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Salience, competition, and decoy goods

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HIGHLIGHTS

- A firm selling to salient thinkers can boost its demand by offering a decoy good.
- The optimal decoy good emphasizes the superior quality of the firm's main product.
- The optimal decoy good renders the price of the competing products salient.

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ABSTRACT

We consider a brand manufacturer who can offer, next to its high-quality product, also a decoy good and faces competition by a competitive fringe that produces low quality. We show that the brand manufacturer optimally provides a decoy good to boost the demand for its main product if consumers' purchasing decisions are distorted by salient thinking. The optimal decoy good is designed such that the superior quality of the brand manufacturer's main product and the unattractive feature of the fringe product are salient.

1. Introduction

There exists a large literature in marketing and psychology that investigates the so-called decoy effect, which was first identified by Huber et al. (1982). The idea is that an extension of the product line may boost the sales of already existing products because "adding a new brand to the choice set can raise the choice likelihood or the attractiveness of one of the existing alternatives" (Huei-Chen and Wen-Liang, 2011 p. 235). This point is nicely illustrated by the following example from Ariely (2008) (see Table 1):

Table 1
Subscription offers by *The Economist*. Source Ariely (2008).

Economist.com offers		Price
Option 1	Web subscription	$59
Option 2	Print subscription	$125
Option 3	Print + web subscription	$125

Why would *The Economist* offer Option 2, that is dominated by Option 3? In an experiment with MBA students, when only Options 1 and 3 were offered, 68% choose Option 1 and only 32% Option 3. When all three options were offered, 84% selected Option 3 and only 16% Option 1. Adding a dominated option to the existing product line can change valuations for previously available options. The preferences of the MBA students thus seem to violate the axiom of independence of irrelevant alternatives.[1]

As is shown by Bordalo et al. (2013), decoy effects can be explained by their theory of salient thinking.[2] However, Bordalo et al. (2013) do not analyze the strategic behavior of firms, i.e., when it is profitable for a firm to offer a decoy good and how it is optimally designed. We build a simple model where a brand manufacturer competes against a competitive fringe for consumers that differ in their marginal willingness to pay for quality. We show that if consumers are salient thinkers, the brand manufacturer,

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[1] See Angner (2012) for a textbook treatment of this example. Further examples are presented by Tversky and Simonson (1993).

[2] Experimental evidence supporting the theory of salient thinking à la Bordalo et al. (2013) is provided by Dertwinkel-Kalt et al. (2016).

who offers a good of superior quality, can always increase its demand by offering an appropriate decoy good, which in equilibrium is not chosen by any consumer. Moreover, the optimal decoy good makes the high quality of the brand product salient and highlights the price – i.e., the unattractive feature – of the competing fringe product.

In a recent working paper, Adrian (2016) analyzes a monopolistic two-type screening model where consumers are salient thinkers. If the monopolist sells only one product – either because it pools both types or excludes the low-type consumers – it can also offer a decoy good. The monopolist always does so in these cases in order to make quality salient in the market. In our model, in contrast, the optimal decoy makes quality salient only for the brand product, but not for all products. Moreover, our brand manufacturer faces competition, whereas the monopolist in Adrian (2016) can directly choose the consumers' full consideration set.[3, 4]

2. The model

We consider a market where a brand manufacturer competes against a competitive fringe. The fringe produces a good of quality $q_f > 0$ at constant marginal cost $c_f > 0$, which is sold at price $p_f = c_f$. The brand manufacturer produces a good of superior quality $q_b > q_f$ at constant marginal cost $c_b > c_f$. The quality of the fringe product is assumed to be not too low in comparison to the brand product's quality, $2q_f > q_b$. The brand manufacturer can introduce an additional good, a so-called decoy good. We assume that introducing this decoy good is costless, whereas its actual production is prohibitively costly. The sole purpose of the decoy good is to distort consumers' preferences, as the brand manufacturer does not want the decoy good to be purchased in equilibrium. If a decoy good is offered, the brand manufacturer is free in the choice of the decoy's quality $q_d \geq 0$ and price p_d.

There is a continuum of consumers of mass one. Each consumer is interested in buying one unit of the good, either the brand's or the fringe's product. Consumers differ in their marginal willingness to pay for quality, which is reflected by the parameter $\theta \in [\underline{\theta}, \bar{\theta}]$, with $0 < \underline{\theta} < \bar{\theta}$. Let $G : [\underline{\theta}, \bar{\theta}] \to [0, 1]$ denote the cumulative distribution function of θ, which is assumed to be continuous. Absent any distortions caused by salience, a consumer of type θ's evaluation of good (q_k, p_k), with $k \in \{f, b, d\}$, is

$$u(q_k, p_k|\theta) = \theta q_k - p_k. \tag{1}$$

We refer to θq_k as the "effective quality" of good k for a consumer of type θ.

We assume that consumers are salient thinkers according to Bordalo et al. (2013). When evaluating a particular good, a salient thinker inflates the weight of the good's salient attribute. Whether the effective quality or the price of a particular good is salient is determined by how that good's value of the respective attribute compares to that attribute's average value in the consumer's choice set $\mathcal{C}$. Formally, let $\bar{q}_\mathcal{C}$ and $\bar{p}_\mathcal{C}$ denote the average quality and the average price in a given choice set $\mathcal{C}$, respectively. When evaluating product (q_k, p_k), a consumer of type θ perceives effective quality to be salient if $\sigma(\theta q_k, \theta \bar{q}_\mathcal{C}) > \sigma(p_k, \bar{p}_\mathcal{C})$ and she perceives price to be salient if $\sigma(\theta q_k, \theta \bar{q}_\mathcal{C}) < \sigma(p_k, \bar{p}_\mathcal{C})$. Following Bordalo et al. (2013, 2016), the salience function σ is assumed to be symmetric and continuous and satisfies two main properties.

Assumption 1 (*Ordering*)**.** For any $x, x', y, y' \in \mathbb{R}_{\geq 0}$ with $[x, y] \subset [x', y']$, it holds that $\sigma(x, y) < \sigma(x', y')$.

Assumption 2 (*Homogeneity of degree zero*)**.** For all $x, y \in \mathbb{R}_{\geq 0}$ and $\alpha > 0$, it holds that $\sigma(\alpha x, \alpha y) = \sigma(x, y)$.

Assumption 2 implies that $\sigma(\theta q_k, \theta \bar{q}_\mathcal{C}) = \sigma(q_k, \bar{q}_\mathcal{C})$ for all $\theta \in [\underline{\theta}, \bar{\theta}]$. In consequence, for a given product (q_k, p_k) in a given choice set $\mathcal{C}$, the same attribute is salient for all consumer types—even though effective quality differs across consumer types. Moreover, according to Proposition 1 in Bordalo et al. (2013), Assumptions 1 and 2 imply that whether all consumer types perceive the quality or the price of a given product (q_k, p_k) in given choice set $\mathcal{C}$ to be salient is completely determined by how that good's quality–price ratio compares to the quality–price ratio of the reference good.[5]

In contrast to a rational consumer, who places equal weight on quality and price when evaluating a product (q_k, p_k) in a choice set $\mathcal{C}$, a salient thinker places higher weight on the salient attribute:

$$u^S(q_k, p_k|\theta, \mathcal{C}) = \begin{cases} \theta q_k - \delta p_k & \text{if} \quad \sigma(q_k, \bar{q}_\mathcal{C}) > \sigma(p_k, \bar{p}_\mathcal{C}) \\ \theta q_k - p_k & \text{if} \quad \sigma(q_k, \bar{q}_\mathcal{C}) = \sigma(p_k, \bar{p}_\mathcal{C}) \\ \delta\theta q_k - p_k & \text{if} \quad \sigma(q_k, \bar{q}_\mathcal{C}) < \sigma(p_k, \bar{p}_\mathcal{C}) \end{cases}.$$

The parameter $\delta \in (0, 1]$ reflects the degree of salient thinking, with lower values of δ representing stronger distortions from the rational benchmark.[6] For $\delta \to 1$, the salient thinker converges to the rational consumer.

Finally, we assume that consumers' tastes are sufficiently dispersed such that in equilibrium both the brand manufacturer and the fringe have a positive market share.

Assumption 3 (*Dispersion in taste*)**.** It holds that:

$$\underline{\theta} < \frac{\delta c_b - c_f}{q_b - \delta q_f} < \bar{\theta}.$$

Assumption 3 implies that $\delta > c_f/c_b$, i.e., that the salience bias is not too strong.

3. The analysis

3.1. Demand for the brand product

First suppose that the brand manufacturer offers only its brand product. The consumers' choice set then is $\mathcal{C} = \{(q_b, p_b), (q_f, c_f)\} =: \tilde{\mathcal{C}}$. Any profit maximizing price must be weakly higher than the brand manufacturer's production costs, such that $p_b \geq c_b > c_f = p_f$. Then, none of the two products is better in both attributes. With only two products in the choice set, by Proposition 1 of Bordalo et al. (2013), the same attribute is salient for both products.

If $q_b/p_b > \bar{q}_{\tilde{\mathcal{C}}}/\bar{p}_{\tilde{\mathcal{C}}}$, quality is salient. A consumer of type θ purchases the high-quality brand product if $\theta q_b - \delta p_b \geq \theta q_f - \delta c_f$, such that the demand for the brand product is given by

$$D^q(p_b) = 1 - G(\hat{\theta}^q(p_b)) \qquad \text{with} \qquad \hat{\theta}^q(p_b) := \delta \frac{p_b - c_f}{q_b - q_f}. \tag{2}$$

If $q_b/p_b < \bar{q}_{\tilde{\mathcal{C}}}/\bar{p}_{\tilde{\mathcal{C}}}$, price is salient. A consumer of type θ purchases the brand product if $\delta\theta q_b - p_b \geq \delta\theta q_f - c_f$, such that the demand for the brand product is

$$D^p(p_b) = 1 - G(\hat{\theta}^p(p_b)) \qquad \text{with} \qquad \hat{\theta}^p(p_b) := \frac{1}{\delta} \frac{p_b - c_f}{q_b - q_f}. \tag{3}$$

As $\delta < 1$, we have $D^q(p_b) > D^p(p_b)$ for all prices $p_b > c_f$. Therefore, the brand manufacturer strictly prefers a market in which quality rather than price is salient. With only the brand product and the fringe product in the choice set, however, quality is

[3] Regarding applications to industrial organization, Inderst and Obradovits (2015) investigate practices like sales and loss-leader pricing in retail competition when consumers are salient thinkers.

[4] Dertwinkel-Kalt (2016) introduces the model of salient thinking into a health context.

[5] Strictly speaking, this result requires that the considered good (q_k, p_k) neither dominates nor is dominated by the reference good, i.e., $(q_k - \bar{q}_\mathcal{C})(p_k - \bar{p}_\mathcal{C}) > 0$.

[6] In the original formulation of Bordalo et al. (2013), the utility of a salient thinker is slightly different. We use the simpler formulation used by Bordalo et al. (2016).