Online Appendix

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In this online appendix, we provide proofs for additional results and claims referred to in the paper "Platforms and the exploration of new products" (hereafter, "the main paper").

A Private signals

In this online appendix we consider what happens when x is a buyer-specific shock (rather than a public signal as in the main paper) and sellers cannot charge prices conditional on x (either because x is privately observed by buyers or, even if it is publicly observed, sellers cannot price discriminate). In this case, the truth-or-noise model captures that the more buyers explore in period 1, the higher the chance that the signal received by any given buyer in period 2 is based on a matching period-1 buyer that shares the same preferences (and so reveals the true value for that period-2 buyer). Our analysis here also applies to the case when x is the same for all buyers, but is not observed by sellers.

First, note that the case with competing risky and competing safe sellers remains unchanged, given sellers do not extract any of the buyer' surplus anyway. There is no exploration in equilibrium and the platform is indifferent to its level.

For the other cases, the only thing that changes is the period-2 expected profit for the seller(s) with market power. Instead of extracting the entire upside from exploration, the seller(s) with market power only capture a fraction of it, reflecting that demand is now downward sloping.

Consider first the case with a risky seller and competing safe sellers. In period 2, a buyer can purchase from the safe sellers at $\frac{c}{1-\alpha}$ and obtain $u_s - \frac{c}{1-\alpha}$. If the buyer that receives the signal x buys from the risky seller, the buyer expects to obtain $E_\lambda [u_r|x] - p_r^2$, where p_r^2 represents the risky seller's period 2 price. Thus, the buyer with signal x will purchase from the risky seller if and only if $x \geq \overline{u}_r + \frac{u_s - \overline{u}_r + p_r^2 - \frac{c}{1-\alpha}}{F(\lambda)}$. The risky seller's period-2 expected profit is then

$$\widetilde{\pi}_r(\lambda) = (1-\alpha) \max_{p_r^2} \left\{ \left(p_r^2 - \frac{c}{1-\alpha} \right) \left(1 - G\left(\overline{u}_r + \frac{u_s - \overline{u}_r + p_r^2 - \frac{c}{1-\alpha}}{F(\lambda)} \right) \right) \right\}.$$

Assumption (2) in the main paper implies that this profit is positive for any λ. Moreover, $\widetilde{\pi}_r(\lambda)$ is increasing in λ since a higher $F(\lambda)$ increases demand for any price $p_r^2 > \frac{c}{1-\alpha}$. Denote by $p_r^{2*}(\lambda)$ the price chosen by the risky seller in period 2.

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The platform's period-2 expected profit is

$$\begin{aligned}
& \alpha\left(\frac{c}{1-\alpha}G\left(\overline{u}_r+\frac{u_s-\overline{u}_r+p_r^{2*}(\lambda)-\frac{c}{1-\alpha}}{F(\lambda)}\right)+p_r^{2*}(\lambda)\left(1-G\left(\overline{u}_r+\frac{u_s-\overline{u}_r+p_r^{2*}(\lambda)-\frac{c}{1-\alpha}}{F(\lambda)}\right)\right)\right) \\
= & \alpha\left(\left(p_r^{2*}(\lambda)-\frac{c}{1-\alpha}\right)\left(1-G\left(\overline{u}_r+\frac{u_s-\overline{u}_r+p_r^{2*}(\lambda)-\frac{c}{1-\alpha}}{F(\lambda)}\right)\right)+\frac{c}{1-\alpha}\right) \\
= & \frac{\alpha}{1-\alpha}\left(\widetilde{\pi}_r(\lambda)+c\right).
\end{aligned}$$

Since the period-1 profits for the seller and the platform are identical to those in Section 3.2 in the main paper, $\widetilde{\pi}_r(\lambda)$ is increasing in λ, and the relationship between the seller's total expected profit and the platform's expected profit is the same as in Section 3.2 in the main paper, Proposition 2 in the main paper continues to hold.

Next, consider the case with a safe seller and competing risky sellers. The safe seller's period-2 expected profit is

$$\widetilde{\pi}_s(\lambda)=(1-\alpha)\max_{p_s^2}\left\{\left(p_s^2-\frac{c}{1-\alpha}\right)G\left(\overline{u}_r+\frac{u_s-\overline{u}_r-p_s^2+\frac{c}{1-\alpha}}{F(\lambda)}\right)\right\}.$$

This profit is clearly positive for any λ. Moreover, $\widetilde{\pi}_s(\lambda)$ is increasing in λ. And the platform's period-2 expected profit is

$$\frac{\alpha}{1-\alpha}\left(\widetilde{\pi}_s(\lambda)+c\right).$$

Since the period-1 profits for the seller and the platform are identical to those in Section 3.3 in the main paper, $\widetilde{\pi}_r(\lambda)$ is increasing in λ, and the relationship between the seller's total expected profit and the platform's expected profit is the same as in Section 3.3 in the main paper, Proposition 3 in the main paper continues to hold.

Finally, consider the case with one risky and one safe seller. Denote by $p_r^*(\lambda)$ and $p_s^*(\lambda)$ the risky and safe seller's period-2 equilibrium prices. They solve:

$$\begin{aligned}
p_r^{2*}(\lambda) &= \arg\max_{p_r^2}\left\{\left(p_r^2-\frac{c}{1-\alpha}\right)\left(1-G\left(\overline{u}_r+\frac{u_s-\overline{u}_r+p_r^2-p_s^{2*}(\lambda)}{F(\lambda)}\right)\right)\right\} \\
p_s^{2*}(\lambda) &= \arg\max_{p_s^2}\left\{\left(p_s^2-\frac{c}{1-\alpha}\right)G\left(\overline{u}_r+\frac{u_s-\overline{u}_r+p_r^{2*}(\lambda)-p_s^2}{F(\lambda)}\right)\right\}.
\end{aligned}$$

The two sellers' period-2 expected profits are then

$$\begin{aligned}
\widetilde{\pi}_r(\lambda) &= (1-\alpha)\left(p_r^{2*}(\lambda)-\frac{c}{1-\alpha}\right)\left(1-G\left(\overline{u}_r+\frac{u_s-\overline{u}_r+p_r^{2*}(\lambda)-p_s^{2*}(\lambda)}{F(\lambda)}\right)\right) \\
\widetilde{\pi}_s(\lambda) &= (1-\alpha)\left(p_s^{2*}(\lambda)-\frac{c}{1-\alpha}\right)G\left(\overline{u}_r+\frac{u_s-\overline{u}_r+p_r^{2*}(\lambda)-p_s^{2*}(\lambda)}{F(\lambda)}\right).
\end{aligned}$$

Note that an increase in λ makes both sellers' demands less sensitive to the difference in their prices, which should naturally result in higher equilibrium prices and profits (this is the same property as in the main paper). Here, we assume $G(.)$ is sufficiently well-behaved such that this property holds (e.g. it holds when $G(.)$ is log-concave).

The period-1 pricing game is then the same as in Section 3.4 in the main paper, so Lemma 1 in the main paper continues to apply, after replacing $\pi_r(\lambda)$ and $\pi_s(\lambda)$ by $\widetilde{\pi}_r(\lambda)$ and $\widetilde{\pi}_s(\lambda)$. Furthermore, the platform's period-2 expected profit is now

$$\begin{aligned} & \alpha\left(p_r^{2*}(\lambda)\left(1-G\left(\overline{u}_r+\frac{u_s-\overline{u}_r+p_r^{2*}(\lambda)-p_s^{2*}(\lambda)}{F(\lambda)}\right)\right)+p_s^{2*}(\lambda)\,G\left(\overline{u}_r+\frac{u_s-\overline{u}_r+p_r^{2*}(\lambda)-p_s^{2*}(\lambda)}{F(\lambda)}\right)\right) \\ = \;& \frac{\alpha}{1-\alpha}\left(\widetilde{\pi}_r(\lambda)+\widetilde{\pi}_s(\lambda)+c\right), \end{aligned}$$

so the platform's profit expression (13) in the main paper also continues to apply, after replacing $\pi_r(\lambda)$ and $\pi_s(\lambda)$ by $\widetilde{\pi}_r(\lambda)$ and $\widetilde{\pi}_s(\lambda)$. Consequently, Proposition 4 in the main paper also continues to hold.

B Explicit platform steering

We consider a specific steering technology that the platform can use to steer buyers in period 1. Suppose prior to sellers setting prices for period-1 buyers, the platform can make a costly investment to temporary increase the perceived utility of buying a unit of the risky product vs. a unit of the safe product. Specifically, the platform can change the utility of buying the risky product in period 1 to $\overline{u}_r+\frac{\Delta}{2}$ and the utility of buying the safe product to $u_s-\frac{\Delta}{2}$ by incurring the cost $C(\Delta)$, where $C(0)=0$, $C(\Delta)$ is increasing for $\Delta>0$ and $C(\Delta)$ is decreasing for $\Delta<0$ (i.e. steering in either direction is costly). With this specification, a positive Δ represents the platform steering towards the risky product and a negative Δ represents the platform steering towards the safe product. Then the game unfolds as before.

For a given λ, the second-period analysis is unchanged. Thus, we can focus on the first-period analysis for all four seller market structures. The first-period analysis will depend on two effects. One is the direct effect of Δ on the platform's period 1 payoffs, holding constant λ. The direct effect consists of the cost of steering C as well as any change in period-1 prices due to the change in Δ (e.g. if the utility of the risky product is increased, then the price of the risky product can be set higher in period 1). The second effect is the strategic effect of Δ through λ. This captures the effect on the platform's profit through any change in the level of exploration, holding constant period 1 prices. In the analysis throughout the paper, we have focused on this strategic effect when determining whether the platform prefers λ to be higher or lower than the equilibrium level λ^*. To work out whether the platform will steer and in what direction with this steering technology, we need to combine these two effects. To avoid that our steering results are driven by the direct effect, we assume the cost of steering is sufficiently high that the platform will never find it profitable to steer (in either direction) unless there is some gain to changing the level of exploration (i.e. the strategic effect is non-positive).

We consider the four different benchmark settings covered in Sections 3.1-3.4.

1. *Competitive sellers of both types.* Due to Bertrand-style price competition in both periods,

prices are set to recover cost, so there is no strategic effect of steering on the platform's profits. Meanwhile, with prices set to recover costs, the direct effect of steering is just the cost of steering, which is positive. Thus, the platform will not steer any buyers and there will be no exploration.

2. *Single seller of risky product.* Following the same argument as in Section 3.2, but modifying the utilities in period 1, the risky seller's total expected profit is

$$-\lambda(1-\alpha)(u_s-\overline{u}_r-\Delta)+\delta\pi_r(\lambda) \tag{B.1}$$

and the platform's expected profit is

$$\frac{\alpha}{1-\alpha}\left((1+\delta)c-\lambda(1-\alpha)(u_s-\overline{u}_r-\Delta)+\delta\pi_r(\lambda)\right)-C(\Delta). \tag{B.2}$$

Note (B.1) together with the property that $\pi_r''(\lambda)<0$ implies λ is increasing in Δ. Since λ is chosen by the risky seller in a way that maximizes (B.2), there is no strategic reason to change Δ to either increase or decrease λ.[1] The lack of a strategic effect of steering just captures the result in Proposition 2, that the platform prefers no change in exploration relative to the (positive) equilibrium level holding first-period prices as given. The direct effect of Δ on the platform's profit is $\alpha\lambda\Delta-C(\Delta)$, which is negative for all $\Delta<0$. For $\Delta>0$, the direct effect of increasing Δ by one unit is just $\alpha\lambda-C'(\Delta)$. A higher Δ temporarily shifts more perceived surplus to the risky seller's product, which reduces the amount the risky seller has to lower its price in period 1 to attract buyers. This benefits the platform since period 1 revenue is higher, and so its share of revenue is higher. But given our assumption that this direct effect is unprofitable, then steering in either direction will not be profitable. A sufficient condition to ensure this is that $|C'(\Delta)|>\alpha$ for any $\Delta\neq 0$.

3. *Single seller of safe product.* A parallel argument to case 2 applies and we conclude that steering in either direction remains unprofitable.

4. *Single seller of each type of product.* Following the analysis in Section 3.4, the equilibrium level of exploration λ^* induced by Δ is determined by

$$\pi_s'(\lambda^*)+\pi_r'(\lambda^*)=\frac{1-\alpha}{\delta}(u_s-\overline{u}_r-\Delta).$$

This implies λ^* is increasing in Δ. Meanwhile, the platform's objective function is

$$\alpha\left(\lambda^*p_r^*+(1-\lambda^*)p_s^*+\frac{\delta}{1-\alpha}(\pi_r(\lambda^*)+\pi_s(\lambda^*)+c)\right)-C(\Delta),$$

[1] The platform also cannot do better by setting $\Delta\geq u_s-\overline{u}_r$ to induce $\lambda=1$. We know that increasing Δ to move from λ^* to $\lambda=1$ lowers the risky seller's profit (by our assumption that $F'(1)$ is sufficiently small so that the equilibrium level of λ is interior), so this also lowers the platform's profit given it is proportional to the risky seller's profit, as shown above.

where (from Lemma 1)

$$p_r^* = \frac{c - \delta\pi_r'(\lambda^*)}{1-\alpha} \text{ and } p_s^* = \frac{c + \delta\pi_s'(\lambda^*)}{1-\alpha}.$$

This implies

$$\begin{aligned}\frac{dp_r^*}{d\Delta} &= -\frac{\delta\pi_r''(\lambda^*)}{1-\alpha}\frac{d\lambda^*}{d\Delta} = \frac{\pi_r''(\lambda^*)}{\pi_s''(\lambda^*) + \pi_r''(\lambda^*)} \\ \frac{dp_s^*}{d\Delta} &= \frac{\delta\pi_s''(\lambda^*)}{1-\alpha}\frac{d\lambda^*}{d\Delta} = -\frac{\pi_s''(\lambda^*)}{\pi_s''(\lambda^*) + \pi_r''(\lambda^*)}.\end{aligned}$$

Thus, the derivative of the platform's profit with respect to Δ can be written

$$\begin{aligned}&\alpha\left(p_r^* - p_s^* + \frac{\delta}{1-\alpha}\left(\pi_r'(\lambda^*) + \pi_s'(\lambda^*)\right)\right)\frac{d\lambda^*}{d\Delta} + \alpha\left(\lambda^*\frac{dp_r^*}{d\Delta} + (1-\lambda^*)\frac{\Delta p_s^*}{d\Delta}\right) - C'(\Delta) \\ =\; &\alpha\left(\lambda^*\frac{dp_r^*}{d\Delta} + (1-\lambda^*)\frac{\Delta p_s^*}{d\Delta}\right) - C'(\Delta) \\ =\; &\alpha\left(\lambda^* - \frac{\pi_s''(\lambda^*)}{\pi_s''(\lambda^*) + \pi_r''(\lambda^*)}\right) - C'(\Delta)\end{aligned}$$

Thus, provided $|C'(\Delta)| > \alpha$ and since $0 < \frac{\pi_s''(\lambda^*)}{\pi_s''(\lambda^*)+\pi_r''(\lambda^*)} < 1$, the platform's profit is lower if $\Delta < 0$ or $\Delta > 0$ compared to $\Delta = 0$. Therefore the platform does not want to steer buyers in either direction.

C Uniform pricing and costly steering by sellers

Suppose there is one risky seller and identical safe sellers, and the risky seller can only set a uniform price. We want to show that we obtain the same result as in Section 3.2 if we allow the risky seller to incur a cost for each buyer that it attracts to buy its product, where the cost to attract the buyer is increasing in the net surplus shortfall of the risky seller's product.

Specifically, suppose the risky seller can invest $K(\Delta)$ in order to get a period-1 buyer to buy the risky product, where $K(\Delta)$ is increasing and continuously differentiable for $\Delta \geq 0$, and $\Delta = (u_s - p_s) - (\overline{u}_r - p_r)$ is the difference in net utility between the two products in period 1. We assume $K(\Delta) = 0$ for all $\Delta \leq 0$ so there is no cost to steer buyers to the risky product if the net utility offered by the two choices is identical or the risky seller offers higher net utility in period 1. Consistent with this specification, we no longer assume that when buyers are indifferent between the two products, buyers all buy the product from the seller with market power, but rather that they can be steered by the risky seller to the seller's desired level of exploration at no cost.[2] Our formulation represents the limit case of this analysis taking p_r to the limit where buyers are indifferent between the two

[2] In practice, to achieve this, the risky seller can set a slightly higher p_r than the price that makes buyers indifferent (so that buyers strictly prefer to buy from the safe sellers), but then steer λ buyers to buy from it at a very small cost $K(\Delta)$ given that Δ is very close to zero.

products. We also assume that $K'(\Delta) > 1-\alpha$ for all $\Delta \geq 0$, so that if the surplus difference increases by one unit, the cost of steering the buyer will increase by more than $1-\alpha$, where recall $\alpha > 0$ is the percentage commission extracted by the platform. Obviously, this assumption means that discounting the price to a set of buyers is a more efficient way to get these buyers to explore than steering them through the costly investment. The timing and payoff specification of the modified game we consider is as follows:

Period 1a Sellers set (uniform) prices for period-1 buyers.

Period 1b The risky seller chooses how many buyers to steer to choose its product. If it wants to steer λ buyers, it has to incur the cost $\lambda K(\Delta)$**.**

Period 1c Then λ buyers purchase from the risky seller and the remaining $1-\lambda$ buyers purchase from the safe seller.

Period 2a The signal x is realized and observed by all players.

Period 2b Sellers set prices for period-2 buyers.

Period 2c Period-2 buyers make their purchase decisions.

Given Bertrand competition, the safe sellers always price at $\frac{c}{1-\alpha}$ in both periods. Given λ buyers explore in period 1, the period 2 analysis is identical to the benchmark case.

In period 1, the risky seller considers whether to induce λ buyers to try its product. The cost to the risky seller of inducing λ buyers to explore through direct steering is $\lambda K\left(\left(u_s - \frac{c}{1-\alpha}\right) - (\overline{u}_r - p_r)\right)$. Provided $p_r \geq \frac{c}{1-\alpha} + \overline{u}_r - u_s$, only buyers that are induced to explore will purchase at this price. This means that to induce λ buyers to explore, the risky seller has a choice between lowering its price p_r for the exploring buyers all the way to $\frac{c}{1-\alpha} + \overline{u}_r - u_s$ (which eliminates the need for incurring direct steering costs), or keeping a larger p_r and incurring positive steering costs. The first-period profit reflecting this choice for a given λ is therefore

$$\lambda\left((1-\alpha)\,p_r - c - K\left(\left(u_s - \frac{c}{1-\alpha}\right) - (\overline{u}_r - p_r)\right)\right),$$

where $p_r \geq \frac{c}{1-\alpha} + \overline{u}_r - u_s$. Given our assumption that $K'(\Delta) > 1-\alpha$ for all $\Delta \geq 0$, the risky seller will always do best setting $p_r = \frac{c}{1-\alpha} + \overline{u}_r - u_s$ and not incurring any direct steering costs to get the λ buyers to buy from it.

Thus, the problem becomes identical to the one in the baseline setting in which the risky seller sets the lower price of $\frac{c}{1-\alpha} + \overline{u}_r - u_s$ for the λ buyers which it sells to, and the rest of the analysis applies as in Section 3.2. This same logic also applies to other two cases in which at least one type of seller has market power.

D Market expansion through elastic buyer participation

Suppose the total number of buyers who participate in period 2 depends positively on their expected surplus (this can be obtained by assuming buyers incur a heterogeneous participation cost). Specifically, assume the total number of buyers in period 2 is $N(U_2(\lambda))$, where $N(.)$ is an increasing function and $U_2(\lambda)$ is the period-2 buyer expected surplus as a function of the level of exploration λ. This presumes that period-2 buyers observe λ but not x prior to joining the platform. For example, buyers may be able to see how many reviews there are before incurring the cost to use the platform, but only observe the signal x after reading the details of the reviews (i.e. incurring the cost to use the platform). The function $U_2(\lambda)$ depends on the seller market structure and was determined in Section 4.1.

With one risky seller and competing safe sellers, we have $U_2(\lambda) = u_s - \frac{c}{1-\alpha}$. This means $N(U_2(\lambda))$ does not depend on λ, so our benchmark result remains unchanged: the platform is content with the equilibrium level of exploration. With one safe seller and competing risky sellers, we have $U_2(\lambda) = E_x\left[E_\lambda[u_r|x] - \frac{c}{1-\alpha}\right] = \overline{u}_r - \frac{c}{1-\alpha}$. This means $N(U_2(\lambda))$ does not depend on λ, so once again our benchmark result still holds: the platform is content with the equilibrium level of exploration.

With competing sellers of both types, we have

$$U_2(\lambda) = u_s G\left(\overline{u}_r + \frac{u_s - \overline{u}_r}{F(\lambda)}\right) + \int_{\overline{u}_r + \frac{u_s - \overline{u}_r}{F(\lambda)}}^{u_H} E_\lambda[u_r|x]\, dG(x) - \frac{c}{1-\alpha},$$

which is increasing in λ. The platform's objective function is $\alpha\left(\frac{c}{1-\alpha} + \delta N(U_2(\lambda))\frac{c}{1-\alpha}\right)$, so is increasing in λ. This means the platform would like to see maximum exploration, whereas the equilibrium level is zero. Thus, in this case there is insufficient exploration, just like in Section 4.1.

With one seller of each type, we have

$$U_2(\lambda) = \int_{u_L}^{\overline{u}_r + \frac{u_s - \overline{u}_r}{F(\lambda)}} E_\lambda[u_r|x]\, dG(x) + u_s\left(1 - G\left(\overline{u}_r + \frac{u_s - \overline{u}_r}{F(\lambda)}\right)\right) - \frac{c}{1-\alpha},$$

which is decreasing in λ.

Lemma 1 is easily extended to this case (the only difference is that second period profits are $N(U_2(\lambda))\pi_s(\lambda)$ and $N(U_2(\lambda))\pi_r(\lambda)$), so the equilibrium level of exploration λ^* is given by

$$\left.\frac{d\left(N(U_2(\lambda))(\pi_s(\lambda) + \pi_r(\lambda))\right)}{d\lambda}\right|_{\lambda=\lambda^*} = \frac{1-\alpha}{\delta}(u_s - \overline{u}_r)$$

The platform's objective function (taking as given the first period equilibrium prices p_r^* and p_s^*) is

$$\alpha\left(\lambda p_r^* + (1-\lambda)p_s^* + \frac{\delta}{1-\alpha}N(U_2(\lambda))(\pi_r(\lambda) + \pi_s(\lambda) + c)\right).$$

Taking into account that in equilibrium we must have $p_r^* - p_s^* = \overline{u}_r - u_s$ and recalling that $N(U_2(\lambda))$ is decreasing in this case, it is straightforward to see that the platform prefers a lower level of expectation than that prevailing in equilibrium, just like in Section 4.1.

In summary, the results in (i)-(iii) in Proposition 5 continue to apply here.

E Proof of Proposition 6

The case with competing sellers of both types and the one with a single risky seller and competing safe sellers were analyzed in the main text. Here, we provide the analysis for the other two cases.

Consider first the case with a single safe seller facing competitive risky sellers. Paralleling the analysis in Section 3.3 in the main paper, the safe seller's period-2 expected profit is $\pi_s(\lambda, N(\lambda))$, where

$$\begin{aligned}\pi_s(\lambda, N) &\equiv (1-\alpha)(1+N)\int_{u_L}^{\overline{u}_r+\frac{u_s-\overline{u}_r}{F(\lambda)}} (u_s - E_\lambda[u_r|x])\, dG(x) \\ &= (1-\alpha)(1+N)(u_s-\overline{u}_r) + \pi_r(\lambda, N).\end{aligned} \tag{E.1}$$

Thus,

$$\frac{\partial \pi_s(\lambda, N)}{\partial \lambda} = \frac{\partial \pi_r(\lambda, N)}{\partial \lambda} \tag{E.2}$$

$$\frac{\partial \pi_s(\lambda, N)}{\partial N} = \frac{\partial \pi_r(\lambda, N)}{\partial N} + (1-\alpha)(u_s-\overline{u}_r), \tag{E.3}$$

so both derivatives are positive. The safe seller's total expected profit is then

$$(1-\alpha)(1-\lambda)(u_s-\overline{u}_r) + \delta\pi_s(\lambda, N(\lambda)). \tag{E.4}$$

Taking the total derivative of (E.4) with respect to λ we obtain that the equilibrium level of exploration induced by the safe seller is the solution to

$$\frac{\partial \pi_s(\lambda, N(\lambda))}{\partial \lambda} + \frac{\partial \pi_s(\lambda, N(\lambda))}{\partial N}N'(\lambda) - \frac{1-\alpha}{\delta}(u_s-\overline{u}_r) = 0. \tag{E.5}$$

Meanwhile, the platform's expected profit can be written as

$$\alpha\left((1-\lambda)(u_s-\overline{u}_r) + \frac{c}{1-\alpha}\right) + \frac{\delta\alpha}{1-\alpha}(\pi_s(\lambda, N) + (1+N)c) - C(N). \tag{E.6}$$

Given λ, the platform chooses N to maximize (E.6), implying $N(\lambda)$ is the solution to

$$\frac{\alpha}{1-\alpha}\left(\frac{\partial \pi_s(\lambda, N)}{\partial N} + c\right) = \frac{C'(N)}{\delta}.$$

From (E.3), $\frac{\partial^2\pi_s(\lambda,N)}{\partial N \partial\lambda} = \frac{\partial^2\pi_r(\lambda,N)}{\partial N \partial\lambda}$, implying that $N(\lambda)$ is the same as the one determined by (17) in the main paper. Moreover, using the envelope theorem, the derivative of the platform's profit with respect to λ (taking as given the sellers' period 1 equilibrium prices) is proportional to

$$\frac{\partial \pi_s(\lambda, N(\lambda))}{\partial \lambda} - \frac{1-\alpha}{\delta}(u_s - \overline{u}_r)$$

Comparing this expression with the left-hand side of (E.5), the difference is the term $\frac{\partial \pi_s(\lambda,N(\lambda))}{\partial N} N'(\lambda)$, which is strictly positive given $\frac{\partial \pi_s(\lambda,N(\lambda))}{\partial N} > 0$ and $N'(\lambda) > 0$. This implies the platform prefers less exploration than the equilibrium level.

Now consider the case with a single safe seller and a single risky seller. In period 2, the risky seller's expected profit is $\pi_r(\lambda, N(\lambda))$, while the safe seller's expected profit is $\pi_s(\lambda, N(\lambda))$, where $\pi_r(\lambda, N)$ and $\pi_s(\lambda, N)$ are given by (14) in the main paper and (E.1), and the function $N(\lambda)$ is determined by the platform.

Taking as given the sellers' period-1 equilibrium prices (p_r^*, p_s^*) (which we will determine below), the platform's expected profit is

$$\alpha\left(\lambda p_r^* + (1-\lambda) p_s^* + \frac{\delta}{1-\alpha}(\pi_s(\lambda, N) + \pi_r(\lambda, N) + (1+N)c)\right) - C(N). \tag{E.7}$$

Taking the first-order condition in N for a given λ, we obtain that $N(\lambda)$ is defined by

$$\frac{\alpha}{1-\alpha}\left(\frac{\partial \pi_r(\lambda, N)}{\partial N} + \frac{\partial \pi_s(\lambda, N)}{\partial N} + c\right) = \frac{C'(N)}{\delta}.$$

Since $\frac{\partial^2 \pi_r(\lambda,N)}{\partial N \partial \lambda} = \frac{\partial^2 \pi_s(\lambda,N)}{\partial N \partial \lambda} > 0$, $N(\lambda)$ is increasing. And since $\pi_r(\lambda, N)$ and $\pi_s(\lambda, N)$ are both increasing in λ, we can conclude that $\pi_r(\lambda, N(\lambda))$ and $\pi_s(\lambda, N(\lambda))$ are increasing in λ. We will also assume second order conditions hold, such that the functions $\pi_r(\lambda, N(\lambda))$ and $\pi_s(\lambda, N(\lambda))$ are concave in λ.

We can then obtain a very similar result to Lemma 1 in the main paper.

Lemma *With market expansion and a single seller of each type, the equilibrium level of exploration* λ^* *is defined by*

$$\left.\frac{d\pi_s(\lambda, N(\lambda))}{d\lambda}\right|_{\lambda=\lambda^*} + \left.\frac{d\pi_r(\lambda, N(\lambda))}{d\lambda}\right|_{\lambda=\lambda^*} = \frac{1-\alpha}{\delta}(u_s - \overline{u}_r). \tag{E.8}$$

We now wish to determine whether the platform prefers more or less exploration relative to this equilibrium level, taking as given the prices chosen by sellers. From (E.7), using the envelope theorem and $p_s^* - p_r^* = u_s - \overline{u}_r$, the derivative of the platform's profit in λ evaluated at $N = N(\lambda)$ is proportional to

$$\left.\frac{\partial \pi_s(\lambda, N)}{\partial \lambda}\right|_{N=N(\lambda)} + \left.\frac{\partial \pi_r(\lambda, N)}{\partial \lambda}\right|_{N=N(\lambda)} - \frac{1-\alpha}{\delta}(u_s - \overline{u}_r). \tag{E.9}$$

Comparing (E.9) with (E.8) and recalling that $\pi_r(\lambda, N)$ and $\pi_s(\lambda, N)$ are increasing in N and $N'(\lambda) > 0$, we can conclude that the platform prefers less exploration relative to the equilibrium level.

F Proof of Proposition 7

The case with competing sellers of each type and the case with one risky seller facing competing safe sellers were treated in the main paper. Here we provide the analysis for the remaining two cases.

Consider first the case with one safe seller and competing risky sellers. The risky sellers price at $\frac{c_r}{1-\alpha_r}$ in both periods. For the safe seller to make any sales in period 1, the maximum price it can charge is

$$p_s = u_s - \overline{u}_r + \frac{c_r}{1-\alpha_r}.$$

In period 2, the safe seller's profit is

$$\pi_s(\lambda) \equiv (1-\alpha_s) \int_{u_L}^{\overline{u}_r + \frac{u_s - \overline{u}_r + \frac{c_r}{1-\alpha_r} - \frac{c_s}{1-\alpha_s}}{F(\lambda)}} \left(u_s - E_\lambda [u_r | x] + \frac{c_r}{1-\alpha_r} - \frac{c_s}{1-\alpha_s} \right) dG(x). \tag{F.1}$$

Thus, the safe seller's total expected profit as a function of the level of exploration chosen is

$$\Pi_s(\lambda) \equiv (1-\lambda)(1-\alpha_s) \left(u_s - \overline{u}_r + \frac{c_r}{1-\alpha_r} - \frac{c_s}{1-\alpha_s} \right) + \delta \pi_s(\lambda).$$

The level of exploration chosen by the safe seller is determined by the first-order condition $\Pi_s'(\lambda) = 0$.

Meanwhile, taking as given the sellers' period-1 equilibrium prices, the platform's expected profit is

$$\alpha_r \lambda \frac{c_r}{1-\alpha_r} + \alpha_s (1-\lambda) \left(u_s - \overline{u}_r + \frac{c_r}{1-\alpha_r} \right)$$
$$+\delta \left(\alpha_s \int_{u_L}^{\overline{u}_r + \frac{u_s - \overline{u}_r + \frac{c_r}{1-\alpha_r} - \frac{c_s}{1-\alpha_s}}{F(\lambda)}} \left(u_s - E_\lambda [u_r|x] + \frac{c_r}{1-\alpha_r} \right) dG(x) + \alpha_r \left(1 - G\left(\overline{u}_r + \frac{u_s - \overline{u}_r + \frac{c_r}{1-\alpha_r} - \frac{c_s}{1-\alpha_s}}{F(\lambda)} \right) \right) \right)$$

which can be re-written as

$$\frac{\alpha_s}{1-\alpha_s} \Pi_s(\lambda) + \left(\frac{\alpha_r c_r}{1-\alpha_r} - \frac{\alpha_s c_s}{1-\alpha_s} \right) \left(\lambda + \delta \left(1 - G\left(\overline{u}_r + \frac{u_s - \overline{u}_r + \frac{c_r}{1-\alpha_r} - \frac{c_s}{1-\alpha_s}}{F(\lambda)} \right) \right) \right) + \frac{\alpha_s c_s}{1-\alpha_s} + \delta \frac{\alpha_s c_s}{1-\alpha_s}.$$

Under assumption (19) in the main paper, the function $\lambda + \delta \left(1 - G\left(\overline{u}_r + \frac{u_s - \overline{u}_r + \frac{c_r}{1-\alpha_r} - \frac{c_s}{1-\alpha_s}}{F(\lambda)} \right) \right)$ is increasing in λ, so the platform prefers more exploration relative to the equilibrium level obtained by maximizing the safe seller's total expected profit $\Pi_s(\lambda)$ if and only if $\frac{\alpha_r c_r}{1-\alpha_r} > \frac{\alpha_s c_s}{1-\alpha_s}$.

Next, consider the case with one seller of each type. Using the second period profit expressions $\pi_s(\lambda)$ and $\pi_r(\lambda)$ defined by (20) in the main paper and (F.1), we can write the equilibrium conditions that must be satisfied by λ^* and by the sellers' period-1 prices p_r^* and p_s^*:

$$\begin{aligned} (1-\alpha_r) p_r^* - c_r + \delta \pi_r'(\lambda) &= 0 \\ -(1-\alpha_s) p_s^* + c_s + \delta \pi_s'(\lambda) &= 0 \\ p_r^* - p_s^* &= \overline{u}_r - u_s. \end{aligned}$$

Combining these equations to eliminate the prices p_r^* and p_s^*, we obtain that the equilibrium level of exploration must satisfy

$$\frac{\pi_r'(\lambda^*)}{1-\alpha_r} + \frac{\pi_s'(\lambda^*)}{1-\alpha_s} = \frac{u_s - \overline{u}_r + \frac{c_r}{1-\alpha_r} - \frac{c_s}{1-\alpha_s}}{\delta}. \tag{F.2}$$

We can also combine the equations above to obtain

$$\alpha_r p_r^* - \alpha_s p_s^* = \delta\left(\pi_r'(\lambda^*) + \pi_s'(\lambda^*)\right) + (\overline{u}_r - u_s) + (c_s - c_r). \tag{F.3}$$

Taking as given the sellers' period 1 equilibrium prices, the platform's expected profit is

$$\alpha_r \lambda p_r^* + \alpha_s (1-\lambda_s) p_s^* + \delta \left(\begin{array}{c} \alpha_r \int_{\overline{u}_r + \frac{u_s - \overline{u}_r + \frac{c_r}{1-\alpha_r} - \frac{c_s}{1-\alpha_s}}{F(\lambda)}}^{u_H} \left(E_\lambda[u_r|x] - u_s + \frac{c_s}{1-\alpha_s}\right) dG(x) \\ +\alpha_s \int_{u_L}^{\overline{u}_r + \frac{u_s - \overline{u}_r + \frac{c_r}{1-\alpha_r} - \frac{c_s}{1-\alpha_s}}{F(\lambda)}} \left(u_s - E_\lambda[u_r|x] + \frac{c_r}{1-\alpha_r}\right) dG(x) \end{array} \right)$$

$$= \alpha_r \lambda p_r^* + \alpha_s (1-\lambda) p_s^* + \delta \left(\begin{array}{c} \frac{\alpha_r}{1-\alpha_r}\pi_r(\lambda) + \frac{\alpha_r c_r}{1-\alpha_r}\left(1 - G\left(\overline{u}_r + \frac{u_s - \overline{u}_r + \frac{c_r}{1-\alpha_r} - \frac{c_s}{1-\alpha_s}}{F(\lambda)}\right)\right) \\ +\frac{\alpha_s}{1-\alpha_s}\pi_s(\lambda) + \frac{\alpha_s c_s}{1-\alpha_s} G\left(\overline{u}_r + \frac{u_s - \overline{u}_r + \frac{c_r}{1-\alpha_r} - \frac{c_s}{1-\alpha_s}}{F(\lambda)}\right) \end{array} \right).$$

Taking the derivative with respect to λ of the platform's profit and evaluating it at the equilibrium level of exploration $\lambda = \lambda^*$, we obtain

$$\alpha_r p_r^* - \alpha_s p_s^* + \delta \left(\begin{array}{c} \frac{\alpha_r}{1-\alpha_r}\pi_r'(\lambda^*) + \frac{\alpha_s}{1-\alpha_s}\pi_s'(\lambda^*) \\ +\left(\frac{\alpha_r c_r}{1-\alpha_r} - \frac{\alpha_s c_s}{1-\alpha_s}\right) F'(\lambda^*) \left(\frac{u_s - \overline{u}_r + \frac{c_r}{1-\alpha_r} - \frac{c_s}{1-\alpha_s}}{F(\lambda^*)^2}\right) g\left(\overline{u}_r + \frac{u_s - \overline{u}_r + \frac{c_r}{1-\alpha_r} - \frac{c_s}{1-\alpha_s}}{F(\lambda^*)}\right) \end{array} \right).$$

Using (F.2) and (F.3), this expression is proportional to

$$\begin{aligned} &\left(\pi_r'(\lambda^*) + \pi_s'(\lambda^*)\right) + \frac{(\overline{u}_r - u_s) + (c_s - c_r)}{\delta} + \left(\frac{\alpha_r}{1-\alpha_r}\pi_r'(\lambda^*) + \frac{\alpha_s}{1-\alpha_s}\pi_s'(\lambda^*)\right) \\ &+ \left(\frac{\alpha_r c_r}{1-\alpha_r} - \frac{\alpha_s c_s}{1-\alpha_s}\right) F'(\lambda^*) \left(\frac{u_s - \overline{u}_r + \frac{c_r}{1-\alpha_r} - \frac{c_s}{1-\alpha_s}}{F(\lambda^*)^2}\right) g\left(\overline{u}_r + \frac{u_s - \overline{u}_r + \frac{c_r}{1-\alpha_r} - \frac{c_s}{1-\alpha_s}}{F(\lambda^*)}\right) \end{aligned}$$

$$\begin{aligned} = \quad &\frac{(\overline{u}_r - u_s) + (c_s - c_r)}{\delta} + \frac{\pi_r'(\lambda^*)}{1-\alpha_r} + \frac{\pi_s'(\lambda^*)}{1-\alpha_s} \\ &+ \left(\frac{\alpha_r c_r}{1-\alpha_r} - \frac{\alpha_s c_s}{1-\alpha_s}\right) F'(\lambda^*) \left(\frac{u_s - \overline{u}_r + \frac{c_r}{1-\alpha_r} - \frac{c_s}{1-\alpha_s}}{F(\lambda^*)^2}\right) g\left(\overline{u}_r + \frac{u_s - \overline{u}_r + \frac{c_r}{1-\alpha_r} - \frac{c_s}{1-\alpha_s}}{F(\lambda^*)}\right) \end{aligned}$$

$$= \left(\frac{\alpha_r c_r}{1-\alpha_r} - \frac{\alpha_s c_s}{1-\alpha_s}\right)\left(\frac{1}{\delta} + F'(\lambda^*)\left(\frac{u_s - \overline{u}_r + \frac{c_r}{1-\alpha_r} - \frac{c_s}{1-\alpha_s}}{F(\lambda^*)^2}\right) g\left(\overline{u}_r + \frac{u_s - \overline{u}_r + \frac{c_r}{1-\alpha_r} - \frac{c_s}{1-\alpha_s}}{F(\lambda^*)}\right)\right).$$

Thus, the derivative with respect to λ of the platform's profit evaluated at the equilibrium level of exploration is positive if and only if $\frac{\alpha_r c_r}{1-\alpha_r} > \frac{\alpha_s c_s}{1-\alpha_s}$. In other words, the platform prefers more exploration relative to the equilibrium level if $\frac{\alpha_r c_r}{1-\alpha_r} > \frac{\alpha_s c_s}{1-\alpha_s}$, and less exploration if $\frac{\alpha_r c_r}{1-\alpha_r} < \frac{\alpha_s c_s}{1-\alpha_s}$.

G Proof of Proposition 9

In period 2, if the signal is x, then the location y of the buyer indifferent between the two sellers is determined by

$$u_s - p_s - ty = E_\lambda [u_r|x] - p_r - t(1-y),$$

where

$$E_\lambda [u_r|x] \equiv F(\lambda)x + (1-F(\lambda))\overline{u}_r.$$

Assuming the market is covered (i.e. u_s and $E_\lambda [u_r|u_L]$ are high enough relative to t), the resulting period 2 profits are

$$\begin{aligned}
\pi_s(\lambda) &= ((1-\alpha)p_s - c)\left(\frac{1}{2} + \frac{u_s - E_\lambda [u_r|x] + p_r - p_s}{2t}\right) \\
\pi_r(\lambda) &= ((1-\alpha)p_r - c)\left(\frac{1}{2} + \frac{E_\lambda [u_r|x] - u_s + p_s - p_r}{2t}\right).
\end{aligned}$$

Then equilibrium pricing in period 2 is

$$\begin{aligned}
p_s^* &= \frac{c}{1-\alpha} + t + \frac{u_s - E_\lambda [u_r|x]}{3} \\
p_r^* &= \frac{c}{1-\alpha} + t + \frac{E_\lambda [u_r|x] - u_s}{3},
\end{aligned}$$

resulting in period-2 equilibrium profits

$$\begin{aligned}
\pi_s^*(\lambda|x) &= (1-\alpha)\frac{t}{2}\left(1 + \frac{u_s - E_\lambda [u_r|x]}{3t}\right)^2 \\
\pi_r^*(\lambda|x) &= (1-\alpha)\frac{t}{2}\left(1 + \frac{E_\lambda [u_r|x] - u_s}{3t}\right)^2.
\end{aligned}$$

From the perspective of period 1, we need to take expectation over x, so expected second-period profits are (assuming the cutoff number of consumers is interior for all x, i.e. that t is high enough, u_s and $E_\lambda [u_r|u_L]$ are not too different, and u_s and $E_\lambda [u_r|u_H]$ are not too different)

$$\begin{aligned}
\pi_s^e(\lambda) &= (1-\alpha)\frac{t}{2}\int_{u_L}^{u_H}\left(1 + \frac{u_s - E_\lambda [u_r|x]}{3t}\right)^2 dG(x) \\
&= (1-\alpha)\frac{(3t + u_s - \overline{u}_r)^2 + F(\lambda)^2 Var(u_r)}{18t} \\
\pi_r^e(\lambda) &= (1-\alpha)\frac{t}{2}\int_{u_L}^{u_H}\left(1 - \frac{u_s - E_\lambda [u_r|x]}{3t}\right)^2 dG(x) \\
&= (1-\alpha)\frac{(3t + \overline{u}_r - u_s)^2 + F(\lambda)^2 Var(u_r)}{18t}.
\end{aligned}$$

Note as in our benchmark model, more exploration increases the expected second-period profits of both the safe and the risky seller because $Var(u_r) > 0$.

Next consider period 1. With a slight abuse of notation, p_s and p_r now denote period 1 prices. Profits are then

$$\begin{aligned}\pi_s &= ((1-\alpha)p_s - c)(1-\lambda) + \delta\pi_s^e(\lambda)\\ \pi_r &= ((1-\alpha)p_r - c)\lambda + \delta\pi_r^e(\lambda)\end{aligned}$$

where

$$\lambda = \frac{1}{2} + \frac{\overline{u}_r - u_s + p_s - p_r}{2t}$$

is the fraction of consumers that buy from the risky seller in period 1 (again, assuming a covered market in period 1). Then the first-order conditions in period 1 are

$$\begin{aligned}\frac{1}{2} + \frac{u_s - \overline{u}_r + \frac{c}{1-\alpha} + p_r - 2p_s}{2t} + \delta\frac{F(\lambda)F'(\lambda)}{18t^2}Var(u_r) &= 0\\ \frac{1}{2} + \frac{\overline{u}_r - u_s + \frac{c}{1-\alpha} + p_s - 2p_r}{2t} - \delta\frac{F(\lambda)F'(\lambda)}{18t^2}Var(u_r) &= 0,\end{aligned}$$

which imply period 1 equilibrium prices are

$$\begin{aligned}p_s^* &= \frac{c}{1-\alpha} + t + \frac{u_s - \overline{u}_r}{3} + \delta\frac{F(\lambda)F'(\lambda)}{27t}Var(u_r)\\ p_r^* &= \frac{c}{1-\alpha} + t + \frac{\overline{u}_r - u_s}{3} - \delta\frac{F(\lambda)F'(\lambda)}{27t}Var(u_r).\end{aligned}$$

The price effect due to exploration means the safe seller increases its price and the risky seller decreases its price, which induces more buyers to try the risky seller in period 1. Note that, unlike our benchmark model, here sellers have no need to offer different prices to different buyer segments since buyers are anyway heterogeneous in their preferences. Thus, sellers compete in uniform prices.

The equilibrium level of exploration is then determined by

$$\lambda^* = \frac{1}{2} - \frac{u_s - \overline{u}_r}{6t} + \delta\frac{F(\lambda^*)F'(\lambda^*)}{27t^2}Var(u_r). \tag{G.1}$$

Note that λ^* can be higher or lower than $\frac{1}{2}$. Assuming t is sufficiently high, (G.1) admits a unique solution λ^* which must lie within $(0,1)$.

The extent to which the safe product is valued higher than the risky product in period 1 ($u_s - \overline{u}_r$) makes fewer buyers want to try the new seller ($\lambda^* < \frac{1}{2}$), but taking into account the effect of exploration on period 2 profits leads to a larger λ^* as both sellers want to induce more exploration (this makes the safe seller price less aggressively and the risky seller to price more aggressively in period 1). The latter effect can be smaller or larger than the former. Note also that λ^* is decreasing in $u_s - \overline{u}_r$ and increasing in the variance $Var(u_r)$, but the effect of t (the degree of differentiation) on λ^* is ambiguous.

Compare now the solution of (G.1) to the level of exploration that the platform wants. The platform's expected profits at the existing period 1 equilibrium prices can be written

$$\alpha\left(\lambda^* p_r^* + \left(1-\lambda^*\right) p_s^*\right) + \frac{\alpha\delta}{1-\alpha}\left(c + \pi_s^e\left(\lambda^*\right) + \pi_r^e\left(\lambda^*\right)\right).$$

Thus, if the platform can exogenously increase λ^* by an infinitesimal amount without affecting first-period prices, but taking into account how this influences second-period prices, then the impact on its profit is measured by

$$\begin{aligned}
& \alpha\left(p_r^* - p_s^*\right) + \frac{\alpha\delta}{1-\alpha}\left(\frac{\partial\pi_s^e\left(\lambda^*\right)}{\partial\lambda} + \frac{\partial\pi_r^e\left(\lambda^*\right)}{\partial\lambda}\right) \\
= \; & \alpha\left(\frac{2}{3}\left(\overline{u}_r - u_s\right) - \delta\frac{2F\left(\lambda^*\right)F'\left(\lambda^*\right)}{27t}\left(\int_{u_L}^{u_H} x^2 dG\left(x\right) - \overline{u}_r^2\right)\right) \\
& + \alpha\delta\frac{2F\left(\lambda^*\right)F'\left(\lambda^*\right)}{9t}\left(\int_{u_L}^{u_H} x^2 dG\left(x\right) - \overline{u}_r^2\right) \\
= \; & 4\alpha t\left(\frac{\overline{u}_r - u_s}{6t} + \delta\frac{F\left(\lambda^*\right)F'\left(\lambda^*\right)}{27t^2}\left(\int_{u_L}^{u_H} x^2 dG\left(x\right) - \overline{u}_r^2\right)\right) \\
= \; & 4\alpha t\left(\lambda^* - \frac{1}{2}\right),
\end{aligned}$$

where we have used (G.1) to obtain the last equality. This result implies that when sellers induce more/less than half of buyers to explore in equilibrium, the platform will want even more/less exploration.