frac{(2+\gamma)\beta_H + (2+3\gamma)\beta_L + 4 + 4\gamma}{4+4\gamma-\gamma^2} + \frac{(4+4\gamma)\theta}{4+4\gamma-\gamma^2}\right] + \frac{4+4\gamma}{4+4\gamma-\gamma^2}.$$

Simplifying the equation,

$$Q_{\text{schur}}(\theta) = -2\left[\frac{(2+\gamma)\beta_H + (2+3\gamma)\beta_L}{4+4\gamma-\gamma^2}\right] - \frac{(4+4\gamma)\theta}{4+4\gamma-\gamma^2} - \frac{4+4\gamma}{4+4\gamma-\gamma^2}.$$

Hence, $Q_{\text{schur}}(\theta) < 0$.

Therefore, $Q_{\text{schur}} < 0$ on the entire interior interval, so the Hessian is negative definite. Since $\nabla^2 \pi \prec 0$ on the interior feasible set, π is strictly concave there. Hence, any interior equilibrium is unique and globally optimal.

Case (ii). $p_H = p_L$. This case is not concerned with the equilibrium under $M(p_H, p_L) \equiv 0$.

According to equations (6) through (8), the interior equilibrium prices for the two types of consumers are equal when

$$f^\star > \frac{\beta_H - \beta_L}{\gamma} - \frac{\beta_H + \beta_L + 2}{2} = f^{\text{uniform}}.$$

Therefore, we can only have $p_H^* \geq p_L^*$ when $f^* \leq f^{\text{uniform}}$. We plug the best responses $p_H^*(f^*)$ and $p_L^*(f^*)$ into $\frac{\partial \pi}{\partial f}$ at f^{uniform}:

$$\frac{\partial \pi}{\partial f}\bigg|_{f=f^{\text{uniform}}} = \frac{(\beta_H - \beta_L)\big[\gamma(\beta_H + \beta_L + 2\theta + 4) - 3(\beta_H - \beta_L)\big]}{2\gamma^2}.$$

Because $\beta_H > \beta_L$ and $\gamma > 0$, the denominator and $(\beta_H - \beta_L)$ are both positive. Hence, $\frac{\partial \pi}{\partial f}$ is negative at $f = f^{\text{uniform}}$ when

$$\theta < \frac{(3-\gamma)\beta_H - (3+\gamma)\beta_L}{2\gamma} - 2.$$

Under this condition, for the equilibrium price f^* to be interior, it must be smaller than f^{uniform}, implying $p_H^* > p_L^*$ on the interior.

With the condition, we check the gradient at the kink $p_H = p_L$. At the kink $p_H = p_L = p$, the right- and left-hand gradients with respect to (p_H, p_L, f) are:

$$\nabla^{(+)}\pi = N\big(D_H + (p+f)(-1-\gamma), D_L + (p+f)(-1+\gamma), [N - (p+f)](D_H + D_L)\big),$$
$$\nabla^{(-)}\pi = N\big(D_H + (p+f)(-1), D_L + (p+f)(-1), [N - (p+f)](D_H + D_L)\big).$$

By Clarke's stationarity theorem, a kink optimum exists iff $\mathbf{0} \in \text{co}\{\nabla^{(+)}, \nabla^{(-)}\}$, that is, there exists $\phi \in [0,1]$ such that

$$\phi \nabla^{(+)} \pi + (1-\phi)\nabla^{(-)}\pi = \mathbf{0}.$$

Since $N > 0$, this is equivalent to the system

$$\begin{cases} D_H + (p+f)(-1-\phi\gamma) = 0, \\ D_L + (p+f)(-1+\phi\gamma) = 0, \\ -(p+f)(D_H + D_L) + N(D_H + D_L) = 0. \end{cases}$$

The third equation implies $f = \frac{1+\theta-p}{2}$. Adding the first two equations yields

$$D_H + D_L = 2(p+f) \implies p + f = \frac{D_H + D_L}{2}.$$

Subtracting them gives

$$D_H - D_L = 2\phi\gamma(p+f) = \phi\gamma(D_H + D_L) \implies \phi = \frac{D_H - D_L}{\gamma(D_H + D_L)}.$$

At $p_H = p_L = p$, we have $D_H = 1 + \beta_H - p$ and $D_L = 1 + \beta_L - p$. By substitution and calculation, we get

$$p^* = \frac{1 + \beta_H + \beta_L - \theta}{3} \quad \text{and} \quad f^* = \frac{2 + 4\theta - (\beta_H + \beta_L)}{6}.$$

Hence, we have

$$\phi^* = \frac{3(\beta_H - \beta_L)}{\gamma(4 + \beta_H + \beta_L + 2\theta)}.$$

For a kink optimum to exist, we must have $\phi^* \in [0,1]$. Given $\beta_H > \beta_L \geq 0$ and $\gamma > 0$, it is obvious to see $\phi^* > 0$. Under the condition $\theta \geq \frac{(3-\gamma)\beta_H - (3+\gamma)\beta_L}{2\gamma} - 2$, we have $\phi^* \leq 1$.

In summary, $p_H = p_L$ is either the unique equilibrium or not an interior equilibrium regardless of the conditions in Proposition 1.

Appendix A.3 Proof of Proposition 3

Lemma 2 directly gives that the consumer-side price difference is independent of the seller side in the case of no fairness concerns. Here, we focus on the situation where consumers have fairness concerns. For the unique $(p_H, p_L, f) = (p_H^*, p_L^*, f^*)$ on the interior, we must have

$$\frac{\partial^2 \pi}{\partial f^2} = -2(D_H + D_L) < 0 \quad \text{and} \quad \frac{\partial^2 \pi}{\partial f \partial \theta} = D_H + D_L > 0.$$

By the implicit function theorem, we have

$$\frac{\partial f^*}{\partial \theta} = -\frac{\frac{\partial^2 \pi}{\partial f \partial \theta}}{\frac{\partial^2 \pi}{\partial f^2}} > 0.$$

Hence, the equilibrium price f^* increases in θ. Recalling equation (13) and applying the chain rule give

$$\frac{\partial (p_H^* - p_L^*)}{\partial \theta} = \frac{\partial (p_H^* - p_L^*)}{\partial f^*} \cdot \frac{\partial f^*}{\partial \theta} < 0 \quad \text{for} \quad \gamma > 0.$$

Appendix A.4 Proof of Proposition 4

We first focus on β_L. Taking derivatives of $p_H^* - p_L^*$ (equation (13)) with respect to β_L gives

$$\frac{\partial (p_H^* - p_L^*)}{\partial \beta_L} = -\frac{2+\gamma}{4+4\gamma-\gamma^2} - \frac{2\gamma}{4+4\gamma-\gamma^2} \cdot \frac{\partial f^*}{\partial \beta_L}.$$

By the implicit function theorem, we have

$$\frac{\partial f^*}{\partial \beta_L} = -\frac{\frac{\partial^2 \pi}{\partial f \partial \beta_L}}{\frac{\partial^2 \pi}{\partial f^2}},$$

with

$$\frac{\partial^2 \pi}{\partial f \partial \beta_L} = N - (p_L + f) = 1 + \theta - p_L - 2f.$$

Suppose

$$I_L(f) \equiv (\theta + 1) - [p_L(f) + 2f].$$

Together with equation (13), we have

$$\frac{\partial I_L}{\partial f} = -\frac{6+7\gamma-\gamma^2}{4+4\gamma-\gamma^2} < 0 \quad \text{for} \quad \gamma > 0.$$

Because D_H and D_L increase in f, we have

$$\frac{\partial f^*}{\partial \beta_L} = \frac{I_L}{2(D_H+D_L)} \geq \frac{I_L}{2(D_H+D_L)}\Big|_{f=\theta+1}.$$

By calculation, we get

$$\frac{\partial f^*}{\partial \beta_L}\Big|_{f=\theta+1} + \frac{2+\gamma}{\gamma} = \frac{\beta_H(4+4\gamma)+\beta_L(4+6\gamma+\gamma^2)+\theta(8+10\gamma+\gamma^2)+(16+20\gamma-2\gamma^2)}{2\beta_H\gamma^2+4\beta_H\gamma+6\beta_L\gamma^2+4\beta_L\gamma+8\theta\gamma^2+8\theta\gamma+16\gamma^2+16\gamma}.$$

It is obvious to see that this fraction has both a positive denominator and a positive numerator for $\gamma \in (0,1)$. This implies

$$\frac{\partial(p_H^*-p_L^*)}{\partial \beta_L} = -\frac{2+\gamma}{4+4\gamma-\gamma^2} - \frac{2\gamma}{4+4\gamma-\gamma^2}\cdot\frac{\partial f^*}{\partial \beta_L} < 0.$$

Then, we turn to β_H. Taking derivatives of $p_H^*-p_L^*$ with respect to β_H gives

$$\frac{\partial(p_H^*-p_L^*)}{\partial \beta_H} = \frac{2-\gamma}{4+4\gamma-\gamma^2} - \frac{2\gamma}{4+4\gamma-\gamma^2}\cdot\frac{\partial f^*}{\partial \beta_H}.$$

By the implicit function theorem, we have

$$\frac{\partial f^*}{\partial \beta_H} = -\frac{\frac{\partial^2\pi}{\partial f\partial \beta_H}}{\frac{\partial^2\pi}{\partial f^2}}.$$

With this, we can rewrite derivatives of $p_H^*-p_L^*$ with respect to β_H as

$$\frac{\partial(p_H^*-p_L^*)}{\partial \beta_H} = \frac{2-\gamma}{4+4\gamma-\gamma^2} - \frac{2\gamma}{4+4\gamma-\gamma^2}\cdot\frac{N-(p_H+f)}{2(D_H+D_L)}.$$

Suppose

$$I_H(f) = N-(p_H+f) = 1+\theta-2f-p_H.$$

Together with equation (11),

$$\frac{\partial[N-(p_H+f)]}{\partial f} = -\frac{6+5\gamma-\gamma^2}{4+4\gamma-\gamma^2} < 0. \tag{A5}$$

Because D_H and D_L increases in f, we have

$$\frac{\partial f^*}{\partial \beta_H} = \frac{I_H}{2(D_H+D_L)} \leq \frac{I_H}{2(D_H+D_L)}\Big|_{f=\theta}.$$

By calculation, we get

$$\frac{\partial f^*}{\partial \beta_H}\Big|_{f=\theta} + \frac{\gamma-2}{2\gamma} = \frac{(3\gamma^2-6\gamma-4)\beta_H+(\gamma^3-4\gamma-4)\beta_L+(4\gamma^2-10\gamma-8)\theta+(7\gamma^2-6\gamma-8)}{2\gamma[(3\gamma+2)\beta_H+(\gamma^2+3\gamma+2)\beta_L+(\gamma^2+6\gamma+4)\theta+(\gamma^2+6\gamma+4)]}.$$

It is obvious to see that the denominator is positive, but the numerator is negative for $\gamma \in (0,1)$. This implies

$$\frac{\partial(p_H^*-p_L^*)}{\partial \beta_H} = \frac{2-\gamma}{4+4\gamma-\gamma^2} - \frac{2\gamma}{4+4\gamma-\gamma^2}\cdot\frac{\partial f^*}{\partial \beta_H} > 0.$$

From Lemma 2, it is easy to derive the same comparative static properties in the case of no fairness concerns.

Appendix A.5 Proof of Proposition 5

For the unique $(p_H, p_L, f) = (p_H^*, p_L^*, f^*)$ on the interior, the FOCs with respect to the prices for high-type and low-type consumers (see equations (6) and (7)) give

$$\frac{\partial \Pi}{\partial p_H \partial \gamma} = -(2p_H+f)(1+\theta-f) < 0 \quad \text{and} \quad \frac{\partial \Pi}{\partial p_L \partial \gamma} = (p_H+f)(1+\theta-f) > 0.$$

The results implies that the function $\Pi(p_H, p_L, f)$ is strictly submodular in (p_H, γ) and strictly supermodular in (p_L, γ). Hence, we have the following results:

$$\frac{\partial p_H^*}{\partial \gamma} < 0 \quad \text{and} \quad \frac{\partial p_L^*}{\partial \gamma} > 0,$$

which together imply that $p_H^* - p_L^*$ decreases in γ.