

Consumer Status Signaling, Wealth inequality and the Dupe Economy

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Abstract: The growing popularity of “dupes”—lower-priced knockoffs (or duplicates) that consumers knowingly purchase—has reshaped how luxury consumption is used for status signaling. By allowing consumers to mimic the visible consumption of luxury goods without paying the full price premium, dupes challenge the traditional role of luxury products in conveying social status and raise new managerial and regulatory concerns about the emerging dupe economy. Motivated by these industry dynamics, we consider a market entry-deterrence game between an incumbent status product firm (the firm) and a dupe entrant. The market demand is endogenously determined by a consumer status signaling sub-game. We show that in the absence of dupe entry market intervention, consumer status signaling can improve the firm’s profit up to a saturation point, and high wealth inequality benefits the firm. We further show that these “free-market” insights may reverse under strong market intervention that penalizes a potential dupe entry, where both status signaling and wealth inequality may make the firm worse off. Finally, we characterize the welfare-maximizing market intervention and show it can restore the positive value of status signaling but may also come with a high social cost of enforcement.

Key words: Status signaling, wealth inequality, dupe economy, non-deceptive counterfeits, pricing strategy, entry deterrence, social welfare

1 Introduction

In order to gain and to hold the esteem of men, it is not sufficient merely to possess wealth or power. The wealth or power must be put in evidence, for esteem is awarded only on evidence.

—Thorstein Veblen, *The Theory of the Leisure Class*, 1899

Consumers often use visible consumption to signal their purchasing power and social status. Because wealth is private information, luxury goods serve as a natural signaling device: by purchasing and displaying expensive products, consumers convey their status to others (Veblen 1899, Ireland 1994). This signaling motive is fundamentally rooted in wealth inequality, which creates incentives for consumers to distinguish themselves through consumption. The rise of social media has dramatically amplified the reach and value of such signals. Platforms such as Instagram and TikTok allow consumers to broadcast their purchases to large audiences at negligible cost, significantly increasing the utility derived from status signaling and

stimulating demand for luxury goods. Consistent with this mechanism, consumer interest in status products is strongly correlated with income and wealth inequality (Walasek and Brown 2015). At the same time, this environment also creates incentives for consumers to seek alternative ways to capture the signaling value of luxury consumption without paying the full price premium.

Against this backdrop, there has been a rapid rise of so-called “dupes”—lower-priced knockoffs (or duplicates) that consumers knowingly purchase as substitutes for authentic luxury goods. As described in a recent Financial Times piece (Ellwood 2025), “an emerging product category, one that occupies a branding DMZ [demilitarized zone] between authentic and fake: the dupe.” In the academic literature, these products are also referred to as *non-deceptive* counterfeits, emphasizing that consumers are aware of the product’s knockoff nature at the time of purchase (Grossman and Shapiro 1988). By unbundling the signaling value of luxury goods from their intrinsic quality, dupes allow consumers with lower purchasing power to mimic the visible consumption patterns of wealthier consumers. Empirically, more than 40% of Gen Z consumers in major luxury markets report having purchased such products, with high luxury prices cited as a primary driver (International Trademark Association 2019, Fontana et al. 2019). “Dupe culture is native to social media, TikTok in particular,” says in the same Financial Times piece (Ellwood 2025). The booming of the dupe economy is also evidenced by the popular online communities such as Reddit, which hosts dedicated forums (e.g., r/FashionReps, self-described as “the internet’s largest community of replica fashion enthusiasts”), where users openly discuss and showcase fashion replicas or dupes.

Unlike fakes (or deceptive counterfeits), dupes do not raise standard consumer protection concerns, since buyers are not misled. Instead, they pose a subtler challenge: by eroding the exclusivity of visible luxury consumption, they weaken the status-signaling function of authentic products and alter firms’ pricing and entry-deterrence incentives. Although consumers themselves recognize that dupes are not authentic, spectators, such as social media followers, peers, or acquaintances, often infer status from visible consumption categories or stylistic cues rather than verifying authenticity. As a result, from the perspective of status signaling, authentic luxury goods and their dupes may generate similar perceived status despite differences in their intrinsic quality.

In response to the erosion of exclusivity, luxury brands have increasingly sought intervention from platforms, regulators, and courts to curb the entry of dupes. Such enforcement can take many forms, including platform-level actions (e.g., delisting sellers or banning accounts), regulatory fines, or legal damages arising from lawsuits for unfair competition or trademark infringement (Ellwood 2025). While these mechanisms differ institutionally, they share a common economic effect: they raise the expected cost for entrants in the dupe economy. Importantly, enforcement is costly, imperfect, and politically constrained, making it nontrivial to simply impose arbitrarily large penalties without affecting other stakeholders in the dupe economy.

Motivated by these industry movements, this paper studies how consumer status signaling, wealth inequality, and market intervention jointly shape the market dynamics and social welfare in the dupe economy.

1.1 Summary of the model

We consider a market entry-deterrence game between an incumbent status product firm (the firm) and a dupe entrant. The quality of the dupe product is inferior to the status product. There are two types of consumers (rich or poor), differing in their willingness-to-pay (affordability) for the products.

Endogenous consumer demand from a signaling game. One of the salient features of our model is that the market demands for the status product and the dupe product are endogenously determined by the equilibrium of a consumer status signaling subgame. In the signaling subgame, following the classic work of Ireland (1994),¹ we introduce a spectator, from whose belief the consumer derives a status utility, in addition to an intrinsic utility from the product itself. In practice, the spectator can be thought as the people around the consumer, such as their social media followers and their friends/neighbors. The consumer tries to signal their private wealth status to the spectator through their product purchases, and the spectator infers a belief of the consumer type based on the purchase signal, affecting the consumer's status utility. The status utility also depends on a *status factor* that measures the relative weight between the status utility and the intrinsic utility. The stronger the status factor, the greater the status utility that consumers derive from signaling their status, thus capturing the social media amplification effect as discussed above.

Market entry-deterrence game. Based on the induced equilibrium demands from the signaling subgame, we characterize the firm's strategic responses to the potential dupe entry. We also provide an in-depth analysis of how consumer status signaling and wealth inequality influence the equilibrium outcomes. We then take a step further to study the effects of market intervention in the form of dupe entry penalty cost. The dupe entry penalty cost can be viewed as the expected legal cost or fines a dupe entrant may face, such as delisting sellers, or banning accounts, or regulatory fines. Finally, we characterize the welfare-maximizing penalty intervention, taking into account the equilibrium behavior of both the firm and the dupe entrant, as well as the underlying consumer signaling dynamics. This welfare-maximizing penalty intervention involves a trade-off of the benefits of broader product access (via status products or dupes) versus the loss of total status utility for consumers.

1.2 Main insights

Through our model analysis, we derive the following key insights of the effects of status signaling, wealth inequality, and market intervention in the dupe economy:

¹ Ireland (1994) first proposed a signaling game model to explain the status product consumption and showed that low-status consumers have the incentive to distort their consumption upward to mimic higher-status consumers. In Ireland (1994), consumers of all types always end up revealing their true wealth in equilibrium, as is a standard result in the signaling game. When consumers have access to dupes as in our paper, the signaling mechanism is more complicated, because the spectator cannot easily differentiate between the authentic status products and the dupes.

- (i) *In the absence of market intervention, status signaling benefits the firm but only up to a saturation point.² However, a strong market intervention that penalizes dupe entry may lead to a negative value of status signaling for the firm.* This finding confirms the positive role of status signaling for a status product firm in a market free of intervention, but it also suggests that a market intervention that deters the dupe entry may make the firm worse off in the dupe economy.
- (ii) *In the absence of market intervention, wealth inequality benefits the firm when the wealth inequality is high and the status factor is strong. However, a strong market intervention that penalizes dupe entry may lead to a negative value of wealth inequality for the firm when the wealth inequality is high.* This finding is consistent with empirical observations of the booming of the dupe economy in markets with higher income inequality and lax law enforcement (Euromonitor International 2020, Fortune 2024), but it also reinforces the insight that a market intervention that deters the dupe entry may make the firm worse off.
- (iii) *A welfare-maximizing market intervention that penalizes dupe entry can restore the positive value of status signaling and generate welfare gains, and the optimal penalty is increasing in the status factor.* This finding again highlights the importance of consumer status signaling in the dupe economy, as it can be leveraged to improve social welfare under a welfare-maximizing market intervention. However, the optimal penalty to deter dupe entry would also increase as the consumer status signaling motive increases. Thus, it may also come with high social costs of implementation and enforcement. This offers a plausible explanation for the booming of the dupe economy observed in practice that is almost free of any penalty intervention (Ellwood 2025).

Overall, our analysis reveals that modeling consumer behavior through a status signaling game provides a rigorous framework to gain more nuanced understanding of how various stakeholders interact in the dupe economy and how the market outcomes are jointly driven by consumer status signaling, wealth inequality, and market interventions.

The rest of the paper is organized as follows. §2 is a review on related literature. §3 introduces the model setup. In §4, we derive the consumer demand functions for the status product and the dupe product from the equilibrium of a consumer status signaling subgame. §5 presents our equilibrium analysis and main results. §6 discusses the managerial implications of market interventions. We conclude the paper in §7. Further model discussions and extensions can be found in the Appendix. All proofs and additional results are found in the E-Companion.

² A comparison with a vertical differentiation model where status utility is directly derived from consumption reveals that this saturation effect is uniquely driven by consumer status signaling. See Appendix C for details.

2 Related literature

There is a growing literature in the field of operations and marketing on counterfeiting, most of which focuses on deceptive counterfeits. Qian (2014) builds a theoretical model to analyze brand-protection strategies for counterfeiting mitigation in economies with weak intellectual property rights. This paper mostly focuses on deceptive counterfeits, although the authors briefly discuss a scenario in which buyers knowingly purchase counterfeits and fool others through counterfeit status signaling as a benchmark to the rest of the analysis. Qian et al. (2015) build a vertical differentiation model to analyze the market equilibrium under the competition between brand-name companies and counterfeiters, showing that authentic brands can combat deceptive counterfeits by improving product quality. Pun et al. (2021) study how blockchain technology can be used for combating deceptive counterfeits. Li et al. (2023) study a contract design problem for the customer-to-customer platform where a seller can signal product authenticity to its consumers through price. Qiu et al. (2025) study counterfeiting on e-commerce platforms when third-party sellers endogenously choose between selling authentic products and counterfeits, showing how platform enforcement can strategically induce sellers to offer genuine goods rather than merely deter fake ones. Yao et al. (2025) examine the role of anti-counterfeiting technology and its interaction with preventative and corrective law enforcements. The central topic in these papers is the information asymmetry between consumers and counterfeiters, while the information asymmetry in our paper lies between consumers and their spectators.

The literature on non-deceptive counterfeits (to which the dupe products belong) is more scarce but growing. For example, Pun and DeYong (2017) study the competition between a manufacturer and a counterfeiter over strategic consumers through a two-period game-theoretic model and show that the timing of consumers' purchases plays an important role in determining the manufacturer's optimal strategy and social welfare. Cho et al. (2015) analyze the anti-counterfeiting strategies for a brand-name company and show that the effectiveness of these strategies critically depends on whether counterfeiters are deceptive or non-deceptive. Zhang et al. (2012) derive and compare different strategies for brand-name products to combat non-deceptive counterfeits through a vertical differentiation model. Yi et al. (2020) study the effect of non-deceptive counterfeits on the global supply chain and analyze the anti-counterfeiting strategies. Lu et al. (2022) examine sourcing strategies of a firm when a potential counterfeiter can be converted to an authorized supplier of the firm. To the best of our knowledge, most of the literature does not consider the status effect or consumers' status signaling behavior, with Gao et al. (2017) being the only exception. They incorporate consumer status-seeking behavior as a modeling feature in their analysis but focus on a distinct research question. Specifically, they examine how product characteristics of copycats, such as the degree of resemblance to authentic products and product quality, influence the dynamics of entry deterrence between the counterfeiter and the authentic brand. In contrast, our study centers on the role of status signaling and wealth inequality under potential non-deceptive dupe entry, and how these factors interact with

dupe entry penalty intervention. To the best of our knowledge, our paper is among the first to analyze the welfare-maximizing dupe entry penalty intervention and show how it can transform status signaling from a consumption distortion to a source for welfare gain.

Our paper is closely related to the literature on conspicuous consumption. Amaldoss and Jain (2005) study how exclusivity and conformity drives consumers' purchasing decisions for conspicuous products and propose a rational expectation mechanism for consumers' behavior. Heffetz (2011) empirically test the relationship between the visibility of a product and its income elasticity, showing that consumers purchase products not just for their intrinsic value but also for their signaling value. Tereyağoğlu and Veeraraghavan (2012) analyze the production strategy for firms that sell conspicuous products and derive conditions when scarcity strategies are optimal. Wei (2020) study the selling strategies for luxury goods when both the snob and follower effects are present. These papers focus on conspicuous consumption through genuine luxury products and do not consider dupes. Our paper complements this literature by further allowing consumers to purchase dupe products to send a "deceptive" status signal.

Another related stream of literature is the study of status signaling in the field of economics. Frank (1985) first associate status signaling with the concept of positional goods and non-positional goods, arguing that interpersonal comparison among consumers can affect their purchasing patterns for positional goods more profoundly than for non-positional goods. Ireland (1994) build on this idea and precisely model the interpersonal comparison with a game-theoretic approach. In particular, the model assumes that consumers have private information about their status level and are better off when others (spectators) perceive them to be wealthier than their true status type. Consumers and spectators are then modeled as two players in a signaling game. Our paper employs a similar consumer status signaling model when deriving the demand for status products and dupes but goes a step further to embed this signaling game in a market entry deterrence game between the status product firm and the dupe entrant.

In terms of broader societal impacts, our research demonstrates that dupes present significant challenges to the status product industry and can potentially "deceive" consumers' perceptions of a brand. Consequently, our study also conceptually connects to the enduring and increasingly pertinent issues of industry sustainability and fairness, as discussed by Nikolakis et al. (2018), Erhun et al. (2021), and Chen et al. (2022). Methodologically, our research applies signaling game theory to analyze strategic consumer behavior, contributing to the significant body of work on Bayesian games previously employed in studies such as those by Chen et al. (2019), Chen and Papanastasiou (2021), Chen and Liu (2022), Ren and Huang (2022), and Zha et al. (2023).

3 Model setup

Market. Consider an incumbent firm that sells a status product at price p , with a unit production cost of c . The product quality is $v > c$, which could also refer to the consumers' taste for the product. A potential

dupe entrant may attempt to offer a knockoff version of the status product at price \tilde{p} .³ We assume that the dupe entry cost is zero in the base model, reflecting the fact that the rise of e-commerce platforms has significantly lowered barriers to market access. The dupe product is *non-deceptive*, meaning that consumers are fully aware that they are not purchasing the authentic product and have perfect information about its inferior quality. Consumers perceive the quality of the dupe product to be a fraction q of that of the status product, with $0 < q < 1$, while the unit production cost of the dupe product is $q'c$, with $0 < q' < 1$.

Consumers. Consumers are heterogeneous in wealth. To capture wealth inequality in a tractable way and to sharpen our discussion of distributional effects, we adopt a two-point distribution.⁴ Each consumer belongs to one of the two types $i \in \{P, R\}$, depending on whether they are rich (type R) or poor (type P). A consumer's type is private information, which is known only to themselves. Without loss of generality, we normalize the total population of consumers to one and denote the proportion of rich consumers by π . To reflect the fact that rich consumers are not the majority in the market, throughout the model, we consider a setting where π is relatively small, i.e., $\pi < 1/(1 + \sqrt{v/(v-c)}) < 1/2$.

Consumers derive *intrinsic* utility from the quality of the products, such as their functionality. Beyond the intrinsic utility, consumers also care about how their wealth status is perceived by others. Accordingly, consumers may derive *status* utility from the status product when it helps send a signal of their type. In this paper, we model the formation of consumer utility under a signaling game framework.

Specifically, the consumer (i.e., the sender) has three choices: purchase nothing, purchase the status product, or purchase the dupe product. Given the prices p and \tilde{p} , the consumer chooses a strategy that maximizes their total utility—the sum of intrinsic and status utility. We denote the strategy of the type- i consumer by a pair $(\mu_i, \tilde{\mu}_i)$, where μ_i and $\tilde{\mu}_i$ are the probability of purchasing the status product and the dupe product, respectively.⁵ Following Rao and Schaefer (2013), owning one unit of the status product gains an intrinsic utility $\theta_i v$, and owning one unit of the dupe product derives an intrinsic utility $\theta_i qv$, where θ_i is the willingness-to-pay (affordability) coefficient of the type i consumers. We assume that $v - c > qv - q'c > 0$ so that the status product delivers strictly higher intrinsic value than the dupe product.⁶

We introduce a *spectator* (i.e., the receiver) who observes the consumer's purchase decision and infers the consumer's (private) type. The spectator cannot distinguish the status product from the dupe product,

³ Our main insights continue to hold in the case of infinitely many dupe entrants who engage in a perfect competition; see the E-Companion EC.4 for further discussion.

⁴ We refer the reader to Appendix A for further discussion on the relation between a two-point distribution and the Gini coefficient commonly used for measuring distributional inequality.

⁵ In other words, the consumer is allowed to play a mixed strategy between purchasing and not purchasing. In particular, the consumer assigns a certain probability to purchasing a status product and another probability to purchasing a dupe product. This probabilistic approach reflects the consumer's best tradeoff between owning an authentic product and a dupe product. Equivalently, the probability of a consumer purchasing a product can also be interpreted as the percentage of consumer population purchasing a product in the market.

⁶ Relaxing the assumption of $v - c > qv - q'c$ does not affect the tractability of our model; however, it would introduce uninteresting cases that offer limited additional insights.

either because the spectator lacks the expertise in discerning the difference, or because the spectator cannot examine the product closely (e.g., when interactions occur on social media platforms where detailed examination is not possible). Therefore, the spectator can only observe the information (i.e., message) on whether a purchase is made or not. The spectator thus needs to derive a belief (b_p, b_n) of the consumer's true type based on this information, where b_p (b_n , respectively) denote the spectator's belief that the consumer is rich after observing the consumer's purchase (no-purchase, respectively) decision.⁷

The spectator's belief reflects the consumer's wealth status recognition, influencing the consumer's status utility. For a type- i consumer, purchasing (not purchasing, respectively) the product will yield a status utility of $\theta_i b_p s$ ($\theta_i b_n s$, respectively), representing the consumers' desire to be recognized as the rich type. Here, $s > 0$ is the *status factor* capturing the fact that consumers' valuation of status (or taste for the status) may vary in different cultural or societal contexts, and $b_p s$ represents the signaling "quality" of the product, which is irrelevant to the intrinsic quality of the product.

With the definitions of the intrinsic and status utility, a type- i consumer's total utility is given by $\theta_i(v + b_p s) - p$ when the consumer purchases a product of quality v at price p , and $\theta_i b_n s$ if the consumer does not make any purchase. It is important note that, according to Tirole (1988, pp. 96–97), the above utility $\theta_i(v + b_p s) - p$ can be equivalently written as $(v + b_p s) - p/\theta_i$ (except for a scaling factor), where $1/\theta_i$ can be interpreted as the type- i consumer's marginal rate of substitution between income and quality.⁸ We should refer to θ_i as the wealth level of type i consumers. Without loss of generality, we normalize $\theta_p = 1$ and let $\theta_R = 1 + w$.⁹ For this reason, we shall refer to w as the *wealth difference* parameter, which captures the extent of rich consumers' additional willingness to pay for each unit of intrinsic/status quality.

The sequence of events for the entry deterrence game is described as follows (see Fig. 1 for illustration): 1) The firm sets the price p for the status product.¹⁰ 2) The dupe entrant decides whether to enter the market or not. 3) Conditional on market entry, the dupe entrant sets the price \tilde{p} for the dupe product. 4) Observing p

⁷ More rigorously, one can define the full belief system of the spectator as a function of the consumer type and the purchase decision. However, given the consumer's status utility is only affected by the spectator's belief on their type, our simplified belief system yields the same equilibrium result as the full belief system.

⁸ Following the literature, consumer heterogeneous preference is placed on the quality instead of the price in the consumer utility to ensure that the price is transferable and social welfare is consistently measured in the same unit. Readers who are familiar with Rao and Schaefer (2013) and Gao et al. (2017) may notice a key difference between their status utility models and ours is that they do not associate a consumer's willingness-to-pay (affordability) with the status utility (i.e., the factor θ_i does not appear in the status utility term). We made this modelling choice after careful consideration. In addition to the better economic interpretation, our modelling choice yields a better prediction when the status factor is strong. Further discussions on this are found in Appendix B.

⁹ For the general case, we can define $\theta_p = \theta$ and let $\theta_R = \theta(1 + w)$. Our results continue to hold except for relabeling v and s to θv and θs , respectively.

¹⁰ Our model is designed to capture the long-term effects in the status product market, with a focus on consumer status signaling. In this framework, the spectator forms beliefs about a consumer's type based on the price of the status product and the consumer's consumption choice. This association in belief between the status and the status product inherently requires the status product firm to commit to a long-term pricing strategy that maintains a price premium for its product. This price commitment is also assumed in the counterfeiting literature (e.g., Qian et al. 2015, Cho et al. 2015), where the status product firm moves first to set the price, and the counterfeiter moves second to respond to the status product firm's pricing decision.

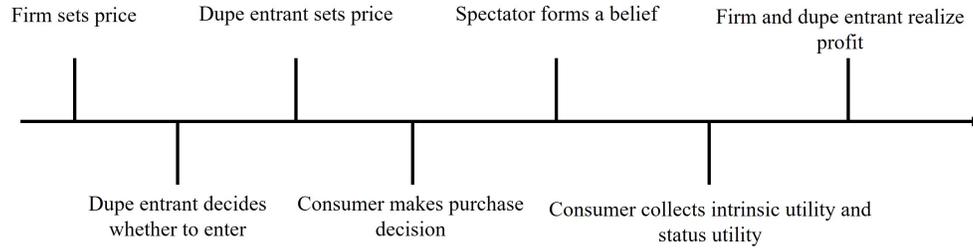


Figure 1 Sequence of events.

and \tilde{p} , the consumer makes a purchase decision. 5) The spectator observes the consumer's purchase decision and forms a belief (b_p, b_n) on the consumer type. 6) The consumer's utility is realized. Finally, 7) the firm and the dupe entrant realize their respective profit (if the latter indeed enters the market).

For ease of reference, a summary of the key notation is provided in Table 1.

Table 1 Key Notation Summary

Notation	Description
p	Price of the status product
\tilde{p}	Price of the dupe product
c	Unit production cost of the status product
q	Quality of the dupe product relative to the status product
q'	Cost of the dupe product relative to the status product
s	The status factor
v	Intrinsic utility derived from the status product
θ_i	Type i consumer's wealth level, $i \in \{R, P\}$
μ_i	Probability (proportion) that a type i consumer purchases the status product
$\tilde{\mu}_i$	Probability (proportion) that a type i consumer purchases the dupe product
w	The wealth difference between the two types of consumers
b_p	Spectator's belief that the consumer is rich after observing a purchase
b_n	Spectator's belief that the consumer is poor after observing no purchase
f	Expected dupe entry penalty cost
Π^*	Equilibrium profit of the firm in the base model
Π^0	Equilibrium profit of the firm in the observable wealth status information benchmark case
Π^m	Equilibrium profit of the firm in the mean-preserving wealth benchmark case

4 Induced demand from consumer status signaling

We adopt the equilibrium concept of Perfect Bayesian Equilibrium (PBE) and solve the game for its subgame perfect equilibrium, starting from the signaling subgame. We aim to establish the existence and uniqueness of the PBE equilibrium $(\mu_p^*, \tilde{\mu}_p^*, \mu_R^*, \tilde{\mu}_R^*, b_n^*, b_p^*)$ for the signaling subgame given the price (p, \tilde{p}) , as well as the induced demand functions. This section serves as a building block of our subsequent equilibrium analysis.

The PBE equilibrium in the status signaling subgame between the consumer and the spectator requires that the type- i consumer maximizes their total utility:

$$(\mu_i^*, \tilde{\mu}_i^*) \in \arg \max_{0 \leq \mu_i + \tilde{\mu}_i \leq 1} \mu_i [\theta_i(v + b_p s) - p] + \tilde{\mu}_i [\theta_i(qv + b_p s) - \tilde{p}] + (1 - \mu_i - \tilde{\mu}_i) \theta_i b_n s, \quad (1)$$

where $[\theta_i(v + b_p s) - p]$ is the utility from purchasing the status product, $[\theta_i(qv + b_p s) - \tilde{p}]$ is the utility from purchasing the dupe product, and $\theta_i b_n s$ is the utility from purchasing nothing. Since the spectator cannot differentiate between the status product and the dupe product, purchasing either of these two products yields the same status utility to the consumer. This can be seen more clearly when (1) is rewritten by

$$(\mu_i^*, \tilde{\mu}_i^*) \in \arg \max_{0 \leq \mu_i + \tilde{\mu}_i \leq 1} \mu_i (\theta_i v - p) + \tilde{\mu}_i (\theta_i qv - \tilde{p}) + (\mu_i + \tilde{\mu}_i) \theta_i b_p s + (1 - \mu_i - \tilde{\mu}_i) \theta_i b_n s,$$

where purchasing either the status product or the dupe product earns the consumer the same status utility $\theta_i b_p s$.

Furthermore, the spectator's equilibrium belief needs to be consistent with the consumer's equilibrium purchase strategy. That is,

$$b_p^* = \frac{\pi (\mu_R^* + \tilde{\mu}_R^*)}{\pi (\mu_R^* + \tilde{\mu}_R^*) + (1 - \pi) (\mu_p^* + \tilde{\mu}_p^*)} \quad (2)$$

and

$$b_n^* = \frac{\pi (1 - \mu_R^* - \tilde{\mu}_R^*)}{\pi (1 - \mu_R^* - \tilde{\mu}_R^*) + (1 - \pi) (1 - \mu_p^* - \tilde{\mu}_p^*)}, \quad (3)$$

where b_p^* is the probability of the consumer being a rich type conditional on that the spectator observes a purchase signal (which could be a purchase of either the status product or the dupe product) and b_n^* is the probability of the consumer being a rich type conditional on that the spectator observes a no purchase signal. The above belief expressions are well-defined when the denominators are nonzero. When the denominators are zero, we refine the possible equilibrium beliefs by applying the divinity D_1 criterion (Banks and Sobel 1987), which is widely used in signaling games (e.g., Feltovich et al. 2002, Qian et al. 2015, Piccolo et al. 2018). Moreover, in cases when more than one D_1 -criterion refined equilibria exist, we select the Pareto-dominant equilibrium, which effectively amounts to selecting the D_1 -criterion refined equilibrium that is preferred by both consumer types (see Tirole 1996, Yu et al. 2015, for similar refinement procedures).¹¹

¹¹ It turns out that in our game, the D_1 -criterion refinement is sufficient to select a unique PBE in most cases. The Pareto refinement is only needed when the resulting Pareto-dominant equilibrium is $\mu_R^* = \tilde{\mu}_p^* = 0$, which does not affect our main analysis.

To assist our subsequent analysis, we first present the consumer status signaling equilibrium for a single-product setting in the following lemma.¹² More specifically, we introduce a more general notation, $\lambda_i^*(p; v)$, to represent type- i consumer's equilibrium purchase of a product with price p and quality v .

LEMMA 1. *Suppose there is only one product on the market. Given the product price p and the quality of the product v , the consumer type i 's equilibrium purchase probability for the product is unique and given by*

$$\lambda_R^*(p; v) = \begin{cases} 1 & \text{if } p \leq (1+w)(v + (1-\pi)s), \\ 0 & \text{otherwise,} \end{cases} \quad (4)$$

and

$$\lambda_P^*(p; v) = \begin{cases} 1 & \text{if } p \leq v + \pi s, \\ \frac{\pi(v+s-p)}{(1-\pi)(p-v)} & \text{if } v + \pi s < p \leq \min\{v + s, (1+w)(v + (1-\pi)s)\}, \\ 0 & \text{otherwise.} \end{cases} \quad (5)$$

A well-known result in the signaling game is that players with private type information may end up revealing their type information, leading to a separating equilibrium. Lemma 1 confirms that this is indeed the case when the product price is relatively high but still affordable for the rich type (i.e., $\min\{v + s, (1+w)(v + (1-\pi)s)\} < p \leq (1+w)(v + (1-\pi)s)$). In this case, the rich type can use the product as a signaling instrument to achieve separation from the poor type, i.e., $\lambda_R^*(p; v) = 1$ and $\lambda_P^*(p; v) = 0$. When the price is low (i.e., $p < v + \pi s$), the product becomes affordable to both consumer types. Purchasing such a product does not provide additional information for the spectator, thereby leading to a pooling equilibrium, i.e., $\lambda_R^*(p; v) = \lambda_P^*(p; v) = 1$. When the price is in between (i.e., $v + \pi s < p \leq \min\{v + s, (1+w)(v + (1-\pi)s)\}$), a semi-separating equilibrium emerges, where the poor type randomly splurges on the product to mimic the rich type to gain status utility, i.e., $\lambda_R^*(p; v) = 1$ and $\lambda_P^*(p; v) = \pi(v + s - p)/((1-\pi)(p - v))$. In this case, the spectator can gain a better understanding of the consumer's true type through the observed purchase decision, compared to the pooling equilibrium where all consumers exhibit the same behavior. It is straightforward to see that when the status factor is zero, that is, $s = 0$, $\lambda_R^*(p; v) = 1$ if $p \leq (1+w)v$ and $\lambda_P^*(p; v) = 0$, otherwise; similarly, $\lambda_P^*(p; v) = 1$ if $p \leq v$ and $\lambda_R^*(p; v) = 0$, otherwise. This implies that the semi-separating equilibrium does not emerge in the absence of consumer status-seeking behavior (i.e., when $s = 0$).

The following corollary characterizes the effects of the status factor and the wealth difference on the equilibrium purchase strategy in the single-product setting, where we use the terms ‘‘increasing’’ and ‘‘decreasing’’ in the weak sense in this paper.

¹² We note that the equilibrium result presented in the lemma applies to either the status product or the dupe product as long as there is only one product on the market. When only the status product is available on the market, the equilibrium strategies of the rich and poor types are $\lambda_R^*(p; v)$ and $\lambda_P^*(p; v)$, respectively. When only the dupe product is available in the market, the nature of the signaling game remains the same; the resulting equilibrium strategies of the rich and poor types are $\lambda_R^*(\tilde{p}; qv)$ and $\lambda_P^*(\tilde{p}; qv)$, respectively.

COROLLARY 1. $\lambda_R^*(p; v)$ and $\lambda_P^*(p; v)$ are both increasing in s and w .

Corollary 1 confirms the intuition that both types are more likely to purchase the product when the status factor is strong. More interestingly, it further reveals that the poor type is more likely to purchase the product as the wealth difference increases. With a high wealth level of the rich type, there is a high chance for the rich type to purchase the product, creating a strong incentive for the poor type to mimic, in order to gain a positive status utility. These results show that it is not only the status factor but also the wealth difference that fuel status seeking purchase behavior, which is consistent with the phenomenon observed in practice (International Trademark Association 2019).

We are now in a position to derive the equilibrium purchase decision when both the status product and the dupe product are available on the market. Intuitively, the consumer's purchase decision should depend on the price difference between the two products, which is confirmed in the following proposition:

PROPOSITION 1. *Given the status product's price p and the dupe product's price \tilde{p} , the equilibrium purchasing decision is given as follows:*

$$(\mu_R^*(p, \tilde{p}), \tilde{\mu}_R^*(p, \tilde{p})) = \begin{cases} (\lambda_R^*(p; v), 0) & \text{if } p - \tilde{p} < (1 - q)v, \\ (\lambda_R^*(p; v), 0) & \text{if } (1 - q)v < p - \tilde{p} < (1 + w)(1 - q)v, \\ (0, \lambda_R^*(\tilde{p}; qv)) & \text{otherwise,} \end{cases}$$

and

$$(\mu_P^*(p, \tilde{p}), \tilde{\mu}_P^*(p, \tilde{p})) = \begin{cases} (\lambda_P^*(p; v), 0) & \text{if } p - \tilde{p} < (1 - q)v, \\ (0, \lambda_P^*(\tilde{p}; qv)) & \text{if } (1 - q)v < p - \tilde{p} < (1 + w)(1 - q)v, \\ (0, \lambda_P^*(\tilde{p}; qv)) & \text{otherwise,} \end{cases}$$

where $\lambda_R^*(\cdot; \cdot)$ and $\lambda_P^*(\cdot; \cdot)$ are defined in (4) and (5), respectively.

Proposition 1 shows that the consumer's equilibrium purchase strategy can be divided into three regions. When the price difference between the status product and the dupe product is less than their intrinsic value difference (i.e., $p - \tilde{p} < (1 - q)v$), there is no demand for the dupe product in equilibrium, i.e., $\tilde{\mu}_R^*(p, \tilde{p}) = \tilde{\mu}_P^*(p, \tilde{p}) = 0$. In this case, the induced demand for the status product only depends on the status product's price p , which is the same as the induced demand as if there were only the status product available on the market (see Lemma 1). When the price difference between the status product and the dupe product is greater than the intrinsic value difference adjusted by the rich type's willingness-to-pay (i.e., $p - \tilde{p} \geq (1 + w)(1 - q)v$), there is no demand for the status product in equilibrium, i.e., $\mu_R^*(p, \tilde{p}) = \mu_P^*(p, \tilde{p}) = 0$. In this case, the induced demand for the dupe product only depends on its price \tilde{p} , which is the same as the induced demand as if there were only the dupe product available on the market.

When the price difference between the status product and the dupe product is in between the above two cases (i.e., $(1 - q)v \leq p - \tilde{p} < (1 + w)(1 - q)v$), the rich type would purchase only the status product (with

a certain probability) and the poor type would purchase only the dupe product (with a certain probability). In this case, the induced demand for the status product is the same as the demand from the rich type as if there were only the status product on the market, and the induced demand for the dupe product is the same as the demand from the poor type as if there were only the dupe product on the market. Thus, the firm loses the demand from the poor type to the dupe entrant, for the dupe product serves as a low-cost substitute for the poor type to mimic the rich type in the signaling subgame.

From Proposition 1, we are able to derive the demands for the status product and the dupe product induced by the signaling game. Specifically, the induced demand for the status product can be written as:

$$d^*(p, \tilde{p}) = \pi \mu_R^*(p, \tilde{p}) + (1 - \pi) \mu_P^*(p, \tilde{p}), \quad (6)$$

and the induced demand for the dupe product can be written as:

$$\tilde{d}^*(p, \tilde{p}) = \pi \tilde{\mu}_R^*(p, \tilde{p}) + (1 - \pi) \tilde{\mu}_P^*(p, \tilde{p}). \quad (7)$$

As a counterpart of single-product setting, the following corollary presents the effect of the status factor and the wealth difference on the equilibrium purchase strategy in the two-product setting:

COROLLARY 2. *The induced demand for the status product $d^*(p, \tilde{p})$ is increasing in s and w ; the induced demand for the dupe product $\tilde{d}^*(p, \tilde{p})$ is increasing in s but non-monotonic in w in general.*

As expected, similar to Corollary 1, the induced demand for the status product is increasing in the status factor s and the wealth difference w . More interestingly, while the induced demand for the dupe product is still increasing in s , this trend does not hold for the wealth difference w in general. This is because an increase in wealth difference not only fuels the poor type to mimic the rich type but also entices the rich type to seek for the better quality one. When the latter effect dominates, the induced demand for the dupe product decreases in the wealth difference. This corollary reveals that the effect of wealth difference on induced consumer demand can be mixed when two vertically different products are available for status-seeking consumers. This mixed effect drives the dupe entrant's pricing strategy as well as the firm's strategy for deterring the dupe entry, which will be discussed in detail below.

5 Equilibrium strategy and insights

With the equilibrium results of signaling subgame, we are ready to derive the equilibrium pricing strategy for the firm. As outlined in the sequence of events (see Fig. 1), the firm moves first to set a price p for the status product while anticipating the dupe entrant's market entry and pricing strategy. The firm's problem can be formulated as follows:

$$\begin{aligned} \Pi^* &= \max_{p \geq 0} (p - c) d^*(p, \tilde{p}^*(p)) \\ s.t. \quad \tilde{p}^*(p) &= \begin{cases} \arg \max_{\tilde{p} \geq 0} \{(\tilde{p} - q'c) \tilde{d}^*(p, \tilde{p})\} & \text{if } (\tilde{p}^*(p) - q'c) \tilde{d}^*(p, \tilde{p}^*(p)) \geq 0, \\ \infty & \text{otherwise,} \end{cases} \end{aligned}$$

where the induced demand functions $d^*(\cdot, \cdot)$ and $\tilde{d}^*(\cdot, \cdot)$ are defined in (6) and (7), respectively. They can be written explicitly according to Proposition 1. For notational convenience, we set $\tilde{p}^*(p) = \infty$ for the no-entry case, such that there is no demand for the dupe product. Let p^* be the firm's equilibrium pricing strategy for the above problem, where we use a superscript "*" to denote all equilibrium variables and functions.

Despite the complexity of the induced demand functions for the status product and the dupe product as shown in Proposition 1, we can derive the following two structural properties: 1) the firm, as the first mover, would always price the status product in a way such that it captures at least the demand from the rich type; 2) either the firm or the dupe entrant would price its product to capture the full demand from the poor type should they intend to sell to the poor type (see the proof in Proposition 2). With the above two properties and defining

$$\bar{w} = \max \left\{ \frac{(1-\pi)[(1-q-\pi q)v - (1-q' - \pi q')c - \pi^2 s]}{\pi(1-q)v}, \frac{(1-\pi)[(1-q)v - (1-q')c]}{(1-q)v} \right\}, \quad (8)$$

we can fully characterize the firm's equilibrium pricing strategy as follows:

PROPOSITION 2. *The following firm strategy holds in equilibrium: with \bar{w} defined in (8),*

(a) *If $w \geq \bar{w}$, the firm coexists with the dupe entrant on the market, and the poor consumer type purchases the dupe product. The firm's equilibrium profit is $\Pi^* = (p^* - c)\pi$, with the pricing strategy given by*

$$p^* = \begin{cases} (1-q)(1+w)v + q'c + (1-\pi)(qv + \pi s) & \text{if } w \geq \frac{\pi(qv - q'c) + \pi^2 s}{(1-q)v}, \\ w(1-q)v/\pi + (1-q)v + q'c & \text{otherwise.} \end{cases}$$

(b) *If $w < \bar{w}$, the firm deters the dupe entrant from entering the market, and both consumer types purchase the status product. The firm's equilibrium profit is $\Pi^* = p^* - c$, with the pricing strategy given by $p^* = (1-q)v + q'c$.*

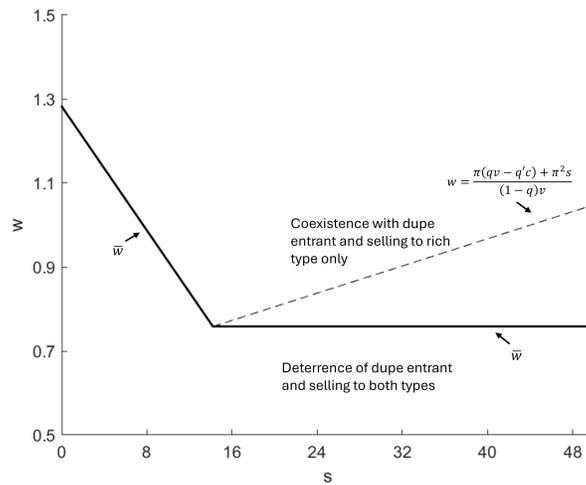


Figure 2 Illustration of the equilibrium results of Proposition 2; model parameters: $v = 20$, $c = 2$, $q = 0.8$, $q' = 0.85$, and $\pi = 0.18$.

Proposition 2 shows that the status product firm's equilibrium strategy is influenced by the wealth difference w . When $w \geq \bar{w}$, that is, when the rich type has a high wealth level, the firm coexists with the dupe entrant on the market (see Fig. 2 for an illustration). In this case, the dupe product serves as a low-cost substitute for the poor type, allowing them to derive status utility. This reduces the consumption utility gap between the rich and poor consumers. Due to high wealth difference, the entry-deterrence competition in this scenario is low. Hence, the firm serves the rich type and settles for strategic coexistence with the dupe entrant on the market.

When $w < \bar{w}$, the rich type has similar affordability as the poor type. This intensifies entry-deterrence competition, making the firm opt for strategic deterrence of the dupe entrant. In this case, the firm prices down to ensure the profit of the dupe entrant from serving just the poor type is zero. As shown in Fig. 2, the threshold \bar{w} is decreasing in the status factor s . Thus, as the status factor increases, the status product firm is less likely to deter the dupe entrant from entering the market. These model predictions for when the firm settles for strategic coexistence with the dupe entrant are consistent with the empirical observations of the dupe economy (Ellwood 2025).

With the equilibrium result of Proposition 2, we can assess the equilibrium social welfare in the dupe economy. Observe that the prices of the status product and the dupe product are just transfer payments between the sellers and the consumer types in the model. Hence, the social welfare, denoted by W , can be written as the expected net social value generated from a consumer's purchase decision:

$$W = \pi [\mu_R (\theta_R v - c + \theta_R b_p s) + \tilde{\mu}_R (\theta_R q v - q' c + \theta_R b_p s) + (1 - \mu_R - \tilde{\mu}_R) \theta_R b_n s] \\ + (1 - \pi) [\mu_P (\theta_P v - c + \theta_P b_p s) + \tilde{\mu}_P (\theta_P q v - q' c + \theta_P b_p s) + (1 - \mu_P - \tilde{\mu}_P) \theta_P b_n s]. \quad (9)$$

Substituting the equilibrium results of Proposition 2 into the above expression, we obtain the equilibrium social welfare W^* as

$$W^* = \begin{cases} \pi [(1 + w) v - c] + (1 - \pi) (v - c) + (1 + \pi w) \pi s & \text{if } w < \bar{w}, \\ \pi [(1 + w) v - c] + (1 - \pi) (q v - q' c) + (1 + \pi w) \pi s & \text{otherwise.} \end{cases} \quad (10)$$

It is worth commenting here that according to Proposition 2, the poor type consumption is always activated in equilibrium, implying that the poor type always sends a “deceiving” status signal by purchasing either the status product or the dupe product to the spectator, resulting in the equilibrium spectator's belief b_p^* to be π . Therefore, the total status utility gained by the consumer is always $(1 + \pi w) \pi s$, whether the firm opts for strategic coexistence with the dupe entrant or not.

5.1 The effect of status signaling

In §4, we have shown that the poor type's incentive to mimic rich type affects the induced demands for the status product and the dupe product in status signaling subgame given the price (p, \bar{p}) . To examine how this status-driven purchase impacts the entry-deterrence game, we conduct a comparative study. Specifically, we

compare the equilibrium outcomes from our base model with those of a benchmark in which the consumer wealth status can be perfectly observable by the spectator, thereby eliminating the status signaling effect on the entry-deterrence game.

When the consumer's wealth status is observable to the spectator, the status utility obtained by the rich (poor, respectively) is always s (0 , respectively), independent of the spectator's belief. Thus, the consumer purchasing decision and the resulting equilibrium outcomes are equivalent to those in the base model with no status factor, i.e., $s = 0$ (that is, the firm coexists with the dupe entrant on the market if and only if the wealth difference $w \geq \bar{w}$). We use superscript "0" to denote the equilibrium results in this benchmark case and present the comparison with the base model results in the following proposition:

PROPOSITION 3. *The following comparative results hold:*

- (a) $p^* \geq p^0$ and $\Pi^* \geq \Pi^0$, with the equalities hold if and only if $w \leq \max \{ \bar{w}, \pi(qv - q'c) / ((1 - q)v) \}$, where \bar{w} is defined in (8).
- (b) $p^* - p^0$ and $\Pi^* - \Pi^0$ are independent of s if $s \geq \max \left\{ \frac{(1-q)vw - \pi(qv - q'c)}{\pi^2}, \frac{[(1-\pi-q)v - (1-\pi-q')c]^+}{\pi^2} \right\}$.
- (c) $W^* < W^0$, and $W^0 - W^*$ is increasing in s .

Proposition 3(a) shows the the positive effect of status signaling on the firm's pricing strategy and equilibrium profit, especially when the wealth difference between the rich and poor types in the dupe economy is high, i.e., $w > \max \{ \bar{w}, \pi(qv - q'c) / ((1 - q)v) \}$. Recall from Proposition 2 that under this condition, the firm opts for strategic coexistence with the dupe entrant and sells only to the rich type. Such strategy helps soften the entry-deterrence competition, allowing the firm to charge a higher price for the status product and benefit from the consumer status signaling behavior. Proposition 3(b) further reveals that when the status factor s is strong, the price premium and the equilibrium profit the firm derives from the status signaling effect will plateau out with respect to the status factor. Thus, the competition introduced by the dupe entrant also puts a cap on the positive effect of status signaling for the firm.

On the other hand, Proposition 3(c) shows that the presence of consumer status signaling reduces the social welfare in the dupe economy, with the reduction increasing in the status factor s . There are two effects at play here. First, as the firm settles for strategic coexistence and selling only to the rich consumer type, the poor consumer type derives less intrinsic utility by consuming the inferior-quality dupe product, thereby lowering the social welfare. Second, as discussed above, the poor consumer type can always send a "deceiving" status signal in equilibrium. It lowers the status utility for the rich consumer type more than the status utility gain by the poor consumer type, further reducing the social welfare. These comparative results suggest that it is important to model the consumer status signaling effect to gain a full understanding of the strategic dynamics and welfare implications in the dupe economy.

5.2 The effect of wealth inequality

We have used the wealth difference parameter w to examine the impact of the additional willingness-to-pay of the rich type on the firm's equilibrium strategy. It is worth noting that a change in w not only alters the wealth difference between the two types but also changes the average wealth level of the two consumer types. To tease out the *distributional* wealth inequality effect, we construct an auxiliary benchmark case in which the average wealth level remains constant.

Formally, we consider a benchmark case in which the wealth level of the two types are the same: $\theta_R = \theta_P = 1 + \pi w$.¹³ Because $1 + \pi w = \pi(1 + w) + (1 - \pi) \cdot 1$, the willingness-to-pay (or affordability) for an average consumer type in this benchmark case remains the same as in the base model. Thus, we refer to this case as the “mean-preserving” benchmark case, where we can show that the firm would deter the dupe entrant from entering the market, and both consumer types purchase the status product, similar to that of case (b) in Proposition 2.

By comparing the equilibrium outcomes of our base model and the mean-preserving benchmark case, we can tease out the wealth inequality effect again through the model parameter w , which we shall refer to as the “wealth inequality” parameter in this section to differentiate it from the wealth difference interpretation in the base model. In what follows, we use the superscript “ m ” to represent the equilibrium outcomes for the mean-preserving benchmark case. It can be shown that in this benchmark case, the firm serves both consumer types and the dupe entrant is always deterred from entry (see the proof in Proposition 4). The comparative results of the firm's equilibrium profit and equilibrium social welfare are summarized in the following proposition:

PROPOSITION 4. *The following results hold:*

- (a) $\Pi^* \geq \Pi^m$ if $w \geq \frac{(1-q)v - (1-q')c}{(1-q)v}$ and $s \geq \left[\frac{(1-q-\pi q)v - (1-q'-\pi q')c}{\pi^2} \right]^+$; otherwise, $\Pi^* < \Pi^m$.
 (b) $W^* \leq W^m$, with the equality holds if and only if $w \leq \bar{w}$, where \bar{w} is defined in (8).

Proposition 4(a) shows that wealth inequality has mixed effects on the firm's equilibrium profit. As illustrated by the shaded area in Fig. 3, the firm's equilibrium profit is greater than that of the mean-preserving benchmark when the wealth inequality is high and the status factor is strong, which is consistent with the insight obtained from the analysis of the status signaling effect. However, when the wealth inequality is relatively low (but not zero), the firm's equilibrium profit is less than that of the mean-preserving benchmark, as illustrated by the unshaded area in Fig. 3. In this case, low wealth inequality makes it more costly for the firm to deter the dupe entrant from entering the market. Our finding on the effect of wealth inequality aligns with empirical evidence indicating that the dupe economy is more prevalent in countries with both strong status signaling and high levels of wealth inequality (Wu and Chang 2025).

¹³ More precisely, we consider the setting in which that $\theta_P = 1 + \pi w$, $\theta_R = 1 + \pi w'$ with $w' \rightarrow w + 0$, to maintain consistency with our base model.

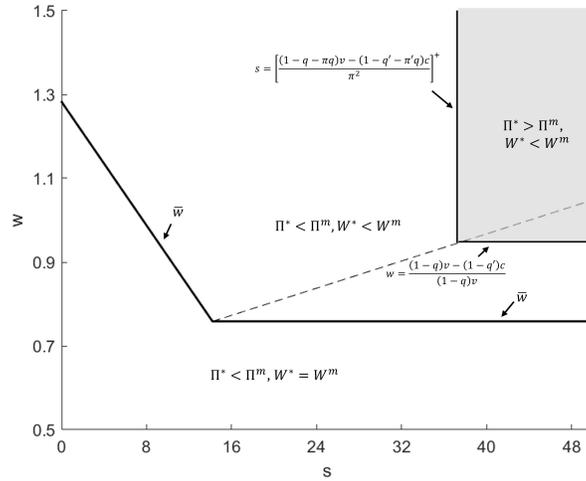


Figure 3 Illustration of the equilibrium results of Proposition 4; model parameters: $v = 20$, $c = 2$, $q = 0.8$, $q' = 0.85$, and $\pi = 0.18$.

Proposition 4(b) reveals a more definitive effect of wealth inequality on social welfare. Like the status signaling effect, the presence of wealth inequality reduces the social welfare in the dupe economy. As illustrated in Fig. 3, when the wealth inequality is relatively high, the social welfare is strictly less than that in the mean-preserving benchmark. In this case, the firm settles for strategic coexistence with the dupe entrant, and the poor consumer type switches to purchase the dupe product instead, resulting in a lower social welfare. These comparative insights again highlight the importance of accounting for the wealth inequality effect, together with the consumer status signaling effect, to understand the strategic dynamics and welfare implications in the dupe economy. The equilibrium conditions of the firm settling for strategic coexistence with the dupe entrant in our model are consistent with the empirical observations of the dupe economy (Ellwood 2025), which also underscore the inherent challenges in curbing the dupe entrants in markets with greater consumer wealth inequality and status signaling motive (Wu and Chang 2025).

6 Implications of market interventions

In the base model, we have established the “free-market” dynamics of the dupe economy and have studied the effects of status signaling and wealth inequality in driving the market equilibrium of strategic coexistence between the firm and the dupe entrant. In practice, there is another important dimension of market intervention that may alter the market equilibrium. For example, dupe entrants may incur certain *ex post* penalty costs due to sanctions at the platform level (such as seller delisting or account bans) or at the regulatory level (such as regulatory fines) (see e.g., Qian 2014, Finklea 2019, Yao et al. 2025). In this section, we take a step further to consider the strategic and welfare implications of such market intervention.

Specifically, we let f denote the expected penalty cost incurred by the dupe entrant upon entering the market, which is determined by multiplying the probability of detection (by platforms, regulators, or even

status firms) and the *ex post* penalty cost upon being caught. Analogous to the problem formulation in §5, the firm's problem with the expected dupe entry penalty cost f can be formulated as follows:

$$\begin{aligned} \Pi_f^* &= \max_{p \geq 0} (p - c)d^*(p, \tilde{p}^*(p)) \\ \text{s.t. } \tilde{p}^*(p) &= \begin{cases} \arg \max_{\tilde{p} \geq 0} \{(\tilde{p} - q'c)\tilde{d}^*(p, \tilde{p}) - f\} & \text{if } (\tilde{p}^*(p) - q'c)\tilde{d}^*(p, \tilde{p}^*(p)) \geq f, \\ \infty & \text{otherwise.} \end{cases} \end{aligned} \quad (11)$$

In the above problem formulation, the dupe entrant enters the market if and only if its expected profit exceeds the expected penalty f . Thus, the problem reduces to that analyzed in §5 when $f = 0$. We present the key equilibrium results here; the full derivation can be found in the proof of Proposition 5. To distinguish the equilibrium results from that of the base model without market intervention, we add a subscript “ f ” to variables and functions for the case with market intervention.

Analogous to the equilibrium analysis in §5, we define the following threshold in this case:

$$\bar{w}_f = \max \left\{ \frac{(1 - \pi)[(1 - q - \pi q)v - (1 - q' - \pi q')c - \pi^2 s] + \frac{f}{1 - \pi}}{\pi(1 - q)v}, \frac{(1 - \pi)[(1 - q)v - (1 - q')c] + \frac{f}{1 - \pi}}{(1 - q)v} \right\}, \quad (12)$$

where it is easy to verify that \bar{w}_f reduces to \bar{w} defined in (8) when $f = 0$.

PROPOSITION 5. *Under a dupe entry penalty f , the following firm strategy holds in equilibrium:*

- (a) *When $f \leq (1 - \pi)(qv - q'c + \pi s)$, there exists a threshold \bar{w}_f defined in (12), such that the firm coexists with the dupe entrant on the market, and the poor consumer type purchases the dupe product, if $w \geq \bar{w}_f$; otherwise, the firm deters the dupe entrant from entering the market, and both consumer types purchase the status product.*
- (b) *When $f > (1 - \pi)(qv - q'c + \pi s)$, the firm deters the dupe entrant from entering the market. There exists a second threshold \bar{w}'_f , such that both consumer types purchase the status product if $w \leq \bar{w}'_f$; otherwise, only the rich consumer type purchases the status product.*

Proposition 5(a) shows that the “free-market” insights obtained in Proposition 2 remain robust for relatively weak market intervention of low dupe entry penalty cost. On the other hand, Proposition 5(b) shows that a high dupe entry penalty cost ensures that it is more profitable for the firm to opt for strategic deterrence of the dupe entrant in equilibrium. In this case, with the strong deterring effect of the dupe entry penalty cost, the firm no longer needs to entirely rely on its pricing strategy to deter the dupe entrant from entering the market. As such, the firm can have the freedom to choose to sell only to the rich consumer type to maximize its profit when the wealth difference is high. It is worth noting that the threshold \bar{w}'_f in Proposition 5(b) can be shown to be quasi-convex in the status factor s , suggesting that status signaling may alter the firm's product exclusivity strategy in a non-monotonic way (see Fig. 4 for an illustration).

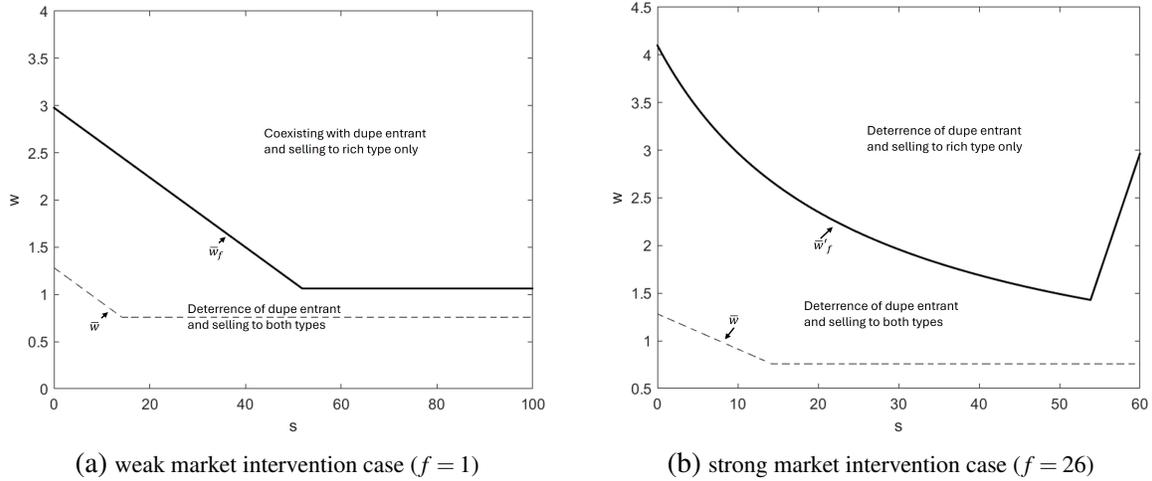


Figure 4 Illustration of the equilibrium results of Proposition 5; model parameters: $v = 20$, $c = 2$, $q = 0.8$, $q' = 0.85$, and $\pi = 0.18$.

6.1 The case of strong market intervention

We have shown in Proposition 5 that, under strong market intervention, the equilibrium insights differ from those under weak or no market intervention. In this subsection, we further examine the effects of status signaling and wealth inequality in such case of strong market intervention, i.e., under the condition of $f > (1 - \pi)(qv - q'c + \pi s)$ given by Proposition 5(b). Following the comparative analysis in §5.1, under the same dupe entry penalty cost f , we compare the firm's equilibrium pricing p_f^* and profit Π_f^* determined by (11) and those of the benchmark case of perfectly observable wealth status, denoted by p_f^0 and Π_f^0 , respectively (recall that this benchmark case is equivalent to the case with no status factor, or $s = 0$). We find the following qualitative insight regarding the effect of status signaling:

PROPOSITION 6. *Suppose that $f > (1 - \pi)(qv - q'c + \pi s)$. There exists a range of f values, such that $p_f^* < p_f^0$ and $\Pi_f^* < \Pi_f^0$ if w is greater than a certain threshold.*

Recall from Proposition 3 that without the market intervention, the presence of the status signaling effect always makes the firm better off in the dupe economy. By contrast, Proposition 6 shows that this result may reverse under strong market intervention, that is, the firm may be *worse off* as a result of consumer status signaling. In this case, the strong status signaling motive of the poor type makes it more costly for the firm to deter the dupe entrant from entering the market. This negative effect of status signaling occurs when the wealth difference is high, a condition characterized by the dupe economy in industry. Therefore, this model finding suggests a quite surprising insight that a strong market intervention such as a high dupe entry penalty cost may not always act in the best interest of the firm to improve its profit in the dupe economy featured by strong status signaling and high wealth difference.

Next, following the comparative analysis in §5.2, under the same dupe entry penalty cost f , we compare the firm's equilibrium profit Π_f^* and that of the mean-preserving benchmark case with no wealth inequality,

denoted by Π_f^m (recall that in this benchmark case, $\theta_R = \theta_P = 1 + \pi w$). We find the following qualitative insight regarding the effect of wealth inequality:

PROPOSITION 7. *Suppose that $f > (1 - \pi)(qv - q'c + \pi s)$. There exists a range of f values, such that $\Pi_f^* < \Pi_f^m$ if w is greater than a certain threshold.*

Recall from Proposition 4 that without market intervention, the firm's equilibrium profit is greater than that of the mean-preserving benchmark under high wealth inequality and strong status signaling. Under strong market intervention, however, Proposition 7 shows that the firm may be *worse off* as a result of high wealth inequality. This model finding again highlights that a strong market intervention such as a high dupe entry penalty cost may not always improve the firm's profit in the dupe economy.

Overall, the above comparative insights suggest that strong market intervention may have unintended consequences such as distorting the positive effects of status signaling and wealth inequality on the firm's profitability in the dupe economy. Thus, it offers a plausible justification for the lack of dupe entry penalty intervention in practice, and in fact, some authentic brands were reported to even dupe themselves to highlight their product status as worthy of being duped (Ellwood 2025).

6.2 The case of welfare-maximizing market intervention

In this subsection, we further discuss the welfare implications of the market intervention of imposing a dupe entry penalty cost. For ease of benchmarking, we consider the best scenario case in which the dupe entry penalty cost is set to maximize the social welfare. To keep things simple, we focus on transferable penalty, which can be redistributed within society. Such penalty intervention is generally regarded as more desirable from a social welfare perspective than non-transferable ones in the context of intellectual property infringement (Marcowitz-Bitton et al. 2023). We also ignore the social cost of implementing and enforcing the penalty intervention in the analysis. As such, the optimal penalty intervention f^* can be determined by the following welfare maximizing problem:

$$W_f^* = \max_{f \geq 0} \left\{ \pi \left[\mu_R^* (\theta_R v - c + \theta_R b_p^* s) + \tilde{\mu}_R^* (\theta_R q v - q'c + \theta_R b_p^* s) + (1 - \mu_R^* - \tilde{\mu}_R^*) \theta_R b_n^* s \right] \right. \\ \left. + (1 - \pi) \left[\mu_P^* (\theta_P v - c + \theta_P b_p^* s) + \tilde{\mu}_P^* (\theta_P q v - q'c + \theta_P b_p^* s) + (1 - \mu_P^* - \tilde{\mu}_P^*) \theta_P b_n^* s \right] \right\}, \quad (13)$$

where μ_R^* , $\tilde{\mu}_R^*$, μ_P^* , and $\tilde{\mu}_P^*$ are the induced purchase decisions under the equilibrium prices p_f^* and \tilde{p}_f^* , each of which is a function of the dupe entry penalty cost f . When multiple penalty levels yield the same optimal social welfare, we choose the lowest one. After obtaining the optimal social welfare W_f^* , we compare it with the social welfare W^* in the case without market intervention (i.e., $f = 0$). We find the following qualitative insight regarding the welfare implications:

PROPOSITION 8. *There exists a threshold \bar{w}' such that*

- (a) If $w \geq \bar{w}'$, $(1 - \pi)(qv - q'c + \pi s) \leq f^* < v - c + \pi s$, and $W_f^* - W^*$ is increasing in s and w .
- (b) If $w < \bar{w}'$, $0 \leq f^* < (1 - \pi)(qv - q'c + \pi s)$, and $W_f^* - W^*$ is either zero or a positive constant independent of s and w .

Moreover, the welfare-maximizing penalty f^* is increasing in s .

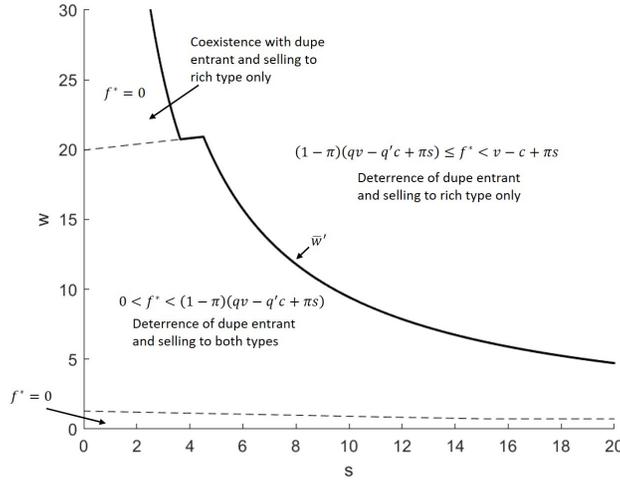


Figure 5 Illustration of the equilibrium results in Proposition 8; model parameters: $v = 20$, $c = 2$, $q = 0.8$, $q' = 0.85$, and $\pi = 0.18$.

Proposition 8(a) shows that when the wealth difference is relatively large (i.e., $w > \bar{w}'$), the maximal welfare gain compared to the case with no market intervention is increasing in both the status factor s and the wealth difference w . In this case, the welfare-maximizing penalty is high enough to deter the dupe entry, thus restoring the positive value of status signaling and the resulting welfare gain. On the other hand, Proposition 8(b) shows that when the wealth difference is relatively small (i.e., $w \leq \bar{w}'$), the maximal welfare gain compared to the case with no market intervention is either zero or capped at a positive constant (see Fig. 5 for an illustration).

Moreover, the welfare-maximizing (expected) penalty f^* is increasing in the status factor s , suggesting that greater enforcement efforts (such as increasing the detection probability and/or the *ex post* penalty levied) are needed as the consumer status signaling motive increases. It may further increase the social cost of implementing such penalty intervention, which is not considered in our model analysis. If such implementation cost is high enough to outweigh the “best-scenario” welfare gain quantified in the above analysis, then no penalty intervention may be socially optimal after all, which can offer yet another plausible explanation for the booming of the dupe economy observed in practice that is almost free of any penalty intervention (Ellwood 2025).

7 Conclusion

In this paper, motivated by the booming of the dupe economy in industry, we develop a game-theoretic model to study a status product firm's pricing and deterrence strategy against a potential dupe entry to the market. A salient feature of our model is that the market demands for the firm and the dupe entrant (if entering the market) are endogenously determined by the equilibrium of a consumer status signaling subgame. With this endogenous demand model, we derive insights regarding the strategic interaction between the firm and the dupe entrant, examine the effects of consumer status signaling and wealth inequality on the equilibrium outcomes, and explore the implications of market interventions that penalize the dupe entry.

Our findings offer managerial and regulatory insights that may be of interest to practitioners in the luxury industry, managers of e-commerce platforms, and policymakers. For example, our analysis reveals that the effects of status signaling and wealth inequality on the firm's profitability depend on the presence and the magnitude of market interventions that penalize the dupe entry. In the absence of market intervention, status signaling allows the firm to extract surplus from rich consumers up to a saturation point. However, a strong market intervention may make the firm worse off. Similarly, high wealth inequality improves the firm's profit in the absence of market intervention but the result may reverse under a strong market intervention.

Our analysis further shows that a "best-scenario" welfare-maximizing market intervention can help restore the positive value of status signaling and generate welfare gains. However, the optimal penalty to deter dupe entry would also increase as the consumer status signaling motive increases. Thus, it may also come with high social costs of implementation and enforcement. These model predictions are consistent with empirical observations of the thrive of the dupe economy in markets with strong status signaling, high wealth inequality, and very little market intervention.

There are several limitations in our study that merit further investigation in future research. First, as a first attempt to model the relationship between consumer status signaling and dupe products, we have made a simplification in our model that spectators cannot discern dupe products and thus there is no penalty intervention for consumers who purchase dupe products. Relaxing this assumption would enable us to investigate how a potential consumer penalty (e.g., in the form of social disutility) for purchasing dupe products would affect the consumer status signaling subgame and the firm's strategy.

Second, we have assumed that consumers are well informed to distinguish dupes from status products. In reality, there could exist less informed consumers who may fail to do so. Allowing for such consumer heterogeneity introduces an interesting but challenging dimension to the game-theoretic analysis of consumer status signaling. Further research is needed to confirm and improve our understanding of the consumer status signaling problem in such a model setting.

Finally, our analysis suggests that consumer status signaling and wealth inequality are two key drivers behind the emergency of the dupe economy. With suitable empirical data, the model presented in the paper

can help develop baseline hypotheses for empirical validation and testing to further advance our understanding of the market dynamics of the dupe economy.

Acknowledgments

The authors gratefully thank the reviewers of POM.

Appendix A: Two-point wealth distribution and Gini coefficient

In this appendix, we provide the rationale for adopting a two-point wealth distribution. We begin by establishing the relationship between the wealth difference w and the Gini coefficient G implied by this distributional assumption.

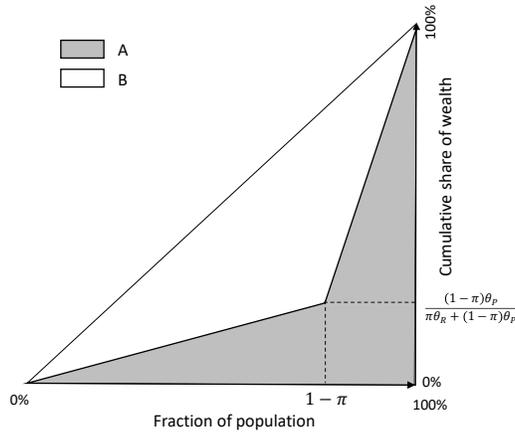


Figure A.1 Illustration of the Gini coefficient with two-point wealth distribution (area $E = A + B$).

According to Gastwirth (1972), the Gini coefficient is defined as the deviation of the population wealth distribution from the totally equal distribution (i.e., the 45 degrees line in Fig. A.1). Specifically, let A and E denote the area under the actual wealth distribution and the area of under the equal distribution in Fig. A.1, respectively. Under the two-point wealth distribution, it can be shown that

$$A = \frac{1}{2} \frac{(1 + \pi)(1 - \pi)\theta_P}{\pi\theta_R + (1 - \pi)\theta_P} + \frac{1}{2} \frac{\pi^2\theta_R}{\pi\theta_R + (1 - \pi)\theta_P}$$

and $E = 1/2$. Thus, we have

$$G = \frac{E - A}{E} = \frac{\pi(1 - \pi)(\theta_R - \theta_P)}{\pi\theta_R + (1 - \pi)\theta_P} = \frac{\pi(1 - \pi) \left(\frac{\theta_R - \theta_P}{\theta_P} \right)}{1 + \pi \left(\frac{\theta_R - \theta_P}{\theta_P} \right)}.$$

It is easy to verify that the above Gini coefficient is an increasing function of the factor $(\theta_R - \theta_P)/\theta_P$, which is the relative percentage wealth difference between the two types and is equal to w in our model. Thus, as the wealth difference w increases, the Gini coefficient of our model increases, reflecting greater

wealth disparity among the consumers. It can be shown that the Gini coefficient of a (continuous) uniform wealth distribution cannot exceed $1/3$, which is a low inequality level. Moreover, if the lower limit of the uniform distribution is zero, then the Gini coefficient is a constant of $1/3$, regardless of the upper limit of the wealth distribution. Therefore, a two-point wealth distribution, which can accommodate more distributional inequality, is more appropriate than a uniform distribution for modelling consumer wealth inequality.

Appendix B: Status utility model discussion

In the base model, we have discussed that $1/\theta_i$ can be interpreted as the type- i consumer's marginal rate of substitution between income and quality. In this appendix, we further discuss the model prediction outcome of assigning consumers' willingness-to-pay (wealth level) to the status utility. The discussion is based on the existing model of Rao and Schaefer (2013) and Gao et al. (2017) in the literature. We note that Rao and Schaefer (2013) and Gao et al. (2017) share the same status utility model. We adopt the notation of Gao et al. (2017) below (which we shall refer to as "GLT") and focus on the benchmark case in GLT, where there is no dupe on the market.

We let p_I be the (incumbent) status product price, v_i be the consumer's willingness-to-pay (wealth level), λ be the consumer's sensitivity to status utility, and k_I be the unit production cost for the (incumbent) status product.

The GLT status utility model and its predictions

According to the model of GLT (p. 275), there are N (normalized to 1) infinitesimal consumers in the market. Each consumer i has wealth level v_i , where v_i is uniformly distributed over $[0, 1]$.

The intrinsic consumption utility for a unit of authentic status product is given by

$$v_i q - p_I, \text{ with } q = 1.$$

The status utility gained by the buyer with the wealth level v_i depends on the average wealth level of the entire group of consumers who buy the status product. Suppose that the wealth level range of this group of buyers is $[\underline{v}, \bar{v}]$, then the status utility is given by

$$\lambda \frac{\int_{\underline{v}}^{\bar{v}} v_i dv_i}{\int_{\underline{v}}^{\bar{v}} dv_i} = \lambda \frac{\bar{v} + \underline{v}}{2}$$

where $\lambda > 0$ is the sensitivity to status utility.

Given the status product price p_I , it can be shown that the equilibrium follows a threshold policy τ_I , that is, consumers with wealth level in $[0, \tau_I]$ do not buy and consumers with wealth level in $[\tau_I, 1]$ buy the status product. Therefore, the buyer with wealth level v_i will purchase the status product if and only if

$$v_i - p_I + \lambda \frac{1 + \tau_I}{2} \geq \lambda \frac{\tau_I}{2}.$$

As a result, the consumer indifference point is $\tau_I = \max\{p_I + \lambda/2, 1\}$. With this indifference point result, the firm solves the following profit maximization problem:

$$\max_{p_I \geq 0} (p_I - k_I)(1 - \max\{p_I + \lambda/2, 1\})$$

Solving this problem yields the following equilibrium pricing and consumption results:

PROPOSITION A.1. *The firm's equilibrium price p_I^B and the consumer purchase threshold τ_I^B are given by*

(a) *If $\lambda < 2(k_I + 1)$, $p_I^B = \frac{1+k_I}{2} + \frac{\lambda}{4}$, $\tau_I^B = \frac{1+k_I}{2} - \frac{\lambda}{4}$.*

(b) *if $\lambda \geq 2(k_I + 1)$, $p_I^B = \frac{\lambda}{2}$, $\tau_I^B = 0$.*

In other words, as the consumers become sufficiently sensitive to status utility, all consumers will purchase the status product in equilibrium, regardless of their wealth levels.

We note that the result of part (a) is the same as shown by GLT, first paragraph of Section 5.1, p. 279) under the assumption of $0 < \lambda < 1$. According to part (b), when $\lambda \geq 2(k_I + 1)$, $\tau_I^B = 0$. This result indicates that as λ becomes sufficiently large, all consumers, regardless of rich or poor, will buy the status product in equilibrium. This model prediction does not seem to effectively capture the fact that the poorest consumer with $\theta_i = 0$ cannot afford the status product when the status factor is strong. For example, an entry-level Hermes Birkin bag is priced at \$10,000 (USD), a price that is out of reach for mainstream consumers in any culture or society, regardless of how much status is valued.

The affordability-adjusted status utility model of GLT and its predictions

In this section, we keep the same model setup of GLT, excepting for adjusting the consumer status utility as follows: we assign the willingness-to-pay (wealth level) v_i of a buyer to the status utility, that is, suppose that wealth level range of the group of buyers is $[\underline{v}, \bar{v}]$, then the status utility for the buyer with wealth level v_i is given by

$$\lambda v_i \frac{\int_{\underline{v}}^{\bar{v}} v_i dv_i}{\int_{\underline{v}}^{\bar{v}} dv_i} = \lambda v_i \frac{\bar{v} + \underline{v}}{2}$$

Note that the above status utility model captures the differential willingness-to-pay (or affordability) for acquiring status utility among consumers through the extra factor v_i , in the same way as the intrinsic consumption utility.

Given the status product price p_I and threshold purchase policy τ_I , the buyer with wealth level v_i will purchase the status product if and only if

$$v_i - p_I + \lambda v_i \frac{1 + \tau_I}{2} \geq \lambda v_i \frac{\tau_I}{2}$$

As a result, the consumer indifference point is $\tau_I = \max\{2p_I/(2 + \lambda), 1\}$. With this indifference point result, the status firm solves the following profit maximization problem:

$$\max_{p_I \geq 0} (p_I - k_I) \left(1 - \max \left\{ \frac{2p_I}{2 + \lambda}, 1 \right\} \right)$$

Solving this problem yields the following equilibrium pricing and consumption results:

PROPOSITION A.2. *The firm's equilibrium price p_i^B and the consumer purchase threshold τ_i^B are given by $p_i^B = (1 + k_i)/2 + \lambda/4$, $\tau_i^B = 1/2 + k_i/(2 + \lambda)$. In other words, as the consumers become sufficiently sensitive to status utility, only the rich half of the consumers will purchase the status product in equilibrium.*

From the above proposition, it is clear that $\tau_i^B > 1/2$ and $\tau_i^B \rightarrow 1/2$ as λ goes to infinity. This indicates that as λ becomes sufficiently large, only the rich half of the consumer population will buy the status product in equilibrium, which is a more plausible prediction when λ is large.

The comparison shows that factoring the consumer affordability in status utility function can achieve a better prediction for the case where the status factor is strong, which is the main focus of this paper.

Appendix C: Vertical differentiation

In the main text, we have discussed the impact of consumer status signaling by comparing the cases of observable and unobservable wealth status. In this appendix, we further extend our discussion on this topic by developing a vertical differentiation model and comparing its outcomes with those of the base model to highlight the additional insights derived from the status signaling game.

Model setup

In this benchmark, we consider a simpler vertical differentiation model as an alternative to the base model. Here, the status product firm offers a product with intrinsic value $(v + s')$, and the dupe entrant offers an inferior product with value $q(v + s')$, where $0 < q < 1$ represents the quality discount of the dupe product. Unlike in our base model, the status utility s' in this benchmark is directly consumed by the consumer, without any interference from a spectator's belief. This means that the status utility is experienced purely as part of the consumption process, with no signaling component involved.

With the above assumption, a type i consumer's utility function is given by

$$\mu_i (\theta_i (v + s') - p) + \tilde{\mu}_i (\theta_i q (v + s') - \tilde{p}), \quad (14)$$

where μ_i and $\tilde{\mu}_i$ represent the probability of purchasing the status product and the dupe product, respectively. The terms $[\theta_i (v + s') - p]$ and $[\theta_i q (v + s') - \tilde{p}]$ correspond to the utilities derived from purchasing the status product at price p and the dupe product at price \tilde{p} , respectively. This setup represents a natural simplification of the signaling stage game, where status is treated as an intrinsic part of the product's utility rather than being inferred by outside observers. By eliminating the signaling component, this benchmark allows us to focus solely on the effects of vertical differentiation, making it easier to isolate the impact of intrinsic product value and quality on market outcomes.

For the remainder of this analysis, we hold v constant and vary the value of s' . Our objective is to examine the impact of s' on key market outcomes, such as consumer purchase decision and firm's pricing strategy, and compare them with the impacts of s in the base model.

Analysis and results

By comparing the utility function (14) with that under the base model given in (1), one can verify that the analysis for this new benchmark can be derived directly from our base model by making the following adjustments: setting the status factor s in the main analysis to 0 and adjusting the intrinsic value v to $v + s'$. By doing so, we eliminate the signaling effect, treating s' as an intrinsic part of the product's utility. This approach allows us to leverage the results from our main analysis.

We find that the vertical differentiation model generates different key insights compare with the base model. In particular, we highlight the following two aspects:

- *Change in consumer purchasing behavior*: In the absence of the signaling game, the vertical differentiation model no longer supports the semi-separating equilibrium where poor consumers occasionally mimic the rich by purchasing the status product. This outcome follows directly from Lemma 1 and the continuity at $s = 0$.
- *Elimination of saturation effect*: In the base model, without dupe entry penalty intervention, dupe entry leads to a saturation effect, where increasing the status factor no longer increase the firm's price and improves the firm's profit (see Proposition 3). In contrast, the vertical differentiation model does not exhibit this saturation effect as shown below.

Elimination of saturation effect

In the base model with no dupe entry penalty intervention, we have identified a saturation effect, formalized by Proposition 3, which shows that as the status factor s increases, the firm's price p^* and profit Π^* become independent of s . This occurs because, beyond a certain point, the rich consumers' willingness to pay for the status product no longer increases with s , leading to a "flat" pricing strategy for the firm. In other words, dupes dilute the brand value of the status products, removing the premium that the firm could have charged to the rich consumers as consumers become more status seeking.

We now show that this effect is unique to the signaling game, where consumer utility is tied to spectators' beliefs rather than a fixed value associated with the product. To this end, we start by defining the threshold value:

$$\bar{w}^\dagger = \max \left\{ \frac{(1 - \pi) [(1 - q - \pi q)(v + s') - (1 - q' - \pi q')c]}{\pi(1 - q)(v + s')}, \frac{(1 - \pi) [(1 - q)(v + s') - (1 - q')c]}{(1 - q)(v + s')} \right\}. \quad (15)$$

Using this threshold, we can characterize the equilibrium pricing strategy under the vertical differentiation model:

PROPOSITION A.3. *Under the vertical differentiation model, the following hold in equilibrium:*

(a) If $w \geq \bar{w}^\dagger$, the firm coexists with the dupe entrant and sells to the rich type only. The firm's profit is $\Pi^* = (p^* - c)\pi$, with the pricing strategy

$$p^* = \begin{cases} (1-q)(1+w)(v+s') + q'c + (1-\pi)q(v+s') & \text{if } w \geq \frac{\pi(qv+qs-d'c)}{(1-q)(v+s')}, \\ \frac{w(1-q)(v+s')}{\pi} + (1-q)(v+s') + q'c & \text{otherwise.} \end{cases}$$

(b) If $w < \bar{w}^\dagger$, the dupe entrant is deterred from entering the market and both types purchase the status product. The firm's profit is $\Pi^* = p^* - c$, with the pricing strategy $(1-q)(v+s') + q'c$.

Proof. The results stated in the proposition can be obtained directly by replacing $s = 0$ and $v = v + s'$ from Proposition 2. ■

From Proposition A.3, we observe that when s' becomes sufficiently large, the optimal price p^* and profit Π^* depend on and increase with s' , creating a clear contrast with Proposition 3. In the vertical differentiation model, increasing the consumer's valuation of the product consistently leads to higher prices and profits for the firm. Therefore, the saturation effect observed in the base model, stemming from the dupe entrant's strong ability to dilute the brand value, is uniquely driven by the signaling dynamics.

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E-Companion for “Consumer Status Signaling, Wealth inequality and the Dupe Economy”

This E-Companion consists of four parts. Section EC.1 contains the proofs of the lemmas for equilibrium consumption behaviors. Following the equilibrium consumption behaviors, we prove the propositions of the results for our base model in Section EC.2. Section EC.3 contains the proofs of the results for dupe entry penalty intervention. Finally, we discuss an extension of the model to accommodate competition among the dupe entrants in Section EC.4.

EC.1 Proofs: Induced demand from consumer status signaling

We start with deriving the equilibrium consumer behavior when they signal status through the purchase of the status product and/or the dupe product. Lemma 1 gives a benchmark result for a market with only one type of products—the status product, or the dupe product. The analysis in this lemma contains details on how we derive the signaling game results. Corollary 1 provides comparative statistics.

Next, Proposition 1 shows the demand function when the status and dupe products are both present. By applying D_1 -criterion refinement, we characterize the perfect Bayesian equilibrium from the signaling game for consumers, which essentially establishes a mapping between the prices of the products and the consumption quantity by the consumers and is the demand function that we use later for modeling the firm’s equilibrium pricing decisions.

As stated in the main body of the paper, we apply D_1 -criterion to refine the spectator’s belief. That is, the spectator assigns the belief for off-equilibrium strategies by considering which type of consumers is more likely to deviate. We take the following steps to refine the belief: (1) compute the sets of the spectator’s beliefs that would cause rich and poor consumers to deviate; (2) identify the type of consumers for whom a larger set of the spectator’s belief will make it beneficial to deviate. (3) assign the most weight to the type identified in (2) as the spectator’s belief for an off-equilibrium strategy.

Proof of Lemma 1

We first characterize all the perfect Bayesian equilibria under the D_1 -criterion refinement. The equilibrium could be separating, pooling or semi-separating:

Pooling equilibrium: Neither of the two consumer types purchases the product, i.e., $\lambda_p^* = \lambda_r^* = 0$. This equilibrium is supported if the equilibrium belief system (b_n^*, b_p^*) satisfies $b_n^* = \pi$, and both types are worse off from deviation (the utility gained from purchase is not greater than the one from no purchase), i.e., $(1+w)v + (1+w)b_p^*s - p \leq (1+w)\pi s$ for the rich type and $v + b_p^*s - p \leq \pi s$ for the poor type. The sets of the spectator’s belief b that causes the poor type and the rich type to strictly deviate to purchase are, respectively, given by $D_P = \{b | v + bs - p > \pi s\} = \{b | b > (\pi s - v + p)/s\}$ and $D_R = \{b | (1+w)v + (1+w)bs - p > (1+w)\pi s\} = \{b | b > (\pi s - v + p/(1+w))/s\}$. Also note that for the poor type the

indifference belief set for purchase and no purchase decisions is given by $D_p^0 = \{b|v + bs - p = \pi s\}$. Clearly, $[D_p \cup D_p^0] = \{b|b \geq (\pi s - v + p)/s\} \subset \{b|b > (\pi s - v + p/(1+w))/s\} = D_R$ when $D_R \neq \emptyset$, and $D_R \neq \emptyset$ if and only if $p < (1+w)(v + (1-\pi)s)$. By the D_1 -criterion refinement (the spectator should assign positive probability only to the type(s) that are most likely to deviate from the equilibrium path given their incentives), the off-equilibrium belief b_p should be 1 when $p < (1+w)(v + (1-\pi)s)$. Under this condition, the pooling equilibrium with $\lambda_p^* = \lambda_R^* = 0$ cannot survive the D_1 -criterion. As a result, the condition that supports the pooling equilibrium with $\lambda_p^* = \lambda_R^* = 0$ and survives the D_1 -criterion is $p \geq (1+w)(v + (1-\pi)s)$.

Pooling equilibrium: Both of the two consumer types purchase the product, i.e., $\lambda_p^* = \lambda_R^* = 1$. The equilibrium is supported if the equilibrium belief system (b_n^*, b_p^*) satisfies $b_p^* = \pi$, and both types are worse off from deviation (utility gained from no purchase is not greater than the one from purchase), i.e., $(1+w)v + (1+w)\pi s - p \geq (1+w)b_n^*s$ for the rich type and $v - p + \pi s \geq b_n^*s$ for the poor type. The set of the spectator's belief b that causes the rich type and the poor type to strictly deviate to no purchase is given by $D_p = \{b|v - p + \pi s < bs\} = \{b|b > (v - p + \pi s)/s\}$ and $D_R = \{b|(1+w)v - p + (1+w)\pi s < (1+w)bs\} = \{b|b > (v - p/(1+w) + \pi s)/s\}$, respectively. For the rich type, the indifference belief set is given by $D_R^0 = \{b|(1+w)v - p + (1+w)\pi s = (1+w)bs\} = \{b|b = (v - p/(1+w) + \pi s)/s\}$. Clearly, $D_R \cup D_R^0 = \{b|b \geq (v - p/(1+w) + \pi s)/s\} \subset \{b|b > (v - p + \pi s)/s\} = D_p$ when $D_p \neq \emptyset$, and $D_p \neq \emptyset$ if and only if $p < v - (1-\pi)s$. Under this condition, by the D_1 -criterion refinement, the off-equilibrium belief b_n should be 0. Hence, if $p < v - (1-\pi)s$ and $v - p + \pi s < 0$ (the poor consumer is better off from deviation), the pooling equilibrium with $\lambda_p^* = \lambda_R^* = 1$ cannot survive the D_1 -criterion. Further, because $v - (1-\pi)s < v + \pi s$, the above two inequalities cannot hold at the same time. Therefore, the D_1 -criterion has no bite. Therefore, there is no restriction on belief b_n^* imposed by the D_1 -criterion on the disequilibrium path. As a result, the condition that supports the pooling equilibrium with $\lambda_p^* = \lambda_R^* = 1$ is given by $v - p + \pi s \geq 0 \cdot s$.

Separating equilibrium: The poor type does not purchase while the rich type purchases, i.e., $\lambda_p^* = 0$ and $\lambda_R^* = 1$. The spectator's equilibrium belief (b_n^*, b_p^*) should satisfy: $b_n^* = 0$ and $b_p^* = 1$. The equilibrium is supported if the rich type's utility gained from purchase is not less than the one from no purchase, i.e., $(1+w)v - p + (1+w)s \geq 0$ and the poor type's utility gained from no purchase is not less than the one from purchase, i.e., $v - p + s \leq 0$, which gives $v + s \leq p \leq (1+w)(v + s)$.

Semi-separating equilibrium: The poor type does not purchase the product with probability 1 while the rich type plays mixed strategy, i.e., $0 = \lambda_p^* < \lambda_R^* < 1$. In this case, applying Bayes' rule, we have $b_n^* = \frac{\pi(1-\lambda_R^*)}{\pi(1-\lambda_R^*)+1-\pi}$ and $b_p^* = 1$. Then, to support such an equilibrium, the product's price should satisfy the indifference condition for the rich consumer, i.e., $(1+w)v - p + (1+w)s = (1+w)\frac{\pi(1-\lambda_R^*)}{\pi(1-\lambda_R^*)+1-\pi}s$, and the condition for no deviation for the poor consumer, i.e., $v - p + s \leq \frac{\pi(1-\lambda_R^*)}{\pi(1-\lambda_R^*)+1-\pi}s$. Hence, the rich consumer's equilibrium strategy can be expressed by $\lambda_R^* = \frac{p/(1+w)-v-(1-\pi)s}{\pi(p/(1+w)-v)}$. One can check that $0 < \lambda_R^* < 1$ if and only if

$(1+w)(v+(1-\pi)s) < p < (1+w)(v+s)$. Hence, such semi-separating equilibrium is supported if and only if $(1+w)(v+(1-\pi)s) < p < (1+w)(v+s)$.

Semi-separating equilibrium: The rich type purchases while the poor type plays mixed strategy, i.e., $0 < \lambda_p^* < \lambda_R^* = 1$. In this case, applying Bayes' rule, we have $b_n^* = 0$ and $b_p^* = \frac{\pi}{\pi+(1-\pi)\lambda_p^*}$. Then the product's price should satisfy the condition for no deviation for the rich consumer, i.e., $(1+w)v - p + (1+w)\frac{\pi s}{\pi+(1-\pi)\lambda_p^*} \geq 0$ and the indifference condition for the poor consumer, i.e., $v - p + \frac{\pi s}{\pi+(1-\pi)\lambda_p^*} = 0$. Therefore, the poor type's equilibrium strategy is given by $0 < \lambda_p^* = \frac{\pi(v-p+s)}{(1-\pi)(p-v)} < 1$ if and only if $v + \pi s < p < v + s$.

By checking the above PBE outcomes, it can be shown that multiple equilibria arise if and only if $[(1+w)(v+(1-\pi)s), +\infty)$ overlaps with $[0, v + \pi s]$ or $(v + \pi s, v + s)$. It can be further shown that for the product's price $p \geq (1+w)(v+(1-\pi)s)$, pooling equilibrium with $\lambda_p^* = \lambda_R^* = 0$ Pareto dominates all other PBE equilibria derived above.

Combining all the above results, we complete the proof of this lemma. ■

Proof of Corollary 1

Observe that $(1+w)(v+(1-\pi)s)$ is increasing in w and s . Moreover, note that $\lambda_R^*(p; v)$ is a decreasing step function of p . Therefore, $\lambda_R^*(p; v)$ is increasing in w and s . Similarly, it can be shown that $\lambda_p^*(p; v)$ is increasing in w and s . This completes the proof of this corollary. ■

Proof of Proposition 1

Following the same logic in the proof of Lemma 1, we first characterize all the perfect Bayesian equilibria under the D_1 -criterion refinement. The equilibrium could be separating, pooling or semi-separating. We divide our characterization into the following cases.

Case 1: $v - p > qv - \tilde{p}$ or equivalently, $p - \tilde{p} < (1-q)v$.

In this case, it can be shown that $(1+w)v + (1+w)b_p^*s - p > (1+w)qv + (1+w)b_p^*s - \tilde{p}$ and $v + b_p^*s - p > qv + b_p^*s - \tilde{p}$. Therefore, neither of the two types purchases the dupe product, that is, $\tilde{\mu}_R^* = \tilde{\mu}_p^* = 0$. Hence, the induced demand for the status product is the same as the one in the benchmark case with no dupe.

Case 2: $(1+w)qv - \tilde{p} \geq (1+w)v - p$ or equivalently, $p - \tilde{p} \geq (1+w)(1-q)v$.

In this case, similar to case 1, $(1+w)v + (1+w)b_p^*s - p \leq (1+w)qv + (1+w)b_p^*s - \tilde{p}$ and $v + b_p^*s - p \leq qv + b_p^*s - \tilde{p}$. Therefore, neither of the two consumer types purchases the status product, that is, $\mu_R^* = \mu_p^* = 0$ (Note that when equality holds, the rich type is indifferent between these two types of products. However, we can focus on the case yielding the highest demand for the dupe product. As a matter of fact, it can be shown that the dupe entrant can induce such consumer behavior by setting its price arbitrarily close to the highest demand. We adopt this criterion to break tie throughout the paper). Hence, the dupe entrant sells its dupe product like the firm in the case with no dupe.

Case 3: $(1-q)v \leq p - \tilde{p} < (1+w)(1-q)v$.

In this case, it can be shown that $(1+w)v + (1+w)b_p^*s - p > (1+w)qv + (1+w)b_p^*s - \tilde{p}$ and $v + b_p^*s - p < qv + b_p^*s - \tilde{p}$. In other words, the rich type never purchases the dupe product while the poor type never purchases the status product. Therefore, $\mu_R^* = \tilde{\mu}_p^* = 0$. Then, we can divide the equilibrium discussion into the following 5 subcases.

Subcase 1: Both types purchase products with $\mu_p^* = \tilde{\mu}_R^* = 1$.

To support this equilibrium, the equilibrium belief system (b_n^*, b_p^*) needs to satisfy: the belief is consistent with equilibrium play, i.e., $b_p^* = \pi$, and both types are worse off from deviation, i.e., $qv + \pi s - \tilde{p} \geq b_n^*s$ for the poor type, $(1+w)v + (1+w)\pi s - p \geq (1+w)b_n^*s$ for the rich type. Then, $b_n^* \leq \frac{qv - \tilde{p} + \pi s}{s}$. This requires $\tilde{p} \leq qv + \pi s$. Note that the set of the spectator's belief that causes the rich type and the poor type to strictly deviate to no purchase are given by $D_P = \{b | bs > qv + \pi s - \tilde{p}\}$ and $D_R = \{b | (1+w)bs > (1+w)v + (1+w)\pi s - p\}$, respectively. For the rich type and the poor type, the indifference sets are given by $D_R^0 = \{b | (1+w)bs = (1+w)v + (1+w)\pi s - p\}$ and $D_P^0 = \{b | bs = v + \pi s - \tilde{p}\}$, respectively. Note that $(1-q)v \leq p - \tilde{p} < (1+w)(1-q)v$. Hence, $qv - \tilde{p} + \pi s \leq qv + \pi s - \frac{\tilde{p}}{1+w} < v + \pi s - \frac{p}{1+w}$. Therefore, $[D_R \cup D_R^0] \subset D_P$ when $D_P \neq \emptyset$. Furthermore, $D_P \neq \emptyset$ if and only if $qv + \pi s - \tilde{p} < s$. In this case, applying D_1 -criterion, the off-equilibrium belief b_n^* should be 0, which can be guaranteed by condition $qv - \tilde{p} + \pi s \geq 0$. Hence, the D_1 -criterion has no bite. As a result, equilibrium with $\mu_p^* = \tilde{\mu}_R^* = 1$ can be supported when $\tilde{p} \leq qv + \pi s$.

Subcase 2: The poor type plays mixed strategy while the rich type only purchases the status product, i.e., $\mu_R^* = 1 > \tilde{\mu}_p^* > 0$. In this case, we have $b_p^* = \frac{\pi}{\pi + (1-\pi)\tilde{\mu}_p^*}$ and $b_n^* = 0$. To support such equilibrium, we require that the equilibrium belief system (b_n^*, b_p^*) satisfies: the rich type is better off from purchase, i.e., $(1+w)v + (1+w)b_p^*s - p \geq 0$ and the poor type is indifferent between purchase and no purchase, i.e., $0 = qv + b_p^*s - \tilde{p}$. Then we have $b_p^* = \frac{\tilde{p} - qv}{s}$ and $\tilde{\mu}_p^* = \frac{\pi(s - \tilde{p} + qv)}{(1-\pi)(\tilde{p} - qv)}$. Note that $0 \leq \tilde{\mu}_p^* \leq 1$, or equivalently, $qv + \pi s \leq \tilde{p} \leq qv + s$. As a result, equilibrium with $\mu_R^* = 1$ and $\tilde{\mu}_p^* = \frac{\pi(s - \tilde{p} + qv)}{(1-\pi)(\tilde{p} - qv)}$ is supported when $qv + \pi s \leq \tilde{p} \leq qv + s$.

Subcase 3: The rich type purchases the status product while the poor type purchases nothing, i.e., $\mu_p^* = 1$ and $\tilde{\mu}_R^* = 0$. In this case, to be an equilibrium, we must have $b_p^* = 1$ and $b_n^* = 0$. To support such equilibrium, we require: the rich type is better off from purchase, i.e., $(1+w)v + (1+w)s - p \geq 0$ and the poor type is better off from no purchase, i.e., $0 \geq qv + s - \tilde{p}$. Hence, the equilibrium with $\mu_p^* = 1$ and $\tilde{\mu}_R^* = 0$ is supported when $qv + s \leq \tilde{p}$ and $p \leq (1+w)(v + s)$.

Subcase 4: The poor type does not purchase the dupe product while the rich type plays mixed strategy, i.e., $0 < \mu_R^* < 1$ and $\tilde{\mu}_p^* = 0$. In this case, the belief system should satisfy: $b_p^* = 1$ and $b_n^* = \frac{\pi(1 - \mu_R^*)}{\pi(1 - \mu_R^*) + (1 - \pi)}$. To support such equilibrium, we require: the rich type is indifferent between purchase and no purchase, i.e., $(1+w)v + (1+w)s - p = (1+w)b_n^*s$ and the poor type is worse off from purchase, i.e., $b_n^*s \geq qv + s - \tilde{p}$. Hence, $b_n^* = \frac{(v+s) - p/(1+w)}{s}$ and then $\mu_R^* = \frac{p/(1+w) - v - (1-\pi)s}{\pi(p/(1+w) - v)}$. Note that $0 \leq \mu_R^* \leq 1$, or equivalently,

$(1+w)(v+(1-\pi)s) \leq p \leq (1+w)(v+s)$. Therefore, equilibrium with $\mu_R^* = \frac{p/(1+w)-v-(1-\pi)s}{\pi(p/(1+w)-v)}$ and $\tilde{\mu}_p^* = 0$ is supported when $(1+w)(v+(1-\pi)s) \leq p \leq (1+w)(v+s)$.

Subcase 5: Neither of the two types purchases a product, i.e., $\mu_R^* = \tilde{\mu}_p^* = 0$. In this case, to be an equilibrium, we have $b_n^* = \pi$. To support such equilibrium, we require neither type has incentive to deviate: $qv + b_p^*s - \tilde{p} \leq \pi s$ for the poor type and $(1+w)v + (1+w)b_p^*s - p \leq (1+w)\pi s$ for the rich type. Note that $(1-q)v \leq p - \tilde{p} < (1+w)(1-q)v$. Hence, it is equivalent to $b_p^* \leq \frac{\pi s + p/(1+w) - v}{s}$, which requires $p \geq (1+w)(v - \pi s)$. Note that the set of the spectator's belief that causes the poor type and the rich type to strictly deviate to purchase are, respectively, given by $D_P = \{b|qv + bs - \tilde{p} > \pi s\}$ and $D_R = \{b|(1+w)v + (1+w)bs - p > (1+w)\pi s\}$. For the rich poor and rich type, the indifference set are given by $D_p^0 = \{b|qv + \pi s - \tilde{p} = bs\}$ and $D_R^0 = \{b|(1+w)v + (1+w)bs - p = (1+w)\pi s\}$, respectively. Note that $(1-q)v \leq p - \tilde{p} < (1+w)(1-q)v$. We therefore have $qv + bs - \tilde{p} \leq qv + bs - \frac{\tilde{p}}{1+w} < v + bs - \frac{p}{1+w}$. Hence, we have $[D_P \cup D_p^0] \subset D_R$ when $D_R \neq \emptyset$. Moreover, note that $D_R \neq \emptyset$ if and only if $(1+w)v + (1+w)s - p > (1+w)\pi s$. In this case, applying the D_1 -criterion, the off-equilibrium belief b_p^* should be 1. The rich type's non deviation constraint becomes: $(1+w)v + (1+w)s - p \leq (1+w)\pi s$, a contradiction. This implies that pooling equilibrium cannot survive when $(1+w)v + (1+w)s - p > (1+w)\pi s$. As a result, equilibrium with $\mu_R^* = \tilde{\mu}_p^* = 0$ is supported when $p \geq (1+w)(v + (1-\pi)s)$.

Finally, it is easy to see that when $(1-q)v \leq p - \tilde{p} < (1+w)(1-q)v$ and $p \geq (1+w)(v + (1-\pi)s)$, the equilibrium with $\mu_R^* = \tilde{\mu}_p^* = 0$ Pareto dominates any other equilibrium. Using the definitions of $\lambda_P^*(\cdot; \cdot)$ and $\lambda_R^*(\cdot; \cdot)$ in Lemma 1, we achieve our desired results stated in this proposition. ■

Proof of Corollary 2

The sensitivity result for the status factor s is straightforward according to Corollary 1 and Proposition 1. For the wealth difference w , it can be shown that $d^*(p, \tilde{p})$ is increasing in w for each of three cases in Proposition 1. Moreover, $(1+w)(1-q)v$ is increasing in w . So $d^*(p, \tilde{p})$ is increasing in w as well. Similarly, we can show that $\tilde{d}^*(p, \tilde{p})$ is increasing in w for each of three cases in Proposition 1. However, $(1+w)(1-q)v$ is increasing in w and $\tilde{d}^*(p, \tilde{p})|_{p=\tilde{p}+(1+w)(1-q)v^-} < \tilde{d}^*(p, \tilde{p})|_{p=\tilde{p}+(1+w)(1-q)v^+}$, so $\tilde{d}^*(p, \tilde{p})$ is in general non-monotone in w . This completes the proof. ■

EC.2 Proofs: Equilibrium strategy and insights

Proof of Proposition 2 We first prove that given any $p > 0$, $\tilde{\mu}_p^*$ or $\tilde{\mu}_R^* \in \{0, 1\}$. In other words, given any status product price p , it is never optimal for the dupe entrant to set a price \tilde{p} such that $0 < \tilde{\mu}_R^* < 1$ or $0 < \tilde{\mu}_p^* < 1$. Note that when $p - \tilde{p} < (1-q)v$, the resulting demand for the dupe product is always zero; that is, $\tilde{\mu}_R^* = 0$ and $\tilde{\mu}_p^* = 0$. When $p - \tilde{p} \geq (1+w)(1-q)v$, the dupe entrant sells its product as a monopolist. From the demand function (4) and (5), it can be shown the mixed strategy is never induced in equilibrium

(otherwise, the monopolist can either increase or decrease its price to be better off). It remains to consider the most complicated case, i.e., $(1 - q)v \leq p - \tilde{p} < (1 + w)(1 - q)v$. According to Proposition 1, it can be shown that the poor type will play mixed strategy only when $qv + \pi s < \tilde{p} < \min\{(1 + w)(qv + (1 - \pi)s), qv + s\}$. In this interval, the profit of the dupe entrant can be written as $\Pi^c(\tilde{p}; p) := (\tilde{p} - q'c) \pi \frac{s - \tilde{p} + qv}{\tilde{p} - qv}$. Note that in this case, $\frac{d\Pi^c}{d\tilde{p}} < 0$. Therefore, the dupe entrant could be better off reducing \tilde{p} in this region. Note that reducing \tilde{p} will reach one of the two boundary cases, $\tilde{p} = qv + \pi s$ and $p - \tilde{p} = (1 + w)(1 - q)v$. Also note that on the boundary of $\tilde{p} = qv + \pi s$ of this region, we have $(s - \tilde{p} + qv)/(\tilde{p} - qv) = 1 - \pi$, suggesting that the dupe entrant is better off by inducing the poor type to purchase the dupe product with probability 1; on the boundary of $p - \tilde{p} = (1 + w)(1 - q)v$, we have $\pi(s - \tilde{p} + qv)/(\tilde{p} - qv) < \pi s/(\tilde{p} - qv)$ because $\tilde{p} > qv + \pi s$, suggesting that the dupe entrant can be better off by reducing its dupe product's price further to induce the rich type to purchase the dupe product with a certain probability (note in this case, the dupe entrant will be a monopolist on the market). As a matter of fact, the dupe entrant would be further better off by setting $\tilde{p} = qv + \pi s$ in which both types purchase the dupe product. In summary, given any status product's price p , it is never optimal for the dupe entrant to play a mixed strategy. So mixed strategy, i.e., $0 < \tilde{\mu}_R^* < 1$ or $0 < \tilde{\mu}_p^* < 1$, will never be induced in equilibrium.

With the above result, we are in position to prove that $\mu_R^* = 1$, $\mu_p^* \in \{0, 1\}$ and $\tilde{\mu}_p^* \in \{0, 1\}$. From the result of Proposition 1, the rich type never plays a mixed strategy and it is impossible that the rich type does not buy the status product while the poor type purchases the status product. Thus, it is sufficient to prove that it is impossible for neither type to purchase the status product. In what follows, we rule out this by contradiction. We divide the discussion into the following four subcases. Subcase one: both types purchase nothing. It is clear that such equilibrium must collapse because the firm can gain positive profit by setting the status product's price equal to $\min\{v + \pi s, (1 + w)(1 - q)v + q'c\}$, no matter whether the dupe entrant coexists with the firm (see Proposition 1). Subcase two: the poor type purchases the dupe product while the rich type purchases nothing. It can be shown that either type has the incentive to deviate (due to high affordability for the rich type, either the poor type pools with the rich type by purchasing nothing or the rich type is better off by purchasing the dupe product), a contradiction. Subcase three: the rich type purchases the dupe product. According to Proposition 1, this is the case when the dupe product is the only product on the market (i.e., in the region of $p^* - \tilde{p}^* > (1 + w)(1 - q)v$), yielding zero profit for the firm. The firm can reduce its status product's price to $\min\{v + \pi s, (1 + w)(1 - q)v + q'c\}$ (which is greater than c) and always yield a positive profit, no matter whether the dupe entrant enters the market (see Proposition 1). Subcase four: the poor type purchases the status product in a mixed strategy. As demonstrated in Proposition 1, in this case, the firm can be better off by either increasing or decreasing its price to induce the poor type to play pure strategy.

With the above preparation, given any status product price p , we only need to focus on the subgame equilibrium resulting in $\tilde{d}^* = \pi, \tilde{d}^* = 1 - \pi$, or $\tilde{d}^* = 1$. According to Proposition 1, it can be shown

that to induce $\tilde{d}^* = \pi$, $\tilde{d}^* = 1 - \pi$, and $\tilde{d}^* = 1$, the highest possible prices for the dupe product are $(1+w)(qv + (1-\pi)s)$, $qv + \pi s$ and $qv + \pi s$, respectively. In what follows, we let $\Pi_c(\tilde{p}, \tilde{d}) = (\tilde{p} - q'c)\tilde{d}$, which is the expression of the dupe entrant's profit function given the price \tilde{p} and the demand \tilde{d} .

Note that $\Pi_c(qv + \pi s, 1) = (qv + \pi s - q'c) > 0$ and $\Pi_c(qv + \pi s, 1 - \pi) = (1 - \pi)(qv + \pi s - q'c) > 0$. Further note that $qv + \pi s$ is the highest price for the dupe product to induce $\tilde{d}^* = 1 - \pi$ and $\tilde{d}^* = 1$, the status product's equilibrium price must be lower than $qv + \pi s + (1+w)(1-q)v$.

Under such a pricing scheme, $\tilde{d}^* = \pi$ will never be induced in equilibrium, so there are only two possible cases for the dupe entrant's demand $\tilde{d}^* = 1 - \pi$ or $\tilde{d}^* = 1$. Note that it is never optimal for the firm to set a price such that $\tilde{d}^* = 1$ in equilibrium. We can always find a threshold p' such that the induced demand for the dupe product is $\tilde{d}^*(p, \tilde{p}^*(p)) = 1$ if and only if $p > p'$. This implies that the firm should at most set $p^* = p'$ to prevent the market from being completely taken over by the dupe entrant. The value of threshold price p' depends on the value of w . We can divide the discussion into two subcases to find such p' .

Subcase 1: $w \geq \frac{\pi(qv - q'c) + \pi^2 s}{(1-q)v}$. One can check p' is the solution to the equation $p - (1-q)(1+w)v - q'c = (1-\pi)[qv + \pi s - q'c]$, where $p - (1-q)(1+w)v - q'c$ is the profit of the dupe entrant when $\tilde{p} = p - (1-q)(1+w)v$ and $\tilde{d} = 1$, and $(1-\pi)[qv + \pi s - q'c]$ is the profit of the dupe entrant when $\tilde{p} = qv + \pi s$ and $\tilde{d} = 1 - \pi$. Hence, the threshold price is $p' = (1-q)(1+w)v - q'c + (1-\pi)[qv + \pi s - q'c] = (1-q)(1+w)v + \pi q'c + (1-\pi)[qv + \pi s]$. Recall that by definition p' is the highest price the firm can set to induce $\tilde{d}^* = 1 - \pi$. One can further check at this price, the profit of the dupe entrant is $(qv + \pi s - q'c)(1-\pi)$, which is greater than zero. Therefore, the firm should set its status product's price to be further lower to make the dupe entrant unprofitable to enter. This requires that $(1-\pi)(p - (1-q)v - q'c) \leq 0$, therefore, $p \leq (1-q)v + q'c$. Such a price must be lower than $v + \pi s$, so the induced demand for status product is 1.

Subcase 2: $w < \frac{\pi(qv - q'c) + \pi^2 s}{(1-q)v}$. In this case, one can check that p' is the solution to the equation $p - (1-q)(1+w)v - q'c = (p - (1-q)v - q'c)(1-\pi)$. Hence, the threshold $p' = \frac{(1-q)(1+w)v + q'c - (1-\pi)(1-q)v - (1-\pi)q'c}{\pi} = \frac{(1-q)(1+w)v - (1-\pi)(1-q)v}{\pi} + q'c$. Note that $\Pi_c(p', 1 - \pi) > 0$, so the dupe entrant's gain from the market is higher than zero. This leads to two subscenarios to discuss. Subscenario 1: $\left[\frac{(1-q)(1+w)v - (1-\pi)(1-q)v}{\pi} + q'c - c \right] \pi \geq (1-q)v + q'c - c$. In this case, the firm is better off selling its product to the rich type and the optimal price is $\frac{(1-q)(1+w)v - (1-\pi)(1-q)v}{\pi} + q'c$, which allows the dupe entrant to sell to the poor type. Subscenario 2: $\left[\frac{(1-q)(1+w)v - (1-\pi)(1-q)v}{\pi} + q'c - c \right] \pi < (1-q)v + q'c - c$. In this sub-scenario, the optimal price is $p^* = (1-q)v + q'c$.

In summary, we have the following results: When $w \geq \frac{\pi(qv - q'c) + \pi^2 s}{(1-q)v}$, $p^* = (1-q)(1+w)v + \pi q'c + (1-\pi)(qv + \pi s)$ if $w \geq \frac{(1-\pi)(1-q-\pi q)v - (1-\pi)(1-q-\pi q') - (1-\pi)\pi^2 s}{\pi(1-q)v}$ and $p^* = (1-q)v + q'c$ if $w < \frac{(1-\pi)(1-q-\pi q)v - (1-\pi)(1-q-\pi q') - (1-\pi)\pi^2 s}{\pi(1-q)v}$. When $w < \frac{\pi(qv - q'c) + \pi^2 s}{(1-q)v}$, $p^* = (1+w)(1-q)v + f + tc$. When $w < \frac{\pi(qv - q'c) + \pi^2 s}{(1-q)v}$ and $\left[\frac{(1-q)(1+w)v - (1-\pi)(1-q)v}{\pi} + q'c - c \right] \pi \geq (1-q)v + q'c - c$, $p^* = \frac{(1-q)(1+w)v - (1-\pi)(1-q)v}{\pi} + q'c$.

When $w < \frac{\pi(qv-q'c)+\pi^2s}{(1-q)v}$ and $\left[\frac{(1-q)(1+w)v-(1-\pi)(1-q)v}{\pi} + q'c - c\right] \pi < (1-q)v + q'c - c$, $p^* = (1-q)v + q'c$. Rearranging the above conditions, we have the desired result as stated in Proposition 2. ■

Proof of Proposition 3 a) From proposition, we can show that both p^* and Π^* are increasing in s . Note that p^0 and Π^0 are equal to p^* and Π^* at $s = 0$. Therefore, we always have $p^* \geq p^0$ and $\Pi^* \geq \Pi^0$. Note that p^* and Π^* are continuous in s . Further note that only in the region that $w \geq \bar{w}$ and $w \geq \frac{\pi(qv-q'c)+\pi^2s}{(1-q)v}$, p^* and Π^* are increasing in s . Therefore, $p^* = p^0$ and $\Pi^* = \Pi^0$ happens if and only if $w < \bar{w}$ or $w < \frac{\pi(qv-q'c)+\pi^2s}{(1-q)v}$ at $s = 0$.

b) $p^* - p^0$ and $\Pi^* - \Pi^0$ are constant in s when $w < \bar{w}$, or $w \geq \bar{w}$ and $w < \frac{\pi(qv-q'c)+\pi^2s}{(1-q)v}$. Using the expression of \bar{w} , we can show that $p^* - p^0$ and $\Pi^* - \Pi^0$ are constant in s when $s \geq \max\left\{\frac{(1-q)v\bar{w}-\pi(qv-q'c)}{\pi^2}, \frac{[(1-\pi-q)v-(1-\pi-q')c]^+}{\pi^2}\right\}$.

c) From the expression of equilibrium social welfare, we have W^* is strictly increasing in s . Due to continuity, we have $W^* < W^0$ and $W^0 - W^*$ is increasing in s . ■

Proof of Proposition 4 a) First, we present the equilibrium results for the new benchmarking case. To this end, we need to generalize our base model. Specifically, we let θ_p be t and θ_R be $(1+w')t$. From the consumer's decision problem, our equilibrium is unchanged except that w is replaced with w' , v and s are replaced with tv and ts , respectively. Next, we let $t = (1+\pi w)$ and $w' \rightarrow 0$. With this adjustment, leveraging the result of Proposition 2, we have the equilibrium results for the new benchmarking setting as follows (we use superscript m to the results for this benchmarking setting): $p^m = (1-q)(1+\pi w)v + q'c$ and $\Pi^m = (1+\pi w)(1-q)v - (1-q')c$.

When $w \geq \bar{w}$ and $w \geq \frac{\pi(qv-q'c)+\pi^2s}{(1-q)v}$, $\Pi^* - \Pi^m = [(1-q)(1+w)v + q'c + (1-\pi)(qv + \pi s) - c] \pi - [(1+\pi w)(1-q)v - (1-q')c]$. Therefore, when $w \geq \bar{w}$ and $w \geq \frac{\pi(qv-q'c)+\pi^2s}{(1-q)v}$, $\Pi^* \geq \Pi^m$ if $s \geq \left[\frac{(1-q-\pi q)v - (1-q' - \pi q')c}{\pi^2}\right]^+$. When $w \geq \bar{w}$ and $w \leq \frac{\pi(qv-q'c)+\pi^2s}{(1-q)v}$, $\Pi^* - \Pi^m = \left[\frac{w(1-q)v}{\pi} + (1-q)v + q'c - c\right] \pi - [(1+\pi w)(1-q)v - (1-q')c]$. Therefore, when $w \geq \bar{w}$ and $w \leq \frac{\pi(qv-q'c)+\pi^2s}{(1-q)v}$, $\Pi^* \geq \Pi^m$ when $w \geq \frac{(1-q)v - (1-q')c}{(1-q)v}$. When $w < \bar{w}$, $\Pi^* - \Pi^m = (1-q)v + q'c - c - [(1+\pi w)(1-q)v - (1-q')c] < 0$. Combined all the above results, we have the desired results.

b) When $w \leq \bar{w}$, both types purchase the status product in either setting, so $W^* = W^m$. When $w > \bar{w}$, $W^* = \pi[(1+w)v - c] + (1-\pi)(qv - q'c) + \pi(1+w)\pi s + (1-\pi)\pi s - \pi[(1+w)v - c] - (1-\pi)(qv - q'c) - (1+\pi w)\pi s < 0$. This completes the proof. ■

EC.3 Proofs: Implications of market interventions

Proof of Proposition 5 Using similar arguments as in the proof of Proposition 2, we can establish that: the firm, as the first mover, will always set the price of the status product to ensure it captures at least the full

demand from the rich type; and whenever either the firm or the dupe entrant intends to sell to the poor type, they will price their product to fully capture the demand from the poor type.

We define the profit function of the dupe entrant as

$$\Pi_c(\tilde{p}, \tilde{d}) = (\tilde{p} - q'c)\tilde{d},$$

where \tilde{p} denotes the price and \tilde{d} denotes the corresponding demand. We organize the discussion into three cases:

Case: $s > \frac{f - (1-\pi)(qv - q'c)}{(1-\pi)\pi}$. In this case, the profit of the dupe entrant is $\Pi_c(qv + \pi s, 1) = (qv + \pi s - q'c) \geq f$ and $\Pi_c(qv + \pi s, 1 - \pi) = (1 - \pi)(qv + \pi s - q'c) \geq f$. Recall that $qv + \pi s$ is the highest price at which the dupe entrant can induce either $\tilde{d}^* = 1 - \pi$ or $\tilde{d}^* = 1$. Given this, according to Proposition 1, the status product's equilibrium price must be lower than $qv + \pi s + (1 + w)(1 - q)v$.

Under such a pricing scheme, $\tilde{d}^* = \pi$ can never arise in equilibrium. Thus, the demand for the dupe product must be either $1 - \pi$ or 1. It is never optimal for the firm to set a price that induces $\tilde{d}^* = 1$ in equilibrium. We can find a threshold p' such that the dupe product captures full market demand, $\tilde{d}^*(p, \tilde{p}^*(p)) = 1$ if and only if $p > p'$. This observation implies that the firm should set its price no higher than $p^* = p'$ to prevent the market being completely taken over by the dupe entrant. The threshold price p' depends on the value of w . We can divide the discussion into two subcases to find such p' .

Subcase 1: $w \geq \frac{\pi(qv - q'c) + \pi^2 s}{(1-q)v}$. In this case, the threshold price p' is the solution to the equation

$$p - (1 - q)(1 + w)v - q'c = (1 - \pi)[qv + \pi s - q'c],$$

where the left-hand side $p - (1 - q)(1 + w)v - q'c$ presents the profit of the dupe entrant when $\tilde{p} = p - (1 - q)(1 + w)v$ and $\tilde{d} = 1$, and the right-hand side is the profit of the dupe entrant when $\tilde{p} = qv + \pi s$ and $\tilde{d} = 1 - \pi$. Solving for p' , we obtain: $p' = (1 - q)(1 + w)v - q'c + (1 - \pi)[qv + \pi s - q'c] = (1 - q)(1 + w)v + \pi q'c + (1 - \pi)[qv + \pi s]$. By definition, p' is the highest price at which the firm can induce $\tilde{d}^* = 1 - \pi$. At this price, the dupe entrant earns a profit of $(qv + \pi s - q'c)(1 - \pi)$, which exceeds the fixed cost of entry under the assumption of $s > \frac{f - (1-\pi)(qv - q'c)}{(1-\pi)\pi}$. Therefore, to prevent the dupe entry, the firm must set a lower price such that the profit of the dupe entrant is no more than f , i.e., $(1 - \pi)(p - (1 - q)v - q'c) \leq f \rightarrow p \leq (1 - q)v + q'c + \frac{f}{1 - \pi}$. This upper bound on p is strictly less than $v + \pi s$, so the firm induces full demand for its status product, i.e., $\tilde{d}^* = 1$.

Comparing the firm's profits under the two candidate price levels, we determine the optimal price p^* as follows: $p^* = (1 - q)(1 + w)v + \pi q'c + (1 - \pi)(qv + \pi s)$ if $w \geq \frac{(1-\pi)(1-q-\pi q)v - (1-\pi)(1-q'-\pi q') + \frac{f}{1-\pi} - (1-\pi)\pi^2 s}{\pi(1-q)v}$; $p^* = (1 - q)v + q'c + \frac{f}{1 - \pi}$ if $w < \frac{(1-\pi)(1-q-\pi q)v - (1-\pi)(1-q'-\pi q') + \frac{f}{1-\pi} - (1-\pi)\pi^2 s}{\pi(1-q)v}$.

Subcase 2: $w < \frac{\pi(qv - q'c) + \pi^2 s}{(1-q)v}$. In this case, the threshold price p' solves the equation: $p - (1 - q)(1 + w)v - q'c = (p - (1 - q)v - q'c)(1 - \pi)$. Solving for p' , we obtain: $p' =$

$\frac{(1-q)(1+w)v+q'c-(1-\pi)(1-q)v-(1-\pi)q'c}{\pi} = \frac{(1-q)(1+w)v-(1-\pi)(1-q)v}{\pi} + q'c$. By definition, this is the highest price the firm can charge while still inducing $\tilde{d}^* = 1 - \pi$. We now consider two mutually exclusive scenarios: Scenario one: $w \leq \frac{\pi f}{(1-\pi)(1-q)v}$. In this case, the profit of the dupe entrant at price p' is less than the fixed cost of dupe entry: $\Pi_c(p', 1 - \pi) < f$, implying that duping is not profitable. To achieve this, the firm can set its price up to: $(1+w)(1-q)v + f + q'c$. Scenario two: $w \geq \frac{\pi f}{(1-\pi)(1-q)v}$. In this scenario, duping is profitable: $\Pi_c(p', 1 - \pi) > f$. We further divide this into two sub-scenarios: Subscenario 2.1: $\left[\frac{(1-q)(1+w)v-(1-\pi)(1-q)v}{\pi} + q'c - c \right] \pi \geq (1-q)v + q'c + \frac{f}{1-\pi} - c$. In this case, the firm is better off serving only the rich type and the optimal price is $\frac{(1-q)(1+w)v-(1-\pi)(1-q)v}{\pi} + q'c$, which allows the dupe entrant to serve the poor type. Subscenario 2.2: $\left[\frac{(1-q)(1+w)v-(1-\pi)(1-q)v}{\pi} + q'c - c \right] \pi < (1-q)v + q'c + \frac{f}{1-\pi} - c$. In this sub-scenario, it is optimal for the firm to deter the dupe entry. The firm should instead set the price: $p^* = (1-q)v + q'c + \frac{f}{1-\pi}$, which leads to full market coverage ($\tilde{d}^* = 1$).

In summary, we have characterized the firm's optimal price p^* based on different regimes of the wealth difference w : When $w \geq \frac{\pi(qv-q'c)+\pi^2s}{(1-q)v}$, $p^* = (1-q)(1+w)v + \pi q'c + (1-\pi)(qv + \pi s)$ if $w \geq \frac{(1-\pi)(1-q-\pi q)v-(1-\pi)(1-q'-\pi q') + \frac{f}{1-\pi} - (1-\pi)\pi^2s}{\pi(1-q)v}$ and $p^* = (1-q)v + q'c + \frac{f}{1-\pi}$ if $w < \frac{(1-\pi)(1-q-\pi q)v-(1-\pi)(1-q'-\pi q') + \frac{f}{1-\pi} - (1-\pi)\pi^2s}{\pi(1-q)v}$. When $w < \frac{\pi(qv-q'c)+\pi^2s}{(1-q)v}$ and $w \leq \frac{\pi f}{(1-\pi)(1-q)v}$, $p^* = (1+w)(1-q)v + f + q'c$. When $w < \frac{\pi(qv-q'c)+\pi^2s}{(1-q)v}$ and $w > \frac{\pi f}{(1-\pi)(1-q)v}$ and $\left[\frac{(1-q)(1+w)v-(1-\pi)(1-q)v}{\pi} + q'c - c \right] \pi \geq (1-q)v + q'c + \frac{f}{1-\pi} - c$, $p^* = \frac{(1-q)(1+w)v-(1-\pi)(1-q)v}{\pi} + q'c$. When $w < \frac{\pi(qv-q'c)+\pi^2s}{(1-q)v}$ and $w > \frac{\pi f}{(1-\pi)(1-q)v}$ and $\left[\frac{(1-q)(1+w)v-(1-\pi)(1-q)v}{\pi} + q'c - c \right] \pi < (1-q)v + q'c + \frac{f}{1-\pi} - c$, $p^* = (1-q)v + q'c + \frac{f}{1-\pi}$.

Rearranging the conditions above, we summarize the optimal price p^* as follows: $p^* = (1-q)(1+w)v + \pi q'c + (1-\pi)(qv + \pi s)$ when $w \geq \bar{w}_f = \max \left\{ \frac{(1-\pi)(1-q-\pi q)v-(1-\pi)(1-q'-\pi q')c + \frac{f}{1-\pi} - (1-\pi)\pi^2s}{\pi(1-q)v}, \frac{\frac{f}{1-\pi} + (1-\pi)(1-q)v - (1-\pi)(1-q')c}{(1-q)v} \right\}$ and $w \geq \frac{\pi(qv-q'c)+\pi^2s}{(1-q)v}$; $p^* = \frac{(1-q)(1+w)v-(1-\pi)(1-q)v}{\pi} + q'c$ when $w < \frac{\pi(qv-q'c)+\pi^2s}{(1-q)v}$ and $w \geq \bar{w}_f$; $p^* = (1-q)v + q'c + \frac{f}{1-\pi} - c$ when $w < \bar{w}_f$ and $w > \frac{\pi f}{(1-\pi)(1-q)v}$; and $p^* = (1+w)(1-q)v + f + q'c$ when $w < \bar{w}_f$ and $w \leq \frac{\pi f}{(1-\pi)(1-q)v}$.

Next we consider the case: $\frac{f-(qv-q'c)}{\pi} < s < \frac{f-(1-\pi)(qv-q'c)}{(1-\pi)\pi}$. In this range of s , we have $\Pi_c(qv + \pi s, 1) = (qv + \pi s - q'c) \geq f$ and $\Pi_c(qv + \pi s, 1 - \pi) = (1 - \pi)(qv + \pi s - q'c) < f$. Recall that $qv + \pi s$ is the highest possible price for the dupe product inducing $\tilde{d}^* = 1$ or $\tilde{d}^* = 1 - \pi$. Hence, given that $\tilde{d}^* = 1 - \pi$, the dupe entrant's gain from the market is less than f . Therefore, if the dupe entrant decides to enter the market, the induced demand for the dupe product must be either $\tilde{d}^* = 1$ or $\tilde{d}^* = \pi$, either of which makes the firm gain zero profit from the market. So the firm should deter the dupe entry. Moreover, one can verify that given any p , if $\tilde{d}^*(p, \tilde{p}) = \pi$ for some \tilde{p} , we have $\tilde{d}^*(p, qv + \pi s) = 1$. Since $\Pi_c(qv + \pi s, 1) > f$ and the deterrence price for $\tilde{d}^* = \pi$ requires a higher price than the one for $\tilde{d}^* = 1$. So, to deter dupe entry, it suffices (and is necessary) to make the dupe entrant gain negative profit when $\tilde{d}^* = 1$. Accordingly the highest price the firm can set to achieve this is $(1+w)(1-q)v + q'c + f$. Note that $(1+w)(1-q)v + q'c + f < (1+w)(v + (1-\pi)s)$. Therefore, the firm's optimal price is

$(1+w)(1-q)v+q'c+f$ (yielding demand π for the status product) if $\pi[(1+w)(1-q)v+q'c+f-c] \geq v+\pi s-c$ and $\min\{(1+w)(1-q)v+q'c+f, v+\pi s\}$ (yielding demand 1 for the status product) if $\pi[(1+w)(1-q)v+q'c+f-c] < v+\pi s-c$. Rearranging the above conditions and defining $\bar{w}'_f = \frac{(1-\pi+\pi q)v-(1-\pi+\pi q')c+\pi s-\pi f}{\pi(1-q)v}$, we have the results: the dupe entrant is deterred from entry and the firm sells to the rich type with $p^* = (1+w)(1-q)v+q'c+f$ if $w > \bar{w}'_f$ and the dupe entrant is deterred from entry and the firm sells to the poor type with $p^* = \min\{(1+w)(1-q)v+q'c+f, v+\pi s\}$ if $w \leq \bar{w}'_f$. Therefore, we have the desired results for $\frac{f-(qv-q'c)}{\pi} < s < \frac{f-(1-\pi)(qv-q'c)}{(1-\pi)\pi}$.

Finally, we consider the case of $s < \left[\frac{f-(qv-q'c)}{\pi}\right]^+$. In this subcase, we have $\Pi_c(qv+\pi s, 1-\pi) \leq \Pi_c(qv+\pi s, 1) = qv-q'c+\pi s \leq f$. The above two inequalities imply that given $\tilde{d}^* = 1$ or $\tilde{d}^* = 1-\pi$, the dupe entrant's gain from the market is less than the penalty f . Hence, in equilibrium, if the dupe entrant decides to enter the market, the induced demand for the dupe products must be $\tilde{d}^* = \pi$. With this observation, we can divide our discussion into two scenarios. Scenario 1: $\Pi_c((1+w)(qv+(1-\pi)s), \pi) \leq f$. In this scenario, the dupe entrant never enters the market no matter what the status product's price is. Hence, the firm faces the same problem as the one in the benchmark with no dupe. As a result, the equilibrium price set by the status product firm is $(1+w)(v+(1-\pi)s)$ if $\pi[(1+w)(v+(1-\pi)s)-c] \geq (v+\pi s-c)$, or equivalently, $w \geq \frac{(1-\pi)(v-c)+\pi^2 s}{\pi v+\pi(1-\pi)s}$ and $v+\pi s$ otherwise. Scenario 2: $\Pi_c((1+w)(qv+(1-\pi)s), \pi) > f$. As indicated by Lemma 1, if the resulting demand for the dupe products is π , the status product firm gains zero profit. Therefore, the firm needs to set the status product's price in order to make the dupe entrant's gain less than the penalty f . To achieve this, the firm needs to set its price such that $\pi[p-(1+w)(1-q)v-q'c] < f$, where $p-(1+w)(1-q)v$ is the dupe entrant's best response to the status product price p . Hence, the highest price to deter the dupe entry is $(1+w)(1-q)v+q'c+\frac{f}{\pi}$. Note that $(1+w)(qv+(1-\pi)s) > (1+w)(1-q)v+q'c+\frac{f}{\pi} > v+\pi s$ by the conditions of $s < \frac{f-(qv-q'c)}{\pi}$ and $\Pi_c((1+w)(qv+(1-\pi)s), \pi) > f$. Therefore, the firm's optimal price is $(1+w)(1-q)v+q'c+\frac{f}{\pi}$ if $[(1+w)(1-q)v+q'c+\frac{f}{\pi}-c]\pi \geq v+\pi s-c$ and $v+\pi s$ otherwise.

Therefore, we can summarize our result for $s < \left[\frac{f-(qv-q'c)}{\pi}\right]^+$ as follows: When $w \leq \frac{\frac{f}{\pi}-(qv+(1-\pi)s)+q'c}{qv+(1-\pi)s}$, $p^* = (1+w)(v+(1-\pi)s)$ if $w \geq \frac{(1-\pi)(v-c)+\pi^2 s}{\pi v+\pi(1-\pi)s}$ and $p^* = v+\pi s$ if $w < \frac{(1-\pi)(v-c)+\pi^2 s}{\pi v+\pi(1-\pi)s}$. When $w > \frac{\frac{f}{\pi}-(qv+(1-\pi)s)+q'c}{qv+(1-\pi)s}$, $p^* = (1+w)(1-q)v+q'c+\frac{f}{\pi}$ if $w \geq \frac{(1-\pi+\pi q)v-(1-\pi+\pi q')c+\pi s-f}{\pi(1-q)v}$ and $v+\pi s$ if $w < \frac{(1-\pi+\pi q)v-(1-\pi+\pi q')c+\pi s-f}{\pi(1-q)v}$. Therefore, by defining $\bar{w}'_f = \max\left\{\frac{(1-\pi)(v-c)+\pi^2 s}{\pi v+\pi(1-\pi)s}, \frac{(1-\pi+\pi q)v-(1-\pi+\pi q')c+\pi s-f}{\pi(1-q)v}\right\}$, we have the desired results for $s < \left[\frac{f-(qv-q'c)}{\pi}\right]^+$. This completes the proof of the proposition.

Proof of Proposition 6 When $\max\{(1-\pi)(qv-q'c+\pi s), qv-q'c\} < f < qv-q'c+\pi s$, it follows that $\frac{f-(qv-q'c)}{\pi} < s < \frac{f-(1-\pi)(qv-q'c)}{\pi(1-\pi)}$ and $f > (1-\pi)(qv-q'c+\pi s)$. According to Proposition 5, we have $p^*_f = (1+w)(1-q)v+q'c+f < (1+w)(1-q)v+q'c+\frac{f}{\pi} = p^0_f$ and consequently, $\Pi^*_f = (p^*_f - c)\pi < (p^0_f - c)\pi = \Pi^0_f$ provided the following conditions hold: $w > \frac{\frac{f}{\pi}-qv+q'c}{qv}$ and $w >$

$\frac{(1-\pi)[(1-q-\pi q)v-(1-q'-\pi q')c]+\frac{f}{1-\pi}-\pi(f-(1-\pi)(qv-q'c))}{\pi(1-q)v}$. Therefore, when $f > (1-\pi)(qv-q'c+\pi s)$, we have $p_f^* < p_f^0$ and $\Pi_f^* < \Pi_f^0$ when w is sufficiently large. This completes the proof. ■

Proof of Proposition 7 According to the equilibrium results of Proposition 5, when f is sufficiently large, the firm's equilibrium profit is $\Pi_f^* = v + \pi s - c$ if $w < \frac{(1-\pi)(v-c)+\pi^2 s}{\pi v+\pi(1-\pi)s}$, $\Pi_f^* = [(1+w)(v+(1-\pi)s)-c]\pi$ if $\frac{(1-\pi)(v-c)+\pi^2 s}{\pi v+\pi(1-\pi)s} < w < \frac{f-\pi[qv+(1-\pi)s]+\pi q'c}{\pi[qv+(1-\pi)s]}$ and $\Pi_f^* = [(1+w)(1-q)v+q'c+\frac{f}{\pi}-c]\pi$ if $w > \frac{f-\pi[qv+(1-\pi)s]+\pi q'c}{\pi[qv+(1-\pi)s]}$. For the mean-preserving benchmark, the firm's profit is $\Pi_f^m = (1+\pi w)(v+\pi s) - c$ if $w < \frac{f-(qv-q'c)-\pi s}{\pi qv+\pi^2 s}$ and $\Pi_f^m = (1+\pi w)(1-q)v+q'c+f-c$ if $w > \frac{f-(qv-q'c)-\pi s}{\pi qv+\pi^2 s}$. Moreover, when f is sufficiently large, we have $\frac{f-(qv-q'c)-\pi s}{\pi qv+\pi^2 s} > \frac{f-\pi[qv+(1-\pi)s]+\pi q'c}{\pi[qv+(1-\pi)s]}$. Then we can divide our discussion into several cases based on these conditions. Case one: $w < \frac{(1-\pi)(v-c)+\pi^2 s}{\pi v+\pi(1-\pi)s}$. Then, $\Pi_f^* - \Pi_f^m = v + \pi s - c - (1+\pi w)(v+\pi s) + c < 0$. Case two: $\frac{(1-\pi)(v-c)+\pi^2 s}{\pi v+\pi(1-\pi)s} < w < \frac{f-\pi[qv+(1-\pi)s]+\pi q'c}{\pi[qv+(1-\pi)s]}$. Then, $\Pi_f^* - \Pi_f^m = [(1+w)(v+(1-\pi)s)-c]\pi - (1+\pi w)(v+\pi s) + c$. It follows that $\Pi_f^* - \Pi_f^m < 0$ if $w < \frac{(1-\pi)(v-c)+\pi^2 s}{\pi(1-2\pi)s}$. Case three: $\frac{f-\pi[qv+(1-\pi)s]+\pi q'c}{\pi[qv+(1-\pi)s]} < w < \frac{f-(qv-q'c)-\pi s}{\pi qv+\pi^2 s}$. Then, $\Pi_f^* - \Pi_f^m = [(1+w)(1-q)v+q'c+\frac{f}{\pi}-c]\pi - (1+\pi w)(v+\pi s) + c$. It follows that $\Pi_f^* - \Pi_f^m < 0$ if $w > \frac{f-(1-\pi+\pi q)v+(1-\pi+\pi q')c-\pi s}{\pi(qv+\pi s)}$. Case four: $w > \frac{f-(qv-q'c)-\pi s}{\pi qv+\pi^2 s}$. Then, $\Pi_f^* - \Pi_f^m = [(1+w)(1-q)v+q'c+\frac{f}{\pi}-c]\pi - (1+\pi w)(1-q)v - q'c - f + c < 0$. Rearranging the above results, we achieve the desired results stated in the proposition. ■

Proof of Proposition 8

Based on the characterization in Proposition 5, we have the following cases for the equilibrium welfare W_f^* : a) When $f < (1-\pi)(qv-q'c+\pi s)$ and $w < \bar{w}_f$, $W_f^* = W_1 := \pi((1+w)v-c) + (1-\pi)(v-c) + (1+\pi w)\pi s$. b) When $f < (1-\pi)(qv-q'c+\pi s)$ and $w > \bar{w}_f$, $W_f^* = W_2 := \pi((1+w)v-c) + (1-\pi)(qv-q'c) + (1+\pi w)\pi s$. c) when $f > (1-\pi)(qv-q'c+\pi s)$ and $w > \bar{w}'_f$, $W_f^* = W_3 := \pi((1+w)v-c) + (1+w)\pi s$. d) when $f > (1-\pi)(qv-q'c+\pi s)$ and $w < \bar{w}'_f$, $W_f^* = W_1 = \pi((1+w)v-c) + (1-\pi)(v-c) + (1+\pi w)\pi s$. Next, define $\bar{w}'_f := \min_{f > (1-\pi)(qv-q'c)+(1-\pi)\pi s} \bar{w}'_f$. By construction, \bar{w}'_f represents the lowest wealth difference such that there exists a penalty f sufficient to induce the deterrence strategy, with the firm selling to the rich type only. Based on the structure of \bar{w}'_f , it can be verified that $\bar{w}'_f = \frac{(1-\pi)(v-c)+\pi^2 s}{\pi v+\pi(1-\pi)s}$.

Next, we characterize the necessary and sufficient conditions under which each firm's pricing strategy maximizes social welfare. Based on Proposition 5, there are three possible equilibrium strategies:

Coexistence strategy. Because \bar{w}_f is increasing in f and $W_1 > W_2$, the coexistence strategy is optimal if and only if $w > \bar{w}_f$ at $f = (1-\pi)(qv-q'c) + (1-\pi)\pi s$ and $W_2 = \pi((1+w)v-c) + (1-\pi)(qv-q'c) + (1+\pi w)\pi s > W_3 = \pi((1+w)v-c) + (1+w)\pi s$. Equivalently, coexistence strategy yields optimal welfare if and only if: $\frac{[(1-\pi)(1-q-\pi q)+q]v-[(1-\pi)(1-q'-\pi q')c+(1-(1-\pi)\pi)\pi s]}{\pi(1-q)v} < w < \frac{qv-q'c}{\pi s}$. In this case, the optimal penalty is $f^* = 0$.

Deterrence strategy with the firm selling to both types. We further distinguish two main scenarios based on the relationship between \bar{w}'_f and \bar{w} .

a) Case one $\bar{w}'_f < \bar{w}$. We divide into subcases: Subcase one: $w < \bar{w}'_f$. In this case, for any f , the firm does not adopt deterrence selling only to the rich type. At $f = 0$, the induced strategy is deterrence, with the firm selling to both types. Therefore, in this case, $f^* = 0$. Subcase two: $\bar{w}'_f < w < \bar{w}$. When f is strong enough, the firm chooses to deterrence strategy and selling to the rich type. Hence, to be optimal, it requires that $W_1 > W_3$ or equivalently, $w < \frac{v-c}{\pi s}$. In this case, $f^* = 0$. Subcase three: $\bar{w} < w < \frac{[(1-\pi)(1-q-\pi q)+q]v - [(1-\pi)(1-q'-\pi q') + q']c + (1-(1-\pi)\pi)\pi s}{\pi(1-q)v}$. From the expression of \bar{w}_f , The minimum f reaches inducing deterrence strategy (selling to both types) is

$$f^* = \max \left\{ \begin{array}{l} (1-\pi) [(1-\pi)\pi^2 s + \pi(1-q)vw - (1-\pi)(1-q-\pi q)v + (1-\pi)(1-q'-\pi q')c], \\ (1-\pi) [(1-q)v w + (1-\pi)(1-q')c - (1-\pi)(1-q)v]. \end{array} \right\}$$

Because $w > \bar{w}'_f$, to ensure the optimality, we also require that $w < \frac{v-c}{\pi s}$. Subcase four: $w > \frac{[(1-\pi)(1-q-\pi q)+q]v - [(1-\pi)(1-q'-\pi q') + q']c + (1-(1-\pi)\pi)\pi s}{\pi(1-q)v}$. No penalty f can induce the deterrence strategy while serving both types.

b) $\bar{w} < \bar{w}'_f$. Similarly we need to divide the discussion into several subcases. Subcase one: $w < \bar{w}$. In this case, for any f , the firm never chooses deterrence strategy and selling to the rich type. Moreover, when $f = 0$, the induced strategy is deterrence strategy, with the firm selling to both types. So, $f^* = 0$. Subcase two: $\bar{w} < w < \bar{w}'_f$. In this case, for any f , the firm never chooses deterrence strategy and selling to the rich type as well. From the expression of \bar{w}_f , the minimum f inducing this deterrence is

$$f^* = \max \left\{ \begin{array}{l} (1-\pi) [(1-\pi)\pi^2 s + \pi(1-q)vw - (1-\pi)(1-q-\pi q)v + (1-\pi)(1-q'-\pi q')c], \\ (1-\pi) [(1-q)v w + (1-\pi)(1-q')c - (1-\pi)(1-q)v]. \end{array} \right\}$$

Subcase three: $\bar{w}'_f < w < \frac{[(1-\pi)(1-q-\pi q)+q]v - [(1-\pi)(1-q'-\pi q') + q']c + (1-(1-\pi)\pi)\pi s}{\pi(1-q)v}$. From the expression of \bar{w}_f , the minimum f yielding deterrence strategy, with the firm selling to both types is also the same as the one in subcase two. But, at this time, for a strong penalty, the firm would choose deterrence strategy and selling to the rich type. So, to ensure the optimality, we require that $w < \frac{v-c}{\pi s}$. Subcase four: $w > \frac{[(1-\pi)(1-q-\pi q)+q]v - [(1-\pi)(1-q'-\pi q') + q']c + (1-(1-\pi)\pi)\pi s}{\pi(1-q)v}$. No penalty f can induce the deterrence strategy while selling to both types.

Deterrence strategy with the firm selling to the rich type. When $w < \bar{w}'_f$. In this case, There is no penalty f that induces the deterrence strategy while selling to the rich type. When $\bar{w}'_f < w < \frac{[(1-\pi)(1-q-\pi q)+q]v - [(1-\pi)(1-q'-\pi q') + q']c + (1-(1-\pi)\pi)\pi s}{\pi(1-q)v}$. In this case, from the expression of \bar{w}'_f , the minimal f yielding deterrence strategy with the firm selling to the rich type is

$$f^* = \begin{cases} \frac{1}{\pi} [(1-\pi+\pi q)v - (1-\pi+\pi q')c + \pi s - \pi(1-q)vw] & \text{if } w > \frac{(1-\pi)[(v-c)+\pi s]}{\pi(1-q)v}, \\ qv - q'c + \pi s & \text{if } \frac{(1-\pi)[(1-q)v - (1-q')c]}{\pi(1-q)v} < w < \frac{(1-\pi)[(v-c)+\pi s]}{\pi(1-q)v}, \\ (1-\pi+\pi q)v - (1-\pi+\pi q')c + \pi s - \pi(1-q)vw & \text{if } w < \frac{(1-\pi)[(1-q)v - (1-q')c]}{\pi(1-q)v}. \end{cases}$$

To achieve optimality, it requires $W_3 > W_1$, or equivalently $w > \frac{v-c}{\pi s}$. When $w > \frac{[(1-\pi)(1-q-\pi q)+q]v - [(1-\pi)(1-q'-\pi q')+q']c + (1-(1-\pi)\pi)\pi s}{\pi(1-q)v}$. In this case, there is no f inducing deterrence with the firm selling to both types. To result in deterrence with the firm selling to rich type to be optimal, it requires $f^* = (1-\pi)(qv - q'c + \pi s)$ and $w > \frac{qv-q'c}{\pi s}$.

Combining the above, we characterize the optimal penalty f as follows:

- (i) When $\left(w > \frac{[(1-\pi)(1-q-\pi q)+q]v - [(1-\pi)(1-q'-\pi q')+q']c + (1-(1-\pi)\pi)\pi s}{\pi(1-q)v} \right.$ and $\left. w > \frac{qv-q'c}{\pi s} \right)$ or $\left(\frac{(1-\pi)(v-c)+\pi^2 s}{\pi v + \pi(1-\pi)s} < w < \frac{[(1-\pi)(1-q-\pi q)+q]v - [(1-\pi)(1-q'-\pi q')+q']c + (1-(1-\pi)\pi)\pi s}{\pi(1-q)v} \right.$ and $\left. w > \frac{v-c}{\pi s} \right)$, we have $f^* > 0$, and the dupe entrant enters the market while only the rich type purchases the status product.
- (ii) When $\frac{[(1-\pi)(1-q-\pi q)+q]v - [(1-\pi)(1-q'-\pi q')+q']c + (1-(1-\pi)\pi)\pi s}{\pi(1-q)v} < w < \frac{qv-q'c}{\pi s}$, we have $f^* = 0$, and the dupe entrant enters the market, with the poor type purchasing the dupe product.

(iii) Otherwise, the dupe entrant is deterred from entering the market, and both consumer types purchase the status product. Moreover, under this case, $f^* = 0$ if and only if

$$w < \min \left\{ \frac{(1-\pi)(v-c) + \pi^2 s}{\pi v + \pi(1-\pi)s}, \bar{w} \right\}.$$

Defining $\bar{w}'' = \frac{[(1-\pi)(1-q-\pi q)+q]v - [(1-\pi)(1-q'-\pi q')+q']c + (1-(1-\pi)\pi)\pi s}{\pi(1-q)v}$ and $\bar{w}' = \min \left\{ \max \left\{ \frac{v-c}{\pi s}, \frac{(1-\pi)(v-c)+\pi^2 s}{\pi v + \pi(1-\pi)s} \right\}, \max \left\{ \bar{w}'', \frac{qv-q'c}{\pi s} \right\} \right\}$, we have the threshold used in the proposition. Moreover, from the characterization of f^* , it can be easily shown that f^* is increasing in s , and $0 \leq f^* < (1-\pi)(qv - q'v + \pi s)$ if $w < \bar{w}'$ and $(1-\pi)(qv - q'v + \pi s) \leq f^* < v - c + \pi s$ if $w \geq \bar{w}'$.

Furthermore, when $w \geq \bar{w}'$, we have $W_f^* - W^* = (1-\pi)(\pi w s - qv + q'c)$ if $w > \bar{w}$ and $w > \bar{w}'$ and $W_f^* - W^* = (1-\pi)(\pi w s - v + c)$ otherwise. Therefore, when $w \geq \bar{w}'$, $W_f^* - W^*$ is increasing in s and w . When $w < \bar{w}'$, $W_f^* - W^* = 0$ if $f^* = 0$ and $W_f^* - W^* = v - c - qv + q'c$ if $f^* > 0$. Therefore, when $w < \bar{w}'$, $W_f^* - W^*$ is either zero or a positive constant independent of s and w . This completes the proof. ■

EC.4 Model extension: Perfect competition among dupe entrants

In our base model, we consider a single dupe entrant. In practice, however, platforms such as Amazon and Taobao enable small sellers to establish businesses and reach consumers globally, creating greater opportunities for dupe entrants to sell their products on the market.

In this section, we extend our model from a single dupe entrant to infinite dupe entrants who have free entry to the market and focus on symmetric equilibrium where the dupe entrants who enter the market set the same price. Like our main text, we first consider the case without dupe entry market intervention, i.e., $f = 0$ and then discuss how our results will change when penalty intervention is in place, i.e., $f > 0$. We use a superscript “ \ddagger ” to present all the variables and functions of the equilibrium outcome in the case of perfectly competitive dupe entrants.

Because the dupe entrants have free entry to the market, they will try to undercut each other's price and steal each other's demand until the point where all set prices exactly the unit cost, $q'c$. Therefore, the firm's

maximizes its profit by solving the following problem: $\max_{p \geq 0} (p - c)d^*(p, q'c)$. Solving this optimization problem, we have the following equilibrium results:

PROPOSITION EC.1. *In equilibrium, the following hold:*

a) When $w \geq \frac{(1-\pi)[(1-q)v - (1-q')c]}{\pi(1-q)v}$, the dupe entrants enter the market and the poor type purchases the dupe product. The firm's profit is $\Pi^\ddagger = [(1+w)(1-q)v - (1-q')c]\pi$, with the pricing strategy $p^\ddagger = (1+w)(1-q)v + q'c$;

b) When $w < \frac{(1-\pi)[(1-q)v - (1-q')c]}{\pi(1-q)v}$, the dupe entrants are deterred from entering the market and both types purchase the status product. The firm's profit is $\Pi^\ddagger = (1-q)v - (1-q')c$, with the pricing strategy $p^\ddagger = (1-q)v + q'c$.

Proof. Given the dupe product's price qc , the induced demand function for the status product is

$$d^*(p, q'c) = \begin{cases} 1 & \text{if } p < (1-q)v + q'c \\ \pi & \text{if } (1-q)v + q'c < p < (1+w)(1-q)v + q'c \\ 0 & \text{if } p > (1+w)(1-q)v + q'c \end{cases}$$

Then, plugging the demand function into the firm's objective function, we obtain the desired results. \blacksquare

It is easy to see that similar to Proposition 2 in the monopolistic dupe entrant case, the firm will coexist with dupe entrants when the wealth difference is high and strategically deters the dupe entry when wealth difference is low. Our main insights for the effects of status signaling and wealth inequality also hold. Recall from Proposition 3, the firm's benefit from status signaling is capped when the status factor is strong. Slightly different from the monopolistic dupe case, due to perfect competition among dupe entrants, the firm's equilibrium profit does not depend on the status factor s at this time.

For the case with dupe entry market intervention $f > 0$, the problem becomes intractable. Nevertheless, our equilibrium results remain unchanged when the penalty level is strong, as summarized in the following proposition:

PROPOSITION EC.2. *Suppose $f > qv - q'c + \pi s$. The equilibrium results are the same as the case with the single dupe entrant setting. Therefore, the dupe entrant is deterred from entering the market. Only the rich type purchases the status product if $w > \max \left\{ \frac{(1-\pi)(v-c) + \pi^2 s}{\pi v + \pi(1-\pi)s}, \frac{(1-\pi + \pi q)v - (1-\pi + \pi q')c + \pi s - f}{\pi(1-q)v} \right\}$ and both types purchase the status product otherwise.*

Proof. Suppose that the lowest price of dupe products is \tilde{p} . When $f > qv - q'c + \pi s$, we have $\Pi_c(qv + \pi s, 1 - \pi) \leq \Pi_c(qv + \pi s, 1) = qv - q'c + \pi s \leq f$, where $\Pi_c(\tilde{p}, \tilde{d}) = (\tilde{p} - q'c)\tilde{d}$. We organize the discussion into three cases: The above two inequalities imply that given $\tilde{d}^* = 1$ or $\tilde{d}^* = 1 - \pi$, the dupe entrant's gain from the market is less than the penalty f . Using this fact, it can be further shown that if a dupe entrant decides to enter the market, the induced demand for the dupe products (which could be shared among dupe entrants) must be $\tilde{d}^* = \pi$. With this observation, we can divide our discussion into two

scenario. Scenario 1: $\Pi_c((1+w)(qv+(1-\pi)s), \pi) \leq f$. In this scenario, the dupe entrant never enters the market no matter what the status product's price is. Hence, the firm faces the same problem as the one with no dupe. As a result, the equilibrium price set by the status product firm is $(1+w)(v+(1-\pi)s)$ if $\pi[(1+w)(v+(1-\pi)s)-c] \geq (v+\pi s-c)$, or equivalently, $w \geq \frac{(1-\pi)(v-c)+\pi^2 s}{\pi v+\pi(1-\pi)s}$ and $v+\pi s$ otherwise. Scenario 2: $\Pi_c((1+w)(qv+(1-\pi)s), \pi) > f$. As indicated by Lemma 1, if the resulting demand for the dupe products is π , the status product firm gains zero profit. Therefore, the firm needs to set the status product's price in order to make any of the dupe entrants' gain less than the penalty f . It can be shown that the highest price to deter dupe entry is equivalent to the one that deters the dupe entry in the single dupe entrant case (If the price required to deter all dupe entrants is higher than the price needed to deter a single dupe entrant, then it becomes profitable for one dupe entrant to enter—yielding a contradiction. The reverse direction follows by a similar argument.) To achieve this, the firm needs to set its price such that $\pi[p-(1+w)(1-q)v-q'c] < f$, where $p-(1+w)(1-q)v$ is the dupe entrant's best response to the status product price p . Hence, the highest price to deter is $(1+w)(1-q)v+q'c+\frac{f}{\pi}$. Note that $(1+w)(qv+(1-\pi)s) > (1+w)(1-q)v+q'c+\frac{f}{\pi} > v+\pi s$ by the conditions of $s < \frac{f-(qv-q'c)}{\pi}$ and $\Pi_c((1+w)(qv+(1-\pi)s), \pi) > f$. Therefore, the firm's optimal price is $(1+w)(1-q)v+q'c+\frac{f}{\pi}$ if $[(1+w)(1-q)v+q'c+\frac{f}{\pi}-c]\pi \geq v+\pi s-c$ and $v+\pi s$ otherwise. To achieve this, the firm needs to set its price such that $\pi[p-(1+w)(1-q)v-q'c] < f$, where $p-(1+w)(1-q)v$ is the dupe entrant's best response to the status product price p . Hence, the highest price to deter the due entry is $(1+w)(1-q)v+q'c+\frac{f}{\pi}$. Note that $(1+w)(qv+(1-\pi)s) > (1+w)(1-q)v+q'c+\frac{f}{\pi} > v+\pi s$ by the conditions of $s < \frac{f-(qv-q'c)}{\pi}$ and $\Pi_c((1+w)(qv+(1-\pi)s), \pi) > f$. Therefore, the firm's optimal price is $(1+w)(1-q)v+q'c+\frac{f}{\pi}$ if $[(1+w)(1-q)v+q'c+\frac{f}{\pi}-c]\pi \geq v+\pi s-c$ and $v+\pi s$ otherwise.

In summary, suppose that $s < \left[\frac{f-(qv-q'c)}{\pi}\right]^+$. When $w \leq \frac{\frac{f}{\pi}-(qv+(1-\pi)s)+q'c}{qv+(1-\pi)s}$, $p^* = (1+w)(v+(1-\pi)s)$ if $w \geq \frac{(1-\pi)(v-c)+\pi^2 s}{\pi v+\pi(1-\pi)s}$ and $p^* = v+\pi s$ if $w < \frac{(1-\pi)(v-c)+\pi^2 s}{\pi v+\pi(1-\pi)s}$. When $w > \frac{\frac{f}{\pi}-(qv+(1-\pi)s)+q'c}{qv+(1-\pi)s}$, $p^* = (1+w)(1-q)v+q'c+\frac{f}{\pi}$ if $w \geq \frac{(1-\pi+\pi q)v-(1-\pi+\pi q')c+\pi s-f}{\pi(1-q)v}$ and $v+\pi s$ if $w < \frac{(1-\pi+\pi q)v-(1-\pi+\pi q')c+\pi s-f}{\pi(1-q)v}$. Therefore, we have the desired result. ■

Proposition EC.2 shows that when $f > qv-q'c+\pi s$, the firm's equilibrium strategy remains unchanged. Under the condition of $f > qv-q'c+\pi s$, the firm should deter all dupe entrants from entry. Proposition EC.2 further shows that while price competition among the dupe entrants may affect the equilibrium price of the dupe products, the firm's deterrence strategy is unaffected compared to the one in the single dupe entrant case. These results indicates our main results and insights about the implications of dupe entry penalty intervention continue to hold when the dupe entry penalty f is large. Moreover, as a direct result from Propositions EC.1 and EC.2, when $w > \max\left\{\frac{(1-\pi)[(1-q)v-(1-q')c]}{\pi(1-q)v}, \frac{(1-\pi)(v-c)+\pi^2 s}{\pi v+\pi(1-\pi)s}, \frac{(1-\pi+\pi q)v-(1-\pi+\pi q')c+\pi s}{\pi(1-q)v}, \frac{qv-q'c}{\pi s}\right\}$, we have W^\ddagger at $f=0$ is less than W^\ddagger at $f > qv-q'c+\pi s$. Therefore, when w is sufficiently large, the optimal penalty intervention level denoted by f^\ddagger should be greater than zero, which aligns with the result in Proposition 8 in the main text.