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Bait and ditch: Consumer naïveté and salesforce incentives

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Abstract

We analyze a model of price competition between a transparent retailer and a deceptive one in a market where a fraction of consumers is naïve. The transparent retailer is an independent shop managed by its owner. The deceptive retailer belongs to a chain and is operated by a manager. The two retailers sell an identical base product, but the deceptive one also offers an add-on. Rational consumers never consider buying the add-on while naïve ones can be "talked" into buying it. By offering the manager a contract that pushes him to never sell the base good without the add-on, the chain can induce an equilibrium in which both retailers obtain more-than-competitive profits. The equilibrium features price dispersion and market segmentation, with the deceptive retailer targeting only naïve consumers whereas the transparent retailer serves only rational ones.

KEYWORDS

add-on pricing, bait and switch, consumer naïveté, incentive contracts

JEL CLASSIFICATION

D03; D18; D21; L13; M52

1 | INTRODUCTION

Many consumers are familiar with so-called bait-and-switch strategies whereby customers are first "baited" by merchants' advertising of products or services at a low price but, upon visiting the store, are then pressured by salespeople to consider similar, but more expensive, items ("switching"). In a series of articles appeared in the "The Haggler"—a column in the Sunday edition of *The New York Times* (NYT)—journalist David Segal describes a somewhat different strategy employed by large retailers like Staples, BestBuy, and others, which he dubs *bait-and-ditch*: escorting shoppers out of the store, empty-handed, when it's clear they have no intention of buying an expensive warranty or some other add-on for some steeply discounted electronic appliance—a practice that employees at Staples themselves call "walking the customer." He further reports that clerks and sales representatives, at Staples and elsewhere, are under enormous pressure to sell warranties and accessories, particularly on computers. For motivation, close tabs are kept on the amount of extras and service plans sold for each and every computer; the goal is to sell an average of $200 worth of add-ons per machine, and a sales clerk who cannot achieve the goal is at risk of termination. Therefore, sale representatives prefer to forgo the sale altogether, rather than selling the base good without the add-on.[1]

In the last few years there has been a dramatic increase in the sale of add-on products such as extended warranties, service plans, credit insurance, and financing programs like "buy now, pay later" arrangements, and it is well known that such practices generate a substantial fraction of retailers' profits in different consumer industries. Likewise, the use of sales quota to motivate sales representatives is not novel nor is the fact that meeting one's quota is usually an attractive goal as it leads to additional benefits such as promotion or job security (see Oyer, 2000). Yet, the NYT article highlights how retail chains design compensation schemes that push their salespeople to target and exploit naïve or less savvy consumers, concluding that such compensation schemes might backfire in the end.[2] Indeed, it is well known that often salespeople successfully "game" incentive systems by taking actions that increase their pay but hurt the objectives of their employer, such as manipulating prices, influencing the timing of customer purchases, and varying effort over their firms' fiscal years.[3]

In this paper, we look at the interplay between employees' compensation schemes and market competition when (some) consumers are naïve. We start from the same premise as the NYT article—that firms' attempts to exploit consumer naïveté might lead them to design somewhat perverse incentive contracts—and show that a firm, by using these seemingly perverse incentive contracts, is able to increase its profits. In particular, our analysis shows that it may be optimal for a retailer to design a compensation scheme that incentivizes its salesforce to exclusively target naïve consumers. The reason is that the contract between the retailer and its salesforce acts as a credible commitment device ensuring that the retailer will not attempt to capture the whole market. This, in turn, induces other retailers in the market to price less aggressively, thereby softening price competition.

Our baseline model is one of price competition between a transparent retailer and a deceptive one. The transparent retailer is an independent local shop managed by its owner. The deceptive retailer is a franchise retailer which belongs to a chain and is operated by an agent (or manager) on behalf of the chain company. The two retailers sell an identical base product, but the deceptive retailer also offers an add-on. There is a unit mass of consumers with heterogeneous willingness to pay for the base good. Consumers can be either sophisticated or naïve. A sophisticated consumer understands that the add-on offered by the deceptive retailer is worthless. A naïve consumer, on the other hand, can be convinced by the agent that the add-on increases the value of the base good; that is, s/he can be "talked" into buying the add-on next to the base product. Our main contribution is to show that by designing an appropriate compensation scheme for its agent, the chain can induce a pricing equilibrium in which both retailers obtain "abnormal" profits; that is above competitive levels. The chain can achieve this outcome by offering its agent a contract that pushes him to never sell the base good without the add-on. In this case, we say that the chain is engaging in "bait-and-ditch" by inducing the agent not to serve those consumers who do not wish to buy the add-on. Hence, complete market segmentation arises in equilibrium with the deceptive retailer targeting only naïve consumers while the transparent retailer serves only rational ones. Market segmentation softens price competition and eliminates the incentives for the retailers to undercut each other's price for the base good. Moreover, we also show that the transparent retailer might obtain a higher profit than the deceptive one. Hence, our analysis implies that even transparent firms may strictly prefer not to educate naïve consumers, even when education is costless.

The idea that contractual delegation to an agent can be profitable for firms' owners is not new. Several authors (e.g., Fershtman, 1985; Fershtman & Judd, 1987; Sklivas, 1987; Vickers, 1985) have shown how, by using an appropriate incentive contract, a firm can commit to behaving more (or less) aggressively than it would without delegation. In particular, a firm may use seemingly perverse incentive schemes. For instance, Fershtman and Judd (1987) showed how owners can benefit by inducing their managers to keep sales low.[4] Our paper differs from these previous contributions in the assumed market structure and, more important, in how we model consumer behavior. These different underlying assumptions generate novel results and implications. For example, in our model contractual delegation to an agent provides the retail chain with a credible commitment device to serve only one kind of consumer; this, in turn, allows for the existence of an equilibrium whereby the market is completely segmented. Moreover, our model predicts dispersion in the base good's price despite the fact that retailers supply identical products and have the same costs. Classical models of price dispersion (e.g., Salop & Stiglitz, 1977; Varian, 1980) rely on the presence of significant search costs for consumers and on price randomization on the part of firms. In our model, instead, consumers are all perfectly informed about the price(s) of the base good and the pricing game's equilibrium is in pure strategies. Nonetheless, price dispersion arises as a byproduct of the endogenous market segmentation.

The finding that the chain can increase its profits by committing to sell only the bundle is—at first glance—reminiscent of the leverage theory of tied sales (Whinston, 1990). According to this theory, bundling is beneficial for the firm that offers both products but hurts the profits of the competitor who offers only one product. By contrast, in our model, both firms obtain higher profits if the chain commits to sell the base good only together with the add-on. Therefore, our finding that the deceptive retailer can increase its profits by committing to serve only naïve consumers, who buy the add-on together with the base good, is more similar to the role of "technological bundling" as a tool to relax price competition. Chen (1997) considers a duopoly model where firms can commit to selling only the bundle via technological bundling. In equilibrium, one firm uses pure bundling while the other specializes by offering only one product. Yet, our model differs from classical theories of bundling for two crucial aspects. First, naïve consumers are attracted by the bundle only if its posted price is lower than that of the base good offered at the competing retailer; hence, if the deceptive retailer were to publicly post a price for the bundle equal to the one that naïve consumers end up actually paying, these consumers would prefer to shop at the transparent retailer instead. Second, in our model the deceptive retailer's ability to commit to offering only the pure bundle is intrinsically connected to this retailer's use of a compensation scheme that induces its agent to target only naïve consumers; that is, commitment to pure bundling is achieved via salesforce incentives.

Our market segmentation result is related to Wilson (2010) who analyzes a duopoly where firms can precommit to the time consumers require to learn about a product and its price. Consumers are heterogeneous in the sense that some have a high and others a low opportunity cost of time. In his model there is an equilibrium where exactly one firm commits to high search costs; that is, it obfuscates consumers. This commitment relaxes price competition and allows both firms to obtain more than Bertrand profits. Moreover, in Wilson (2010) the prominent firm (with low search cost) has no incentives to inform consumers about the strategy of the obfuscating firm. In our model, in contrast to Wilson (2010), the possibility of market segmentation is rooted in consumers' naïveté and not in differences in effective search costs. Furthermore, we obtain full market segmentation while in Wilson (2010) consumers with high (resp. low) search cost is more (resp. less) likely to purchase from the prominent firm (since pricing is in mixed strategies).

Our model also delivers interesting policy implications. First, we find that welfare is not monotone in the fraction of naïve consumers in the market, implying that policy interventions designed to de-bias naïve consumers can backfire. The reason is that reducing the fraction of naïve consumers may actually help firms to achieve perfect market segmentation. Johnen (2019) obtains a similar result whereby firms' profits and consumer surplus are nonmonotone in the fraction of naïve consumers. In his model, a customer base with more sophisticates induces a more severe adverse selection of unprofitable sophisticated consumers and less intense customer poaching, thereby softening competition. Second, we show that welfare is higher if the deceptive retailer is a monopolist than if it competes with a transparent retailer. Indeed, a monopolistic deceptive retailer has an incentive to serve both naïve as well as sophisticated consumers. As a result, compared to the bait-and-ditch outcome under duopoly, a larger fraction of sophisticated consumers would buy the base good (at a lower price) and a lower fraction of naïve consumers would buy the bundle (at a higher price). As the additional sophisticated consumers who are served under monopoly have a higher willingness to pay than the naïve ones that are served only under duopoly, consumer and total welfare are higher under monopoly. Hence, fostering competition by adding a transparent firm in a market where a deceptive firm operates as a monopolist might be welfare detrimental.

The paper is organized as follows. Section 2 introduces and analyzes our baseline model. Section 3 presents various extensions of our basic framework. Section 4 places our paper in context by relating it to the literature on consumer naïveté. Section 5 concludes the paper and discusses possible avenues for future research. All proofs are relegated to Appendix A.

2 | BASELINE MODEL

Consider a market with two retailers, denoted by D and T. Retailer T is an independent local shop managed by its owner. Retailer D is a franchise retailer that belongs to a chain. Both retailers offer the same base product; for example, a laptop. The prices charged by retailer D and T for the base good are denoted by p_D and p_T, respectively. For simplicity, we assume that the costs for the base good (wholesale prices) are zero for both retailers. Retailer D can also offer an add-on; for example, an extended warranty or service plan. The price for the add-on is f_D and selling the add-on is without costs for retailer D. Retailer T, on the other hand, has prohibitively high costs for offering the add-on and, therefore, offers only the base good.[5]

There is a unit mass of consumers interested in purchasing one unit of the base good. A consumer's willingness to pay for the base good is denoted by v. We assume v is distributed uniformly on the unit interval; that is $v \sim U[0, 1]$. Each consumer can be either sophisticated or naïve and the probability of being naïve, which is independent of the willingness to pay, is denoted by $\sigma \in (0, 1)$. The add-on is worthless and a sophisticated consumer understands this. In other words, owning the add-on does not increase a sophisticated consumer's willingness to pay for the base good. A naïve consumer, on the other hand, can be convinced by a sales agent that the add-on increases the value of the base good by $\bar{f} \in (0, 1)$; that is, a naïve consumer can be "talked" into paying up to $\bar{f}$ for the add-on if he purchases the base good as well.[6],[7]

Retailer T is operated by its owner, who chooses the price for the base good to maximize the shop's profit π_T. Retailer D is operated by a sales agent who reacts on the incentive payments offered to him by the chain. When the agent's compensation depends solely on the profits made by the retail outlet, π_D, he chooses the base good and the add-on prices to maximize π_D. The chain company could also offer a more complex compensation scheme depending, for instance, on the revenue generated by the add-on sales. Why offering such a scheme, which might create misalignment between the chain company's and the manager's interests, can be optimal will be explained later. We posit that the store manager has an outside option yielding a utility of $\bar{U} = 0$. The sequence of events is as follows:

1. Retailer D offers a contract to its sales agent, who either accepts or rejects the offer. The agent's decision as well as the terms of the contract are observed by T.[8]
2. The sales agent of D and the owner of T simultaneously set prices for their products.
3. Consumers with $v \geq \min\{p_D, p_T\}$ visit the cheaper retailer first. If T is cheaper, all these consumers, sophisticated and naïve, purchase the base good from T. If D is cheaper, the agent decides whether to sell only the bundle—base good + add-on—at price $p_D + f_D$ or to sell also the base good by itself at price p_D. In the former case, we say that sophisticated consumers are *walked out* of the shop.[9] If $p_D = p_T$, we assume consumers visit D first.[10]

The analysis is decomposed into two parts. First, we analyze the equilibrium of the pricing game for the case where the agent of D cares only about the profits of the retail outlet he manages. This situation is equivalent to the chain company having full control over the strategic decisions of retailer D. Thereafter, we assume that the agent has an incentive not to serve sophisticated consumers. We derive the equilibrium of the pricing game under this presumption and then obtain sufficient conditions so that the agent indeed does not want to serve sophisticates. This second scenario can also be thought of as delegation—the chain company delegates all strategic decisions to the sales agent. Finally, we compare the two scenarios and show that *bait-and-ditch* may occur in a subgame perfect equilibrium.

2.1 | Manager maximizes profits

Suppose that the compensation of the agent of D depends positively on the profits of the chain and on nothing else. Then, both the agent of D and the owner of T choose prices to maximize the profits of their respective stores. Hence, there is Bertrand competition for the base good and the equilibrium prices are

$$\hat{p}_D = \hat{p}_T = 0. \tag{1}$$

The add-on is offered only by D and thus charging the monopoly price for it is optimal; that is,

$$\hat{f}_D = \bar{f}. \tag{2}$$

The profits of the retailers are

$$\hat{\pi}_D = \sigma\bar{f}, \quad \hat{\pi}_T = 0. \tag{3}$$

Sophisticated consumers are indifferent between the two retailers and the equilibrium outcome is independent on how we break the indifference.[11] To achieve this outcome, the chain company could offer the following wage contract to its sales agent who manages retailer D

$$\hat{w}(\pi_D) = \pi_D - \sigma\bar{f}. \tag{4}$$

The agent accepts this contract and all rents accrue to the chain company whose profit is

$$\hat{\Pi} = \sigma\bar{f}. \tag{5}$$

In essence, the chain company charges the agent of retailer D a franchise fee equal to $\sigma\bar{f}$.

2.2 | Walking sophisticated consumers

Suppose now that the sales agent of retailer D has an incentive not to serve sophisticated consumers; that is, to walk sophisticated consumers out of the store. In the following, we characterize an equilibrium of the pricing game in which retailers make “abnormal” profits. We posit that D is committed to serve only naïve consumers and T is aware of this commitment. Thereafter, we investigate whether this commitment can be achieved by an appropriate incentive scheme offered by the chain company to the agent of D.

Assume there is an equilibrium in which D serves only naïve consumers and T serves only sophisticated consumers. If such an equilibrium exists, then for any price p_D of the base good that D charges, it is optimal for this retailer to set the price of the add-on good at its highest possible level; that is, $f_D = \bar{f}$. The price p_i, with $i = D, T$, has to maximize the retail profit π_i under the presumed market segmentation. The profit of retailer D is

$$\pi_D(p_D) = \sigma(1 - p_D)(p_D + \bar{f}). \tag{6}$$

All naïve consumers with a willingness to pay of $v \geq p_D$ purchase from retailer D. Each naïve consumer purchases next to the base good also the add-on and thus each sale is worth $p_D + \bar{f}$ to the retailer. From the first-order condition, we obtain

$$\tilde{p}_D = \frac{1}{2}(1 - \bar{f}). \tag{7}$$

The corresponding profit of retailer D is

$$\tilde{\pi}_D := \pi_D(\tilde{p}_D) = \sigma\left[1 - \frac{1}{2}(1 - \bar{f})\right]\left[\frac{1}{2}(1 - \bar{f}) + \bar{f}\right] = \frac{\sigma}{4}(1 + \bar{f})^2. \tag{8}$$

The profit of retailer T is

$$\pi_T(p_T) = (1 - \sigma)(1 - p_T)p_T. \tag{9}$$

All sophisticated consumers with a willingness to pay of $v \geq p_T$ purchase from retailer T. They buy only the base good at price p_T. From the first-order condition we obtain

$$\tilde{p}_T = \frac{1}{2}. \tag{10}$$

The corresponding profit of retailer T is

$$\tilde{\pi}_T := \pi_T(\tilde{p}_T) = \frac{1 - \sigma}{4}. \tag{11}$$

Hence, we have the following result:

Proposition 1. *Suppose retailer D is committed not to serve sophisticated consumers. Then, if $\sigma \leq \bar{f}^2$ there exists a Nash equilibrium of the pricing game with higher than Bertrand profits. The equilibrium prices and profits are*

$$\tilde{p}_D = \frac{1-\bar{f}}{2}, \quad \tilde{p}_T = \frac{1}{2}, \quad \tilde{f}_D = \bar{f}, \quad \tilde{\pi}_D = \frac{\sigma}{4}(1+\bar{f})^2, \quad \tilde{\pi}_T = \frac{1-\sigma}{4}.$$

If retailer D is able to commit not to serve sophisticated consumers, and if the fraction of naïve consumers in the market is not too high, both retailers are able to achieve higher than Bertrand profits. The intuition for this result is that when retailer D is committed to serve only naïve consumers, complete market segmentation arises in equilibrium with firm T targeting only sophisticated consumers while firm D targets only naïve ones. Hence, the two retailers essentially operate as "local" monopolists. Market segmentation, in turn, softens price competition on the base good so that both retailers are able to charge prices above marginal cost. Furthermore, it is worth highlighting that the Nash equilibrium of the pricing game described in Proposition 1 features dispersion in the base good's price despite the fact that the retailers supply identical products and have the same costs. Indeed, it is easy to verify that

$$\tilde{p}_D < \tilde{p}_T < \tilde{p}_D + \bar{f}. \tag{12}$$

Intuitively, retailer D has a direct incentive to lower the price of the base good to sell more units as it can extract more per-sale profits via the add-on. This, in principle, would induce retailer T to match (or undercut) retailer D until all profits from the base good are competed away. Yet, if retailer D is committed to serve only naïve consumers, retailer T can charge the monopoly price for the base good and extract the monopoly profit from sophisticated consumers. Extracting monopoly rents from sophisticated consumers leads to a higher profit than slightly undercutting retailer D if the share of sophisticates is sufficiently high; that is, if $\sigma \leq \bar{f}^2$. Finally, notice that while both retailers achieve strictly positive profits in the equilibrium described in Proposition 1, it is not necessarily the case that retailer D is the one benefiting more in this equilibrium. Indeed, it is easy to verify that

$$\tilde{\pi}_T \geq \tilde{\pi}_D \;\Leftrightarrow\; \sigma \leq \frac{1}{1+(1+\bar{f})^2}. \tag{13}$$

Therefore, if the fraction of naïve consumers is low enough, retailer T attains higher profits than retailer D, despite the fact that retailer T does not sell an add-on product. This, in turn, generates the novel, interesting implication that even if a firm is not the one obtaining the largest profit in the market, it may still be possible that the firm is selling its product deceptively, thereby exploiting naïve consumers.

2.3 | Optimal strategy and corresponding sales contract

The question at hand now is: How can the chain company, in the first stage of the game, achieve that its agent does not serve all customers that are willing to pay the base good's price? In other words, how can retailer D credibly commit not to serve sophisticated consumers? The chain company can offer its agent a wage payment $w = w(r_B, r_A)$, which depends both on the revenue from the base good, r_B, and the add-on revenue, r_A, generated by the store. Hence, to achieve the outcome of the pricing subgame equilibrium described in Proposition 1, the chain company could offer its agent the following compensation scheme:

$$\widetilde{w}(r_B, r_A) = \min\{r_A, \tilde{r}_A\} + \min\{r_B, \tilde{r}_B\} - F, \tag{14}$$

where $\tilde{r}_B = \frac{\sigma}{4}(1-\bar{f}^2)$, $\tilde{r}_A = \frac{\sigma}{2}(1+\bar{f})\bar{f}$, and $F = \tilde{r}_B + \tilde{r}_A$ is a fixed franchise fee. For this compensation scheme, it is readily established that an optimal strategy for the agent is to set $p_D = \tilde{p}_D, f_D = \tilde{f}_D$, and not to serve sophisticated consumers. There are two crucial elements in this compensation scheme. First, according to this contract, the agent gets to keep the revenues from the sales of both the base good and the add-on up to the target values $\tilde{r}_B$ and $\tilde{r}_A$. Therefore, there is no incentive for the agent to try to increase revenue beyond $\tilde{r}_A + \tilde{r}_B$. The second crucial aspect of this compensation scheme is that it specifies two distinct revenue targets: one for the sales of the base good and one for the add-on sales. If the chain were to specify a target for overall revenue, instead, this would not work as a credible commitment device not to serve sophisticated consumers because it would give the sales agent too much leeway in choosing prices and reshuffling revenue between sales of the base good and add-on sales. In turn, then, retailer T would price its base good more aggressively in an attempt to gain further market share. Notice that specifying a precise target for the revenue generated through add-on sales is indeed consistent with actual practice at Staples and other large retail chains, as mentioned in the Introduction.

As all relevant variables are observable, there is symmetric information between the chain and the agent. Hence, by choosing F appropriately, the chain company can acquire all the rents in the end. The chain's profit—when offering the incentive (14)—is

$$\tilde{\Pi} = \frac{\sigma}{4}(1 + \bar{f})^2. \tag{15}$$

The following proposition summarizes this result:[12]

Proposition 2. *Suppose that $\sigma \leq \bar{f}^2$. Then there exists a subgame-perfect equilibrium where the chain offers its agent the compensation scheme in (14) so that he has no incentives to sell the base good without the add-on; that is, the sales agent walks sophisticated customers out of the store.*

Hence, by steering the incentives of its agent away from simple (downstream) profit maximization, and providing him instead with an incentive not to serve sophisticated consumers, the chain company is able to sustain an equilibrium with "abnormal" profits. The point that consumer naïveté can generate "abnormal" profits in markets with add-on pricing or deceptive products has already been recognized by several authors, including Ellison (2005), Gabaix and Laibson (2006), Armstrong (2015), and Heidhues, Kőszegi, and Murooka (2016, 2017). Yet, in these models the firms are symmetric and can all offer an add-on or deceptive product. In our model, instead, the firms are extremely asymmetric on this dimension, with only one firm being able to sell an add-on; yet, an "exploitative" equilibrium is still possible.[13]

Another difference with respect to the prior literature on consumer naïveté is that in our model the presence of naïve consumers imposes a negative externality on rational ones, whereas in most of the models mentioned above rational consumers benefit from the presence of naïve ones. Indeed, in our model each type of consumer, rational or naïve, would be better off if they were the only type in the market. Moreover, notice that the equilibrium described in Proposition 2 is highly inefficient because a positive measure of naïve as well as sophisticated consumers end up being priced out of the market for the base good. Specifically, all sophisticated consumers with $v < \frac{1}{2}$ and all naïve consumers with $v < \frac{1-\bar{f}}{2}$ end up not buying the base good. Hence, in addition to redistributing surplus away from the consumers and toward the firms, the practice of bait-and-ditch also lowers total welfare in the market. Indeed, as the following proposition shows, welfare would be higher with a single retail outlet operated by D:

Proposition 3. *Suppose that $\sigma \leq \bar{f}^2$. Then total welfare is higher when the deceptive retailer is a monopolist than when it competes with a transparent retailer.*

Proposition 3 points out that fostering competition in a market where a deceptive firm operates as a monopolist might actually be welfare detrimental. While it may appear counterintuitive at first, the intuition behind this result is as follows. First, notice that if it were a monopolist, retailer D would charge $p_D^m = \frac{1-\sigma\bar{f}}{2}$ for the base good and $f_D^m = \bar{f}$ for the add-on. Hence, the overall fraction of consumers that end up buying the base good is the same. However, compared to the bait-and-ditch outcome under duopoly, a larger fraction of sophisticated consumers would consume the base good (at a lower price) whereas a lower fraction of naïve consumers would consume the bundle (at a higher price). As the additional sophisticated consumers who are served under monopoly have a higher willingness to pay than the naïve ones that are served only under duopoly, consumer and total welfare is higher under monopoly.[14]

What measures should a social planner undertake to increase welfare? Interestingly, an important implication of our model is that social welfare is nonmonotone in the fraction of naïve consumers. Therefore, consumer education policies aimed at increasing consumer sophistication in the market might be counterproductive and welfare detrimental.[15] Indeed, let σ_1 denote the initial fraction of naïve consumers in the market and suppose $\sigma_1 > \bar{f}^2$. In this case, the Bertrand outcome (for the base good) is the equilibrium of the pricing game.[16] It is true that in this equilibrium naïve consumers are taken advantage of since they end up buying a worthless add-on and paying $\bar{f}$ for it. Yet, a policy that reduces the fraction of naïve consumers in the market can hurt both naïve as well as sophisticated consumers. To see why let $\sigma_2 < \sigma_1$ denote the new fraction of naïve consumers after the policy intervention. Unless $\sigma_2 = 0$, the effect of the policy is ambiguous ex ante. If $\sigma_2 > \bar{f}^2$, the Bertrand outcome continues to be the equilibrium, but now the fraction of exploited consumers is reduced; in this case, the policy increases welfare. Yet, if $\sigma_2 < \bar{f}^2$, then the policy is giving the deceptive retailer exactly the commitment power necessary to engage in bait-and-ditch and achieve perfect market segmentation.[17] On the other hand, mandating retailers to issue rainchecks when advertised products are (claimed to be) out of stock would unambiguously improve consumer and total welfare.

Can the chain company achieve the *bait-and-ditch* outcome by (technologically) bundling the base good with the add-on good instead of relying on an incentive sales contract? The answer is no. Indeed, naïve consumers would still visit the retailer with a lower total price. Hence, retailer D cannot charge a higher price for the bundle than the one retailer T charges for the base product alone. The usual Bertrand outcome then arises as competition is not relaxed. Importantly, retailer D first has to attract naïve consumers into the store with a low price on the base good, and then it can exploit their naïveté by making them purchase the over-priced add-on. Moreover, the Bertrand outcome can be avoided only if the manager of retailer D does not want to serve the sophisticated consumers who might also be attracted to the store by the low price on the base good.

Finally, we point out that there exists an equivalent "standard" version of our model where all consumers are rational; that is where naïve consumers have a true willingness to pay for the add-on equal to $\bar{f}$. The same type of equilibria would exist also under this alternative "rational" interpretation. However, the welfare implications are slightly different because consumption of the add-on good is now desirable from a welfare perspective. Nevertheless, market segmentation still results in prices for the base good that are too high and hence detrimental for welfare. Most importantly, under this alternative "rational" interpretation—in contrast to our interpretation where some consumers are naïve—the bundling of the two goods is a feasible strategy for the chain to achieve commitment. Hence, in this case, there would be no role for the sales agent.

2.4 | Both retailers can sell the add-on good

In this short section, we show that for market separation to arise it is not necessary that the two retailers are ex ante unequal. Indeed, suppose that the market consists of two ex ante identical retailers, indexed by $i = 1, 2$; each retailer is operated by an agent on behalf of an owner. Both retailers can sell next to the base good also the add-on product. Moreover, both owners can commit via an appropriate wage contract to sell only the bundle.

If both retailers use the same strategy, the standard Bertrand outcome emerges; that is both make zero profits. To see this suppose first that both managers try to maximize retail profits. In the price game equilibrium, the base good prices are $p_1 = p_2 = -\sigma\bar{f}$ and the add-on prices are $f_1 = f_2 = \bar{f}$. Hence, we obtain the usual cross-subsidization result: naïve consumers who also buy the add-on cross-subsidize the cheap base good for sophisticated consumers. On the other hand, if both retailers commit to selling only the bundle, then we have Bertrand competition with effectively one homogeneous product. The sophisticated consumers decide where to buy based on the price for the bundle, while naïve consumers make this decision purely based on the base good's prices. The equilibrium prices are $p_1 = p_2 = -\bar{f}$ and $f_1 = f_2 = \bar{f}$.

Now, suppose that one retailer is committed to sell only the bundle. Can market segmentation arise in equilibrium? If market segmentation occurs, and says retailer 1 sells only the bundle, prices and profits are[18]:

$$\tilde{p}_1 = \frac{1}{2}(1 - \bar{f}), \quad \tilde{p}_2 = \frac{1}{2}, \quad \tilde{f}_1 = \bar{f}, \quad \tilde{\pi}_1 = \frac{\sigma}{4}(1 + \bar{f})^2, \quad \tilde{\pi}_2 = \frac{1 - \sigma}{4}. \tag{16}$$

Thus, retailer 2 effectively behaves as a transparent firm and serves only sophisticated consumers. In other words, the outcome is exactly the same as in our baseline model with one transparent and one deceptive retailer.

Proposition 4. *Suppose that* $\sigma \le \frac{\bar{f}^2}{1 + 2\bar{f}(1 + \bar{f})}$. *Then there exists a subgame-perfect equilibrium where exactly one retailer offers its agent the compensation scheme in (14) so that he has no incentives to sell the base good without the add-on; that is, the sales agent walks sophisticated customers out of the store.*

The difference with Proposition 2 is that the upper bound on σ is tighter. This is intuitive because the retailer that serves only sophisticated consumers can now—by deviating—not only attract naïve consumers but also sell the add-on good to these consumers.

3 | EXTENSIONS

In this section, we discuss three extensions of our framework. The first two analyze how more intense competition affects our main result, while the third—which we discuss only briefly—discusses a richer contracting problem with moral hazard.

3.1 | Imperfect substitutes and fringe competition

In this section, we discuss a simple form of competition between more than two retailers and show that our main result relies on some amount of market power.

Consider a market with $N \geq 3$ retailers. Retailer D sells a base product and an add-on while retailer T sells only the base product. As in Section 2, the costs of both products are normalized to zero and the add-on generates per-sale profits up to $\bar{f}$. The remaining $N-2$ retailers belong to a competitive fringe and supply a base product at zero cost. As before, there is a unit mass of consumers interested in buying at most one of the base products. The base products supplied by D and T are perfect substitutes. A consumer's value for one of these products is denoted by v, which is distributed uniformly on the unit interval $v \sim U[0,1]$. Each consumer can be either sophisticated or naïve and the probability of being naïve, which is independent of the willingness to pay, is denoted by $\sigma \in (0,1)$. A sophisticated consumer understands that the add-on is worthless whereas a naïve consumer can be "talked" into paying up to $\bar{f}$ for the add-on if he purchases the base good as well. The fringe supplies an imperfect substitute base good that consumers value at $v_F = kv$, with $k \in (0, 1-\bar{f})$. The parameter k measures the substitutability of the base product supplied by the fringe. Firms compete by simultaneously choosing prices for their base goods.

Proposition 5. *Suppose retailer D is committed not to serve sophisticated consumers. Then, if* $\sigma(1-k)^2 \leq \bar{f}^2$ *there exists a Nash equilibrium of the pricing game with higher than Bertrand profits for retailers D and T. The equilibrium prices and profits are*

$$p_F^* = 0, \quad p_D^* = \frac{1-k-\bar{f}}{2}, \quad p_T^* = \frac{1-k}{2}, \quad f_D^* = \bar{f}$$

and

$$\pi_F^* = 0, \quad \pi_D^* = \frac{\sigma(1-k+\bar{f})^2}{4(1-k)}, \quad \pi_T^* = \frac{(1-\sigma)(1-k)}{4}.$$

At these prices, all naïve consumers with $v \in \left[\frac{1-k-\bar{f}}{2(1-k)}, 1\right]$ buy from D, all sophisticated consumers with $v \in \left[\frac{1}{2}, 1\right]$ buy from T and all remaining consumers buy from the fringe.[19] Hence, market segmentation still arises in equilibrium. Yet, the equilibrium prices and profits of D and T are decreasing in k since, as the product supplied by the fringe becomes a better substitute, the market power of D and T is reduced. Intuitively, the addition of a competitive fringe represents an attractive outside option for some consumers; this, in turn, forces D and T to charge lower prices and it reduces their profits compared to the model of Section 2. Notice, however, that the condition for an equilibrium with market segmentation to exist is less restrictive than in the duopoly model of Section 2 as the critical threshold on the fraction of naïve consumers is higher $\left(\frac{\bar{f}^2}{(1-k)^2} > \bar{f}^2\right)$. While this might appear counterintuitive at first, the intuition is that the incentives to deviate for the transparent retailer are now weaker. Indeed, exactly because of the outside option represented by the fringe, the gains for retailer T to undercut retailer D are reduced: the necessary price cut is now relatively high compared to the lower markup. As the product supplied by the fringe is an imperfect substitute for the one supplied by D and T, these two retailers still retain some market power which enables them to avoid the Bertrand trap. Hence, retailers D and T need to retain sufficient market power for our main result to extend beyond duopoly.[20]

3.2 | Horizontally differentiated products

In this section, we consider a market with four horizontally differentiated retailers, two transparent ones (T_1 and T_2) and two deceptive ones (D_1 and D_2). The market is modeled as a circular city with a circumference equal to 1 as in Salop (1979). The deceptive retailers, D_1 and D_2, are located at zero and 1/2, respectively. The transparent retailers, T_1 and T_2, are located at 1/4 and 3/4, respectively. The market structure is depicted in Figure 1.

A mass one of consumers are located uniformly on the circle and a share $\sigma \in (0, 1)$ of the consumers is naïve; that is, the density of naïve consumers is σ around this circle. Each consumer is interested in buying at most one unit of the base good. A consumer's gross valuation is $v > 0$, which is sufficiently high so that the market is fully covered in any equilibrium. Naïve consumers can be "tricked" into paying $\bar{f}$ for an add-on, which is offered only by the deceptive retailers. Sophisticated consumers are not willing to pay a positive amount for the add-on good. All travel occurs around the circle and if a consumer purchases from a retailer that is located d units away from her location, she incurs transportation cost of td, where $t > 0$.

The two deceptive retailers belong to the same chain. The chain, however, cannot commit to certain prices; that is there is always price competition between the two deceptive retailers.[21] The timing is as in the baseline model.

1. The chain decides whether or not to commit to sell only the bundle, base good plus add-on (potentially via an appropriate sales contract).
2. All four retailers simultaneously set prices for their products.
3. Consumers decide where to buy.

Suppose that the chain does not commit to sell the base good only with the add-on. In this case, each consumer buys from the retailer that offers the base good deal with the lowest total cost; that is, base good price plus transportation cost. A naïve consumer who purchases from a deceptive retailer is convinced by the sales agent to purchase the add-on good as well. The four retailers compete in prices—here, all retailers act independently and non-cooperatively—but the deceptive retailers have an advantage because they can make an extra profit of $\sigma\bar{f}$ on average per customer.

Now, suppose that the chain commits to sell only the bundle. Naïve consumers are not aware of this and decide which retailer to visit solely based on the base good's price. Thus, in equilibrium, a naïve consumer either purchases

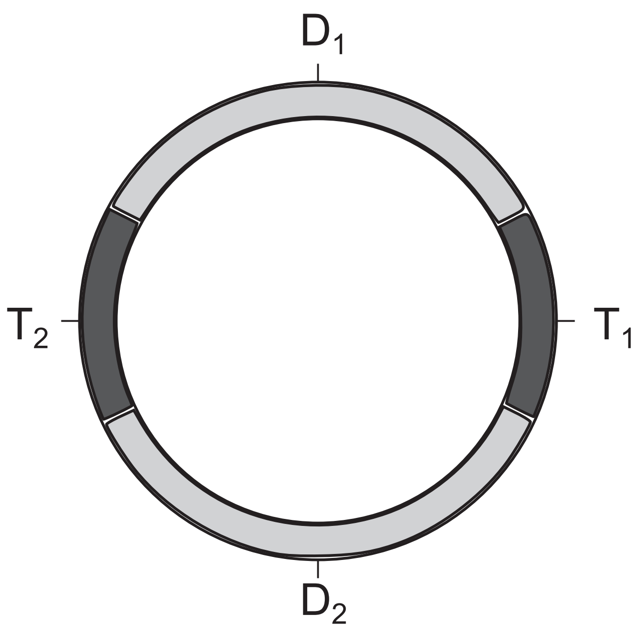

FIGURE 1 Market structure

from D_1 or D_2. A sophisticated consumer, on the other hand, understands that he has to pay $p_{D_i} + f_{D_i}$ when purchasing from retailer D_i. Nevertheless, in equilibrium, sophisticated consumers located close to a deceptive retailer end up buying from it. Importantly, the commitment of the chain does not lead to monopolization of the "naïve market segment" because there is still price competition between the two deceptive retailers.

As the next result shows, for intermediate transportation costs the chain commits to sell the base good only together with the add-on.

Proposition 6. *Suppose that* $\sigma \in [0.06, 0.375]$ *and that*

$$\frac{4(3-\sigma)}{3} \geq \frac{t}{\bar{f}} \geq 4\sigma.$$

Then, there exists a subgame-perfect equilibrium where the chain commits to sell only the bundle.

For too low transportation cost, the transparent retailers cannot compete with the deceptive ones who then serve the whole market. For too high transportation cost, some naïve consumers purchase from the transparent firms even though the chain commits to sell only the bundle; that is, there is never direct competition between the two deceptive retailers. Importantly, the conditions on $t/\bar{f}$ and σ provided in the proposition are sufficient but not necessary. It can readily be established that the interval of $t/\bar{f}$-values is nonempty for $\sigma < 3/4$.

3.3 | Moral hazard

To clearly highlight the key intuition behind our results, we have kept the contracting problem as simple as possible by assuming symmetric information between the deceptive retailer and its agent. In the Supporting Information, we enrich the baseline model by considering a contracting problem with moral hazard. In particular, we consider a situation where the fraction of naïve consumers is stochastic and allow for the agent of the deceptive retailer to (a) exert costly private effort that enhances the probability that a customer buys the add-on and (b) incur an additional cost when walking out consumers who are not willing to purchase the add-on.

The addition of this two-task agency problem makes it more costly for the deceptive retailer to engage in bait-and-ditch. Nevertheless, as we show in detail in the Supporting Information, it is often profitable for the deceptive retailer to do so even if it has to pay an information rent to its agent. Intuitively, this is more likely to happen when the add-on good has a high-profit margin and/or when the cost of walking out consumers empty-handed is not too high. Interestingly, we also identify a "complementarity of inefficiencies" whereby the chain company is more likely to induce the manager to exert (socially costly) effort when it engages in bait-and-ditch.[22] Indeed, the rent that the agent demands to exert high effort may already compensate him also for the disutility arising from not serving sophisticated consumers. In this case, incentivizing the agent to serve only naïve consumers comes without additional costs for the deceptive retailer.

4 | RELATED LITERATURE ON CONSUMER NAÏVETÉ

Our paper joins the recent literature on consumer naïveté. Starting with the seminal contribution of Gabaix and Laibson (2006), most papers in this literature focus on the incentives (or lack thereof) for deceptive firms to educate naïve consumers by unshrouding their hidden fees or attributes, and derive conditions for a deceptive equilibrium—one in which naïve consumers are exploited—to exist.[23] The main implications of this literature are twofold: (a) deceptive firms do not want to educate/de-bias naïve consumers as this would turn them from profitable into unprofitable; and (b) the presence of naïve consumers benefits rational ones who take advantage of low-priced base goods (often loss leaders) but do not buy the expensive add-ons. While related, our paper differs from previous contributions in this literature on several key dimensions. First, we do not focus on the question of whether firms want to educate consumers as we consider an asymmetric set-up with one deceptive firm and one transparent firm (or more). Nevertheless, we find that even in such an asymmetric environment, a deceptive equilibrium can be sustained.

Moreover, in most of the models in this literature, deceptive and transparent equilibria result in the same profits for the firms as profits gained from naïve consumers via the add-on are passed on to sophisticated consumers via lower prices on the base good; in our model, instead, both the deceptive firm and the transparent one attain strictly higher profits in a deceptive equilibrium, with the transparent firm potentially obtaining the lion's share of the total profits. Furthermore, in our model, the presence of naïve consumers actually hurts sophisticated ones.[24] The reason is that in equilibrium naïve and sophisticated consumers buy from different retailers and this relaxes price competition on the base good. Indeed, in our model sophisticated consumers end up buying the base good at the monopoly price (if they buy at all). Within this literature, the papers most related to ours are Heidhues and Kőszegi (2017), Kosfeld and Schüwer (2017), and Michel (2017). The former two are models of third-degree price discrimination where firms can condition the terms of their offers on external information about consumers' naïveté. Our model, instead, is one of uniform pricing where retailers only know that a fraction of consumers is naïve, but cannot tell ex ante which consumers are naïve and which ones are not. Similar to us, Kosfeld and Schüwer (2017) find that educating consumers may backfire as in their model a larger share of sophisticated consumers may trigger an equilibrium reaction by firms that is undesirable for all consumers. Michel (2017) is more in the vein of Heidhues et al. (2016). He explicitly models extended warranties as useless add-on products. As in our model, naïve consumers do not pay attention to the add-on when choosing which store to visit, but then overestimate the add-on's value at the point of sale. In contrast to us, Michel (2017) analyzes a symmetric game between firms and is primarily concerned with the welfare effects of consumer protection policies; for example, minimum warranty standards.

Our paper is also related to the literatures on bait-and-switch, add-on pricing, and loss leaders. Lazear (1995) derives conditions for bait-and-switch to be profitable in a model where firms may claim to sell a different good than the one they actually sell. Hess and Gerstner (1987) develop a model of bait-and-switch where firms sometimes stock out on advertised products and offer rain checks to consumers who buy "impulse goods" whenever they visit a store. Gerstner and Hess (1990) present a model of bait-and-switch in which retailers advertise only selected, low-priced brands that are understocked and in-store promotions are biased toward more expensive substitute brands. Rosato (2016) proposes a model of bait-and-switch in which a retailer offers limited-availability bargains to exploit consumers' loss aversion. A further reason for stockouts is presented by Balachander and Farquhar (1994), who show that by having occasional stockouts firms can soften price competition.

Add-on pricing is analyzed, among others, by Lal and Matutes (1994), Verboven (1999), Ellison (2005), and Johnson (2017). For instance, Ellison (2005) proposes a model in which add-on pricing enables firms to more effectively price discriminate between high-demand and low-demand consumers. Johnson (2017) considers an asymmetric duopoly similar to ours where one large firm carries a full portfolio of products while the other carries an incomplete, smaller one. In his model, consumers are naïve as they have biased beliefs about their future purchase probabilities and so end up making unplanned purchases. He shows that loss leading naturally arises in this framework.

5 | CONCLUSION

The recent literature in Behavioral Industrial Organization has highlighted how consumer naïveté affects firms' pricing and advertising strategies and how these, in turn, affect consumer and total welfare in many different markets. Our paper contributes to this literature by showing how firms' attempts to exploit consumer naïveté may have important implications for the design of employees' compensation schemes. In particular, our analysis suggests that incentive schemes that at first glance may appear counterproductive—like enforcing a target on add-on sales that pushes employees to forgo a sale altogether rather than selling a product without an add-on—may actually increase firms' profits. Moreover, our model delivers several new, interesting welfare implications; for example, naïve consumers might exercise a negative externality on rational consumers who end up facing higher prices because of the formers.

While we have framed our analysis in the context of a retail market for products like consumer electronics, we believe that our model applies also to retail financial services such as credit cards, insurance policies, and mortgages. Indeed, it is not uncommon for firms operating in this industry to bundle basic financial products, like a checking account, together with expensive add-ons, like an overdraft service, and offer them as an indivisible package.[25] For instance, in what has become known as the UK payment protection insurance misselling scandal, financial institutions sold consumers credit lines together with payment protection insurance (PPI), also known as credit insurance. To obtain the credit, consumers were often forced to purchase also the PPI. The PPI was not only heftily priced but also often useless to the consumers as shown by the fact that the fraction of rejected claims was very high compared to other types of insurance. Yet, bank clerks had strong incentives to sell these products via huge commissions (Ferran, 2012).

An important assumption in our model is that the contract of the deceptive retailer's manager is observable to the other firms in the market as this makes the contract work as a credible commitment device. We think this is a reasonable assumption since employment contracts usually last for several years and cannot be adjusted as easily or frequently as prices. Hence, repeated play would presumably cause the other firms to eventually learn the true incentives of the deceptive retailer's manager—for instance, by looking at past sales data—even if they were not initially common knowledge; especially since in our framework a deceptive firm would want its manager's incentives to be common knowledge. Moreover, even if the specific details of his contract are not publicly available, a salesman could easily make a credible claim that the terms of his employment do not allow him to sell a computer component by itself and/or below some set price. Indeed, several prior contributions have shown that unobservable agency contracts can still serve as effective precommitments, often yielding outcomes similar to those attainable via observable contracts; see Katz (1991), Fershtman and Kalai (1997), and Koçkesen (2004).

An interesting policy question is whether firms have an incentive to educate consumers by disclosing/unshrouding information about the add-on. We have chosen not to directly model this issue in our paper as the environment that we consider is a highly asymmetric one, with only one deceptive firm in the market that can offer the add-on. One might conjecture that transparent firms would have a strong incentive to educate consumers and warn them about the deceptive firm's add-on. Yet, as our analysis has shown, a transparent firm also benefits from the deceptive firm's bait-and-ditch strategy and the resulting market segmentation. Hence, our model suggests that even transparent firms might prefer to keep naïve consumers in the dark.

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ENDNOTES

1 "Selling It With Extras, or Not at All": http://nyti.ms/PcobqM.

2 In the context of financial advice, Anagol, Cole, and Sarkar (2017) report evidence that suggests that sales agents tend to cater to, rather than correct, customers' biases. That financial advisers often reinforce customers' biases that are in their interest is also documented by Mullainathan, Noeth, and Schoar (2012).

3 Oyer (1998) argues that as firms often use the fiscal year as the unit of time over which many sales quota and compensation schemes are measured, a salesperson who is under pressure to meet a quota near the end of the year may offer a client a bigger price discount if the client orders immediately. In fact, he shows that firms tend to sell more (and at lower margins) near the end of fiscal years than they do in the middle of the year. Similarly, Larkin (2014) analyzes the pricing distortions that arise from the use of nonlinear incentive schemes at an enterprise software vendor and finds that salespeople are adept at gaming the timing of deal closure to take advantage of the vendor's commission scheme.

4 Delegation can also be used to collude more effectively; see Fershtman, Judd, and Kalai (1991) and Lee (2010).

5 This is consistent with the observation that many large consumer electronics retailers offer their own extended warranties whereas smaller shops are usually not able to do so; see, for example, OFT (2012) for recent evidence.

[6] Hence, we interpret the add-on offered by the deceptive retailer as a purely worthless product that naïve consumers can be tricked into buying; see Armstrong (2015) for a similar model. For a richer model of "sales talk" with rational and credulous consumers, see Inderst and Ottaviani (2013).

[7] The assumption $\bar{f} < 1$ is made for technical reasons—to avoid corner solutions—and to make the problem interesting. Note that for $\bar{f} \geq 1$ a naïve consumer would always be willing to pay more for the add-on than the base good. We believe this to be a rather extreme case. Moreover, in this case, the problem becomes uninteresting: even when engaging in bait-and-ditch, retailer D would want to serve all naïve consumers by charging a price for the base good equal to zero. Thus, there would be no rationale for relaxing price competition.

[8] The assumption that the terms of the agent's contract are common knowledge is of course not appropriate in all settings. Yet, as shown by Katz (1991), Fershtman and Kalai (1997), and Koçkesen (2004), unobservable agency contracts can often serve as effective commitment devices yielding the same outcomes as attainable with observable contracts. Hence, we believe that our results can be extended also to environments where unobservable contracts are the norm.

[9] The assumption that the agent can make sure not to sell the base product without the add-on—which we recognize might appear somewhat extreme—is made only for the purpose of exposition and to be consistent with our motivating example in Section 1. Our main result continues to hold under the alternative, perhaps more common scenarios. For instance, consider the case where retailer D explicitly writes in the fine print that the low-price offer on the base good is available only in conjunction with the purchase of the add-on. In this case, sophisticated consumers read and understand the fine print and so do not bother visiting retailer D, while naïve consumers do not pay attention to the fine print, visit retailer D and eventually buy from it. Moreover, stores often advertise deals that are valid only "while supplies last" and, according to current FTC regulation, it is not a bait-and-switch if the retailer communicates up-front that availability is limited. Indeed, the FTC Guides Against Bait Advertising require retailers "to have available at all outlets listed in the advertisement a sufficient quantity of the advertised product to meet reasonably anticipated demands, unless the advertisement clearly and adequately discloses that supply is limited" (16 C.F.R. Part 238.3). Additionally, as argued by Chu, Gerstner, and Hess (1995), aggressive selling practices—also known as "hard-selling"—which are often associated with unsought add-ons can frustrate consumers and push (some of) them away. Hence, there are several realistic scenarios where retailers can avoid serving consumers who insist on getting the base product at the announced price.

[10] This tie-breaking rule is assumed only for expositional simplicity and to guarantee equilibrium existence. If anything, this assumption favors retailer D and thus reduces the incentives for the chain to use the "commitment strategy" of not serving sophisticated consumers.

[11] To see why this is the unique equilibrium outcome, suppose retailer D were to serve only naïve consumers. Now, retailer T can demand a strictly positive price from the unserved sophisticated consumers. This, however, cannot be an equilibrium. Retailer D is not committed to serve only naïve consumers and, therefore, has an incentive to undercut the base product's price of retailer T and to serve both consumer groups. Hence, regarding the base product's price, the standard Bertrand outcome is the unique equilibrium outcome.

[12] For the simple wage Scheme (14) the equilibrium outcome is not unique. In particular, $p_D = p_T = 0$ is also part of a subgame perfect equilibrium. For more complex wage schemes the outcome described in Proposition 2 is the unique equilibrium outcome.

[13] A notable exception is the model presented by Murooka (2015) where a deceptive and a nondeceptive firm sell to consumers via a common intermediary. He shows that a deceptive equilibrium, whereby only the deceptive firm ends up selling to consumers, is possible despite the firms being asymmetric. Yet, the intuition behind his result does not hinge on market segmentation as a mechanism, but rather on the common agency of the intermediary. Moreover, in his model, all consumers are naïve ex ante (but can be "educated" by the intermediary).

[14] The fact that the total quantity supplied is the same with and without segmentation is a direct byproduct of the assumption of linear demand. Yet, the result in Proposition 3 continues to hold as long as the total quantity supplied under monopoly is at least as large as under segmentation; see Aguirre, Cowan, and Vickers (2010) for explicit conditions on when segmentation reduces total output.

[15] Huck and Weizsäcker (2016) obtain a similar result in markets for sensitive personal information where some naïve consumers underestimate the chance that their private information will be revealed to a third party.

[16] The scheme in (14) creates commitment not only to sell only the bundle but also to some price. We focus on equilibria where the prices have to be optimal given the equilibrium market structure, that is monopoly prices for the respective segments. This rules out that the wage contract can be used to (mainly) commit to higher base-good prices. If this is feasible, then even for $\sigma > \bar{f}^2$, there can exist equilibria with higher than Bertrand profits.

[17] A similar implication arises in Ispano and Schwardmann (2018) who analyze firms' quality disclosure and pricing decisions in the presence of "cursed" consumers, who fail to be sufficiently skeptical about undisclosed quality.

[18] Notice that the add-on price of retailer 2, $\tilde{f}_2$, is not uniquely pinned down.

[19] It is easy to see that the chain company can design a compensation scheme, along the lines of the one derived in Section 2, that would induce the agent of retailer D not to serve sophisticated consumers. For the sake of brevity we omit the details.

[20] This is a feature shared by many models with add-on pricing and shrouded attributes: with perfect (or Bertrand) competition all add-on profits are competed away by reducing the base good's price. To have an equilibrium with strictly positive profits, some authors have assumed product differentiation; see Ellison (2005), Dahremöller (2013), and Heidhues and Kőszegi (2017). Others, instead, have introduced an exogenous price floor for the base good; see Heidhues et al. (2016, 2017). A notable exception is Johnen (2019). In his model

with deceptive products and shrouded attributes, profits have not competed away even under Bertrand competition with homogeneous products when firms are initially uninformed and perfectly symmetric.

[21] Here we depart from our baseline model and do not allow for contracts such that the manager of D_i is committed not just to sell only the bundle but also indirectly to certain prices. We do not allow for this indirect price commitment to be able to analyze price competition between two deceptive retailers. The assumption that the two deceptive retailers belong to the same chain is used only for the ex ante choice of whether or not to commit to sell only the bundle.

[22] Inderst and Ottaviani (2009) analyze a two-task agency model of sales where an agent needs to prospect for customers as well as advise them on the product's suitability. In their model, the two tasks are in direct conflict with each other so that when structuring its salesforce compensation, a firm must trade off the expected losses from "misselling" unsuitable products with the agency costs of providing marketing incentives to its agent. In our model, instead, in equilibrium, the agent's tasks end up being complementary with one another.

[23] See also Armstrong and Vickers (2012), Dahremöller (2013), Miao (2010), Murooka (2015), Heidhues et al. (2016, 2017), and Johnen (2019).

[24] Analyzing a competitive insurance market with rational and overconfident consumers, Sandroni and Squintani (2007) also find that the presence of overconfident (naïve) consumers can hurt rational ones.

[25] In the wake of the Wells Fargo fake accounts scandal in the United States, initial reports blamed individual Wells Fargo branch managers for the problem, claiming that they gave their employees strong incentives to sell multiple financial products. This blame was later shifted to a pressure from higher-level management to open as many accounts as possible through cross-selling—the practice of selling an additional product or service to an existing customer.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section.

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APPENDIX A: PROOFS

This appendix gathers proof of the results in the main text.

Proof of Proposition 1. The prices $\tilde{p}_D$ and $\tilde{p}_T$ constitute a Nash equilibrium only if no retailer has an incentive to deviate. Under the presumption that the manager of retailer D is committed not to serve sophisticated consumers, there is no profitable deviation for him. Retailer T, on the other hand, is not committed to serve only sophisticated consumers. It could slightly undercut D by offering the base good at price $p_T = \tilde{p}_D - \varepsilon$ and serve both types of consumers. For $\varepsilon \to 0$, retailer T's profit from this deviation is

$$\pi_T^{\text{DEV}} = \left[1 - \frac{1}{2}(1 - \bar{f})\right]\frac{1}{2}(1 - \bar{f}) = \frac{1}{4}(1 - \bar{f}^2).$$

The deviation is not profitable if

$$\frac{1}{4}(1 - \sigma) \geq \frac{1}{4}(1 - \bar{f}^2) \;\Leftrightarrow\; \bar{f}^2 \geq \sigma.$$

Hence, prices $\tilde{p}_D$ and $\tilde{p}_T$ constitute a Nash equilibrium of the pricing game. □

Proof of Proposition 2. Suppose $\sigma \leq \bar{f}^2$. To prove that we have a subgame-perfect equilibrium we need to show that no player has an incentive to deviate at each stage of the game. We know from Proposition 1 that retailer T has no incentive to deviate if $\sigma \leq \bar{f}^2$. Next, we need to show that fixing retailer T's strategy and the contract signed between the chain company and the manager of D, the latter does not want to deviate. Recall that the compensation scheme offered by the chain company is

$$\widetilde{w}(r_B, r_A) = \min\{r_A, \tilde{r}_A\} + \min\{r_B, \tilde{r}_B\} - F,$$

where $\tilde{r}_B = \frac{\sigma}{4}(1 - \bar{f}^2)$, $\tilde{r}_A = \frac{\sigma}{2}(1 + \bar{f})\bar{f}$, and $F = \tilde{r}_B + \tilde{r}_A$. Given this scheme, if the manager follows the presumed equilibrium strategy of charging $p_D = \tilde{p}_D$, $f_D = \tilde{f}_D$, and not serving sophisticated consumers, his utility is exactly zero. The manager of D could deviate by serving sophisticates at the presumed equilibrium prices and/or by changing the prices as well. Yet, any deviation is (weakly) dominated. Indeed, if he were to raise a revenue from add-on (resp. base good) sales lower than $\tilde{r}_A$ (resp. $\tilde{r}_B$), the manager would attain a strictly negative payoff. On the other hand, if he were to raise a higher revenue on either product, his compensation would not increase. Hence, there are no profitable deviations for the manager of store D.

Finally, we need to show that at the first stage the manager is willing to accept the proposed contract and that the chain company cannot do better by offering a different contract. First, given that the manager's outside option is $\overline{U} = 0$, he is indifferent between rejecting the contract and accepting it. Next, notice that any contract that induces the manager to maximize downstream profits would result in Bertrand's pricing for the base good so that the chain's profits would be $\hat{\Pi} = \sigma\bar{f}$. By offering the contract $\widetilde{w}(r_B, r_A)$, instead, the chain's profits are $\tilde{\Pi} = \frac{\sigma}{4}(1 + \bar{f})^2$. We have that

$$\frac{\sigma}{4}(1 + \bar{f})^2 > \sigma\bar{f} \Leftrightarrow (1 - \bar{f})^2 > 0.$$

Therefore, we have that the proposed strategy profile constitutes a subgame-perfect equilibrium.

A final remark regarding equilibrium existence is in order. With the contract space being unrestricted, existence of a subgame-perfect equilibrium cannot be guaranteed. For instance, if the agent's wage is increasing in r_B for r_B strictly smaller than a certain threshold, then the agent's best response is not well defined. To avoid this issue, we have to assume that the wage payment can be contingent only on a discrete set of revenues $\mathscr{R} = \{(r_A, r_B)\}$ that always includes $(\tilde{r}_A, \tilde{r}_B)$. For any $|\mathscr{R}| > 1$—in particular for $|\mathscr{R}| \to \infty$—equilibrium existence is guaranteed and the outcome described in the proposition is an equilibrium outcome. □

Proof of Proposition 3. First, it is easy to see that when retailer D is a monopolist, it is optimal to charge $f_D^m = \bar{f}$ for the add on. Then, for the base good, retailer D chooses the price that maximizes the following expression:

$$\pi_D^m(p_D) = (1 - p_D)(p_D + \sigma\bar{f}).$$

Taking the first-order condition and rearranging yields

$$p_D^m = \frac{1 - \sigma\bar{f}}{2}.$$

Hence, profits and consumer welfare in the market equal

$$\pi_D^m = \frac{(1+\sigma\bar{f})^2}{4} \text{ and}$$
$$CS^m = \sigma\int_{p_D^m}^1 (v - p_D^m - \bar{f})dv + (1-\sigma)\int_{p_D^m}^1 (v - p_D^m)dv = \frac{1 - 2f\sigma - 3f^2\sigma^2}{8}$$

In contrast, under duopoly and bait-and-ditch we have

$$\tilde{\pi}_T = \frac{1-\sigma}{4},$$
$$\tilde{\pi}_D = \frac{\sigma}{4}(1+\bar{f})^2, \quad \text{and}$$
$$\widetilde{CS} = \sigma\int_{\tilde{p}_D}^1 (v - \tilde{p}_D - \bar{f})dv + (1-\sigma)\int_{\tilde{p}_T}^1 (v - \tilde{p}_T)dv = \frac{1 - 2f\sigma - 3f^2\sigma}{8}.$$

It is easy to verify that $\widetilde{CS} < CS^m$ and $\pi_D^m < \tilde{\pi}_T + \tilde{\pi}_D$. The result then follows since the overall measure of consumers who buy is the same under both scenarios; yet, more sophisticates buy when when retailer D is a monopolist. In other words, when moving from monopoly to duopoly with bait-and-ditch, consumption is shifted away from high-value sophisticated consumers to low value naïve consumers. □

Proof of Proposition 4. If one retailer is committed and the other not and market segmentation arises, then the situation is as if there is one deceptive and one transparent firm. This implies that the results from Propositions 1 and 2 can be applied. It remains to be shown that the retailer who is not committed to sell only the bundle, say retailer 2, has no incentive to deviate. Retailer 2 can attract naïve consumers by charging $p_2 < p_1$ and offering the add-on at $f_2 = \bar{f}$. The profit function is

$$\pi_2^{DEV}(p_2) = \sigma(p_2 + \bar{f})(1 - p_2) + (1-\sigma)p_2(1-p_2) \tag{A1}$$

$$= p_2(1-p_2) + \sigma\bar{f}(1-p_2). \tag{A2}$$

If such a deviation is profitable, then it is optimal to undercut the rival only slightly, that is, charging (slightly less) $p_2^{\text{DEV}} = \frac{1}{2}(1-\bar{f})$. At this price, the profit amounts to

$$\pi_2^{\text{DEV}} = \frac{1}{4}(1-\bar{f}^2) + \frac{\sigma}{2}(\bar{f} + \bar{f}^2). \tag{A3}$$

The deviation is not profitable if $\pi_2^{\text{DEV}} \leq \tilde{\pi}_2$, which is equivalent to

$$\sigma \leq \frac{\bar{f}^2}{1 + 2\bar{f}(1+\bar{f})} < \bar{f}^2. \tag{A4}$$

This completes the proof. □

Proof of Proposition 5. If retailer D is not committed to serve only naïve consumers, the unique equilibrium of the pricing game takes the following form:

$$p_F = p_D = p_T = 0 \quad \text{and} \quad f_D = \bar{f}.$$

With these prices, all consumers buy from retailer D and profits equal

$$\pi_F = \pi_T = 0 \quad \text{and} \quad \pi_D = \sigma\bar{f}\,.$$

Next, we look for an equilibrium where retailer D serves only naïve consumers. Firms in the competitive fringe must make zero profits, hence $p_F^* = 0$. Therefore, when buying from a firm in the fringe (F), a consumer with type v obtains surplus equal to kv.

Under the presumed market segmentation, a sophisticated consumer will not be served by D. Hence, a sophisticated consumer with valuation v will buy from T (rather than F) if

$$v - p_T \geq kv \Leftrightarrow v \geq \frac{p_T}{1-k}.$$

From the inequality above we immediately obtain the demand function of retailer T. Hence, retailer T solves the following problem:

$$\max_{p_T} \left[1 - \frac{p_T}{1-k}\right] p_T(1-\sigma).$$

Taking the first-order condition and rearranging yields

$$p_T^* = \frac{1-k}{2}.$$

Retailer D, on the other hand, targets only naïve consumers. A naïve consumer with valuation v will buy from D rather than F if

$$v - p_D \geq kv \Leftrightarrow v \geq \frac{p_D}{1-k}.$$

Hence, firm D solves the following problem:

$$\max_{p_D} \left[1 - \frac{p_D}{1-k}\right](p_D + \bar{f})\sigma.$$

Taking the first-order condition and rearranging yields

$$p_D^* = \frac{(1-\bar{f}) - k}{2}.$$

The prices p_F^*, p_D^*, and p_T^* constitute a Nash equilibrium of the pricing game only if no retailer has an incentive to deviate. Firms in the fringe cannot deviate because they have to make zero profits. Under the presumption that the manager of retailer D is committed not to serve sophisticated consumers, there is no profitable deviation for him either. Retailer T, on the other hand, is not committed to serve only sophisticated consumers. It could slightly undercut D by offering the base good at price $p_T = p_D^* - \varepsilon$ and serve both types of consumers. For $\varepsilon \to 0$, retailer T's profit from this deviation is

$$\pi_T^{\text{DEV}} = \left[1 - \frac{1-k-\bar{f}}{2(1-k)}\right]\frac{1-k-\bar{f}}{2} = \frac{(1-k)^2 - \bar{f}^2}{4(1-k)}.$$

The deviation is not profitable if

$$\frac{1-\sigma}{1-k}\left(\frac{1-k}{2}\right)^2 \geq \frac{(1-k)^2-\bar{f}^2}{4(1-k)} \Leftrightarrow \bar{f}^2 \geq \sigma(1-k)^2.$$

Hence, prices p_F^*, p_D^*, and p_T^* constitute a Nash equilibrium of the pricing game. □

Proof of Proposition 6. The proof is decomposed into three parts: (a) The chain is not committed to sell the base good only in combination with the add-on good; (b) the chain is committed to sell the base good only in combination with the add-on good; and (c) optimal commitment decision by the chain.

1. Pure profit maximization: Suppose that all four firms are interested in profit maximization so that the deceptive retailers sell the base good without add-on to sophisticated consumers. All consumer types select the retailer based on base-good price and transport cost. Thus, the marginal consumer who is indifferent between deceptive firm D_1 and transparent firm T_1 is the same for naïve and sophisticated consumers. The marginal consumer $\hat{x}$ is characterized by

$$v - t\hat{x} - p_D = v - t\left(\frac{1}{4} - \hat{x}\right) - p_T, \tag{A5}$$

where p_D is the base good price of D_1 and p_T that of T_1. Rearranging yields

$$\hat{x}(p_D, p_T) = \frac{1}{8} + \frac{p_T - p_D}{2t}. \tag{A6}$$

The profit functions of a deceptive and a transparent retailer are

$$\pi_D = (p_D + \sigma f_D)2\left[\frac{1}{8} + \frac{p_T - p_D}{2t}\right] \tag{A7}$$

$$\pi_T = p_T 2\left[\frac{1}{8} + \frac{p_D - p_T}{2t}\right] \tag{A8}$$

Note that the two deceptive retailers are symmetric and the two transparent ones are symmetric. Moreover, a transparent retailer competes against the two deceptive retailers but not against the other transparent one. Similarly, a deceptive retailer competes only against the two transparent ones. From (A7) it follows immediately that $f_D = \bar{f}$. From the two first-order conditions, the next result is readily obtained. □

Lemma 1 (No commitment). *Suppose retailers D_1 and D_2 are not committed to sell only the bundle. Then, if $t \geq 4\sigma\bar{f}$ the Nash equilibrium prices and profits are*

$$\hat{p}_D = \frac{1}{4}t - \frac{2}{3}\sigma\bar{f}, \quad \hat{p}_T = \frac{1}{4}t - \frac{1}{3}\sigma\bar{f}, \quad \hat{f}_D = \bar{f}$$
$$\hat{\pi}_D = \frac{1}{t}\left(\frac{t}{4} + \frac{\sigma\bar{f}}{3}\right)^2, \quad \hat{\pi}_T = \frac{1}{t}\left(\frac{t}{4} - \frac{\sigma\bar{f}}{3}\right)^2.$$

For $t \geq 4\sigma\bar{f}$ we have $\hat{p}_T > 0$. To establish Lemma 1. it remains to be shown that there is no profitable discrete deviation (complete undercutting). A deceptive firm may have an incentive to charge a price (slightly) less than

$$p^{\text{DEV}} = -\frac{1}{3}\sigma\bar{f}. \tag{A9}$$

With such a price none of the (sophisticated) consumers purchases from a transparent firm. The other deceptive firm still charges $\hat{p}_D$. The profit of the deviating deceptive firm is

$$\pi_D^{\mathrm{DEV}}(p) = (p + \sigma\bar{f})2\left[\frac{1}{4} + \frac{\hat{p}_D - p}{2t}\right]. \tag{A10}$$

From the first-order condition, we obtain the following optimal price:

$$p^* = \frac{3}{8}t - \frac{5}{6}\sigma\bar{f}. \tag{A11}$$

Note that $p^* \geq p^{\mathrm{DEV}} \Leftrightarrow t \geq 4\sigma\bar{f}/3$. Thus, the optimal price for such a deviation is p^{DEV} (slightly less). The corresponding profit is

$$\pi_D^{\mathrm{DEV}} = \frac{4\sigma\bar{f}}{3t}\left(\frac{1}{8}t - \frac{1}{6}\sigma\bar{f}\right). \tag{A12}$$

The deviation is not profitable if and only if $\pi_D^{\mathrm{DEV}} \leq \hat{\pi}_D$, which is equivalent to

$$0 \leq t^2 - \frac{16}{3}\sigma\bar{f}\,t + \frac{1}{3}(\sigma\bar{f})^2. \tag{A13}$$

The above inequality holds if $t \geq 4\sigma\bar{f}$.

2. Chain retailers sell only the bundle: The two chain retailers sell only the bundle, while the two transparent ones sell only the base good. If full market segmentation occurs due to this commitment, then the deceptive firms serve all naïve consumers and the transparent firms all sophisticated consumers; that is, competition takes place only between retailers of the same type. It is readily established that in this situation the equilibrium prices are: $\tilde{p}_D = \frac{1}{2}t - \bar{f}$, $\tilde{p}_T = \frac{1}{2}t$, and $\tilde{f}_D = \bar{f}$. For these prices sophisticated consumers located close to a deceptive firm prefer to purchase from the deceptive firm at price $\tilde{p}_D + f_D$ (base good plus add-on) instead of purchasing from a transparent retailer at price p_T. Hence, complete segmentation cannot arise in equilibrium. In equilibrium, some of the sophisticated consumers must purchase from a deceptive firm.

There is a naïve marginal consumer $\hat{x}^N$, who is indifferent between D_1 and D_2, given by

$$\hat{x}^N(p_D, \tilde{p}_D) = \frac{1}{4} + \frac{\tilde{p}_D - p_D}{2t}, \tag{A14}$$

where p_D is the base good price of D_1 and $\tilde{p}_D$ the base good price of D_2 (the equilibrium price). Moreover, there is a sophisticated marginal consumer $\hat{x}^S$ who is indifferent between D_1 and T_1:

$$\hat{x}^S(p_D + f_D, p_T) = \frac{1}{8} + \frac{p_T - p_D - f_D}{2t}, \tag{A15}$$

where $p_D + f_D$ is the bundle price of D_1 and p_T is the base good price of T_1.

Let the bundle price be $\check{p} := p_D + f_D$ so that $p_D = \check{p} - f_D$. The profit functions are:

$$\pi_D(\check{p}, f_D) = 2\sigma\check{p}\left[\frac{1}{4} + \frac{\tilde{p}_D - \check{p} + f_D}{2t}\right] + 2(1-\sigma)\check{p}\left[\frac{1}{8} + \frac{p_T - \check{p}}{2t}\right], \tag{A16}$$

$$\pi_T(p_T) = (1-\sigma)2p_T\left[\frac{1}{8} + \frac{\check{p} - p_T}{2t}\right]. \tag{A17}$$

First note that $f_D = \bar{f}$ is always optimal. Solving the system of equations yields

$$\check{p} = \frac{3+\sigma}{4(3-\sigma)}\, t. \tag{A18}$$

Lemma 2 (Commitment). *Suppose retailers D_1 and D_2 are committed to sell only the bundle. Then, if $\sigma \le 3/8$ and*

$$\frac{4(3-\sigma)}{3} \ge \frac{t}{\bar{f}} \ge \frac{4\sigma(3-\sigma)}{9(1-\sigma)+2\sigma^2}$$

the Nash equilibrium prices and profits are

$$\tilde{p}_D = \frac{3+\sigma}{4(3-\sigma)}t - \bar{f}, \quad \tilde{p}_T = \frac{3}{4(3-\sigma)}t, \quad \tilde{f}_D = \bar{f}$$
$$\tilde{\pi}_D = \frac{t}{16}\left(\frac{3+\sigma}{3-\sigma}\right)^2, \qquad \tilde{\pi}_T = (1-\sigma)t\left(\frac{3}{4(3-\sigma)}\right)^2.$$

To establish the above result we need to show that (a) all naïve consumers purchase from a deceptive firm, (b) a transparent firm has no incentives to attract naïve consumers.

All naïve consumers purchase from a deceptive firm iff

$$v - t\frac{1}{4} - \tilde{p}_D \ge v - \tilde{p}_T. \tag{A19}$$

Even a naïve consumer located at the position of a transparent firm prefers to buy from a deceptive one. The above condition is equivalent to

$$t \le \frac{4\bar{f}(3-\sigma)}{3}. \tag{A20}$$

Second, we have to rule out that a profitable deviation for a transparent firm exists (the profit function can have two peaks). A transparent firm can attract, next to sophisticated consumers, also naïve consumers with a sufficiently low base good price $p_T < t/4 + \tilde{p}_D$. First, suppose p_T is not so low that all sophisticates purchase from a transparent firm; that is, $p_T > \tilde{p}_D + \bar{f} - t/4$. The profit function is

$$\pi_T(p_T) = 2\sigma p_T\left[\frac{1}{8} + \frac{\tilde{p}_D - p_T}{2t}\right] + 2(1-\sigma)p_T\left[\frac{1}{8} + \frac{\tilde{p}_D + \bar{f} - p_T}{2t}\right]. \tag{A21}$$

Thus,

$$\frac{d\pi_T}{dp_T} = 2\left[\frac{1}{8} + \frac{\tilde{p}_D - p_T}{2t} - \frac{p_T}{2t}\right] + 2(1-\sigma)\left[\frac{1}{8} + \frac{\tilde{p}_D + \bar{f} - p_T}{2t} - \frac{p_T}{2t}\right]. \tag{A22}$$

A sufficient condition so that this deviation is unprofitable is

$$\left.\frac{d\pi_T}{dp_T}\right|_{p_T = t/4 + \tilde{p}_D} \ge 0, \tag{A23}$$

which is equivalent to

$$t \leq \bar{f}\ \frac{3(3-\sigma)(2-\sigma)}{2}. \tag{A24}$$

The above condition is less restrictive than $t \leq 4\bar{f}(3-\sigma)/3$.

Nonlocal deviation: There can exist profitable nonlocal deviations, that is, a firm exploits that demand may jump discontinuously.

First, by charging a base good price a transparent firm completely undercuts the deceptive ones so that all sophisticated consumers purchase from a transparent firm. The critical deviation price is

$$p^{\mathrm{DEV}} = \frac{2\sigma}{4(3-\sigma)}\ t. \tag{A25}$$

The profit of the deviating transparent firm when charging $p < p^{\mathrm{DEV}}$ is

$$\pi_T^{\mathrm{DEV}}(p) = 2\sigma p\left[\frac{1}{8} + \frac{\tilde{p}_D - p}{2t}\right] + 2(1-\sigma)p\left[\frac{1}{4} + \frac{\tilde{p}_T - p}{2t}\right]. \tag{A26}$$

From the first-order condition we obtain the optimal deviation price

$$p^* = \frac{9 - 5\sigma + 2\sigma^2}{8(3-\sigma)}t - \frac{1}{2}\sigma\bar{f}. \tag{A27}$$

Note that $p^* \geq p^{\mathrm{DEV}}$ if and only if

$$t \geq \frac{4(3-\sigma)}{9(1-\sigma) + 2\sigma^2}\sigma\bar{f}. \tag{A28}$$

If (A28) holds, the highest profit from such a deviation is

$$\pi_T^{\mathrm{DEV}} = \frac{t\sigma}{8(3-\sigma)^2}[9 - 7\sigma + 2\sigma^2] - \frac{\sigma^2\bar{f}}{2(3-\sigma)}. \tag{A29}$$

The deviation is not profitable if and only if $\pi_T^{\mathrm{DEV}} \leq \tilde{\pi}_T$, which is equivalent to

$$\frac{1}{16(3-\sigma)^2}[-9 + 27\sigma - 14\sigma^2 + 2\sigma^3] \leq \frac{\sigma^2\bar{f}}{2(3-\sigma)t}. \tag{A30}$$

The above condition is always satisfied if $-9 + 27\sigma - 14\sigma^2 + 2\sigma^3 \leq 0$, which holds for

$$\sigma \in \left[0,\ 2 - \frac{\sqrt{10}}{2}\right]. \tag{A31}$$

Note that $2 - \frac{\sqrt{10}}{2} \approx 0.4188$.

Second, a transparent firm may charge an extremely low base-good price so that even naïve consumers prefer to purchase from a transparent and not from a deceptive retailer. The deviating transparent firm charges $p_T < \tilde{p}_D - t/4 =: p^{\mathrm{DEV}}$. The other transparent firm charges $\tilde{p}_T = 3t/[4(3-\sigma)]$. The profit function of the deviating transparent retailer is

$$\pi_T^{\mathrm{DEV}}(p) = 2p\left[\frac{1}{4} + \frac{\tilde{p}_T - p}{2t}\right]. \tag{A32}$$

The partial derivative with respect to p is

$$\frac{d\pi_T^{\mathrm{DEV}}}{dp} = 2\left[\frac{1}{4} + \frac{3}{8(3-\sigma)} - \frac{p}{t}\right]. \tag{A33}$$

Thus,

$$\left.\frac{d\pi_T^{\mathrm{DEV}}}{dp}\right|_{\mathrm{p=p^{DEV}}} = 2\left[\frac{9-6\sigma}{8(3-\sigma)} - \frac{\bar{f}}{t}\right] > 0. \tag{A34}$$

This implies that if such a deviation is profitable, the optimal price is $p = p^{\mathrm{DEV}}$. The corresponding profit is

$$\pi_T^{\mathrm{DEV}} = t\left(\frac{\sigma}{2(3-\sigma)} - \frac{\bar{f}}{t}\right)\left(\frac{9-4\sigma}{4(3-\sigma)} + \frac{\bar{f}}{t}\right). \tag{A35}$$

The deviation is unprofitable if $\tilde{\pi}_T \geq \pi_T^{\mathrm{DEV}}$, which is equivalent to

$$(1-\sigma)\left(\frac{3}{4(3-\sigma)}\right)^2 \geq t\left(\frac{\sigma}{2(3-\sigma)} - \frac{\bar{f}}{t}\right)\left(\frac{9-4\sigma}{4(3-\sigma)} + \frac{\bar{f}}{t}\right) \tag{A36}$$

$$\Leftrightarrow \quad \frac{9-27\sigma+8\sigma^2}{16(3-\sigma)^2}\left(\frac{t}{\bar{f}}\right)^2 + \frac{9-6\sigma}{4(3-\sigma)}\left(\frac{t}{\bar{f}}\right) + 1 \geq 0. \tag{A37}$$

The above condition is always satisfied for $9 - 27\sigma + 8\sigma^2 \geq 0$, which holds if

$$\sigma \leq \frac{3}{8} = 0.375.$$

Finally, a deceptive retailer may charge $p < \tilde{p}_T - t/4 - \bar{f} =: p_D^{\mathrm{DEV}}$, so that next to all naïve consumers also all sophisticated consumers prefer to purchase from a deceptive retailer. The other deceptive firm charges $\tilde{p}_D$. Note that

$$p_D^{\mathrm{DEV}} = \frac{\sigma}{4(3-\sigma)}t - \bar{f}. \tag{A38}$$

The profit function of the deviating deceptive retailer is

$$\pi_D^{\mathrm{DEV}}(p) = (p+\bar{f})2\left[\frac{1}{4} + \frac{\tilde{p}_D - p}{2t}\right]. \tag{A39}$$

Taking the partial derivative with respect to p yields

$$\frac{d\pi_D^{\mathrm{DEV}}}{dp} = 2\left(\frac{1}{4} + \frac{3+\sigma}{8(3-\sigma)} - \frac{\bar{f}}{2t} - \frac{p}{t}\right). \tag{A40}$$

Thus,

$$\left.\frac{d\pi_D^{\mathrm{DEV}}}{dp}\right|_{p=p_D^{\mathrm{DEV}}} = \frac{3(2-\sigma)}{4(3-\sigma)} + \frac{\bar{f}}{t} > 0. \tag{A41}$$

Hence, if such a deviation is profitable, the profit is maximized at $p = p_D^{\mathrm{DEV}}$. This profit amounts to

$$\pi_D^{\mathrm{DEV}} = t\,\frac{2\sigma}{4(3-\sigma)}\left[\frac{1}{4} + \frac{\frac{3+\sigma}{4(3-\sigma)}t - \frac{\sigma}{4(3-\sigma)}t}{2t}\right] \tag{A42}$$

$$= t\,\frac{\sigma(9-2\sigma)}{16(3-\sigma)^2}. \tag{A43}$$

The deviation is unprofitable if $\tilde{\pi}_D \geq \pi_D^{\mathrm{DEV}}$:

$$\frac{t}{16}\left(\frac{3+\sigma}{3-\sigma}\right)^2 \geq \frac{\sigma(9-2\sigma)}{16(3-\sigma)^2} \tag{A44}$$

$$\Leftrightarrow\ 9 - 3\sigma + 3\sigma^2 \geq 0, \tag{A45}$$

which holds for all $\sigma \in [0, 1]$.

3. Chains optimal strategy and existence: The chain prefers to commit to sell only the bundle if the resulting profit from committing is higher than the profit without commitment, that is, if $\tilde{\pi}_D \geq \hat{\pi}_D$. This is the case if and only if

$$t \geq \frac{2\bar{f}}{3(3-\sigma)}. \tag{A46}$$

Existence: Sufficient conditions for the existence of an equilibrium with commitment is that $\sigma \leq 3/8$ and that the following four inequalities are all jointly satisfied:

$$t \geq 4\sigma\bar{f}\,, \tag{A47}$$

$$t \geq \frac{(3-\sigma)4\sigma\bar{f}}{9(1-\sigma)+2\sigma^2}, \tag{A48}$$

$$t \leq \frac{4\bar{f}\,(3-\sigma)}{3}, \tag{A49}$$

$$t \geq \frac{2\bar{f}}{3(3-\sigma)}. \tag{A50}$$

It is straightforward to show that (A47) is stricter than (A48). Moreover

$$\max\left\{\frac{2}{3(3-\sigma)},\ 4\sigma\right\} = 4\sigma \tag{A51}$$

if and only if $\sigma \geq \frac{3}{2} - \sqrt{\frac{25}{12}} \approx 0.057$. This establishes the result from the proposition.