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Abstract

Digital platforms display sellers' prices and collect ad valorem commissions. We study how these roles shape sellers' disclosure choices and a platform's incentives to regulate them. Sellers offer a base good and an avoidable add-on, which some consumers overlook when choosing sellers. Because commissions apply to the base good but not off-platform add-ons, add-on profit is passed through more than one-for-one into lower base-good prices, creating a competition multiplier. Hidden add-on prices can reduce efficiency while raising consumer surplus through this mechanism. A platform regulates disclosure to protect commission revenue, while mandatory transparency can improve efficiency but reduce consumer surplus.

Keywords: Platform governance, add-on pricing, consumer myopia, market transparency, ad-valorem commissions, shrouding, information disclosure.

JEL Classification: D11, D21, D82, L12, L15, L81.

1 Introduction

Hidden add-on prices are common in platform markets. A traveler may compare airlines using headline fares displayed by an online travel agency or metasearch platform, but observe seller-specific charges for baggage or seat selection only through sellers' own websites or at the airport. A hotel may similarly acquire a guest through a booking platform and sell parking, breakfast, or spa access at the hotel. These add-ons are often avoidable if consumers anticipate them,

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but become costly or difficult to avoid after they have chosen a seller. Whether consumers can anticipate these costs depends in part on when add-on prices are visible. A European Commission study found that some sampled airline and travel-agent websites did not display baggage fees when consumers initially observed flight prices.¹

Platforms charge commissions on transactions completed through their systems, while sellers may be able to sell ancillary products directly to consumers outside the platform. If displaying an add-on price on the platform requires processing the corresponding sale through the platform, disclosure makes the add-on revenue subject to commission. Hiding the add-on instead allows the seller to complete the sale elsewhere and retain the full margin. The platform's commission affects both prices and sellers' incentives to disclose add-ons and the platform's own incentives to regulate disclosure.

This paper studies these interactions. We ask when competing sellers disclose add-on prices, when a profit-maximizing platform intervenes in their disclosure choices, and whether the platform's preferred policy coincides with the interests of consumers or a welfare-maximizing regulator.

We consider two competing sellers, each offering a base good and an add-on through a monopoly platform. The platform charges a fixed proportional commission on transactions completed on-platform. Consumers differ in their attention to add-ons. Sophisticated consumers anticipate the add-on when choosing a seller and can incur a cost in advance to avoid purchasing it later. Myopic consumers initially overlook the add-on and compare sellers using only their base good prices. Add-on disclosure makes some myopic consumers aware of the add-on, although some may remain inattentive even after disclosure.

In the baseline, the platform does not mandate whether sellers disclose their add-on prices. It links disclosure to the sales channel: a seller that displays its add-on price must sell the add-on on-platform and pay the commission, whereas a seller that hides its add-on price can sell the add-on off-platform and avoid the commission. We refer to the latter behaviour as *shrouding*: consumers do not observe the seller's add-on price when choosing the base good.

Our first result is that the proportional commission changes how add-on profits are competed away. As in standard add-on models (Gabaix and Laibson, 2006), competition for consumers leads sellers to use anticipated add-on profits to subsidize the base good price. When both goods are sold through the platform, the same commission applies to both sides of this price adjustment, and the pass-through is one-for-one. However, when the add-on is sold off-platform, the seller keeps the entire add-on margin but retains only a fraction of each dollar charged for the base good. As a result, competing away one dollar of commission-free add-on profit requires the seller to reduce the base good price by more than one dollar. This amplification increases with the commission rate. We call it the *competition multiplier*.

¹European Commission, DG MOVE, *Price Transparency Provisions in Regulation 1008/2008 and Other Relevant EU Legal Texts: Final Report*, January 2012, paras. 3.35–3.38, https://transport.ec.europa.eu/system/files/2016-09/final_report_price_transparency.pdf.

The competition multiplier changes both the magnitude and the incidence of the cross-subsidy generated by hidden add-on prices. Shrouding is socially inefficient whenever some consumers anticipate the add-on, because these consumers incur a real cost to avoid the later high add-on price. Yet shrouding can increase consumer surplus. When the commission rate and the share of myopic consumers are sufficiently high, the amplified reduction in the base good price more than compensates consumers for the avoidance costs and higher add-on payments generated by shrouding. The effect can be strong enough that even consumers who overlook the add-on are better off despite eventually paying a high add-on price. This differs from the standard one-for-one cross-subsidy in Gabaix and Laibson (2006), under which sophisticated consumers benefit from shrouding at the expense of myopic consumers.

We next allow the platform to regulate what sellers disclose while leaving them free to complete add-on sales off-platform. This separation between disclosure and the add-on sales channel is motivated by regulatory frameworks that impose price-disclosure requirements while preserving sellers' ability to steer consumers and conclude transactions outside the platform. In the European Union, the Consumer Rights Directive requires pre-contractual disclosure of the total price, while Article 5(4) of the Digital Markets Act protects business users' ability to communicate offers and conclude contracts with users outside a designated gatekeeper's core platform service.²

Under either a disclosure or a non-disclosure mandate, sellers prefer to sell positive price add-ons off-platform to avoid the platform's commission. The platform chooses its disclosure policy to maximize commission revenue from the base good. Whenever sellers voluntarily disclose and sell the add-on through the platform, the platform prefers to leave their disclosure choice unrestricted. Otherwise, it mandates disclosure only when doing so raises the commissionable base good price. It never strictly prefers to require sellers to hide add-on prices.

The platform chooses disclosure to maximize its commission revenue, which need not align with consumer surplus or social welfare. When relatively few consumers overlook add-ons, the platform can tolerate hidden add-on prices even though disclosure would increase consumer surplus. At the other extreme, when many consumers remain inattentive even after prices are disclosed, the platform can require disclosure and induce sellers to charge a high add-on price only to the consumers who remain inattentive. The consumers who become informed then incur costs to avoid the add-on, making this the least efficient outcome in the model. Platform intervention can be insufficient in one part of the parameter space and excessive in another.

²Directive 2011/83/EU, Article 6(1)(e). See <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:32011L0083>. Regulation (EU) 2022/1925, Article 5(4). See <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32022R1925>. The European Commission applied this obligation to Apple's App Store steering terms in its April 2025 non-compliance decision. See European Commission, *Commission Finds Apple and Meta in Breach of the Digital Markets Act*, April 23, 2025, <https://digital-strategy.ec.europa.eu/en/news/commission-finds-apple-and-meta-breach-digital-markets-act>. In the United States, the Federal Trade Commission's Rule on Unfair or Deceptive Fees, effective May 12, 2025, similarly imposes price-disclosure requirements for live-event tickets and short-term lodging. See <https://www.ftc.gov/business-guidance/resources/rule-unfair-or-deceptive-fees-frequently-asked-questions>.

These results have several policy implications. A transparency requirement combined with the right to sell off-platform can improve social efficiency but reduce consumer surplus. The reason is that disclosure changes add-on pricing, and off-platform sales amplify the pass-through of add-on profits into lower base good prices. A commission rate cap can restore transparency and efficiency in some markets, but it can reduce consumer surplus by weakening the pass-through of off-platform add-on profits. When disclosure leaves many consumers inattentive, policies that improve consumer attention can address this problem more directly.

Literature Review

This paper relates to three strands of literature on competitive add-on pricing, platform disclosure and governance, and transaction fees and off-platform sales.

Competitive Add-On Pricing Our analysis builds on the literature on competitive add-on pricing and consumer myopia, particularly Gabaix and Laibson (2006). In their model, hidden add-on profits are competed away through lower base good prices, creating a cross-subsidy from myopic to sophisticated consumers. In our model, commission-free off-platform add-on profits are passed through more than one-for-one into lower base good prices. As a result, even myopic consumers who pay the high hidden add-on price can have higher surplus under shrouding, although shrouding reduces social welfare through costly avoidance.

Related work identifies other circumstances in which high or hidden add-on charges can benefit consumers. Under Cournot competition with isoelastic demand, de Meza and Reyniers (2012) find that a hidden surcharge can reduce the upfront price by more than the surcharge. Zenger (2013) demonstrates that high add-on prices can improve welfare by correcting inefficient avoidance decisions by myopic consumers. Our mechanism is different. The amplified price reduction comes from the fact that the base good is subject to commission while the off-platform add-on is not.

Other papers study why add-on pricing and deception can persist under competition. Ellison (2005) establishes that adverse selection can prevent add-on profits from being fully competed away. Wenzel (2014) shows that increasing the number of competing firms strengthens incentives to unshroud add-on information. Heidhues et al. (2017) find that socially inferior products can facilitate profitable deception.

Ghosh (2025) studies competitive add-on pricing with consumer naivete and asymmetric seller costs. Greater naivete can distort product matching and lower consumer surplus despite lowering average prices. We abstract from cost asymmetry and make seller disclosure and the add-on sales channel endogenous.

Experimental and field evidence supports limited attention to secondary price components. Experimental evidence shows that partitioned and drip prices can reduce attention to total costs and distort consumer choices (Morwitz et al., 1998; Santana et al., 2020). Field experiments on

eBay and StubHub show that the salience and disclosure of fees affect bidding, spending, and purchase decisions (Hossain and Morgan, 2006; Brown et al., 2010; Blake et al., 2021). Using market data and a consumer survey, Seim and Vitorino (2025) document limited foresight about add-on fees in the market for driving instruction.

Platform Disclosure and Governance The paper also relates to work on platform information provision and non-price governance. Johnen and Somogyi (2024) establish that a platform charging sellers a membership fee can have stronger incentives than sellers to shroud seller fees. Shrouding raises buyers’ perceived surplus and attracts more buyers to the platform, allowing the platform to extract more surplus from sellers. In our model, shrouding moves the add-on off-platform and lowers the commissionable base good price. The platform never strictly prefers to mandate shrouding and instead either leaves the disclosure decision to sellers or mandates unshrouding.

Belleflamme and Peitz (2019b) study whether users are informed about the platform price charged to users on the opposite side of the market. We study disclosure of sellers’ add-on prices to consumers. More broadly, our paper connects to work on non-price platform governance and the ways platforms shape seller competition and market outcomes (Teh, 2022; de Cornière and Taylor, 2019; Hagiü et al., 2022; Belleflamme and Peitz, 2019a). Our disclosure policy affects both consumer information and whether the platform receives commission on the add-on sale.

Transaction Fees and Off-Platform Sales A third strand studies how platform fees and restrictions on off-platform transactions affect seller pricing. Miao (2022) finds that differential ad valorem fees induce sellers to shift revenue toward the less heavily taxed good. A lower fee on the ancillary good can increase the ancillary good price. Consumers observe both prices in that model. In ours, the commission rate not only affects prices but also seller disclosure and the add-on sales channel.

Geng et al. (2018) study how an upstream firm’s add-on strategy interacts with wholesale and agency contracts. The firm prefers bundling the add-on with the base good under a wholesale contract and selling the add-on separately under an agency contract. Their model has a single upstream firm and takes disclosure as given. We hold the agency structure fixed and study competing sellers with endogenous disclosure and add-on sales channels.

Our analysis is also related to work on price-parity and anti-steering restrictions. Edelman and Wright (2015) establish that price coherence restrictions can generate excessive intermediation and reduce consumer surplus. Wang and Wright (2020) study price-parity clauses when consumers can search on-platform and purchase directly. Gomes and Mantovani (2025) study commission regulation when price-parity and anti-steering provisions restrict alternative sales channels. In these papers, the transactions can move between the intermediary and the direct channel. We hold base good intermediation fixed and allow only the add-on sale to move off-platform. This distinction makes the commission rate affect both disclosure incentives and the

strength of the base good cross-subsidy. A commission cap can induce sellers to disclose their add-on prices and increase social welfare while reducing consumer surplus.

Paper Outline

Sections 2 and 3 study the baseline, in which the platform does not mandate disclosure but links disclosure to the add-on sales channel, and characterize sellers' disclosure choices. Section 4 separates disclosure from the sales channel and presents the platform's optimal disclosure choice. Section 5 discusses policy implications. Section 6 concludes. Appendix A contains the omitted proofs.

2 Baseline Model

2.1 Model Setup

The market contains two sellers, a monopoly platform, and a unit mass of consumers.

Sellers Two sellers, indexed by $i \in \{A, B\}$, offer horizontally differentiated base goods and homogeneous add-ons. Seller i sets a base good price p_i and an add-on price $\hat{p}_i$ before consumers choose a seller. The base good has constant marginal cost c , and the marginal cost of add-on is normalized to zero.³ Each seller also decides whether to *shroud* or *unshroud* its add-on price. Only an unshrouded add-on price is displayed before consumers choose a base good.

Platform The platform is a monopoly intermediary with marginal cost normalized to zero. All base good sales are processed on-platform. The platform charges an exogenous ad-valorem commission rate $\gamma \in (0, 1)$ on every transaction processed through its system. The platform adopts a *bundled laissez-faire* policy. It mandates neither shrouding nor unshrouding, but it ties access to its disclosure tools to use of its payment system. A seller that displays an add-on price must sell the add-on on-platform and pay the commission on that sale. A seller that shrouds sells the add-on off-platform and avoids the add-on commission.

Consumers Each consumer demands one base good and chooses between sellers A and B . Base goods are horizontally differentiated. Let ϵ_{iA} and ϵ_{iB} denote consumer i 's idiosyncratic match values for the two base goods. Consumer i 's value for seller j 's base good is $V + \epsilon_{ij}$. Define the consumer's relative preference for seller B over seller A as $x_i \equiv \epsilon_{iB} - \epsilon_{iA}$. x_i has support with endpoints $\underline{x} < 0 < \bar{x}$, which may be finite or infinite, and a continuously differentiable cumulative distribution function F . The distribution is log-concave and symmetric around zero, so $F(0) = \frac{1}{2}$, with density $f > 0$. The match values satisfy $\mu \equiv \mathbb{E}[\max\{\epsilon_{iA}, \epsilon_{iB}\}] < \infty$.

³We assume that the marginal cost of the base good c is sufficiently large to ensure that equilibrium base good prices are positive.

Every consumer values the add-on at R . A consumer can purchase the add-on only from the seller whose base good she selected. She can avoid the add-on by incurring a one-time substitution cost e , but she must do so when purchasing the base good, before any shrouded add-on price is revealed. We assume $0 < e < R$. Appendix C studies the case $e > R$.

A fraction $1 - \alpha$ of consumers are *sophisticated*, and the remaining fraction $\alpha \in (0, 1]$ are *myopic*. Sophisticated consumers anticipate the add-on price and any substitution cost when they choose a seller. Myopic consumers initially ignore the add-on and compare only base good prices. If at least one seller unshrouds, a fraction $1 - \lambda$ of initially myopic consumers becomes informed and then behaves like sophisticated consumers. The remaining share $\lambda \in [0, 1)$, with population mass $\alpha\lambda$, remains uninformed. We refer to these consumers as uninformed myopic consumers. The parameter λ measures the persistence of myopia after disclosure.

If a consumer is indifferent between purchasing the add-on and substituting, she purchases the add-on. If no consumer would reach the add-on purchase stage under a shrouding strategy, the seller chooses $\hat{p} = R$. This tie-breaking convention selects the limit of the seller's unique optimum when the mass of locked-in buyers is positive.

Timing The game proceeds in three stages:

- **Stage 1:** Sellers simultaneously set base good price p_i , add-on price $\hat{p}_i$, and decide whether to shroud or unshroud the add-on prices.
- **Stage 2:** Consumers observe base good prices (and add-on prices if unshrouded) and choose a seller. Sophisticated consumers also decide whether to exert substitution effort e .
- **Stage 3:** Any previously shrouded add-on prices are revealed. Consumers who have not substituted decide whether to purchase the add-on.

In the baseline model, we label each equilibrium by the sellers' action alone. The superscript u denotes the unshrouding equilibrium, and the superscript s denotes the shrouding equilibrium. The full notation, which also includes the platform policy prefix, is introduced in Section 4.

Our solution concept is Perfect Bayesian Equilibrium. Whenever seller j shrouds, sophisticated consumers expect $\hat{p}_j = R$, independently of the observed base good prices and disclosure profile. Appendix A verifies that this belief is consistent with the seller's optimal hidden pricing.

2.2 Discussion of Key Assumptions

Bundled Disclosure and Anti-Steering The bundled policy captures anti-steering rules that prevent sellers from using the platform to communicate off-platform offers. At the time of the *Epic Games v. Apple* litigation, Apple required in-app purchases of digital content to use its payment system and prohibited buttons, external links, or other calls to action directing

users to alternative purchasing mechanisms.⁴ We model this restriction by requiring a seller that unshrouds its add-on price to sell the add-on on-platform. A seller that shrouds does not communicate the add-on offer through the platform. It reveals the offer directly to consumers only after they have chosen its base good and sells the add-on off-platform.

Exogenous Commission Rate We treat γ as fixed within the market under study. A platform may set a common commission across many products or geographic markets, so the rate facing sellers in one local market need not be chosen to maximize profit in that market alone.

Add-On Unavoidability Once a consumer purchases the base good, the add-on becomes unavoidable unless she incurred the substitution cost in advance. This assumption captures lock-in in travel and service markets. A traveler who reaches the airport without arranging baggage service, for example, cannot realistically switch airlines to avoid the baggage fee. The selected seller then has ex post monopoly power over the add-on.

3 Equilibrium Analysis under Laissez-Faire Platform

3.1 Consumers' Behavior

Sophisticated consumers observe disclosed add-on prices and form rational expectations about shrouded prices. Let $\hat{p}_j$ denote the add-on price incorporated into sophisticated consumers' seller choice. It equals the disclosed price if seller j unshrouds and the expected price R if seller j shrouds. Consumer i 's net utility from seller j is

$$u_{ij}^{\text{soph}} = V + R - p_j - \min\{\hat{p}_j, e\} + \epsilon_{ij}.$$

A sophisticated consumer chooses seller A if $u_{iA}^{\text{soph}} \geq u_{iB}^{\text{soph}}$, yielding the following sophisticated base good demand for seller A .

$$D_A^{\text{soph}}(p_A, p_B, \hat{p}_A, \hat{p}_B) = F(p_B + \min\{\hat{p}_B, e\} - p_A - \min\{\hat{p}_A, e\}).$$

Myopic consumers ignore the add-on price and evaluate options based solely on the base good price. Their perceived utility from seller j is

$$u_{ij}^{\text{myop}} = V - p_j + \epsilon_{ij}.$$

⁴See the Ninth Circuit's description of Apple's in-app purchase and anti-steering provisions in *Epic Games, Inc. v. Apple Inc.*, 67 F.4th 946 (9th Cir. 2023). Current rules differ across storefronts. See Apple's *App Review Guidelines*, Sections 3.1.1 and 3.1.1(a). European regulation also limits such restrictions. Article 5(4) of the Digital Markets Act requires designated gatekeepers to allow business users to communicate offers and conclude contracts outside the gatekeeper's core platform service. See Regulation (EU) 2022/1925, Article 5(4), at <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32022R1925>.

This yields the following myopic base good demand for seller A .

$$D_A^{\text{myop}}(p_A, p_B) = F(p_B - p_A).$$

For a seller that unshrouds, sophisticated consumers buy the add-on if $\hat{p}_A \leq e$ and otherwise substitute. For a seller that shrouds, sophisticated consumers expect the hidden add-on price to equal R , which is the monopoly price for locked-in consumers. Because $R > e$, they substitute before choosing a base good. Myopic consumers do not substitute and buy at every add-on price weakly below R .

3.2 Sellers' Behavior

We write seller A 's profit in each possible disclosure environment, taking seller B 's strategy as given.

Case 1: Seller A Unshrouds

When seller A unshrouds, the mass of consumers who behave sophisticatedly becomes $1 - \alpha\lambda$, regardless of seller B 's disclosure choice. Seller A processes both transactions on-platform and pays the commission on the total revenue. Seller A 's profit is

$$\begin{aligned} \Pi_A = & (1 - \alpha\lambda) [(1 - \gamma)(p_A + \mathbb{1}_{\{\hat{p}_A \leq e\}}\hat{p}_A) - c] D_A^{\text{soph}}(p_A, p_B, \hat{p}_A, \hat{p}_B) \\ & + \alpha\lambda [(1 - \gamma)(p_A + \mathbb{1}_{\{\hat{p}_A \leq R\}}\hat{p}_A) - c] D_A^{\text{myop}}(p_A, p_B). \end{aligned}$$

The first line is profit from consumers who behave sophisticatedly, who purchase the add-on only when $\hat{p}_A \leq e$. The second line is profit from the uninformed myopic consumers, who choose a seller based only on the base good price and purchase the add-on whenever $\hat{p}_A \leq R$.

Case 2: Seller A Shrouds, Seller B Unshrouds

Seller B 's disclosure informs the same fraction of consumers, so the type composition is unchanged as in Case 1. Seller A shrouds and moves its add-on sales off-platform. It pays commission only on the base good:

$$\begin{aligned} \Pi_A = & (1 - \alpha\lambda) [(1 - \gamma)p_A - c] D_A^{\text{soph}}(p_A, p_B, R, \hat{p}_B) \\ & + \alpha\lambda [(1 - \gamma)p_A + R - c] D_A^{\text{myop}}(p_A, p_B). \end{aligned}$$

Relative to Case 1, add-on revenue enters without the factor $1 - \gamma$. This difference creates an incentive to shroud because shrouding allows the seller to earn add-on revenue without paying commission.

Case 3: Both Sellers Shroud

When both sellers shroud, neither seller informs initially myopic consumers, and each seller

avoids commission on add-on revenue. Seller A 's profit is

$$\begin{aligned}\Pi_A = & (1 - \alpha) [(1 - \gamma)p_A - c] D_A^{soph}(p_A, p_B, R, R) \\ & + \alpha [(1 - \gamma)p_A + R - c] D_A^{myop}(p_A, p_B).\end{aligned}$$

Because no seller discloses add-on information, the mass of sophisticated consumers remains $1 - \alpha$.

Under laissez-faire, there is no asymmetric equilibrium and there are two classes of symmetric equilibria. In one class, both sellers unshroud, and in the other, both sellers shroud. We next characterize the existence conditions for each class. Appendix A provides the complete proofs.

Lemma 1. (i) Define $\bar{\alpha} \equiv \frac{e(1-\gamma)}{\lambda R}$. If $\alpha \leq \bar{\alpha}$, there exists a symmetric equilibrium in which sellers unshroud add-on prices and sell the add-ons on-platform.

In this equilibrium, the base good price is $p^u = \frac{c}{1-\gamma} - e + \frac{1}{2f(0)}$, and the add-on price is $\hat{p}^u = e$. Each seller earns $\frac{1-\gamma}{4f(0)}$, and the platform earns $\Pi_P^u = \gamma \left(\frac{c}{1-\gamma} + \frac{1}{2f(0)} \right)$.

(ii) Define $\underline{\alpha} \equiv \frac{e(1-\gamma)}{R}$. If $\alpha \geq \underline{\alpha}$, there exists a symmetric equilibrium in which sellers shroud add-on prices and sell the add-ons off-platform.

In this equilibrium, the base good price is $p^s = \frac{c-\alpha R}{1-\gamma} + \frac{1}{2f(0)}$, and the add-on price is $\hat{p}^s = R$. Each seller earns $\frac{1-\gamma}{4f(0)}$, and the platform earns $\Pi_P^s = \gamma \left(\frac{c-\alpha R}{1-\gamma} + \frac{1}{2f(0)} \right)$.

Under unshrouding, both consumer types purchase the add-on, so sellers set $\hat{p}^u = e$, the highest price at which sophisticated consumers do not substitute. Under shrouding, sophisticated consumers anticipate a high add-on price and substitute in advance, leaving only myopic consumers to purchase the add-on at $\hat{p}^s = R$.

Base good prices reflect competition for the associated add-on profit. As in standard add-on models (Ellison, 2005; Gabaix and Laibson, 2006; Wenzel, 2014), sellers pass anticipated add-on revenue through to consumers in the base good price. Under unshrouding, both base good and add-on face the same commission, so the add-on margin e reduces the base good price one-for-one. Under shrouding, sellers earn commission-free expected add-on profit αR , while each base good price reduction is reduced by the commission. Therefore, competing away αR requires the larger price reduction $\frac{\alpha R}{1-\gamma}$.

Each seller earns $\frac{1-\gamma}{4f(0)}$ in either equilibrium. Add-on profit changes the equilibrium base good price but not the seller's equilibrium payoff. The equilibrium disclosure decision changes how surplus is divided between the platform and consumers. Under shrouding, sellers pass $\frac{\alpha R}{1-\gamma}$ to consumers through the base good price even though they earn only αR in off-platform add-on profit. The difference between the amount passed to consumers, $\frac{\alpha R}{1-\gamma}$, and the add-on profit earned by sellers, αR , is exactly the same as the difference between platform profits under the

two equilibria:

$$\Pi_P^u - \Pi_P^s = \frac{\alpha R}{1 - \gamma} - \alpha R = \frac{\gamma \alpha R}{1 - \gamma} > 0.$$

This amount is transferred from the platform to consumers through the base good price. The platform earns strictly more under the unshrouding equilibrium. Under the shrouding equilibrium, the add-on is sold off-platform and generates no commission revenue.

The two equilibrium thresholds govern opposite unilateral deviations. Starting from a shrouding equilibrium, a seller earns the off-platform add-on margin αR . By deviating to unshrouding, it instead earns the retained on-platform margin $(1 - \gamma)e$. For any given base good price, consumers make the same seller choice under shrouding and unshrouding, so the deviation changes profits only through the add-on margin. Hence, shrouding is sustainable if and only if $\alpha R \geq (1 - \gamma)e$, or $\alpha \geq \underline{\alpha}$. Starting from an unshrouding equilibrium, a seller earns $(1 - \gamma)e$. A deviation to shrouding yields the off-platform margin $\alpha \lambda R$, since only the residual uninformed consumers buy the add-on. Because the rival remains unshrouded, the share of informed consumers is unchanged, and the same demand comparison applies. Hence, unshrouding is sustainable if and only if $(1 - \gamma)e \geq \alpha \lambda R$, or $\alpha \leq \bar{\alpha}$.

The sellers' disclosure decisions are strategic complements. Switching from unshrouding to shrouding changes a seller's effective margin by $\alpha R - (1 - \gamma)e$ when the rival shrouds and by $\alpha \lambda R - (1 - \gamma)e$ when the rival unshrouds. Since $\lambda < 1$, shrouding is more attractive when the rival also shrouds. This generates the multiplicity region in which both symmetric equilibria can be sustained.

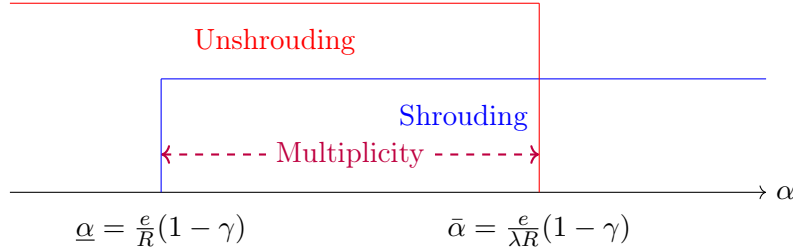


Figure 1: Equilibrium conditions under bundled laissez-faire platform

Figure 1 illustrates the equilibrium regions. A higher commission rate lowers both $\underline{\alpha}$ and $\bar{\alpha}$. It makes shrouding easier to sustain and unshrouding harder to sustain. The effect of λ is different. A higher λ means that fewer myopic consumers become informed after disclosure. It lowers $\bar{\alpha}$ but leaves $\underline{\alpha}$ unchanged. Therefore, the multiplicity region shrinks, while the shrouding-only region expands. When $\lambda = 0$, disclosure informs all initially myopic consumers, so unshrouding can be sustained for every α , with $\bar{\alpha} = +\infty$. If $\lambda \leq \frac{e(1-\gamma)}{R}$, then $\bar{\alpha} \geq 1$, and the unshrouding equilibrium exists for every $\alpha \in (0, 1]$.

3.3 Welfare Analysis

3.3.1 Social Welfare

We define social welfare as the sum of consumer surplus, seller profits, and platform profit: $W \equiv CS + \Pi_A + \Pi_B + \Pi_P$.

Social welfare losses arise from the substitution cost e paid by sophisticated consumers when the add-on price is R . Under the unshrouding equilibrium, the add-on price equals e and no consumer substitutes, so the equilibrium is socially efficient. Under the shrouding equilibrium, a mass $1 - \alpha$ of sophisticated consumers substitutes to avoid the high add-on price, generating deadweight loss $(1 - \alpha)e$. Hence,

$$W^u \geq W^s,$$

3.3.2 Consumer Welfare

Consumer surplus in each equilibrium equals the gross value $V + R + \mu$ minus the base good price and either the add-on payment or the substitution cost. $\mu \equiv \mathbb{E}[\max\{\epsilon_{iA}, \epsilon_{iB}\}]$ represents the average match quality a consumer obtains from optimal seller choice.

Under the unshrouding equilibrium, sellers sell add-ons on-platform at price e . Since both the base good and add-on are sold on-platform and subject to the commission, sellers compete away add-on profit e into the base good price one-for-one. Every consumer obtains

$$CS^u = V + R + \mu - \frac{c}{1 - \gamma} - \frac{1}{2f(0)}.$$

Under the shrouding equilibrium, sellers sell add-ons off-platform at price R , avoiding the commission. Since the add-on profit αR is earned off-platform while the base good remains subject to the commission γ , sellers compete away an amplified amount $\frac{\alpha R}{1 - \gamma}$ into the base good price. Sophisticated consumers pay the substitution cost e , whereas myopic consumers purchase the add-on at R . Their respective per-consumer surpluses are

$$CS^{s, \text{soph}} = V + R \left(1 + \frac{\alpha}{1 - \gamma} \right) + \mu - \frac{c}{1 - \gamma} - \frac{1}{2f(0)} - e,$$

and

$$CS^{s, \text{myop}} = V + \frac{\alpha R}{1 - \gamma} + \mu - \frac{c}{1 - \gamma} - \frac{1}{2f(0)}.$$

Aggregating across consumer types gives

$$CS^s = V + R \left(1 + \frac{\gamma \alpha}{1 - \gamma} \right) + \mu - \frac{c}{1 - \gamma} - \frac{1}{2f(0)} - (1 - \alpha)e.$$

The amplified base good price reduction is the source of potential consumer surplus gain under shrouding relative to the unshrouding equilibrium. The following proposition establishes the

conditions under which this gain outweighs the harm from the high add-on price.

Proposition 1. *Consumer surplus in the shrouding equilibrium is weakly higher than in the unshrouding equilibrium under the following conditions:*

- (i) *For sophisticated consumers, if and only if $\alpha \geq \frac{e(1-\gamma)}{R} = \underline{\alpha}$.*
- (ii) *For total consumer surplus, if and only if $\alpha \geq \frac{e(1-\gamma)}{\gamma R + (1-\gamma)e} \equiv \tilde{\alpha}$.*
- (iii) *For myopic consumers, if and only if $\alpha \geq 1 - \gamma$.*

Because every consumer pays the same base good price within a symmetric equilibrium, moving from unshrouding to shrouding changes each consumer's base good payment by $p^u - p^s = \frac{\alpha R}{1-\gamma} - e$. Whenever the shrouding equilibrium exists, this price reduction is weakly positive. Proposition 1 compares this per-consumer price reduction with the additional add-on-related cost relative to unshrouding. That additional cost is zero for a sophisticated consumer, $\alpha(R - e)$ on average across all consumers, and $R - e$ for a myopic consumer.

Under shrouding, sellers earn commission-free expected off-platform add-on profit αR . Competing away this profit requires a base good price reduction of $\frac{\alpha R}{1-\gamma}$. The factor $\frac{1}{1-\gamma}$ is the competition multiplier. This amplification generates the strict ordering $\underline{\alpha} < \tilde{\alpha} < 1 - \gamma$. Sophisticated consumers benefit when the base good price reduction is nonnegative, total consumer surplus rises when it exceeds $\alpha(R - e)$, and myopic consumers benefit when it exceeds $R - e$. All three cutoffs decrease strictly with γ , so a higher commission expands the region in which shrouding raises consumer surplus.

The consumer welfare analysis depends on the set of feasible equilibria. For every $\alpha \in (0, 1]$, shrouding is sustainable when the commission rate is sufficiently high. If $\alpha < \frac{e}{R}$, this requires $\gamma \geq 1 - \frac{\alpha R}{e}$. If $\alpha \geq \frac{e}{R}$, shrouding is sustainable for every $\gamma \in (0, 1)$. Unshrouding is sustainable if and only if $\alpha \leq \bar{\alpha} \equiv \frac{e(1-\gamma)}{\lambda R}$. When $\lambda > \frac{e}{R}$ and $\alpha \geq \frac{e}{\lambda R}$, unshrouding cannot be sustained for any $\gamma \in (0, 1)$, so shrouding is the unique equilibrium for every commission rate. When $\lambda < \frac{e}{R}$, a sufficiently low commission γ makes $\bar{\alpha} > 1$, so at such commission rates unshrouding is sustainable for every $\alpha \in (0, 1]$. We analyze each case in turn.

Case $\lambda > \frac{e}{R}$ (so that $\bar{\alpha} < 1$ for every $\gamma \in (0, 1)$)

Figure 2 maps these thresholds in the (α, γ) space for a market where consumer myopia is highly persistent (high λ). The region confined between the two solid blue lines (the yellow-hatched green region) denotes where both equilibria coexist. Below the lower blue line, the market supports a unique unshrouding equilibrium with no deadweight loss. If the share of myopic consumers is sufficiently large ($\alpha > \frac{e}{\lambda R}$), the upper existence threshold drops below zero, implying sellers will always shroud add-ons regardless of the commission rate.

The dashed red line ($\gamma = 1 - \alpha$) marks the welfare boundary for myopic consumers. In the yellow region below this line, myopic consumer surplus is lower in the shrouding equilibrium than in the unshrouding equilibrium. The entire multiple equilibria region lies below the

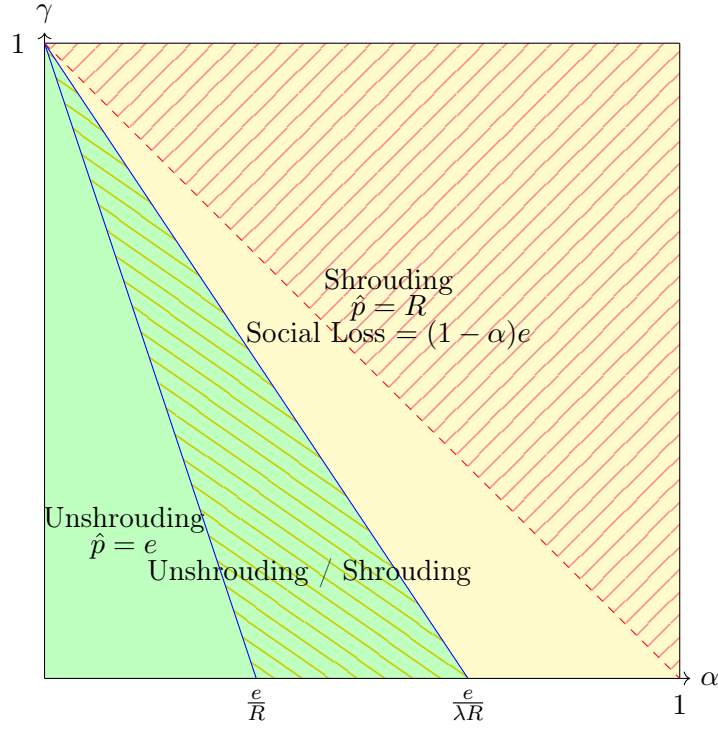


Figure 2: Sellers' equilibrium conditions on a laissez-faire platform as functions of α and γ

Note: The solid blue lines correspond to the equilibrium existence cutoffs $\gamma = 1 - \frac{\alpha R}{e}$ and $\gamma = 1 - \frac{\alpha \lambda R}{e}$, and the dashed red line indicates $\gamma = 1 - \alpha$. The lower and upper blue lines intersect $\gamma = 0$ at $\alpha = \frac{e}{R}$ and $\alpha = \frac{e}{\lambda R}$, respectively.

dashed red line. Whenever both equilibria coexist, myopic consumers are better off under the unshrugging equilibrium. In the red-hatched region above the line, base good price competition becomes sufficiently amplified that the shrouding equilibrium generates higher surplus for all consumers including myopic ones.

Case $\lambda < \frac{e}{R}$ (so that $\bar{\alpha} > 1$ for low γ)

Figure 3 maps the equilibrium and welfare regions when $\lambda < \frac{e}{R}$, so that for some γ , $\bar{\alpha} > 1$, and the unshrugging equilibrium extends to all $\alpha \in (0, 1]$. The green region below the lower blue line supports a unique unshrugging equilibrium. The yellow region above the upper blue line supports a unique shrouding equilibrium. Between the two blue lines, both equilibria coexist (yellow-hatched green region).

In the multiplicity region, equilibrium selection has different welfare implications across sub-regions. For $1 - \frac{\alpha R}{e} < \gamma < 1 - \alpha$, selecting shrouding is social welfare-reducing. It creates deadweight loss and lowers myopic consumer surplus relative to unshrugging. For $\gamma > 1 - \alpha$, all consumers benefit from shrouding. The commission-amplified base good price reduction is large enough to outweigh the add-on overcharge, so both sophisticated and myopic consumers are better off under shrouding. A policy that mandates unshrugging can improve outcomes in

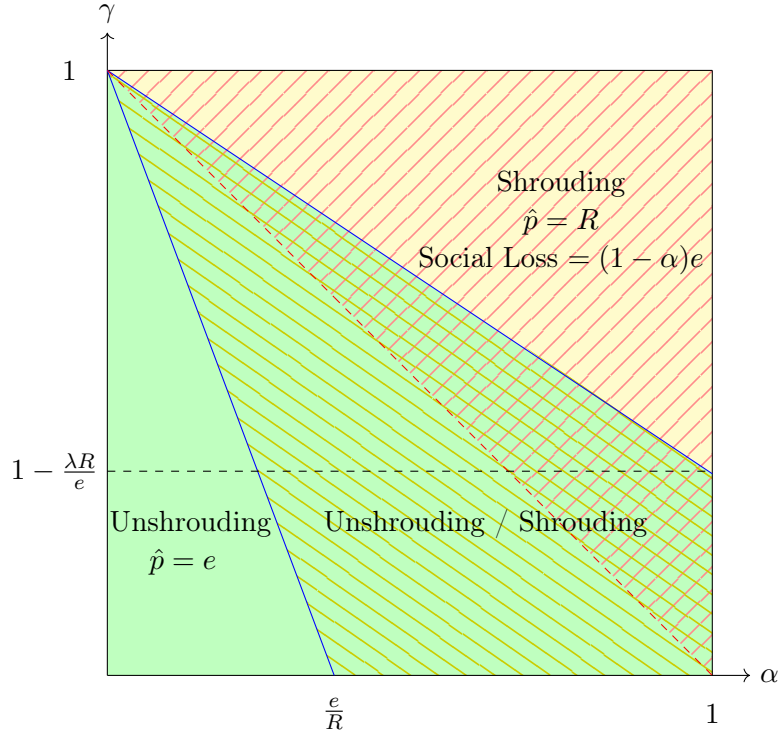


Figure 3: Sellers' equilibrium conditions on a laissez-faire platform as functions of α and γ

Note: The solid blue lines correspond to the equilibrium existence cutoffs $\gamma = 1 - \frac{\alpha R}{e}$ and $\gamma = 1 - \frac{\alpha \lambda R}{e}$. The lower blue line intersects $\gamma = 0$ at $\alpha = \frac{e}{R}$. The upper blue line equals $1 - \frac{\lambda R}{e}$ at $\alpha = 1$ and intersects $\gamma = 0$ at $\alpha = \frac{e}{\lambda R} > 1$ (outside the figure). The dashed red line indicates $\gamma = 1 - \alpha$.

the lower sub-region ($\gamma < 1 - \alpha$), but it is harmful for all consumers in the upper sub-region ($\gamma > 1 - \alpha$), where forcing unshrouding eliminates the commission-amplified base good price subsidy generated by off-platform add-on profit.

At the knife-edge $\lambda = \frac{e}{R}$, the upper blue line coincides with the dashed red line $\gamma = 1 - \alpha$. Hence, throughout the multiple equilibrium region, myopic consumer surplus is weakly higher under unshrouding than under shrouding.

4 Platform's Disclosure Governance

In the baseline model, the platform follows a bundled laissez-faire policy: it imposes no disclosure mandate, and sellers jointly choose disclosure and the add-on sales channel. This section introduces disclosure mandates that separate the two choices. Under either mandate, the platform determines whether the add-on is disclosed but does not restrict the sales channel. As discussed in the introduction, this separation is motivated by regulatory frameworks that combine price-disclosure requirements with rights to steer consumers and conclude transactions off-platform.

We introduce policy-outcome notation. The policy prefix is *LF* for bundled laissez-faire, *PS* for platform-mandated shrouding, and *PU* for platform-mandated unshrouding. Under laissez-faire, the suffix records the sellers' disclosure choice: *LF-u* denotes symmetric unshrouding, and *LF-s* denotes symmetric shrouding. Under mandated unshrouding, the suffix records the equilibrium add-on price: *PU-e* is the low-price outcome, and *PU-R* is the high-price outcome. Under mandated shrouding, *PS-s* denotes the resulting shrouding outcome.

4.1 Platform's Mandates

We first characterize the two mandated regimes. Conditional on the platform imposing a disclosure mandate, the game has four stages:

- **Stage 1:** The platform chooses a disclosure mandate: shrouding (PS) or unshrouding (PU).
- **Stage 2:** Sellers choose the add-on sales channel and set base good price p_i and add-on price $\hat{p}_i$.
- **Stage 3:** Consumers observe the disclosed information and select a seller. Sophisticated consumers also decide whether to exert effort e to substitute away from the add-on.
- **Stage 4:** Any previously shrouded add-on prices are revealed. Consumers make their add-on purchase decision.

Under PU, $\hat{p}_i$ is disclosed before purchase even when the add-on is sold off-platform. Under PS, $\hat{p}_i$ cannot be disclosed before the consumer selects a seller, either on-platform or off-platform. Conditional on either mandate, selling a positive-price add-on off-platform strictly dominates selling it on-platform: the seller retains $\hat{p}_i$ off-platform but only $(1-\gamma)\hat{p}_i$ on-platform. Under either mandate, sellers move all add-on sales off-platform.

4.1.1 Platform Mandates Shrouding

When the platform mandates shrouding (PS), neither the existence nor the price of the add-on is disclosed before the base good purchase, whether the add-on is sold on-platform or off-platform. Sellers have no disclosure choice under this mandate. Because off-platform sales avoid the commission, sellers optimally sell add-ons off-platform.

Mandated shrouding yields exactly the LF-s outcome characterized in Lemma 1(ii). Thus, PS-s and LF-s have identical prices and payoffs.

4.1.2 Platform Mandates Unshrouding

When the platform mandates unshrouding (PU), it displays all add-on prices alongside the base good before purchase. This informs $1 - \lambda$ of initially myopic consumers, creating a market with

$1 - \alpha\lambda$ sophisticated-behaving consumers and $\alpha\lambda$ uninformed myopic consumers. Disclosure under PU is independent of the sales channel. Sellers sell add-ons off-platform because doing so avoids the commission. Seller A's profit function is

$$\begin{aligned}\Pi_A = & (1 - \alpha\lambda) \left[(1 - \gamma)p_A + \mathbb{1}_{\{\hat{p}_A \leq e\}} \hat{p}_A - c \right] D_A^{soph}(p_A, p_B, \hat{p}_A, \hat{p}_B) \\ & + \alpha\lambda \left[(1 - \gamma)p_A + \mathbb{1}_{\{\hat{p}_A \leq R\}} \hat{p}_A - c \right] D_A^{myop}(p_A, p_B).\end{aligned}$$

The equilibrium depends on α relative to $\alpha^* \equiv \frac{e}{\lambda R}$, where $\alpha^* = +\infty$ when $\lambda = 0$. We focus on symmetric equilibria except at $\alpha = \alpha^*$.⁵

Lemma 2. *When the platform mandates unshrouding (PU), let $\alpha^* \equiv \frac{e}{\lambda R}$:*

- (i) *If $\alpha \leq \alpha^*$, there exists a symmetric equilibrium, the low add-on pricing equilibrium (PU-e), in which sellers do not sell the add-on on the platform and set $\hat{p} = e$, serving all consumers. The equilibrium base good price is $p^{PU-e} = \frac{c-e}{1-\gamma} + \frac{1}{2f(0)}$. Each seller earns $\frac{1-\gamma}{4f(0)}$, and the platform's profit is $\Pi_P^{PU-e} = \gamma \left(\frac{c-e}{1-\gamma} + \frac{1}{2f(0)} \right)$.*
- (ii) *If $\alpha \geq \alpha^*$, there exists a symmetric equilibrium, the high add-on pricing equilibrium (PU-R), in which sellers do not sell the add-on on the platform and set $\hat{p} = R$, serving only uninformed myopic consumers. The equilibrium base good price is $p^{PU-R} = \frac{c-\alpha\lambda R}{1-\gamma} + \frac{1}{2f(0)}$. Each seller earns $\frac{1-\gamma}{4f(0)}$, and the platform's profit is $\Pi_P^{PU-R} = \gamma \left(\frac{c-\alpha\lambda R}{1-\gamma} + \frac{1}{2f(0)} \right)$.*

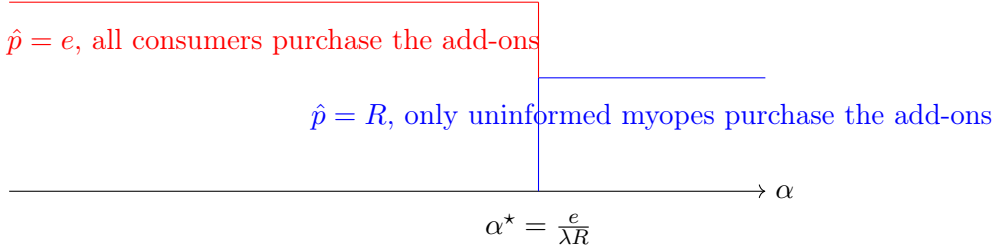


Figure 4: Equilibrium when the platform mandates unshrouding

Mandated unshrouding changes who remains inattentive to add-ons, but it does not restore add-on commission revenue for the platform. Sellers choose between two add-on pricing strategies. Charging e serves all consumers and generates add-on revenue e per base good buyer. Charging R serves only the $\alpha\lambda$ uninformed myopic consumers and generates expected add-on revenue $\alpha\lambda R$ per base good buyer. At $\alpha = \alpha^*$, these revenues are equal: $e = \alpha\lambda R$. Below this threshold, sellers choose PU-e, and above it, they choose PU-R.

Because both outcomes involve off-platform add-on sales, the pass-through mechanism established in the baseline model applies. Expected add-on revenue lowers the base good price

⁵If $\alpha = \alpha^*$, sellers are indifferent between $\hat{p} = e$ and $\hat{p} = R$. Both symmetric add-on pricing equilibria and the asymmetric equilibrium exist. Each equilibrium can be supported by the common base good price $p_A = p_B = \frac{c-e}{1-\gamma} + \frac{1}{2f(0)}$, which also equals $\frac{c-\alpha\lambda R}{1-\gamma} + \frac{1}{2f(0)}$. Appendix A.3 provides this.

by $\frac{e}{1-\gamma}$ under PU-e and by $\frac{\alpha\lambda R}{1-\gamma}$ under PU-R. This yields the base good prices in Lemma 2 and leaves seller profit unchanged across the two outcomes. The platform earns commission only on the base good and thus earns less under the outcome with greater expected add-on revenue. If $0 < \lambda < \frac{e}{R}$, then $\alpha^* = \frac{e}{\lambda R} > 1$. Since $\alpha \leq 1$, the condition $\alpha \geq \alpha^*$ required for PU-R cannot hold. When $\lambda = 0$, PU-R also cannot arise because no consumers remain uninformed after disclosure.

4.1.3 Platform's Optimal Mandate: Shrouding versus Unshrouding

The platform next compares the two mandates.

Proposition 2. *When the platform chooses between mandated shrouding and mandated unshrouding, its profit-maximizing mandate is:*

- (i) *Mandated shrouding (PS) if $\alpha \leq \frac{e}{R}$;*
- (ii) *Mandated unshrouding (PU) if $\alpha \geq \frac{e}{R}$.*

Because all add-ons are sold off-platform, the platform earns revenue only from the base good. Its preferred mandate is the one under which sellers compete away the smaller add-on profit and sustain the higher commissionable base good price. Mandated shrouding leads sellers to compete away expected revenue αR . Mandated unshrouding leads them to compete away either e or $\alpha\lambda R$.

4.2 Platform's Optimal Disclosure Governance

This section compares all three policy regimes. The platform chooses among regimes LF, PS, and PU, before sellers act. The LF policy (Section 2) bundles disclosure with the add-on sales channel. A seller that unshrouds must use the platform's disclosure tools and sell the add-on on-platform (LF-u), while a seller that shrouds sells the add-on off-platform (LF-s). The mandated policies (PS, PU) separate disclosure from the sales channel. Under PS, disclosure is prohibited on both channels; under PU, prices are disclosed regardless of the sales channel. Under either mandate, sellers optimally sell add-ons off-platform to avoid the commission.

Equilibrium Selection. Under the bundled laissez-faire policy, both shrouding (LF-s) and unshrouding (LF-u) equilibria may coexist (Lemma 1). When multiplicity arises, we select LF-u because it weakly maximizes social welfare.

The welfare-based selection of LF-u also coincides with the platform's preferred equilibrium. Sellers earn identical profits in both equilibria, so their preferences do not resolve the multiplicity. The platform strictly prefers LF-u since $\Pi_P^{LF-u} = \gamma \left(\frac{c}{1-\gamma} + \frac{1}{2f(0)} \right) > \gamma \left(\frac{c-\alpha R}{1-\gamma} + \frac{1}{2f(0)} \right) = \Pi_P^{LF-s}$. Equivalently, we select LF-u whenever it is sustainable.⁶

⁶Appendix D studies the opposite equilibrium selection rule, under which LF-s is selected whenever it is sustainable.

The governance results below use this LF-u selection rule. The consumer welfare rankings in Proposition 4, including $CS^{PU-e} > CS^{LF-u}$ and $CS^{LF-s} > CS^{PU-R}$, do not depend on the selection rule.

Corollary 1.1. *Let $\bar{\gamma} \equiv 1 - \frac{\alpha\lambda R}{e}$.*

- (i) *If $\gamma > \bar{\gamma}$, shrouding (LF-s) is the selected equilibrium.*
- (ii) *If $\gamma \leq \bar{\gamma}$, unshrouding (LF-u) is the selected equilibrium.*

We next characterize the platform's optimal governance policy. When laissez-faire and another policy both maximize platform profit, the platform selects laissez-faire.

Proposition 3. *Apply the equilibrium-selection and policy tie-breaking rules stated above. The platform's profit-maximizing governance is:*

- (i) *If $\alpha \leq \frac{e}{R}$, or if $\frac{e}{R} < \alpha < \alpha^*$ and $\gamma \leq \bar{\gamma}$, the platform adopts bundled laissez-faire.*
- (ii) *If $\alpha \geq \alpha^*$, or if $\frac{e}{R} < \alpha < \alpha^*$ and $\gamma > \bar{\gamma}$, the platform mandates unshrouding.*
- (iii) *The platform never strictly prefers to mandate shrouding.*

When $\gamma \leq \bar{\gamma}$, sellers voluntarily unshroud and sell add-ons on-platform under laissez-faire. Any mandate unbundles disclosure from the sales channel and causes sellers to move the add-on off-platform. Laissez-faire yields strictly higher platform profit.

When $\gamma > \bar{\gamma}$, laissez-faire induces LF-s. All add-on sales are off-platform under LF and under either mandate, so the platform compares base good prices, the only source of commission revenue. Under LF-s and PS-s, sellers compete away αR . Under PU-e, they compete away e , and under PU-R they compete away $\alpha\lambda R$. If $\alpha < \frac{e}{R}$, $\alpha R < e$, so LF-s and PS-s yield a higher base good price than PU-e. If $\alpha > \frac{e}{R}$, mandated unshrouding yields a higher base good price, whether the outcome is PU-e or PU-R.

Mandating shrouding is never strictly optimal. Whenever it reproduces LF-s, laissez-faire gives the platform exactly the same profit and is selected by the policy tie-breaking rule.

Applications Amazon illustrates bundled laissez-faire. Its product-bundling rules allow a seller to offer a base product and related add-ons in a single listing.⁷ A seller that chooses this format discloses the bundle's components and sells the bundle through Amazon. The seller chooses whether to use the platform's disclosure format, but using that format requires the disclosed products to be sold on-platform. This arrangement matches the model's requirement that disclosure is voluntary but entails on-platform sale of the add-on.

Skyscanner resembles the laissez-faire setting in that ancillary prices may not be fully displayed at the initial comparison stage. Its current guidance states that baggage fees vary by

⁷See Amazon's *Product Bundling Policy* at <https://sellercentral.amazon.com/help/hub/reference/external/G200442350>.

airline and fare type, that the cheapest fare may exclude baggage, and that consumers should verify specific fees with the airline or travel provider.⁸ Whether baggage is included is part of the fare's product specification.

Airbnb illustrates the disclosure component of mandated unshrouding. In April 2025, Airbnb made total price display standard worldwide, so all guests see the total price including fees in search results.⁹

4.3 Welfare Analysis

We rank all outcomes by social welfare and consumer surplus, and then compare these rankings with the platform's governance choice.

4.3.1 Social Welfare

Social welfare losses arise from the substitution cost e paid by sophisticated consumers when the add-on price is R . Under PU-e and LF-u, the add-on price equals e and no consumer substitutes, so both equilibria are socially efficient. Under LF-s (equivalently PS-s), a mass $1 - \alpha$ of sophisticated consumers substitutes, generating welfare loss $(1 - \alpha)e$. Under PU-R, platform unshrouding converts a share $1 - \lambda$ of myopes into sophisticated consumers, raising the substituting mass to $1 - \alpha\lambda > 1 - \alpha$ and producing the largest loss $(1 - \alpha\lambda)e$. The social-welfare ranking is:

$$W^{PU-e} = W^{LF-u} \geq W^{PS-s} = W^{LF-s} > W^{PU-R}.$$

When mandated unshrouding induces PU-R, social welfare is lower than under every other equilibrium outcome because converting some myopes into sophisticates increases the mass of consumers who incur the substitution cost.

4.3.2 Consumer Welfare

Consumer surplus in each equilibrium consists of three components: the gross match value $V + \mu$, minus the base good price, minus any add-on cost borne directly by consumers. The consumer welfare properties of LF-u and LF-s are established in Section 3.3.2. Mandated shrouding reproduces LF-s and requires no separate analysis. We compare consumer surplus across the four distinct outcomes LF-u, LF-s, PU-e, and PU-R.

Proposition 4. *For every admissible parameter, $CS^{LF-s} > CS^{PU-R}$ and $CS^{PU-e} > CS^{LF-u}$. Among all outcome allocations, consumer welfare is maximized by:*

$$(i) \text{ PU-e if } \alpha < \frac{e}{R}, \text{ and LF-s if } \alpha \geq \frac{e}{R} \quad (\text{sophisticated consumers});$$

⁸Skyscanner, *Luggage*, <https://help.skyscanner.net/hc/en-gb/articles/201303131-Luggage>.

⁹See Airbnb, *Total Price Display Is Now Standard for Guests Worldwide*, April 21, 2025, at <https://news.airbnb.com/total-price-display-is-now-standard-globally/>.

- (ii) PU-e if $\alpha < \frac{e}{e+\gamma(R-e)}$, and LF-s if $\alpha \geq \frac{e}{e+\gamma(R-e)}$ (total consumer surplus);
- (iii) PU-e if $\alpha < 1 - \frac{\gamma(R-e)}{R}$, and LF-s if $\alpha \geq 1 - \frac{\gamma(R-e)}{R}$ (myopic consumers).

The consumer-surplus comparisons in Proposition 4 do not depend on the equilibrium-selection rule. The inequality $CS^{LF-s} > CS^{PU-R}$ follows because both outcomes charge the same high off-platform add-on price, but expected add-on profit is αR under LF-s and $\alpha\lambda R$ under PU-R. The corresponding base good price reductions are $\frac{\alpha R}{1-\gamma}$ and $\frac{\alpha\lambda R}{1-\gamma}$, respectively. Because $\lambda < 1$, the base good price reduction is larger and the base good price is lower under LF-s. The inequality $CS^{PU-e} > CS^{LF-u}$ follows because both outcomes charge the same low add-on price e , but the add-on is sold off-platform under PU-e and on-platform under LF-u. The corresponding base good price reductions are $\frac{e}{1-\gamma}$ and e , respectively. Because $\gamma > 0$, the base good price reduction is larger and the base good price is lower under PU-e. These two inequalities leave LF-s and PU-e as the only candidates for maximizing consumer welfare.

Parts (i)–(iii) compare LF-s with PU-e for each consumer group. Sophisticated consumers incur cost e in both outcomes: they purchase the add-on under PU-e and substitute under LF-s. Their ranking depends only on the base good price. Their surplus is higher under PU-e when $e > \alpha R$ and LF-s when $e \leq \alpha R$. For total and myopic consumer surplus, PU-e lowers the add-on price paid by myopic consumers from R to e . Relative to LF-s, this saving is $\alpha(R - e)$ per consumer on average and $R - e$ for each myopic consumer. Comparing these savings with the difference in base good prices yields the cutoffs in parts (ii) and (iii). The cutoffs satisfy $\frac{e}{R} < \frac{e}{e+\gamma(R-e)} < 1 - \frac{\gamma(R-e)}{R}$. The cutoff is lowest for sophisticated consumers and highest for myopic consumers. At a given commission rate, shrouding (LF-s) requires the largest myopic share to benefit myopic consumers themselves.

The cutoffs for total and myopic consumer surplus decrease strictly with γ . The sophisticated consumer cutoff $\frac{e}{R}$ is independent of γ . A higher commission expands the region where the shrouding equilibrium (LF-s) maximizes total and myopic consumer surplus. In Gabaix and Laibson (2006), the base good price reduction is one-for-one and myopic consumers are always harmed by shrouding. Here, the amplified price reduction can generate a net gain even for myopic consumers when the commission rate is sufficiently high.

Figures 5 and 6 partition the (α, γ) parameter space into equilibrium regions under the platform's governance choice. We compare these regions with the welfare rankings from Propositions 1 and 4 to identify where platform incentives and consumer welfare diverge. The social welfare losses annotated in each region follow directly from Section 4.3.1. The dashed red line ($\gamma = 1 - \alpha$) is the myopic consumer threshold from Proposition 1(iii). Above it, LF-s dominates LF-u in consumer surplus for all consumer types. Appendix B provides the complete consumer surplus rankings across all equilibria as a function of γ .

Whether mandated unshrouding can induce PU-R depends on λ . Recall that the threshold $\alpha^* = \frac{e}{\lambda R}$ governs whether PU-R exists (Lemma 2). Whether α^* falls below or above one is determined by λ relative to $\frac{e}{R}$. When $\lambda > \frac{e}{R}$, we have $\alpha^* < 1$, so PU-R is attainable for

sufficiently large α and all four equilibrium regions obtain. When $\lambda < \frac{e}{R}$, we have $\alpha^* > 1$, so PU-R is unattainable for every $\alpha \in (0, 1]$ and mandated unshrouding always produces the efficient PU-e outcome throughout the feasible range.

Case $\lambda > \frac{e}{R}$ (so that $\alpha^* < 1$).

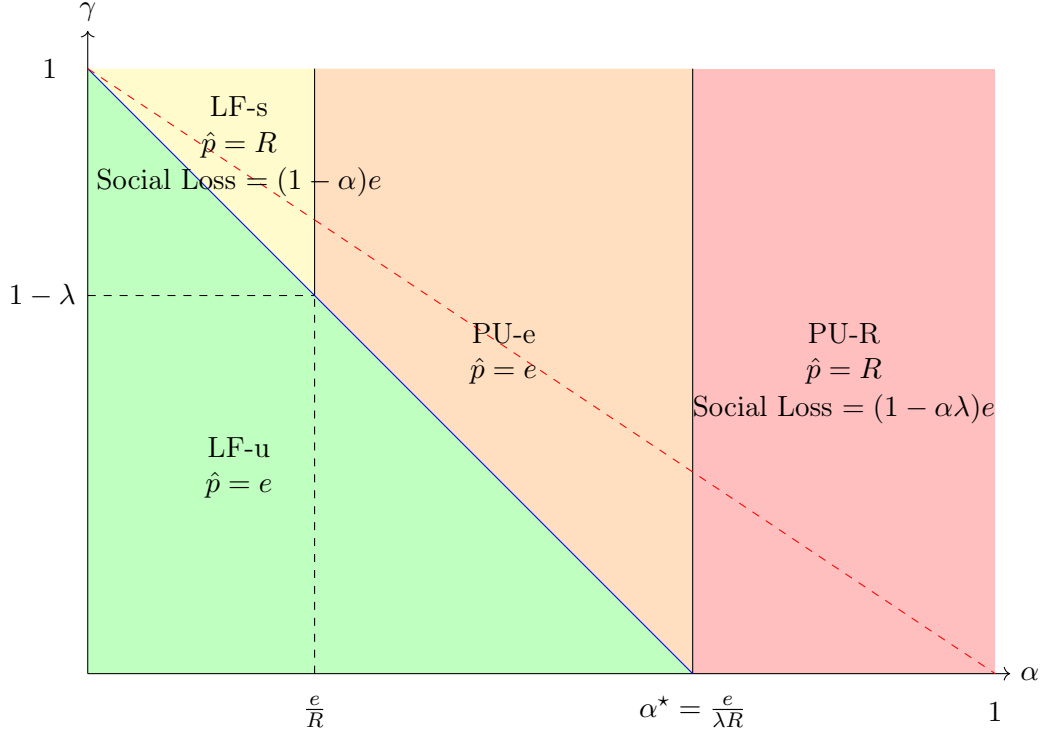


Figure 5: Equilibrium governance as functions of α and γ with $\bar{\gamma} = 1 - \frac{\alpha\lambda R}{e}$

Note: The blue line is $\bar{\gamma} = 1 - \frac{\alpha\lambda R}{e}$; it intersects $\gamma = 0$ at $\alpha = \alpha^$ and equals $1 - \lambda$ at $\alpha = \frac{e}{R}$. The dashed red line is $\gamma = 1 - \alpha$. Above it, LF-s delivers higher myopic consumer surplus than LF-u.*

Figure 5 maps the four equilibrium regions in (α, γ) space. On or below the blue line, $\gamma \leq \bar{\gamma}$, sellers unshroud under laissez-faire and the outcome is LF-u. Consumers are strictly better off under PU-e than under LF-u. Above the blue line and to the left of $\frac{e}{R}$ ($\gamma > \bar{\gamma}$ and $\alpha < \frac{e}{R}$), the platform's laissez-faire induces LF-s, while total consumer surplus is higher under PU-e. To the right of $\frac{e}{R}$ but below α^* ($\frac{e}{R} < \alpha < \alpha^*$), the platform mandates unshrouding and induces PU-e. PU-e maximizes total consumer surplus when $\alpha < \frac{e}{e + \gamma(R - e)}$. When the former inequality is reversed, the platform mandates unshrouding and induces PU-e even though LF-s maximizes total consumer surplus, so its incentive is not aligned with consumers' interests. When $\alpha > \alpha^*$, the platform mandates unshrouding and induces PU-R, which has the lowest social welfare and is strictly dominated in consumer surplus by LF-s.

At the knife-edge $\lambda = \frac{e}{R}$, $\alpha^* = 1$. Thus, mandated unshrouding induces PU-e for $\alpha < 1$, while PU-e and PU-R coexist at $\alpha = 1$.

Case $\lambda < \frac{e}{R}$ (so that $\alpha^* > 1$).

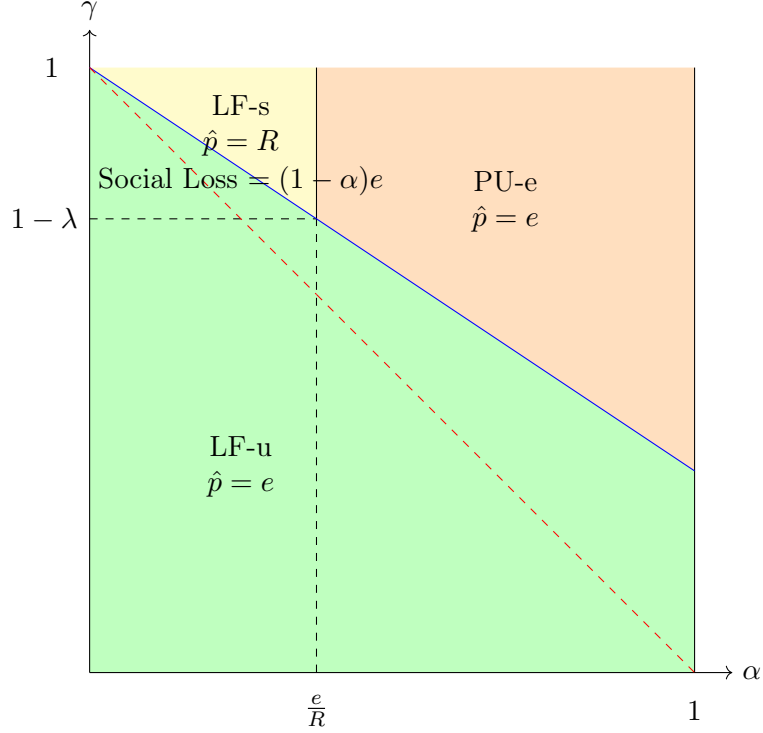


Figure 6: Equilibrium governance as functions of α and γ with $\bar{\gamma} = 1 - \frac{\alpha\lambda R}{e}$

Note: The blue line is $\bar{\gamma} = 1 - \frac{\alpha\lambda R}{e}$; it equals $1 - \lambda$ at $\alpha = \frac{e}{R}$ and intersects $\gamma = 0$ at $\alpha^ = \frac{e}{\lambda R} > 1$ (outside the figure). The dashed red line is $\gamma = 1 - \alpha$. Above it, LF-s delivers higher myopic consumer surplus than LF-u. Since $\alpha^* > 1$, the platform's unshrouding mandate leads to PU-e throughout the feasible range.*

Figure 6 maps the three equilibrium regions when $\lambda < \frac{e}{R}$. Total consumer surplus is strictly higher under PU-e than under LF-u and is higher under PU-e than under LF-s when $\alpha < \frac{e}{e + \gamma(R - e)}$. The PU-R region vanishes because $\alpha^* > 1$, so mandated unshrouding always produces PU-e. However, if $\alpha > \frac{e}{e + \gamma(R - e)}$, total consumer surplus would be higher under LF-s.

The platform's governance is misaligned with total consumer surplus in two directions. When the myopic share is low, the platform retains laissez-faire even though PU-e yields the highest total consumer surplus. When the myopic share is high, the platform mandates unshrouding and induces PU-e even though LF-s yields the highest total consumer surplus.

5 Policy Implications

The preferred policy depends on whether the regulator maximizes social welfare or consumer surplus. Social welfare depends on real substitution costs, whereas consumer surplus also reflects transfers generated by base good competition. A policy can restore efficiency while

reducing consumer surplus.

5.1 Social Welfare

The two low add-on price equilibria, LF-u and PU-e, are always socially efficient. In either outcome, the add-on price equals the substitution cost, so no consumer incurs a real cost to avoid the add-on. The shrouding outcome LF-s generates deadweight loss $(1 - \alpha)e$, which is strictly positive when $\alpha < 1$. The high add-on price outcome under mandated unshrouding, PU-R, generates the largest loss $(1 - \alpha\lambda)e$, because disclosure induces additional consumers to exert effort to substitute.

When sellers shroud under laissez-faire, a commission cap can restore efficiency. Recall that $\bar{\gamma} = 1 - \frac{\alpha\lambda R}{e}$. A cap satisfying $\gamma \leq \bar{\gamma}$ makes the unshrouding equilibrium sustainable and selects LF-u under the baseline equilibrium selection rule. In the region where the platform retains laissez-faire and sellers shroud, $\alpha \leq \frac{e}{R}$, which implies $\bar{\gamma} \geq 1 - \lambda$. Hence, a uniform cap $\gamma \leq 1 - \lambda$ is sufficient to restore the efficient unshrouding outcome throughout that region.

Commission caps do not correct the PU-R region. If $\alpha > \alpha^*$, $\alpha\lambda R > e$, so $\bar{\gamma} < 0$. No feasible nonnegative cap can induce LF-u under laissez-faire. An effective policy needs to lower λ , the fraction of initially myopic consumers who remain uninformed after disclosure, thereby raising $\alpha^* = \frac{e}{\lambda R}$ and shrinking the uninformed myopic mass $\alpha\lambda$. If consumer education lowers λ enough that $\alpha < \alpha^*$, the platform's unshrouding mandate induces the efficient low-price outcome PU-e instead of PU-R.

5.2 Consumer Welfare

When $\alpha < \frac{e}{R}$, the low add-on price outcome under mandated unshrouding (PU-e) maximizes total consumer surplus. The platform instead retains laissez-faire, which produces LF-u when $\gamma \leq \bar{\gamma}$ and LF-s when $\gamma > \bar{\gamma}$. A regulator that maximizes consumer surplus should require unbundled disclosure and implement PU-e. This intervention is related to requirements that prices be disclosed before purchase under the EU Consumer Rights Directive and the U.S. Federal Trade Commission's Rule on Unfair or Deceptive Fees.¹⁰

In the intermediate region, $\frac{e}{R} < \alpha < \alpha^*$, the consumer-surplus-maximizing policy depends on both γ and α . If $\gamma \leq \bar{\gamma}$, laissez-faire induces LF-u. A regulator that maximizes consumer surplus instead prefers PU-e when $\alpha < \frac{e}{e + \gamma(R - e)}$, and LF-s when the inequality is reversed. It should require the platform to mandate unshrouding in the first case and shrouding in the second. If $\gamma > \bar{\gamma}$, the platform mandates unshrouding and induces PU-e. This choice is consumer optimal when $\alpha \leq \frac{e}{e + \gamma(R - e)}$, and otherwise LF-s yields higher total consumer surplus,

¹⁰See Directive 2011/83/EU, Article 6(1)(e), at <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:32011L0083>, and the FTC's Rule on Unfair or Deceptive Fees, effective May 12, 2025, in the FTC compliance guidance. The FTC rule applies to live-event tickets and short-term lodging and requires upfront display of mandatory charges.

so the regulator should prevent the unshrouding mandate and require the platform to retain laissez-faire.

When $\alpha > \alpha^*$, the platform mandates unshrouding and induces the high add-on price outcome PU-R. This outcome has the lowest social welfare and yields lower consumer surplus than LF-s. A regulator that maximizes either objective should prevent PU-R. Requiring laissez-faire or mandating shrouding implements the LF-s allocation and improves both social welfare and consumer surplus relative to the platform's preferred policy.

5.3 Unintended Consequences

Policies that require price disclosure while allowing sellers to steer consumers off-platform implement the mandated unshrouding (PU) outcome: information is disclosed, while add-on sales occur off-platform in equilibrium. Article 5(4) of the Digital Markets Act provides the steering-right component by allowing business users of designated gatekeepers to communicate offers and conclude contracts outside the gatekeeper's service.¹¹ If mandated unshrouding produces PU-e, consumers are better off than under LF-u because the off-platform add-on margin is amplified through base good competition. This comparison alone does not establish that the regulation increases consumer surplus. The same regulation can eliminate LF-s when LF-s maximizes consumer surplus. When $\alpha > \alpha^*$, it can induce PU-R, which yields lower consumer surplus than LF-s and the lowest social welfare among the four outcomes.

Commission caps also create a risk. A cap satisfying $\gamma \leq \bar{\gamma}$ restores social efficiency by selecting LF-u, but it also removes the amplified base good price reduction that can make LF-s consumer optimal. The same policy can increase total surplus and reduce consumer surplus.

6 Conclusion

This paper studies how proportional platform commissions affect seller disclosure, platform governance, and the welfare consequences of hidden add-on prices. The baseline model considers bundled laissez-faire, under which sellers choose whether to disclose add-ons, but disclosure requires selling the add-on on-platform. We then separate disclosure from the sales channel and allow the platform to govern add-on disclosure directly by mandating either shrouding or unshrouding, while sellers retain the right to sell add-ons off-platform. Finally, we allow the platform to choose among bundled laissez-faire, mandated shrouding, and mandated unshrouding.

The baseline model identifies commission rate as the competition multiplier. Sellers use anticipated add-on profit to subsidize the base good price. When the add-on is sold on-platform, the base good and add-on face the same commission, so one unit of anticipated add-on profit

¹¹See Regulation (EU) 2022/1925, Article 5(4), at <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32022R1925>.

lowers the base good price by one unit. When a shrouded add-on is sold off-platform, the seller keeps the full add-on margin but retains only $1 - \gamma$ from each unit of the base good price. One unit of commission-free add-on profit lowers the base good price by $\frac{1}{1-\gamma}$. A higher commission strengthens the base good price subsidy generated by shrouding.

This amplification can cause social welfare and consumer surplus to rank the equilibria differently. When some consumers are sophisticated, the shrouding equilibrium is socially inefficient because these consumers incur the real substitution cost e . Nevertheless, a high commission rate and a large myopic share can make shrouding yield higher consumer surplus than unshrouding because the additional reduction in the base good price exceeds the increase in add-on payments by myopic consumers. When the base good price reduction also exceeds the higher add-on payment borne by each myopic consumer, myopic consumers benefit from shrouding.

The platform chooses its governance policy to protect commission revenue. It adopts bundled laissez-faire whenever sellers' voluntary unshrouding is sustainable, since that outcome allows it to collect commission on both goods. If voluntary unshrouding is not sustainable, all add-on sales occur off-platform, and the platform selects the disclosure rule that sustains the highest commissionable base good price. It mandates unshrouding when the myopic share is large and never strictly prefers mandated shrouding. The platform may retain bundled laissez-faire even when mandated unshrouding would induce the add-on price e and maximize consumer surplus. Conversely, it may mandate unshrouding when the mandate induces sellers to charge R and sell the add-on only to consumers who remain uninformed, even though the shrouding equilibrium under bundled laissez-faire yields higher consumer surplus.

The main mechanisms remain with homogeneous base goods and downward-sloping add-on demand (see Appendix E and F). With homogeneous base goods, Bertrand competition eliminates seller rents and the differentiation markup, but the competition multiplier and the resulting governance and welfare implications remain unchanged. Relaxing unit add-on demand preserves the competition multiplier and the role of commission in shaping seller incentives. When add-on demand is sufficiently elastic, transparent sellers optimally charge below the substitution threshold, which raises consumer surplus and makes symmetric shrouding equilibrium harder to sustain.

The policy implications depend on whether the regulator values social welfare or consumer surplus. A commission cap can restore the efficient transparent equilibrium when the platform's laissez-faire induces shrouding, but may reduce consumer surplus by eliminating the competition multiplier. Similarly, a transparency rule combined with steering rights raises consumer surplus relative to bundled laissez-faire when it induces the low add-on pricing equilibrium, but it can also eliminate consumer-benefiting shrouding or even induce the high add-on pricing equilibrium. When the high add-on price equilibrium under mandated unshrouding arises, reducing residual myopia is more effective than lowering the commission.

Future work could study how platform competition affects disclosure governance and how

endogenous consumer attention allows disclosure policy, seller behavior, and education to shape the composition of informed demand.

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A Proofs

Let $\hat{p}_A^e$ and $\hat{p}_B^e$ denote sophisticated consumers’ beliefs about shrouded add-on prices. An unshrouded price is observed before consumers choose a seller, whereas a shrouded price is chosen at the same time but remains unobserved until the add-on purchase stage. In every PBE characterized in the appendix, sophisticated consumers expect $\hat{p}_i^e = R$ whenever seller i shrouds, independently of the observed base good prices.

To verify the expectation $\hat{p}_i^e = R$, consider a seller that shrouds. Conditional on its base good price and disclosure choice, the actual hidden add-on price does not affect base good demand because consumers do not observe it when choosing a seller. Among consumers who reach the add-on stage without substituting, demand is constant on $[0, R]$ and zero above R . Hence, R uniquely maximizes add-on revenue whenever a positive mass of consumers reaches that stage without substituting. If no consumer reaches the add-on stage, the tie-breaking convention selects R . Since $R > e$, sophisticated consumers substitute in advance, whereas myopic consumers ignore the add-on when choosing a base good and buy it after lock-in at R .

We first establish a general result for base good pricing and then characterize add-on pricing and disclosure.

Lemma A.1. *Let a denote the seller's average retained add-on profit per base good customer. For every rival price p_j , seller i 's base good pricing problem admits a maximizer. If the maximum profit is strictly positive, the maximizer is unique. If both sellers have the same a , the unique symmetric equilibrium base good price and each seller's profit are $p(a) = \frac{c-a}{1-\gamma} + \frac{1}{2f(0)}$, $\pi(a) = \frac{1-\gamma}{4f(0)}$.*

Proof. For given p_j and a , seller i 's profit at base good price p_i is $\pi_i(p_i; a, p_j) = [(1-\gamma)p_i + a - c]F(p_j - p_i)$. Let $p_i^0 \equiv \frac{c-a}{1-\gamma}$ be the zero-margin price. Prices below p_i^0 yield nonpositive profit. Positive profit requires $p_i > p_i^0$ and $F(p_j - p_i) > 0$.

When $p_i > p_i^0$ and $F(p_j - p_i) > 0$, $\log \pi_i(p_i; a, p_j) = \log[(1-\gamma)p_i + a - c] + \log F(p_j - p_i)$. The first term is strictly concave in p_i , and the second is concave because F is log-concave and $p_j - p_i$ is affine. Hence, profit is strictly log-concave wherever positive, so a positive-profit maximizer is unique.

For existence at fixed rival price p_j , restrict to $p_i \geq p_i^0$, where profit is continuous and nonnegative and tends to zero as $p_i \downarrow p_i^0$. If $\underline{x}$ is finite, the demand $F(p_j - p_i)$ is zero for $p_i \geq p_j - \underline{x}$. Choosing $M > \max\{p_i^0, p_j - \underline{x}\}$, a maximizer on the compact interval $[p_i^0, M]$ is a global maximizer, including when the maximum profit is zero.

If $\underline{x} = -\infty$, $F(x) > 0$ for every finite x . Let $g = \log F$. Concavity of g implies that, for $t \in (0, 1)$, $g(tx) \geq (1-t)g(0) + tg(x) \iff g(x) - g(0) \leq \frac{g(tx)-g(0)}{t}$. Taking $t \downarrow 0$, $\frac{g(tx)-g(0)}{t} \rightarrow g'(0)x$. Thus, $g(x) \leq g(0) + g'(0)x$. We have $g'(0) = \frac{f(0)}{F(0)}$ and $F(0) = \frac{1}{2}$. Letting $x = p_j - p_i$ gives $\log F(p_j - p_i) \leq \log F(0) + \frac{f(0)}{F(0)}(p_j - p_i) = -\log 2 + 2f(0)(p_j - p_i)$. Therefore, $F(p_j - p_i) \leq \frac{1}{2}e^{2f(0)p_j}e^{-2f(0)p_i}$. Hence, for $p_i > p_i^0$, $0 \leq \pi_i(p_i; a, p_j) \leq \frac{1}{2}e^{2f(0)p_j}e^{-2f(0)p_i}[(1-\gamma)p_i + a - c] \xrightarrow{p_i \rightarrow \infty} 0$. The squeeze theorem gives $\lim_{p_i \rightarrow \infty} \pi_i(p_i; a, p_j) = 0$. Choose any $q > p_i^0$, which yields strictly positive profit. Since profit converges to zero as $p_i \rightarrow \infty$, while the price q yields strictly positive profit, there exists $M > q$ such that every price $p_i > M$ yields less profit than q . A maximizer on $[p_i^0, M]$ is a global maximizer.

Differentiating gives $\frac{\partial \pi_i}{\partial p_i} = (1-\gamma)F(p_j - p_i) - [(1-\gamma)p_i + a - c]f(p_j - p_i)$. At a symmetric equilibrium, $p_i = p_j = p$, $F(0) = \frac{1}{2}$, and the first-order condition becomes $\frac{1-\gamma}{2} = [(1-\gamma)p + a - c]f(0)$, which yields $p(a) = \frac{c-a}{1-\gamma} + \frac{1}{2f(0)}$. Then the demand is $\frac{1}{2}$, and profit is $\frac{1-\gamma}{4f(0)}$.

At $p_i = p_j = p(a)$, the effective margin is $\frac{1-\gamma}{2f(0)} > 0$. Strict log-concavity makes this stationary point the global maximizer on the positive-profit region, and nonpositive-profit prices cannot improve on it. Thus, $p(a)$ is the unique best response to $p(a)$.

At a symmetric profile, each seller serves half the consumers. A negative margin gives negative profit, whereas p_i^0 gives zero profit. At p_i^0 , a small price increase preserves positive demand because 0 lies inside the support and creates a positive margin. Hence, any symmetric equilibrium has a positive effective margin and satisfies the first-order condition above, which uniquely gives equilibrium price $p(a)$. $\square$

Lemma A.2. *A seller can sell the add-on to consumers who behave sophisticatedly only by unshrouding. Conditional on selling to them, the seller has an optimal strategy with $\hat{p} = e$.*

Proof of Lemma A.2. If a seller shrouds, sophisticated consumers expect $R > e$ and substitute before the add-on is offered. A seller can sell to these consumers only by unshrouding and choosing $\hat{p} \leq e$.

Consider an unshrouding best response $(p_i, \hat{p}_i)$ with $\hat{p}_i < e$ that serves a positive mass of consumers who behave sophisticatedly. A negative effective margin yields negative profit, whereas the zero-margin base good price gives zero profit. At a zero margin, a small price increase preserves positive demand by continuity and yields positive profit. Thus, the effective margin is positive.

Set $\delta = e - \hat{p}_i > 0$ and consider $(p_i - \delta, e)$. Under this deviation, $(p_i - \delta) + e = p_i - (e - \hat{p}_i) + e = p_i + \hat{p}_i$. Sophisticated demand is unchanged. The base good price falls by δ , so myopic demand weakly increases. With bounded support, this increase need not be strict if myopic demand is already saturated.

If the add-on is sold on-platform, retained revenue per add-on buyer is $(1 - \gamma)(p_i - \delta + e) = (1 - \gamma)(p_i + \hat{p}_i)$. The deviation is weakly profitable, and it is strictly profitable when residual myopic demand strictly increases.

If the add-on is sold off-platform, retained revenue per buyer rises from $(1 - \gamma)p_i + \hat{p}_i$ to $(1 - \gamma)(p_i - \delta) + e$. The increase is $(1 - \gamma)(p_i - \delta) + e - [(1 - \gamma)p_i + \hat{p}_i] = -(1 - \gamma)\delta + (e - \hat{p}_i) = \gamma\delta > 0$. The deviation is strictly profitable when the seller serves a positive mass of consumers.

Thus, $\hat{p} = e$ is weakly optimal. $\square$

Lemma A.3. *When selling the add-on exclusively to myopic consumers¹², a seller optimally sets the add-on price $\hat{p} = R$.*

Proof of Lemma A.3. A myopic consumer ignores the add-on price when choosing a base good. After purchasing the base good without substituting, the consumer is locked in and buys the add-on if and only if $\hat{p} \leq R$. Since marginal cost is zero, add-on profit per locked-in myopic consumer is

$$\hat{p} \mathbb{1}_{\{0 \leq \hat{p} \leq R\}} = \begin{cases} \hat{p}, & \text{if } 0 \leq \hat{p} \leq R, \\ 0, & \text{if } \hat{p} > R. \end{cases}$$

Therefore, $\arg \max_{\hat{p} \geq 0} \hat{p} \mathbb{1}_{\{0 \leq \hat{p} \leq R\}} = R$. $\square$

Lemma A.4. *On a bundled laissez-faire platform, if a seller chooses to unshroud, it is optimal to sell add-ons to both myopic and sophisticated consumers by setting $\hat{p}_A = e$.*

Proof of Lemma A.4. Suppose an unshrouding seller instead sets $\hat{p} = R$ and consider a deviation to shrouding at the same add-on price, holding its base good price p_i fixed.

¹²Consumers who behave myopically, excluding informed myopic consumers.

If the rival unshrouds, the masses $1 - \alpha\lambda$ and $\alpha\lambda$ of consumers behaving sophisticatedly and myopically are unchanged, as is base good demand. Moving add-on sales off-platform changes seller i 's profit by $\alpha\lambda[R - (1 - \gamma)R]F(p_j - p_i) = \alpha\lambda\gamma RF(p_j - p_i) \geq 0$, with strict inequality when $\alpha\lambda > 0$ and base good demand is positive.

If the rival shrouds, the deviation leaves both sellers shrouding, so the myopic mass rises from $\alpha\lambda$ to α . Base good demand remains $F(p_j - p_i)$ because consumers behaving sophisticatedly incur e at either seller and myopic consumers compare only base good prices. Seller i 's profit changes by $[\alpha R - \alpha\lambda(1 - \gamma)R]F(p_j - p_i) = \alpha R[1 - \lambda(1 - \gamma)]F(p_j - p_i) \geq 0$, with strict inequality when base good demand is positive. Thus, unshrouding at R is weakly dominated by shrouding at R , whether the rival shrouds or unshrouds, and strictly dominated against a shrouding rival when base good demand is positive. Lemmas A.2 and A.3 leave only two candidate unshrouding prices: e , at which both consumer types buy, and R , at which only consumers who remain myopic buy. Since unshrouding at R is dominated, the optimal unshrouding price is $\hat{p} = e$. $\square$

Lemma A.5. *On a bundled laissez-faire platform, if a seller chooses to shroud, it is optimal to sell add-ons only to consumers who behave myopically by setting $\hat{p}_i = R$.*

Proof of Lemma A.5. Seller i 's shrouded price is chosen before base good purchase but remains unobserved then. Base good demand depends on beliefs $\hat{p}_i^e$, not the hidden price $\hat{p}_i$. A deviation in $\hat{p}_i$ holds beliefs and base good choices fixed, so the demand is unchanged. Because the shrouded add-on is sold off-platform, the seller retains the full add-on price.

With a positive mass of locked-in consumers, seller i solves $\max_{\hat{p}_i \geq 0} \hat{p}_i \mathbb{1}_{\{\hat{p}_i \leq R\}}$, uniquely yielding $\hat{p}_i = R$. If no consumer reaches the add-on stage without substituting, the tie-breaking convention selects $\hat{p}_i = R$. Belief consistency gives $\hat{p}_i^e = R$. Since $\hat{p}_i^e = R > e$, sophisticated consumers substitute before choosing a base good and have zero demand for seller i 's shrouded add-on. $\square$

Lemma A.6. *Forgoing add-on sales is weakly dominated by selling the add-on. It is strictly dominated under either mandate and, under bundled laissez-faire whenever a positive mass of consumers remains myopic after unshrouding ($\alpha\lambda > 0$).*

Proof of Lemma A.6. Fix the rival's strategy and consider a no-add-on best response at base good price p_i , with demand $D_i^0 > 0$ and margin $m_i \equiv (1 - \gamma)p_i - c$. A negative margin yields negative profit, whereas the zero-margin price gives zero profit. At a zero margin, a small price increase preserves positive demand by continuity and yields positive profit. Hence, $m_i > 0$.

Seller i 's consumers incur no add-on or substitution cost, whereas perceived add-on costs at the rival lie in $[0, e]$. Thus, $F(p_j - p_i) \leq D_i^0 \leq F(p_j - p_i + e)$. Also, $F(p_j - p_i) < 1$, since otherwise, all consumers buy from seller i , and continuous differentiability of F gives $D_i^0 = 1$ and $\frac{\partial D_i^0}{\partial p_i} = 0$, including at a finite upper support endpoint. Then $\frac{\partial \pi_i}{\partial p_i} = (1 - \gamma)D_i^0 > 0$, contradicting optimality. Since $D_i^0 > 0$, we have $F(p_j - p_i + e) > 0$. Positivity of f implies $F(p_j - p_i + e) > F(p_j - p_i)$.

Under bundled laissez-faire, consider a seller's deviation that unshrouds at $\hat{p}_i = e$ and lowers the base good price to $p_i - e$. Consumers who account for the add-on face the same total price, $(p_i - e) + e = p_i$. Newly informed consumers face a weakly higher perceived total price at the rival, while residual myopic consumers observe the lower base good price. Let D_i^e denote demand after the deviation. The retained margin remains $(1 - \gamma)[(p_i - e) + e] - c = m_i$, so $\Pi_i^{LF,e} - \Pi_i^0 = m_i(D_i^e - D_i^0) \geq m_i\alpha\lambda[F(p_j - p_i + e) - F(p_j - p_i)] \geq 0$, with strict inequality whenever $\alpha\lambda > 0$.

Under mandated unshrouding, consider a deviation that sets $\hat{p}_i = e$, lowers the base good price to $p_i - e$, and sells the add-on off-platform. Demand satisfies $D_i^e \geq D_i^0$, while the retained margin becomes $(1 - \gamma)(p_i - e) + e - c = m_i + \gamma e > m_i$. Therefore, $\Pi_i^{PU,e} - \Pi_i^0 = m_i(D_i^e - D_i^0) + \gamma e D_i^e > 0$.

Under mandated shrouding, hold p_i fixed and add a shrouded off-platform add-on at R . Holding consumers' beliefs fixed, this deviation does not change base good demand. At least the mass α of myopic consumers buys the add-on, so profit rises by at least $\alpha R F(p_j - p_i) > 0$. $\square$

A.1 Proof of Lemma 1

Proof of Lemma 1. We first verify the two symmetric equilibrium classes and then rule out asymmetric disclosure.

- (i) *Unshrouding.* Suppose both sellers unshroud. By Lemmas A.2 and A.4, $\hat{p} = e$ is optimal for each seller. We verify the symmetric profile in which both sellers choose this price and sell the add-on on-platform. Consumers who account for the add-on compare $p_A + e$ with $p_B + e$, while consumers who behave myopically compare p_A with p_B . Both types of consumers generate demand $F(p_B - p_A)$ for seller A , whose profit is

$$\Pi_A^u(p_A, p_B) = [(1 - \gamma)p_A + (1 - \gamma)e - c]F(p_B - p_A). \quad (1)$$

Applying Lemma A.1 with $a = (1 - \gamma)e$ gives $p^u = \frac{c}{1 - \gamma} - e + \frac{1}{2f(0)}$, $\Pi_A^u = \Pi_B^u = \frac{1 - \gamma}{4f(0)}$.

The platform receives commission on both goods, so $\Pi_P^u = \gamma \left(\frac{c}{1 - \gamma} + \frac{1}{2f(0)} \right)$.

Consider a unilateral deviation by seller A to shrouding. Seller B still unshrouds, so the residual myopic mass is $\alpha\lambda$. By Lemmas A.3 and A.5, seller A sets $\hat{p}_A = R$, sells the add-on only to consumers who behave myopically, and completes those sales off-platform. Seller A 's profit is

$$\Pi_A^{u,D}(p_A, p^u) = [(1 - \gamma)p_A + \alpha\lambda R - c]F(p^u - p_A). \quad (2)$$

We prove that the unshrouding equilibrium exists if and only if

$$\alpha\lambda R \leq (1 - \gamma)e. \quad (3)$$

When $\lambda > 0$, condition (3) is equivalent to $\alpha \leq \frac{e(1-\gamma)}{\lambda R}$. When $\lambda = 0$, it holds for every α .

Necessity. Evaluate the candidate profit and the deviation profit at $p_A = p^u$. Since $F(0) > 0$, $\Pi_A^u(p^u, p^u) < \Pi_A^{u,D}(p^u, p^u) \iff (1-\gamma)e < \alpha\lambda R$. If condition (3) fails, then $\Pi_A^u(p^u, p^u) < \Pi_A^{u,D}(p^u, p^u)$. Seller A profits by shrouding while keeping its base good price at p^u . Hence, condition (3) is necessary.

Sufficiency. Suppose condition (3) holds, and let $p_A^{u,D}$ denote a maximizer of (2) given $p_B = p^u$, whose existence follows from Lemma A.1. For every p_A , $\Pi_A^u(p_A, p^u) - \Pi_A^{u,D}(p_A, p^u) = [(1-\gamma)e - \alpha\lambda R]F(p^u - p_A) \geq 0$. Since p^u maximizes (1) given $p_B = p^u$, $\Pi_A^u(p^u, p^u) \geq \Pi_A^u(p_A^{u,D}, p^u) \geq \Pi_A^{u,D}(p_A^{u,D}, p^u) = \max_{p_A} \Pi_A^{u,D}(p_A, p^u)$. Thus, deviation is not profitable, so condition (3) is sufficient.

- (ii) *Shrouding.* Suppose both sellers shroud. By Lemmas A.3 and A.5, each seller sets $\hat{p} = R$, sells the add-on only to consumers who behave myopically, and completes those sales off-platform. Only the mass α of myopic consumers buys the add-on. Seller A 's profit is

$$\Pi_A^s(p_A, p_B) = [(1-\gamma)p_A + \alpha R - c]F(p_B - p_A). \quad (4)$$

Applying Lemma A.1 with $a = \alpha R$ gives $p^s = \frac{c-\alpha R}{1-\gamma} + \frac{1}{2f(0)}$, $\Pi_A^s = \Pi_B^s = \frac{1-\gamma}{4f(0)}$. The platform profit is $\Pi_P^s = \gamma \left(\frac{c-\alpha R}{1-\gamma} + \frac{1}{2f(0)} \right)$.

By Lemmas A.2 and A.4, a unilateral deviation to unshrouding by seller A sets $\hat{p} = e$. The deviation yields effective add-on margin $(1-\gamma)e$ and profit

$$\Pi_A^{s,D}(p_A, p^s) = [(1-\gamma)p_A + (1-\gamma)e - c]F(p^s - p_A). \quad (5)$$

We prove that the shrouding equilibrium exists if and only if

$$\alpha R \geq (1-\gamma)e \iff \alpha \geq \frac{e(1-\gamma)}{R}. \quad (6)$$

Necessity. Evaluate the candidate profit and the deviation profit at $p_A = p^s$. Since $F(0) > 0$, $\Pi_A^s(p^s, p^s) < \Pi_A^{s,D}(p^s, p^s) \iff \alpha R < (1-\gamma)e$. If condition (6) fails, seller A profits by unshrouding while keeping its base good price at p^s . Hence, condition (6) is necessary.

Sufficiency. Suppose condition (6) holds, and let $p_A^{s,D}$ denote a maximizer of (5) given $p_B = p^s$, whose existence follows from Lemma A.1. For every p_A , $\Pi_A^s(p_A, p^s) - \Pi_A^{s,D}(p_A, p^s) = [\alpha R - (1-\gamma)e]F(p^s - p_A) \geq 0$. Since p^s maximizes (4) given $p_B = p^s$, $\Pi_A^s(p^s, p^s) \geq \Pi_A^s(p_A^{s,D}, p^s) \geq \Pi_A^{s,D}(p_A^{s,D}, p^s) = \max_{p_A} \Pi_A^{s,D}(p_A, p^s)$. Thus, deviation is not profitable, so condition (6) is sufficient.

- (iii) *No asymmetric disclosure equilibrium.* Suppose seller A unshrouds and seller B shrouds.

By Lemmas A.2 and A.4, seller A sets $\hat{p}_A = e$. By Lemmas A.3 and A.5, seller B sets $\hat{p}_B = R$. Because seller A unshrouds, the residual myopic mass is $\alpha\lambda$.

Both sellers must have positive base good demand. Otherwise, if one seller has zero demand, its rival serves everyone and must earn a positive margin per consumer. The excluded seller can match its base good price and disclosure, obtaining demand $F(0) = \frac{1}{2}$ and at least the same margin: retained add-on profit per customer is $(1 - \gamma)e$ if both unshroud and rises from $\alpha\lambda R$ to αR if both shroud. The resulting positive profit contradicts equilibrium.

Seller A 's profit function is $\Pi_A^{asy-u}(p_A, p_B) = [(1 - \gamma)p_A + (1 - \gamma)e - c]F(p_B - p_A)$. If seller A deviates to shrouding at $\hat{p}_A = R$ while keeping p_A fixed, neither seller unshrouds, and its profit becomes $\Pi_A^{asy-u,D}(p_A, p_B) = [(1 - \gamma)p_A + \alpha R - c]F(p_B - p_A)$. Base good demand remains $F(p_B - p_A)$ because consumers who account for the add-on incur e under both disclosure profiles, while consumers who behave myopically compare only base good prices. Therefore, a necessary condition for seller A not to deviate is

$$(1 - \gamma)e \geq \alpha R. \quad (7)$$

Seller B 's profit function is $\Pi_B^{asy-s}(p_B, p_A) = [(1 - \gamma)p_B + \alpha\lambda R - c]F(p_A - p_B)$. If seller B deviates to unshrouding at $\hat{p}_B = e$ while keeping p_B fixed, its profit becomes $\Pi_B^{asy-s,D}(p_B, p_A) = [(1 - \gamma)p_B + (1 - \gamma)e - c]F(p_A - p_B)$. Base good demand remains $F(p_A - p_B)$ because seller A already unshrouds, so seller B 's deviation does not change the residual myopic mass. Consumers who account for the add-on incur e with either seller, and residual myopic consumers compare only base good prices. Therefore, a necessary condition for seller B not to deviate is

$$\alpha\lambda R \geq (1 - \gamma)e. \quad (8)$$

Combining conditions (7) and (8) gives $\alpha\lambda R \geq \alpha R$. This contradicts $\alpha > 0$ and $\lambda < 1$. Therefore, no asymmetric disclosure equilibrium exists.

Let $\mu \equiv \mathbb{E}[\max\{\epsilon_{iA}, \epsilon_{iB}\}]$. The welfare expressions are $CS^u = V + R + \mu - \frac{c}{1-\gamma} - \frac{1}{2f(0)}$, $W^u = V + R - c + \mu$, $CS^{s,\text{soph}} = V + R \left(1 + \frac{\alpha}{1-\gamma}\right) + \mu - \frac{c}{1-\gamma} - \frac{1}{2f(0)} - e$, $CS^{s,\text{myop}} = V + \frac{\alpha R}{1-\gamma} + \mu - \frac{c}{1-\gamma} - \frac{1}{2f(0)}$, $CS^s = V + R \left(1 + \frac{\gamma\alpha}{1-\gamma}\right) + \mu - \frac{c}{1-\gamma} - \frac{1}{2f(0)} - (1 - \alpha)e$, $W^s = V + R - c + \mu - (1 - \alpha)e$. Aggregating the two type-specific expressions yields CS^s . $\square$

A.2 Proof of Proposition 1

Proof. Sophisticated consumers: Since $1 - \gamma > 0$, $CS^{s,\text{soph}} \geq CS^u \iff \frac{\alpha R}{1-\gamma} - e \geq 0 \iff \alpha R \geq (1 - \gamma)e \iff \alpha \geq \frac{e(1-\gamma)}{R} = \underline{\alpha}$.

Total consumer surplus: Since $1 - \gamma > 0$, $CS^s \geq CS^u \iff \frac{\gamma\alpha R}{1-\gamma} - (1-\alpha)e \geq 0 \iff \alpha[\gamma R + (1-\gamma)e] \geq (1-\gamma)e \iff \alpha \geq \frac{e(1-\gamma)}{\gamma R + (1-\gamma)e} = \tilde{\alpha}$. Equivalently, this condition is $\gamma \geq \frac{(1-\alpha)e}{\alpha R + (1-\alpha)e}$.

Myopic consumers: Since $R > 0$ and $1 - \gamma > 0$, $CS^{s, \text{myop}} \geq CS^u \iff \frac{\alpha R}{1-\gamma} - R \geq 0 \iff \alpha \geq 1 - \gamma \iff \gamma \geq 1 - \alpha$. $\square$

A.3 Proof of Lemma 2

Proof. Under PU, the platform discloses every add-on price before consumers choose a seller. The mass of consumers who behave sophisticatedly is $1 - \alpha\lambda$, and the residual myopic mass is $\alpha\lambda$. For any positive add-on price, off-platform sales strictly dominate on-platform sales because seller A retains $\hat{p}_A$ rather than $(1 - \gamma)\hat{p}_A$.

- (i) *Low add-on price.* By Lemma A.2, the optimal add-on price for serving consumers who behave sophisticatedly is e . Suppose both sellers set $\hat{p} = e$. Consumers who account for the add-on compare $p_A + e$ with $p_B + e$, while consumers who remain myopic compare only base good prices. Seller A 's base good demand is $F(p_B - p_A)$, and its profit is

$$\Pi_A^{PU-e}(p_A, p_B) = [(1 - \gamma)p_A + e - c]F(p_B - p_A). \quad (9)$$

Applying lemma A.1 with $a = e$, gives $p^{PU-e} = \frac{e-c}{1-\gamma} + \frac{1}{2f(0)}$, $\Pi_A^{PU-e} = \Pi_B^{PU-e} = \frac{1-\gamma}{4f(0)}$.

Consider a unilateral deviation to the high add-on price serving only myopic consumers by seller A . By Lemma A.3, seller A sets $\hat{p}_A = R$ and sells the add-on only to the residual myopic consumers. Consumers who account for the add-on incur e with either seller: they substitute at cost e from seller A 's add-on or buy seller B 's add-on at e . Residual myopic consumers continue to compare only base good prices. Seller A 's base good demand is $F(p^{PU-e} - p_A)$, and its deviation profit is

$$\Pi_A^{PU-e,D}(p_A, p^{PU-e}) = [(1 - \gamma)p_A + \alpha\lambda R - c]F(p^{PU-e} - p_A). \quad (10)$$

We prove that PU-e exists if and only if

$$e \geq \alpha\lambda R. \quad (11)$$

Necessity. Evaluate the profit (9) and the deviation profit (10) at $p_A = p^{PU-e}$. Since $F(0) > 0$, $\Pi_A^{PU-e}(p^{PU-e}, p^{PU-e}) < \Pi_A^{PU-e,D}(p^{PU-e}, p^{PU-e}) \iff e < \alpha\lambda R$. If condition (11) fails, the deviation is profitable even without changing the base good price. Hence, the condition is necessary.

Sufficiency. Suppose condition (11) holds, and let $p_A^{PU-e,D}$ denote a maximizer of (10), whose existence follows from Lemma A.1. For every p_A , $\Pi_A^{PU-e}(p_A, p^{PU-e}) - \Pi_A^{PU-e,D}(p_A, p^{PU-e}) =$

$$[e - \alpha\lambda R]F(p^{PU-e} - p_A) \geq 0.$$

Since p^{PU-e} maximizes (9) given the rival price p^{PU-e} , $\Pi_A^{PU-e}(p^{PU-e}, p^{PU-e}) \geq \Pi_A^{PU-e}(p_A^{PU-e,D}, p^{PU-e}) \geq \Pi_A^{PU-e,D}(p_A^{PU-e,D}, p^{PU-e}) = \max_{p_A} \Pi_A^{PU-e,D}(p_A, p^{PU-e})$. Thus, condition (11) is sufficient even when the deviator reoptimizes its base good price.

The platform receives commission only on the base good, so the platform's profit is $\Pi_P^{PU-e} = \gamma \left(\frac{c-e}{1-\gamma} + \frac{1}{2f(0)} \right)$. Consumer surplus and total welfare are $CS^{PU-e} = V + R + \mu - \frac{c}{1-\gamma} - \frac{1}{2f(0)} + \frac{\gamma e}{1-\gamma}$, and $W^{PU-e} = V + R - c + \mu$.

- (ii) *High add-on price.* By Lemma A.3, the optimal add-on price for serving only consumers who remain myopic is R . Suppose both sellers set $\hat{p} = R$. Consumers who account for the add-on substitute at cost e from either seller, while residual myopic consumers compare only base good prices. Seller A 's base good demand is $F(p_B - p_A)$, and its profit is

$$\Pi_A^{PU-R}(p_A, p_B) = [(1-\gamma)p_A + \alpha\lambda R - c]F(p_B - p_A). \quad (12)$$

Applying lemma A.1 with $a = \alpha\lambda R$, gives $p^{PU-R} = \frac{c-\alpha\lambda R}{1-\gamma} + \frac{1}{2f(0)}$, $\Pi_A^{PU-R} = \frac{1-\gamma}{4f(0)}$.

Consider a unilateral deviation to the low add-on price to serve both types of consumers. By Lemma A.2, seller A sets $\hat{p}_A = e$ and sells the add-on to every base good consumer. Consumers who account for the add-on incur e with either seller: they buy seller A 's add-on at e or substitute at cost e from seller B 's add-on. Residual myopic consumers continue to compare only base good prices. Seller A 's base good demand is $F(p^{PU-R} - p_A)$, and its deviation profit is

$$\Pi_A^{PU-R,D}(p_A, p^{PU-R}) = [(1-\gamma)p_A + e - c]F(p^{PU-R} - p_A). \quad (13)$$

We prove that PU-R exists if and only if

$$\alpha\lambda R \geq e. \quad (14)$$

Necessity. Evaluate the profit function (12) and the deviation profit (13) at $p_A = p^{PU-R}$. Since $F(0) > 0$, $\Pi_A^{PU-R}(p^{PU-R}, p^{PU-R}) < \Pi_A^{PU-R,D}(p^{PU-R}, p^{PU-R}) \iff \alpha\lambda R < e$. If condition (14) fails, the deviation is profitable even without changing the base good price. Hence, the condition is necessary.

Sufficiency. Suppose condition (14) holds, and let $p_A^{PU-R,D}$ denote a maximizer of (13), whose existence follows from Lemma A.1. For every p_A , $\Pi_A^{PU-R}(p_A, p^{PU-R}) - \Pi_A^{PU-R,D}(p_A, p^{PU-R}) = [\alpha\lambda R - e]F(p^{PU-R} - p_A) \geq 0$.

Since p^{PU-R} maximizes (12) given the rival price p^{PU-R} , $\Pi_A^{PU-R}(p^{PU-R}, p^{PU-R}) \geq \Pi_A^{PU-R}(p_A^{PU-R,D}, p^{PU-R}) \geq \Pi_A^{PU-R,D}(p_A^{PU-R,D}, p^{PU-R}) = \max_{p_A} \Pi_A^{PU-R,D}(p_A, p^{PU-R})$. Thus, condition (14) is sufficient even when the deviator reoptimizes its base good price.

Platform profit is $\Pi_P^{PU-R} = \gamma \left(\frac{c-\alpha\lambda R}{1-\gamma} + \frac{1}{2f(0)} \right)$. Consumers who behave sophisticatedly pay substitution cost e , while residual myopic consumers pay R . The corresponding consumer surpluses are $CS^{PU-R} = V + R \left(1 + \frac{\gamma\alpha\lambda}{1-\gamma} \right) + \mu - \frac{c}{1-\gamma} - \frac{1}{2f(0)} - (1-\alpha\lambda)e$, and $W^{PU-R} = V + R - c + \mu - (1-\alpha\lambda)e$. The corresponding type-specific consumer surpluses are $CS^{PU-R, \text{soph}} = V + R \left(1 + \frac{\alpha\lambda}{1-\gamma} \right) + \mu - \frac{c}{1-\gamma} - \frac{1}{2f(0)} - e$ and $CS^{PU-R, \text{myop}} = V + \frac{\alpha\lambda R}{1-\gamma} + \mu - \frac{c}{1-\gamma} - \frac{1}{2f(0)}$.

- (iii) *Asymmetric Equilibrium.* Suppose seller A sets $\hat{p}_A = e$ and seller B sets $\hat{p}_B = R$. Both sellers must have positive base good demand. If one had zero demand, the seller serving all consumers would have a positive effective margin. Matching that seller's base good and add-on prices would then give the other seller demand $F(0) = \frac{1}{2}$ and the same positive margin, contradicting equilibrium. With positive demand, keeping base good prices fixed shows that seller A can avoid a profitable deviation to $\hat{p}_A = R$ only if $e \geq \alpha\lambda R$, and seller B can avoid a profitable deviation to $\hat{p}_B = e$ only if $\alpha\lambda R \geq e$. Therefore, an asymmetric equilibrium requires $e = \alpha\lambda R$. Because $e > 0$, this equality requires $\lambda > 0$ and is equivalent to $\alpha = \alpha^* \equiv \frac{e}{\lambda R}$. Thus, no asymmetric equilibrium exists when $\lambda = 0$.

When $e = \alpha\lambda R$, Equations (9) and (12) coincide. Both demands lie strictly between zero and one, so both base good first-order conditions apply. Symmetry of F gives $F(p_A - p_B) = 1 - F(p_B - p_A)$ and $f(p_A - p_B) = f(p_B - p_A) > 0$. Subtracting the first-order conditions after dividing by this common density gives $p_A - p_B = \frac{2F(p_B - p_A) - 1}{f(p_B - p_A)}$. The two sides have opposite signs unless $p_A = p_B$. Lemma A.1, applied with $a = e = \alpha\lambda R$, then gives $p_A = p_B = \frac{c-e}{1-\gamma} + \frac{1}{2f(0)} = \frac{c-\alpha\lambda R}{1-\gamma} + \frac{1}{2f(0)}$, $\Pi_A = \Pi_B = \frac{1-\gamma}{4f(0)}$.

□

A.4 Proof of Proposition 2

Proof. Under PS, outcome equivalence with the LF-s equilibrium in Lemma 1(ii) gives $\Pi_P^{PS-s} = \gamma \left(\frac{c-\alpha R}{1-\gamma} + \frac{1}{2f(0)} \right)$.

- (i) If $\alpha \leq \frac{e}{R}$, then $\lambda < 1$ implies $\alpha \leq \frac{e}{R} < \frac{e}{\lambda R} = \alpha^*$. Mandated unshrouding induces PU-e, and $\Pi_P^{PS-s} - \Pi_P^{PU-e} = \frac{\gamma(e-\alpha R)}{1-\gamma} \geq 0$. Thus, PS is optimal when $\alpha < \frac{e}{R}$. At $\alpha = \frac{e}{R}$, the profit difference is zero, so both PS and PU are optimal.
- (ii) If $\alpha > \frac{e}{R}$, then PU induces PU-e when $\alpha < \alpha^*$, and $\Pi_P^{PU-e} - \Pi_P^{PS-s} = \frac{\gamma(\alpha R - e)}{1-\gamma} > 0$. If $\alpha \geq \alpha^*$, which implies $\alpha > \frac{e}{R}$, PU-R is an equilibrium and $\Pi_P^{PU-R} - \Pi_P^{PS-s} = \frac{\gamma\alpha(1-\lambda)R}{1-\gamma} > 0$. Hence, PU is optimal for every $\alpha > \frac{e}{R}$.

□

A.5 Proof of Proposition 3

Proof. Under the equilibrium-selection rule, laissez-faire induces LF-u if $\gamma \leq \bar{\gamma}$ and LF-s if $\gamma > \bar{\gamma}$. The corresponding platform profits are $\Pi_P^{LF-u} = \gamma \left(\frac{c}{1-\gamma} + \frac{1}{2f(0)} \right)$ and $\Pi_P^{LF-s} = \gamma \left(\frac{c-\alpha R}{1-\gamma} + \frac{1}{2f(0)} \right) = \Pi_P^{PS-s}$.

- (i) If $\gamma \leq \bar{\gamma}$, laissez-faire induces LF-u. Relative to LF-u, every mandate moves add-on sales off-platform and subtracts strictly positive average retained add-on profit from the commissionable base good price. In particular, $\Pi_P^{LF-u} - \Pi_P^{PS-s} = \frac{\gamma\alpha R}{1-\gamma} > 0$ and $\Pi_P^{LF-u} - \Pi_P^{PU-e} = \frac{\gamma e}{1-\gamma} > 0$. Whenever PU-R exists, $\Pi_P^{LF-u} - \Pi_P^{PU-R} = \frac{\gamma\alpha\lambda R}{1-\gamma} > 0$. Thus, laissez-faire (LF) is optimal.
- (ii) If $\gamma > \bar{\gamma}$ and $\alpha \leq \frac{e}{R}$, laissez-faire induces LF-s, which is outcome-equivalent to PS-s. Mandated unshrouding induces PU-e, and $\Pi_P^{LF-s} - \Pi_P^{PU-e} = \frac{\gamma(e-\alpha R)}{1-\gamma} \geq 0$. Hence, LF maximizes platform profit. It yields the same profit as PS throughout this region and when $\alpha = \frac{e}{R}$, also the same profit as PU. The tie-breaking rule selects LF.
- (iii) If $\gamma > \bar{\gamma}$ and $\alpha > \frac{e}{R}$, Proposition 2 implies that PU yields strictly more profit than PS. LF induces LF-s, and $\Pi_P^{LF-s} = \Pi_P^{PS-s}$. Therefore, PU also yields strictly more profit than LF, and the platform mandates unshrouding.

In case (i), PS yields strictly less profit than LF. In case (ii), PS and LF yield the same profit. In case (iii), PS yields strictly less profit than PU. Therefore, PS is never strictly optimal. $\square$

A.6 Proof of Proposition 4

Proof. Since LF-s and PS-s are welfare-equivalent, we use CS^{LF-s} throughout.

Transfers between consumers, sellers, and the platform cancel in social welfare. The social welfare expressions are $W^{LF-u} = W^{PU-e} = V + R - c + \mu$, $W^{LF-s} = W^{PS-s} = V + R - c + \mu - (1-\alpha)e$, $W^{PU-R} = V + R - c + \mu - (1-\alpha\lambda)e$.

Because $\alpha > 0$ and $\lambda < 1$, $(1-\alpha\lambda)e > (1-\alpha)e$. These expressions establish the social welfare ranking stated in Section 4.3.1.

Dominance comparisons: $CS^{PU-e} > CS^{LF-u}$ because $CS^{PU-e} - CS^{LF-u} = \frac{\gamma e}{1-\gamma} > 0$. $CS^{LF-s} > CS^{PU-R}$ because $CS^{LF-s} - CS^{PU-R} = \frac{\alpha(1-\lambda)}{1-\gamma} [\gamma R + (1-\gamma)e] > 0$.

Since PU-R is dominated by LF-s and LF-u is dominated by PU-e, the consumer surplus comparison reduces to comparing LF-s with PU-e.

- (i) *Sophisticated consumers:* $CS^{LF-s, \text{soph}} - CS^{PU-e} = \frac{\alpha R - e}{1-\gamma}$. Hence, LF-s yields weakly higher surplus if and only if $\alpha \geq \frac{e}{R}$. This threshold is independent of γ .
- (ii) *Total consumer surplus:* $CS^{LF-s} - CS^{PU-e} = \frac{\alpha[e + \gamma(R-e)] - e}{1-\gamma}$. Hence, LF-s yields weakly higher total consumer surplus if and only if $\alpha \geq \frac{e}{e + \gamma(R-e)}$, or equivalently $\gamma \geq \frac{(1-\alpha)e}{\alpha(R-e)}$.

(iii) *Myopic consumers*: $CS^{LF-s, \text{myop}} - CS^{PU-e} = \frac{\alpha R - (1-\gamma)R - \gamma e}{1-\gamma}$. Hence, LF-s yields weakly higher surplus if and only if $\alpha \geq 1 - \frac{\gamma(R-e)}{R}$, or equivalently $\gamma \geq \frac{(1-\alpha)R}{R-e}$.

Ordering of thresholds. $\frac{e}{R} < \frac{e}{e+\gamma(R-e)}$ since $e + \gamma(R-e) < R$ for $\gamma \in (0,1)$. For the second inequality, $\frac{e}{e+\gamma(R-e)} \leq 1 - \frac{\gamma(R-e)}{R}$ is equivalent to $eR \leq [e + \gamma(R-e)][R - \gamma(R-e)] = eR + \gamma(1-\gamma)(R-e)^2$. The inequality is strict because $\gamma \in (0,1)$ and $R > e$. The cutoff $\frac{e}{R}$ is independent of γ . The other two cutoffs decrease with γ because their derivatives are $-\frac{e(R-e)}{[e+\gamma(R-e)]^2} < 0$ and $-\frac{R-e}{R} < 0$, respectively.

Finally, $CS^{LF-u} \leq CS^{PU-R}$ if and only if $\gamma \geq \frac{(1-\alpha\lambda)e}{\alpha\lambda R + (1-\alpha\lambda)e}$. This threshold is weakly below $\frac{(1-\alpha)e}{\alpha(R-e)}$ if and only if $\alpha \leq \frac{e}{R-\lambda(R-e)}$.

□

B Consumer Surplus Rankings

Since the platform never strictly prefers mandated shrouding and LF-s is welfare-equivalent to PS-s, the figures below illustrate only the LF and PU policy outcomes. Figures 7 and 8 display the consumer surplus rankings as a function of γ .

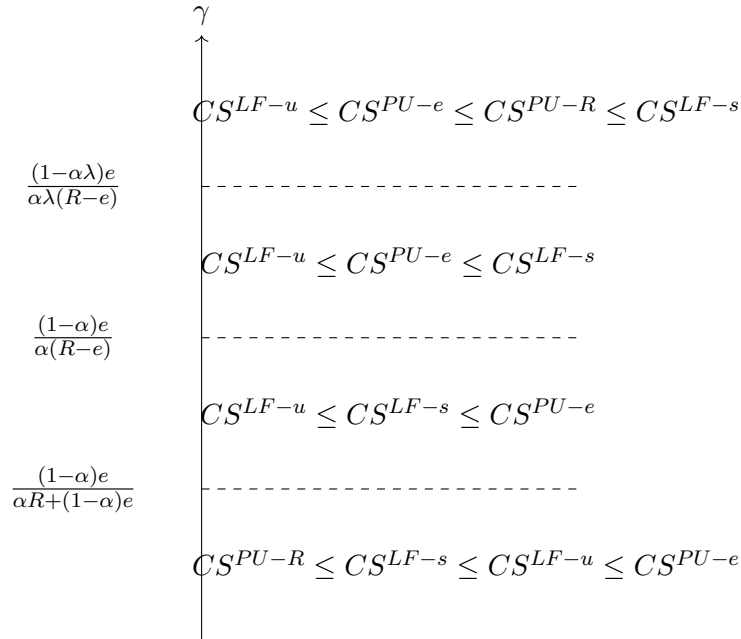


Figure 7: Total consumer surplus rankings as a function of γ

Note: In the two intermediate regions, the figure omits the direct ranking of CS^{LF-u} and CS^{PU-R} . The former is weakly lower if and only if $\gamma \geq \frac{(1-\alpha\lambda)e}{\alpha\lambda R + (1-\alpha\lambda)e}$. This cutoff is weakly below $\frac{(1-\alpha)e}{\alpha(R-e)}$ if and only if $\alpha \leq \frac{e}{R-\lambda(R-e)}$.

LF-s always yields weakly higher total consumer surplus than PU-R. As γ rises, LF-s first

overtakes LF-u and then PU-e. LF-s delivers the highest total consumer surplus when $\gamma \geq \frac{(1-\alpha)e}{\alpha(R-e)}$. When $\alpha < \frac{e}{R}$, this threshold exceeds one and is unattainable: PU-e always dominates LF-s in total consumer surplus.

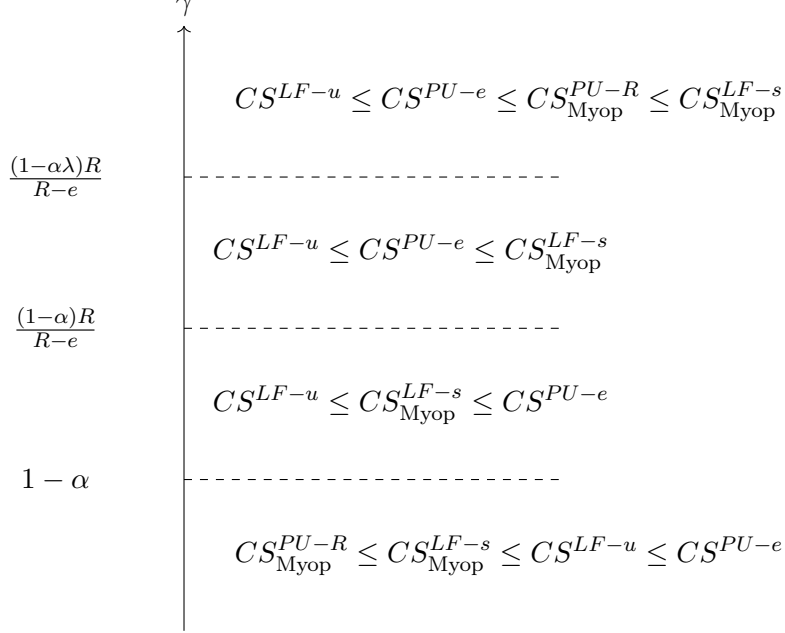


Figure 8: Myopic consumer surplus rankings as a function of γ

Note: In the two intermediate regions, the figure omits the direct ranking of CS^{LF-u} and CS_{Myop}^{PU-R} . The former is weakly lower if and only if $\gamma \geq 1 - \alpha\lambda$. This cutoff is weakly below $\frac{(1-\alpha)R}{R-e}$ if and only if $\alpha \leq \frac{e}{R-\lambda(R-e)}$.

Within each of LF-u and PU-e, sophisticated and myopic consumers obtain the same surplus because every consumer buys the add-on at price e . Thus, CS^{LF-u} and CS^{PU-e} also denote myopic consumer surplus in these outcomes. The conditions for myopic consumers to benefit from shrouding are more demanding than those for total consumer surplus, consistent with Proposition 4 (iii). When $\alpha > \frac{e}{R}$, LF-s maximizes myopic consumer surplus only when $\gamma \geq \frac{(1-\alpha)R}{R-e}$, which is a higher cutoff than the $\frac{(1-\alpha)e}{\alpha(R-e)}$ required for total consumer surplus. When $\alpha < \frac{e}{R}$, PU-e yields the highest total consumer surplus and the highest myopic consumer surplus for every $\gamma \in (0, 1)$.

C Unavoidable Add-Ons

If $e > R$, the add-ons become unavoidable since the substitution cost exceeds the add-on valuation.

Proposition 5. *When $e > R$, the platform chooses bundled laissez-faire. There exists a unique*

symmetric equilibrium, in which sellers shroud, sell add-ons off-platform at $\hat{p} = R$, and set the base good price $p = \frac{c-R}{1-\gamma} + \frac{1}{2f(0)}$.

Proof. At any symmetric equilibrium, each seller has positive base good demand. Thus, we consider best responses with positive demand. Such a best response has a positive effective margin by the same bounded-support, tail, and continuity arguments as in Lemma A.2.

Because $e > R$, buying the add-on is weakly better than substituting at every price $\hat{p} \leq R$. A price above R generates no add-on demand and is strictly dominated by charging R , which gives consumers the same zero net add-on surplus and generates positive revenue. It suffices to consider $\hat{p} \in [0, R]$.

(i) **Add-on price:** We first establish that R is the unique optimal add-on price under every policy conditional on positive base good demand, as occurs at any symmetric equilibrium. If the price is shrouded, changing $\hat{p} < R$ to R does not affect base good demand because consumers do not observe the deviation before choosing a seller, but it strictly raises revenue from every locked-in consumer. If the price is disclosed and sold off-platform, consider any strategy $(p_A, \hat{p}_A)$ with $\hat{p}_A < R$ and positive demand. Let $\delta = R - \hat{p}_A$ and consider a deviation with $(p_A - \delta, R)$. The base good price falls by δ for all consumers. The increase in the add-on price leaves the total price unchanged for consumers who attend to the add-on. Myopic consumers who overlook the add-on choose based only on the lower base good price, which weakly increases the seller's demand from these consumers. Retained revenue from each consumer who buys both goods rises by $\gamma\delta > 0$ since the add-ons are sold off-platform. The deviation is strictly profitable, so every disclosed off-platform optimum with positive demand also has $\hat{p}_A = R$.

(ii) **Sales channel and disclosure:** Under either mandate, moving a positive-price add-on sale from the platform to the off-platform channel leaves disclosure and demand unchanged but raises retained add-on revenue from $(1 - \gamma)R$ to R . Hence, all mandated add-on sales occur off-platform.

Under bundled laissez-faire, disclosure requires an on-platform sale. Consider any unshrouding strategy $(p_A, \hat{p}_A)$ with $\hat{p}_A \leq R$ and positive demand. Suppose seller A deviates to shrouding, sets the off-platform add-on price to R , and sets the base good price to $p'_A = p_A + \hat{p}_A - R$. Attentive consumers face the same total price because $p'_A + R = p_A + \hat{p}_A$. Since $\hat{p}_A \leq R$, $p'_A \leq p_A$, so myopic consumers observe a weakly lower base good price. Retained revenue from each consumer who buys both goods rises by $\gamma R > 0$. Thus, every unshrouding strategy with positive demand is strictly dominated. In particular, no symmetric unshrouding equilibrium exists under laissez-faire.

(iii) **No add-on:** Suppose seller A offers no add-on at base good price p_A and has positive demand. Any such best response must have a positive margin $m_A = (1 - \gamma)p_A - c$. A

negative margin gives negative profit, whereas a sufficiently high base good price gives zero profit when $\underline{x}$ is finite. If $\underline{x} = -\infty$, a price above $\frac{c}{1-\gamma}$ gives positive demand and profit. At a zero margin, a sufficiently small increase in p_A preserves positive demand by continuity and creates a positive margin.

Let D_A^0 denote seller A 's initial demand. Consider a deviation that sells the add-on off-platform at R and lowers the base good price to $p_A - R$. Under LF and PS, seller A shrouds the add-on. Under PU, the add-on price is disclosed. Consumers who account for the add-on face the same total price, while myopic consumers observe a lower base good price. Hence, demand after the deviation, denoted by D_A^R , satisfies $D_A^R \geq D_A^0$. The retained margin rises from m_A to $m_A + \gamma R$, so $(m_A + \gamma R)D_A^R - m_A D_A^0 = m_A(D_A^R - D_A^0) + \gamma R D_A^R > 0$. Thus, offering no add-on cannot be optimal under any policy.

- (iv) **Base good pricing:** In every policy regime, all consumers buy the add-on at the common off-platform price R . They choose the seller with a lower base good price, and seller A earns $\Pi_A(p_A, p_B) = [(1 - \gamma)p_A + R - c]F(p_B - p_A)$. Applying Lemma A.1 with $a = R$, gives the unique symmetric price and seller profit, $p_A = \frac{c-R}{1-\gamma} + \frac{1}{2f(0)}$, $\hat{p}_A = R$, $\Pi_A = \frac{1-\gamma}{4f(0)}$. Because only the base good is sold on-platform, platform profit is $\Pi_P = \gamma \left(\frac{c-R}{1-\gamma} + \frac{1}{2f(0)} \right)$ under LF, PS, and PU. The platform's policy tie-breaking rule selects LF.

□

D Robustness Checks for Equilibrium Selection

Section 4.2 selects LF-u whenever it exists. LF-u maximizes social welfare, strictly so when $\alpha < 1$ and weakly so when $\alpha = 1$. This rule is the most favorable possible selection criterion for LF-u.

To assess the robustness of our results, we consider the implications of relaxing this assumption. Specifically, we analyze the opposite extreme, where sellers always select the shrouding equilibrium (LF-s) whenever it is sustainable. In other words, when both shrouding and unshrouding equilibria coexist, sellers choose the shrouding equilibrium. This approach allows us to identify which results hold regardless of the specific equilibrium selection rule. Under this alternative assumption, the cutoff $\bar{\gamma}$ in Corollary 1.1 changes to $\bar{\gamma}' = 1 - \frac{\alpha R}{e}$.

Corollary 1.2. *Let $\bar{\gamma}' \equiv 1 - \frac{\alpha R}{e}$.*

- (i) *if $\gamma \geq \bar{\gamma}'$, shrouding (LF-s) is the sellers' selected equilibrium.*
- (ii) *if $\gamma < \bar{\gamma}'$, unshrouding (LF-u) is the sellers' selected equilibrium.*

Proposition 6. *Apply the equilibrium-selection and policy tie-breaking rules stated above. The platform's profit-maximizing governance is:*

- (i) If $\alpha \leq \frac{e}{R}$, the platform adopts bundled laissez-faire.
- (ii) If $\alpha > \frac{e}{R}$, the platform mandates unshrouding.
- (iii) The platform never strictly prefers to mandate shrouding.

Proof. Under the alternative equilibrium-selection rule, laissez-faire induces LF-u if $\gamma < \bar{\gamma}'$ and LF-s if $\gamma \geq \bar{\gamma}'$. The corresponding platform profits are $\Pi_P^{LF-u} = \gamma \left(\frac{c}{1-\gamma} + \frac{1}{2f(0)} \right)$ and $\Pi_P^{LF-s} = \gamma \left(\frac{c-\alpha R}{1-\gamma} + \frac{1}{2f(0)} \right) = \Pi_P^{PS-s}$.

- (i) Suppose first that $\alpha < \frac{e}{R}$. Since $\lambda < 1$, we have $\alpha < \frac{e}{R} < \alpha^*$, where $\alpha^* = +\infty$ when $\lambda = 0$. Mandated unshrouding induces PU-e. If $\gamma < \bar{\gamma}'$, laissez-faire induces LF-u, and $\Pi_P^{LF-u} - \Pi_P^{PS-s} = \frac{\gamma\alpha R}{1-\gamma} > 0$, $\Pi_P^{LF-u} - \Pi_P^{PU-e} = \frac{\gamma e}{1-\gamma} > 0$. Thus, laissez-faire is strictly optimal. If $\gamma \geq \bar{\gamma}'$, laissez-faire induces LF-s, and $\Pi_P^{LF-s} - \Pi_P^{PU-e} = \frac{\gamma(e-\alpha R)}{1-\gamma} > 0$. Laissez-faire and mandated shrouding yield the same platform profit, so the policy tie-breaking rule selects laissez-faire. At $\alpha = \frac{e}{R}$, we have $\bar{\gamma}' = 0$, so laissez-faire induces LF-s for every $\gamma \in (0, 1)$. Mandated unshrouding induces PU-e, and all three policies yield the same platform profit. The policy tie-breaking rule selects laissez-faire.
- (ii) Suppose next that $\alpha > \frac{e}{R}$. Then $\bar{\gamma}' < 0$, so laissez-faire induces LF-s for every $\gamma \in (0, 1)$. If $\alpha < \alpha^*$, mandated unshrouding induces PU-e, and $\Pi_P^{PU-e} - \Pi_P^{LF-s} = \frac{\gamma(\alpha R - e)}{1-\gamma} > 0$. If $\alpha \geq \alpha^*$, every equilibrium under mandated unshrouding gives the platform the PU-R profit. Hence, $\Pi_P^{PU-R} - \Pi_P^{LF-s} = \frac{\gamma\alpha(1-\lambda)R}{1-\gamma} > 0$. Mandated unshrouding is strictly optimal whenever $\alpha > \frac{e}{R}$.
- (iii) Mandated shrouding always reproduces the LF-s outcome. It gives the platform the same profit as laissez-faire whenever LF-s is selected and a lower profit whenever LF-u is selected. For $\alpha > \frac{e}{R}$, mandated unshrouding yields strictly more profit than LF-s. Hence, the platform never strictly prefers mandated shrouding.

□

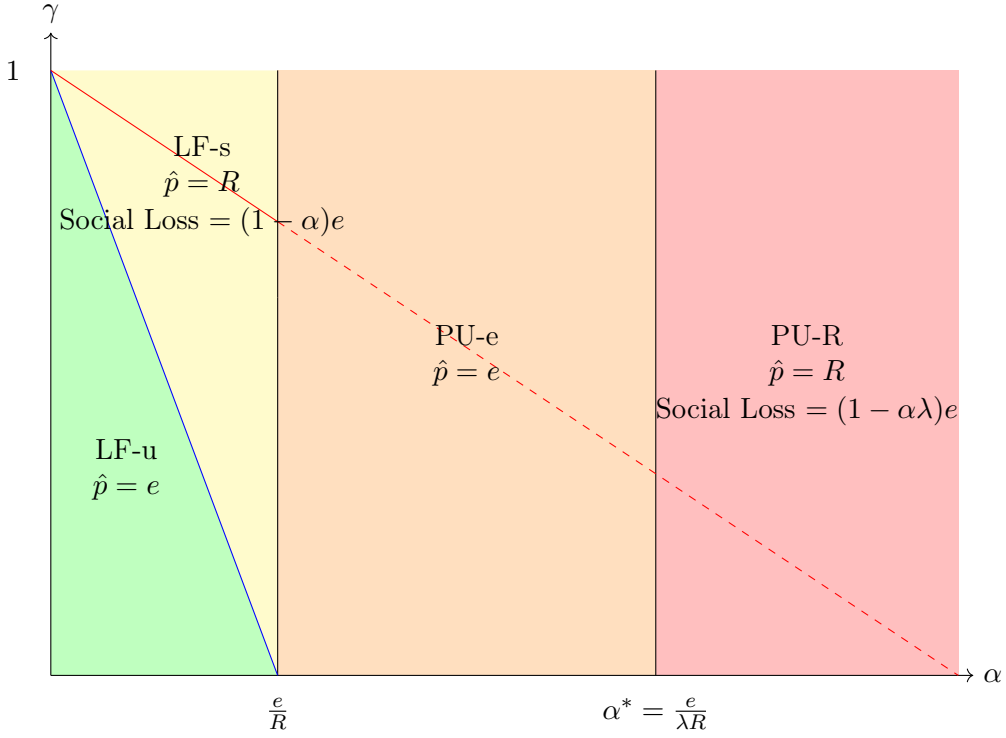


Figure 9: Case $\lambda > \frac{e}{R}$. Equilibrium conditions as functions of α and γ with $\bar{\gamma}' = 1 - \frac{\alpha R}{e}$

Note: The blue line corresponds to the cutoff $\bar{\gamma}' = 1 - \frac{\alpha R}{e}$ and intersects $\gamma = 0$ at $\alpha = \frac{e}{R}$. The red line indicates $\gamma = 1 - \alpha$. If $\gamma \geq 1 - \alpha$, consumer surplus for both types is weakly higher under LF-s than under LF-u.

Figure 9 illustrates the equilibrium regions, taking into account the platform's decisions. The blue line in the figure shows the cutoff $\bar{\gamma}' = 1 - \frac{\alpha R}{e}$ as a function of α . As in Figure 5, the commission rate γ only influences add-on pricing and shrouding decisions when $\alpha < \frac{e}{R}$. If the commission is weakly above $\bar{\gamma}'$, sellers shroud the add-ons and set a high add-on price that serves only myopic consumers, generating deadweight loss $(1 - \alpha)e$. All other aspects of the analysis remain unchanged from Figure 5.

Under this equilibrium selection rule, the uniform cap $1 - \lambda$ no longer prevents shrouding in every market. A market-specific cap can prevent shrouding:

$$\gamma < \bar{\gamma}' = 1 - \frac{\alpha R}{e}.$$

If $\bar{\gamma}' \leq 0$, no feasible nonnegative commission rate can guarantee selection of LF-u under the alternative rule.

E Extension: Homogeneous Base Goods

This extension replaces horizontal differentiation with homogeneous base goods. All other primitives remain unchanged. Two symmetric sellers produce the base good at marginal cost c , the add-on has zero marginal cost and value R , and the platform charges commission $\gamma \in (0, 1)$. A fraction $1 - \alpha$ of consumers are sophisticated, and a fraction α are initially myopic. If at least one seller unshrouds, only the residual mass $\alpha\lambda$ remains myopic.

Consumers buy from the seller with the lower perceived base good price. At equal perceived prices, they split equally between sellers. We restrict attention to pure-strategy equilibria.

E.1 Bundled Laissez-Faire

Lemma 3. *Under bundled laissez-faire:*

- (i) Let $\bar{\alpha}^H \equiv \frac{e(1-\gamma)}{\lambda R}$. A symmetric unshrouding equilibrium (LF-u) exists if and only if $\alpha \leq \bar{\alpha}^H$. In this equilibrium, $\hat{p}^{LF-u} = e$, $p^{LF-u} = \frac{c}{1-\gamma} - e$, each seller earns zero profit, and the platform earns $\Pi_P^{LF-u} = \frac{\gamma c}{1-\gamma}$.
- (ii) Let $\underline{\alpha}^H \equiv \frac{e(1-\gamma)}{R}$. A symmetric shrouding equilibrium (LF-s) exists if and only if $\alpha \geq \underline{\alpha}^H$. In this equilibrium, $\hat{p}^{LF-s} = R$, $p^{LF-s} = \frac{c-\alpha R}{1-\gamma}$, each seller earns zero profit, and the platform earns $\Pi_P^{LF-s} = \frac{\gamma(c-\alpha R)}{1-\gamma}$.

Proof. (i) **Unshrouding equilibrium:** Suppose both sellers set $\hat{p} = e$, unshroud, and sell the add-on on-platform. Their retained add-on margin is $(1-\gamma)e$, so Bertrand competition gives base good price $p^{LF-u} = \frac{c-(1-\gamma)e}{1-\gamma} = \frac{c}{1-\gamma} - e$. A deviation to shrouding sets $\hat{p}_i = R$ and yields expected retained add-on margin $\alpha\lambda R$ because the rival continues to unshroud.

Necessity. If $(1-\gamma)e < \alpha\lambda R$, the deviator's zero-profit base good price $\frac{c-\alpha\lambda R}{1-\gamma} < p^{LF-u}$. For sufficiently small $\varepsilon > 0$, the deviator can set $p_j^D = p^{LF-u} - \varepsilon$, capture the market, and earn $(1-\gamma)(p^{LF-u} - \varepsilon) + \alpha\lambda R - c = \alpha\lambda R - (1-\gamma)e - (1-\gamma)\varepsilon > 0$. Hence, $(1-\gamma)e \geq \alpha\lambda R$ is necessary.

Sufficiency. Suppose $(1-\gamma)e \geq \alpha\lambda R$, so $\frac{c-\alpha\lambda R}{1-\gamma} \geq p^{LF-u}$. A deviator that charges less than p^{LF-u} earns a nonpositive margin, a deviator that charges more receives no demand, and a deviator that matches p^{LF-u} earns nonpositive profit. Thus, no deviation is profitable.

In this equilibrium, the platform's profit is $\Pi_P^{LF-u} = \gamma(p^{LF-u} + e) = \frac{\gamma c}{1-\gamma}$.

- (ii) **Shrouding equilibrium:** Suppose both sellers set $\hat{p} = R$, shroud, and sell the add-on off-platform. Each seller's expected retained add-on margin is αR , so Bertrand competition gives base good price $p^{LF-s} = \frac{c-\alpha R}{1-\gamma}$. A deviation to unshrouding sets $\hat{p}_i = e$ and yields retained add-on margin $(1-\gamma)e$.

Necessity. If $\alpha R < (1 - \gamma)e$, the deviator's zero-profit base good price $\frac{c}{1-\gamma} - e < p^{LF-s}$. For sufficiently small $\varepsilon > 0$, a deviation to $p_j^D = p^{LF-s} - \varepsilon$ captures the market and yields $(1 - \gamma)(p^{LF-s} - \varepsilon + e) - c = (1 - \gamma)e - \alpha R - (1 - \gamma)\varepsilon > 0$. Hence, $\alpha R \geq (1 - \gamma)e$ is necessary.

Sufficiency. Suppose $\alpha R \geq (1 - \gamma)e$, so $\frac{c}{1-\gamma} - e \geq p^{LF-s}$. Undercutting yields a nonpositive margin, charging more yields no demand, and matching p^{LF-s} yields nonpositive profit. Thus, no deviation is profitable.

The platform receives commission only on the base good, so the equilibrium platform profit is $\Pi_P^{LF-s} = \frac{\gamma(c - \alpha R)}{1 - \gamma}$.

- (iii) **Asymmetric equilibrium:** Suppose seller A unshrouds at $\hat{p}_A = e$ and seller B shrouds at $\hat{p}_B = R$. Their zero-profit base good prices are $p_A = \frac{c}{1-\gamma} - e$ and $p_B = \frac{c - \alpha \lambda R}{1 - \gamma}$.

If $p_A \neq p_B$, the lower-price seller serves the entire market. If its margin is negative, it can obtain zero profit by charging more than its rival. If its margin is zero or positive, it can raise its price slightly while remaining below its rival's price, which strictly raises its profit. Hence, an asymmetric equilibrium requires $p_A = p_B$.

At a common price $p_A = p_B$, equilibrium requires the two zero-profit prices to coincide. If the common price is below both zero-profit prices, both sellers earn negative profit. If the zero-profit prices differ and the common price equals the lower one, the seller with the higher zero-profit price earns negative profit. If the common price exceeds the lower zero-profit price, the seller with that price can profitably undercut. Therefore, a candidate asymmetric equilibrium requires $\frac{c}{1-\gamma} - e = \frac{c - \alpha \lambda R}{1 - \gamma} \iff (1 - \gamma)e = \alpha \lambda R$. Seller A can deviate to shrouding while keeping its base good price fixed. Because neither seller unshrouds after the deviation, seller A 's expected retained add-on margin rises from $(1 - \gamma)e = \alpha \lambda R$ to αR . The increase is strictly positive when $\alpha > 0$ and $\lambda < 1$, while base good demand is unchanged. Thus, seller A has a profitable deviation, and no asymmetric disclosure equilibrium exists. □

Homogeneous competition removes seller rents and the differentiation markup, but it does not change the comparison between retained add-on margins that determines the cutoffs $\underline{\alpha}^H$ and $\bar{\alpha}^H$.

E.2 Platform Mandates and Governance

Lemma 4. Suppose the platform decouples disclosure from the sales channel, and let $\alpha^* \equiv \frac{c}{\lambda R}$.

- (i) Mandated shrouding induces the unique symmetric equilibrium PS-s, in which $\hat{p}^{PS-s} = R$, $p^{PS-s} = \frac{c - \alpha R}{1 - \gamma}$, and each seller earns zero profit.

- (ii) If $\alpha \leq \alpha^*$, mandated unshrouding admits the symmetric low add-on pricing equilibrium PU-e, in which $\hat{p}^{PU-e} = e$ and $p^{PU-e} = \frac{c-e}{1-\gamma}$. If $\alpha \geq \alpha^*$, it admits the symmetric high add-on pricing equilibrium PU-R, in which $\hat{p}^{PU-R} = R$ and $p^{PU-R} = \frac{c-\alpha\lambda R}{1-\gamma}$. At $\alpha = \alpha^*$, both symmetric profiles and the two asymmetric add-on price profiles are equilibria. Sellers earn zero profit in every equilibrium.

Proof. (i) **Mandated shrouding:** Sellers set $\hat{p} = R$ and sell the add-on off-platform. Sophisticated consumers substitute, while the mass α of myopic consumers buys the add-on. The expected retained add-on margin is αR , so Bertrand competition gives $p^{PS-s} = \frac{c-\alpha R}{1-\gamma}$ and zero seller profit.

- (ii) **Mandated unshrouding:** Suppose both sellers set $\hat{p} = e$. Each seller earns retained add-on margin e , and Bertrand competition gives $p^{PU-e} = \frac{c-e}{1-\gamma}$. A deviation to $\hat{p}_i = R$ yields expected retained add-on margin $\alpha\lambda R$. By the same undercutting argument as in Lemma 3, PU-e is an equilibrium if and only if $e \geq \alpha\lambda R$.

Suppose instead that both sellers set $\hat{p} = R$. Each seller earns expected retained add-on margin $\alpha\lambda R$, and Bertrand competition gives $p^{PU-R} = \frac{c-\alpha\lambda R}{1-\gamma}$. A deviation to $\hat{p}_i = e$ yields retained add-on margin e . By the same undercutting argument as in Lemma 3, PU-R is an equilibrium if and only if $\alpha\lambda R \geq e$.

When $e = \alpha\lambda R$, charging the add-on at either e or R yields the same retained add-on margin. Therefore, the two symmetric add-on price profiles and the two asymmetric profiles are all equilibria at the common base good price $p_A = p_B = \frac{c-e}{1-\gamma} = \frac{c-\alpha\lambda R}{1-\gamma}$.

Sellers earn zero profit in every equilibrium. □

Homogeneous Bertrand competition changes only the level of seller profit, not the comparison between add-on margins.

The platform profits under the three mandated equilibria are

$$\Pi_P^{PS-s} = \frac{\gamma(c - \alpha R)}{1 - \gamma}, \quad \Pi_P^{PU-e} = \frac{\gamma(c - e)}{1 - \gamma}, \quad \Pi_P^{PU-R} = \frac{\gamma(c - \alpha\lambda R)}{1 - \gamma}.$$

Proposition 7. Let $\bar{\gamma}^H \equiv 1 - \frac{\alpha\lambda R}{e}$, and apply the baseline equilibrium-selection and policy tie-breaking rules. The platform's profit-maximizing governance is:

- (i) If $\alpha \leq \frac{e}{R}$, or if $\frac{e}{R} < \alpha < \alpha^*$ and $\gamma \leq \bar{\gamma}^H$, the platform adopts bundled laissez-faire.
- (ii) If $\alpha \geq \alpha^*$, or if $\frac{e}{R} < \alpha < \alpha^*$ and $\gamma > \bar{\gamma}^H$, the platform mandates unshrouding.
- (iii) The platform never strictly prefers to mandate shrouding.

Proof. (i) When $\gamma \leq \bar{\gamma}^H$, LF-u is sustainable and selected. It is the only outcome in which the platform receives commission on both goods. $\Pi_P^{LF-u} - \Pi_P^{PS-s} = \frac{\gamma\alpha R}{1-\gamma} > 0$, $\Pi_P^{LF-u} - \Pi_P^{PU-e} = \frac{\gamma e}{1-\gamma} > 0$, and $\Pi_P^{LF-u} - \Pi_P^{PU-R} = \frac{\gamma\alpha\lambda R}{1-\gamma} > 0$ whenever PU-R exists.

Hence, LF is uniquely optimal whenever $\gamma \leq \bar{\gamma}^H$.

We then consider $\alpha \leq \frac{e}{R}$ and $\gamma > \bar{\gamma}^H$. LF induces LF-s, which is outcome-equivalent to PS-s. Because $\lambda < 1$, $\alpha \leq \frac{e}{R} < \alpha^*$, so PU induces PU-e. Moreover, $\Pi_P^{LF-s} - \Pi_P^{PU-e} = \frac{\gamma(e-\alpha R)}{1-\gamma} \geq 0$.

LF maximizes platform profit and is selected by the policy tie-breaking rule.

(ii) Suppose $\frac{e}{R} < \alpha < \alpha^*$ and $\gamma > \bar{\gamma}^H$. LF induces LF-s, while PU induces PU-e. Because $\Pi_P^{PU-e} - \Pi_P^{LF-s} = \frac{\gamma(\alpha R - e)}{1-\gamma} > 0$, the platform mandates unshrouding.

If $\alpha \geq \alpha^*$, then $\bar{\gamma}^H \leq 0$, so $\gamma > \bar{\gamma}^H$. LF induces LF-s, while PU admits PU-R. Moreover, $\Pi_P^{PU-R} - \Pi_P^{LF-s} = \frac{\gamma\alpha(1-\lambda)R}{1-\gamma} > 0$. The platform mandates unshrouding.

(iii) Mandated shrouding yields the same profit as LF whenever LF induces LF-s. When LF induces LF-u, mandated shrouding yields strictly less profit. When mandated unshrouding is optimal, it yields strictly more profit than mandated shrouding. Therefore, the platform never strictly prefers to mandate shrouding. □

Homogeneous base good competition removes seller rents but leaves the platform's governance cutoffs unchanged because its profit still depends on the commissionable base good price and on whether add-ons remain on-platform.

E.3 Welfare

Social welfare is $W^{LF-u} = W^{PU-e} = V + R - c$, $W^{LF-s} = W^{PS-s} = V + R - c - (1 - \alpha)e$, and $W^{PU-R} = V + R - c - (1 - \alpha\lambda)e$.

Proposition 8. *With homogeneous base goods:*

- (i) Define $\tilde{\alpha}^H \equiv \frac{e(1-\gamma)}{\gamma R + (1-\gamma)e}$. Consumer surplus under LF-s is weakly higher than under LF-u if and only if $\alpha \geq \tilde{\alpha}^H$.
- (ii) Across outcome allocations, $CS^{PU-e} > CS^{LF-u}$ and $CS^{LF-s} > CS^{PU-R}$. Total consumer surplus is maximized by PU-e if $\alpha < \frac{e}{e+\gamma(R-e)}$, by LF-s if $\alpha > \frac{e}{e+\gamma(R-e)}$.

Proof. With homogeneous base goods, equilibrium prices contain neither the match-surplus term μ nor the differentiation markup $\frac{1}{2f(0)}$. Removing these common terms from the baseline

consumer-surplus formulas gives

$$\begin{aligned}
CS^{LF-u} &= V + R - \frac{c}{1-\gamma}, \\
CS^{LF-s} &= V + R \left(1 + \frac{\gamma\alpha}{1-\gamma} \right) - \frac{c}{1-\gamma} - (1-\alpha)e, \\
CS^{PU-e} &= V + R - \frac{c}{1-\gamma} + \frac{\gamma e}{1-\gamma}, \\
CS^{PU-R} &= V + R \left(1 + \frac{\gamma\alpha\lambda}{1-\gamma} \right) - \frac{c}{1-\gamma} - (1-\alpha\lambda)e.
\end{aligned}$$

- **Laissez-faire comparison:** $CS^{LF-s} - CS^{LF-u} = \frac{\gamma\alpha R}{1-\gamma} - (1-\alpha)e$, which is weakly positive if and only if $\alpha \geq \frac{e(1-\gamma)}{\gamma R + (1-\gamma)e}$.
- **Dominance comparisons:** We have $CS^{PU-e} - CS^{LF-u} = \frac{\gamma e}{1-\gamma} > 0$ and $CS^{LF-s} - CS^{PU-R} = \frac{\alpha(1-\lambda)}{1-\gamma} [\gamma R + (1-\gamma)e] > 0$.
- **LF-s versus PU-e:** Their difference is $CS^{LF-s} - CS^{PU-e} = \frac{\alpha[e + \gamma(R-e)] - e}{1-\gamma}$, which is positive if and only if $\alpha > \frac{e}{e + \gamma(R-e)}$.

□

Homogeneous competition removes match surplus and the differentiation markup from consumer surplus, but it leaves the price reductions generated by add-on margins unchanged. The competition multiplier and all welfare cutoffs are unchanged. The extension shows that the mechanism does not rely on local market power from horizontal differentiation.

F Extension: Elastic Add-On Demand

The baseline assumes unit add-on demand. This extension allows quantity to decrease with the add-on price. With sufficiently inelastic demand, the unshrouded add-on price remains at the substitution threshold. With more elastic demand, sellers choose a lower, interior price. The interior price raises consumer surplus, makes shrouding harder to sustain, and strengthens the welfare advantage of unshrouding. Elastic demand also creates a quantity distortion under monopoly add-on pricing.

All primitives, timing, sales-channel restrictions, disclosure spillovers, and the equilibrium concept remain as in the baseline.

Conditional on purchasing an add-on at price $\hat{p}$, a consumer buys $D(\hat{p})$ units. The demand function is twice continuously differentiable and log-concave on $[0, \bar{p}]$, with $D(0) > 0$, $D(\bar{p}) > 0$ and $D'(\hat{p}) < 0$ for $\hat{p} \in (0, \bar{p})$, and $D(\bar{p}) = 0$. Consumer surplus from add-on is $S(\hat{p}) = \int_{\hat{p}}^{\bar{p}} D(t) dt$, and gross seller add-on revenue is $\pi(\hat{p}) = \hat{p}D(\hat{p})$, which is also add-on profit before commission. Define $\hat{p}^m \equiv \arg \max_{\hat{p} \in [0, \bar{p}]} \pi(\hat{p})$ and $\pi^m \equiv \pi(\hat{p}^m)$.

A sophisticated consumer can incur the real substitution cost $e > 0$ and obtain add-on surplus $S(0) - e$. The substitution threshold $\hat{e} \in (0, \bar{p})$ satisfies

$$S(\hat{e}) = S(0) - e \iff \int_0^{\hat{e}} D(t) dt = e. \quad (15)$$

We assume $e < \int_0^{\hat{p}^m} D(t) dt$, or equivalently $\hat{e} < \hat{p}^m$, and define $\pi_e \equiv \pi(\hat{e})$. Consistent with the baseline tie-breaking rule, a sophisticated consumer buys add-on from the seller when $\hat{p} \leq \hat{e}$ and substitutes when $\hat{p} > \hat{e}$. Thus, the consumer's net add-on surplus after choosing a seller is $\max\{S(\hat{p}), S(0) - e\}$. Myopic consumers ignore the add-on when choosing the base good and buy $D(\hat{p})$ units after lock-in.

A shrouding seller chooses an add-on price equal to $\hat{p}^m$, since its hidden add-on price does not affect base good demand and $\hat{p}^m$ uniquely maximizes revenue from each locked-in buyer. Sophisticated consumers expect $\hat{p}^m$ from a shrouding seller and substitute.

The elasticity of add-on demand is

$$\varepsilon(\hat{p}) \equiv -\frac{\hat{p}D'(\hat{p})}{D(\hat{p})}. \quad (16)$$

Log-concavity of D implies that $(\log D)'' \leq 0$. Besides, $D'(\hat{p}) < 0$. Therefore, for $\hat{p} \in (0, \bar{p})$, $\varepsilon'(\hat{p}) = -\frac{D'(\hat{p})}{D(\hat{p})} - \hat{p}(\log D(\hat{p}))'' > 0$. Thus, ε is continuous and strictly increasing, with $\varepsilon(0) = 0$.

We assume that, against each symmetric rival strategy considered below, the seller's profit as a function of its base good price p_i and disclosed add-on price $\hat{p}_i \in [0, \hat{e}]$ is strictly concave and attains a maximum.

We first derive the unshrouded add-on prices.

Suppose both sellers unshroud under bundled laissez-faire. At a symmetric profile with $\hat{p} \leq \hat{e}$, a seller's profit is

$$\Pi^{LF-u} = [(1 - \gamma)(p_i + \pi(\hat{p}_i)) - c] [(1 - \alpha\lambda)F(p_j - p_i + S(\hat{p}_i) - S(\hat{p}_j)) + \alpha\lambda F(p_j - p_i)].$$

By symmetry, the base good price first order condition is

$$\frac{1 - \gamma}{2} - [(1 - \gamma)(p^u + \pi(\hat{p}^u)) - c] f(0) = 0,$$

which implies $(1 - \gamma)(p^u + \pi(\hat{p}^u)) - c = \frac{1 - \gamma}{2f(0)}$. Applying the envelope theorem to profit maximized over the base good price gives $\pi'(\hat{p}^u) = (1 - \alpha\lambda)D(\hat{p}^u)$. Since $\pi'(\hat{p}) = D(\hat{p}) + \hat{p}D'(\hat{p})$, an interior unshrouded add-on price under bundled laissez-faire satisfies $\varepsilon(\hat{p}^u) = \alpha\lambda$.

Under mandated unshrouding, the seller retains all off-platform add-on revenue but only $1 - \gamma$ of base good revenue. Its profit when both sellers charge an add-on price below $\hat{e}$ is

$$\Pi^{PU} = [(1 - \gamma)p_i + \pi(\hat{p}_i) - c] [(1 - \alpha\lambda)F(p_j - p_i + S(\hat{p}_i) - S(\hat{p}_j)) + \alpha\lambda F(p_j - p_i)].$$

Let $\hat{p}^{PU-\ell}$ denote the low add-on price under mandated unshrouding. Applying the envelope theorem to profit maximized over the base good price gives $\pi'(\hat{p}^{PU-\ell}) = (1 - \gamma)(1 - \alpha\lambda)D(\hat{p}^{PU-\ell})$, or $\varepsilon(\hat{p}^{PU-\ell}) = \gamma + (1 - \gamma)\alpha\lambda$.

At a symmetric equilibrium, let $\tilde{\Pi}_i^u(\hat{p})$ and $\tilde{\Pi}_i^{PU}(\hat{p})$ denote seller i 's profit maximized over its base good price under LF-u and mandated unshrouding, respectively. At the upper bound $\hat{p} = \hat{e}$,

$$\left. \frac{d\tilde{\Pi}_i^u(\hat{p})}{d\hat{p}} \right|_{\hat{p}=\hat{e}} \geq 0 \iff \varepsilon(\hat{e}) \leq \alpha\lambda,$$

$$\left. \frac{d\tilde{\Pi}_i^{PU}(\hat{p})}{d\hat{p}} \right|_{\hat{p}=\hat{e}} \geq 0 \iff \varepsilon(\hat{e}) \leq \gamma + (1 - \gamma)\alpha\lambda.$$

A nonnegative derivative at the upper bound implies that the corresponding low add-on price equals $\hat{e}$. Because $\gamma + (1 - \gamma)\alpha\lambda > \alpha\lambda$, the analysis has three regions. If $\varepsilon(\hat{e}) \leq \alpha\lambda$, then $\hat{p}^u = \hat{p}^{PU-\ell} = \hat{e}$. If $\alpha\lambda < \varepsilon(\hat{e}) \leq \gamma + (1 - \gamma)\alpha\lambda$, then $\hat{p}^u < \hat{e}$ while $\hat{p}^{PU-\ell} = \hat{e}$. If $\varepsilon(\hat{e}) > \gamma + (1 - \gamma)\alpha\lambda$, both prices are below $\hat{e}$.

F.1 Unshrouded Add-On Prices at the Substitution Threshold

Suppose

$$\varepsilon(\hat{e}) \leq \alpha\lambda. \quad (17)$$

The conditions $\varepsilon(\hat{p}^u) = \alpha\lambda$ and $\varepsilon(\hat{p}^{PU-\ell}) = \gamma + (1 - \gamma)\alpha\lambda$ imply $\hat{p}^u = \hat{p}^{PU-\ell} = \hat{e}$.

Lemma 5. *Under condition (17), let $\bar{\alpha}_e \equiv \frac{(1-\gamma)\pi_e}{\lambda\pi^m}$ and $\underline{\alpha}_e \equiv \frac{(1-\gamma)\pi_e}{\pi^m}$:*

- (i) *A symmetric unshrouding equilibrium exists if and only if $\alpha \leq \bar{\alpha}_e$. It has $\hat{p}^u = \hat{e}$ and $p^u = \frac{c}{1-\gamma} + \frac{1}{2f(0)} - \pi_e$.*
- (ii) *A symmetric shrouding equilibrium exists if and only if $\alpha \geq \underline{\alpha}_e$. It has $\hat{p}^s = \hat{p}^m$ and $p^s = \frac{c-\alpha\pi^m}{1-\gamma} + \frac{1}{2f(0)}$.*

Each seller earns $\frac{1-\gamma}{4f(0)}$ in either equilibrium. Platform profit is $\Pi_P^u = \gamma \left(\frac{c}{1-\gamma} + \frac{1}{2f(0)} \right)$ under unshrouding and $\Pi_P^s = \gamma \left(\frac{c-\alpha\pi^m}{1-\gamma} + \frac{1}{2f(0)} \right)$ under shrouding.

Proof. (i) **Unshrouding equilibrium:** Suppose both sellers unshroud and charge $\hat{p}_A = \hat{e}$.

Every consumer buys the add-on, and consumers compare sellers by their base good prices because both sellers provide add-on surplus $S(\hat{e})$. Seller A 's profit is

$$\Pi_A^u(p_A, p_B) = [(1 - \gamma)(p_A + \pi_e) - c] F(p_B - p_A). \quad (18)$$

Lemma A.1, applied with retained add-on profit $(1 - \gamma)\pi_e$, gives $p^u = \frac{c}{1-\gamma} + \frac{1}{2f(0)} - \pi_e$ and $\Pi_A^u(p^u, p^u) = \frac{1-\gamma}{4f(0)}$. Condition (17) implies that $(p^u, \hat{e})$ is the unique best response

among unshrouded strategies with $\hat{p}_A \in [0, \hat{e}]$. An unshrouded price above $\hat{e}$ is dominated by shrouding because sophisticated consumers substitute under either strategy, while shrouding moves any remaining add-on sales off-platform and avoids the commission. It remains to consider a deviation to shrouding.

Consider a unilateral deviation to shrouding. The rival continues to unshroud, so the residual myopic mass is $\alpha\lambda$. The deviator charges $\hat{p}_A = \hat{p}^m$, sells the add-on off-platform only to residual myopic consumers, and earns

$$\Pi_A^{u,D}(p_A, p^u) = [(1 - \gamma)p_A + \alpha\lambda\pi^m - c] F(p^u - p_A). \quad (19)$$

Sophisticated consumers obtain $S(\hat{e}) = S(0) - e$ from either seller, while residual myopic consumers compare only base good prices. The deviation leaves the demand unchanged. The condition for unshrouding equilibrium to be sustained is $(1 - \gamma)\pi_e \geq \alpha\lambda\pi^m$, which is equivalent to $\alpha \leq \bar{\alpha}_e$. We show that this condition is both necessary and sufficient.

Necessity. Since $F(0) > 0$, $\Pi_A^u(p^u, p^u) < \Pi_A^{u,D}(p^u, p^u) \iff (1 - \gamma)\pi_e < \alpha\lambda\pi^m$. If $\alpha \leq \bar{\alpha}_e$ fails, shrouding is profitable without changing the base good price.

Sufficiency. Suppose $\alpha \leq \bar{\alpha}_e$, and let $p_A^{u,D}$ maximize Equation (19). For every p_A , $\Pi_A^u(p_A, p^u) - \Pi_A^{u,D}(p_A, p^u) = [(1 - \gamma)\pi_e - \alpha\lambda\pi^m] F(p^u - p_A) \geq 0$. Since p^u maximizes Equation (18) against p^u ,

$$\Pi_A^u(p^u, p^u) \geq \Pi_A^u(p_A^{u,D}, p^u) \geq \Pi_A^{u,D}(p_A^{u,D}, p^u) = \max_{p_A} \Pi_A^{u,D}(p_A, p^u).$$

Hence, no deviation is profitable.

- (ii) **Shrouding equilibrium:** Suppose both sellers shroud and charge $\hat{p}_A = \hat{p}^m$. Sophisticated consumers substitute, and only the mass α of myopic consumers buys the add-on. Seller A 's profit is

$$\Pi_A^s(p_A, p_B) = [(1 - \gamma)p_A + \alpha\pi^m - c] F(p_B - p_A). \quad (20)$$

Lemma A.1, applied with retained add-on profit $\alpha\pi^m$, gives $p^s = \frac{c - \alpha\pi^m}{1 - \gamma} + \frac{1}{2f(0)}$ and $\Pi_A^s(p^s, p^s) = \frac{1 - \gamma}{4f(0)}$.

Among unshrouding deviations, let p_A^e be the conditionally optimal base good price when $\hat{p}_A = \hat{e}$. At $\hat{p}_A = \hat{e}$, both consumer groups generate demand $F(p^s - p_A^e)$. The base good first-order condition and $\pi'(\hat{e}) = D(\hat{e})[1 - \varepsilon(\hat{e})]$ imply

$$\left. \frac{\partial \Pi_A}{\partial \hat{p}_A} \right|_{(p_A^e, \hat{e})} = (1 - \gamma)D(\hat{e})F(p^s - p_A^e) [\alpha\lambda - \varepsilon(\hat{e})] \geq 0.$$

The last inequality follows from condition (17). Thus, $\hat{e}$ is the unique optimal unshrouding

deviation in $[0, \hat{e}]$. An unshrouded price above $\hat{e}$ is dominated by remaining shrouded. We then compare shrouding with unshrouding at $\hat{e}$.

Consider a unilateral deviation to unshrouding. The deviator charges $\hat{p}_A = \hat{e}$, sells the add-on on-platform to every customer, and earns

$$\Pi_A^{s,D}(p_A, p^s) = [(1 - \gamma)(p_A + \pi_e) - c] F(p^s - p_A). \quad (21)$$

Buying at $\hat{e}$ and substituting both yield $S(0) - e$, so the deviation leaves the demand unchanged. The condition for shrouding equilibrium to be sustained is $\alpha\pi^m \geq (1 - \gamma)\pi_e$, which is equivalent to $\alpha \geq \underline{\alpha}_e$. We show that this condition is both necessary and sufficient.

Necessity. Since $F(0) > 0$, $\Pi_A^s(p^s, p^s) < \Pi_A^{s,D}(p^s, p^s) \iff \alpha\pi^m < (1 - \gamma)\pi_e$. If $\alpha \geq \underline{\alpha}_e$ fails, unshrouding is profitable without changing the base good price.

Sufficiency. Suppose $\alpha \geq \underline{\alpha}_e$, and let $p_A^{s,D}$ maximize Equation (21). For every p_A , $\Pi_A^s(p_A, p^s) - \Pi_A^{s,D}(p_A, p^s) = [\alpha\pi^m - (1 - \gamma)\pi_e] F(p^s - p_A) \geq 0$. Since p^s maximizes Equation (20) against p^s ,

$$\Pi_A^s(p^s, p^s) \geq \Pi_A^s(p_A^{s,D}, p^s) \geq \Pi_A^{s,D}(p_A^{s,D}, p^s) = \max_{p_A} \Pi_A^{s,D}(p_A, p^s).$$

Hence, no deviation is profitable.

- (iii) **Asymmetric equilibrium:** Suppose seller A unshrouds at $\hat{e}$ and seller B shrouds at $\hat{p}^m$. Because seller A unshrouds, the residual myopic mass is $\alpha\lambda$. Seller A 's retained add-on profit per customer is $(1 - \gamma)\pi_e$, while seller B 's expected retained add-on profit per customer is $\alpha\lambda\pi^m$.

If seller A deviates to shrouding while holding its base good price fixed, both sellers shroud, the myopic mass rises from $\alpha\lambda$ to α , and seller A 's expected retained add-on profit becomes $\alpha\pi^m$. A necessary no-deviation condition for seller A is $(1 - \gamma)\pi_e \geq \alpha\pi^m$. If seller B deviates to unshrouding at $\hat{e}$ while holding its base good price fixed, its retained add-on profit becomes $(1 - \gamma)\pi_e$. A necessary no-deviation condition for seller B is $\alpha\lambda\pi^m \geq (1 - \gamma)\pi_e$. Combining these conditions gives $\alpha\lambda\pi^m \geq \alpha\pi^m$, which contradicts $\alpha > 0$, $\pi^m > 0$, and $\lambda < 1$. Hence, no asymmetric pure-strategy disclosure equilibrium exists. $\square$

Add-on profit lowers the base good price by π_e under unshrouding and by $\frac{\alpha\pi^m}{1-\gamma}$ under shrouding. Monopoly pricing under shrouding also reduces the quantity purchased by myopic consumers.

Lemma 6. Let $\alpha_e^* \equiv \frac{\pi_e}{\lambda\pi^m}$.

- (i) Mandated shrouding induces $\hat{p}^{PS-s} = \hat{p}^m$ and $p^{PS-s} = \frac{c - \alpha\pi^m}{1 - \gamma} + \frac{1}{2f(0)}$.

- (ii) If $\varepsilon(\hat{e}) \leq \gamma + (1 - \gamma)\alpha\lambda$, mandated unshrinking admits the symmetric low add-on pricing equilibrium $PU-e$, with $\hat{p}^{PU-e} = \hat{e}$ and $p^{PU-e} = \frac{c - \pi_e}{1 - \gamma} + \frac{1}{2f(0)}$, if and only if $\alpha \leq \alpha_e^*$. It admits the symmetric high add-on pricing equilibrium $PU-m$, with $\hat{p}^{PU-m} = \hat{p}^m$ and $p^{PU-m} = \frac{c - \alpha\lambda\pi^m}{1 - \gamma} + \frac{1}{2f(0)}$, if and only if $\alpha \geq \alpha_e^*$. When $\lambda > 0$ and $\alpha = \alpha_e^*$, both symmetric profiles and the two asymmetric add-on price profiles are equilibria.

Each seller earns $\frac{1 - \gamma}{4f(0)}$ in every equilibrium described above.

Proof. (i) **Mandated shrouding:** The mandate hides the add-on price, and sellers sell the add-on off-platform. Each seller charges $\hat{p}_A = \hat{p}^m$. Sophisticated consumers substitute, and only the mass α of myopic consumers buys the add-on. Seller A 's profit is $\Pi_A^{PS-s}(p_A, p_B) = [(1 - \gamma)p_A + \alpha\pi^m - c] F(p_B - p_A)$. Lemma A.1, applied with retained add-on profit $\alpha\pi^m$, gives $p^{PS-s} = \frac{c - \alpha\pi^m}{1 - \gamma} + \frac{1}{2f(0)}$ and $\Pi_A^{PS-s} = \frac{1 - \gamma}{4f(0)}$.

- (ii) **Mandated unshrinking:** Suppose $\varepsilon(\hat{e}) \leq \gamma + (1 - \gamma)\alpha\lambda$. Under mandated unshrinking, sellers sell add-ons off-platform and the residual myopic mass is $\alpha\lambda$.

- (a) **Low add-on pricing equilibrium:** Suppose both sellers charge $\hat{p}_A = \hat{e}$. Every consumer buys the add-on, and seller A 's profit is

$$\Pi_A^{PU-e}(p_A, p_B) = [(1 - \gamma)p_A + \pi_e - c] F(p_B - p_A). \quad (22)$$

Lemma A.1 gives $p^{PU-e} = \frac{c - \pi_e}{1 - \gamma} + \frac{1}{2f(0)}$ and $\Pi_A^{PU-e}(p^{PU-e}, p^{PU-e}) = \frac{1 - \gamma}{4f(0)}$. A deviation that charges an add-on price above $\hat{e}$ induces sophisticated consumers to substitute. The deviator optimally charges $\hat{p}^m$ to residual myopic consumers, and its profit is

$$\Pi_A^{PU-e,D}(p_A, p^{PU-e}) = [(1 - \gamma)p_A + \alpha\lambda\pi^m - c] F(p^{PU-e} - p_A). \quad (23)$$

The condition $\varepsilon(\hat{e}) \leq \gamma + (1 - \gamma)\alpha\lambda$ makes $\hat{e}$ the unique optimal add-on price in $[0, \hat{e}]$. It remains to compare Equations (22) and (23).

Necessity. Since $F(0) > 0$,

$$\Pi_A^{PU-e}(p^{PU-e}, p^{PU-e}) < \Pi_A^{PU-e,D}(p^{PU-e}, p^{PU-e}) \iff \pi_e < \alpha\lambda\pi^m.$$

If $\alpha \leq \alpha_e^*$ fails, charging $\hat{p}^m$ is profitable without changing the base good price.

Sufficiency. Suppose $\alpha \leq \alpha_e^*$, and let $p_A^{PU-e,D}$ maximize Equation (23). For every p_A ,

$$\Pi_A^{PU-e}(p_A, p^{PU-e}) - \Pi_A^{PU-e,D}(p_A, p^{PU-e}) = [\pi_e - \alpha\lambda\pi^m] F(p^{PU-e} - p_A) \geq 0.$$

Since p^{PU-e} maximizes Equation (22) against p^{PU-e} ,

$$\Pi_A^{PU-e}(p^{PU-e}, p^{PU-e}) \geq \Pi_A^{PU-e}(p_A^{PU-e,D}, p^{PU-e}) \geq \Pi_A^{PU-e,D}(p_A^{PU-e,D}, p^{PU-e}).$$

Thus, PU-e is an equilibrium if and only if $\alpha \leq \alpha_e^*$.

- (b) **High add-on pricing equilibrium:** Suppose both sellers charge $\hat{p}_A = \hat{p}^m$. Sophisticated consumers substitute, residual myopic consumers buy the add-on, and seller A's profit is

$$\Pi_A^{PU-m}(p_A, p_B) = [(1 - \gamma)p_A + \alpha\lambda\pi^m - c] F(p_B - p_A). \quad (24)$$

Lemma A.1 gives $p^{PU-m} = \frac{c - \alpha\lambda\pi^m}{1 - \gamma} + \frac{1}{2f(0)}$ and $\Pi_A^{PU-m}(p^{PU-m}, p^{PU-m}) = \frac{1 - \gamma}{4f(0)}$. Among deviations that serve every consumer, let p_A^e be the conditionally optimal base good price when $\hat{p}_A = \hat{e}$. The base good first-order condition and $\pi'(\hat{e}) = D(\hat{e})[1 - \varepsilon(\hat{e})]$ give $\left. \frac{\partial \Pi_A}{\partial p_A} \right|_{(p_A^e, \hat{e})} = D(\hat{e})F(p^{PU-m} - p_A^e) [\gamma + (1 - \gamma)\alpha\lambda - \varepsilon(\hat{e})] \geq 0$. Hence, $\hat{e}$ is the unique optimal deviation in $[0, \hat{e}]$. Its profit is

$$\Pi_A^{PU-m,D}(p_A, p^{PU-m}) = [(1 - \gamma)p_A + \pi_e - c] F(p^{PU-m} - p_A). \quad (25)$$

Any deviation above $\hat{e}$ yields no more add-on revenue than $\hat{p}^m$.

Necessity. Since $F(0) > 0$,

$$\Pi_A^{PU-m}(p^{PU-m}, p^{PU-m}) < \Pi_A^{PU-m,D}(p^{PU-m}, p^{PU-m}) \iff \alpha\lambda\pi^m < \pi_e.$$

If $\alpha \geq \alpha_e^*$ fails, charging $\hat{e}$ is profitable without changing the base good price.

Sufficiency. Suppose $\alpha \geq \alpha_e^*$, and let $p_A^{PU-m,D}$ maximize Equation (25). For every p_A ,

$$\Pi_A^{PU-m}(p_A, p^{PU-m}) - \Pi_A^{PU-m,D}(p_A, p^{PU-m}) = [\alpha\lambda\pi^m - \pi_e] F(p^{PU-m} - p_A) \geq 0.$$

Since p^{PU-m} maximizes Equation (24) against p^{PU-m} ,

$$\Pi_A^{PU-m}(p^{PU-m}, p^{PU-m}) \geq \Pi_A^{PU-m}(p_A^{PU-m,D}, p^{PU-m}) \geq \Pi_A^{PU-m,D}(p_A^{PU-m,D}, p^{PU-m}).$$

Thus, PU-m is an equilibrium if and only if $\alpha \geq \alpha_e^*$.

- (c) **Asymmetric add-on prices:** At $\alpha = \alpha_e^*$, $\pi_e = \alpha\lambda\pi^m$, so Equations (22) and (24) coincide. The common base good price is $p_A = p_B = \frac{c - \pi_e}{1 - \gamma} + \frac{1}{2f(0)} = \frac{c - \alpha\lambda\pi^m}{1 - \gamma} + \frac{1}{2f(0)}$. Each seller earns $\frac{1 - \gamma}{4f(0)}$, and either seller can charge $\hat{e}$ or $\hat{p}^m$. Hence, both symmetric profiles and the two asymmetric add-on price profiles are equilibria. When $\lambda = 0$, $\alpha_e^* = +\infty$, and this equality case cannot occur for $\alpha \in (0, 1]$.

□

The corresponding platform profits are

$$\begin{aligned}\Pi_P^{PS-s} &= \gamma \left(\frac{c - \alpha\pi^m}{1 - \gamma} + \frac{1}{2f(0)} \right), \\ \Pi_P^{PU-e} &= \gamma \left(\frac{c - \pi_e}{1 - \gamma} + \frac{1}{2f(0)} \right), \\ \Pi_P^{PU-m} &= \gamma \left(\frac{c - \alpha\lambda\pi^m}{1 - \gamma} + \frac{1}{2f(0)} \right).\end{aligned}$$

Proposition 9. *Apply the baseline equilibrium-selection and policy tie-breaking rules, and define $\bar{\gamma}_e \equiv 1 - \frac{\alpha\lambda\pi^m}{\pi_e}$. The platform's profit-maximizing governance is:*

- (i) *If $\alpha \leq \frac{\pi_e}{\pi^m}$, or if $\frac{\pi_e}{\pi^m} < \alpha < \alpha_e^*$ and $\gamma \leq \bar{\gamma}_e$, the platform adopts bundled laissez-faire.*
- (ii) *If $\alpha \geq \alpha_e^*$, or if $\frac{\pi_e}{\pi^m} < \alpha < \alpha_e^*$ and $\gamma > \bar{\gamma}_e$, the platform mandates unshrouding.*
- (iii) *The platform never strictly prefers to mandate shrouding.*

Proof. (i) Suppose $\alpha \leq \frac{\pi_e}{\pi^m}$, or $\frac{\pi_e}{\pi^m} < \alpha < \alpha_e^*$ and $\gamma \leq \bar{\gamma}_e$. If $\gamma \leq \bar{\gamma}_e$, the LF-u condition in Lemma 5(i) holds and the selection rule chooses LF-u. Since $\alpha < \alpha_e^*$, mandated unshrouding induces PU-e. Direct comparison yields $\Pi_P^{LF-u} - \Pi_P^{PS-s} = \frac{\gamma\alpha\pi^m}{1-\gamma} > 0$, and $\Pi_P^{LF-u} - \Pi_P^{PU-e} = \frac{\gamma\pi_e}{1-\gamma} > 0$. Thus, bundled laissez-faire is uniquely optimal whenever $\gamma \leq \bar{\gamma}_e$.

It remains to consider $\alpha \leq \frac{\pi_e}{\pi^m}$ and $\gamma > \bar{\gamma}_e$. Laissez-faire induces LF-s, mandated shrouding reproduces LF-s, and mandated unshrouding induces PU-e. Since $\Pi_P^{LF-s} - \Pi_P^{PU-e} = \frac{\gamma}{1-\gamma} (\pi_e - \alpha\pi^m) \geq 0$, bundled laissez-faire maximizes platform profit and is selected by the policy tie-breaking rule.

- (ii) Suppose $\alpha \geq \alpha_e^*$, or $\frac{\pi_e}{\pi^m} < \alpha < \alpha_e^*$ and $\gamma > \bar{\gamma}_e$. In the second region, laissez-faire induces LF-s and mandated unshrouding induces PU-e. Because $\alpha > \frac{\pi_e}{\pi^m}$, $\Pi_P^{PU-e} - \Pi_P^{LF-s} = \frac{\gamma}{1-\gamma} (\alpha\pi^m - \pi_e) > 0$.

If $\alpha \geq \alpha_e^*$, then $\bar{\gamma}_e \leq 0$, so laissez-faire induces LF-s. Mandated unshrouding induces PU-m when $\alpha > \alpha_e^*$, and it also admits PU-e at $\alpha = \alpha_e^*$. At the boundary, PU-e and PU-m give the platform the same profit. In either case, $\Pi_P^{PU-m} - \Pi_P^{LF-s} = \frac{\gamma\alpha(1-\lambda)\pi^m}{1-\gamma} > 0$. Hence, the platform mandates unshrouding.

- (iii) When laissez-faire induces LF-u, mandated shrouding yields strictly lower platform profit. When laissez-faire induces LF-s, mandated shrouding reproduces LF-s, and the policy tie-breaking rule selects laissez-faire whenever both policies maximize platform profit. Thus, the platform never strictly prefers to mandate shrouding.

□

We next compare consumer surplus and welfare. Total add-on surplus at price $\hat{p}$ is $S(\hat{p}) + \pi(\hat{p})$. Its derivative is $\hat{p}D'(\hat{p}) < 0$ for $\hat{p} > 0$, so a higher add-on price reduces total add-on surplus. Define the monopoly quantity distortion relative to the substitution threshold as $DWL^m \equiv S(\hat{e}) + \pi_e - S(\hat{p}^m) - \pi^m > 0$.

Proposition 10. *Under Equation (17), the symmetric bundled laissez-faire equilibria satisfy:*

- (i) *The difference in consumer surplus is $CS^s - CS^u = \frac{\gamma\alpha\pi^m}{1-\gamma} - (1-\alpha)\pi_e - \alpha DWL^m$.*
- (ii) *The welfare difference is $W^u - W^s = (1-\alpha)\pi_e + \alpha DWL^m > 0$.*

Proof. (i) Consumer surplus under the symmetric unshrouding and shrouding equilibria is

$$\begin{aligned} CS^u &= V + S(\hat{e}) + \mu - \frac{1}{2f(0)} - \frac{c}{1-\gamma} + \pi_e, \\ CS^s &= V + (1-\alpha)S(\hat{e}) + \alpha S(\hat{p}^m) + \mu - \frac{1}{2f(0)} - \frac{c - \alpha\pi^m}{1-\gamma}. \end{aligned}$$

Subtracting gives

$$\begin{aligned} CS^s - CS^u &= \alpha [S(\hat{p}^m) - S(\hat{e})] + \frac{\alpha\pi^m}{1-\gamma} - \pi_e \\ &= \frac{\gamma\alpha\pi^m}{1-\gamma} - (1-\alpha)\pi_e - \alpha [S(\hat{e}) + \pi_e - S(\hat{p}^m) - \pi^m] \\ &= \frac{\gamma\alpha\pi^m}{1-\gamma} - (1-\alpha)\pi_e - \alpha DWL^m. \end{aligned}$$

- (ii) Transfers between consumers, sellers, and the platform cancel in social welfare. Total welfare is $W^u = V + \mu - c + S(\hat{e}) + \pi_e$ under unshrouding and $W^s = V + \mu - c + (1-\alpha)S(\hat{e}) + \alpha [S(\hat{p}^m) + \pi^m]$ under shrouding. Therefore,

$$\begin{aligned} W^u - W^s &= S(\hat{e}) + \pi_e - (1-\alpha)S(\hat{e}) - \alpha [S(\hat{p}^m) + \pi^m] \\ &= (1-\alpha)\pi_e + \alpha [S(\hat{e}) + \pi_e - S(\hat{p}^m) - \pi^m] \\ &= (1-\alpha)\pi_e + \alpha DWL^m > 0. \end{aligned}$$

The inequality is strict because $\pi_e > 0$ and $DWL^m > 0$. □

Relative to the baseline, the consumer surplus difference in Proposition 10 (i) adds the quantity loss αDWL^m from monopoly add-on pricing.

Welfare under the two mandated-unshrouding equilibria is $W^{PU-e} = V + \mu - c + S(\hat{e}) + \pi_e$ and $W^{PU-m} = V + \mu - c + (1-\alpha\lambda)S(\hat{e}) + \alpha\lambda [S(\hat{p}^m) + \pi^m]$. Thus, PU-e yields higher welfare than PU-m.

F.2 Interior Unshrouded Add-On Price

Suppose

$$\varepsilon(\hat{e}) > \alpha\lambda. \quad (26)$$

The analysis in this subsection focuses on symmetric equilibria. Condition (26) implies $\hat{p}^u < \hat{e}$ and $\varepsilon(\hat{p}^u) = \alpha\lambda$.

Lemma 7. *Under Equation (26):*

- (i) *The symmetric unshrouding candidate satisfies $\varepsilon(\hat{p}^u) = \alpha\lambda$ and $p^u = \frac{c}{1-\gamma} + \frac{1}{2f(0)} - \pi(\hat{p}^u)$. It is an equilibrium if and only if*

$$\begin{aligned} \max_{p_i \in \mathbb{R}} [(1-\gamma)p_i - c] [(1-\alpha\lambda)F(p^u - p_i + S(\hat{e}) - S(\hat{p}^u)) + \alpha\lambda F(p^u - p_i)] \\ + \alpha\lambda\pi^m F(p^u - p_i) \leq \frac{1-\gamma}{4f(0)}. \end{aligned} \quad (27)$$

- (ii) *The symmetric shrouding candidate satisfies $\hat{p}^s = \hat{p}^m$ and $p^s = \frac{c-\alpha\pi^m}{1-\gamma} + \frac{1}{2f(0)}$. It is an equilibrium if and only if*

$$\max_{\substack{p_i \in \mathbb{R} \\ 0 \leq p_i \leq \hat{e}}} [(1-\gamma)(p_i + \pi(\hat{p}_i)) - c] [(1-\alpha\lambda)F(p^s - p_i + S(\hat{p}_i) - S(\hat{e})) + \alpha\lambda F(p^s - p_i)] \leq \frac{1-\gamma}{4f(0)}. \quad (28)$$

Each seller earns $\frac{1-\gamma}{4f(0)}$ in either symmetric equilibrium. In the symmetric unshrouding equilibrium, $\Pi_P^u = \gamma \left(\frac{c}{1-\gamma} + \frac{1}{2f(0)} \right)$.

Proof. (i) **Unshrouding:** Suppose both sellers unshroud. Against the symmetric rival strategy $(p^u, \hat{p}^u)$, the first order conditions for the seller's joint choice of $(p_A, \hat{p}_A)$ give the unique best response $\varepsilon(\hat{p}^u) = \alpha\lambda$ and $p^u = \frac{c}{1-\gamma} + \frac{1}{2f(0)} - \pi(\hat{p}^u)$. The base good first order condition gives the effective margin $\frac{1-\gamma}{2f(0)}$, so $\Pi_A^u(p^u, \hat{p}^u; p^u, \hat{p}^u) = \frac{1-\gamma}{4f(0)}$. The platform collects commission on $p^u + \pi(\hat{p}^u)$. Substituting $p^u = \frac{c}{1-\gamma} + \frac{1}{2f(0)} - \pi(\hat{p}^u)$ gives $\Pi_P^u = \gamma \left(\frac{c}{1-\gamma} + \frac{1}{2f(0)} \right)$.

Consider a unilateral deviation to shrouding. The deviator charges $\hat{p}_A = \hat{p}^m$ and sells the add-on off-platform only to the residual myopic mass $\alpha\lambda$. Sophisticated consumers obtain $S(\hat{e})$ after substituting from the deviator and $S(\hat{p}^u)$ from the rival. The deviation profit is

$$\begin{aligned} \Pi_A^{u,D}(p_A; p^u, \hat{p}^u) = [(1-\gamma)p_A - c] [(1-\alpha\lambda)F(p^u - p_A + S(\hat{e}) - S(\hat{p}^u)) + \alpha\lambda F(p^u - p_A)] \\ + \alpha\lambda\pi^m F(p^u - p_A). \end{aligned}$$

The unshrouded candidate is optimal among strategies with $\hat{p}_A \in [0, \hat{e}]$, and an unshrouded price above $\hat{e}$ is dominated by shrouding. The only remaining deviation is to shrouding.

Necessity. If Equation (27) fails, some base good price p_A satisfies $\Pi_A^{u,D}(p_A; p^u, \hat{p}^u) > \frac{1-\gamma}{4f(0)} = \Pi_A^u(p^u, \hat{p}^u; p^u, \hat{p}^u)$. The seller then has a profitable deviation to shrouding. Hence, Equation (27) is necessary.

Sufficiency. If Equation (27) holds, no deviation to shrouding is profitable after any reoptimization of the base good price. The unshrouded candidate is optimal in $[0, \hat{e}]$, and an unshrouded price above $\hat{e}$ is dominated by shrouding. Hence, Equation (27) is sufficient.

- (ii) **Shrouding:** Suppose both sellers shroud and charge $\hat{p}_A = \hat{p}^m$. Sophisticated consumers substitute, while the mass α of myopic consumers buys the add-on. Seller A 's profit is $\Pi_A^s(p_A, p_B) = [(1-\gamma)p_A + \alpha\pi^m - c]F(p_B - p_A)$. Lemma A.1 gives $\hat{p}^s = \hat{p}^m$, $p^s = \frac{c-\alpha\pi^m}{1-\gamma} + \frac{1}{2f(0)}$, and $\Pi_A^s(p^s, p^s) = \frac{1-\gamma}{4f(0)}$.

Consider a unilateral deviation to unshrouding at $\hat{p}_A \in [0, \hat{e}]$. The deviation moves the add-on on-platform and leaves the residual myopic mass $\alpha\lambda$. Sophisticated consumers obtain $S(\hat{p}_A)$ from the deviator and $S(\hat{e})$ after substituting from the rival. The deviation profit is

$$\Pi_A^{s,D}(p_A, \hat{p}_A; p^s) = [(1-\gamma)(p_A + \pi(\hat{p}_A)) - c] [(1-\alpha\lambda)F(p^s - p_A + S(\hat{p}_A) - S(\hat{e})) + \alpha\lambda F(p^s - p_A)].$$

An unshrouded price above $\hat{e}$ is dominated by shrouding because sophisticated consumers substitute under either strategy, while shrouding avoids commission on any remaining add-on sales.

Necessity. If Equation (28) fails, some pair $(p_A, \hat{p}_A) \in \mathbb{R} \times [0, \hat{e}]$ yields $\Pi_A^{s,D}(p_A, \hat{p}_A; p^s) > \frac{1-\gamma}{4f(0)} = \Pi_A^s(p^s, p^s)$. The seller then has a profitable deviation to unshrouding. Hence, Equation (28) is necessary.

Sufficiency. If Equation (28) holds, no unshrouding deviation in $[0, \hat{e}]$ is profitable after the seller jointly reoptimizes its base good price and add-on price. Every unshrouding deviation above $\hat{e}$ is dominated by shrouding. Hence, Equation (28) is sufficient.

Finally, set $p_A = p^s$ and $\hat{p}_A = \hat{e}$ in the deviation profit. The deviation leaves every consumer's add-on surplus at $S(\hat{e})$, so $\Pi_A^{s,D}(p^s, \hat{e}; p^s) > \Pi_A^s(p^s, p^s) \iff (1-\gamma)\pi_e > \alpha\pi^m$. Therefore, $\alpha \geq \underline{\alpha}_e$ is necessary for symmetric shrouding. It is not sufficient because a deviation with $\hat{p}_A < \hat{e}$ also raises sophisticated-consumer demand.

□

Mandated shrouding is unaffected by whether the unconstrained unshrouded add-on price is interior. It induces $\hat{p}^{PS-s} = \hat{p}^m$ and $p^{PS-s} = \frac{c-\alpha\pi^m}{1-\gamma} + \frac{1}{2f(0)}$. Each seller earns $\frac{1-\gamma}{4f(0)}$, and the platform earns $\Pi_P^{PS-s} = \gamma \left(\frac{c-\alpha\pi^m}{1-\gamma} + \frac{1}{2f(0)} \right)$.

F.2.1 Mandated Unshrouding at the Substitution Threshold

Consider

$$\alpha\lambda < \varepsilon(\hat{e}) \leq \gamma + (1 - \gamma)\alpha\lambda. \quad (29)$$

Bundled laissez-faire yields $\hat{p}^u < \hat{e}$, whereas the low add-on pricing equilibrium under mandated unshrouding has $\hat{p}^{PU-e} = \hat{e}$. Retaining all off-platform add-on revenue makes sellers choose the higher price under the mandate.

Since $\varepsilon(\hat{e}) \leq \gamma + (1 - \gamma)\alpha\lambda$, Lemma 6 characterizes all mandated-unshrouding equilibria in this region.

Conditional on the selected symmetric equilibrium, LF-u gives the platform $\gamma \left(\frac{c}{1-\gamma} + \frac{1}{2f(0)} \right)$, which strictly exceeds its profit under either mandate. If laissez-faire induces LF-s, mandated shrouding reproduces LF-s. Relative to LF-s, $\Pi_P^{PU-e} - \Pi_P^{LF-s} = \frac{\gamma}{1-\gamma} (\alpha\pi^m - \pi_e)$, while $\Pi_P^{PU-m} - \Pi_P^{LF-s} = \frac{\gamma\alpha(1-\lambda)\pi^m}{1-\gamma} > 0$. Because the laissez-faire equilibrium conditions are implicit in this region, we cannot determine platform's optimal disclosure policy.

F.2.2 Interior Pricing under Mandated Unshrouding

Consider

$$\varepsilon(\hat{e}) > \gamma + (1 - \gamma)\alpha\lambda. \quad (30)$$

Both unshrouded add-on prices are below the substitution threshold and satisfy $\varepsilon(\hat{p}^u) = \alpha\lambda$ and $\varepsilon(\hat{p}^{PU-\ell}) = \gamma + (1 - \gamma)\alpha\lambda$. Strictly increasing elasticity and $\gamma > 0$ imply $\hat{p}^u < \hat{p}^{PU-\ell} < \hat{e}$.

Lemma 8. *Under mandated unshrouding and Equation (30):*

- (i) *The symmetric low-price candidate satisfies $\varepsilon(\hat{p}^{PU-\ell}) = \gamma + (1 - \gamma)\alpha\lambda$ and $p^{PU-\ell} = \frac{c - \pi(\hat{p}^{PU-\ell})}{1-\gamma} + \frac{1}{2f(0)}$. It is an equilibrium if and only if*

$$\begin{aligned} \max_{p_i \in \mathbb{R}} [(1 - \gamma)p_i - c] & \left[(1 - \alpha\lambda)F(p^{PU-\ell} - p_i + S(\hat{e}) - S(\hat{p}^{PU-\ell})) + \alpha\lambda F(p^{PU-\ell} - p_i) \right] \\ & + \alpha\lambda\pi^m F(p^{PU-\ell} - p_i) \leq \frac{1 - \gamma}{4f(0)}. \end{aligned} \quad (31)$$

- (ii) *The symmetric high-price candidate satisfies $\hat{p}^{PU-m} = \hat{p}^m$ and $p^{PU-m} = \frac{c - \alpha\lambda\pi^m}{1-\gamma} + \frac{1}{2f(0)}$. It is an equilibrium if and only if*

$$\max_{\substack{p_i \in \mathbb{R} \\ 0 \leq \hat{p}_i \leq \hat{e}}} [(1 - \gamma)p_i + \pi(\hat{p}_i) - c] \left[(1 - \alpha\lambda)F(p^{PU-m} - p_i + S(\hat{p}_i) - S(\hat{e})) + \alpha\lambda F(p^{PU-m} - p_i) \right] \leq \frac{1 - \gamma}{4f(0)}. \quad (32)$$

Each seller earns $\frac{1-\gamma}{4f(0)}$ in either symmetric equilibrium.

Proof. (i) **Low add-on pricing equilibrium:** Suppose both sellers charge the interior add-on price $\hat{p}^{PU-\ell}$. The joint first-order conditions for the base good price and add-on price give the unique best response $\varepsilon(\hat{p}^{PU-\ell}) = \gamma + (1-\gamma)\alpha\lambda$ and $p^{PU-\ell} = \frac{c-\pi(\hat{p}^{PU-\ell})}{1-\gamma} + \frac{1}{2f(0)}$. The base good first-order condition gives the effective margin $\frac{1-\gamma}{2f(0)}$, so $\Pi_A^{PU-\ell}(p^{PU-\ell}, p^{PU-\ell}) = \frac{1-\gamma}{4f(0)}$.

Consider a deviation to an add-on price above $\hat{e}$. Sophisticated consumers substitute and obtain $S(\hat{e})$, while only residual myopic consumers buy the add-on. The deviator optimally charges $\hat{p}^m$. Its profit is

$$\begin{aligned} \Pi_A^{PU-\ell,D}(p_A) = & [(1-\gamma)p_A - c] \left[(1-\alpha\lambda)F(p^{PU-\ell} - p_A + S(\hat{e}) - S(\hat{p}^{PU-\ell})) + \alpha\lambda F(p^{PU-\ell} - p_A) \right] \\ & + \alpha\lambda\pi^m F(p^{PU-\ell} - p_A). \end{aligned}$$

Necessity. If Equation (31) fails, some base good price p_A satisfies $\Pi_A^{PU-\ell,D}(p_A) > \frac{1-\gamma}{4f(0)} = \Pi_A^{PU-\ell}(p^{PU-\ell}, p^{PU-\ell})$. The seller has a profitable deviation to $\hat{p}^m$. Hence, Equation (31) is necessary.

Sufficiency. If Equation (31) holds, no deviation to an add-on price above $\hat{e}$ is profitable after the seller reoptimizes its base good price, because $\hat{p}^m$ uniquely maximizes revenue in that region. The low-price candidate is optimal in $[0, \hat{e}]$. Hence, Equation (31) is sufficient.

(ii) **High add-on pricing equilibrium:** Suppose both sellers charge $\hat{p}^{PU-m} = \hat{p}^m$. Sophisticated consumers substitute, residual myopic consumers buy the add-on, and seller A 's profit is $\Pi_A^{PU-m}(p_A, p_B) = [(1-\gamma)p_A + \alpha\lambda\pi^m - c] F(p_B - p_A)$. Lemma A.1 gives $\hat{p}^{PU-m} = \hat{p}^m$, $p^{PU-m} = \frac{c-\alpha\lambda\pi^m}{1-\gamma} + \frac{1}{2f(0)}$, and $\Pi_A^{PU-m}(p^{PU-m}, p^{PU-m}) = \frac{1-\gamma}{4f(0)}$.

Consider a deviation to $\hat{p}_A \in [0, \hat{e}]$. Every customer buys the add-on from the deviator. Sophisticated consumers obtain the surplus advantage $S(\hat{p}_A) - S(\hat{e})$, while residual myopic consumers continue to compare base good prices. The deviation profit is

$$\begin{aligned} \Pi_A^{PU-m,D}(p_A, \hat{p}_A) = & [(1-\gamma)p_A + \pi(\hat{p}_A) - c] \\ & \times [(1-\alpha\lambda)F(p^{PU-m} - p_A + S(\hat{p}_A) - S(\hat{e})) + \alpha\lambda F(p^{PU-m} - p_A)]. \end{aligned}$$

Necessity. If Equation (32) fails, some pair $(p_A, \hat{p}_A) \in \mathbb{R} \times [0, \hat{e}]$ satisfies

$$\Pi_A^{PU-m,D}(p_A, \hat{p}_A) > \frac{1-\gamma}{4f(0)} = \Pi_A^{PU-m}(p^{PU-m}, p^{PU-m}).$$

The seller has a profitable deviation to a low add-on price. Hence, Equation (32) is necessary.

Sufficiency. If Equation (32) holds, no deviation in $[0, \hat{e}]$ is profitable after the seller jointly reoptimizes its base good price and add-on price. Among add-on prices above

$\hat{e}$, $\hat{p}^m$ maximizes add-on revenue. Therefore, no alternative price above $\hat{e}$ is profitable. Hence, Equation (32) is sufficient. $\square$

In the low add-on pricing equilibrium, platform profit is $\Pi_P^{PU-\ell} = \gamma \left[\frac{c - \pi(\hat{p}^{PU-\ell})}{1 - \gamma} + \frac{1}{2f(0)} \right]$. In the high add-on pricing equilibrium, it is $\Pi_P^{PU-m} = \gamma \left[\frac{c - \alpha\lambda\pi^m}{1 - \gamma} + \frac{1}{2f(0)} \right]$. If the selected laissez-faire equilibrium is LF-s and mandated unshrouding induces the interior low add-on pricing equilibrium, then

$$\Pi_P^{PU-\ell} - \Pi_P^{LF-s} = \frac{\gamma}{1 - \gamma} \left[\alpha\pi^m - \pi(\hat{p}^{PU-\ell}) \right]. \quad (33)$$

Consequently, $\Pi_P^{PU-\ell} > \Pi_P^{LF-s}$ if and only if $\alpha\pi^m > \pi(\hat{p}^{PU-\ell})$. If mandated unshrouding induces the high add-on pricing equilibrium, then $\Pi_P^{PU-m} - \Pi_P^{LF-s} = \frac{\gamma\alpha(1-\lambda)\pi^m}{1-\gamma} > 0$. If laissez-faire induces LF-u, bundled laissez-faire remains strictly more profitable because the platform earns commission on both goods.

F.2.3 Consumer Surplus and Welfare with an Interior Laissez-Faire Price

Proposition 11. *Under Equation (26):*

(i) *Shrouding raises consumer surplus if and only if*

$$\frac{\gamma\alpha\pi^m}{1 - \gamma} > (1 - \alpha)\pi_e + \alpha\text{DWL}^m + S(\hat{p}^u) + \pi(\hat{p}^u) - S(\hat{e}) - \pi_e. \quad (34)$$

(ii) *Bundled LF-u yields strictly higher social welfare than LF-s:*

$$W^u - W^s = S(\hat{p}^u) + \pi(\hat{p}^u) - S(\hat{e}) - \pi_e + (1 - \alpha)\pi_e + \alpha\text{DWL}^m > 0. \quad (35)$$

(iii) *If mandated unshrouding induces its low add-on pricing equilibrium, then*

$$W^u - W^{PU-\ell} = S(\hat{p}^u) + \pi(\hat{p}^u) - S(\hat{p}^{PU-\ell}) - \pi(\hat{p}^{PU-\ell}) > 0. \quad (36)$$

If it induces its high add-on pricing equilibrium, then

$$W^u - W^{PU-m} = S(\hat{p}^u) + \pi(\hat{p}^u) - S(\hat{e}) - \pi_e + (1 - \alpha\lambda)\pi_e + \alpha\lambda\text{DWL}^m > 0. \quad (37)$$

Proof. (i) Consumer surplus under symmetric LF-u and LF-s is

$$\begin{aligned} CS^u &= V + \mu - \frac{1}{2f(0)} - \frac{c}{1 - \gamma} + S(\hat{p}^u) + \pi(\hat{p}^u), \\ CS^s &= V + (1 - \alpha)S(\hat{e}) + \alpha S(\hat{p}^m) + \mu - \frac{1}{2f(0)} - \frac{c - \alpha\pi^m}{1 - \gamma}. \end{aligned}$$

Subtracting, adding and subtracting $S(\hat{e}) + \pi_e$, and using $DWL^m = S(\hat{e}) + \pi_e - S(\hat{p}^m) - \pi^m$ gives

$$CS^s - CS^u = \frac{\gamma\alpha\pi^m}{1-\gamma} - (1-\alpha)\pi_e - \alpha DWL^m - [S(\hat{p}^u) + \pi(\hat{p}^u) - S(\hat{e}) - \pi_e].$$

Rearranging proves Condition (34).

- (ii) Transfers cancel in social welfare. Under symmetric LF-u, $W^u = V + \mu - c + S(\hat{p}^u) + \pi(\hat{p}^u)$. Under symmetric LF-s, $W^s = V + \mu - c + (1-\alpha)S(\hat{e}) + \alpha[S(\hat{p}^m) + \pi^m]$. Hence,

$$\begin{aligned} W^u - W^s &= S(\hat{p}^u) + \pi(\hat{p}^u) - S(\hat{e}) - \pi_e + (1-\alpha)\pi_e + \alpha[S(\hat{e}) + \pi_e - S(\hat{p}^m) - \pi^m] \\ &= S(\hat{p}^u) + \pi(\hat{p}^u) - S(\hat{e}) - \pi_e + (1-\alpha)\pi_e + \alpha DWL^m > 0. \end{aligned}$$

The first term is positive because $\hat{p}^u < \hat{e}$ and $S(\hat{p}) + \pi(\hat{p})$ is strictly decreasing in $\hat{p}$. The remaining two terms are nonnegative.

- (iii) If mandated unshrouding induces its low add-on pricing equilibrium, then $W^{PU-\ell} = V + \mu - c + S(\hat{p}^{PU-\ell}) + \pi(\hat{p}^{PU-\ell})$ and $W^u - W^{PU-\ell} = S(\hat{p}^u) + \pi(\hat{p}^u) - S(\hat{p}^{PU-\ell}) - \pi(\hat{p}^{PU-\ell})$. In the first interior subcase, $\hat{p}^{PU-\ell} = \hat{e} > \hat{p}^u$. In the second, $\hat{p}^u < \hat{p}^{PU-\ell} < \hat{e}$. Since $S(\hat{p}) + \pi(\hat{p})$ is strictly decreasing in $\hat{p}$, $W^u - W^{PU-\ell} > 0$ in both subcases.

If mandated unshrouding induces its high add-on pricing equilibrium, then $W^{PU-m} = V + \mu - c + (1-\alpha\lambda)S(\hat{e}) + \alpha\lambda[S(\hat{p}^m) + \pi^m]$. Subtracting gives

$$\begin{aligned} W^u - W^{PU-m} &= S(\hat{p}^u) + \pi(\hat{p}^u) - S(\hat{e}) - \pi_e + (1-\alpha\lambda)\pi_e + \alpha\lambda[S(\hat{e}) + \pi_e - S(\hat{p}^m) - \pi^m] \\ &= S(\hat{p}^u) + \pi(\hat{p}^u) - S(\hat{e}) - \pi_e + (1-\alpha\lambda)\pi_e + \alpha\lambda DWL^m > 0. \end{aligned}$$

□