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Abstract

Some sellers display high "regular" prices, but mark down these prices the vast majority of the time, advertising the good as "on sale" or "discounted". This note suggests a framework for understanding the practice, emphasizing the role of buyer uncertainty about their future valuations for the good. We argue that so-called "regular" prices set buyers' expectations regarding future prices, expectations that need not be tethered to the prices actually set. By manipulating upwards buyers' expectations of future prices, the seller can increase demand for the good at the current "sale" price, increasing profits.

JEL classification: D82, L12

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1 Introduction

A number of large retailers follow what is often labeled a deceptive practice. They advertise goods as being "on sale" or sold at "marked down prices", while referencing also a "regular" price at which the good is purportedly usually sold. But the regular price is a ruse, since the good is rarely, if ever, sold at this price. These advertised discounts are sometimes referred to as "fake sales".

One apparent goal of this sales tactic is to influence buyers' beliefs about future prices. As Patrick Camasta claimed in his suit against Jos. A. Bank Clothiers, Inc., "this sales technique encourages a sense of urgency and makes customers feel "pressure" to make purchases before an expected deadline" (*Camasta v. Jos. A. Bank Clothiers, Inc*; No. 13-2831, 7th Cir. 2014). This might be expected to raise current period demand among customers who naively believe the implicit claim regarding future prices, in turn raising profits.

This note proposes a framework for understanding the above rationale for false claims about regular prices. We introduce the study of dynamic pricing models in which the seller, in addition to setting prices, makes pure cheap-talk claims about the regular price for the good. Absent regulation or other policy interventions, buyers understand the regular price claim as a genuine attempt to convey pricing policy. A buyer who arrives to the market and learns only the advertised regular price and current discounted offer then believes future prices will most likely return to the regular level.

We focus for simplicity on a seller who is a monopolist. The decision faced by a buyer who arrives to the market and sees the claimed regular price and current purchase price is then whether to buy or delay and possibly do so at a later date. We assume that buyers must take into account uncertainty about their future values for the good (i.e., they expect their tastes to change). Such uncertainty potentially creates an option value for buyers of delaying purchase to see whether and how values change.

We show how the seller often most profitably responds to buyers' motive for delay with precisely the sales tactic described above. The seller sets a high regular price, which buyers perceive as an implicit promise to choose the price in future, but then renegs on the promise at future dates. The role of the high advertised regular price, then, is to deter buyers from delaying purchase.

1.1 Literature Review

Our theory of misleading regular prices can be contrasted with what is perhaps the predominant view in the marketing literature. In this view, the role of claims about so-called regular prices lies chiefly in influencing buyers' perceptions about the worth of the good (see, for instance, Grewal, Monroe and Krishnan, 1998, and Grewal and Compeau, 1992). One channel for such influence may be consumers' inferences about the quality of the good (see, e.g., Grewal and Compeau), while another relates simply to consumers' enjoyable sensation that they are getting a good deal.

Related, Armstrong and Chen (2019) provide formal economic models to illustrate how consumers may make judgments about the quality of the good based on a seller's claims about *past* prices. For instance, high past prices may indicate that a clearance sale in the present period does not result from low demand for the good in the past (such low demand would suggest that earlier consumers thought the good had low quality). In one version of the model, Armstrong and Chen permit the seller to misrepresent past prices, so consumers are deceived in equilibrium. Note that while claims regarding past prices seem closely related to claims regarding "regular" prices (indeed regular price claims might well be interpreted by consumers as claims about the price that prevailed earlier), our theory views regular prices as conveying information about prices the seller will charge in the future. In this sense, our theory is forward-looking rather than backward-looking. In particular, our theory focuses on consumers' decisions whether to delay purchases, whereas in Armstrong and Chen's model, consumers have only one opportunity to purchase (the period in which they are "born").

This paper connects two apparently disparate literatures: one on false advertising and other deceptive practices, and another on dynamic pricing. The dynamic pricing literature can be broadly divided into two strands. While one strand assumes that the seller fully commits to future prices (recent contributions include Board and Skrzypacz, 2016, and Gershkov, Moldovanu and Strack, 2017), the other assumes such commitments are impossible (see, e.g., Conlisk, Gerstner and Sobel, 1984, and Sobel, 1991). In contrast, we study here a seller who claims to commit to a future pricing policy but (absent regulation) is not bound to honor these claims. As discussed above, we adopt the same perspective as a number of papers in the dynamic pricing literature, that consumers' values change randomly over time. Examples include Conlisk (1984), Biehl (2001), Deb (2014) and Garrett (2016). As observed in these papers, commitments to high future prices can be particularly valuable for a seller when consumers' values are expected to change, since such commitments limit the (perceived) option value of delaying and purchasing at a later date. Such commitments are also valuable in our framework; the key difference in our framework is that consumers can be misled about future prices.

Several papers on misleading advertising focus on claims about product quality. For instance, Glaeser and Ujhelyi (2010) and Hattori and Higashida (2012) study sellers with the ability to deceive through false claims about products that consumers naively believe. Piccolo et al. (2015) and Rhodes and Wilson (2018) instead study consumers who make rational inferences based on possibly false claims about quality. Like our paper, Piccolo et al. emphasize that false claims can induce firms to charge lower prices, which can leave consumers better off. This finding is a consequence of competition among firms (false claims can lead otherwise differentiated firms to appear similar to consumers, leading to lower equilibrium prices), whereas the effect identified in this paper is present also for a monopolist seller.

2 Model

Primitive environment. The economy is populated by mass one of buyers, each with unit demand for a durable good, and a single seller with no production costs or capacity constraints. The seller may sell its goods at either date 1 or date 2. Mass $\rho \in (0,1)$ of buyers arrive to the market at date 1, while mass $1-\rho$ arrive at date 2. Buyers who arrive at date 1 are able to purchase the good at either date and are forward-looking in that they anticipate the opportunity to purchase at date 2. All players discount time according to the common discount factor $\delta \in (0,1)$.

For each cohort of buyers (date-1 or date-2 arrivals), a fraction $\beta \in (0,1)$ initially has high values (θ_H), while a fraction $1-\beta$ has low values (θ_L), where $\theta_H > \theta_L > 0$. If a buyer arrives at date 1 with a low value, then his value becomes high at date 2 with probability α_L. If the buyer's value is instead initially high, it remains high at date 2 with probability α_H. We assume that $\alpha_H \geq \alpha_L$, so a buyer with a high value at date 1 is more likely to have a high value at date 2.

Discussion of the primitive environment. While θ_L and θ_H refer to the buyer's payoff from acquiring a unit on a given date, note that these values could be understood as representing the expected discounted flow value of purchasing the good and using it from then on, given that the flow values from usage continue to evolve randomly with time (see Garrett, 2016, for further discussion). Under this view, a buyer's value for acquiring the good is θ_L if his flow value is presently low, but this acquisition value must be calculated accounting for possible future shocks to the flow value (i.e., that the flow value may later become "high"). Note that, in this case, acquisition values depend on a buyer's "state" (whether his flow value is high or low) but not on the date of acquisition. A natural interpretation is that the selling season is limited to two periods, but the buyer can continue to enjoy the good afterwards, with the depreciation profile of the good the same irrespective of whether the buyer purchases at date 1 or date 2.

Our primitive environment is similar to Biehl's (2001), but departs in two ways. The first difference is that we permit buyers who arrive to the market in the second period. This will mean, in particular, that even if the seller sells to all buyers who arrive in the first period it still faces positive demand in the second. This provides a rationale for lowering prices in the second period. The other difference is the aforementioned assumption that a buyer's acquisition value depends on his state but not the acquisition date, consistent with a view that the buyer continues to use the good after date 2 as discussed above. In contrast, Biehl understands buyers as ceasing to use the good after date 2, which means that acquisition values are systematically lower at date 2 (a buyer acquiring the good at date 2 can use it for a single period only).

Pricing and incentives. The firm chooses at date 1 a sequence of prices $(p_1, p_2) \in \mathbb{R}_+^2$. In addition, it also sets a "regular price" $p_2^r \in \mathbb{R}_+$ whose only role will be to influence the date-2 price expectations of consumers in the market at date 1. We assume that consumers are perfectly deceived in the sense that date-1 consumers believe that the date-2 price will be exactly p_2^r. This implies date-1 purchases depend only on the initial price p_1 and the promised "regular price" p_2^r, but not on

the actual date-2 price p_2. In particular, a customer with value θ_k, $k \in \{L, H\}$, at date 1 is assumed to purchase if and only if

$$\theta_k - p_1 \geq \delta \left(\alpha_k \max \{\theta_H - p_2^r, 0\} + (1 - \alpha_k) \max \{\theta_L - p_2^r, 0\} \right).$$

Date-2 purchases depend only on the date-2 price p_2, since consumers understand the good will never be offered for sale in the future. Buyers (who have not already purchased) simply purchase at date 2 if their value at that date, θ_k for $k \in \{L, H\}$, is no less than p_2. Given this purchasing behavior, the seller maximizes discounted profits. Note that, since date-1 purchases do not depend on p_2, an equilibrium choice of p_2 by the seller must be sequentially optimal.

In the context of the various pricing policies $(p_1, p_2, p_2^r) \in \mathbb{R}^3_+$, it is now possible to give expression to notions of a "sale" and a "fake sale" as follows.

Definition 1 *[Genuine sale] We say there is a "genuine sale" at date 1 if $p_1 < p_2^r$ and $p_2 \geq p_2^r$. I.e., the seller announces that the date-1 price is lower than the future (or "regular" price) and the date-2 price set by the seller meets or exceeds the announcement.*

Definition 2 *[Fake sale] We say that there is a "fake sale" at date 1 if $p_1 < p_2^r$ and $p_2 < p_2^r$. I.e., the seller announces that the date-1 price is lower than the future (or "regular" price) and the date-2 price set by the seller is strictly less than the announcement.*

It is worth pointing out that the set of feasible pricing policies $(p_1, p_2, p_2^r) \in \mathbb{R}^3_+$ permit a broader range of deceptions than "fake sales" alone. For instance, the seller might set a reference price equal to the date-1 price, amounting to a claim that prices will not change, but nonetheless reduce prices at date 2 (setting $p_2 < p_2^r = p_1$). Our focus on "fake sales" simply reflects that this seems the practice to have received more attention from policy makers and consumer rights groups.

3 Analysis

The optimal pricing policy (p_1, p_2, p_2^r) in our benchmark setting can be described by the following result.

Proposition 1 *Setting $p_2^r = \theta_H$ is always optimal. One of the following pricing policies is optimal:*

1. *Sell to high-value consumers only in each period, setting $(p_1, p_2) = (\theta_H, \theta_H)$, or*
2. *Sell to high-value consumers in the first period and all remaining consumers in the second, setting $(p_1, p_2) = (\theta_H, \theta_L)$, or*
3. *Sell to all consumers present in the market in both periods, setting $(p_1, p_2) = (\theta_L, \theta_L)$.*

There exist values $\underline{m}$, $\bar{m} \in (0,1)$, $\underline{m} < \bar{m}$, such that: if $\frac{\theta_L}{\theta_H} \leq \underline{m}$, then the first policy is optimal; if $\frac{\theta_L}{\theta_H} \in [\underline{m}, \bar{m}]$, then the second policy is optimal; and if $\frac{\theta_L}{\theta_H} \geq \bar{m}$, then the third policy is optimal. Selling to all consumers in the first period and high-value consumers in the second is never optimal.

Proof. The prices in policies 1-3 represent the highest prices attainable while selling to the specified groups of consumers. The corresponding profits are

$$\rho\beta\theta_H + \delta\theta_H\left(\beta\left(1-\rho\right) + \rho\alpha_L\left(1-\beta\right)\right)$$

for the first policy,

$$\rho\beta\theta_H + \delta\theta_L\left(1-\rho+\rho\left(1-\beta\right)\right)$$

for the second policy, and

$$\rho\theta_L + \delta\theta_L\left(1-\rho\right)$$

for the third policy. The optimal prices for a policy of selling to low-value consumers at date 1 and high-value consumers at date 2 are $(p_1, p_2) = (\theta_L, \theta_H)$, and the corresponding profits are $\rho\theta_L + \delta\beta\theta_H\left(1-\rho\right)$. A comparison of these profit levels yields the result. ■

The result can be understood as follows. As one should expect, the seller sets the claimed "regular" price as high as needed for the option value of delayed purchase to a date-1 arrival to equal zero. For this it is enough that p_2^r be no lower than θ_H. Since buyers believe the option value of waiting to purchase is zero, they are willing to purchase at date 1 provided their date-1 value exceeds the date-1 price p_1. Given this, it is easy to calculate prices that maximize profits subject to inducing purchase by the different groups of consumers (i.e., low- and high-valuers) at each date.

The optimal policy can then be derived by a simple comparison of profits and depends on the ratio $\frac{\theta_L}{\theta_H}$. The reason why it is never optimal to sell to all consumers in the first period but then only high-value consumers in the second is as follows. By selling to all consumers at date 1, the seller obtains profits from date-1 arrivals equal to $\rho\theta_L$. By selling instead only to high-value buyers at date 1, the seller obtains profits strictly greater than $\rho\beta\theta_H$, since it makes sales both to high-value consumers at date 1 and to at least some of the remaining date-1 arrivals subsequently (under optimal prices, at least the high-value consumers buy at date 2). Hence, if it were optimal to sell to all consumers at date 1, we must have $\theta_L > \beta\theta_H$, so it is optimal to sell to low-value consumers at date 2. This part of the result is hence a consequence of our assumption that a fraction β of new arrivals in each period have high values.

Case 3 of Proposition 1 is the case where the seller employs "fake sales". Indeed, it targets

low-value consumers in both periods provided that

$$\frac{\theta_L}{\theta_H} > \bar{m} \equiv \frac{\beta}{1-\delta+\beta\delta}. \tag{1}$$

In this case, the seller sets true prices equal to θ_L in each period, while the claimed regular price is $p_2^r = \theta_H$.

The seller uses a different deceptive practice for other parameter values. In particular, when the second policy in Proposition 1 is optimal, the seller sets a price θ_H at date 1 and claims that the price will remain the same at date 2. However, it chooses to reneg on this promise by setting $p_2 = \theta_L$. This policy corresponds to the one mentioned above, where a retailer leads its customers to believe that it does not discount its goods, but does so anyway.

4 Discussion and future directions

Role of buyer uncertainty (changing values). Let us consider why we permitted buyer values to change randomly over time in our theory. First, as discussed recently by Garrett (2016), changes in consumer values are realistic and to be expected for a wide range of goods. To give an example, the value a customer attaches to the cookware set of Figure 1 might evolve randomly, according to changes in the amount of time he spends on home cooking. More generally, a customer's enjoyment from purchasing a new item could fluctuate simply according to the customer's mood or other buying conditions, an idea that is often invoked in the literature on dynamic demand estimation (e.g., Gowrisankaran and Rysman, 2012). In other words, it may turn out that the buyer would be better off purchasing the good later simply because he "feels like it" or because he finds it easier to take the good home on that day (perhaps because it is not raining).

Second, the possibility that values change heightens the option value of delaying purchase for the marginal consumer, i.e. the consumer who is indifferent about buying in the present period. In fact, the possibility that values change will be essential for the profitability of deceiving the buyer by promising a higher future price. If consumers do not anticipate that their values might change, then the marginal consumer does not expect to benefit by waiting provided the anticipated future price is no lower than the current one. In this case, the marginal consumer is the one whose current value is the same as the current price, and this customer expects a payoff zero whether purchasing immediately or waiting. In this context, promising the customer that the future price will be higher, *rather than the same*, as compared to the present one does not affect his decision to purchase. Hence, displaying the good as "on sale" together with a misleading "regular" price does not raise profits relative to, say, a policy of promising the customer that the same price will prevail at future dates.

One caveat to the importance of changing values is that the above argument applies to a *monopolist* seller. Things may be different in a competitive environment if the marginal customer enjoys a positive surplus, perhaps because he has a positive option value of leaving the store and searching

elsewhere before returning at a later date. While the profitability of deceptive regular prices could be obtained in a setting with competition among sellers and customer values that are constant over time, our framework shows that competition is not essential. It also appears to offer the simplest possible framework for fake sales to arise as optimal, avoiding the difficulties of modeling dynamic price competition.

Empirical tests. Our key departure from the established theory of dynamic pricing is to posit that advertised "regular" prices influence consumers' beliefs over future prices. There are at least two avenues for testing this assumption. Most directly, consumers could be asked about these expectations for different claims regarding the "regular" price. This has been done, at least experimentally, in the marketing literature (see, e.g., Kan et al., 2014, for a recent review). For instance, Lichtenstein and Bearden (1989) presented subjects with different price advertisements by a furniture store for a particular model of desk, together with claims such as "Was $699, Now Only $299". Among other things, subjects were asked to infer the normal selling price for the desk at that retailer when not on promotion. Varying the reference price across subjects, reference prices were found to raise subjects' price beliefs.

It is worth pointing out that the marketing literature often finds that consumers do not take "regular" price claims at face value, but that regular prices influence price expectations nonetheless. Note that, in our theory, consumers need not be fully convinced of the regular price claim for it to be profitable; influencing beliefs about future prices upwards is enough.

An alternative empirical approach would be to find plausibly exogenous variation in advertised reference prices (perhaps due to unexpected litigation affecting firms' abilities to make reference price claims) and examine the demand response. This approach seems more challenging (and remains unstudied in the economics literature on dynamic demand estimation; see Gowrisankaran and Rysman, 2012, among others). Indeed, it would seem to require data on prices, reference prices, and quantities in market settings.

Regulatory interventions. Our framework can be used to investigate how the implications of "fake sales" are affected by regulatory policy. Such policy might take one of at least two forms. The first is to prohibit the practice directly, by enforcing a ban on advertisements of regular prices that are not consistent with the actual prices charged. If the regulator is enforcing such a ban, deceiving customers through false regular price claims is no longer feasible. Assuming regulatory policy is common knowledge, regular prices become a credible commitment to high future prices. That is, consumers not only believe that the regular price will be charged in future, but are also correct in their belief. Although the enforced ban prevents (or at least mitigates) deception, perhaps a desirable policy objective in its own right, it is easy to show that it can reduce both total welfare and ex-ante consumer surplus. Intuitively, the ban on "fake sales" makes it less profitable for the seller to target low-value consumers, which can lead to higher prices.

A second possible regulatory policy, with distinct implications for equilibrium pricing, is a form of "unshrouding" (see for instance Ellison, 2005, and Gabaix and Laibson, 2006, for study of equilibrium

unshrouding in competitive markets). In particular, a regulator (or a consumer rights group) might engage in an information campaign to educate consumers about the deceptive practice. Informed consumers would presumably pay little or no attention to regular prices that they understand the seller has no intention to honor, and would rely instead on their own inferences of future prices. Again, the seller might optimally respond to such an information policy by targeting low-value consumers less often, which could reduce both welfare and consumer surplus.

Dynamics and longer horizons. For simplicity, we have considered a setting with two periods — any fake sale occurs in the first period and the possibility that the seller renegs pertains to the second. A more ambitious model would both permit multiple periods and some buyer uncertainty (in terms of buyers' subjective beliefs) regarding in which periods and how often the claimed regular price will be charged. In such a more realistic setting, the modeler would need to take a precise view regarding the meaning of the word "regular". For instance, it would be necessary to determine how often a buyer expects a seller to set the regular price (e.g., a buyer may believe the seller cannot depart from the regular price more than some fraction or the time or more than once every n periods). We leave such modeling as well as a formal treatment of regulatory policy to future work.

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