Regulating Product Communication

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Public debate

- Firms not telling truth about certain product or firm features consumers may care about
  - Dieselgate (Volkwagen), more generally how much environmental damage a product causes
  - Use of child labor (Nike)
  - Illegal sales (seller is not owner, or forgery in art)
  - Your information is safe with us (Facebook)
  - Financial stability of a firm (bank or other financial institution)
- These are usually experience or credence goods (consumer cannot know the true quality at the moment of purchase (use))
- Firm has (truly) private information

Regulation in response

- Newspapers, government, regulators: Consumers are mislead to trust (and thus buy from) the firm
- Regulators respond to enact consumer protection rights, mainly by affecting cost of (false) quality communication
  - FTC Policy on Advertising Substantiation
  - Competition Act in Canada
  - EC 2016 Directive on Misleading & Comparative Advertising
- May affect any type of Public Announcement: Informative Advertising, Product Labeling, Certification & Rating, which we broadly refer to as "(quality) communication"

Some aspects seem to be neglected

- Price signaling: Consumer may infer product quality from price
- How does policy affect ommunication cost? Raising or decreasing cost for all firms, or is there a differential impact?
- What is the effect on market competition (other variables firms choose)?

Price signaling

- Consumer usually knows price when he buys product and price may also convey information about product quality
  - If someone in Amsterdam wants to sell you a second-hand bike for EUR 25, you should infer it is stolen
  - If a so-called art dealer wants to sell you a Van Gogh painting for M 1 EUR, you know it is either stolen or a forgery
  - This remains true even if seller says it is his own bike, or has a document saying the Van Gogh painting is (truly) made by the master himself
- Price signaling found to work experimentally or empirically (wine markets (Mastrubuoni et al., 2014), hotels (Chiu and Chen, 2014))
- Recognized by courts (e.g., in the so-called Benckiser case of illegal dumping; Dutch Supreme Court 1990)
- How does price signaling and direct communication interact?

Policies affecting disclosure cost

- Regulation regarding quality communication may make (i) all forms of communication, or (ii) only the differential cost of false claims more costly
  - Requiring communication satisfies certain standards (externally validated) affect cost of any communication
  - Introducing fines for providing false information (in case of ex-post verifiability), only affects the differential cost of false communication
- Thus, communication is just another way to signal quality with a cost difference for low quality firms; multiple signals, which to use?
- In public policy debate this distinction is usually not made, but may affect market outcomes
- In academic literature, usually interaction with price signaling not taken into account

Competitiveness of markets

- Government policies may affect degree of market competition
  - Information to consumers may affect their choice from which firm to buy, and thus affects competition
  - (differential) cost of direct communication may affect the signaling mechanism firms use (direct communication or price signaling)
- In public policy debate, impact on competitiveness of market is usually not taken into account
- In academic literature, usually a monopolistic setting is studied

Questions

- What is the role of direct (imperfect) communication in communicating private information in the presence of other signaling instruments?
- With cost of false claims, firms have effectively different instruments to signal private information: price and direct communication. How do they choose which signal to use, or do they combine signals?
- What is the case for strengthening regulation and institutions in order to make false disclosure more costly?
- How would it affect strategic behavior of *competing* firms and the eventual market outcome?

Literature

- Regulation of deception: Corts (2013, 2014) Monopoly, allow firms to learn their own true quality at a cost; informal discussion of how penalty on false claims reduces price signaling distortion (closest to our paper)
- Most of the existing literature on quality disclosure: assumes that disclosure is always truthful (credible and verifiable)
- Recent literature on deceptive advertising: Pooling equilibria where low quality advertises as if they are high quality.
  - Rhodes and Wilson (2018) : monopoly, rules out price signaling
  - Piccolo, Tadeschi and Ursino (2015, 2017): duopoly; one firm is known to be high other of low quality, no difference in cost of supplying high and low quality
  - Celik et al. (2018): manipulation through biased product reviews

Literature

- Anderson & Renault (2006): firm provides limited "match" information to buyers, socially undesirable to require more informative content
- Strategic Communication and Persuasion Games
- Kartik, Ottaviani and Squintani (2007), Kartik (2009), Hedlund (2015)

Model

- Competition among firms with private information about quality
- Signals: Price + Direct communication (with possibility of lying)
- Competing senders, multidimensional signaling, signal enters payoff of both senders & receivers
- Direct communication has a fixed cost $D \geq 0$
- Expected future penalty for lying (fine:) $f \geq 0$
- Both D and f are partially influenced by regulation and not both equal to 0

Model

- 2 symmetric firms: $i = 1, 2$
- Products identical except for quality
- Two types of quality: H (High), L (Low)
- Constant unit cost of production (depends on quality):c_H, c_L

$$0 \leq c_L < c_H$$

- Unit mass of identical buyers; unit demand
- Representative buyer's valuation of a unit of quality s : V_s

$$0 < V_L < V_H$$

-

$$V_L > c_L, V_H > c_H$$

- Firms engage in price competition

Model

- Assume
$$\Delta V = V_H - V_L > \Delta c = c_H - c_L$$
Quality Premium exceeds cost differential
- Implies:
$$V_H - c_H > V_L - c_L$$
High quality consumption creates higher social surplus
- Socially desirable: as long as one firm supplies high quality product, all buyers should buy high quality
$\Rightarrow$ Low quality firms should have no market share unless all firms supply low quality.

Disclosure

- Each firm has the option of directly sending a message its product quality by incurring a cost $D \geq 0$
- wlog assume: the only message that can be sent by a firm is "*High*"
- If sent, it is observed publicly by all buyers prior to purchase decisions
- If low quality firm sends this message (misrepresenting its quality), it faces (future, expected) penalty for false disclosure: $f \geq 0$

Extensive Form

1. Each firm (independently) draws its type (product quality) from a common distribution (that assigns probabilities $\alpha, 1-\alpha$ to H, L)
2. Each firm observes its realized type
3. Firms simultaneously decide whether or not to disclose (i.e., send message "HIGH") and set their prices p_1, p_2
4. All buyers observe messages sent and the prices; update their beliefs about product qualities of all firms
5. Buyers decide whether to buy and if so, which firm to buy from
6. Payoffs realized

Payoffs

- Firm's payoff: expected profit (net of any cost of disclosure and false disclosure)
- Buyer's payoff: expected net surplus

Equilibrium Concept

- Perfect Bayesian Equilibrium
- Restriction on out-of-equilibrium beliefs: D1 criterion
  - Generalization of standard D1 to games with multiple senders
  - Looks at the relative strength of different types to deviate
  - Unique symmetric D1 equilibrium (except for a very small region of the parameter space), picking the most competitive revealing equilibrium

Comments on Model I: D and f

- We think of D and f as partially industry-specific and partially determined by government policies
- In some industries with technically more complicated products, it is more costly to convey high quality message. In others, it is (simply) adding a note to an (already existing) ad. Thus, D may vary.
- In some industries where there is third-party certification, it may be more or less costly to buy a good report. Thus, f may vary.
- But, there is also a policy dimension to both parameters. Regulatory fines for lying may increase the cost differential f of disclosure between high and low quality firms. Insisting on third party certification increases D for all firms, whereas introducing categories in environmental standards may facilitate disclosure.

Comments II: Disclosure as a long-term decision

- Direct communication may sometimes have a long-term character
- In that case, it is not a multi-signal signaling game with purely private info anymore as at start of the pricing stage firms may infer quality from the claim of the rival
  - In Janssen and Roy (2015) we have analyzed such an interaction, but where direct communication is always truthful (f is large)
  - As prices depend on claims, strategic interaction between firms is quite different. For example, high quality firms may not want to disclose even if D is small as this may lead to fierce price competition
  - Sequential decisions with differential disclosure cost (f) not large: interesting topic for further research

Comments III: Monopoly Version

- Pure price signaling equilibrium has high quality sets $p_H = V_H$ and low quality $p_L = V_L$. Consumers buy at V_L for sure and buy at V_H with probability $\beta = \frac{V_L - c_L}{V_H - c_L}$
- A direct communication equilibrium has identical pricing, but β_D is now $\beta_D = \frac{V_L - c_L + D + f}{V_H - c_L}$ (to make low quality indifferent to imitate).
- High quality will disclose if $f > \frac{c_H - c_L}{V_H - c_H} D$.
- Individual and social incentives aligned

Comments IV: Without D1 deception in equilibrium

- As it is costly, lying is worthwhile only if it can deceive buyers
- Requires pooling of message and price
- D1 : No pooling or partial pooling
  - $c_H > c_L$: High type can distinguish itself by raising price slightly (and sending same message)
  - buyers recognize that high type has greater incentive to deviate in this fashion

Comments IV: Pooling and Why D1?

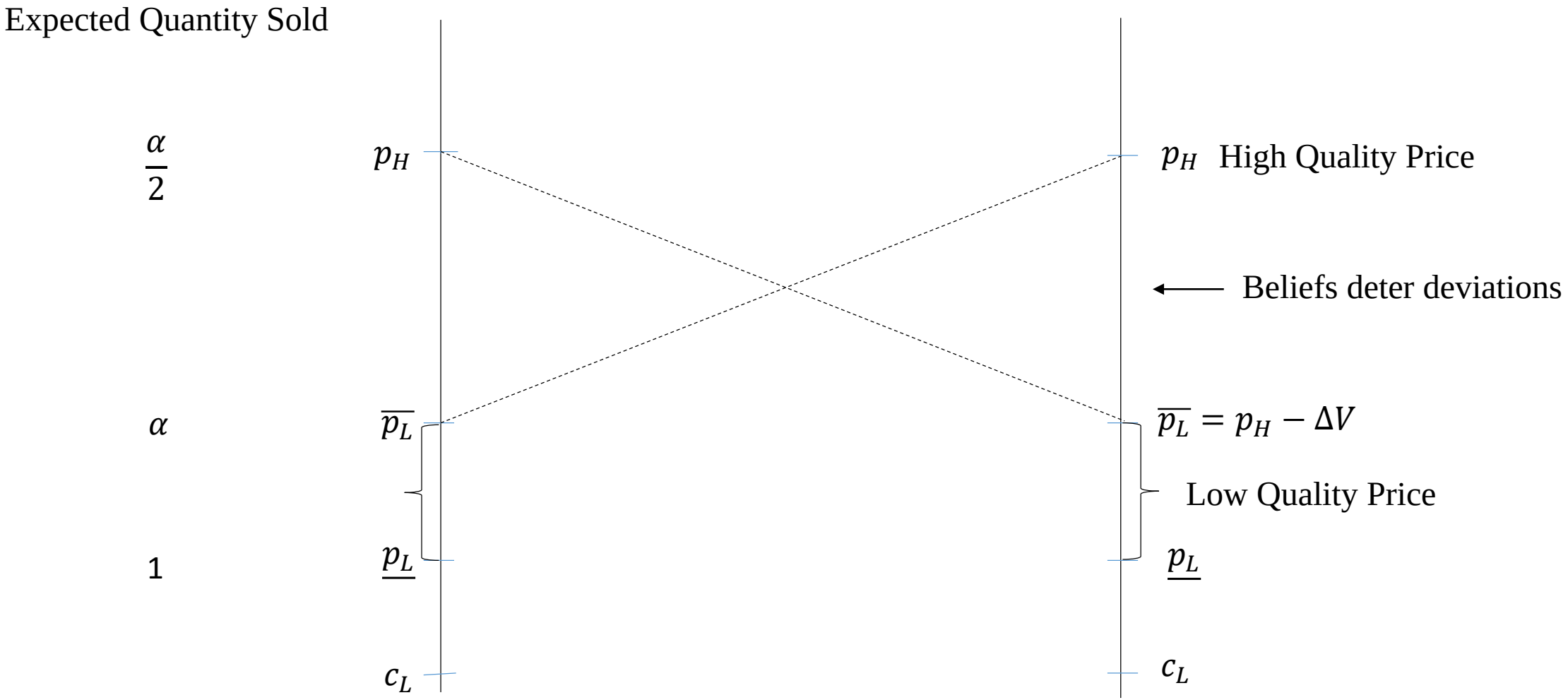
- Literature relies on no cost differential $c_H = c_L$ or on arbitrary out-of-equilbrium beliefs to explain lying (in monopoly context)
- We do not want our results to depend on arbitrary beliefs
- Qualitatively, for large D or large f results continue to hold if weaker refinement is used
- For smaller values, we get (large) multiplicity of equilibria without imposing D1
- Regulation to make lying more costly, may still have more subtle effects, even if in equilibrium no firm lies.
    - alters set of reasonable beliefs buyers can have about type of deviating firm

Pure Price Signaling when Disclosure is not possible

- Only prices are used to signal
- Janssen and Roy (2010): unique symmetric D1 equilibrium that is revealing

Pure Price Signaling: Equilibrium properties

- In any equilibrium: Low quality randomizes prices; high quality does not
  - Low quality should have sufficient rent not to imitate high quality price, but for any price above marginal cost, incentive to undercut
  - This does not apply to high quality as consumer beliefs may be used to destroy incentives to undercut
- Considerable market power and rent for both types
  - Only way to give low quality rents is to create rents to high quality as well
- Consumption distortion: buyers buy low quality even when high quality is available; loss of social surplus (not in monopoly model)
- High and low quality prices (and profits) interlinked, rise and fall together (D1 selects most competitive eq)

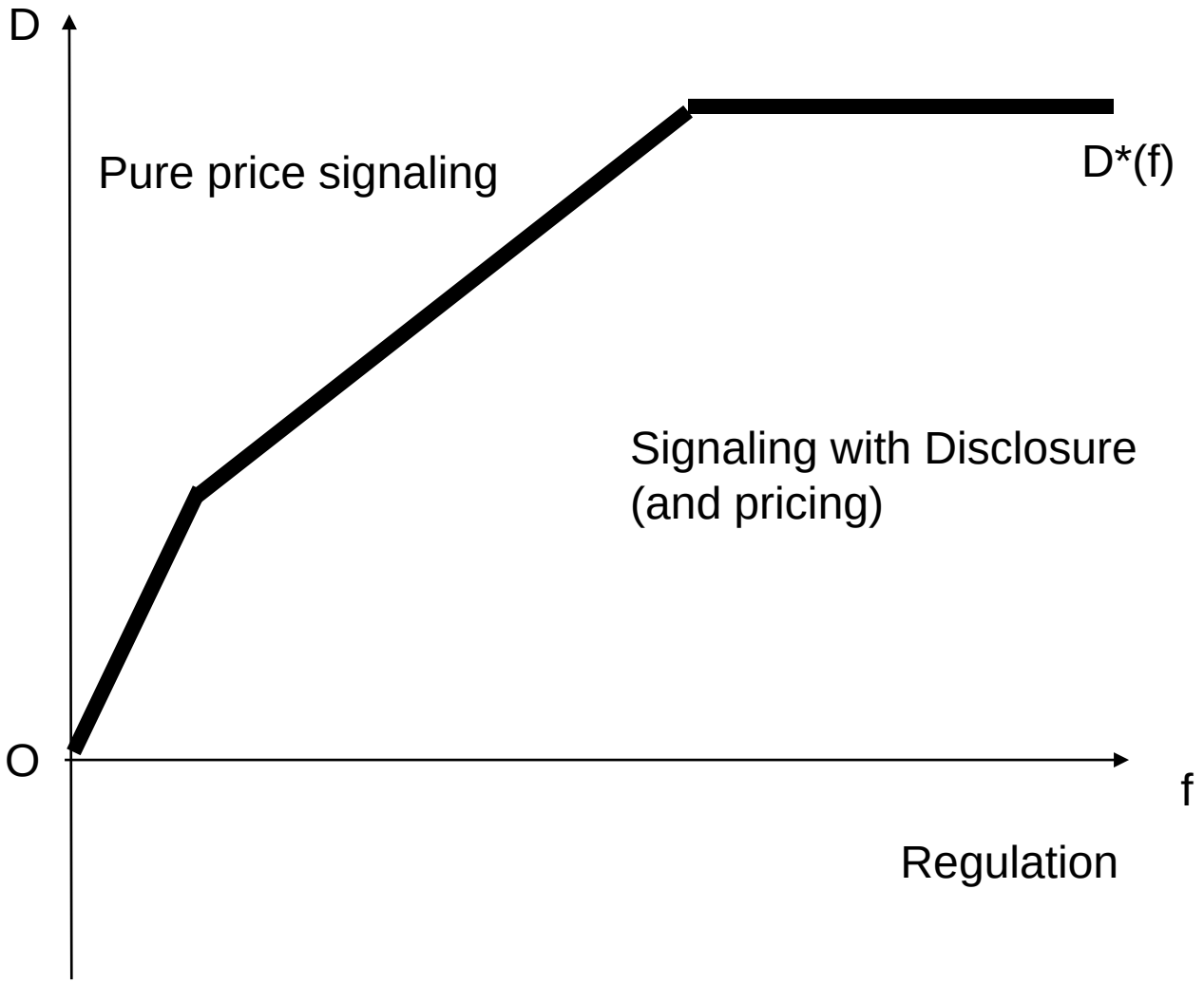


Pure Price Signaling

$$p_H = 2\Delta V - c_L$$

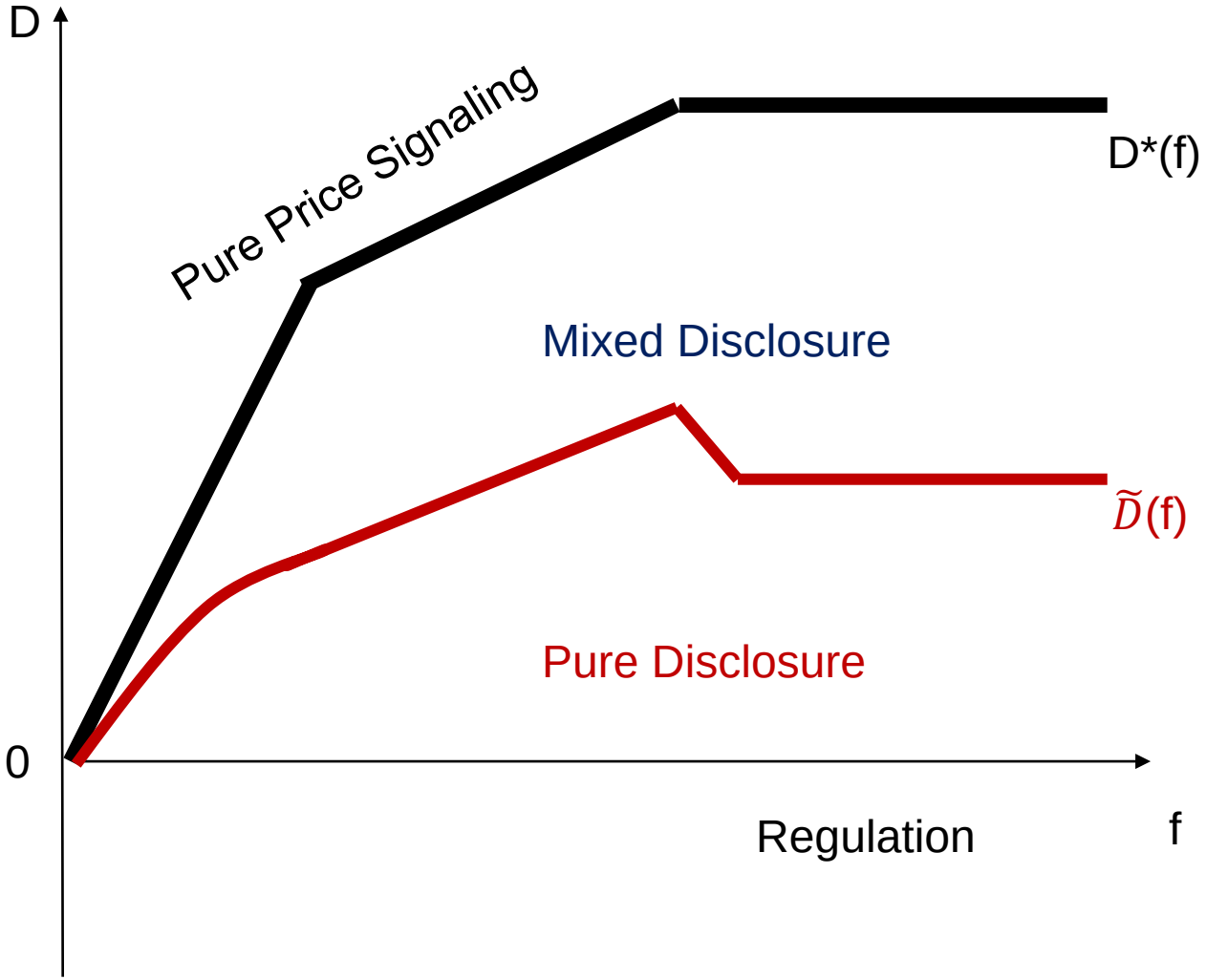
Pure Price Signaling even if Disclosure is Possible?

- Allow direct communication
- If there is a pure price signaling equilibrium (no firm directly communicates), then it must be identical to the one in the version of the model where communicationi allowed.
- The price signaling equilibrium (with no disclosure) is not a D1 equilibrium if false claims are costly to make and direct communication itself is not too costly:
  - high quality firms not deterred (enough) from undercutting pure price signaling outcome
- Thus, a symmetric pure price signaling (D1) equilibrium exists if, and only if, either, direct communication itself is too costly (D exceeds a critical level) or, regulation of false claims is "weak": (f is smaller than a critical level $f(D)$)


D
Pure price signaling
D*(f)
Signaling with Disclosure
(and pricing)
O
f
Regulation

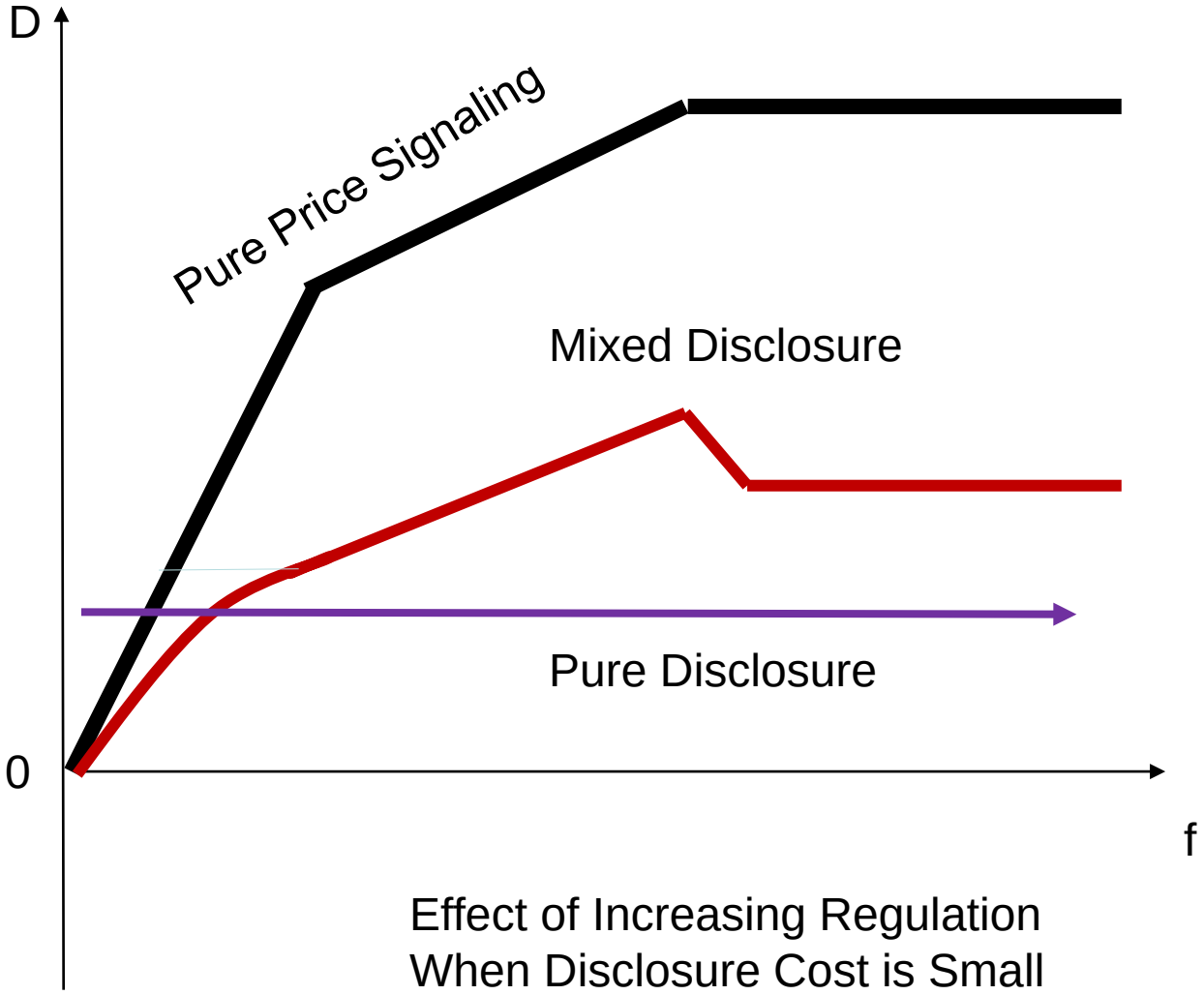
Equilibrium with Disclosure

- Equilibria with moderate regulation : lower prices and more direct communication
  - both direct communication and prices used to communicate information
  - competition (business stealing) creates incentive to directly communicate
- Pure disclosure: high types claim high quality for sure
- Mixed Disclosure: high types randomize between disclosure and non-disclosure

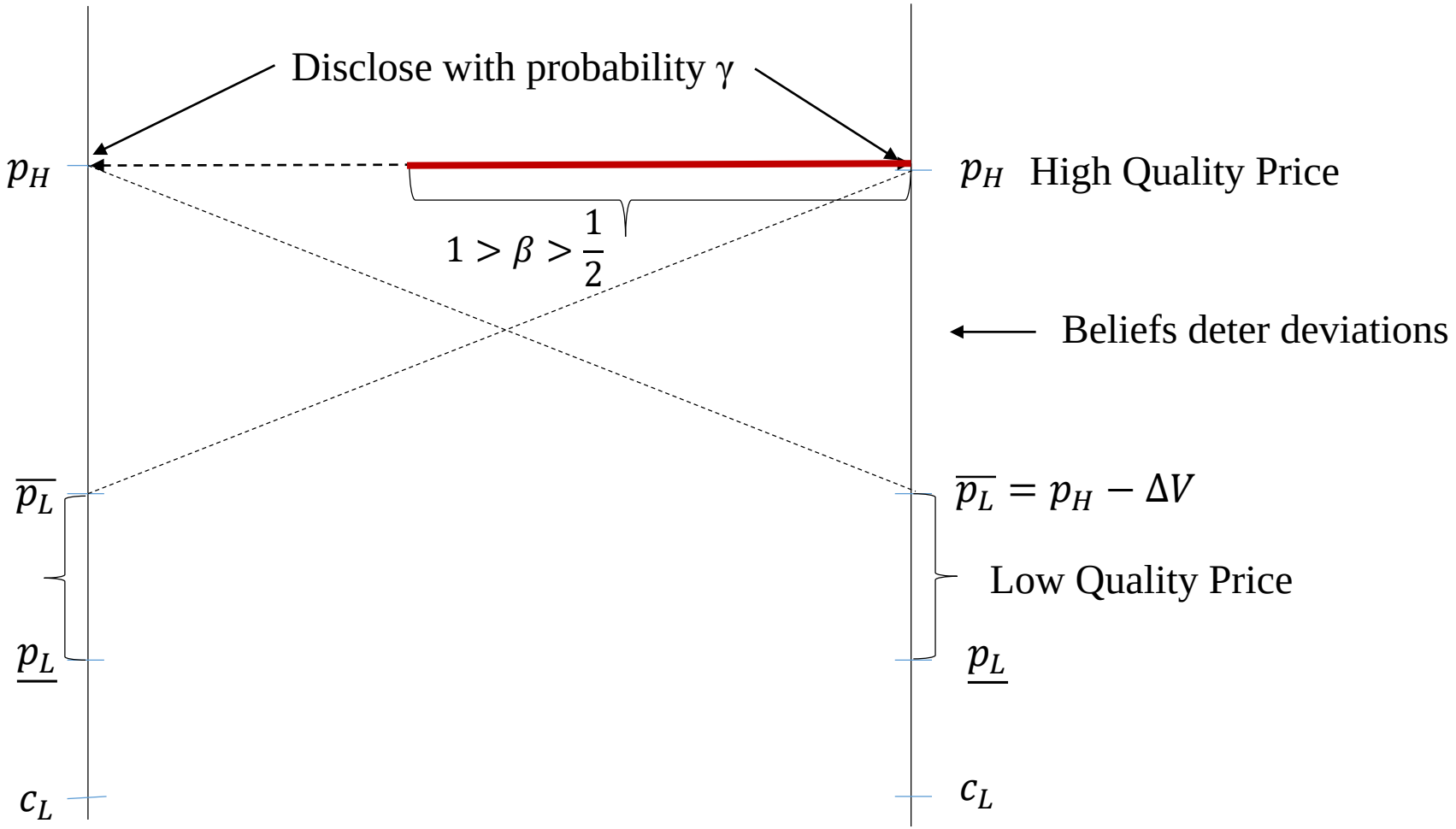


Pure Disclosure: High quality types disclose with prob 1

Mixed Disclosure: High quality types randomize between disclosure and non-disclosure



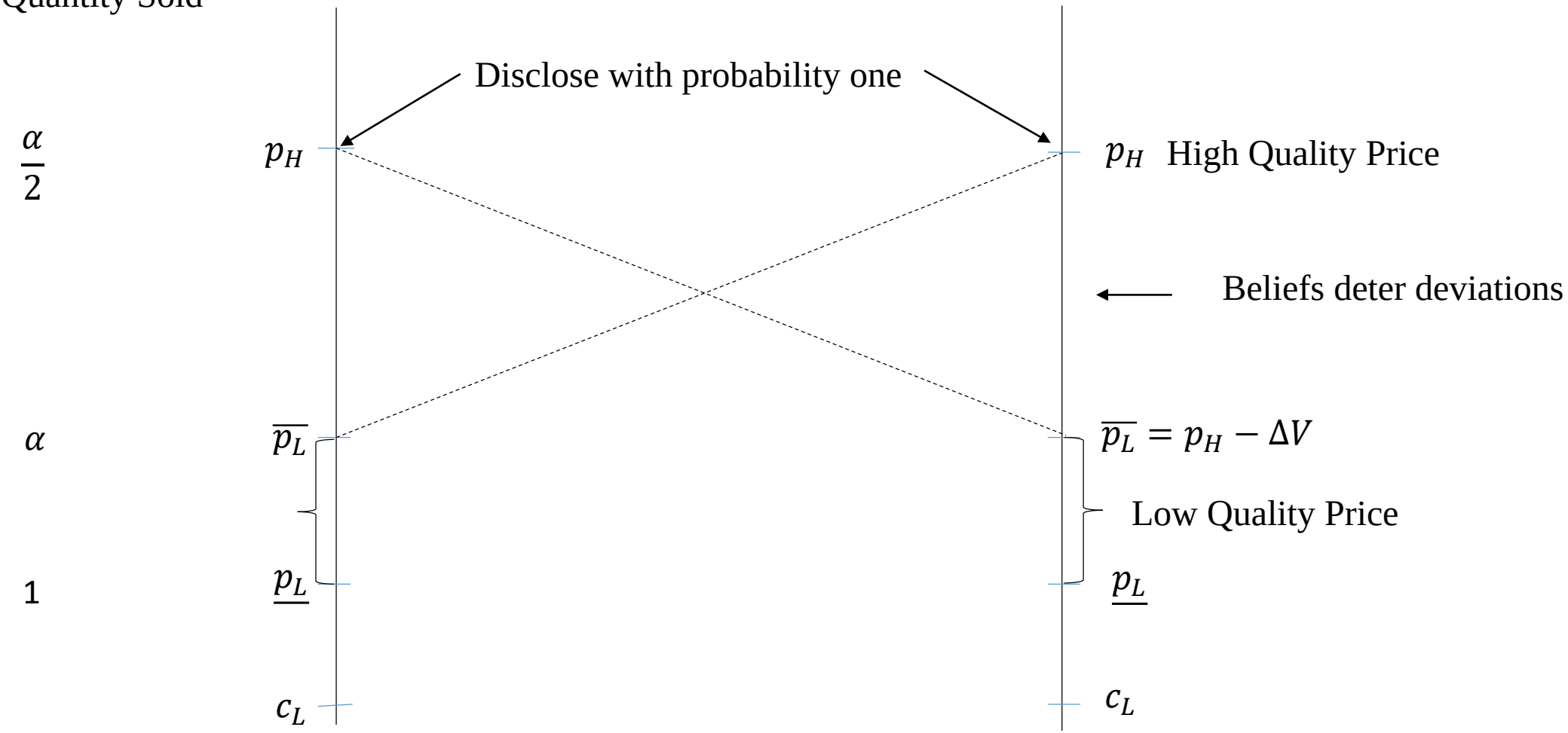
Effect of Increasing Regulation
When Disclosure Cost is Small



$$\uparrow f \Rightarrow p_H \downarrow, \beta \uparrow, \gamma \uparrow, profits \downarrow$$

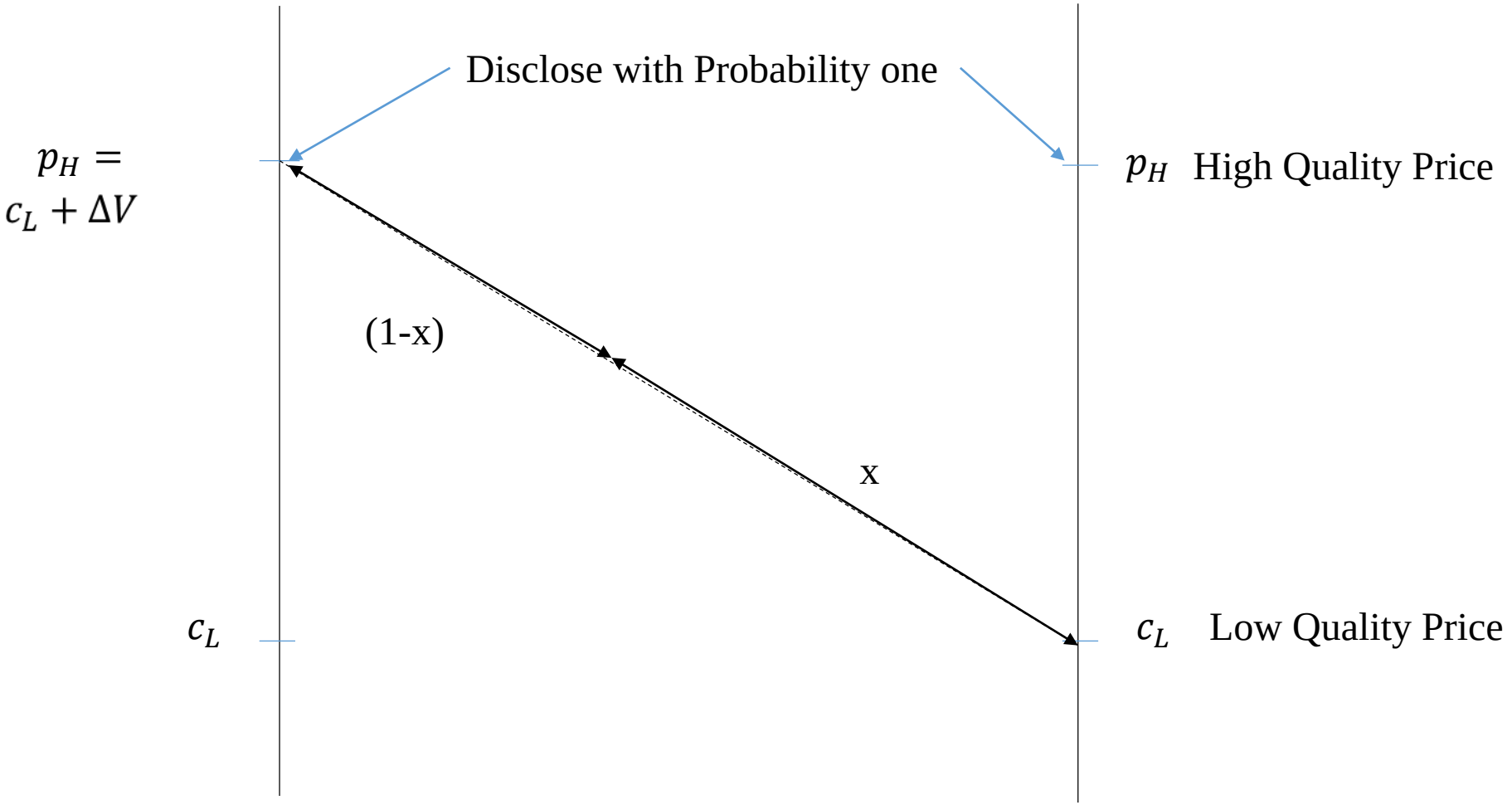
Low Regulation: Mixed Disclosure Equilibrium, Reduced market power, Full distortion, Deadweight Loss of Disclosure Cost

Expected Quantity Sold



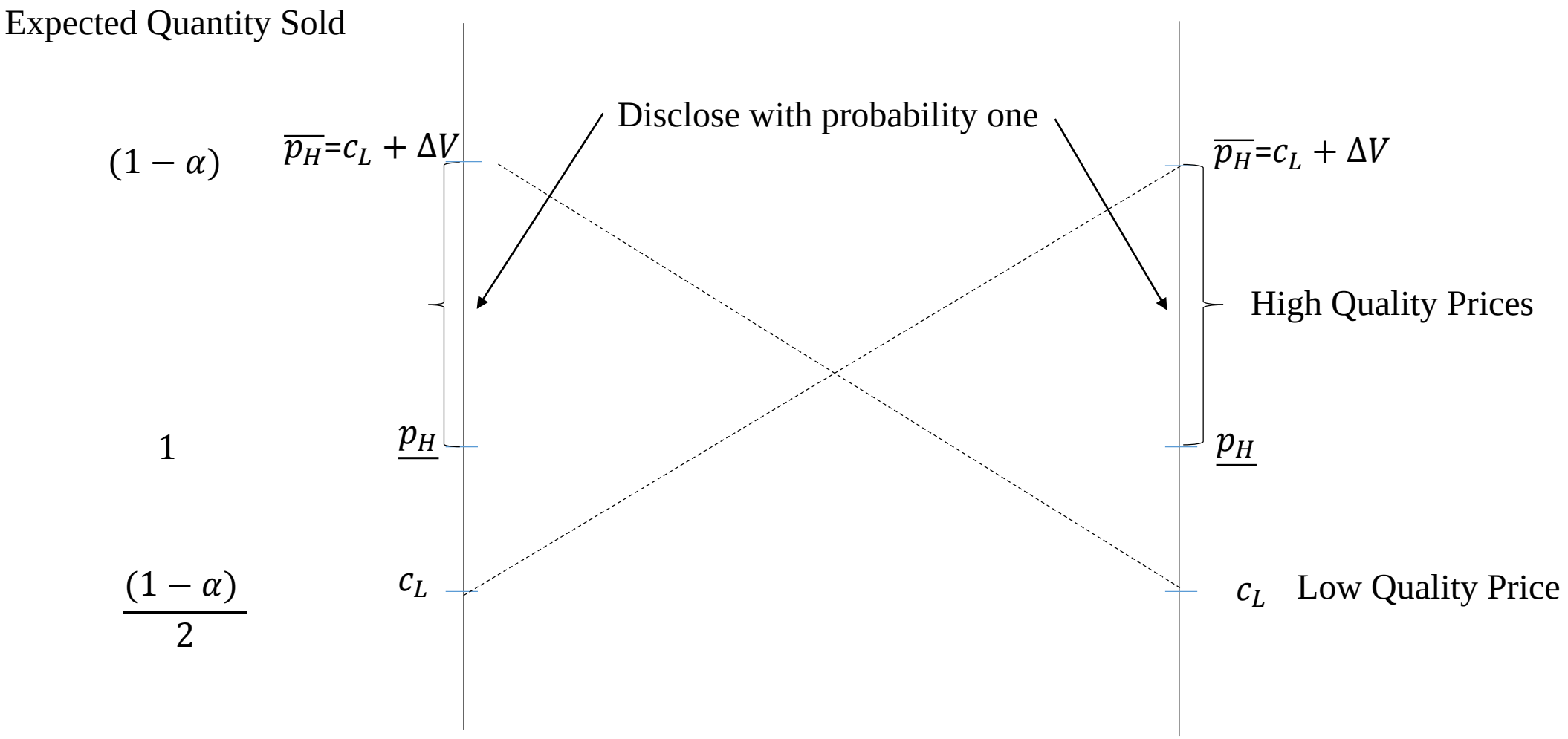
$$f \uparrow \Rightarrow p_H \downarrow, profit \downarrow$$

Moderate Regulation: Pure Disclosure, Full Distortion, Lower profits
Worse than no regulation



$$f \uparrow \Rightarrow x \downarrow$$

Intermediate Regulation: Pure Disclosure with deterministic pricing
Partial Distortion, welfare increases with regulation



High Regulation: Fully non-distortionary pure disclosure outcome

Lowest Market Power

High quality better off than under no regulation only if D is very small

Key Mechanism: Competitive Effect of Regulation

- As making false claims becomes more costly
  - low quality has lower incentive to deviate by making claims AND undercutting rivals high quality price
  - buyers should believe such price and direct communication comes from a high quality firm
  - incentive of high quality firm to reduce price to grab more market share
  - intensifies competition, reduces distortion

Effect of increasing cost of making false claims

- If direct communication cost D is low,
  - increasing f initially leads to disclosure without correcting consumption distortion, so welfare decreases
  - eventually eliminates consumption distortion and welfare increases
- strong regulation is socially optimal but weak regulation is worse than no regulation
- Prices decrease (in first order stochastic sense), expected consumer surplus increases
- Low quality firms: profit always decrease
- Profit of high quality firms falls initially but eventually increases

Intermediate Direct Communication Cost

- Always a mixed disclosure equilibrium
- No matter how strong regulation is
  - high quality firms disclose with less than probability one (use pure price signaling with positive probability)
  - covering direct communication cost requires high quality to charge higher prices $\Rightarrow$ low quality (rival) needs to earn rent
  - consumption distortions persist, over-disclosure
- Optimal: no regulation
- Low and high quality profits lower than under no regulation

Conclusion

- Direct communication/disclosure of product attributes may be used by firms even when
  - regulation of false claims is somewhat weak
  - information can be communicated through price signaling
- Regulation that makes lying more costly:
  - may not change the information available to buyers before purchase
  - intensifies price competition, reduces market power
  - leads to more disclosure
  - but may not correct allocation distortions sufficiently
  - $\Rightarrow$ competitive overdisclosure

Conclusion

- Weak regulation is always worse than no regulation
- Strong regulation may be socially desirable, but only if direct communication cost itself is small.
- No regulation is optimal if direct communication cost is somewhat high (as it can lead to excessive disclosure)
- Unless direct communication cost is extremely low and the proposed penalty is strong, even high quality firms will want to lobby against regulation.