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"Price Parity Clauses and Platform Data Acquisition"

Andreea Enache and Andrew Rhodes

Toulouse School of Economics

Price Parity Clauses and Platform Data Acquisition*

Andreea Enache
Stockholm School of Economics†

Andrew Rhodes
Toulouse School of Economics‡

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Abstract

Many platforms have used a Price Parity Clause (PPC) to prevent sellers charging lower prices on other sales channels. PPCs are often considered anti-competitive and have been banned in some jurisdictions. We provide a novel rationale—centered on how PPCs affect platforms' data acquisition—for why a complete ban on PPCs may harm buyers and sellers.

Keywords: Price Parity Clauses, Platforms, Data, Product Discovery

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†Andreea Enache, Stockholm School of Economics, Sveavägen 65, 11383 Stockholm, Sweden. Email: andreea.enache@hhs.se

‡Corresponding author: Andrew Rhodes, Toulouse School of Economics, Toulouse University Capitole, 1 esplanade de l'université, 31000, Toulouse, France. Email andrew.rhodes@tse-fr.eu

1 Introduction

Online platforms play an important role in helping buyers discover products that they like. Typically platforms use the agency model, whereby sellers choose the price of their product and the platform charges a fee for intermediating the transaction. Over the years, many platforms have enforced a Price Parity Clause (PPC), forbidding sellers from charging less on their own website or other sales channels. Platforms argue that this prevents free-riding, where buyers and sellers use the platform to meet but then transact elsewhere to avoid paying any fees. Nevertheless, PPCs have faced much scrutiny: several European countries have banned them, while the European Union's Digital Markets Act (DMA) outlaws their usage by large "gatekeeper" platforms, and in the U.S. the FTC is investigating whether Amazon has used them.

One common justification for banning PPCs is that they enable platforms to charge higher fees, squeezing sellers and raising prices for consumers. (See, e.g., Edelman and Wright, 2015; Boik and Corts, 2016; Johnson, 2017; Ronayne and Taylor, 2021; Calzada, Manna, and Mantovani, 2022.[1]) Other justifications include that PPCs may lead to adoption of business models that relax competition (Foros, Kind, and Shaffer, 2017), or may encourage socially excessive platform investments (Wang and Wright, 2023). On the other hand, PPCs may ensure platforms are viable (Wang and Wright, 2020) and discourage other behaviors that relax competition (Heresi, 2023).[2]

We provide a new rationale for why a complete ban on PPCs might *harm* buyers and sellers. We consider a parsimonious two-period model, where in each period the platform attempts to match buyers and sellers. After being matched, some buyers are willing to purchase off the platform provided they receive a small discount. The more first-period sales hosted by the platform, the more data it collects, and the better is its matching technology in the second period.[3] We show that seller profit (and in an extension, buyer surplus) can be maximized by a PPC in the first period (a "young" market) followed by no PPC in the second period (a "mature" market). Intuitively, a PPC in the first period enables the platform to squeeze buyers and sellers, but also

[1] However Johansen and Vergé (2017) caution that, when sellers can delist from a platform, whether PPCs lead to higher fees and prices depends on how substitutable are products and sales channels.

[2] See Hagiu and Wright (2024) for other ways that platforms can prevent sales "leakage," and Enache and Rhodes (2025) for how leakage can benefit platforms when buyers make repeat purchases.

[3] See, e.g., Rhodes and Zhou (2024) for a summary of evidence that platforms use data to offer better recommendations.

keeps sales on the platform, leading to higher data collection and thus better matches in the second period. Under certain conditions the latter dominates the former.

2 Model

Consider the following two-period model. In each period there is a (different) unit mass of buyers, and a (different) unit mass of sellers whose marginal costs are normalized to zero. Each buyer "matches" with exactly one seller: she has valuation $v > 0$ for that seller's product, and zero valuation for all other products.[4] Each buyer is ex ante uninformed about which product she matches with, but there is a platform that receives a signal about this: in period $t = 1, 2$, the signal is correct with probability $\lambda_t \in (0, 1)$. The platform informs each buyer about the realization of its signal, and the buyer observes whether she matches with that product.[5] If the buyer does not match, she quits the market (e.g., because finding her matched product on her own is too costly). If the buyer does match, she can buy either on the platform or via the seller's direct channel (e.g., its website). The platform charges sellers a fee τ_t for each transaction it hosts in period $t = 1, 2$; in contrast, it is costless for a seller to sell via its direct channel.

In period $t = 1, 2$ a fraction α_t of buyers are "loyal" to the platform and will only buy there; the remaining fraction $1 - \alpha_t$ are "non-loyal," and are willing to buy via the direct channel but incur a small disutility $\Delta > 0$ from doing so.[6] In each period, each seller sets two prices: p_P on the platform, and p_D on its direct channel. If there is a PPC in a given period, each seller is restricted to set $p_P \leq p_D$.

We assume that λ_2 increases in the volume of first-period sales that occur on the platform. This captures the idea that the platform gleans data from first-period buyers, enabling it to learn about buyer preferences and so offer better second-period product discovery.

The timing is as follows. In each period $t = 1, 2$ the platform sets τ_t and then sellers set prices. The platform informs each buyer about its signal, and buyers who match with the recommended product decide if and where to buy it. The platform has zero

[4]See Chen (2024) for a discussion of this (tractable) way of capturing product differentiation.

[5]Given our modeling assumptions, it is easy to show that the platform strictly prefers to reveal its signal rather than recommend a different product.

[6]We break ties as follows: a buyer purchases when indifferent about doing so, and a non-loyal buyer purchases from the direct channel when indifferent between purchasing there or on the platform. When a seller is indifferent between two prices, it picks the one that is best for the platform.

marginal cost and puts equal weight on payoffs from the two periods.

3 Analysis

Optimal buyer behavior is straightforward. Loyal "matched" buyers purchase on the platform if and only if $p_P \le v$. Non-loyal "matched" buyers purchase on the platform if $p_P \le v$ and $p_P < p_D + \Delta$, purchase via the direct channel if $p_D + \Delta \le v$ and $p_P \ge p_D + \Delta$, and otherwise do not purchase. We now solve for equilibrium in each period.

3.1 Second-period Equilibrium

In the second period the precision λ_2 of the platform's signal is fixed.

First, suppose there is a PPC. Notice that for any $\tau_2 \le v$ set by the platform, sellers optimally charge $p_D \ge p_P = v$ and all matched buyers purchase on the platform, leading to platform profit $\lambda_2 \tau_2$. Hence the platform optimally sets $\tau_2 = v$.[7]

Lemma 1. *Suppose there is a PPC in the second period. The platform sets $\tau_2 = v$ and sellers charge $p_D \ge p_P = v$. Sellers earn zero profit and the platform earns $\lambda_2 v$.*

Lemma 1 shows that when there is a PPC, the platform faces no competition from the direct channel, and so fully extracts all the available surplus $\lambda_2 v$.

Next, suppose there is no PPC. Notice that if the platform sets $\tau_2 \le \Delta$ sellers (weakly) prefer non-loyal buyers to purchase on the platform rather than via the direct channel: the platform's per-transaction fee τ_2 is smaller than the price discount Δ needed to shift sales off the platform. Hence sellers charge $p_P = v$ and $p_D > v - \Delta$, and all matched buyers purchase on the platform, leading to seller profit $\lambda_2(v - \tau_2)$ and platform profit $\lambda_2 \tau_2$. Notice that if instead the platform sets $\tau_2 \in (\Delta, v]$ sellers prefer non-loyal buyers to purchase directly. Hence sellers charge $p_P = v$ and $p_D = v - \Delta$, and of the matched buyers, loyals buy on the platform and non-loyals buy off the platform, leading to seller profit $\lambda_2[\alpha_2(v - \tau_2) + (1 - \alpha_2)(v - \Delta)]$ and platform profit $\lambda_2 \alpha \tau_2$. Clearly for Δ sufficiently small the platform optimally sets $\tau_2 = v$.

[7]Clearly it is strictly dominated for the platform to set $\tau_2 > v$: sellers would price in such a way that no transaction occurred on the platform, so the platform would earn zero profit.

Lemma 2. *Suppose there is no PPC in the second period. If $\Delta > 0$ is sufficiently small the platform sets $\tau_2 = v$ and sellers charge $p_P = v$ and $p_D = v - \Delta$. Sellers earn $\lambda_2(1 - \alpha_2)(v - \Delta)$ and the platform earns $\lambda_2\alpha_2 v$.*

Proof. Platform profit for $\tau_2 \leq \Delta$ (i.e., $\lambda_2\tau_2$) is strictly less than platform profit for $\tau_2 = v$ (i.e., $\lambda_2\alpha_2 v$) provided $\Delta < \alpha_2 v$. □

Lemma 2 shows that when there is no PPC and Δ is sufficiently small, it is too costly for the platform to set a low τ_2 and host all transactions. Instead, the platform sets $\tau_2 = v$ and fully extracts all surplus from loyal matched buyers, while sellers earn profit selling to non-loyal matched buyers off the platform by offering them a Δ discount (i.e., $p_D = p_P - \Delta$).

3.2 First-period Equilibrium

We now turn to the first period. When there is a PPC the equilibrium is the same as in Lemma 1, as are its proof and intuition (which are therefore omitted).[8]

Lemma 3. *Suppose there is a PPC in the first period. The platform sets $\tau_1 = v$ and sellers charge $p_D \geq p_P = v$. Sellers earn zero profit and the platform earns $\lambda_1 v$.*

Now suppose there is no PPC. Let $\underline{\lambda}_2$ and $\overline{\lambda}_2$ denote the precision of the platform's second-period signal when in the first period it sold, respectively, only to loyal matched buyers or to all matched buyers. Let π_2 denote the platform's profit per matched buyer in the second period.[9] Following the same logic behind Lemma 2, if the platform sets $\tau_1 \leq \Delta$, sellers price in such a way that all matched buyers purchase on the platform: the platform collects relatively much data, giving it discounted profit

$$\lambda_1\tau_1 + \overline{\lambda}_2\pi_2. \tag{1}$$

If instead the platform sets $\tau_1 \in (\Delta, v]$, sellers price in such a way that matched non-loyal buyers purchase via the direct channel: the platform collects relatively little data, giving it discounted profit

$$\lambda_1\alpha_1\tau_1 + \underline{\lambda}_2\pi_2. \tag{2}$$

[8] Note that for any $\tau_1 \leq v$ sellers price in such a way that all matched buyers purchase on the platform, so the amount of data is the same, as is the resulting $\lambda_2 = \overline{\lambda}_2$.

[9] From Lemmas 1 and 2, $\pi_2 = v$ if there is a PPC in the second period, and otherwise $\pi_2 = \alpha_2 v$.

Using equations (1) and (2) the platform optimally sets $\tau_1 = \Delta$ or $\tau_1 = v$, and the former is optimal if and only if

$$\lambda_1(\alpha_1 v - \Delta) \leq (\overline{\lambda}_2 - \underline{\lambda}_2)\pi_2. \tag{3}$$

Lemma 4. *Suppose there is no PPC in the first period.*

i) If (3) *holds the platform sets* $\tau_1 = \Delta$ *and sellers charge* $p_P = v$ *and* $p_D > v - \Delta$. *Sellers earn* $\lambda_1(v - \Delta)$ *and the platform earns* $\lambda_1\Delta$ *that period.*

ii) Otherwise the platform sets $\tau_1 = v$ *and sellers charge* $p_P = v$ *and* $p_D = v - \Delta$. *Sellers earn* $\lambda_1(1 - \alpha_1)(v - \Delta)$ *and the platform earns* $\lambda_1\alpha_1 v$ *that period.*

Lemma 4 shows that when there is no PPC in the first period, platform behavior depends on $\overline{\lambda}_2 - \underline{\lambda}_2$, i.e., how much selling to non-loyal matched buyers in the first period improves product discovery in the second period. When $\overline{\lambda}_2 - \underline{\lambda}_2$ is large the platform sets a low $\tau_1 = \Delta$ so as to host all transactions and generate lots of data; when $\overline{\lambda}_2 - \underline{\lambda}_2$ is low the platform sets a high $\tau_1 = v$, hosts only transactions involving loyal buyers, and generates less data.

4 Impact of PPCs

We now compare platform and seller profit across three scenarios: i) a PPC in both periods, ii) no PPC in either period, and iii) a PPC in only the first period.[10,11]

Proposition 1. *Platform profit is highest when there is a PPC in both periods.*

A PPC in both periods maximizes platform profit for two reasons. First, the platform extracts all the available surplus in a given period. Second, the platform hosts all first-period transactions, maximizing its data and thus the available surplus in the second period.

Proposition 2. *Suppose* Δ *is sufficiently small. Seller profit across the two periods is maximized by having* a PPC in the first period and no PPC in the second period *if*

$$\frac{1 - \alpha_1}{1 - \alpha_2} < \frac{\overline{\lambda}_2 - \underline{\lambda}_2}{\lambda_1} < \frac{\alpha_1 v - \Delta}{\alpha_2 v}. \tag{4}$$

[10] We do not consider the case with a PPC only in the second period; as noted by a referee, it would be hard for a policymaker to commit to such a policy after initially having no PPC.

[11] Note that buyer surplus is always zero; we consider an extension with positive buyer surplus in Section 5. Note that total welfare is always maximized when there is a PPC in both periods.

Otherwise seller profit is maximized by having no PPC in either period.

A PPC in both periods is the worst situation for sellers, because they get zero surplus. One might expect that the best situation for sellers is no PPC in either period, because they earn profit from non-loyal buyers in both periods. However Proposition 2 shows this is not necessarily the case. To understand why, suppose initially there is no PPC in either period. Condition (4) ensures that $\overline{\lambda}_2 - \underline{\lambda}_2$ is low enough that the platform offers $\tau_1 = v$ and sells only to its loyal buyers in the first period, generating little data. If a PPC is then permitted in the first period, the platform sells to all buyers that period, generating more data and improving its second-period matching by $\overline{\lambda}_2 - \underline{\lambda}_2$. Condition (4) ensures that $\overline{\lambda}_2 - \underline{\lambda}_2$ is sufficiently large that the loss in sellers' first-period profit from the PPC is outweighed by the gain in their second-period profit from better matching.[12] Notice that a necessary condition for (4) to hold is $\alpha_1 > \alpha_2$, i.e., loyalty to the platform falls over time.[13] Notice also that another necessary condition for (4) to hold is $\overline{\lambda}_2 - \underline{\lambda}_2 > 0$, i.e., data strictly improves matching.

5 Extension

In our baseline model buyer surplus is zero, irrespective of whether there are PPCs. However, consider the following extension. (Proofs are available in the Online Appendix.) Suppose that each period a fraction $\beta \in (0, 1)$ of non-loyal buyers have $\Delta = \underline{\Delta}$, and the remaining fraction $1 - \beta$ have $\Delta = \overline{\Delta} > \underline{\Delta}$. Suppose for simplicity that $\lambda_2 = \underline{\lambda}_2$ *unless* the platform hosts all matched buyers in the first period, in which case $\lambda_2 = \overline{\lambda}_2 > \underline{\lambda}_2$.

Proposition 3. *Suppose $\underline{\Delta}$ is sufficiently small, and $\overline{\Delta}$ is sufficiently close to $\underline{\Delta}$. Buyer surplus and seller profit across the two periods are both strictly maximized by having a PPC in the first period and no PPC in the second period if*

$$\frac{1 - \alpha_1}{1 - \alpha_2} < \frac{\overline{\lambda}_2 - \underline{\lambda}_2}{\lambda_1} < \frac{\alpha_1 v - \underline{\Delta}}{\alpha_2 v}. \tag{5}$$

[12] We assumed for simplicity that sellers in the two periods are different, so introducing a PPC in the first period has distributional consequences. Nevertheless, since sellers are atomistic, it is easy to see that Lemmas 1-4 would hold even if the sellers were the same in each period.

[13] Intuitively, this makes it more likely that the platform reacts to a first-period PPC by acquiring more data, and it also makes the extra data more valuable for sellers in the second period.

Intuitively, heterogeneity in Δ opens up the possibility for (non-loyal) buyers to get positive surplus. Similar to in the baseline model, a PPC in the first period softens competition and so removes this surplus. On the other hand, a first-period PPC generates more data, leading to more matches and thus higher buyer surplus in the second period. Under condition (5) the latter dominates the former.

6 Conclusion

We study PPCs in a model where a platform accumulates data from transactions that it hosts. We show that buyers and sellers may be better off if there is a PPC when the market is young, because this enables the platform to collect more data and hence offer better matching when the market is mature.

A Omitted Proofs

Proof of Proposition 1. The total available surplus in the first period is $\lambda_1 v$, while the total available surplus in the second period is bounded by $\overline{\lambda}_2 v$. By Lemmas 1 and 3 the platform earns $\lambda_1 v + \overline{\lambda}_2 v$ with a PPC in each period. $\square$

Proof of Proposition 2. Let $\Pi^{i,j}$ with $i, j \in \{Y, N\}$ be seller profit with i (resp. j) denoting whether there is a PPC in the first (resp. second) period. From Lemmas 1-4 for Δ sufficiently small:

$$\Pi^{Y,Y} = 0$$
$$\Pi^{Y,N} = \overline{\lambda}_2(1-\alpha_2)(v-\Delta)$$
$$\Pi^{N,N} = \begin{cases} \lambda_1(v-\Delta) + \overline{\lambda}_2(1-\alpha_2)(v-\Delta) & \text{if } \lambda_1(\alpha_1 v - \Delta) \leq (\overline{\lambda}_2 - \underline{\lambda}_2)\alpha_2 v, \\ \lambda_1(1-\alpha_1)(v-\Delta) + \underline{\lambda}_2(1-\alpha_2)(v-\Delta) & \text{otherwise.} \end{cases}$$

If $\lambda_1(\alpha_1 v - \Delta) \leq (\overline{\lambda}_2 - \underline{\lambda}_2)\alpha_2 v$ then $\Pi^{N,N}$ is largest. If $\lambda_1(\alpha_1 v - \Delta) > (\overline{\lambda}_2 - \underline{\lambda}_2)\alpha_2 v$ then $\Pi^{N,N}$ is largest if $(\overline{\lambda}_2 - \underline{\lambda}_2)(1-\alpha_2) \leq \lambda_1(1-\alpha_1)$ and otherwise $\Pi^{Y,N}$ is largest. $\square$

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Online Appendix: Not for Publication

Here we provide details for the extension to heterogeneous Δ in Section 5. The case with a PPC is straightforward:

Lemma 5. *Suppose there is a PPC in period $t = 1, 2$. The platform sets $\tau_t = v$ and sellers charge $p_D \geq p_P = v$. Sellers earn zero profit, buyers get zero surplus, and the platform earns $\lambda_t v$.*

Proof. The proof follows the same steps as for Lemmas 1 and 3 and so is omitted. □

As in our baseline model, a PPC fully relaxes competition with the direct channel, allowing the platform to extract all the available surplus, thereby leaving buyers and sellers with zero surplus.

Now consider the case without a PPC. We can assume, without loss of generality, that the platform chooses $\tau_1, \tau_2 \leq v$.[14] We also have the following straightforward result on seller pricing:

Lemma 6. *Suppose there is no PPC in a given period. Sellers optimally charge $p_P = v$.*

Proof. First, we rule out $p_P > v$. On the way to a contradiction, suppose a seller charges $p_P > v$, in which case it makes zero on-platform sales. If the seller deviates to $p'_P = v$ it sells to all platform-loyal buyers, and also any non-loyal buyers who were previously not buying anywhere, and it earns (weakly) positive profit on these sales. (Any non-loyal buyer who was previously buying off the platform will still do so, given our tie-break rule, as buying on the platform at price $p'_P = v$ generates zero surplus.) Note that even if the per-transaction fee is v, sellers charge $p'_P = v$ instead of $p_P > v$ given our tie-break rule that when indifferent they do what is best for the platform. Second, we rule out $p_P < v$. On the way to a contradiction, suppose a seller charges $p_P < v$. If the seller deviates and charges $p'_P = p_P + \epsilon$ and $p'_D = p_D + \epsilon$ for $\epsilon \in (0, v - p_P)$ then no buyer (loyal or non-loyal) changes their purchase behavior but the seller makes strictly higher profit. □

The next lemma provides the optimal off-platform price as a function of the platform's per-transaction fee, in a given period $t = 1, 2$. It shows that when τ_t is sufficiently small,

[14] If the platform sets $\tau_t > v$ in period $t = 1, 2$ it hosts zero transactions that period and so earns zero fee revenues; for $t = 1$ it also collects zero data. We will show below that by setting $\tau_1, \tau_2 \in (0, v]$ the platform earns strictly positive fee revenues and, for $t = 1$, generates data.

sellers set p_D sufficiently large that all matched buyers purchase on the platform. It also shows that when τ_t is intermediate, sellers price in such a way that non-loyal matched buyers with $\Delta = \underline{\Delta}$ purchase off the platform, but all other buyers purchase on the platform. Finally, it shows that when τ_t is sufficiently high, sellers charge a sufficiently low price that all non-loyal buyers purchase via the direct channel. Specifically:

Lemma 7. *Suppose there is no PPC in period $t = 1, 2$. Optimal off-platform seller pricing is as follows:*

a) If $\tau_t \leq \underline{\Delta}$ then $p_D > v - \underline{\Delta}$.

b) If $\underline{\Delta} < \tau_t \leq \frac{\overline{\Delta} - \beta\underline{\Delta}}{1-\beta}$ then $p_D = v - \underline{\Delta}$.

c) If $\tau_t > \frac{\overline{\Delta} - \beta\underline{\Delta}}{1-\beta}$ then $p_D = v - \overline{\Delta}$.

Proof. Given that $p_P = v$ from Lemma 6, we can write a seller's profit as follows. (i) If it charges $p_D \leq v - \overline{\Delta}$ all non-loyal buyers purchase off the platform. Seller profit is $\lambda_t[\alpha_t(v - \tau_t) + (1 - \alpha_t)p_D]$, platform profit is $\lambda_t\alpha_t\tau_t$, and buyer surplus is $\lambda_t(1 - \alpha_t)[\beta(v - p_D - \underline{\Delta}) + (1 - \beta)(v - p_D - \overline{\Delta})]$. (ii) If it charges $p_D \in (v - \overline{\Delta}, v - \underline{\Delta}]$ then non-loyal buyers with $\Delta = \underline{\Delta}$ purchase off the platform and all other buyers purchase on the platform. Seller profit is $\lambda_t[\{1 - (1 - \alpha_t)\beta\}(v - \tau_t) + (1 - \alpha_t)\beta p_D]$, platform profit is $\lambda_t[1 - (1 - \alpha_t)\beta]\tau_t$, and buyer surplus is $\lambda_t(1 - \alpha_t)\beta(v - p_D - \underline{\Delta})$. (iii) If it charges $p_D \in (v - \underline{\Delta}, v]$ then all buyers purchase on the platform. Seller profit is $\lambda_t(v - \tau_t)$, platform profit is $\lambda_t\tau_t$, and buyers get zero surplus.

Using the above, then, a seller charges either $p_D = v - \overline{\Delta}$ or $p_D = v - \underline{\Delta}$ or any $p_D > v - \underline{\Delta}$, earning respectively profit $\lambda_t[\alpha_t(v - \tau_t) + (1 - \alpha_t)(v - \overline{\Delta})]$, $\lambda_t[\{1 - (1 - \alpha_t)\beta\}(v - \tau_t) + (1 - \alpha_t)\beta(v - \underline{\Delta})]$, or $\lambda_t(v - \tau_t)$. The optimal prices in the lemma then follow immediately, given our usual tie-break assumption that when indifferent between two prices a seller chooses the one which is best for the platform—which in this case, means the one that leads to more on-platform transactions. □

Using Lemma 7, we can now solve for the platform's optimal fees τ_1 and τ_2 when there is no PPC. We start with the second period. Just like in Lemma 2 from earlier, the next lemma shows that when $\underline{\Delta}$ and $\overline{\Delta}$ are sufficiently small, the platform prefers to set $\tau_2 = v$ and extract all surplus from loyal buyers, rather than set a very low τ_2 and host non-loyal buyers as well. Specifically:

Lemma 8. *Suppose there is no PPC in the second period. If $\underline{\Delta}, \overline{\Delta} > 0$ are sufficiently small the platform sets $\tau_2 = v$ and sellers charge $p_P = v$ and $p_D = v - \overline{\Delta}$. Sellers earn $\lambda_2(1-\alpha_2)(v-\overline{\Delta})$, buyers get surplus $\lambda_2(1-\alpha_2)\beta(\overline{\Delta}-\underline{\Delta})$, and the platform earns $\lambda_2\alpha_2 v$.*

Proof. Using the proof of Lemma 7, platform profit is as follows. (a) If $\tau_2 \leq \underline{\Delta}$ then platform profit is $\lambda_2\tau_2$. (b) If $\underline{\Delta} < \tau_2 \leq \frac{\overline{\Delta}-\beta\underline{\Delta}}{1-\beta}$ then platform profit is $\lambda_2[1-(1-\alpha_2)\beta]\tau_2$. (c) If $\tau_2 > \frac{\overline{\Delta}-\beta\underline{\Delta}}{1-\beta}$ then platform profit is $\lambda_2\alpha_2\tau_2$. Clearly, the optimum must have $\tau_2 = \underline{\Delta}$ or $\tau_2 = \frac{\overline{\Delta}-\beta\underline{\Delta}}{1-\beta}$ or $\tau_2 = v$, and the latter is optimal provided that

$$\alpha_2 v > \max\left\{\underline{\Delta}, [1-(1-\alpha_2)\beta]\frac{\overline{\Delta}-\beta\underline{\Delta}}{1-\beta}\right\},$$

which holds for $\underline{\Delta}$ and $\overline{\Delta}$ sufficiently small.

Finally, notice that for $\underline{\Delta}, \overline{\Delta} > 0$ sufficiently small, $\tau_2 = v > \frac{\overline{\Delta}-\beta\underline{\Delta}}{1-\beta}$. It then follows from Lemma 7 that sellers charge $p_D = v - \overline{\Delta}$. Buyer, seller, and platform profits also then follow from the expressions in the proof of Lemma 7. □

We now turn to the first period. Just like in Lemma 4 from earlier, the next lemma shows that the platform either sets a low τ_1 to keep all sales on the platform and acquire lots of data, or sets $\tau_1 = v$ to extract all surplus from loyal buyers but in doing so acquires less data. Specifically, letting π_2 again denote platform profit per matched buyer in the second period[15], the following inequality plays an important role

$$\lambda_1(\alpha_1 v - \underline{\Delta}) \leq (\overline{\lambda}_2 - \underline{\lambda}_2)\pi_2. \tag{6}$$

We then find the following:

Lemma 9. *Suppose there is no PPC in the first period. If $\overline{\Delta}$ is sufficiently close to $\underline{\Delta}$ then:*

i) If (6) holds the platform sets $\tau_1 = \underline{\Delta}$ and sellers charge $p_P = v$ and $p_D > v - \underline{\Delta}$. Sellers earn $\lambda_1(v-\underline{\Delta})$, buyers get zero surplus, and the platform earns $\lambda_1\underline{\Delta}$ that period.

ii) Otherwise the platform sets $\tau_1 = v$ and sellers charge $p_P = v$ and $p_D = v - \overline{\Delta}$. Sellers earn $\lambda_1(1-\alpha_1)(v-\overline{\Delta})$, buyers get surplus $\lambda_1(1-\alpha_1)\beta(\overline{\Delta}-\underline{\Delta})$, and the platform earns $\lambda_1\alpha_1 v$ that period.

[15]From Lemmas 5 and 8, if there is a PPC in the second period $\pi_2 = v$, and if there is no PPC in the second period $\pi_2 = \alpha_2 v$, i.e., the same as in the baseline model.

Proof. Following the same procedure as in the proof of Lemma 8, platform profit is as follows. (a) If $\tau_1 \leq \underline{\Delta}$ then platform profit is $\lambda_1\tau_1 + \overline{\lambda}_2\pi_2$. (b) If $\underline{\Delta} < \tau_1 \leq \frac{\overline{\Delta}-\beta\underline{\Delta}}{1-\beta}$ then platform profit is $\lambda_1[1-(1-\alpha_1)\beta]\tau_1 + \underline{\lambda}_2\pi_2$. (c) If $\tau_1 > \frac{\overline{\Delta}-\beta\underline{\Delta}}{1-\beta}$ then platform profit is $\lambda_1\alpha_1\tau_1 + \underline{\lambda}_2\pi_2$. Clearly, the optimum must have $\tau_1 = \underline{\Delta}$ or $\tau_1 = \frac{\overline{\Delta}-\beta\underline{\Delta}}{1-\beta}$ or $\tau_1 = v$. Moreover, for $\overline{\Delta}$ sufficiently close to $\underline{\Delta} > 0$, notice that $\tau_1 = \underline{\Delta}$ dominates $\tau_1 = \frac{\overline{\Delta}-\beta\underline{\Delta}}{1-\beta}$ for any $\overline{\lambda}_2 \geq \underline{\lambda}_2$. Moreover, $\tau_1 = \underline{\Delta}$ is better for the platform than $\tau_1 = v$ if and only if (6) holds. □

Using the above results, we can now prove Proposition 3.

Proof of Proposition 3. Let $\Pi^{i,j}$ and $V^{i,j}$ be seller profit and buyer surplus, respectively, with i (resp. j) denoting whether or not there is a PPC in the first (resp. second) period. From Lemmas 5-9, for $\underline{\Delta}$ sufficiently small and $\overline{\Delta}$ sufficiently close to $\underline{\Delta}$, we have

$$\Pi^{Y,Y} = 0$$
$$\Pi^{Y,N} = \overline{\lambda}_2(1-\alpha_2)(v-\overline{\Delta})$$
$$\Pi^{N,N} = \begin{cases} \lambda_1(v-\underline{\Delta}) + \overline{\lambda}_2(1-\alpha_2)(v-\overline{\Delta}) & \text{if } \lambda_1(\alpha_1 v - \underline{\Delta}) \leq (\overline{\lambda}_2 - \underline{\lambda}_2)\alpha_2 v, \\ \lambda_1(1-\alpha_1)(v-\overline{\Delta}) + \underline{\lambda}_2(1-\alpha_2)(v-\overline{\Delta}) & \text{otherwise.} \end{cases}$$

Similarly, we have

$$V^{Y,Y} = 0$$
$$V^{Y,N} = \overline{\lambda}_2(1-\alpha_2)\beta(\overline{\Delta}-\underline{\Delta})$$
$$V^{N,N} = \begin{cases} \overline{\lambda}_2(1-\alpha_2)\beta(\overline{\Delta}-\underline{\Delta}) & \text{if } \lambda_1(\alpha_1 v - \underline{\Delta}) \leq (\overline{\lambda}_2 - \underline{\lambda}_2)\alpha_2 v, \\ \lambda_1(1-\alpha_1)\beta(\overline{\Delta}-\underline{\Delta}) + \underline{\lambda}_2(1-\alpha_2)\beta(\overline{\Delta}-\underline{\Delta}) & \text{otherwise.} \end{cases}$$

Notice that $\Pi^{Y,N} > \Pi^{N,N}$ and $V^{Y,N} > V^{N,N}$ if and only if

$$\frac{1-\alpha_1}{1-\alpha_2} < \frac{\overline{\lambda}_2 - \underline{\lambda}_2}{\lambda_1} < \frac{\alpha_1 v - \underline{\Delta}}{\alpha_2 v}.$$

□