

Communicating Quality: Disclosure or Price Signaling

A step-by-step exercise in the spirit of Daughety and Reinganum (2008)

Companion note to Daughety, A. F., and J. F. Reinganum (2008), “Communicating Quality: A Unified Model of Disclosure and Signalling,” *RAND Journal of Economics* 39(4): 973–989. Full references at the end.

Overview. A firm that knows the quality of its product can tell consumers about it in two ways. It can *disclose* the quality through a credible channel, such as an independent audit, at a cost, or it can *signal* the quality through an action that consumers observe, such as a high price. The two literatures have developed separately. Disclosure models assume that marginal cost does not depend on quality, so a firm that does not disclose can only pool with others; signaling models assume that higher quality is costlier to produce and ignore disclosure. Daughety and Reinganum (2008) put the two together: when higher quality is costlier to produce, the alternative to disclosure is not silence but a revealing price, so disclosure and signaling are substitutes, and the firm picks the less costly channel. The main results are that the lowest type signals without distortion, that higher types distort their price upward and so earn less, that types above a cutoff disclose, and therefore that profit is U-shaped in quality; that voluntary disclosure is socially *insufficient*, whereas the classical pooling analysis finds it excessive; and that a decentralized subsidy can restore efficiency. This note builds the model with a linear demand and a uniform prior, so that every number can be computed. Section 1 sets up the model; Step (a) solves the full-information benchmark, which is the outcome under disclosure; Step (b) solves the separating signaling equilibrium; Step (c) shows how signaling costs profit and how the loss grows with quality; Step (d) solves the firm’s choice between the two channels; Step (e) compares it with the social optimum and describes mandatory disclosure and a subsidy; Step (f) contrasts the result with the classical model in which quality does not affect cost; and Step (g) lists what the toy model keeps and drops.

1. The Toy Model

Quality. A monopolist produces a good of quality $\theta \in [\underline{\theta}, \bar{\theta}] = [0, 1]$, which it observes and consumers do not. Quality is the probability that a unit is completely satisfactory, and consumers’ prior is uniform on the unit interval. Step (f) uses the same type space and prior.

Consumers. A consumer’s utility from q units is $(\alpha - (1 - \tilde{\theta})\delta)q - \frac{\beta}{2}q^2 + I - pq$, where $\tilde{\theta}$ is the perceived quality, p is the price, and I is income. A satisfactory unit yields a linear coefficient α and a disappointing unit yields $\alpha - \delta$, so a higher perceived quality shifts demand out, and demand is

$$q(p, \tilde{\theta}) = \frac{A(\tilde{\theta}) - p}{\beta}, \quad A(\tilde{\theta}) \equiv \alpha - (1 - \tilde{\theta})\delta. \quad (1)$$

Perceived quality equals θ if the firm discloses. Otherwise consumers form it from the price, by a belief function $B(p)$ that is part of a perfect Bayesian equilibrium.

The firm. A firm of type θ produces at constant marginal cost $k\theta$, so higher quality is costlier, and earns

$$\pi(p, \theta, \tilde{\theta}) = \frac{(p - k\theta)(A(\tilde{\theta}) - p)}{\beta}. \quad (2)$$

Once it knows θ , the firm chooses its price and whether to disclose, which costs $D > 0$ (for example, an audit). Disclosure is truthful, so the perceived quality is θ .

Parameter values. $\alpha = \frac{5}{2}$, $\beta = 1$, $\delta = 1$, and $k = \frac{1}{2}$, so $A(\bar{\theta}) = \frac{3}{2} + \bar{\theta}$ and $q = \frac{3}{2} + \bar{\theta} - p$. The choices $\beta = \delta = 1$ are normalizations. The paper assumes $0 < \underline{\theta} < \bar{\theta} < 1$, so the unit type space is a limiting case, which the paper itself uses in its Section 4. The value $\alpha = \frac{5}{2}$ keeps the intercept $A(\bar{\theta}) = \frac{3}{2} + \bar{\theta}$ simple while satisfying the paper's assumptions: quality is socially valuable, $\delta > k$ (Assumption 1); every type can earn a positive margin at some price, $A(\underline{\theta}) = \frac{3}{2} > k\bar{\theta} = \frac{1}{2}$ (Assumption 2); and a slightly stronger version used in the proofs, $A(\underline{\theta}) = \frac{3}{2} > k\bar{\theta} + k(\bar{\theta} - \underline{\theta}) = 1$ (Assumption A3). Step (f) reuses α, β , and δ with $k = 0$. Figure 1 depicts demand (1) for three perceived qualities: each unit of perceived quality raises the intercept $A(\bar{\theta})$ by $\delta = 1$, so the same price sells more when consumers believe quality is higher, which is why the firm cares about perceptions.

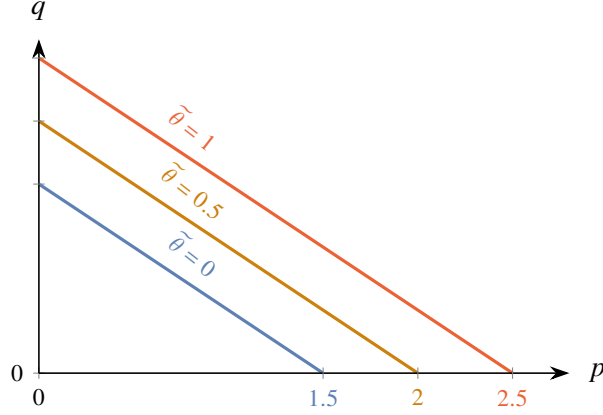


Figure 1: Demand $q = \frac{3}{2} + \bar{\theta} - p$ for three perceived qualities; the intercepts on the price axis are $A(\bar{\theta}) = \frac{3}{2} + \bar{\theta}$.

2. Step (a): Full Information

Suppose consumers observe θ . The firm maximizes (2) with $\bar{\theta} = \theta$, so

$$P^f(\theta) = \frac{A(\theta) + k\theta}{2}, \quad \pi^f(\theta) = \frac{(A(\theta) - k\theta)^2}{4\beta}, \quad CS^f(\theta) = \frac{(A(\theta) - P^f(\theta))^2}{2\beta}, \quad (3)$$

the price, profit, and consumer surplus. In the toy, $P^f(\theta) = \frac{3}{4}(1 + \theta)$, $\pi^f(\theta) = \frac{(3+\theta)^2}{16}$, and $CS^f(\theta) = \frac{(3+\theta)^2}{32}$. All three rise with quality: a unit of quality raises the demand intercept by δ and marginal cost by $k < \delta$. A firm that discloses pays D and charges $P^f(\theta)$, earning $\pi^f(\theta) - D$. At the two ends of the interval, $P^f = 0.75$ and $\pi^f = 0.5625$ at $\theta = 0$, and $P^f = 1.5$ and $\pi^f = 1$ at $\theta = 1$.

3. Step (b): The Separating Signaling Equilibrium

Now suppose disclosure is too costly to be used, and consumers infer quality from the price. A *separating* equilibrium is a strictly increasing price function $P^s(\theta)$ and beliefs $B^*(p)$ such that each type prefers its price to any other, $\pi(P^s(\theta), \theta, \theta) \geq \max_p \pi(p, \theta, B^*(p))$, and beliefs are correct, $B^*(P^s(\theta)) = \theta$.

The differential equation. A type that charges p is perceived as $B(p)$, so its profit is $\pi(p, \theta, B(p))$. The first-order condition in p is

$$(A(B(p)) - p) + (p - k\theta)(\delta B'(p) - 1) = 0.$$

In equilibrium $B(P^s(\theta)) = \theta$ and $B'(p) = \frac{1}{P^s(\theta)}$, so P^s solves

$$\frac{dp}{d\theta} = \frac{\delta(p - k\theta)}{2p - A(\theta) - k\theta} = \frac{p - \frac{1}{2}\theta}{2p - \frac{3}{2} - \frac{3}{2}\theta} \quad \text{in the toy.} \quad (4)$$

The numerator is positive. The denominator is positive if and only if $p > P^f(\theta)$, since $2P^f = A + k\theta$. So the equilibrium price rises with quality, has a slope above δ (because $p - k\theta > 2p - A - k\theta$ when $p < A$), and lies above the full-information price wherever it is defined. The lowest type has no one below it to deter, so it has no reason to distort: the initial condition is $P^s(\underline{\theta}) = P^f(\underline{\theta}) = 0.75$, where the denominator is zero and the slope is infinite.

The solution. The paper solves (4) implicitly:

$$(A(\theta) - p)^{\delta-k} \left(2p - k\theta + \frac{k(\alpha - \delta)}{\delta - k} \right)^{\delta} = K, \quad \text{that is,} \quad \sqrt{\frac{3}{2} + \theta - p} \left(2p - \frac{1}{2}\theta + \frac{3}{2} \right) = K \quad (5)$$

in the toy. Differentiating the logarithm of the left side along (4) gives zero, so the left side is constant along the solution, and K is set by the boundary condition at $\theta = 0$: $K = \sqrt{0.75} \cdot 3 = \frac{3}{2}\sqrt{3} = 2.598$. Solving for p at each θ gives the schedule of Table 1.

Result 1 (Proposition 1 of the paper). There is a unique separating perfect Bayesian equilibrium:

- the lowest type charges its full-information price, $P^s(\underline{\theta}) = P^f(\underline{\theta})$;
- every higher type charges more than its full-information price, and P^s is strictly increasing and concave, given by (5);
- beliefs are $B^*(p) = (P^s)^{-1}(p)$ for prices on the schedule, $\underline{\theta}$ below it, and $\bar{\theta}$ above it.

Intuitively, a higher price is a costly signal because it cuts the quantity sold, and a lower-quality type, which has the lower cost $k\theta$, would gain from being taken for a higher type. To deter that, the price schedule must climb faster than the value of quality to consumers, δ , and the distortion accumulates with quality. In the toy, $P^s(1) = 2.282$ against $P^f(1) = 1.5$, and quantity at the top falls from 1 to $A - P^s = 0.218$.

Figure 2 depicts the two price functions against quality. They coincide at $\theta = 0$, the signaling price rises steeply at first and then flattens (concave), and the gap, which is the price distortion, widens with quality.

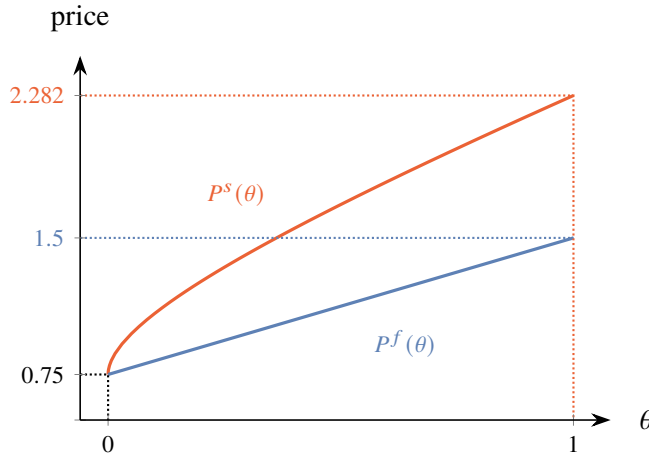


Figure 2: Signaling price $P^s(\theta)$ and full-information price $P^f(\theta) = \frac{3}{4}(1 + \theta)$ against quality, with $\delta = 1$ and $k = \frac{1}{2}$.

The equilibrium price is the best reply of each type to the beliefs. Figure 3 depicts, for the type $\theta = 0.5$, its profit against the price it charges. The blue curve is the profit if consumers perceived the true quality at every price, which peaks at the full-information price $P^f(0.5) = 1.1250$ with height $\pi^f = 0.7656$. The red curve is the profit under the equilibrium beliefs $B^*(p)$: consumers infer a higher quality from a higher price, which raises demand along the curve. The red curve lies below the blue one at lower prices, where consumers underestimate quality, and above it at higher prices, where they overestimate it; the two cross at $P^s(0.5) = 1.6833$, where beliefs are correct, and the red curve peaks there with height $\pi^s = 0.4539$. Under these beliefs the type does not gain from any other price.

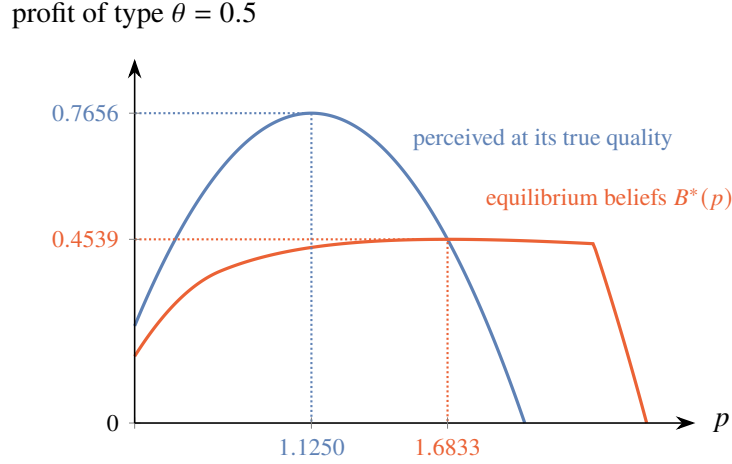


Figure 3: Profit of type $\theta = 0.5$ against its price, if perceived at its true quality at every price (blue) and under the equilibrium beliefs (red).

4. Step (c): The Cost of Signaling

Substituting the equilibrium price, the profit of type θ under signaling is $\pi^s(\theta) = \frac{(P^s - k\theta)(A - P^s)}{\beta}$. Beliefs are correct in equilibrium and the first-order condition holds, so by the envelope theorem only the direct effect of quality on cost remains,

$$\frac{d\pi^s}{d\theta} = -\frac{k(A(\theta) - P^s(\theta))}{\beta} = -k q^s(\theta) < 0, \quad (6)$$

while the full-information profit rises, $\frac{d\pi^f}{d\theta} = \frac{(\delta - k)(A - k\theta)}{2\beta} > 0$. Signaling profit *falls* with quality because of the price distortion, and the two coincide at the lowest type, $\pi^s(\underline{\theta}) = \pi^f(\underline{\theta})$. The profit loss from having to signal, $\Delta\pi \equiv \pi^f - \pi^s$, is therefore strictly increasing in quality,

$$\frac{d\Delta\pi}{d\theta} = \frac{(\delta - k)(A - k\theta)}{2\beta} + k q^s(\theta) > 0. \quad (7)$$

Result 2 (Proposition 2 of the paper). The difference $\pi^f(\theta) - \pi^s(\theta)$ is strictly increasing in θ , from zero at the lowest type.

Table 1 reports the two prices and the two profits. The loss rises from 0 at $\theta = 0$ to 0.6115 at $\theta = 1$, and signaling profit falls from 0.5625 to 0.3885 while full-information profit rises from 0.5625 to 1.

θ	P^f	P^s	π^f	π^s	$\Delta\pi = \pi^f - \pi^s$
0.0	0.7500	0.7500	0.5625	0.5625	0.0000
0.2	0.9000	1.2613	0.6400	0.5094	0.1306
0.4	1.0500	1.5520	0.7225	0.4705	0.2520
0.6	1.2000	1.8093	0.8100	0.4388	0.3712
0.8	1.3500	2.0505	0.9025	0.4119	0.4906
1.0	1.5000	2.2820	1.0000	0.3885	0.6115

Table 1: Prices and profits under full information (f) and under signaling (s), with $\alpha = \frac{5}{2}$, $\beta = 1$, $\delta = 1$, and $k = \frac{1}{2}$.

5. Step (d): The Choice between Signaling and Disclosure

A type strictly prefers to disclose if and only if $\pi^f(\theta) - D > \pi^s(\theta)$, that is, if and only if $\Delta\pi(\theta) > D$. By Result 2, there are three cases:

- if $D \geq \Delta\pi(\bar{\theta}) = 0.6115$, every type signals;
- if $D = 0$, every type discloses;
- if $0 < D < \Delta\pi(\bar{\theta})$, there is a marginal type θ^V with $\Delta\pi(\theta^V) = D$: types below it signal and types above it disclose. The marginal type is indifferent and, as in the paper, is assumed to disclose.

A nondisclosing price above $P^s(\theta^V)$ is off the equilibrium path, and consumers treat it as coming from the type $B^*(p)$; the incentive constraints then guarantee that no disclosing type gains by signaling instead. The firm's overall profit is

$$\Pi(\theta) = \begin{cases} \pi^s(\theta) & \text{if } \theta < \theta^V, \\ \pi^f(\theta) - D & \text{if } \theta \geq \theta^V, \end{cases} \quad (8)$$

which is continuous. It falls on $[\underline{\theta}, \theta^V]$, because π^s falls, and rises on $[\theta^V, \bar{\theta}]$, because π^f rises: profit is *U-shaped* in quality. The highest type earns more than the lowest if $\pi^f(\bar{\theta}) - D > \pi^s(\underline{\theta}) = \pi^f(\underline{\theta})$, that is, if $D < D^{\text{mod}} \equiv \pi^f(\bar{\theta}) - \pi^f(\underline{\theta})$, a *moderate* disclosure cost.

Result 3 (voluntary disclosure and U-shaped profit). For $0 < D < \Delta\pi(\bar{\theta})$:

- types below θ^V signal and types above it disclose, where $\Delta\pi(\theta^V) = D$;
- overall profit $\Pi(\theta)$ is U-shaped in θ , with its minimum at θ^V ;
- if $D < D^{\text{mod}}$, the highest type earns the most; if $D^{\text{mod}} < D < \Delta\pi(\bar{\theta})$, the lowest type does.

In the toy, $D^{\text{mod}} = 1 - 0.5625 = 0.4375$. For $D = 0.3$ (moderate), $\theta^V = 0.480$, the minimum profit is $\Pi(\theta^V) = 0.4571$, and $\Pi(\bar{\theta}) = 0.7000 > \Pi(\underline{\theta}) = 0.5625$. For $D = 0.5$ (between D^{mod} and 0.6115), $\theta^V = 0.816$, the minimum is 0.4099, and $\Pi(\bar{\theta}) = 0.5000 < \Pi(\underline{\theta})$. Disclosure at moderate cost partly resolves a problem of many price-signaling models: there, higher-quality firms earn less, so firms would want to produce low quality, whereas here the highest type earns the most.

Figure 4 depicts the profits for $D = 0.3$ in panel (a) and $D = 0.5$ in panel (b). The red curve is signaling profit π^s and the blue curves are full-information profit π^f (solid) and net of the disclosure cost (dashed).

The firm earns the higher of the red curve and the dashed blue curve, shown in green, and the two cross at θ^V . In panel (a) the right end of the green curve is above its left end, and in panel (b) it is below.

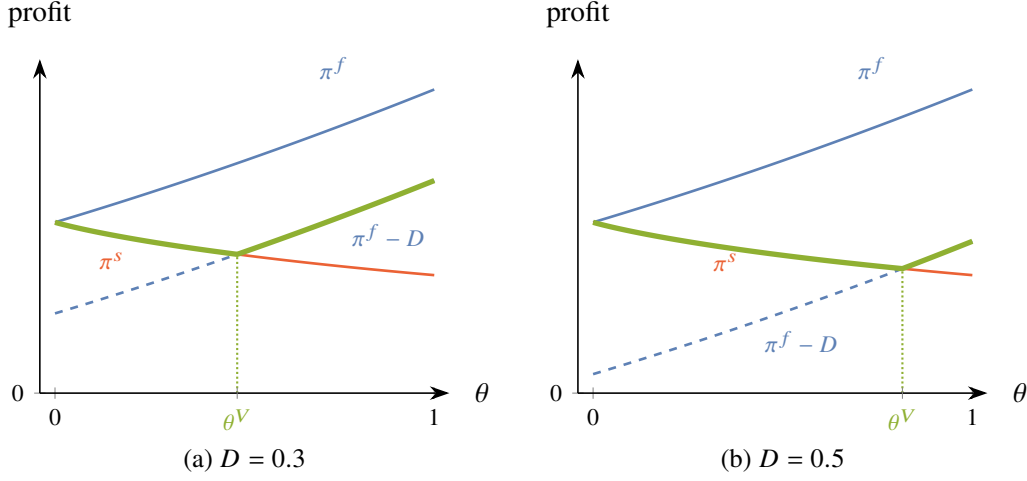


Figure 4: Full-information profit π^f , its value net of the disclosure cost, signaling profit π^s , and the firm's overall profit Π (green) against quality.

6. Step (e): Social Efficiency, Mandatory Disclosure, and a Subsidy

The firm weighs only its own profit when it chooses its channel. Disclosure also lowers the price from the signaling schedule to the full-information line and raises output, which benefits consumers. Define consumer surplus under signaling as $CS^s(\theta) = \frac{(A - P^s)^2}{2\beta}$ and the surplus gain from disclosure as $\Delta CS(\theta) \equiv CS^f(\theta) - CS^s(\theta)$, which is strictly increasing in θ (Proposition 3 of the paper). Table 2 reports the numbers. Let $W(\hat{\theta})$ be total surplus when types below $\hat{\theta}$ signal and types above it disclose,

$$W(\hat{\theta}) = \int_{\underline{\theta}}^{\hat{\theta}} (CS^s + \pi^s) dG(\theta) + \int_{\hat{\theta}}^{\bar{\theta}} (CS^f + \pi^f - D) dG(\theta), \quad (9)$$

so that

$$W'(\hat{\theta}) = [D - \Delta\pi(\hat{\theta}) - \Delta CS(\hat{\theta})] g(\hat{\theta}). \quad (10)$$

The bracket equals $D > 0$ at $\underline{\theta}$ and decreases in $\hat{\theta}$, by Result 2 and Proposition 3. When $0 < D < \Delta\pi(\bar{\theta})$, the case the paper studies, it equals $-\Delta CS(\theta^V) < 0$ at θ^V , so surplus is maximized at the unique θ^W with $\Delta\pi(\theta^W) + \Delta CS(\theta^W) = D$. The firm's own cutoff solves $\Delta\pi(\theta^V) = D$. Since $\Delta CS > 0$, $\theta^W < \theta^V$.

Result 4 (Section 3 of the paper).

- Voluntary disclosure is socially insufficient: types in $[\theta^W, \theta^V)$ signal although surplus would be higher if they disclosed.
- Mandatory disclosure lowers prices and raises output, but it makes types below θ^W pay D although surplus is higher if they signaled.
- A subsidy $s(\theta; D) = \pi^s(\theta) - (\pi^f(\theta) - D)$ for $\theta \in [\theta^W, \theta^V]$ and zero otherwise, paid to a type that obtains an audit, induces the efficient channel with the smallest payments that achieve it and leaves the firm's overall profit $\Pi(\theta)$ unchanged.

In the toy with $D = 0.3$, $\theta^V = 0.480$ and $\theta^W = 0.152$. Figure 5 depicts the two conditions: θ^V is where the red curve $\Delta\pi$ reaches D , and θ^W is where the green curve $\Delta\pi + \Delta CS$ does. The subsidy equals $D - \Delta\pi(\theta)$: at θ^W it equals $\Delta CS(\theta^W) = 0.1995$, the consumer gain that the firm does not internalize, and it falls to zero at θ^V . Table 3 reports average surplus per type, with the uniform prior. For $D = 0.3$, voluntary disclosure gives 0.8170, mandatory disclosure gives 0.8563, and the optimum gives 0.8728, against 0.5271 if every type must signal. For $D = 0.5$ the numbers are 0.6204, 0.6563, and 0.7217, so the gap between the voluntary outcome and the optimum is larger when disclosure is costlier.

θ	CS^f	CS^s	ΔCS
0.0	0.2813	0.2813	0.0000
0.2	0.3200	0.0962	0.2238
0.4	0.3613	0.0606	0.3007
0.6	0.4050	0.0423	0.3627
0.8	0.4513	0.0311	0.4201
1.0	0.5000	0.0238	0.4762

Table 2: Consumer surplus under full information and under signaling.

gain from disclosure

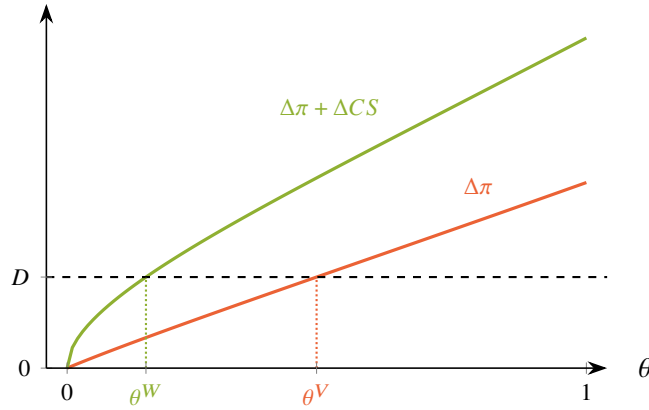


Figure 5: Profit gain $\Delta\pi$ and total gain $\Delta\pi + \Delta CS$ from disclosing, against quality, with the disclosure cost $D = 0.3$.

7. Step (f): The Classical Disclosure Model, Where Quality Does Not Affect Cost

The classical disclosure literature finds that a monopolist discloses too *much*. The paper attributes the difference to two assumptions: that cost does not depend on quality, so that nondisclosure can only pool, and that demand is inelastic. Set $k = 0$ and keep everything else unchanged: θ uniform on $[0, 1]$ and $\alpha = \frac{5}{2}$, $\beta = \delta = 1$, so that $A(\theta) = \frac{3}{2} + \theta$ as before. All types below a cutoff θ^P pool and charge a common price, and consumers' perceived quality is the average of the pool, $\frac{\theta^P}{2}$. The pooled price and profit are $P^f(\frac{\theta^P}{2})$ and $\pi^f(\frac{\theta^P}{2})$, because cost does not vary with type.

	$D = 0.3$	$D = 0.5$
All types signal	0.5271	0.5271
Voluntary disclosure (types above θ^V)	0.8170	0.6204
Mandatory disclosure (all types)	0.8563	0.6563
Socially optimal (types above θ^W)	0.8728	0.7217

Table 3: Average total surplus per type, with a uniform prior on $[0, 1]$.

The firm's cutoff. The marginal type θ^{PV} is indifferent between pooling and disclosing, so $D = \pi^f(\theta) - \pi^f(\frac{\theta}{2})$. With $A(\theta) = \frac{3}{2} + \theta$ and $\pi^f = \frac{A^2}{4}$,

$$D = \frac{A(\theta)^2 - A(\theta/2)^2}{4} = \frac{3\theta}{8} + \frac{3\theta^2}{16}. \quad (11)$$

The planner's cutoff. With $k = 0$, a pooled type consumes $q^P = \frac{A(\theta^P/2)}{2}$ at the pooled price and gains the utility of its true quality, so average surplus over the pool equals the surplus at the pool's average quality: the term that is linear in $\theta - \frac{\theta^P}{2}$ integrates to zero over the pool. Total surplus is $W^P(\theta^P) = \frac{3}{8} \left[\theta^P A(\frac{\theta^P}{2})^2 + \int_{\theta^P}^1 A(\theta)^2 d\theta \right] - D(1 - \theta^P)$, and $\frac{dW^P}{d\theta^P} = 0$ gives

$$D = \frac{3}{8} \left[A(\theta)^2 - A(\frac{\theta}{2})^2 - \theta A(\frac{\theta}{2}) \right] = \frac{3\theta^2}{32}. \quad (12)$$

Figure 6 depicts both cutoffs against D . For the same D , (11) exceeds (12) at every $\theta > 0$, so $\theta^{PV} < \theta^{PW}$: too many types disclose, as in the classical result. Solving the two equations gives $\theta^{PV} = \sqrt{1 + \frac{16D}{3}} - 1$ and $\theta^{PW} = \sqrt{\frac{32D}{3}}$. For example, at $D = 0.06$ the firm's cutoff is $\theta^{PV} = 0.149$ and the planner's is $\theta^{PW} = 0.8$. The planner's cutoff reaches one at $D = \frac{3}{32} = 0.094$, beyond which no disclosure is socially optimal at all.

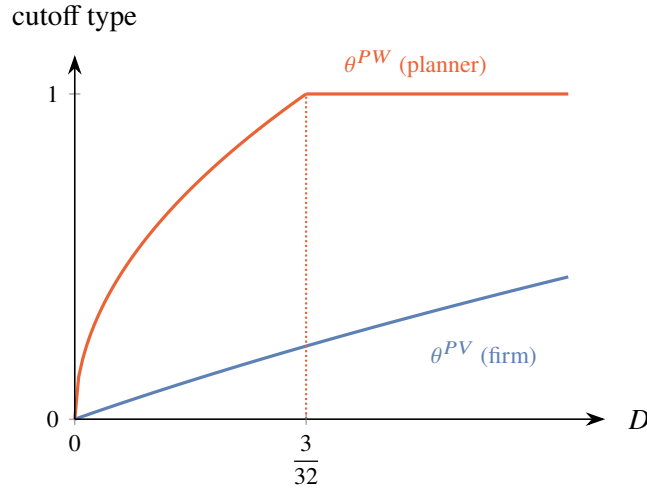


Figure 6: Cutoff type above which types disclose, chosen by the firm (θ^{PV}) and by the planner (θ^{PW}), against the disclosure cost D , with $k = 0$ and θ uniform on $[0, 1]$.

Two comments. First, this reproduces the paper's contrast: with a cost that does not depend on quality, voluntary disclosure is excessive, whereas with $k > 0$ in Step (e) it is insufficient. In the signaling model disclosure lowers a distorted price and raises output, a social gain that the firm does not capture; in the pooling model disclosure by a high type mainly redistributes, and it lowers the pool's average quality, which hurts the types that remain in it. Second, Proposition 4(ii) of the paper adds that the ranking reverses, with insufficient disclosure, when D exceeds $\frac{2(\alpha-\delta)^2}{3\beta}$, which is $\frac{3}{2}$ here. The reversal could not be reproduced: for the planner's problem in the paper's equation (6), with each pooled type treated as the pool's mean, as the paper states, the toy gives $\theta^{PV} < \theta^{PW}$ at every D below $\frac{9}{16}$, the cost at which the firm's cutoff reaches one, and both cutoffs equal one above it. The same holds for any parameters that satisfy Assumption 2, which with $k = 0$ and $\underline{\theta} = 0$ requires $\alpha > \delta$: the firm's condition is $D = \frac{4\delta\theta(\alpha-\delta)+3\delta^2\theta^2}{16\beta}$, the planner's is $D = \frac{3\delta^2\theta^2}{32\beta}$, and the first exceeds the second by $\frac{\delta\theta[8(\alpha-\delta)+3\delta\theta]}{32\beta} > 0$. The threshold in Proposition 4(ii) is the value of D at which the two conditions cross: they are equal at $\theta = \frac{8(\delta-\alpha)}{3\delta}$, where $D = \frac{2(\alpha-\delta)^2}{3\beta}$, but this crossing is positive only if $\alpha < \delta$, a case that Assumption 2 rules out.

8. Step (g): What the Toy Model Keeps and Drops

The toy model keeps the main conclusions of the paper:

1. When higher quality is costlier, the unique separating equilibrium has the lowest type undistorted and every higher type charging more than its full-information price (Step (b), Proposition 1).
2. Signaling profit falls with quality, full-information profit rises, and the gap grows, so only high types disclose (Steps (c) and (d), Proposition 2).
3. Overall profit is U-shaped in quality, and for a moderate disclosure cost the highest type earns the most (Step (d)).
4. Voluntary disclosure is socially insufficient, mandatory disclosure is excessive, and a decentralized subsidy achieves the optimum without changing the firm's profit (Step (e); Section 3 of the paper).
5. When cost does not depend on quality, nondisclosure means pooling and voluntary disclosure is excessive (Step (f)).

The toy fixes a linear-quadratic specification, a uniform prior, and the parameters of Section 1. Relative to Daughety and Reinganum (2008), the firm is a monopolist and price is the only signal; the paper notes that other signals used alongside price, such as advertising, could raise signaling profit and so raise the cutoff θ^V . Disclosure is a perfect, verifiable report bought from a competitive auditor, and a noisy report that keeps the same support would be worth nothing, because the separating price schedule depends only on the support of beliefs. The type space is exogenous: the paper speculates that a firm that chooses its quality by R&D would sample until it draws a low or a high quality, and that its type space could become the union of two intervals. An extension to oligopoly is hard, because each firm's incentive constraint is also a best reply to its rival's price schedule. Each of these features can be relaxed one at a time.

References

Daughety, A. F., and J. F. Reinganum (2008). "Communicating Quality: A Unified Model of Disclosure and Signalling." *RAND Journal of Economics*, 39(4), pp. 973–989.