Information Sharing, Personalized Pricing, and Welfare in Vertical Supply Chains

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Abstract

We study a vertical supply chain in which two upstream suppliers differ in product quality and downstream firms have heterogeneous quality tastes. We compare three information-sharing regimes governing upstream suppliers' access to downstream firms' purchasing histories: mandatory, voluntary, and no sharing. Under mandatory sharing, suppliers set personalized prices. The disadvantaged supplier prices at cost, and the advantaged supplier sets the downstream firm's indifference price. This generates a V-shaped payment schedule in downstream firms' taste for quality, with intermediate-taste firms paying the least and low- and high-taste firms paying more, which delivers the tightest competition and the highest welfare. Under voluntary sharing, some existing downstream firms remain anonymous, reweighting the anonymous pool and raising the uniform price in that segment. The higher anonymous price taxes new downstream firms, boosts supplier profits, and yields intermediate welfare relative to the no- and mandatory-sharing regimes. In the absence of information sharing, suppliers post uniform prices, which soften competition, distort quality allocation, and yield the lowest welfare. Upstream profits are highest under voluntary sharing and lowest under mandatory sharing, whereas downstream surplus is maximized under mandatory sharing. The model highlights a key trade-off between upstream profitability and downstream surplus faced by policymakers when designing information-sharing rules.

Keywords: Information Sharing, Vertical Supply Chain, Price Personalization, Welfare Analysis

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1 Introduction

Supply-chain information-sharing rules are reshaping pricing and competition in product markets by regulating whether and how upstream suppliers can use downstream firms' transaction histories, as reflected in the EU Data Act and the proposed American Innovation and Choice Online Act (AICOA) in the United States. Although downstream information disclosure enhances coordination in vertically differentiated supply chains, it simultaneously enables personalized pricing by changing the bargaining power, and reallocates surplus at the expense of new downstream firms lacking transaction histories (Cachon and Fisher, 2000; Chen et al., 2020; DellaVigna and Gentzkow, 2019; Elmachtoub et al., 2021; Lee et al., 2000). Three research streams in accounting, operations, and information economics highlight a common tension in the use of information: more granular information can improve decision-making and operational efficiency, while also affecting the distribution and extraction of rents. Accounting studies focus on how disclosure design and proprietary costs affect the release of sensitive data and its real effect (Armstrong et al., 2011; Berger and Hann, 2007; Beyer et al., 2010; Ellis et al., 2012; Kanodia and Sapra, 2016; Lambert et al., 2007). Operations research shows sharing operational data improves coordination yet alters rivalry and bargaining power within supply chains (Cui et al., 2015; Li and Zhang, 2008). Information economics literature highlights how granular data enables personalized pricing, which can enhance competition while enabling greater surplus extraction (Armstrong, 2006; Bergemann and Bonatti, 2011; Brown and Goolsbee, 2002; Ellison and Ellison, 2009; Goldfarb and Tucker, 2011; Iyer et al., 2005; Jin and Leslie, 2003). We refer to this broad pattern as an efficiency–rent extraction tension. In contrast to the efficiency–rent extraction tension, we show that in a vertically differentiated supply chain, mandatory access to downstream operational histories can simultaneously maximize total welfare and downstream surplus, while a benign voluntary information-sharing regime can leave downstream firms worse off by raising prices in the anonymous segment.

Regulators play a central role in balancing corporate efficiency and social welfare. They set the rules governing information sharing along the supply chain. Yet we know little

about how different regulatory choices regarding suppliers' access to downstream data affect product-market outcomes and the welfare of market participants in vertical supply chains. In particular, it remains unclear how alternative information sharing regimes, from mandatory sharing to voluntary sharing to no sharing, induce downstream firms to self-select into anonymous versus personalized-pricing segments, and how this endogenous segmentation shapes pricing, quality allocation, and welfare for upstream suppliers, existing downstream firms, and new downstream firms.

We provide a comprehensive analysis of the three information-sharing regimes available to regulators. The study reveals a sharp and simple result: from the aggregate perspective, there is no efficiency–rent extraction trade-off, as mandatory supply-chain information sharing strictly maximizes both total surplus and downstream welfare. However, from the upstream suppliers' perspective, voluntary supply-chain information sharing is particularly attractive because it locks in customers, softens peer competition, and enables additional rent extraction. The real trade-off for policymakers lies in how they weigh the upstream supplier profits against the aggregate social welfare. Our model addresses these two questions. First, which data-sharing regime (mandatory, voluntary, or no sharing) generates the largest coordination gains and how does it redistribute surplus? Second, in each regime, who gains and who loses among upstream suppliers, existing downstream firms, and new downstream firms?

We model a vertical duopoly in which a regulator's information-sharing rule partitions the market into an anonymous segment with uniform prices and a personalized segment with specific prices to downstream firms. Two upstream suppliers provide inputs that differ in both quality and cost: one is higher-quality and higher-cost, and the other is lower-quality and lower-cost. Downstream firms differ in how much they value product quality but share a common sensitivity to price. Existing downstream firms with transaction histories produce verifiable operational records, such as transaction logs and performance metrics, allowing suppliers to infer preferences. New downstream firms lack such histories and remain in the anonymous segment. The chosen regime determines whether and how this information can

be used: with mandatory sharing, existing downstream firms face personalized prices while new downstream firms remain anonymous; with voluntary sharing, existing downstream firms choose whether to disclose their histories and thereby join the personalized segment; and with no sharing, all downstream firms are priced anonymously.

Uncertainty about how operational data are shared in supply relationships makes it hard for market participants to know how much information suppliers have about individual downstream firms, and thus how far they can personalize prices. We show that uncertainty about access to downstream firm histories shifts pricing power and alters the allocation of input quality across heterogeneous downstream firms, with first-order welfare consequences. While accounting research has emphasized how proprietary-cost considerations shape managers' decisions to disclose information to outside investors (Dye, 1985; Ellis et al., 2012; Healy and Palepu, 2001), our focus is on the information sharing of inter-firm operational histories. In our setting, the information-sharing rule—specifically, whether past histories are observable—substantially affects how parties coordinate and how surplus is divided among upstream suppliers, existing downstream firms, and new downstream firms.

Our main results are driven by the following mechanism. When operational histories are observable, suppliers meet each downstream firm in a head-to-head contest: the disadvantaged supplier is competed down to marginal cost, while the advantaged supplier sets the price that leaves the downstream firm indifferent across qualities. This downstream rivalry yields a distinctive, non-monotone, V-shaped payment schedule as a function of downstream firms' tastes for quality and tightens the matching between supplier product quality and downstream firms' quality tastes. When disclosure is optional and governed by voluntary contracts, downstream firms with sharp tastes for quality who anticipate high personalized prices tend to remain anonymous. This reshapes the composition of the anonymous pool and pushes up its uniform price, with the incidence borne disproportionately by new downstream firms. Pricing, allocation, and welfare outcomes are determined by three forces: supplier rivalry at the downstream level, surplus extraction by the advantaged supplier, and downstream self-selection under optional disclosure.

Under mandatory information sharing, existing downstream firms are priced individually, while new downstream firms remain anonymous. This regime delivers the tightest supplier rivalry at the downstream level and aligns input quality more closely with the tastes of downstream consumers, compressing markups for the existing downstream firms. It also generates differentiated incidence patterns: Equilibrium prices decrease for downstream firms with an intermediate taste for quality but increase for downstream firms at the extremes of the taste for quality distribution, where the best-matching supplier enjoys the strongest quality-based advantage and thus the greatest market power. We take this allocation and incidence as the benchmark for evaluating the voluntary-sharing and no-sharing regimes in the next paragraphs.

Under voluntary information sharing, existing downstream firms endogenously decide whether to authorize suppliers' access to their operational histories. Downstream firms whose records indicate a high taste for quality remain anonymous, whereas downstream firms expecting competitive personalized prices disclose their histories. This self-selection alters the composition of the anonymous market segment, concentrating it with downstream firms who either cannot or prefer not to share information. Anticipating this shift, the supplier advantaged in the anonymous segment raises the uniform price. We refer to the resulting effect as the anonymous pool pricing externality, which is borne primarily by new downstream firms without histories. Consequently, the voluntary regime yields intermediate outcomes: personalized disclosure still disciplines prices for some existing downstream firms, but the higher uniform price in the anonymous segment weakens overall allocative efficiency and transfers surplus from downstream firms to upstream suppliers. This mechanism underscores that even when information sharing is endogenous, the decentralized equilibrium generally fails to replicate the welfare gains achievable under mandatory access to operational histories.

When the use of operational histories is prohibited with no sharing, suppliers post uniform list prices to a pooled market. The assignment of inputs collapses to a single market-wide threshold in quality tastes that generically diverges from the efficient rule. The direction and magnitude of this divergence are governed by the trade-off between quality and unit cost

and by downstream firms' price sensitivity: when the quality premium is economical, the market tilts toward the high-quality input, whereas high price sensitivity shifts the allocation toward the low-quality input. Uniform pricing also softens head-to-head rivalry, sustaining markups on inframarginal downstream firms and inducing misallocation at the tails of the taste-for-quality distribution.

The three information-sharing regimes yield distinct equilibrium outcomes with clear welfare orderings. Total welfare is highest when suppliers can fully access downstream firms' operational histories, intermediate under voluntary access, and lowest when information use is prohibited. The downstream surplus is highest under mandatory access and lowest under no information sharing, and it is lower under voluntary sharing because selective anonymity raises the uniform price in the anonymous segment. In contrast, upstream profits are greatest when information sharing is voluntary, reflecting suppliers' ability to exploit the anonymous-pool pricing externality, and are smallest under mandatory access, where upstream competition erodes margins. These results yield clear comparative predictions. Markets with richer operational histories or more precise learning about quality should show tighter price-quality alignment, lower price dispersion, and smaller penalties for downstream firms. Markets with restricted access or no disclosure show the opposite.

This paper makes three main contributions to the literature on supply-chain information disclosure. First, we provide a new perspective on supply chain analysis. Rather than taking a firm-level perspective, we adopt a regulatory perspective to assess which information-sharing regime is most appropriate and to provide a unified analysis of the information-sharing rules available to regulators. We cover the most common information-sharing regimes: mandatory, voluntary, and no sharing. By analyzing how the three regimes shape market segmentation, matching efficiency, and welfare, we extend both the supply-chain literature on vertical information exchange and the regulatory literature on data-sharing rules (Colangelo and Khandelwal, 2025; Feasey and de Streel, 2020; Martens et al., 2025). We show that, if the regulator's goal is to maximize aggregate social welfare, the mandatory information-sharing rule is optimal. Thus, the regulator's true trade-off is not

between matching efficiency and firms' ability to personalize prices, but between upstream suppliers' profits and downstream surplus. This finding has important policy implications for how data-sharing regimes should be designed.

Second, we extend the industrial organization literature on personalized and data-driven pricing (Armstrong, 2006; Bergemann and Bonatti, 2011; Chen et al., 2020; Elmachtoub et al., 2021; Iyer et al., 2005) by shifting the focus from personalized output pricing in horizontally differentiated consumer markets to personalized input pricing in a vertically differentiated supply chain. When an upstream supplier leverages downstream operational histories, the equilibrium payment schedule can become non-monotonic in the downstream firms' types. We provide incidence results for the downstream, identifying which downstream firms gain and which lose surplus under personalized versus uniform input pricing. Under the mandatory-sharing regime, for example, the intermediate downstream firms benefit from lower prices and better quality matching, whereas the resulting welfare losses are concentrated on downstream firms at the extremes of the taste-for-quality distribution.

Third, we contribute to the supply-chain literature on information sharing and vertical coordination (Cui et al., 2015; Li and Zhang, 2008) by extending endogenous information-sharing models to a vertically differentiated, data-driven buyer–supplier setting. Whereas prior work endogenizes retailers' incentives to share aggregate demand information with upstream suppliers (Li, 2002; Li and Zhang, 2008; Yao et al., 2008), we instead model downstream firms' decision of whether to remain anonymous or share their buyer-level operational histories. This information-sharing choice generates a sharp trade-off between coordination and surplus extraction. Sharing information intensifies head-to-head upstream competition and improves coordination by matching input quality more closely to heterogeneous tastes, but it also enlarges the scope for personalized input pricing and surplus extraction from disclosing firms (Dubé and Misra, 2023; Hu et al., 2025). Under voluntary information sharing, selective anonymity further reweights the anonymous segment and raises its uniform price. Our framework thus embeds upstream competition and the anonymous-pool pricing externality as the key channels through which supply-chain information sharing affects

welfare.

2 A Motivating Example: Premium Filtration for Beverage Bottling

Two upstream suppliers sell sterile filters to beverage bottlers. Supplier B offers a premium membrane with tighter pore-size control (high quality) at a high unit cost; Supplier A offers a standard membrane at a low unit cost. Downstream bottlers buy one filter set per production run. Existing bottlers have rich operational histories, including vendor-managed inventory (VMI) feeds, electronic data interchange (EDI) transaction logs, contamination incidents, and downtime and throughput records, whereas new downstream firms have no such history. A plant's benefit from the premium filter depends on its learning precision in tuning and monitoring the line. A well-trained plant can capture more of the premium filter's nominal quality advantage. Plants differ in their taste for quality, but all face similar competitive pressures on price and thus have the same price sensitivity.

Mandatory information sharing: Mandatory sharing rules permit suppliers to use plant histories in pricing. Existing plants move to a personalized segment. For each plant, one supplier delivers higher value conditional on the plant's quality and is thus competitively advantaged; the other is disadvantaged. In equilibrium, the disadvantaged supplier bids at cost, while the advantaged supplier sets a personalized price for each plant that equalizes the plant's utility between buying from the advantaged supplier and buying from the disadvantaged supplier at cost. This personalized price is the plant's indifference price. Suppliers compete head to head at the plant level. New plants, lacking histories, remain in the anonymous segment and face uniform prices. Upstream competition compresses suppliers' markups and maximizes total welfare and downstream surplus.

Voluntary information sharing: Contracts give existing plants the option to disclose their histories to upstream suppliers. Plants that choose to disclose move to the personalized segment, while those that choose not to disclose remain in the anonymous segment with

new downstream firms. Plants with a high and observable taste for quality anticipate high personalized prices and prefer to remain anonymous, whereas plants with a low taste for quality tend to disclose their histories. Let the taste for quality be the type of a downstream firm. This selection skews the anonymous pool toward low-type downstream firms and induces suppliers to re-optimize the uniform price upward for that segment. New downstream firms, which lack historical data to disclose, bear the incidence of the higher anonymous price.

No information sharing: No information sharing: Master supply agreements bar suppliers from using plant-level operational histories for pricing. Both suppliers post list prices to a single anonymous segment that pools existing and new bottlers. The allocation is governed by a single cutoff in taste for quality: plants above the cutoff buy the premium filter, and those below buy the standard filter. The cutoff is determined by an indifference condition that trades off posted prices against quality in use and therefore generally deviates from the planner's assignment. When the incremental cost per unit of quality is small relative to price sensitivity, the cutoff is too high and the share of plants choosing the standard filter is larger than in the planner's allocation; when the incremental cost is large, the cutoff is too low and too many plants adopt the premium filter.

Examples: three representative plants

- *Existing plant with high precision and a high taste for quality.* Under mandatory information sharing, this plant's rich history is used in pricing, and it is served in the personalized segment. Head-to-head competition pushes the disadvantaged supplier to cost, and the advantaged supplier sets a personalized price close to the plant's indifference value. Under no information sharing, the plant still buys the premium filter but pays a uniform price that reflects the market-wide cutoff rather than its own gains. Under voluntary information sharing, this high-valuation plant anticipates a high personalized price and therefore has a strong incentive to remain anonymous and pay the uniform price instead.

- *Existing plant with low precision and a moderate taste for quality.* Under mandatory information sharing, personalized competition reveals that the premium filter delivers

little additional value for this plant, so it often buys the standard filter at a relatively low personalized price. Under voluntary information sharing, such a plant is more willing to share its history, because its personalized price is below the anonymous uniform price; it stays in the personalized segment and does not contribute to reweighting the anonymous pool.

- *New entrant with no operational history.* Under all regimes, this plant remains in the anonymous segment and can only be offered uniform prices. Under voluntary information sharing, it pays the higher re-optimized anonymous price generated by existing plants that choose anonymity, despite having the same underlying feature as some existing peers.

Economic forces: Two forces discipline outcomes across these regimes. First, a competition effect: access to plant-level information intensifies head-to-head competition, pushing the disadvantaged supplier toward cost in plant-level contests. Second, a surplus-extraction effect: the advantaged supplier sets the plant's personalized indifference price. Figure 1 illustrates their interaction, which, together with the cost–quality trade-off, drives the pricing, allocation, and welfare comparisons developed formally below.

3 Model Setup

We consider a vertically differentiated supply chain with two upstream suppliers, A and B, who set prices simultaneously. Supplier A produces quality Q_A at a marginal cost C_A; supplier B produces quality Q_B at a marginal cost C_B, with $Q_B > Q_A$ and $C_B > C_A$. Let $\Delta Q \equiv Q_B - Q_A > 0$ and $\Delta C \equiv C_B - C_A > 0$. Hence, supplier B is the high-quality supplier, and supplier A is the low-quality supplier.[1]

Suppose there is a continuum of downstream firms with a unit measure. Each downstream firm requires one unit of input from the upstream supplier. The price sensitivity is γ. And

[1] In the following exposition, we use supplier A(B) and low(high) quality supplier interchangeably in case there is no further confusion.

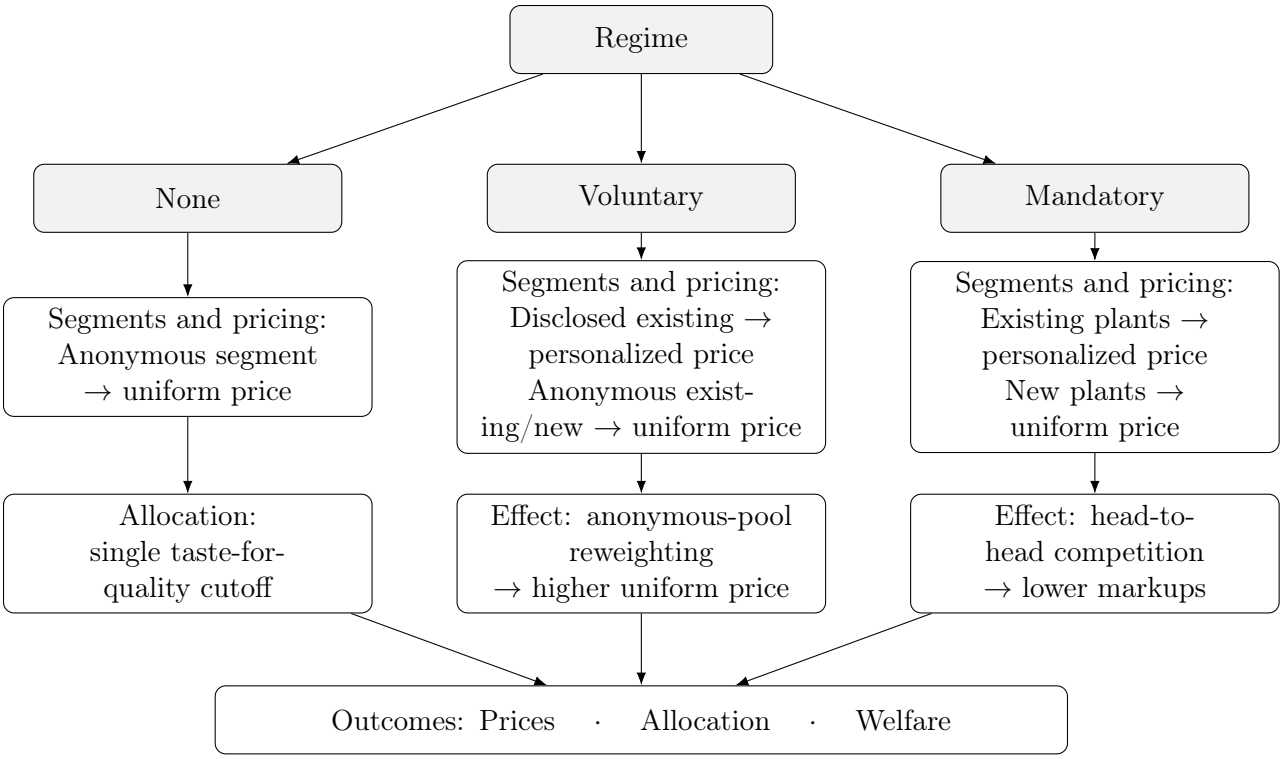


Figure 1 – Regimes → Segments → Outcomes

the type of downstream firms' is determined by their taste for quality, i.e., $\eta_j \in [0,1]$ for $j \in [0,1]$. To ensure tractability, we assume $\gamma \in (0,3)$ for the analysis, which rules out the polar cases in which downstream firms are either completely insensitive or infinitely sensitive to price changes. Downstream firm j's utility from buying input from upstream supplier i at price P_i is

$$U_j(Q_i, P_i, \eta_j) = V_0 + \eta_j Q_i - \gamma P_i,$$

where V_0 is a common baseline valuation. The mass of downstream firms is normalized to one, $\eta_j \sim$ Uniform$[0,1]$, and V_0 is large enough to ensure full market coverage[2]. Each downstream firm's η_j is private information; all other primitives are common knowledge. Information-sharing regimes determine how downstream firms disclose their η_j to upstream firms.

Firstly, to capture heterogeneity in downstream firms' information transparency, we par-

[2]The outside option of downstream firms is normalized to zero. So all of them will only buy from these two upstream suppliers.

tition them into two categories: new and existing. Let $\alpha \in [0,1]$ denote the fraction of new firms, so the fraction of existing firms is $1-\alpha$. Upstream suppliers have no historical information about new downstream firms because there were no transactions before, and therefore, they offer them uniform prices. By contrast, existing downstream firms maintain longer relationships. They can share transactional records—such as audited filings, purchase histories, and standardized performance metrics. These data allow upstream suppliers to estimate each existing downstream firm's taste-for-quality parameter η_j and, whenever firm-level information is revealed, to implement downstream firm-specific pricing schedules $P_i(\eta_j)$, where $i \in \{A, B\}$ indexes suppliers and j indexes downstream firms.

Because new downstream firms lack transactional histories, upstream suppliers cannot infer their taste-for-quality parameters η_j solely from analytics. Consequently, suppliers cannot condition prices on j for these firms, and new firms remain in the anonymous segment facing uniform input prices. We assume that existing downstream firms do not strategically distort their information sharing; the firm-level information observed by upstream suppliers accurately reflects the characteristics of existing firms, including η_j. Hence, in our framework, information-sharing regimes affect existing downstream firms by governing whether and how upstream suppliers may implement firm-specific pricing schedules $P_i(\eta_j)$. In reality, new downstream firms are those with limited or non-verifiable operational histories. Hence, they never share information, or the information they share is not informative.

We assume that information about a downstream firm is generated through order execution. Pre-trade statements are often non-verifiable or not relevant to downstream firms, whereas purchase orders, inspections, and settlements create auditable traces (ERP/EDI) that bind information to the downstream–upstream relationship. The dyad produces observables that reveal the downstream firm's taste for quality—e.g., specification tightness and acceptance thresholds, inspection/return rates attributable to tolerance, upgrade share in the SKU mix, expedite frequency, and QA audit requests. Accordingly, new pairs begin nearly uninformed ("cold start"), and uncertainty resolves as transactions accumulate. We model these records as stored in a centralized repository and made visible to all suppliers

whenever the information-use rule permits; without permission, firms remain anonymous.[3]

Based on the extent of information sharing from downstream firms to upstream suppliers, we study three regimes: mandatory, voluntary, and no information sharing. Under mandatory information sharing, upstream suppliers can use firm-level operational information from existing firms' information sharing to accurately infer each downstream firm's taste-for-quality parameter η_j; equipped with this information, supplier $i \in \{A, B\}$ posts a firm-specific pricing schedule $P_i(\eta_j)$ that conditions the input price on downstream firm j's η_j. Under voluntary information sharing, a fraction of existing firms has legacy, verifiable records from prior voluntary information sharing, making their η_j usable; the remaining existing downstream firms did not share their information previously. Thus, this fraction of the existing firms and all new firms are anonymous. Under the regime of no information sharing, suppliers lack information from all downstream firms and cannot use firm-specific information for pricing. As a result, all existing and new downstream firms are anonymous and face uniform prices.

3.1 Actions

The interaction proceeds in five stages. First, a regulator selects the information-sharing regime—mandatory, voluntary, or none—that governs upstream suppliers' use of firm-level records provided by downstream firms. Second, conditional on the chosen regime: under voluntary information sharing, the subset of existing downstream firms that share enters the personalized segment, while non-sharing existing firms and all new downstream firms remain anonymous; under no information sharing, no firm's records may be used; under mandatory information sharing, all existing downstream firms share (personalized), whereas new downstream firms, lacking records, remain anonymous (access is required where records exist). Third, given the regime and the implied segmentation, each upstream supplier $i \in \{A, B\}$ posts prices—uniform in the anonymous segment and, where information permits,

[3]Allowing a coarse onboarding signal for new downstream firms (precision $\phi_0 \in [0, 1)$) does not alter the qualitative results; we set $\phi_0 = 0$ accordingly.

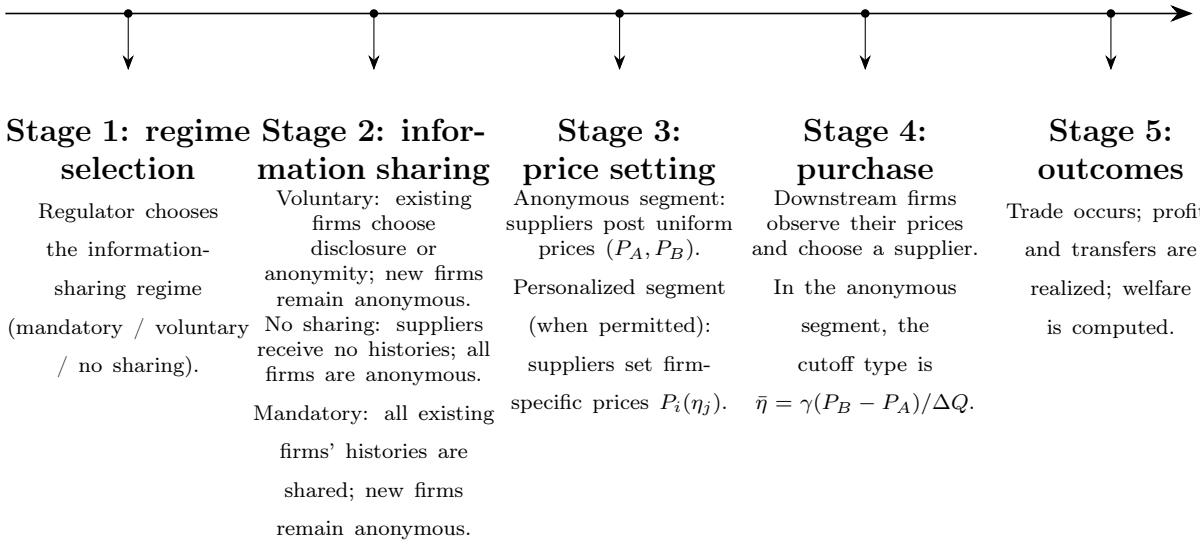


Figure 2 – Sequence of the game under information sharing regimes in a vertically differentiated supply chain.

firm-specific schedules $P_i(\eta_j)$ in the personalized segment. Fourth, downstream firms observe posted prices and select a supplier. Finally, payoffs are realized: trade occurs, and profits and transfers are settled. This timing and information structure (Figure 2) is common knowledge.

Prior to analyzing equilibrium outcomes, we first establish the socially optimal benchmark. A social planner assigns each downstream firm to an upstream supplier with no regard for prices to maximize total supply-chain surplus. Let $\hat{\eta}$ denote the marginal downstream firm that is indifferent between inputs from the supplier A and B. The cutoff satisfies

$$\hat{\eta}\, Q_A - C_A \;=\; \hat{\eta}\, Q_B - C_B,$$

which implies

$$\hat{\eta} \;=\; \frac{C_B - C_A}{Q_B - Q_A} \;=\; \frac{\Delta C}{\Delta Q}.$$

In the efficient allocation, downstream firms with $\eta \leq \hat{\eta}$ are assigned to Supplier A, and those with $\eta > \hat{\eta}$ are assigned to Supplier B.[4]

The cutoff $\hat{\eta}$ equates the incremental cost per unit of quality, $\Delta C/(\,\Delta Q)$, with a down-

[4]Prices are transfers in the planner's objective; hence V_0 and the price-sensitivity parameter γ do not affect $\hat{\eta}$.

stream firm's marginal value of the taste for quality. Accordingly, the efficient allocation assigns all firms with $\eta \leq \hat{\eta}$ to Supplier A and all firms with $\eta > \hat{\eta}$ to Supplier B. Any departure from this assignment misallocates inputs and reduces total welfare. Because $\eta \sim \text{Uniform}[0, 1]$, we impose an interiority condition

$$0 \ < \ \frac{\Delta C}{\Delta Q} \ < \ 1,$$

Therefore, the planner's cutoff $\hat{\eta} = \Delta C/(\,\Delta Q)$ lies strictly inside the unit interval, and both upstream suppliers serve positive masses of downstream firms. The ratio $\Delta C/(\,\Delta Q)$ is the incremental cost per unit of quality. A larger ratio means the extra quality provided by Supplier B is costly relative to its quality advantage, so the efficient assignment shifts toward Supplier A (a high $\hat{\eta}$). A smaller ratio means quality is cheap relative to the cost differential, expanding the set efficiently served by Supplier B (a low $\hat{\eta}$).

4 Decentralized Equilibrium

To derive the model's decentralized equilibrium predictions, we analyze the three information-sharing regimes in turn. We begin with no information sharing, proceed to mandatory information sharing, and conclude with voluntary information sharing. For each regime, we characterize upstream pricing in the personalized versus anonymous segments—personalized pricing via schedules $P_i(\eta_j)$ when firm-level information from the downstream is usable, and anonymous (uniform) pricing otherwise—and the induced sourcing decisions of downstream firms. Throughout, recall that $\hat{\eta} \equiv \Delta C/\Delta Q$ denotes the planner's cutoff, which we use as the benchmark across regimes.

4.1 No information sharing

Under the regime of no information sharing, upstream suppliers do not have any firm-specific information from downstream firms for pricing. Therefore, all existing and new downstream

firms are priced in the anonymous segment and each supplier $i \in \{A, B\}$ posts a uniform price P_i. In equilibrium a unique cutoff type $\hat{\eta}^f \in [0, 1]$ partitions the market: firms with $\eta \leq \hat{\eta}^f$ source from the low-quality supplier A, while those with $\eta > \hat{\eta}^f$ source from the high-quality supplier B. The indifference condition under uniform pricing pins down this cutoff.

$$V_0 + \hat{\eta}^{\mathrm{f}} Q_A - \gamma P_A \;=\; V_0 + \hat{\eta}^{\mathrm{f}} Q_B - \gamma P_B,$$

which implies

$$\hat{\eta}^{\mathrm{f}} = \gamma \, \frac{P_B - P_A}{Q_B - Q_A} = \gamma \, \frac{P_B - P_A}{\Delta Q}.$$

Downstream firms above the cutoff select the high-quality input because the incremental quality $Q_B - Q_A$ outweighs the price difference due to their taste for quality, while downstream firms below the cutoff purchase the low-quality input.

Because η is uniformly distributed on $[0, 1]$, the cutoff $\hat{\eta}^{\mathrm{f}} = \gamma \, \frac{P_B^{\mathrm{f}} - P_A^{\mathrm{f}}}{\Delta Q}$ equals the measure of downstream firms that source from Supplier A. All firms with $\eta \leq \hat{\eta}^{\mathrm{f}}$ choose the low-quality supplier because, at their valuation, the incremental quality does not justify the price premium for Supplier B; firms with $\eta > \hat{\eta}^{\mathrm{f}}$ purchase from the high-quality supplier. Given this market partition, and denoting uniform prices by P_i^{f} with $i = A, B$, upstream suppliers' profits are

$$\pi_A^{\mathrm{f}} = \left(P_A^{\mathrm{f}} - C_A\right) \hat{\eta}^{\mathrm{f}}, \qquad \pi_B^{\mathrm{f}} = \left(P_B^{\mathrm{f}} - C_B\right) \left(1 - \hat{\eta}^{\mathrm{f}}\right),$$

i.e., per-unit margins multiplied by the mass of downstream firms served.

Solving the upstream suppliers' first–order conditions under no information sharing yields the uniform equilibrium prices.

$$P_A^{\mathrm{f}} = \frac{\Delta Q}{3\gamma} + \frac{2C_A + C_B}{3}, \qquad P_B^{\mathrm{f}} = \frac{2\,\Delta Q}{3\gamma} + \frac{C_A + 2C_B}{3}.$$

Substituting these expressions into the cutoff formula $\hat{\eta}^{\mathrm{f}} = \gamma \, (P_B^{\mathrm{f}} - P_A^{\mathrm{f}}) / (\, \Delta Q)$ implies

the following expression.

$$\hat{\eta}^{\mathrm{f}} = \frac{1}{3}\big(1 + \gamma\,\hat{\eta}\big)$$

Proposition 1 (No information sharing)**.** *When downstream firms do not share information with upstream suppliers, suppliers post uniform prices. In equilibrium, these prices are*

$$P_A^f = \frac{\Delta Q}{3\gamma} + \frac{2C_A + C_B}{3}, \qquad P_B^f = \frac{2\,\Delta Q}{3\gamma} + \frac{C_A + 2C_B}{3}.$$

Recall $\hat{\eta} \equiv \Delta C/(\,\Delta Q)$, the planner's cutoff between low- and high-quality inputs. Under no information sharing, the taste for quality of the downstream firm that is indifferent between suppliers is

$$\hat{\eta}^f = \frac{1 + \gamma\,\hat{\eta}}{3}.$$

Downstream firms with $\eta < \hat{\eta}^f$ procure from the low-quality supplier A, whereas firms with $\eta > \hat{\eta}^f$ procure from the high-quality supplier B.

The equilibrium cutoff $\hat{\eta}^{\mathrm{f}}$ generally differs from the planner's cutoff $\hat{\eta}$. Under the maintained assumption $\gamma \in (0, 3)$, the sign of the gap is pinned down by the comparison threshold $1/(3-\gamma)$:

$$\hat{\eta}^{\mathrm{f}} \begin{cases} > \hat{\eta}, & \text{if } \hat{\eta} < \dfrac{1}{3-\gamma} \ \Big(\text{equivalently } \dfrac{\Delta C}{\Delta Q} < \dfrac{1}{3-\gamma}\Big), \\ = \hat{\eta}, & \text{if } \hat{\eta} = \dfrac{1}{3-\gamma}, \\ < \hat{\eta}, & \text{if } \hat{\eta} > \dfrac{1}{3-\gamma} \ \Big(\text{equivalently } \dfrac{\Delta C}{\Delta Q} > \dfrac{1}{3-\gamma}\Big). \end{cases}$$

When $\hat{\eta}^{\mathrm{f}} > \hat{\eta}$, too many downstream firms source from the low-quality supplier A; when $\hat{\eta}^{\mathrm{f}} < \hat{\eta}$, too many source from the high-quality supplier B. Only at the knife-edge $\hat{\eta} = 1/(3-\gamma)$ does uniform pricing replicate the planner's allocation. We illustrate the relationship between $\hat{\eta}^{\mathrm{f}}$ and $\hat{\eta}$ with γ being 1 in Figure 3.

The comparison above implies that no information sharing—by eliminating firm-specific pricing—generically distorts the input allocation. Using $\hat{\eta}^{\mathrm{f}} = (1 + \gamma\hat{\eta})/3$, the equilibrium threshold exceeds the planner's cutoff when $\hat{\eta} < 1/(3-\gamma)$ (equivalently, $\Delta C/(\,\Delta Q) <$

$1/(3-\gamma)$), so too many downstream firms source from the low-quality upstream supplier A. When $\hat{\eta} > 1/(3-\gamma)$ (equivalently, $\Delta C/(\Delta Q) > 1/(3-\gamma)$), the equilibrium threshold falls below the planner's cutoff, and too many downstream firms procure from the high-quality upstream supplier B. Only at the knife-edge $\hat{\eta} = 1/(3-\gamma)$ does uniform pricing replicate the efficient assignment.

The economics are straightforward. When the quality advantage is large (small $\Delta C/\Delta Q$), the planner assigns many firms to B. Anticipating this, supplier B raises its uniform price; given price sensitivity γ, the anonymous-market cutoff increases so that $\hat{\eta}^f > \hat{\eta}$, tilting too many firms toward A. Conversely, when the quality advantage is small (large $\Delta C/\Delta Q$), supplier A raises its uniform price, lowering the cutoff so that $\hat{\eta}^f < \hat{\eta}$ and tilting too many firms toward B. At the comparison threshold $\hat{\eta} = 1/(3-\gamma)$ the two cutoffs coincide.

Consider the impacts of price sensitivity on welfare. Holding primitives fixed, the anonymous cutoff is strictly increasing in γ, so the distortion switches direction exactly once: for low γ the partition tilts toward B (excess high–quality adoption), while for high γ it tilts toward A (excess low–quality adoption). There is a unique threshold $\gamma^\star$ at which the distortion vanishes (i.e., $\hat{\eta}^f(\gamma^\star) = \hat{\eta}$). Moreover, the magnitude of the efficiency gap is single-peaked (increasing then decreasing) when the planner's cutoff is interior and sufficiently large ($\hat{\eta} > 1/3$); otherwise, it rises monotonically with γ. If the planner's cutoff lies at a boundary, the realized cutoff is clipped, and misallocation disappears once γ is high enough to push the market to the efficient corner.

4.2 Mandatory information sharing

Under mandatory information sharing, upstream suppliers can acquire firm-level operational information for all existing downstream firms and thus accurately infer each existing downstream firm j' taste-for-quality parameter η_j. Given this information, upstream supplier $i \in \{A, B\}$ implements firm-specific pricing schedules $P_i^n(\eta_j)$ in a personalized segment. By contrast, new downstream firms enter the market without historical information sharing, so suppliers cannot reliably infer η_j for these firms. New firms, therefore, remain in

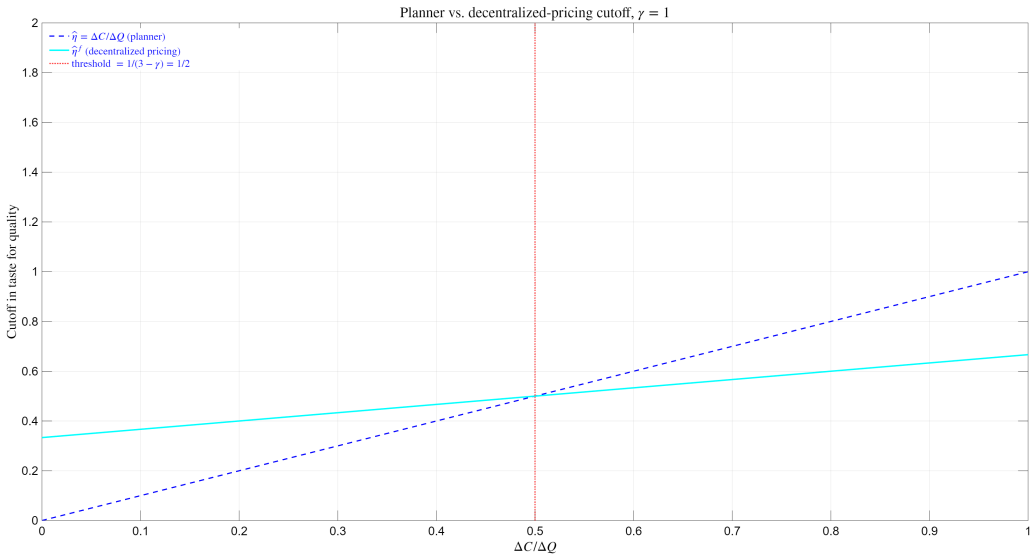


Figure 3 – Planner vs. market cutoff under no information sharing. Parameters: $\hat{\eta} = \Delta C/\Delta Q = 2$. The solid curve plots the market cutoff under uniform pricing, $\hat{\eta}^f(\gamma) = (1+2\gamma)/3$; the dashed line shows the planner's efficient cutoff $\hat{\eta}$. Vertical red line marks the threshold of $\Delta C/\Delta Q$ when $\gamma = 1$.

an anonymous segment and face uniform prices that do not depend on j. This personalized/anonymous segmentation—existing versus new—will be maintained throughout the analysis.

In the anonymous segment—comprising new downstream firms—upstream suppliers lack firm-specific information and therefore post uniform prices. The resulting prices and allocation are identical to those under no information sharing; in particular, the market partitions at the same cutoff $\hat{\eta}^{\mathrm{f}}$, with firms $\eta \leq \hat{\eta}^{\mathrm{f}}$ procuring from Supplier A and firms $\eta > \hat{\eta}^{\mathrm{f}}$ procuring from Supplier B.

In the personalized segment with information sharing, upstream suppliers observe each existing downstream firm's taste for quality η_j and set personalized prices. For firms with $\eta_j < \hat{\eta} \equiv \Delta C/(\,\Delta Q)$, the low-quality supplier A has the competitive advantage: with supplier B pricing at marginal cost ($P_B^n(\eta_j) = C_B$), supplier A posts

$$P_A^n(\eta_j) \;=\; C_B - \frac{\eta_j\;\Delta Q}{\gamma},$$

which leaves the downstream firm j indifferent and secures the sale (Ties broken are in favor

of the advantaged supplier. This convention only selects the seller for a measure-zero set of downstream firms and does not affect aggregate allocations, prices, or welfare comparisons.).

Conversely, for downstream firms with $\eta_j > \hat{\eta}$, the high-quality upstream supplier B has the competitive advantage. Intense competition drives the disadvantaged supplier A to marginal-cost pricing, $P_A^n(\eta_j) = C_A$. Supplier B then sets a personalized price that leaves firm j indifferent between the two suppliers,

$$P_B^n(\eta_j) = C_A + \frac{\eta_j}{\gamma}\,\Delta Q,$$

and, with ties resolved in favor of the high-quality supplier, the firm procures from B.

Proposition 2 (Mandatory information sharing)**.** *Suppose there is mandatory information sharing. Then the equilibrium is as follows.*

(A) ***Anonymous segment.*** *Upstream suppliers post uniform prices to all anonymous downstream firms. These prices coincide with the uniform prices characterized under no information sharing (Proposition 1).*

(B) ***Personalized segment.*** *With firm-specific information, suppliers implement personalized prices. Let $\hat{\eta} \equiv \Delta C/(\,\Delta Q)$ denote the planner's cutoff. For an existing downstream firm j with η:*

$$\text{if } \eta < \hat{\eta}: \quad P_B^n(\eta) = C_B, \qquad P_A^n(\eta) = C_B - \frac{\eta\,\Delta Q}{\gamma} \quad \Rightarrow \quad \text{the firm buys from Supplier } A;$$

$$\text{if } \eta > \hat{\eta}: \quad P_A^n(\eta) = C_A, \qquad P_B^n(\eta) = C_A + \frac{\eta\,\Delta Q}{\gamma} \quad \Rightarrow \quad \text{the firm buys from Supplier } B.$$

At $\eta = \hat{\eta}$ the firm j is indifferent. The equilibrium payment by the existing firm is

$$P^n(\eta) = \begin{cases} C_B - \dfrac{\eta\,\Delta Q}{\gamma}, & \eta < \hat{\eta}, \\ C_A + \dfrac{\eta\,\Delta Q}{\gamma}, & \eta > \hat{\eta}, \end{cases}$$

which strictly decreases in η for $\eta < \hat{\eta}$ and strictly increases in η for $\eta > \hat{\eta}$.

Under personalized pricing, the equilibrium payment schedule is non-monotonic in the taste-for-quality parameter. In the low-taste range ($\eta_j < \hat{\eta}$), the personalized price set by the low-quality upstream supplier A decreases with η_j, so the least quality-sensitive downstream firms pay the highest prices within that segment. Once $\eta_j > \hat{\eta}$, downstream firms procure from the high-quality supplier B, whose personalized price increases with η_j; firms at the top of the taste-for-quality distribution, therefore, pay more than their slightly less sensitive counterparts.

The intuition is as follows. Under mandatory sharing, each upstream supplier develops a captive base of downstream firms: those with a low taste for quality ($\eta_j < \hat{\eta}$) strictly prefer the low-quality input and gravitate to supplier A. In contrast, those with a high taste for quality ($\eta_j > \hat{\eta}$) strictly prefer the high-quality input and gravitate to supplier B. In each captive range, the disadvantaged supplier is bid down to marginal cost, and the advantaged supplier sets the largest firm-specific markup consistent with downstream firms' indifference. Consequently, supplier A exercises market power over low-η_j firms and charges relatively high prices within that set (so $P_A^n(\eta_j)$ decreases in η_j), whereas supplier B exercises market power over high-η_j firms and sets prices that increase with η_j. This mechanism produces the non-monotone payment schedule and redistributes surplus across downstream firms according to their taste for quality.

Compared with uniform pricing under no information sharing, personalized pricing under mandatory information sharing can either raise or lower downstream firms' procurement costs—and hence their welfare—depending on the cost–quality ratio and each firm's taste for quality. The key determinants are (i) the ratio $\Delta C/(\,\Delta Q)$, which pins down whether the uniform-pricing cutoff $\hat{\eta}^{\mathrm{f}} = (1+\gamma\hat{\eta})/3$ lies above or below the planner's cutoff $\hat{\eta} = \Delta C/(\,\Delta Q)$, and (ii) the location of a firm's η relative to these cutoffs. Accordingly, we consider two cases: $\Delta C/(\,\Delta Q) < 1/(3-\gamma)$ and $\Delta C/(\,\Delta Q) > 1/(3-\gamma)$ (the boundary case is addressed where relevant). To simplify the exposition, we consider that supplier B is the advantaged supplier if $\Delta C/(\,\Delta Q) < 1/(3-\gamma)$ and supplier A is the advantaged one otherwise.

Scenario 1: $\dfrac{\Delta C}{\Delta Q} < \dfrac{1}{3-\gamma}$. In this case, $\hat{\eta}^f > \hat{\eta}$. Downstream firms with $\eta < \hat{\eta}$ procure

from Supplier A under both the anonymous (uniform-price) segment and the personalized segment. They face the uniform price P_A^f in the anonymous segment and the personalized price $P_A^n(\eta)$ in the personalized segment, with $P_A^n(\eta) < P_A^f$ by firm-level competition. Hence, for these firms, personalized pricing lowers procurement costs and increases net surplus.[5]

For downstream firms with $\eta > \hat{\eta}^f$—who procure from Supplier B under both no information sharing (uniform pricing) and mandatory information sharing (personalized pricing)—the prices are P_B^f and $P_B^n(\eta)$, respectively. From the personalized schedules above,

$$P_B^n(\eta) > P_B^f \quad \Longleftrightarrow \quad \eta > \frac{2}{3}\big(1 + \gamma\,\hat{\eta}\big) \;=\; 2\,\hat{\eta}^f.$$

Thus, personalized pricing generates two opposing forces. First, an surplus-extraction effect: personalized pricing allows Supplier B to raise the price for downstream firms with sufficiently high taste for quality ($\eta > 2\hat{\eta}^f$), increasing procurement costs and reducing net surplus. Second, a competitive effect: firm-level competition lowers prices for moderately high taste for quality ($\hat{\eta}^f < \eta < 2\hat{\eta}^f$), reducing procurement costs and increasing net surplus.

For downstream firms with intermediate taste for quality ($\hat{\eta} < \eta < \hat{\eta}^f$), anonymous (uniform) pricing leads them to procure from Supplier A at price P_A^f. In contrast, personalized pricing induces procurement from Supplier B at $P_B^n(\eta)$. The net welfare difference (anonymous minus personalized) is

$$\big[\eta\, Q_A - \gamma P_A^f\big] \;-\; \big[\eta\, Q_B - \gamma P_B^n(\eta)\big] \;=\; \eta(Q_A - Q_B) - \gamma\big(P_A^f - P_B^n(\eta)\big) \;=\; \gamma\,(C_A - P_A^f) < 0,$$

where the last equality uses $P_B^n(\eta) = C_A + \frac{\eta}{\gamma}\,\Delta Q$ and $Q_B - Q_A = \Delta Q$. Hence, personalized pricing strictly increases welfare for these firms.

In summary, under mandatory information sharing, personalized pricing reduces net welfare only for downstream firms with a very high taste for quality, $\eta > 2\hat{\eta}^f$ (equivalently, $\eta > \frac{2}{3}(1+\gamma\hat{\eta})$), and raises net welfare for all firms with $\eta < 2\hat{\eta}^f$. At the boundary $\eta = 2\hat{\eta}^f$,

[5] At the boundary $\Delta C/(\,\Delta Q) = 1/(3-\gamma)$ we have $\hat{\eta}^f = \hat{\eta}$, and $P_j^n(\eta) < P_j^f$ for all $\eta < 1$ and $j \in \{A, B\}$. Thus, competitive pressure under personalized pricing uniformly reduces prices and raises welfare for all downstream firms.

the welfare effect is zero.

Scenario 2: $\dfrac{\Delta C}{\Delta Q} \geq \dfrac{1}{3-\gamma}$, so $\hat{\eta}^f < \hat{\eta}$. Downstream firms with a high taste for quality ($\eta > \hat{\eta}$) procure from Supplier B in both segments, paying the uniform price P_B^f in the anonymous segment and the personalized price $P_B^n(\eta)$ in the personalized segment. Using the pricing expressions above,

$$P_B^n(\eta) \gtrless P_B^f \quad \Longleftrightarrow \quad \eta \gtrless 2\,\hat{\eta}^f,$$

so personalized pricing lowers procurement costs for $\hat{\eta} < \eta < 2\hat{\eta}^f$ and raises them for $\eta > 2\hat{\eta}^f$. Low-taste firms ($\eta < \hat{\eta}^f$) procure from Supplier A in both segments, facing P_A^f in the anonymous segment and $P_A^n(\eta)$ in the personalized segment; in this range $P_A^n(\eta) > P_A^f$ only when

$$\eta \;<\; \frac{2\gamma\,\hat{\eta} - 1}{3}\,.$$

For downstream firms with an intermediate taste for quality ($\hat{\eta}^f < \eta < \hat{\eta}$), procurement switches from Supplier B in the anonymous segment (uniform price P_B^f) to Supplier A in the personalized segment (personalized price $P_A^n(\eta)$), yielding a welfare gain.[6] Accordingly, personalized pricing reduces procurement costs and raises surplus for these downstream firms.

Proposition 3 (Welfare under Personalized vs. anonymous)**.** *Let $\hat{\eta} \equiv \Delta C/(\,\Delta Q)$ be the planner's cutoff and $\hat{\eta}^f \equiv (1+\gamma\,\hat{\eta})/3$ the uniform-pricing cutoff under full information sharing. Comparing personalized pricing (mandatory information sharing) with uniform pricing (no information sharing), the welfare effects by taste for quality η are:*

(A) *If $\dfrac{\Delta C}{\Delta Q} < \dfrac{1}{3-\gamma}$ ($\hat{\eta}^f > \hat{\eta}$), personalized pricing decreases welfare only for very high taste for quality $\eta > 2\hat{\eta}^f$ and increases welfare for all $\eta \leq 2\hat{\eta}^f$.*

(B) *If $\dfrac{\Delta C}{\Delta Q} > \dfrac{1}{3-\gamma}$ ($\hat{\eta}^f < \hat{\eta}$), personalized pricing decreases welfare for firms with a low*

[6] The welfare difference (anonymous minus personalized) is

$$\big[\eta\,Q_B - \gamma P_B^f\big] - \big[\eta\,Q_A - \gamma P_A^n(\eta)\big] = \eta(Q_B - Q_A) - \gamma\big(P_B^f - P_A^n(\eta)\big) = \gamma\,(C_B - P_B^f) < 0,$$

using $Q_B - Q_A = \Delta Q$ and $P_A^n(\eta) = C_B - \frac{\eta\,\Delta Q}{\gamma}$. The inequality follows because the uniform price P_B^f exceeds C_B under the equilibrium characterized above.

taste for quality $\eta < \dfrac{2\gamma\,\hat{\eta} - 1}{3}$.

(C) *If* $\dfrac{\Delta C}{\Delta Q} = \dfrac{1}{3-\gamma}$ *(*$\hat{\eta}^f = \hat{\eta}$*), personalized pricing uniformly (weakly) increases welfare for all downstream firms.*

4.3 Voluntary information sharing

The two regimes analyzed above are extreme: no information sharing, under which upstream suppliers are prohibited from using downstream firms' information, and mandatory information sharing, under which suppliers have access to firm-level records wherever they exist. We now consider the intermediate regime of voluntary information sharing, under which each existing downstream firm decides whether to authorize supplier use of its firm-specific records. Authorized firms enter the personalized segment; firms that withhold remain anonymous. New downstream firms lack usable records and are treated as anonymous under all regimes. In equilibrium, an existing firm authorizes information sharing if and only if its surplus under personalized pricing exceeds its surplus under anonymous (uniform) pricing; the resulting threshold(s) are characterized below.

As before, new downstream firms always remain in the anonymous segment because they have no historical information to reveal. Under voluntary information sharing, only existing downstream firms face a choice: to conceal their taste for quality η and procure anonymously, or to share it and enter the personalized segment voluntarily. For simplicity, we assume that once an existing firm opts for personalized procurement, its true taste for quality becomes perfectly observable to all upstream suppliers.

To build intuition, consider a scenario under voluntary information sharing in which all new downstream firms remain in the anonymous segment. In contrast, all existing firms authorize access and enter the personalized segment. In this benchmark, equilibrium prices coincide with those under mandatory information sharing. As shown in Proposition 3, however, a subset of existing downstream firms prefers to conceal once these prices are in place. When $\Delta C/(\,\Delta Q) < \frac{1}{3-\gamma}$ (so $\hat{\eta}^f > \hat{\eta}$), any existing firm with $\eta > 2\,\hat{\eta}^f$ finds the anonymous

uniform price lower than its personalized price and thus switches to the anonymous segment. Conversely, when $\Delta C/(\Delta Q) > \frac{1}{3-\gamma}$ (so $\hat{\eta}^f < \hat{\eta}$), existing firms with $\eta < \frac{2\gamma\hat{\eta}-1}{3}$ benefit from the uniform price and likewise choose anonymous procurement. (Types at the threshold are indifferent.)

Once existing downstream firms choose anonymity, the conditional distribution of taste for quality η in the anonymous segment becomes non-uniform. If downstream firms with a high taste for quality conceal, mass shifts toward the upper tail of η; if those with a low taste for quality conceal, mass shifts toward the lower tail. Upstream suppliers anticipate these compositional changes and revise the uniform prices they post in the anonymous segment. The revised prices, in turn, reshape existing firms' information-sharing incentives. Equilibrium is a fixed point of this information–sharing–pricing mapping. The resulting equilibrium is characterized in the next proposition.

Proposition 4 (Voluntary Information Sharing)**.** ***(A) Personalized segment.*** *Equilibrium pricing and procurement are identical to Proposition 2(B).*

(B) Anonymous segment. *Upstream suppliers post uniform prices P_A^v, P_B^v. The marginal anonymous type is*

$$\eta^v = \frac{1+\alpha\,\hat{\eta}}{2+\alpha}, \qquad \hat{\eta} \equiv \frac{\Delta C}{\Delta Q}.$$

Firms with $\eta < \eta^v$ buy from Supplier A and those with $\eta > \eta^v$ buy from Supplier B. Two parameter regions obtain:[7]

1. *If $\dfrac{\Delta C}{\Delta Q} < \dfrac{1}{3-\gamma}$ (so $\hat{\eta}^f > \hat{\eta}$), then*

$$P_A^v = P_A^f, \qquad P_B^v > P_B^f.$$

Define $\bar{\eta}_B \in (\eta^v, 1)$ by

$$P_B^v = C_A + \frac{\Delta Q}{\gamma}\,\bar{\eta}_B.$$

[7] Here $\gamma < 3$ ensures $1/(3-\gamma) > 0$.

Existing firms share their information (personalize) iff $\eta < \bar{\eta}_B$; those with $\eta > \bar{\eta}_B$ choose anonymity. Type $\eta = \bar{\eta}_B$ is indifferent.

2. *If* $\dfrac{\Delta C}{\Delta Q} > \dfrac{1}{3-\gamma}$ *(so* $\hat{\eta}^f < \hat{\eta}$*), then*

$$P_B^v = P_B^f, \qquad P_A^v > P_A^f.$$

Define $\underline{\eta}_A \in (0, \eta^v)$ *by*

$$P_A^v = C_B - \frac{\Delta Q}{\gamma}\,\underline{\eta}_A.$$

Existing firms share their information iff $\eta > \underline{\eta}_A$; those with $\eta < \underline{\eta}_A$ choose anonymity. Type $\eta = \underline{\eta}_A$ is indifferent.

Remark (Anonymous price externality under voluntary information sharing). By Proposition 4(B.2), when $\hat{\eta}_f > \hat{\eta}$ we have $P_B^v > P_B^f$ (and $P_A^v \leq P_A^f$); when $\hat{\eta}_f < \hat{\eta}$ we have $P_A^v > P_A^f$ (and $P_B^v \leq P_B^f$). Hence, selective anonymity raises the advantaged supplier's anonymous uniform price and moves the anonymous cutoff η^v away from the planner's $\hat{\eta}$, which reduces the surplus of new downstream firms whenever that supplier serves a positive measure of new downstream firms (strictly if $\alpha > 0$ and $\hat{\eta}_f \neq \hat{\eta}$).

Relative to the mandatory information sharing benchmark (in which all existing firms are in the personalized segment), allowing existing firms to opt for anonymity under voluntary information sharing raises uniform prices in the anonymous segment. When $\Delta C/(\,\Delta Q) < 1/(3-\gamma)$ (so $\hat{\eta}^f > \hat{\eta}$), the existing firms with a high taste for quality choose anonymity. Their migration increases the mass of high-η downstream firms in the anonymous segment, enlarging Supplier B's base of quality-sensitive downstream firms; B therefore raises its anonymous price above P_B^f, and Supplier A's best response is weakly higher than P_A^f (equal in the equilibrium characterized above). Conversely, when $\Delta C/(\,\Delta Q) > 1/(3-\gamma)$ (so $\hat{\eta}^f < \hat{\eta}$), the existing firms with the lowest taste for quality prefer anonymity, expanding Supplier A's captive base; A raises its anonymous price above P_A^f, and Supplier B's best response is weakly higher than P_B^f. Thus, anonymous-segment prices under voluntary information sharing are

weakly higher than under mandatory information sharing, with a strict increase for the supplier advantaged in that segment.

Under voluntary information sharing, the anonymous-segment allocation mirrors the distortion under no information sharing and is likewise inefficient. The equilibrium cutoff η^v diverges from the planner's benchmark $\hat{\eta}$: when $\Delta C/(\Delta Q) < 1/(3-\gamma)$ (so $\hat{\eta}^f > \hat{\eta}$), we obtain $\eta^v > \hat{\eta}^f > \hat{\eta}$; when $\Delta C/(\Delta Q) > 1/(3-\gamma)$ (so $\hat{\eta}^f < \hat{\eta}$), we have $\eta^v < \hat{\eta}^f < \hat{\eta}$. This reconfirms that banning personalized pricing induces allocative inefficiency.[8] Moreover, the distortion is magnified under voluntary information sharing: allowing existing firms to withhold information shifts the composition of the anonymous segment (toward high-η types in the first case and toward low-η types in the second), prompting the advantaged supplier to raise its uniform price. Through strategic complementarities, anonymous prices adjust in a way that moves the cutoff farther from $\hat{\eta}$. For example, when $\Delta C/(\Delta Q)$ is small, firms with a high taste for quality choose anonymity, Supplier B raises its anonymous price, and the high cutoff η^v pushes additional firms to Supplier A, deepening the misallocation relative to the first best.

5 Welfare Comparison

Using the equilibrium pricing schedules and sourcing decisions derived above, we compare aggregate welfare, downstream surplus, and upstream profits across the three information-sharing regimes—no, voluntary, and mandatory.

5.1 Total Welfare

Let W^f, W^n, and W^v denote total welfare under no information sharing (uniform pricing), mandatory information sharing (personalized pricing for existing downstream firms; anonymous for new downstream firms), and voluntary information sharing (an endogenous mix

[8] See Section 4.1, which shows that uniform pricing distorts the allocation of downstream firms across suppliers.

of anonymous and personalized pricing), respectively. Using the closed-form expressions derived above (see Propositions 1, 2, and 4), we obtain the strict ranking of the total welfare.[9]

$$W^n > W^v > W^f.$$

Thus, total welfare is highest when upstream suppliers can fully access downstream firm-specific information, lowest when downstream firm-specific information is entirely not shared, and intermediate when existing downstream firms can choose whether to authorize access. This ordering reflects the efficiency gains achieved by aligning input quality with heterogeneous tastes for quality through personalized pricing. It is consistent with the classical result that first-degree price discrimination can increase total surplus, and with Shulman and Geng (2013). Unlike their framework, in which the information sharing of existing downstream firms is always exogenous, our setting endogenizes access to downstream firm-specific information through downstream firms' voluntary information-sharing decisions.

5.2 Downstream Surplus

Comparing downstream surplus under no information sharing and mandatory information sharing, we obtain $CS^n > CS^f$. The intuition is that firm-level competition under personalized pricing for existing firms pushes equilibrium prices below the uniform levels that prevail when suppliers cannot acquire information from the downstream; on average, this competitive effect dominates the surplus-extraction effect. Because suppliers lack sufficient information to price-discriminate among new downstream firms in either regime, their surplus is identical across the two policies. Consequently, total downstream surplus is higher under mandatory information sharing than under no information sharing, consistent with the view that greater information availability intensifies price competition (Acquisti et al. (2016)).

Integrating Proposition 3, downstream firms' welfare ranking across information-sharing

[9] All the derivation of welfare analysis is in Appendix A.3: comparing (1) with (3) yields $W^n - W^v > 0$, and comparing (2) with (3) yields $W^v - W^f > 0$.

regimes depends on the cost–quality ratio and on their taste for quality. When $\Delta C/(\,\Delta Q) < \frac{1}{3-\gamma}$ (so $\hat{\eta}^f > \hat{\eta}$), existing firms with a very high taste for quality $\eta > 2\hat{\eta}^f$ attain high welfare under no information sharing (uniform pricing), whereas those with $\eta < 2\hat{\eta}^f$ benefit from mandatory information sharing (personalized pricing for existing firms). Thus, even though aggregate downstream surplus satisfies $CS^n > CS^f$, the upper tail of existing downstream firms is worse off under mandatory information sharing; new firms are unaffected because they face uniform prices in both regimes.

When $\Delta C/(\,\Delta Q) > \frac{1}{3-\gamma}$ (so $\hat{\eta}^f < \hat{\eta}$), the comparison is V-shaped in η: existing firms with very low taste for quality $\eta < \frac{2\gamma\,\hat{\eta}-1}{3}$ and very high taste for quality $\eta > 2\hat{\eta}^f$ prefer no information sharing, while those with an intermediate taste for quality

$$\max\left\{0,\ \tfrac{2\gamma\,\hat{\eta}-1}{3}\right\}\ \leq\ \eta\ \leq\ 2\hat{\eta}^f$$

prefer mandatory information sharing. In short, heterogeneous tastes for quality imply that personalized pricing benefits intermediate existing downstream firms but can reduce welfare at the extremes.

Furthermore, comparing downstream surplus under voluntary and mandatory information sharing, we obtain $CS^n > CS^v$. Under voluntary information sharing, existing firms that remain in the personalized segment face the same personalized prices as they would under mandatory information sharing, while those that opt for anonymity do so only when the uniform anonymous price is low for them, thereby gaining. However, their exit reshapes the anonymous segment and raises its uniform prices (for the advantaged supplier, and weakly for the rival), which applies to the full mass of new downstream firms and to any existing firms that remain anonymous. The losses borne by these groups exceed the gains of the switchers, implying a low aggregate downstream surplus under voluntary information sharing (strictly, except at boundary cases where the segments or thresholds coincide).

Existing downstream firms that remain personalized under voluntary information sharing face the same sourcing decisions and prices as under mandatory information sharing. By

contrast, existing firms that choose anonymity do so only when the uniform anonymous price is (weakly) lower than their personalized price; hence, their welfare weakly increases (strictly, away from the indifference type). Thus, moving from mandatory information sharing to voluntary information sharing benefits only those existing firms that opt into anonymity. In particular, when $\Delta C/(\,\Delta Q) < \frac{1}{3-\gamma}$ (so $\hat{\eta}^f > \hat{\eta}$), the gain accrues to existing firms with $\eta > \bar{\eta}_B$, where $\bar{\eta}_B$ is defined by

$$P_B^v = C_A + \frac{\Delta Q}{\gamma}\,\bar{\eta}_B.$$

When $\Delta C/(\,\Delta Q) > \frac{1}{3-\gamma}$ (so $\hat{\eta}^f < \hat{\eta}$), the gain accrues to existing firms with $\eta < \underline{\eta}_A$, where $\underline{\eta}_A$ satisfies[10]

$$P_A^v = C_B - \frac{\Delta Q}{\gamma}\,\underline{\eta}_A.$$

Under voluntary information sharing, upstream suppliers anticipate that some existing downstream firms will opt for anonymity and, therefore, raise the uniform prices posted in the anonymous segment. New downstream firms—who are always anonymous and cannot share information—bear these high prices. The resulting losses for new firms (and for existing firms that remain anonymous) exceed the gains to existing switchers, so downstream surplus is lower under voluntary information sharing than under mandatory information sharing, i.e., $CS^n > CS^v$.

Further comparing downstream surplus under no and voluntary information sharing, we obtain

$$CS^v > CS^f \quad \Longleftrightarrow \quad A_1(\gamma) \;<\; \frac{\Delta C}{\Delta Q} \;<\; A_2(\gamma),$$

and otherwise $CS^v \leq CS^f$.[11] When the ratio of new downstream firms $\alpha < \alpha_1(\gamma)$, we have $A_1(\gamma) < 0$ and $A_2(\gamma) > 1$, so the condition holds for all admissible $\Delta C/(\,\Delta Q) \in (0,1)$ and hence $CS^v > CS^f$. The intuition is that under voluntary information sharing, some existing downstream firms switch to anonymity to secure low prices; however, their exit raises uniform prices in the anonymous segment, thereby reducing new firms' surplus relative to

[10] Types at $\eta = \bar{\eta}_B$ or $\eta = \underline{\eta}_A$ are indifferent.

[11] Critical values (functions of α and γ) $A_1(\gamma)$ and $A_2(\gamma)$ are in Appendix A.5.

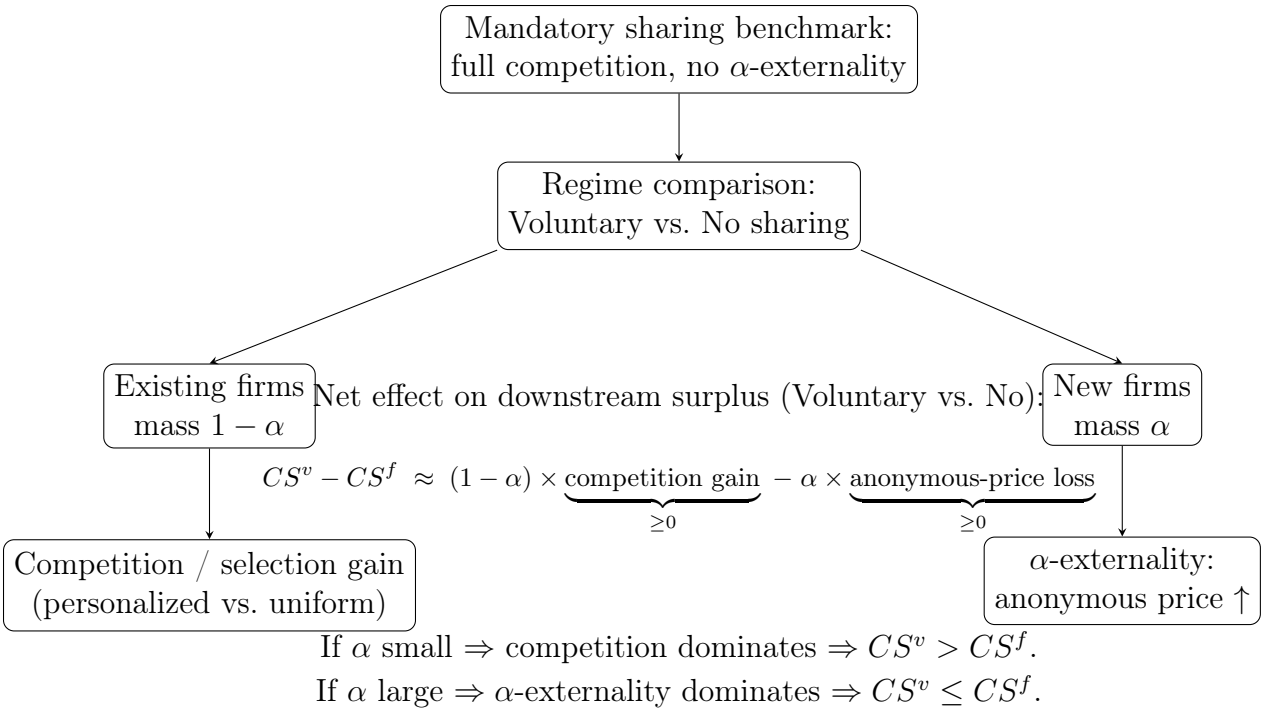


Figure 4 – Conceptual trade-off between intensified competition and the α-externality in information-sharing regimes. Mandatory sharing captures the pure competition effect; moving to voluntary sharing adds an α-weighted anonymous-pool externality that can overturn the benefit of voluntary sharing relative to no sharing when α is large.

no information sharing. These offsetting forces imply that as the cost–quality ratio becomes more extreme and as α increases, the anonymous-price externality grows; for sufficiently large α (specifically, $\alpha > \alpha_1(\gamma)$) it outweighs the switchers' gains, yielding $CS^v \leq CS^f$. We present the mechanism in the following figure.

Under voluntary information sharing, existing downstream firms choose whether to share information to maximize their own surplus, while new firms remain anonymous. One might therefore expect downstream surplus under voluntary information sharing to exceed that under mandatory information sharing, since strategic concealment can limit the extent of supplier extraction, whereas full access to firm-level information enables discrimination. Our analysis shows the opposite in a vertically differentiated duopoly: $CS^n > CS^v$. With mandatory information sharing, firm-specific competition disciplines prices for most existing downstream firms, and the resulting gains outweigh the surplus extracted from the tails of the distribution of tastes. Under voluntary information sharing, selective anonymity raises uni-

form prices in the anonymous segment; the induced losses for new firms (and for existing downstream firms that remain anonymous) dominate the gains for switchers. Hence, downstream surplus is maximized when suppliers face mandatory information sharing.

5.3 Upstream Profits

Comparing upstream profits under mandatory information sharing and no information sharing yields

$$PS^n < PS^f.$$

The intuition is that, for existing downstream firms, personalized pricing induces head-to-head competition at each type of downstream firm: the disadvantaged supplier prices at marginal cost, and the advantaged supplier sets an indifference price that leaves a limited margin. Uniform pricing under no information sharing softens this competition, sustaining high markups on an inframarginal mass of downstream firms. Profits from new downstream firms are identical across the two regimes (they face uniform prices in both), so the profit decline under mandatory information sharing is driven entirely by the existing downstream firms. We summarize the analysis of upstream profits in the following proposition.[12]

Proposition 5. *Profits comparisons by supplier (superscripts f and n denote mandatory information sharing and no information sharing, respectively) are:*

$$\begin{cases} \pi_A^f > \pi_A^n, \quad \pi_B^f < \pi_B^n, \quad R \in \big(0,\ R_B^\star(\gamma)\big], \\ \pi_A^f > \pi_A^n, \quad \pi_B^f > \pi_B^n, \quad R \in \big[R_B^\star(\gamma),\ R_A^\star(\gamma)\big], \\ \pi_A^f < \pi_A^n, \quad \pi_B^f > \pi_B^n, \quad R \in \big[R_A^\star(\gamma),\ 1\big), \end{cases} \qquad R \equiv \frac{\Delta C}{\Delta Q},$$

with thresholds

$$R_B^\star(\gamma) = \frac{5\gamma - 3\sqrt{3\gamma^2 - 2\gamma + 1}}{18\gamma - 9 - 2\gamma^2}, \qquad R_A^\star(\gamma) = \frac{2\gamma + 3\sqrt{4\gamma - 2}}{18\gamma - 9 - 2\gamma^2}.$$

[12] The proof of proposition 5 is in Appendix A.4.

Thus, when the cost–quality ratio $\Delta C/\,\Delta Q$ is low, the high-quality supplier B gains from mandatory information sharing while A loses; when it is high, the low-quality supplier A gains while B loses; in the intermediate range, intensified competition under personalized pricing lowers both suppliers' profits.

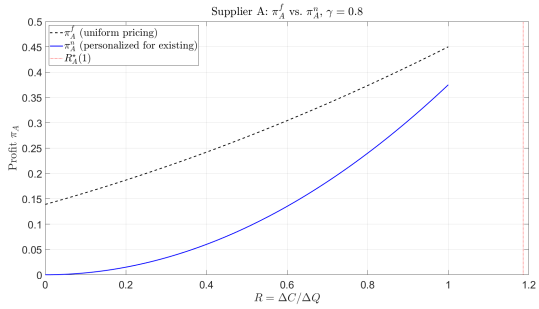
When product differentiation is either very strong or very weak, the high-quality and low-quality suppliers do not favor the same information-sharing regime. Their preferences hinge on the cost–quality ratio $R \equiv \frac{\Delta C}{\Delta Q}$. Low-quality supplier A earns high profits under no information sharing if $R \in \big(0, R_A^\star(\gamma)\big)$ and under mandatory information sharing if $R \in \big[R_A^\star(\gamma), 1\big)$. High-quality Supplier B earns high profits under mandatory information sharing if $R \in \big(0, R_B^\star(\gamma)\big]$ and under no information sharing if $R \in \big[R_B^\star(\gamma), 1\big)$. Hence, at the extremes of R the suppliers' preferences are opposed; only on the intermediate interval

$$\Big[R_B^\star(\gamma),\ R_A^\star(\gamma)\Big)$$

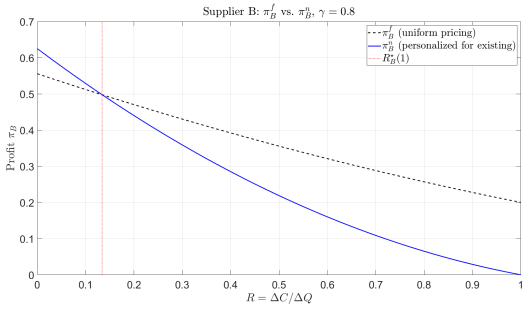
do both suppliers prefer no information sharing.

The three panels in Figure 5 conduct a comparative-statics exercise in the price-sensitivity parameter γ. Holding $\alpha = 0.5$ fixed, each row corresponds to one value of $\gamma \in \{0.8, 1.0, 1.5\}$, with the left subplot plotting supplier A's profits and the right subplot plotting supplier B's profits. In every subplot, the dashed curve shows profits under no information sharing (uniform pricing), $\pi_i^f(R;\gamma)$, and the solid curve shows profits under mandatory information sharing (personalized pricing for existing downstream firms), $\pi_i^n(R;\gamma)$. For any given γ, the no-information-sharing regime delivers π_A^f increasing in R and π_B^f decreasing in R. Under mandatory information sharing, personalized profits embed the factor $1/\gamma$: as γ rises, $\pi_A^n(R;\gamma)$ shifts up because the coefficient $1 - \frac{1}{2\gamma}$ increases, whereas $\pi_B^n(R;\gamma)$ shifts down because the term $\frac{1-R^2}{2\gamma}$ shrinks. In each row, the vertical red line marks the unique value of R at which the two profit schedules cross—$R_A^\star(\gamma)$ for supplier A on the left, and $R_B^\star(\gamma)$ for supplier B on the right—coinciding with the breakpoints characterized in Proposition 5. Both $R_B^\star(\gamma)$ and $R_A^\star(\gamma)$ are decreasing in γ, so as γ increases the interval $\big[R_B^\star(\gamma),\ R_A^\star(\gamma)\big]$

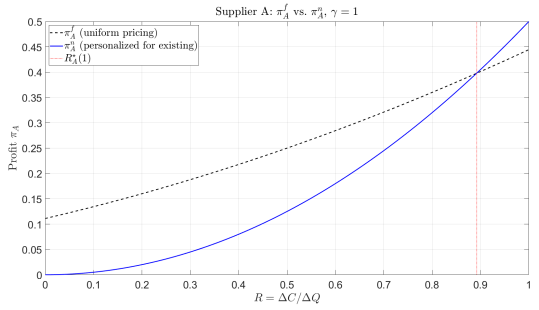
over which both suppliers strictly prefer no information sharing moves left and contracts. Quantitatively, when $\gamma = 0.8$ we have $R_A^\star(\gamma) > 1$, so on the unit interval, the region in which both suppliers prefer no information sharing essentially spans almost all R; at $\gamma = 1.0$ this region remains wide, whereas by $\gamma = 1.5$ it is visibly narrower.



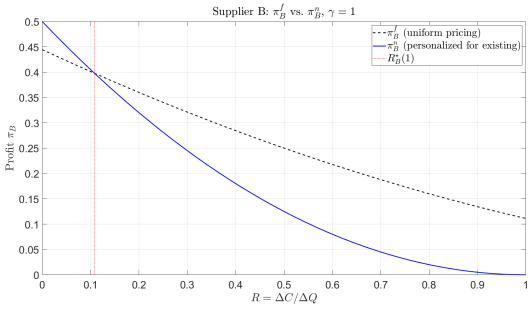
Supplier A, $\gamma = 0.8$



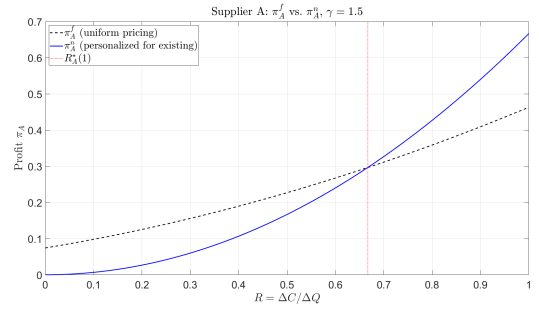
Supplier B, $\gamma = 0.8$



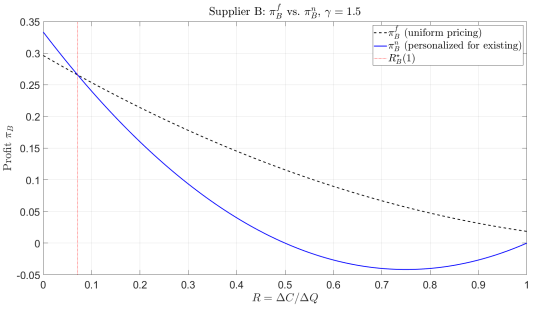
Supplier A, $\gamma = 1.0$



Supplier B, $\gamma = 1.0$



Supplier A, $\gamma = 1.5$



Supplier B, $\gamma = 1.5$

Figure 5 – Profit comparisons by supplier under no vs. mandatory information sharing. Top row (Panel A) uses $\gamma = 0.8$, middle row (Panel B) $\gamma = 1.0$, and bottom row (Panel C) $\gamma = 1.5$. Left column plots supplier A profits, right column plots supplier B profits.

Comparing supplier profits under voluntary and no information sharing, we obtain the

following results, which do not vary with R.

$$\pi_A^v > \pi_A^f, \qquad \pi_B^v > \pi_B^f.$$

Taken together with $PS^n < PS^f$ established above, it follows that total upstream profits satisfy $PS^v > PS^f > PS^n$. The intuition is that voluntary information sharing enlarges and reweights the anonymous segment, prompting high uniform prices there (for the advantaged supplier and weakly for the rival), while personalized prices for existing downstream firms choosing to share information remain the same as under mandatory information sharing; the resulting increase in anonymous segment markups raises aggregate upstream profits relative to both no information sharing and mandatory information sharing.

Further comparing upstream profits under no and mandatory information sharing, we obtain

$$PS^v > PS^f \quad \Longleftrightarrow \quad A_3(\gamma) \; < \; \frac{\Delta C}{\Delta Q} \; < \; A_4(\gamma),$$

and otherwise $PS^v \leq PS^f$.[13] Notably, for the ratio of new downstream firms $\alpha > \alpha_2(\gamma)$ the inequality $PS^v > PS^f$ holds for all admissible $\Delta C/\Delta Q$. Intuitively, voluntary information sharing creates two opposing forces relative to no information sharing: personalized pricing for existing firms choosing to share information intensifies competition and compresses margins, whereas selective anonymity raises uniform prices in the anonymous segment. When the fraction of new firms is sufficiently large, or the cost–quality ratio is moderate, the anonymous-segment price increase dominates, so total upstream profits under voluntary information sharing exceed those under no information sharing.

6 Policy Implications

The growing use of downstream firm-specific information in pricing has heightened downstream firms' attention to information-sharing policies. Comparing welfare under mandatory

[13] Specifically, The thresholds depend on γ and α, which are presented in Appendix A.6.

information sharing versus voluntary information sharing is therefore practically relevant. Under full rationality, our analysis characterizes the welfare trade-offs between these regimes. However, empirical evidence and surveys suggest that information-sharing choices may deviate from full rationality due to cognitive limits or procedural defaults: some downstream firms routinely authorize suppliers' access to information through standardized procurement systems or overlook the implications of information collection, thereby revealing their taste for quality. Such departures from optimal information sharing imply that policy conclusions based solely on fully rational behavior should be interpreted with caution.

When some existing downstream firms share optimally while others are inattentive or indifferent to information sharing, the equilibrium under voluntary information sharing lies between the rational-benchmark voluntary regime and the mandatory information sharing regime. Inattentive firms tend to authorize information access by default, expanding the personalized segment and shrinking the anonymous segment; thus, anonymous prices and allocations move toward those under mandatory information sharing. As the share of inattentive existing downstream firms increases, the voluntary sharing outcome converges to the mandatory benchmark. Consequently, the welfare comparison between voluntary and no information sharing in this setting approaches the mandatory-versus-no comparison developed earlier.

Summarizing the welfare analysis across the three information-sharing regimes, Table 1 ranks total welfare, downstream surplus, and upstream profits with a given γ.

Table 1 – Welfare Rankings by information-sharing Regime

Metric	Ranking of Regimes	Range for $\frac{\Delta C}{\Delta Q}$
Total Welfare	$W^n > W^v > W^f$	$(0, 1)$
Downstream Surplus	$CS^n > CS^v > CS^f$	$(A_1(\gamma), A_2(\gamma))$
	$CS^n > CS^f \geq CS^v$	$(0, A_1(\gamma)] \cup [A_2(\gamma), 1)$
Upstream Profits	$PS^n < PS^f < PS^v$	$(A_3(\gamma), A_4(\gamma))$
	$PS^n < PS^v \leq PS^f$	$(0, A_3(\gamma)] \cup [A_4(\gamma), 1)$

Taken together, the results imply a clear regulatory trade-off. mandatory information

sharing maximizes total welfare and downstream surplus but yields the lowest upstream profits; no information sharing reverses this ranking. voluntary information sharing lies between these extremes, with its net effect determined by the cost–quality ratio $\Delta C/(\Delta Q)$ and the share of new downstream firms α.

Within our framework, a regulator selects the information-sharing regime by trading off total welfare (W), downstream surplus (CS), and upstream profits (PS). Considering W and CS, mandatory information sharing is most attractive; from the perspective of PS, it is least attractive. The information consists of non-sensitive operational information, taste proxies, and transactional histories of downstream firms. In practice, however, the abundance of information-sharing can invite extensive collection of sensitive attributes by suppliers or intermediaries, potentially infringing on downstream firms' rights and undermining business confidence. Because current rules largely target information collection rather than use, a complementary policy is to permit industry-wide sharing of non-sensitive downstream information under common governance—treating it as an existing good—to prevent supplier-specific information monopolies and improve market performance. An illustrative precedent is the U.S. Department of Transportation's 2014 approval of a system enabling airlines and travel agencies to use traveler information for personalized offers.

Although aggregate downstream surplus is maximized under mandatory information sharing, type-level welfare is not uniform. When $\Delta C/(\Delta Q) < \frac{1}{3-\gamma}$ (so $\hat{\eta}^f > \hat{\eta}$), downstream firms with $\eta > 2\hat{\eta}^f$ are worse off under mandatory information sharing than under no information sharing. When $\Delta C/(\Delta Q) > \frac{1}{3-\gamma}$ (so $\hat{\eta}^f < \hat{\eta}$), downstream firms with $\eta < \frac{2\gamma\hat{\eta}-1}{3}$ are worse off, and downstream firms with $\eta > 2\hat{\eta}^f$ can also be worse off. Hence, the choice of information-sharing policy should balance the aggregate gains from personalized pricing against the heterogeneous losses concentrated at the tails of the distribution of downstream firms' taste for quality.

Globally, two canonical architectures for information sharing prevail: a decentralized, industry-specific model with industry self-regulation (exemplified by the United States) and a centralized, uniform national model (exemplified by the European Union). Our results

suggest that effective policy should reflect industry fundamentals—cost–quality trade-offs, dispersion in taste for quality among downstream firms, and market structure—rather than imposing a single rule across industries. An industry-specific framework, complemented by enforceable self-regulatory standards, can better accommodate this heterogeneity by harnessing market incentives (e.g., reputational discipline, interoperability commitments, certification) to align information sharing and pricing practices with efficiency. As markets evolve, legislators can progressively codify successful industry practices into formal rules, tightening oversight where externalities persist.

7 Conclusion

We develop a model of a vertically differentiated supply chain to evaluate no, voluntary, and mandatory information-sharing regimes when downstream firms differ in their taste for quality. We characterize equilibrium pricing under each information-sharing regime: under no information sharing, pricing is anonymous and uniform, while under mandatory information sharing, existing downstream firms face personalized prices. We then derive a welfare benchmark based on the socially optimal (planner's) allocation and use it to evaluate the equilibrium allocations under each regime. The analysis shows that allowing upstream suppliers to use downstream firm-specific information intensifies competition and improves allocation, with the strength of these effects governed by the cost–quality ratio $\Delta C/\Delta Q$ and the share of new downstream firms α. Because the voluntary regime makes information about only a subset of existing downstream firms available to suppliers, leaving the remaining firms in an anonymous segment, it delivers intermediate levels of competition, allocation efficiency, and welfare relative to the mandatory and no-sharing regimes. At the same time, the distributional effects across downstream types are uneven. Losses are concentrated among firms in the tails of the taste-for-quality distribution.

Under mandatory information sharing, existing downstream firms face firm-specific prices, while new downstream firms remain anonymous. Total welfare and downstream surplus are

maximized because competition between upstream suppliers disciplines prices and improves allocation. These gains are not uniform: surplus shifts away from downstream types at the tails of the distribution of taste for quality. By contrast, under no information sharing, downstream firms face a uniform price, and competition between upstream suppliers is softened, inducing allocative inefficiencies even as upstream profits rise.

Under voluntary information sharing, existing downstream firms choose whether to reveal or withhold their operational histories. High taste-for-quality firms that anticipate paying high personalized prices have an incentive to remain anonymous and instead pay the uniform price in the anonymous segment, gaining surplus relative to the mandatory regime. However, this selective hiding in the anonymous segment makes that segment more attractive to the advantaged supplier, who responds by increasing the uniform price. The higher anonymous price imposes losses on new downstream firms and on existing firms that remain anonymous. In aggregate, these losses outweigh the gains enjoyed by the high-taste-for-quality firms that switch to anonymity under the mandatory information-sharing regime. This anonymity-induced externality reduces downstream surplus relative to mandatory information sharing.

These findings yield clear implications for the design of industry-specific information-sharing regimes. In our setting, information-sharing rules are part of the accounting infrastructure that determines which firm-level records are observable, to whom, and for pricing versus coordination. Regulators and standard setters should therefore evaluate alternative regimes (no, voluntary, and mandatory information sharing) along three dimensions: allocative efficiency (W), the distribution of surplus across downstream firms (CS), and upstream suppliers' profits (PS). Mandatory information sharing scores highest on W and CS but lowest on PS; voluntary information sharing reverses this ranking for PS because the anonymous-pool pricing externality shifts surplus upstream; and banning information sharing performs worst on efficiency and downstream surplus. The results support an industry-specific approach—complemented by enforceable industry self-regulation—in which information-sharing rules are tailored to an industry's cost–quality distribution and the prevalence of new downstream firms (α). Future accounting research can test these pre-

dictions using institutional variation in data-governance rules and extend the framework to dynamic settings in which learning, entry and exit, and information accumulation jointly shape both operational and reporting environments.

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Appendix A.1. Proof of Proposition 2 (Part B)

We prove the personalized–segment result under mandatory information sharing. Fix a downstream type $\eta < \hat{\eta}$, where $\hat{\eta} \equiv \Delta C/(\,\Delta Q)$ and utilities are $U_i = V_0 + \eta\, Q_i - \gamma P_i$ with $Q_B - Q_A = \,\Delta Q$.

Claim. In any equilibrium for such a type, $P_B^n(\eta) = C_B$ and $P_A^n(\eta) = C_B - \frac{\eta\,\Delta Q}{\gamma}$.

Proof. Suppose, toward a contradiction, that $P_B^n(\eta) > C_B$. Consider three exhaustive cases:

(i) If $U_A > U_B$, then supplier B can profitably deviate by slightly lowing its personalized price (while remaining above C_B), for example to

$$P_B' \;=\; P_A^n(\eta) + \frac{\eta\;\Delta Q}{\gamma} - \varepsilon,$$

which makes the firm strictly prefer B and yields strictly positive profit. Thus $(P_A^n(\eta), P_B^n(\eta))$ is not an equilibrium.

(ii) If $U_A = U_B$, then B can profitably deviate by a small price cut (still $\geq C_B$) to capture the firm, again contradicting equilibrium.

(iii) If $U_A < U_B$ while $P_B(\eta) > C_B$, then supplier A can profitably undercut by setting

$$P_A^{n\prime} \;=\; P_B^n(\eta) - \frac{\eta\;\Delta Q}{\gamma} - \varepsilon,$$

which makes the firm strictly prefer A and yields strictly positive profit to A. Hence the original pair cannot be an equilibrium.

In all cases $P_B^n(\eta) > C_B$ is untenable; therefore $P_B^n(\eta) = C_B$ in equilibrium. Given $P_B^n(\eta) = C_B$, supplier A maximizes profit subject to the firm's indifference condition

$$\eta\, Q_A - \gamma P_A^n(\eta) \;=\; \eta\, Q_B - \gamma C_B \quad\Longrightarrow\quad P_A^n(\eta) \;=\; C_B - \frac{\eta\;\Delta Q}{\gamma},$$

and, by the tie–breaking rule, secures the firm at this price. This establishes the claim.

For $\eta > \hat{\eta}$, the argument is symmetric with the roles of A and B reversed. In equilibrium

$P_A^n(\eta) = C_A$ and

$$P_B^n(\eta) \;=\; C_A + \frac{\eta\ \Delta Q}{\gamma}.$$

And the expression of $P_A^n(\eta)$ in part (A) can be proved in a similar way. □

Appendix A.2. Proof of Proposition 4 (Part B)

We also prove Part B only since Part A follows the same logic in the Proof of Proposition 2.

(1) Case $\dfrac{\Delta C}{\Delta Q} < \dfrac{1}{3-\gamma}$ (equivalently, $\hat{\eta}^f > \hat{\eta}$).

Let $\bar{\eta}_B$ denote the existing type that is indifferent between buying anonymously in the voluntary information-sharing regime and buying at a personalized price. For $\eta > \hat{\eta}$, the personalized prices are (Proposition 2(B))

$$P_A^n(\eta) = C_A, \qquad P_B^n(\eta) = C_A + \frac{\eta\ \Delta Q}{\gamma}.$$

If P_B^v is supplier B's uniform price in the anonymous segment under voluntary information-sharing region, indifference at $\eta = \bar{\eta}_B$ requires

$$P_B^v = C_A + \frac{\bar{\eta}_B\ \Delta Q}{\gamma}.$$

Hence $P_B^n(\eta) \gtrless P_B^v$ iff $\eta \gtrless \bar{\eta}_B$, so existing firms with $\eta > \bar{\eta}_B$ choose anonymity and those with $\eta < \bar{\eta}_B$ disclose; at $\eta = \bar{\eta}_B$ the downstream firm is indifferent and procures from supplier B at the same price in either segment.

In the anonymous segment, uniform pricing induces a cutoff η^v determined by downstream indifference,

$$\eta^v Q_A - P_A^v = \eta^v Q_B - P_B^v \quad \Longrightarrow \quad \eta^v = \frac{1+\alpha\,\hat{\eta}}{2+\alpha},$$

so firms with $\eta < \eta^v$ buy from supplier A and those with $\eta > \eta^v$ buy from supplier B. Under $\hat{\eta}^f > \hat{\eta}$ one has $\bar{\eta}_B \geq \eta^v$, implying that all existing types who choose anonymity (the

set $\{\eta > \bar{\eta}_B\}$) are served by supplier B in the anonymous segment.

Profits under partial information sharing therefore decompose into (i) anonymous–segment profits from new firms (mass α) and the existing types who hide, plus (ii) personalized–segment profits from existing types who disclose. Using the margins implied by the equilibrium prices above,

$$\pi_A^v = \underbrace{\alpha\left(P_A^v - C_A\right)\eta^v}_{\text{anonymous new}} + \underbrace{(1-\alpha)\int_0^{\min\{\hat{\eta},\,\bar{\eta}_B\}}\left(\Delta C - \frac{\eta\ \Delta Q}{\gamma}\right)d\eta}_{\text{personalized, disclosing existing served by } A},$$

$$\pi_B^v = \underbrace{\left(P_B^v - C_B\right)\Big[\alpha\left(1-\eta^v\right) + (1-\alpha)\left(1-\bar{\eta}_B\right)\Big]}_{\text{anonymous new and anonymous existing}} + \underbrace{(1-\alpha)\int_{\max\{\hat{\eta},\,0\}}^{\bar{\eta}_B}\Big(-\Delta C + \frac{\eta\ \Delta Q}{\gamma}\Big)d\eta}_{\text{personalized, disclosing existing served by } B}.$$

Evaluating these integrals and substituting the equilibrium relation $P_B^v = C_A + \frac{\bar{\eta}_B\ \Delta Q}{\gamma}$ yields the closed forms stated in Proposition 4(B).

Setting the first–order conditions $\frac{\partial \pi_A^v}{\partial P_A^v} = 0$ and $\frac{\partial \pi_B^v}{\partial P_B^v} = 0$ yields the anonymous-segment equilibrium prices under partial information sharing:

$$P_A^v = \frac{\Delta Q}{3\gamma} + \frac{2C_A + C_B}{3}, \qquad P_B^v = \frac{2\,\Delta Q}{3\gamma} + \frac{C_A + 2C_B}{3} + \frac{\alpha(1-\alpha)}{2+\alpha}\,\frac{\Delta Q}{\gamma}\,\bar{\eta}_B,$$

where $\bar{\eta}_B \in [0,1]$ is the existing-firm type that is indifferent between anonymous and personalized procurement, defined implicitly by the indifference condition

$$P_B^v \;=\; C_A + \frac{\bar{\eta}_B\ \Delta Q}{\gamma}.$$

Consequently, existing firms choose anonymity iff $\eta > \bar{\eta}_B$, information sharing iff $\eta < \bar{\eta}_B$, and are indifferent at $\eta = \bar{\eta}_B$ (where $P_B^v = C_A + \frac{\bar{\eta}_B\ \Delta Q}{\gamma} = P_B^n(\bar{\eta}_B)$).

Under the parameter restriction $\frac{\Delta C}{\Delta Q} < \frac{1}{3-\gamma}$ (equivalently, $\hat{\eta}^f > \hat{\eta}$), one has $\bar{\eta}_B \in (0,1)$, so a non-trivial set of existing firms with high taste for quality optimally conceals information and buys anonymously even when quality differentiation is substantial.

It can be verified that $\bar{\eta}_B < \eta_v$ always holds, and when $\dfrac{\Delta C}{\Delta Q} < \dfrac{1}{3-\gamma}$, we have $\bar{\eta}_B < 1$. This implies that once existing downstream firms choose personalized procurement, they

consistently source inputs from the high-quality upstream supplier.

(2) Case $\dfrac{\Delta C}{\Delta Q} \geq \dfrac{1}{3-\gamma}$ (equivalently, $\hat{\eta}^f > \hat{\eta}$).

In this region the socially efficient cutoff exceeds the uniform-pricing cutoff. Among existing firms, very low taste for quality find anonymity attractive. Let

$$\underline{\eta}_A \;\equiv\; \frac{\gamma}{\Delta Q}\left(C_B - P_A^v\right)$$

denote the existing type indifferent between buying anonymously from supplier A at the uniform price P_A^v and buying personalized from A at $P_A^n(\eta) = C_B - \frac{\eta\,\Delta Q}{\gamma}$. Then existing firms choose anonymity iff $\eta < \underline{\eta}_A$, and choose personalized pricing otherwise. New firms remain anonymous. In the anonymous subgame, the marginal anonymous type satisfies

$$\eta^{\,v} \;=\; \frac{\gamma\,(P_B^v - P_A^v)}{\Delta Q},$$

so that those with $\eta \leq \eta^{\,v}$ buy from A and those with $\eta > \eta^{\,v}$ buy from B. Under $\hat{\eta}^f < \hat{\eta}$ one has $\underline{\eta}_A \leq \eta^{\,v}$, i.e., all anonymous existing firms are served by A.

Profits in the anonymous market. Aggregating over anonymous new firms and anonymous existing firms,

$$\pi_A^v = \left(P_A^v - C_A\right)\left[\alpha\,\eta^{\,v} + (1-\alpha)\,\underline{\eta}_A\right] \;+\; (1-\alpha)\int_{\underline{\eta}_A}^{\hat{\eta}}\left(\Delta C - \frac{\eta\;\Delta Q}{\gamma}\right)d\eta,$$

$$\pi_B^v = \left(P_B^v - C_B\right)\alpha\left(1-\eta^{\,v}\right) \;+\; (1-\alpha)\int_{\hat{\eta}}^{1}\left(-\Delta C + \frac{\eta\;\Delta Q}{\gamma}\right)d\eta,$$

and $PS^v = \pi_A^v + \pi_B^v$. The first terms in π_A^v and π_B^v are margins times anonymous demand (new plus, for A, low-taste existing); the integrals are margins from personalized existing downstream firms on $[\underline{\eta}_A, \hat{\eta})$ for A and $[\hat{\eta}, 1]$ for B.

Indifference at the planner cutoff. Under personalized pricing the downstream firm is left indifferent between suppliers at every η (the advantaged supplier sets the binding price).

Evaluated at $\eta = \hat{\eta} = \Delta C/(\,\Delta Q)$,

$$\hat{\eta}\, Q_B - \gamma\, P_B^n(\hat{\eta}) = \hat{\eta}\, Q_A - \gamma\, P_A^n(\hat{\eta}), \quad \text{with} \quad P_A^n(\hat{\eta}) = C_B - \frac{\hat{\eta}\;\Delta Q}{\gamma}, \;\; P_B^n(\hat{\eta}) = C_A + \frac{\hat{\eta}\;\Delta Q}{\gamma}.$$

These identities pin down the personalized benchmarks used by existing firms when comparing anonymity (P_A^v, P_B^v) to personalized pricing.

Solving the suppliers' first-order conditions $\partial \pi_A^v / \partial P_A^v = 0$ and $\partial \pi_B^v / \partial P_B^v = 0$ in the anonymous segment (with quality gap ΔQ and price sensitivity γ) yields

$$P_A^v = \frac{\Delta Q}{3\gamma} + \frac{2C_A + C_B}{3}, \qquad P_B^v = \frac{2\,\Delta Q}{3\gamma} + \frac{C_A + 2C_B}{3}.$$

Define the existing-firm anonymity threshold by indifference between anonymous pricing at A and personalized pricing at A:

$$\underline{\eta}_A \;\equiv\; \frac{\gamma\,(C_B - P_A^v)}{\Delta Q} \;=\; \frac{2\gamma\,\hat{\eta} - 1}{3}, \qquad \hat{\eta} \;=\; \frac{\Delta C}{\Delta Q}.$$

Thus, existing firms with $\eta < \underline{\eta}_A$ optimally choose anonymity (buying from A at P_A^v), while those with $\eta > \underline{\eta}_A$ opt for personalized procurement. The marginal type satisfies

$$P_A^v = C_B - \frac{\underline{\eta}_A\;\Delta Q}{\gamma}.$$

The anonymous-market cutoff between A and B is

$$\eta^{\,v} = \frac{\gamma\,(P_B^v - P_A^v)}{\Delta Q} = \frac{1 + \gamma\,\hat{\eta}}{3}.$$

Since $\eta^{\,v} - \underline{\eta}_A = \frac{2 - \gamma\,\hat{\eta}}{3} > 0$ for $\hat{\eta} \in (0,1)$ and $\gamma > 0$, it follows that any existing firm that discloses (i.e., $\eta > \underline{\eta}_A$) lies to the right of the anonymous cutoff and, under personalized pricing, is served by supplier B. $\square$

A.3. Derivation of the Welfare Analysis

Under full information sharing, suppliers post uniform prices

$$P_A^f = \frac{\Delta Q}{3\gamma} + \frac{2C_A + C_B}{3}, \qquad P_B^f = \frac{2\,\Delta Q}{3\gamma} + \frac{C_A + 2C_B}{3},$$

and the market partitions at

$$\hat{\eta}^f = \frac{1 + \gamma\,\hat{\eta}}{3}, \qquad \hat{\eta} = \frac{\Delta C}{\Delta Q} \in (0, 1).$$

The upstream profits are

$$\pi_A^f = \left(P_A^f - C_A\right)\hat{\eta}^f = \frac{1}{9}\Big(\frac{\Delta Q}{\gamma} + \Delta C\Big)\Big(1 + \frac{\gamma\,\Delta C}{\Delta Q}\Big),$$

$$\pi_B^f = \left(P_B^f - C_B\right)\left(1 - \hat{\eta}^f\right) = \frac{1}{9}\Big(\frac{2\,\Delta Q}{\gamma} - \Delta C\Big)\Big(2 - \frac{\gamma\,\Delta C}{\Delta Q}\Big),$$

so total upstream profit equals

$$PS^f = \pi_A^f + \pi_B^f = \frac{1}{9}\left[\frac{5\,\Delta Q}{\gamma} - 2\Delta C + \frac{2\gamma\,\Delta C^2}{\Delta Q}\right].$$

Downstream surplus under full information sharing is

$$\begin{aligned} CS^f &= V_0 + \int_0^{\hat{\eta}^f} \left(\eta\,Q_A - \gamma P_A^f\right) d\eta + \int_{\hat{\eta}^f}^1 \left(\eta\,Q_B - \gamma P_B^f\right) d\eta \\ &= V_0 + \frac{Q_A}{2} + \frac{\Delta Q}{2}\left(1 - (\hat{\eta}^f)^2\right) - \gamma\Big[P_A^f\hat{\eta}^f + P_B^f\left(1 - \hat{\eta}^f\right)\Big], \end{aligned}$$

where $Q_A = Q_A$ and $Q_B = Q_A + \Delta Q$.

Total welfare—the sum of upstream profits and downstream surplus—is

$$W^f = V_0 + \int_0^{\hat{\eta}^f} \left(\eta\,Q_A - C_A\right) d\eta + \int_{\hat{\eta}^f}^1 \left(\eta\,Q_B - C_B\right) d\eta,$$

which simplifies to

$$W^f = V_0 + \frac{Q_A}{2} + \frac{\Delta Q}{2}\big(1 - (\hat{\eta}^f)^2\big) - \Big[C_A\hat{\eta}^f + C_B\big(1 - \hat{\eta}^f\big)\Big]. \tag{1}$$

These expressions serve as the baseline for welfare comparisons across information-sharing regimes.

Given the equilibrium prices and procurement behavior in Proposition 2, we compute upstream profits (PS^n) under no information sharing as follows. Let $\hat{\eta} = \Delta C/(\,\Delta Q)$ and recall that existing downstream firms (mass $1-\alpha$) face personalized prices, while new firms (mass α) face the uniform prices from full information sharing:

$$\pi_A^n = (1-\alpha)\int_0^{\hat{\eta}}\Big(\Delta C - \tfrac{\eta\,\Delta Q}{\gamma}\Big)\,d\eta + \alpha\,\pi_A^f, \qquad \pi_B^n = (1-\alpha)\int_{\hat{\eta}}^1\Big(-\Delta C + \tfrac{\eta\,\Delta Q}{\gamma}\Big)\,d\eta + \alpha\,\pi_B^f.$$

Thus,

$$PS^n = \pi_A^n + \pi_B^n = (1-\alpha)\Big[\int_0^{\hat{\eta}}\Big(\Delta C - \tfrac{\eta\,\Delta Q}{\gamma}\Big)\,d\eta + \int_{\hat{\eta}}^1\Big(-\Delta C + \tfrac{\eta\,\Delta Q}{\gamma}\Big)\,d\eta\Big] + \alpha\,PS^f.$$

For downstream surplus, using $P_A^n(\eta) = C_B - \frac{\eta\,\Delta Q}{\gamma}$ for $\eta < \hat{\eta}$ and $P_B^n(\eta) = C_A + \frac{\eta\,\Delta Q}{\gamma}$ for $\eta > \hat{\eta}$, with qualities $Q_A = Q_A$ and $Q_B = Q_A + \,\Delta Q$, we have

$$CS^n = (1-\alpha)\Big[V_0 + \int_0^{\hat{\eta}}\big(\eta Q_A - \gamma C_B + \eta\,\Delta Q\big)\,d\eta + \int_{\hat{\eta}}^1\big(\eta Q_A - \gamma C_A\big)\,d\eta\Big] + \alpha\,CS^f.$$

Total welfare (prices are transfers) is

$$W^n = (1-\alpha)\Big[V_0 + \int_0^{\hat{\eta}}\big(\eta Q_A - C_A\big)\,d\eta + \int_{\hat{\eta}}^1\big(\eta(Q_A + \,\Delta Q) - C_B\big)\,d\eta\Big] + \alpha\,W^f. \tag{2}$$

Using the equilibrium anonymous prices and information sharing choices of existing downstream firms from Proposition 4, we next derive the corresponding aggregates under partial

information sharing case by case according to

$$\frac{\Delta C}{\Delta Q} \lesseqgtr \frac{1}{3-\gamma} \quad \Longleftrightarrow \quad \hat{\eta}^f \gtreqless \hat{\eta}.$$

Scenario 1: $\dfrac{\Delta C}{\Delta Q} < \dfrac{1}{3-\gamma}$

In this scenario, both upstream suppliers serve two market segments: an anonymous market (with threshold firm η^v) and a personalized market (with threshold firm $\hat{\eta} = \Delta C/(\Delta Q)$). The upstream suppliers' profit functions and total upstream profits under partial information sharing are:

$$\pi_A^v = \alpha\big(P_A^v - C_A\big)\,\eta^v + (1-\alpha)\int_0^{\hat{\eta}} \Big(\Delta C - \tfrac{\eta\,\Delta Q}{\gamma}\Big)\,d\eta,$$

$$\pi_B^v = \big(P_B^v - C_B\big)\Big[\alpha\big(1-\eta^v\big) + (1-\alpha)\big(1-\bar{\eta}_B\big)\Big] + (1-\alpha)\int_{\hat{\eta}}^{\bar{\eta}_B} \Big(-\Delta C + \tfrac{\eta\,\Delta Q}{\gamma}\Big)\,d\eta,$$

$$PS^v = \pi_A^v + \pi_B^v.$$

Total downstream surplus under partial information sharing is:

$$\begin{aligned} CS^v = V_0 &+ \alpha\bigg(\int_0^{\eta^v} \big(\eta Q_A - \gamma P_A^v\big)\,d\eta + \int_{\eta^v}^1 \big(\eta(Q_A + \Delta Q) - \gamma P_B^v\big)\,d\eta\bigg) \\ &+ (1-\alpha)\bigg(\int_0^{\hat{\eta}} \big(\eta Q_A - \gamma C_B + \eta\,\Delta Q\big)\,d\eta + \int_{\hat{\eta}}^{\bar{\eta}_B} \big(\eta Q_A - \gamma C_A\big)\,d\eta\bigg). \end{aligned}$$

Total welfare under partial information sharing is:

$$\begin{aligned} W^v = V_0 &+ \alpha\bigg(\int_0^{\eta^v} (\eta Q_A - C_A)\,d\eta + \int_{\eta^v}^1 (\eta(Q_A + \Delta Q) - C_B)\,d\eta\bigg) \\ &+ (1-\alpha)\bigg(\int_0^{\hat{\eta}} (\eta Q_A - C_A)\,d\eta + \int_{\hat{\eta}}^{\bar{\eta}_B} (\eta(Q_A + \Delta Q) - C_B)\,d\eta\bigg). \end{aligned} \tag{3}$$

Scenario 2: $\dfrac{\Delta C}{\Delta Q} \geq \dfrac{1}{3-\gamma}$

Under partial information sharing, each upstream supplier serves two segments: an anonymous segment (with threshold η^v) and a personalized segment (with threshold $\hat{\eta} = \Delta C/(\Delta Q)$). Let $\underline{\eta}_A$ denote the information sharing cutoff for existing firms on the low-

taste side (existing firms with $\eta < \underline{\eta}_A$ choose anonymity; those with $\eta > \underline{\eta}_A$ disclose). The suppliers' profits are

$$\pi_A^v = (P_A^v - C_A)\Big[\alpha\,\eta^{\,v} + (1-\alpha)\,\underline{\eta}_A\Big] + (1-\alpha)\int_{\underline{\eta}_A}^{\hat{\eta}} \Big(\Delta C - \tfrac{\eta\,\Delta Q}{\gamma}\Big)\,d\eta,$$

$$\pi_B^v = \alpha\,(P_B^v - C_B)\big(1-\eta^{\,v}\big) + (1-\alpha)\int_{\hat{\eta}}^{1} \Big(-\Delta C + \tfrac{\eta\,\Delta Q}{\gamma}\Big)\,d\eta, \qquad PS^v = \pi_A^v + \pi_B^v.$$

Total downstream surplus is

$$\begin{aligned} CS^v = V_0 &+ \alpha\left[\int_0^{\eta^{\,v}} \big(\eta Q_A - \gamma P_A^v\big)\,d\eta + \int_{\eta^{\,v}}^{1} \big(\eta(Q_A + \Delta Q) - \gamma P_B^v\big)\,d\eta\right] \\ &+ (1-\alpha)\left[\int_0^{\underline{\eta}_A} \big(\eta Q_A - \gamma P_A^v\big)\,d\eta + \int_{\underline{\eta}_A}^{\hat{\eta}} \big(\eta Q_A - \gamma C_B + \eta\,\Delta Q\big)\,d\eta + \int_{\hat{\eta}}^{1} \big(\eta Q_A - \gamma C_A\big)\,d\eta\right], \end{aligned}$$

where qualities are $Q_A = Q_A$ and $Q_B = Q_A + \Delta Q$.

Total welfare (replacing prices by costs in the integrands) is

$$\begin{aligned} W^v = V_0 &+ \alpha\left[\int_0^{\eta^{\,v}} \big(\eta Q_A - C_A\big)\,d\eta + \int_{\eta^{\,v}}^{1} \big(\eta(Q_A + \Delta Q) - C_B\big)\,d\eta\right] \\ &+ (1-\alpha)\left[\int_0^{\hat{\eta}} \big(\eta Q_A - C_A\big)\,d\eta + \int_{\hat{\eta}}^{1} \big(\eta(Q_A + \Delta Q) - C_B\big)\,d\eta\right]. \end{aligned}$$

A.4. Proof of Proposition 5

Let $S \equiv \Delta Q > 0$ and $R \equiv \Delta C/S > 0$. Downstream types $\eta \sim U[0,1]$ choose the supplier that maximizes $\eta\,Q_i - \gamma P_i$. Throughout we focus on the interior region where both suppliers serve a positive measure of downstream firms (the knife-edges are handled at the end).

1) Full information sharing (anonymous/uniform pricing). Let $m_i^f \equiv P_i^f - C_i$ denote equilibrium markups. With uniform prices, the indifferent type solves

$$\eta^{\mathrm{f}} \;=\; \frac{\gamma\,(P_B^f - P_A^f)}{S}\,.$$

Best responses from $\pi_A^f = (P_A^f - C_A)\eta^{\mathrm{f}}$ and $\pi_B^f = (P_B^f - C_B)\big(1-\eta^{\mathrm{f}}\big)$ yield the unique interior

solution

$$m_A^f = \frac{\Delta C + \frac{S}{\gamma}}{3}, \qquad m_B^f = \frac{\frac{2S}{\gamma} - \Delta C}{3}, \qquad \eta^{\mathrm{f}} = \frac{1+\gamma R}{3}.$$

Hence total profits (market size normalized to 1) are

$$\pi_A^f \;=\; m_A^f\,\eta^{\mathrm{f}} \;=\; \frac{S}{\gamma}\cdot\frac{(1+\gamma R)^2}{9}, \qquad \pi_B^f \;=\; m_B^f\left(1-\eta^{\mathrm{f}}\right) \;=\; \frac{S}{\gamma}\cdot\frac{(2-\gamma R)^2}{9}.$$

2) No information sharing (personalized pricing for existing firms). Fix an existing downstream firm with taste-for-quality η.

$$\eta < R: \quad P_B^n = C_B,\;\; P_A^n(\eta) = C_B - \frac{\eta S}{\gamma} \;\Rightarrow\; P_A^n(\eta) - C_A = \Delta C - \frac{\eta S}{\gamma}.$$

$$\eta > R: \quad P_A^n = C_A,\;\; P_B^n(\eta) = C_A + \frac{\eta S}{\gamma} \;\Rightarrow\; P_B^n(\eta) - C_B = \frac{\eta S}{\gamma} - \Delta C.$$

Integrating over η (uniform on $[0,1]$) gives the existing-segment profits:

$$\pi_A^n = \int_0^R \Big(\Delta C - \frac{\eta S}{\gamma}\Big)\,d\eta \;=\; S\,R^2\Big(1-\frac{1}{2\gamma}\Big), \qquad \pi_B^n = \int_R^1 \Big(\frac{\eta S}{\gamma} - \Delta C\Big)\,d\eta \;=\; S\Big[\frac{1-R^2}{2\gamma} - R + R^2\Big].$$

Under no information sharing, new firms remain anonymous at the same uniform prices as under no information sharing, so their profit contribution is identical across the two regimes and cancels in pairwise comparisons. Therefore, comparing π_i^f and π_i^n reduces to comparing the expressions above.[14]

3) Breakpoints (profit comparisons). For Supplier B,

$$\pi_B^n \;\gtrless\; \pi_B^f \iff \underbrace{\Big[\tfrac{1-R^2}{2} - \gamma R + \gamma R^2\Big]}_{\text{dimensionless}} \;\gtrless\; \underbrace{\tfrac{(2-\gamma R)^2}{9}}_{\text{dimensionless}}.$$

This is a quadratic inequality in R with a unique interior root

$$R_B^\star(\gamma) \;=\; \frac{5\gamma - 3\sqrt{3\gamma^2 - 2\gamma + 1}}{18\gamma - 9 - 2\gamma^2} \in (0,1),$$

[14] Equivalently, total-profit differences equal the existing-mass share times the per-existing differences.

so that $\pi_B^n > \pi_B^f$ for $R \in (0, R_B^\star(\gamma))$ and $\pi_B^n < \pi_B^f$ for $R > R_B^\star(\gamma)$.

For Supplier A,

$$\pi_A^f \gtrless \pi_A^n \iff \underbrace{\tfrac{(1+\gamma R)^2}{9\gamma}}_{\text{dimensionless}} \gtrless \underbrace{R^2\Big(1-\tfrac{1}{2\gamma}\Big)}_{\text{dimensionless}}.$$

Again a quadratic in R, with the unique interior root

$$R_A^\star(\gamma) \;=\; \frac{2\gamma + 3\sqrt{4\gamma-2}}{18\gamma - 9 - 2\gamma^2} \in (0,1),$$

so that $\pi_A^f > \pi_A^n$ for $R \in (0, R_A^\star(\gamma))$ and $\pi_A^f < \pi_A^n$ for $R > R_A^\star(\gamma)$.

4) Partition. Combining the two comparisons yields exactly the three regions stated in Proposition 5, with the two thresholds $R_B^\star(\gamma)$ and $R_A^\star(\gamma)$ (the latter exceeding the former).[15]

□

Appendix A.5. Consumer Surplus Bounds (CS^v vs. CS^f)

Let

$$R \equiv \frac{\Delta C}{\Delta Q} \in (0,1), \qquad R^\star \equiv \frac{1}{3-\gamma}, \qquad R_f \equiv \frac{1+\gamma R}{3}, \qquad \eta^{\,v} \equiv \frac{1+\alpha R}{2+\alpha}. \tag{C.1}$$

Under voluntary information sharing, existing downstream firms either disclose or choose anonymity. On the side that hides, the anonymous price is pinned by the marginal disclosing existing type. Together with new firms' indifference between anonymous A and B,

$$\eta^{\,v} = \bar{\eta}_B - R_f \quad \text{if } R < R^\star, \qquad \eta^{\,v} = R_f - \underline{\eta}_A \quad \text{if } R \geq R^\star, \tag{C.2}$$

and $P_A^v = P_A^f$ when $R < R^\star$ while $P_B^v = P_B^f$ when $R \geq R^\star$.

Subtracting no information-sharing consumer surplus from voluntary information-sharing consumer surplus and using (C.1)–(C.2) to eliminate $\bar{\eta}_B, \underline{\eta}_A, \eta^{\,v}$ yields, in both regions, a

[15] At the endpoints the suppliers are weakly indifferent. For completeness: when $R \geq 1$ the market collapses to Supplier A under both regimes (Supplier B earns zero), so the ranking is degenerate.

quadratic in R:

$$\Delta CS \equiv CS^v - CS^f = \frac{\Delta Q}{18(2+\alpha)^2}\Big(A_\diamond(\alpha,\gamma)\,R^2 + B_\diamond(\alpha,\gamma)\,R + C_\diamond(\alpha)\Big), \tag{C.3}$$

where $\diamond \in \{<, >\}$ denotes $R < R^\star$ or $R \geq R^\star$.

Coefficients.

$$\begin{aligned}
\text{Case } R < R^\star: \quad A_<(\alpha,\gamma) &= 30\alpha^3\gamma - \alpha^2\gamma^2 + 78\alpha^2\gamma - 27\alpha^2 - 4\alpha\gamma^2 - 4\gamma^2 - 72\gamma + 36,\\
B_<(\alpha,\gamma) &= -(18\alpha^3\gamma + 24\alpha^3 + 50\alpha^2\gamma + 30\alpha^2 + 8\alpha\gamma - 40\gamma),\\
C_<(\alpha) &= 9\alpha^3 + 14\alpha^2 + 5\alpha + 8;\\
\text{Case } R \geq R^\star: \quad A_>(\alpha,\gamma) &= 9\alpha^3\gamma^2 - 12\alpha^3\gamma + 9\alpha^3 + 28\alpha^2\gamma^2 - 72\alpha^2\gamma + 36\alpha^2\\
&\quad + 28\alpha\gamma^2 - 36\alpha\gamma - 32\gamma^2 + 72\gamma - 36,\\
B_>(\alpha,\gamma) &= -(6\alpha^3\gamma + 12\alpha^3 + 10\alpha^2\gamma + 6\alpha^2 - 2\alpha\gamma - 18\alpha - 4\gamma),\\
C_>(\alpha) &= 12\alpha^3 + 25\alpha^2 - 2\alpha - 17.
\end{aligned} \tag{C.4}$$

Roots and per-case bounds. For each case $\diamond$, define the ordered roots

$$A^\diamond_{1,2}(\alpha,\gamma) = \frac{-B_\diamond(\alpha,\gamma) \;\mp\; \sqrt{B_\diamond(\alpha,\gamma)^2 - 4A_\diamond(\alpha,\gamma)C_\diamond(\alpha)}}{2A_\diamond(\alpha,\gamma)}, \qquad A^\diamond_1(\alpha,\gamma) < A^\diamond_2(\alpha,\gamma). \tag{C.5}$$

Exact set where $CS^v > CS^f$ (necessary and sufficient).

$$\{R:\, CS^v > CS^f\} = \big(A_1^<(\alpha,\gamma),\, A_1^>(\alpha,\gamma)\cap(0,R^\star)\big) \,\cup\, \big(A_2^<(\alpha,\gamma),\, A_2^>(\alpha,\gamma)\cap[R^\star,1)\big). \tag{C.6}$$

Case-free sufficient interval (conservative).

$$A_1(\alpha,\gamma) = \max\{A_1^<(\alpha,\gamma),\, A_1^>(\alpha,\gamma)\}, \qquad A_2(\alpha,\gamma) = \min\{A_2^<(\alpha,\gamma),\, A_2^>(\alpha,\gamma)\}. \tag{C.7}$$

Whenever $A_1(\alpha,\gamma) < A_2(\alpha,\gamma)$, every $R \in (A_1(\alpha,\gamma), A_2(\alpha,\gamma))$ guarantees $CS^v > CS^f$ without checking which case applies.

Threshold in α (existence of a nonempty conservative interval).

$$\boxed{\alpha_1(\gamma) \;\equiv\; \sup\Big\{\alpha \in (0,1) :\; A_1(\alpha,\gamma) < A_2(\alpha,\gamma)\Big\}.} \tag{C.8}$$

For any $\alpha < \alpha_1(\gamma)$, the conservative interval $(A_1(\alpha,\gamma), A_2(\alpha,\gamma))$ is nonempty. A stronger "all-R" guarantee requires $A_1(\alpha,\gamma) \le 0$ and $A_2(\alpha,\gamma) \ge 1$.

Appendix A.6. Profit Bounds (PS^v vs. PS^f)

Let

$$R \equiv \frac{\Delta C}{\Delta Q} \in (0,1), \qquad R^\star \equiv \frac{1}{3-\gamma}, \qquad R_f \equiv \frac{1+\gamma R}{3}, \qquad \eta^{\,v} \equiv \frac{1+\alpha R}{2+\alpha}. \tag{P.1}$$

Under partial information sharing, existing downstream firms either disclose or stay anonymous. On the side that hides, the anonymous price is pinned by the marginal disclosing existing type. Together with the new-firm indifference condition $\gamma(P_B^v - P_A^v) = \eta^{\,v}\Delta Q$, this yields

$$\eta^{\,v} = \bar{\eta}_B - R_f \quad (R < R^\star), \qquad \eta^{\,v} = R_f - \underline{\eta}_A \quad (R \ge R^\star), \tag{P.2}$$

and implies $P_A^v = P_A^f$ when $R < R^\star$ and $P_B^v = P_B^f$ when $R \ge R^\star$.

Subtracting no information-sharing profits from voluntary information-sharing profits and using (**??**)–(**??**) to eliminate $\bar{\eta}_B, \underline{\eta}_A, \eta^{\,v}$, we obtain in both regions a quadratic in R:

$$\Delta PS \equiv PS^v - PS^f = \frac{\Delta Q}{18\,\gamma(2+\alpha)^2}\Big(A_\diamond^{PS}(\alpha,\gamma)\,R^2 + B_\diamond^{PS}(\alpha,\gamma)\,R + C_\diamond^{PS}(\alpha)\Big), \tag{P.3}$$

where $\diamond \in \{<, >\}$ denotes $R < R^\star$ or $R \ge R^\star$.

Coefficients.

$$\begin{aligned}
\text{Case } R < R^\star: \quad A_<^{PS}(\alpha,\gamma) &= \alpha^3\gamma^2 - 12\alpha^3\gamma + 9\alpha^3 - \alpha^2\gamma^2 - 66\alpha^2\gamma + 45\alpha^2 - 16\alpha\gamma^2 \\
&\quad - 12\alpha\gamma - 20\gamma^2 + 144\gamma - 72, \\
B_<^{PS}(\alpha,\gamma) &= 2\alpha^3\gamma + 6\alpha^3 + 22\alpha^2\gamma + 6\alpha^2 + 10\alpha\gamma + 6\alpha - 52\gamma, \\
C_<^{PS}(\alpha) &= \alpha^3 + 5\alpha^2 - \alpha - 5; \\
\text{Case } R \geq R^\star: \quad A_>^{PS}(\alpha,\gamma) &= \alpha^3\gamma^2 - 24\alpha^3\gamma + 45\alpha^3 - \alpha^2\gamma^2 - 78\alpha^2\gamma + 45\alpha^2 \\
&\quad - 16\alpha\gamma^2 + 12\alpha\gamma - 20\gamma^2 + 144\gamma - 72, \\
B_>^{PS}(\alpha,\gamma) &= 14\alpha^3\gamma - 24\alpha^3 + 52\alpha^2\gamma + 12\alpha^2 + 22\alpha\gamma - 6\alpha - 52\gamma, \\
C_>^{PS}(\alpha) &= 4\alpha^3 - 10\alpha^2 - 7\alpha - 5.
\end{aligned} \tag{P.4}$$

Roots and per-case bounds. For each region $\diamond \in \{<, >\}$, define the ordered roots

$$A_{3,4}^{\diamond}(\alpha,\gamma) = \frac{-B_\diamond^{PS}(\alpha,\gamma) \;\mp\; \sqrt{\left(B_\diamond^{PS}(\alpha,\gamma)\right)^2 - 4A_\diamond^{PS}(\alpha,\gamma)\, C_\diamond^{PS}(\alpha)}}{2A_\diamond^{PS}(\alpha,\gamma)}, \qquad A_3^{\diamond}(\alpha,\gamma) < A_4^{\diamond}(\alpha,\gamma). \tag{P.5}$$

Exact condition (necessary & sufficient).

$$PS^v > PS^f \iff \begin{cases} A_3^{<}(\alpha,\gamma) < R < A_4^{<}(\alpha,\gamma), & \text{if } R < R^\star, \\ A_3^{>}(\alpha,\gamma) < R < A_4^{>}(\alpha,\gamma), & \text{if } R \geq R^\star. \end{cases} \tag{P.6}$$

Case-free sufficient interval (conservative).

$$A_3(\alpha,\gamma) = \max\{A_3^{<}(\alpha,\gamma),\, A_3^{>}(\alpha,\gamma)\}, \qquad A_4(\alpha,\gamma) = \min\{A_4^{<}(\alpha,\gamma),\, A_4^{>}(\alpha,\gamma)\}. \tag{P.7}$$

Whenever $A_3(\alpha,\gamma) < A_4(\alpha,\gamma)$, every $R \in \big(A_3(\alpha,\gamma), A_4(\alpha,\gamma)\big)$ implies $PS^v > PS^f$ without checking which case applies.

Threshold in α (existence of a nonempty conservative interval).

$$\boxed{\alpha_2(\gamma) \;\equiv\; \sup\Big\{\alpha \in (0,1) :\; A_3(\alpha,\gamma) < A_4(\alpha,\gamma)\Big\}.} \tag{P.8}$$

For any $\alpha < \alpha_2(\gamma)$, the conservative interval $\big(A_3(\alpha,\gamma), A_4(\alpha,\gamma)\big)$ is nonempty.