Salience in Markets

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Abstract: A consumer's evaluation of a product often depends on the choice context. Specifically, the choice context influences which of a product's attributes the consumer perceives as outstanding, i.e., salient. This chapter is devoted to a particular model of context-dependent choice, the model of salient thinking introduced by Bordalo, Gennaioli, and Shleifer (2013b), and its application to models of industrial organization. We first restate the model's main implications for consumer behavior. Thereafter, we address how a profit-maximizing firm responds to its consumers' choice behavior being context dependent. To this end, we present a streamlined model of market competition when consumers are salient thinkers, which allows us to synthesize several important implications of context-dependent choice for market outcomes that have been discussed in the literature. Furthermore, within this model, we develop novel insights regarding how firms can benefit from manipulating consumers' choice context by offering decoy goods. Finally, we survey the extant applications of the theory of salient thinking to models of industrial organization, discuss the empirical evidence in support of the theory of salient thinking, and outline venues for future research.

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1 Introduction

Neoclassical economic theory assumes that consumers have well-defined and stable preferences over all goods they are potentially interested in. So if a consumer enters a store to purchase a certain good, say a pair of shoes, she knows – probably after an inspection – what each pair of shoes is worth to her. She then selects the pair with the highest net valuation, if this pair's net valuation exceeds her reservation utility. Crucially, the consumer's choice would have been the same if the store had available (i) fewer pairs of shoes, but still her preferred one, or (ii) additional pairs of shoes, which are considered as inferior to the initially selected pair. Moreover, the consumer's valuation for the selected pair is the same at the store and later when she is wearing it. In other words, the consumer's preferences satisfy the axiom of independence of irrelevant alternatives (Sen, 1970) and her decision utility coincides with her experienced utility.

Many consumers, however, do not behave as the perfectly rational agent. Typically, a consumer does not have a clear and stable willingness to pay. In particular, the willingness to pay for certain goods and services often depends on the choice context. For example, on the other goods and services available at the store, the goods or services the consumer purchased previously, etc. This point is nicely illustrated by the following example: According to Ariely (2008), readers of *The Economist* at that time could choose between the following subscriptions:

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

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

Why would *The Economist* offer Option 2, that is obviously dominated by Option 3? As it turns out, there is a good reason for *The Economist* to do so. When only Option 1 and Option 3 were presented to MBA students, 68% choose Option 1 and only 32% choose Option 3. In the treatment where all three options were presented to MBA students, 84% selected Option 3 and only 16% selected Option 1. This example shows that adding a dominated – and thus, according to standard theory, irrelevant – option to the existing mix can change consumers' valuations for previously available options. The preferences of the MBA students thus seem to violate the axiom of independence of irrelevant alternatives.[1]

Next to context-dependent preferences, another anomaly regarding choice behavior is that consumers often seem to think in relative rather than absolute terms. This is illustrated by the following example from Kahneman and Tversky (1984):

> Imagine that you are about to purchase a jacket for \$125 and a calculator for \$15.

[1] Further examples in this vein are presented by Tversky and Simonson (1993).

Scenario (i) The calculator salesman informs you that the calculator you wish to buy is on sale for \$10 at the other branch of the store, located 20 minutes drive away.

Scenario (ii) The jacket salesman informs you that the jacket you wish to buy is on sale for \$120 at the other branch of the store, located 20 minutes drive away.

Would you make a trip to the other store?

A rational consumer asks herself whether it is worth to make a 20 minutes drive in order to save \$5. Thus, under standard consumer theory, there is no difference between Scenario (i) and Scenario (ii). However, experimental subjects are typically more willing to make the trip in order to save \$5 on the calculator than to save \$5 on the jacket. In the original study, 68% of the participants were willing to make the trip in Scenario (i), but only 29% in Scenario (ii). This observation strongly suggests that consumers often think in relative terms: A typical consumer is willing to make the trip if the *relative* saving, which is more than 30% for the calculator, but only 4% for the jacket, makes the hassle of making the 20 minutes drive worthwhile.

Common to both examples is that the different treatments make a different aspect of the choice stand out. In the first example, the apposition of the print-only option might hint to the buyer that a print subscription is highly valuable. Thereby the customer's focus is shifted away from price to quality and she opts for the high-quality print+web subscription. In the second example, in Scenario (ii), the hassle of the 20 minutes drive stands out compared to the extremely low relative saving. In Scenario (i), on the other hand, the relative saving is huge and thus attracts more attention than the hassle of the 20 minutes drive. This explains while many subjects are willing to make the drive in Scenario (i), but not in Scenario (ii).

Quite recently, several economic models have been proposed to capture behavior as displayed by the participants in the aforementioned experiments – i.e., having context dependent preferences, reacting to the salience of particular features, and thinking in relative terms.[2] In this chapter, we present the model of salient thinking proposed by Bordalo, Gennaioli and Shleifer (2013b).[3] After introducing the formal framework of salient thinking in Section 2, we briefly restate the model's main implications for consumer choice behavior in Section 3. In Section 4, we also take the the supply side into account and address how profit-maximizing firms best respond to their consumers being salient thinkers. Specifically, within a streamlined model of market competition, we synthesize several important implications of context-dependent choice for market outcomes that have been discussed in the extant literature. Furthermore, within this model, we develop novel insights regarding

[2] While in sociology and psychology preferences and tastes are traditionally considered as endogenous, in neoclassical economics preferences are exogenous and constant. For early discussions about endogenous preferences in the economics literature see Pollak (1978) or Bowles (1998).

[3] Alternative models are developed, for instance, by Kőszegi and Szeidl (2013) and Bushong, Rabin and Schwarzstein (2015). In Section 7, we briefly discuss how these competing models of context-dependent choice compare to one another. For an extensive discussion, see Bushong, Rabin and Schwarzstein (2015).

how profit-maximizing firms can benefit from manipulating the consumer's choice context by offering decoy goods. After discussing the extant applications of the theory of salient thinking to models of industrial organization in more detail in Section 5, we present experimental evidence that supports the model of salient thinking in Section 6. Section 7 concludes.

2 The Model of Salient Thinking

The model of salient thinking proposed by Bordalo, Gennaioli and Shleifer (2013b) considers a consumer who faces a choice set $\mathcal{C} = \{(q_1, p_1), \ldots, (q_N, p_N)\}$, which encompasses all the goods available to the consumer. Specifically, (q_k, p_k) is a good with quality $q_k \geq 0$ that can be purchased at price $p_k \geq 0$. Without loss of generality, it is assumed that $p_1 < \ldots < p_N$.[4]

The consumer is assumed to evaluate good k according to a linear utility function. Without any distortions caused by salient thinking, equal weight is placed on quality and price, such that a rational consumer assigns utility

$$u(q_k, p_k) = q_k - p_k$$

to good $k = 1, \ldots, N$. When evaluating good k, a salient thinker, on the other hand, inflates the weight of the good's attribute that she perceives to be salient – i.e., to "stand out" – in the choice set relative to the good's other attribute. The degree to which a particular attribute 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 within the choice set. Denote the average value of attribute $a \in \{q, p\}$ in the choice set by $\bar{a} = \frac{\sum_{i=1}^{N} a_i}{N}$. Then the salience of good k's attribute $a_k \in \{q_k, p_k\}$ is determined by the so-called salience function $\sigma(a_k, \bar{a})$, which is symmetric, continuous, and satisfies the properties of ordering and diminishing sensitivity.[5]

Ordering. For any $x, x', y, y' \in \mathbb{R}_{\geq 0}$ with $[x, y] \subset [x', y']$, the following holds:

$$\sigma(x, y) < \sigma(x', y') \tag{1}$$

Diminishing Sensitivity. For any $x, y \in \mathbb{R}_{\geq 0}$, where $x \neq y$, and all $\varepsilon > 0$, the following holds:

$$\sigma(x + \varepsilon, y + \varepsilon) < \sigma(x, y) \tag{2}$$

As discussed in Bordalo, Gennaioli and Shleifer (2012, 2013b), ordering and diminishing sensitivity reflect two key properties of sensory perception. First, ordering leads to salience being increasing in contrast: a particular attribute of a particular

[4] Unless otherwise mentioned, the choice set $\mathcal{C}$ does not include the consumer's outside option of not buying, $(q, p) = (0, 0)$, which corresponds to zero quality at a zero price.

[5] For strictly positive attribute values, two simple salience functions which satisfy these assumptions are $\sigma(x, y) = \left(\frac{x-y}{y}\right)^2$ and $\sigma(x, y) = \frac{|x-y|}{|x|+|y|}$, with $\sigma(0, 0) = 0$.

good is very salient if that good's value of this attribute is very different from the attribute's average value across the goods in the choice set. Ordering thus captures that human perception is attuned to detect changes in stimuli. Second, diminishing sensitivity implies that the salience of a particular attribute of a particular good decreases if that attribute's value uniformly increases for all goods in the choice set. This feature reflects Weber's law, according to which changes in stimuli are perceived with diminishing sensitivity. Before discussing how the interplay of ordering and diminishing sensitivity determines the salience of a good's attributes, we first complete the description of how salient thinking affects the consumer's valuation of the goods in his choice set.

In the choice set $\mathcal{C}$, for good k quality is said to be salient if $\sigma(q_k, \bar{q}) > \sigma(p_k, \bar{p})$, price is said to be salient if $\sigma(q_k, \bar{q}) < \sigma(p_k, \bar{p})$, and quality and price are equally salient if $\sigma(q_k, \bar{q}) = \sigma(p_k, \bar{p})$. While a rational consumer places equal weight on quality and price, a salient thinker places higher weight on the attribute that she perceives to stand out. Formally, a salient thinker evaluates good k according to

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

where $\delta \in (0, 1]$ reflects the degree of salient thinking.[6] If $\delta \to 1$, the salient thinker converges to the rational consumer as the weights attached to quality and price become identical. If $\delta \to 0$, the salient thinker takes into account only the salient attribute and neglects the other.

The interplay of ordering and diminishing sensitivity determines the salience of a good's attributes. For example, suppose that the price of the most pricy good N increases from p_N to $p'_N = p_N + \Delta p$, where $\Delta p > 0$. For the average price in the consumer's choice set this implies an increase from $\bar{p}$ to $\bar{p}' = \bar{p} + \frac{\Delta p}{N}$. Let us try to disentangle how this change in price affects salience via ordering and diminishing sensitivity. If the price of good N and the average price were both to increase only by the amount of $\frac{\Delta p}{N}$, then diminishing sensitivity would imply that the price of good N becomes less salient after this hypothetical uniform price increase because $\sigma(p_N, \bar{p}) > \sigma(p_N + \frac{\Delta p}{N}, \bar{p} + \frac{\Delta p}{N})$. When taking into account that the price of good N increases not by $\frac{\Delta p}{N}$ but by the larger amount Δp, however, ordering implies that good N's price is more salient after the actual price increase than after the hypothetical uniform price increase because $\sigma(p_N + \Delta p, \bar{p} + \frac{\Delta p}{N}) > \sigma(p_N + \frac{\Delta p}{N}, \bar{p} + \frac{\Delta p}{N})$. Which of these countervailing effects dominates, i.e., whether salience of good N's price increases or decreases, is a priori unclear. To resolve the trade-off between

[6] In the original formulation of Bordalo, Gennaioli and Shleifer (2013b), a salient thinker evaluates good k according to

$$u^S(q_k, p_k) = \begin{cases} \frac{2}{1+\delta} q_k - \frac{2\delta}{1+\delta} p_k & \text{if} \quad \sigma(q_k, \bar{q}) > \sigma(p_k, \bar{p}) \\ q_k - p_k & \text{if} \quad \sigma(q_k, \bar{q}) = \sigma(p_k, \bar{p}) \\ \frac{2\delta}{1+\delta} q_k - \frac{2}{1+\delta} p_k & \text{if} \quad \sigma(q_k, \bar{q}) < \sigma(p_k, \bar{p}) \end{cases}.$$

We use the simpler formulation used by Bordalo, Gennaioli and Shleifer (2016).

ordering and diminishing sensitivity, the salience function usually is assumed to be homogeneous of degree zero.

Homogeneity of degree zero: For all $x, y \in \mathbb{R}_{\geq 0}$ and $\alpha > 0$, the following holds:

$$\sigma(\alpha x, \alpha y) = \sigma(x, y) \tag{3}$$

Homogeneity of degree zero resolves the trade-off between ordering and diminishing sensitivity as follows: ordering outweighs diminishing sensitivity – and salience of the attribute under consideration increases – if and only if the change in the attribute under consideration proportionally exceeds the change of that attribute's average in the choice set. In what follows, we will assume that the salience function satisfies ordering and is homogeneous of degree zero, which, in fact, implies diminishing sensitivity for positive attribute levels.[7] The most important implication of this assumption is that whether a good's quality or price is salient is completely determined by how that good's quality-price ratio compares to the quality-price ratio of the reference good.[8]

Observation 1. *Let (q_k, p_k) be a good that neither dominates nor is dominated by the reference good $(\bar{q}, \bar{p})$, i.e., $(q_k - \bar{q})(p_k - \bar{p}) > 0$, and suppose the salience function satisfies ordering and is homogeneous of degree zero. If good k is of superior quality, $q_k > \bar{q}$, its quality [price] is salient if and only if $\frac{q_k}{p_k} > [<] \frac{\bar{q}}{\bar{p}}$. If good k is of inferior quality, $q_k < \bar{q}$, its quality [price] is salient if and only if $\frac{q_k}{p_k} < [>] \frac{\bar{q}}{\bar{p}}$.*

Proof of Observation 1. Given that $(q_k - \bar{q})(p_k - \bar{p}) > 0$, we have to distinguish two possible cases. (i) If $q_k > \bar{q}$ and $p_k > \bar{p}$, then $\frac{q_k}{\bar{q}} > 1$ and $\frac{p_k}{\bar{p}} > 1$. Thus, by homogeneity of degree zero and ordering, $\sigma(q_k, \bar{q}) = \sigma(\frac{q_k}{\bar{q}}, 1) \gtreqless \sigma(\frac{p_k}{\bar{p}}, 1) = \sigma(p_k, \bar{p})$ if and only if $\frac{q_k}{\bar{q}} \gtreqless \frac{p_k}{\bar{p}}$ or, equivalently, $\frac{q_k}{p_k} \gtreqless \frac{\bar{q}}{\bar{p}}$. (ii) If $q_k < \bar{q}$ and $p_k < \bar{p}$, then $\frac{q_k}{\bar{q}} < 1$ and $\frac{p_k}{\bar{p}} < 1$. Thus, by homogeneity of degree zero and ordering, $\sigma(p_k, \bar{p}) = \sigma(\frac{p_k}{\bar{p}}, 1) \gtreqless \sigma(\frac{q_k}{\bar{q}}, 1) = \sigma(q_k, \bar{q})$ if and only if $\frac{p_k}{\bar{p}} \lesseqgtr \frac{q_k}{\bar{q}}$ or, equivalently, $\frac{q_k}{p_k} \gtreqless \frac{\bar{q}}{\bar{p}}$. □

3 Implications for Consumer Behavior

To illustrate how salient thinking creates scope for choice being distorted from the rational benchmark, we focus on the simple case of a binary choice set. Formally, let $\mathcal{C} = \{(q_l, p_l), (q_h, p_h)\}$ with $0 < q_l < q_h$ and $0 < p_l < p_h$. Thus, good h is a relatively expensive high-quality good, whereas good l is a relatively cheap low-quality good. It is readily verified that $\frac{q_h}{p_h} \gtreqless \frac{\bar{q}}{\bar{p}}$ if and only if $\frac{q_l}{p_l} \lesseqgtr \frac{\bar{q}}{\bar{p}}$. Thus, it cannot be the case that price is salient for the one good and quality is salient for the other good. In case of a binary choice set, the same attribute is salient for both good h and good l.

[7] Homogeneity of degree zero implies $\sigma(a_k, \bar{a}) = \sigma(\frac{a_k}{\bar{a}}, 1)$ and $\sigma(a_k + \varepsilon, \bar{a} + \varepsilon) = \sigma(\frac{a_k + \varepsilon}{\bar{a} + \varepsilon}, 1)$, where $\varepsilon > 0$. As $\frac{a_k}{\bar{a}} \gtrless \frac{a_k + \varepsilon}{\bar{a} + \varepsilon}$ if and only if $\bar{a} \lessgtr a_k$, we have $1 < \frac{a_k + \varepsilon}{\bar{a} + \varepsilon} < \frac{a_k}{\bar{a}}$ for $\bar{a} < a_k$ and $\frac{a_k}{\bar{a}} < \frac{a_k + \varepsilon}{\bar{a} + \varepsilon} < 1$ for $\bar{a} > a_k$. Ordering then implies $\sigma(a_k, \bar{a}) > \sigma(a_k + \varepsilon, \bar{a} + \varepsilon)$ for both $\bar{a} > a_k$ and $\bar{a} < a_k$, which corresponds to diminishing sensitivity.

[8] In fact, as established in Proposition 1 of Bordalo, Gennaioli and Shleifer (2013b), also the reverse direction of the implication listed in Observation 1 holds.

3.1 Comparison to the rational benchmark

For a rational consumer, we have $u(q_h, p_h) \gtreqless u(q_l, p_l)$ if and only if $\frac{q_h - q_l}{p_h - p_l} \gtreqless 1$; i.e., a rational consumer opts for the more expensive high-quality good if and only if its advantage in quality exceeds the markup in price. To determine a salient thinker's choice, we have to take into account which attribute she focuses on. If $\frac{q_h}{p_h} < \frac{\bar{q}}{\bar{p}} < \frac{q_l}{p_l}$, then price is salient for both goods and $u^S(q_h, p_h) \gtreqless u^S(q_l, p_l)$ if and only if $\frac{q_h - q_l}{p_h - p_l} \gtreqless \frac{1}{\delta}$. If, on the other hand, $\frac{q_l}{p_l} < \frac{\bar{q}}{\bar{p}} < \frac{q_h}{p_h}$, then quality is salient for both goods and $u^S(q_h, p_h) \gtreqless u^S(q_l, p_l)$ if and only if $\frac{q_h - q_l}{p_h - p_l} \gtreqless \delta$.

Thus, for a given degree of salient thinking $\delta \in (0, 1)$, if the difference in quality is either substantially higher or substantially lower than the difference in price, $\frac{q_h - q_l}{p_h - p_l} < \delta$ or $\frac{q_h - q_l}{p_h - p_l} > \frac{1}{\delta}$, then the choices of a rational consumer and a salient thinker coincide. Intuitively, if, for a given substantial price difference, good h offers only slightly better quality than good l, then not even a focus on quality can make a salient thinker opt for good h. Likewise, if, for a given substantial difference in quality, good l is only slightly less expensive than good h, then not even a focus on price can make the salient thinker opt for good l. However, if the difference in quality and the difference in price are not too different, $\delta < \frac{q_h - q_l}{p_h - p_l} < \frac{1}{\delta}$, then a salient thinker's focus indeed dictates her choice: if she focuses on prices, she opts for the less expensive good l; if her focus is on quality, she opts for the high-quality good h.[9] Thus, depending on which attribute is salient, a salient thinker's choice may, in fact, diverge from a rational consumer's choice. These observations are summarized in Figure 1.

By Observation 1, quality is salient for both goods if good h offers a higher quality-price ratio than good l, whereas price is salient for both goods if good l offers a higher quality-price ratio than good h. Thus, whenever there is scope for salience to make a salient thinker's choice diverge from a rational consumer's, salience tilts the preference toward the good which is a "better deal" in the sense of having a higher quality-price ratio.

3.2 Demand shifts due to salience effects

One implication of this preference shift toward high quality-price ratios is that a salient thinker becomes less price sensitive as the price level increases. To see this, suppose that $\delta < \frac{q_h - q_l}{p_h - p_l} < \frac{1}{\delta}$ and $\frac{q_h}{p_h} < \frac{\bar{q}}{\bar{p}} < \frac{q_l}{p_l}$. Hence, at current prices, price is salient for both goods and a salient thinker chooses the less expensive low-quality good. Now consider an increase in the price level brought forth by a uniform price increase by $\Delta > 0$; i.e., the high-quality good now costs $p'_h = p_h + \Delta$ and the low-quality good costs $p'_l = p_l + \Delta$. This uniform price increase leaves the ratio of quality difference and price difference unchanged, $\frac{q_h - q_l}{p'_h - p'_l} = \frac{q_h - q_l}{p_h - p_l}$, such that a rational consumer's choice remains unaffected. The uniform price increase may, however,

[9] The condition $\delta < \frac{q_h - q_l}{p_h - p_l} < \frac{1}{\delta}$ is equivalent to $\delta < \min\{\frac{q_h - q_l}{p_h - p_l}, \frac{p_h - p_l}{q_h - q_l}\} \in (0, 1]$. Hence, salience may distort choice only if the degree of salient thinking is sufficiently high.

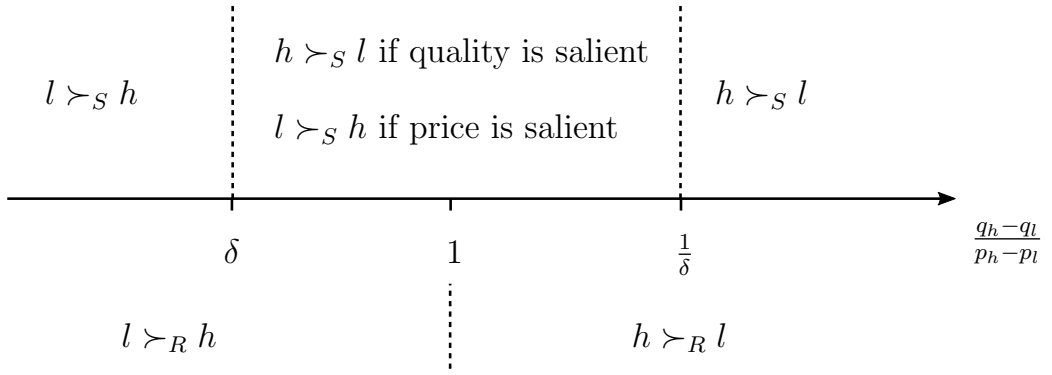

Figure 1: Differences in choice behavior ($\succ_R$: strict preference relation for a rational consumer; $\succ_S$: strict preference relation for a salient thinker).

reverse the salience ranking across attributes. Specifically, with $\bar{p}' = \bar{p} + \Delta$, we have $\frac{q_l}{p'_l} < \frac{\bar{q}}{\bar{p}'} < \frac{q_h}{p'_h}$ if and only if $\Delta > \frac{q_l p_h - q_h p_l}{q_h - q_l}$. Hence, a sufficiently high uniform price increase renders the price difference insignificant (against the backdrop of a much higher average price), such that quality becomes salient. As the ratio of quality difference and price difference remains unchanged by the increase in the price level, this switch in the salience ranking makes a salient thinking consumer switch away from the less expensive low-quality good l to the more expensive high-quality good h.

3.3 Decoy goods and compromise effects

We just have seen how shifts in the price level can shift a salient thinker's demand by affecting the price of the reference good and thus reversing the salience ranking across attributes of the actual goods in the choice set. In similar vein, expanding or reducing the choice set generally will affect the reference good's quality or price and thus potentially changes the salience ranking. As changes in the salience ranking might induce demand shifts for a salient consumer, adding further options to the choice set can induce the so-called compromise effect. The compromise effect, which is one of the most persistent findings in behavioral research in marketing, relates to the gain in market share that a brand experiences when it becomes an intermediate (rather than an extreme) option after a new option has been added to a consumer's choice set.[10] Demand shifts in the sense of the compromise effect are hard to reconcile with the notion of a rational consumer, whose demand might, if at all, shift to the newly added option, but never to a previously rejected option.

To fix ideas, let q_l, p_l, q_h, and p_h be such that $\frac{q_h}{p_h} < \frac{q_l}{p_l}$ and $\delta < \frac{q_h - q_l}{p_h - p_l} < \frac{1}{\delta}$. As outlined before, we know that a salient thinker chooses the low-quality good l from the binary choice set $\mathcal{C} = \{(q_l, p_l), (q_h, p_h)\}$ with reference good $(\bar{q}, \bar{p}) = (\frac{q_l + q_h}{2}, \frac{p_l + p_h}{2})$.

[10] The compromise effect was first demonstrated by Simonson (1989) and further investigated by Benartzi and Thaler (2002), Chernev (2004), Dahr, Nowlis and Sherman (2000), Drolet (2002), and Nowlis and Simonson (2000).

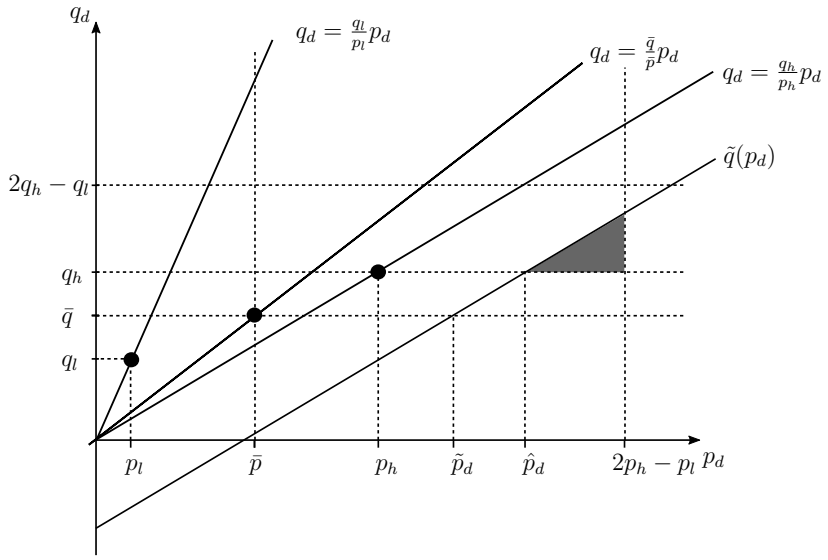

Figure 2: Construction of a decoy good that leads to a compromise effect.

Now suppose that a third-good, a so-called decoy good, (q_d, p_d) is added to the choice set. The reference good of the extended choice set $\mathcal{C}^d = \{(q_l, p_l), (q_h, p_h), (q_d, p_d)\}$ is denoted by $(\bar{q}^d, \bar{p}^d) = (\frac{q_l+q_h+q_d}{3}, \frac{p_l+p_h+p_d}{3})$. It is readily verified that

$$\frac{q_h}{p_h} > \frac{\bar{q}^d}{\bar{p}^d} \iff q_d < p_d \frac{q_h}{p_h} - p_l \left(\frac{q_l}{p_l} - \frac{q_h}{p_h} \right) =: \tilde{q}(p_d).$$

Hence, if the decoy good (q_d, p_d) is chosen such that $q_d < \tilde{q}(p_d)$, $\bar{p}^d < p_d < 2p_h - p_l$, and $\bar{q}^d < q_d < 2q_h - q_l$, where the latter two conditions ensure that $\bar{p}^d < \min\{p_h, p_d\}$ and $\bar{q}^d < \min\{q_h, q_d\}$, then quality is salient for good h and price is salient for good d. To see that the set of parameters satisfying these conditions is not empty, it suffices to realize that $\tilde{p}_d < 2p_h - p_l$, where $\tilde{p}_d$ is implicitly defined by $\tilde{q}(\tilde{p}_d) = \bar{q}$. For this constellation of parameters, in the extended choice set $\mathcal{C}^d$, quality is salient for good h, such that a salient thinker prefers good h over good l, irrespectively of which attribute is salient for good l (as we assumed $\delta < \frac{q_h - q_l}{p_h - p_l} < \frac{1}{\delta}$). Furthermore, a salient thinker strictly prefers good h over good d if $q_h - \delta p_h > \delta q_d - p_d$ or, equivalently, if the degree of salient thinking is sufficiently strong, $\delta < \frac{q_h + p_d}{q_d + p_h}$.[11] Hence, if the degree of salient thinking is sufficiently strong, i.e., if

$$\delta < \min \left\{ \frac{q_h - q_l}{p_h - p_l}, \frac{p_h - p_l}{q_h - q_l}, \frac{q_h + p_d}{q_d + p_h} \right\},$$

then a salient thinker's demand will shift away from good l, which is chosen in the original choice set $\mathcal{C}$, to good h when the choice set is enlarged by the introduction

[11] Note that $\frac{q_h + p_d}{q_d + p_h} > 1$ if and only if $q_h - p_h > q_d - p_d$; i.e., if good d lies on a lower rational indifference curve than good h, then good h is preferred by a salient thinker irrespective of the degree of salient thinking.

of the decoy good d. Importantly, demand will not shift to the newly available good d, but to the previously rejected good h. As indicated by the gray-shaded area in Figure 2, there exist decoy goods satisfying $q_d > q_h$ and $p_d > p_h$. In this case, good h becomes the middle-of-the-road option and the shift in demand upon introduction of the decoy good represents a compromise between the two now extreme options l and d.[12]

4 Competition, Salience, and Decoy Options

Having outlined the most basic implications of salient thinking for consumer choice, we now address firms' best responses to consumers' choice behavior being driven by contextual factors. To this end, we set up a streamlined model in which a single brand manufacturer competes against a number of fringe firms, where the latter price competitively at cost. While lacking the depths of strategic interaction found in Bordalo, Gennaioli and Shleifer (2015), this simple model allows us to draw out several important implications of salient thinking for market outcomes that have been discussed in the extant literature. Furthermore, within this framework, we provide novel insights regarding how firms can benefit from manipulating consumers' perception by appropriate design of the choice set. In the literature review in Section 5, we relate our observations in this section to the extant literature in more detail.

4.1 Competing against a competitive fringe

In this section, we consider competition between a brand manufacturer, denoted by index b, and a competitive fringe, denoted by index f. There is a homogeneous group of consumers with measure one. The unbiased utility – i.e., the experienced utility – of a consumer who consumes good (q, p) is $u = q-p$. The competitive fringe produces a good with quality q_f at constant unit cost $c_f > 0$ and offers the good (q_f, p_f) with price $p_f = c_f$. We assume that $q_f - c_f > 0$, such that a consumer's unbiased utility from purchasing the fringe product is strictly positive. In comparison to the fringe product, the brand manufacturer produces a good of superior quality $q_b > q_f$ at (weakly) higher unit cost $c_b \geq c_f$. Moreover, the brand manufacturer produces the socially efficient good with the higher net value; i.e., $q_b - c_b > q_f - c_f$. As a measure of efficiency we consider material gains from trade or, equivalently, the sum of producer profits and unbiased (i.e., experienced) consumer utilities.[13]

First, we briefly consider the benchmark of rational consumers with $\delta = 1$. The equilibrium prices are $p_f^R = c_f$ and $p_d^R = q_b - q_f + c_f$. In equilibrium, the brand

[12] To see that this gray-shaded area always exists, it suffices to realize that $\hat{p}_d < 2p_h - p_l$, where $\hat{p}_d$ is implicitly defined by $\tilde{q}(\hat{p}_d) = q_h$.

[13] Regarding the interaction of fully rational firms and behaviorally biased consumers, for whom decision utility and experienced utility diverge, the efficiency of a specific allocation is typically measured as the sum of the actually experienced utilities of the participating agents – see, e.g., Sandroni and Squintani (2007), Grubb (2009), and Herweg and Müller (2016) with regard to overconfidence. One might argue, however, that salient thinking is more than a behavioral bias.

manufacturer serves all consumers and makes a strictly positive profit of $\pi_b^R = (q_b - q_f) - (c_b - c_f)$.

Next, suppose that consumers are salient thinkers with $\delta < 1$. We assume that the choice set of each consumer consists only of the brand and the fringe product. In other words, the outside option good $(q, p) = (0, 0)$ is not part of a consumer's choice set. From Observation 1, we know that either quality is salient for both goods or price is salient for both goods. More specifically, quality is salient if and only if $q_b/q_f > p_b/p_f$. With qualities and the price of the fringe product being fixed, the brand manufacturer's choice of price determines whether quality or price is salient for consumers. As the brand manufacturer produces the high quality, it is able to charge a higher mark-up if quality is salient. This makes choosing a price under which quality is salient a seemingly good idea, so we address this case first. The brand manufacturer's optimal choice of a price such that quality becomes salient solves

$$\max_{p_b} \quad p_b - c_b \tag{4}$$

subject to

$$\frac{q_b}{q_f} \geq \frac{p_b}{p_f}, \tag{SC^Q}$$

$$q_b - \delta p_b \geq q_f - \delta p_f. \tag{PC^Q}$$

The brand manufacturer maximizes its profits subject to two constraints. First, the brand manufacturer has to set a price such that quality is indeed salient, which is true if the salience constraint (SC^Q) holds. Second, given quality salience, the brand manufacturer has to ensure that consumers prefer the brand product to the fringe product; i.e., the consumers' participation constraint (PC^Q) has to be satisfied. In order to have a well-defined solution, we assume that if the salience constraint holds with equality, then the feature that the brand manufacturer wants to have salient is indeed salient.

Both constraints impose an upper bound on p_b. Making use of $p_f = c_f$, (PC^Q) is satisfied if and only if $p_b \leq \frac{q_b - q_f}{\delta} + c_f =: \bar{p}_b$, whereas (SC^Q) is satisfied if and only if $p_b \leq \frac{q_b}{q_f} c_f =: \tilde{p}_b$. It is readily verified that $\bar{p}_b > \tilde{p}_b$ if and only if $\delta < \frac{q_f}{c_f}$. As $\delta < 1$ for a salient thinker and $q_f > c_f$ by the assumption that the fringe product yields strictly positive rational utility, (SC^Q) imposes a more restrictive bound on the brand product's price than (PC^Q). Hence, the optimal price for the brand product under which quality is salient satisfies (SC^Q) with equality:

$$p_b^Q = c_f \frac{q_b}{q_f}. \tag{5}$$

The brand manufacturer's corresponding profit in this quality-salient environment amounts to

$$\pi_b^Q = c_f \frac{q_b}{q_f} - c_b. \tag{6}$$

While making quality salient seems to be the brand manufacturer's most natural course of action, we came to understand that this comes at the cost of a rather

restrictive upper bound on the brand product's price imposed by (SC^Q). Hence, the brand manufacturer might actually prefer that the price is salient. In this case, the optimal price for the brand product solves

$$\max_{p_b} \quad p_b - c_b \tag{7}$$

subject to

$$\frac{q_b}{q_f} \leq \frac{p_b}{p_f}, \tag{SC^P}$$

$$\delta q_b - p_b \geq \delta q_f - p_f. \tag{PC^P}$$

While (PC^P) imposes an upper bound on the brand product's price, (SC^P) now requires the brand product's price to be sufficiently high for the price to be salient. Making use of $p_f = c_f$, (PC^P) is satisfied if and only if $p_b \leq \delta(q_b - q_f) + c_f$, whereas ($\text{SC}^P$) is satisfied if and only if $p_b \geq \frac{q_b}{q_f} c_f$. It is readily verified that both constraints can jointly be satisfied only if $\delta \geq \frac{c_f}{q_f}$, where $\frac{c_f}{q_f} < 1$. Hence, if the degree of salient thinking is not overly strong, the brand manufacturer can make the price salient without losing all consumers to the fringe. In this case, the brand product's optimal price makes (PC^P) binding,

$$p_b^P = \delta(q_b - q_f) + p_f. \tag{8}$$

The brand manufacturer's corresponding profit in the price-salient environment is

$$\pi_b^P = \delta(q_b - q_f) - (c_b - c_f). \tag{9}$$

Comparison of profits reveals that $\pi_b^Q \leq \pi_b^P$ if and only if $\delta \geq \frac{c_f}{q_f}$. Hence, the brand manufacturer prefers a price-salient environment whenever he can induce price salience – despite himself offering the high-quality product.[14]

Proposition 1. *Consider a brand manufacturer that produces a product of superior quality and competes against a fringe. If consumers have a mild salience bias, $\delta \geq c_f/q_f$, the brand product's optimal price is $p_b^P = \delta(q_b - q_f) + c_f$, which induces a price-salient environment. If consumers have a strong salience bias, $\delta < c_f/q_f$, the brand product's optimal price is $p_b^Q = q_b \frac{c_f}{q_f}$, which induces a quality-salient environment.*

Whether we observe a price-salient or a quality-salient market depends on how strong the salience bias is in comparison to the relative attractiveness of the fringe product – i.e., on the quality-price ratio of the fringe product. If consumers are only mildly affected by the salience of a particular attribute when making the purchase, the brand manufacturer prefers a price salient environment and charges a price so that the participation constraint is just satisfied. If, on the other hand, consumers are highly affected by the salience of a particular attribute, the brand manufacturer prefers to ensure that quality is salient so that consumers focus on the advantage

[14] We assume that the brand manufacturer has sufficiently low cost and thus is always able to make a positive profit, $c_b < \min\{\delta(q_b - q_f) + c_f, c_f \frac{q_b}{q_f}\}$.

of its own product compared to the fringe product. The optimal price is then determined by the salience constraint. Importantly, the better the deal offered by the fringe product in terms of quality per dollar, the less likely it is that the manufacturer induces quality salience.

When having a look at the brand manufacturer's profits, it becomes apparent that it cannot benefit from the salience bias of consumers. Formally, $\pi_b^R > \max\{\pi_b^Q, \pi_b^P\}$. In other words, salience enhances competition. This is not a general prediction of the model of salient thinking. For instance, if the fringe produces a good with a negative net value and, thus, with a quality-price ratio of less than one, the optimal price under quality salience may be determined by the participation constraint. If this is the case, the brand manufacturer makes a profit of $(q_b - q_f)/\delta - (c_b - c_f) > \pi_b^R$.[15]

4.2 Endogenous quality

So far, we assumed the quality level of the brand product to be exogenously given. Next, we extend the previous analysis by endogenizing the quality produced by the brand manufacturer. Here, we pursue the idea that the brand manufacturer initially produces the same quality as the fringe, but now can gain market power by developing a product of higher quality. Before engaging in price competition with the fringe, the brand manufacturer now can choose the quality level $q_b \geq q_f$ of its product. The per-unit production costs for the brand product depend on the quality level chosen by the brand manufacturer as follows:

$$c_b(q_b|q_f) = c_f + \frac{1}{2}(q_b - q_f)^2.$$

The question of obvious interest is whether salient thinking leads to over- or underinvestment in quality of the brand manufacturer. In order to answer this question, we first need to establish a benchmark, which we take to be the materially efficient quality level q_b^* for the brand product. The materially efficient quality level q_b^* solves

$$\max_{q_b} \quad q_b - c_b(q_b|q_f), \tag{10}$$

such that $q_b^* = q_f + 1$.

The brand manufacturer, however, chooses the quality of his product to maximize profits and not to maximize material efficiency. As outlined before, the brand manufacturer's profits depend on whether price competition results in a price-salient or in a quality-salient equilibrium, which in turn depends on how the degree of salient thinking relates to the fringe product's price-quality ratio – cf. Proposition 1. For a mild salience bias ($\delta > c_f/q_f$) the optimal price for the brand product makes price salient and the brand manufacturer's profit as a function of the brand product's quality is given by

$$\pi_d(q_b) = \delta(q_b - q_f) - \frac{1}{2}(q_b - q_f)^2. \tag{11}$$

[15] One might argue, however, that if the alternative to the brand product has a negative experienced utility, a consumer's choice set should be enlarged by including the consumer's outside option $(q, p) = (0, 0)$.

Hence, the profit maximizing quality in this case is

$$q_b^P = q_f + \delta. \tag{12}$$

If the salience bias is severe ($\delta \leq c_f/q_f$), the brand manufacturer optimally charges a price that makes quality salient. In this case, the brand manufacturer's profit as function of the brand product's quality is

$$\pi_b(q_b) = \frac{c_f}{q_f} q_b - c_f - \frac{1}{2}(q_b - q_f)^2. \tag{13}$$

The profit maximizing quality then is

$$q_b^Q = q_f + \frac{c_f}{q_f}. \tag{14}$$

Obviously, $\max\{q_b^P, q_b^Q\} < q_b^*$. Hence, even though salience may increase consumers' willingness to pay for a quality upgrade, we observe an under-investment in quality by the brand manufacturer.

Proposition 2. *The brand manufacturer always chooses a quality level which is lower than the materially efficient quality level.*

The reason for the under-investment in quality is the following. If the salience bias is mild, the market exhibits price salience and thus consumers do not value a high-quality product appropriately. In this case it is not surprising that the brand manufacturer has inefficiently low incentives to invest in quality. If the salience bias is severe, on the other hand, the market is quality salient and consumers overvalue differences in quality. The quality produced by the brand manufacturer, however, is still too low from the perspective of material efficiency. The reason is that the salience constraint (and not the participation constraint) imposes a binding upper bound on the brand product's price, such that the brand manufacturer cannot fully extract the increase in consumers' willingness-to-pay that is brought forth by a quality improvement.

If the fringe product has a negative net value – i.e., $q_f - c_f < 0$ (but consumers still prefer to buy the fringe product to not buying), there are cases where quality is salient and the price for the brand product is determined by the binding participation constraint. In this case we have $p_b^Q = c_f + (q_b - q_f)/\delta$. Moreover, if this is the case, the brand manufacturer produces a good of excessively high quality, i.e., $q_b^Q = q_f + 1/\delta > q_b^*$.

4.3 Decoy goods

Starting with Huber, Payne and Puto (1982), in marketing and psychology there exists a large literature investigating the so-called decoy effect. The idea is that a firm, by extending its own product line, may be able to boost sales for existing products, thereby increasing its profits. Or, to put it in the words of Huei-Chen and Wen-Liang (2011, p. 235), "adding a new brand to the choice set can raise the

choice likelihood or the attractiveness of one of the existing alternatives". This effect is nicely illustrated by the example of subscription options offered by *The Economist* that we discussed in the introduction. Adding the print-only option boosts sales of the high quality web+print subscription.[16]

In Section 3.3, we have seen that exogenously introducing a decoy good into a given choice set can lead to a shift in demand for a salient thinker, that would not result for a rational consumer. In this section, we address a question that, to the best of our knowledge, so far has gained little attention: If consumers are salient thinkers, do firms indeed have an incentive to offer a decoy option? To this end, we extend the baseline model from Subsection 4.1 by allowing the brand manufacturer to offer a second good, which we denote by (q_d, p_d).[17] For simplicity, we assume that extending the product line is without costs to the brand manufacturer, as long as none of the customers actually purchases the decoy option, and that the brand manufacturer in fact does not want any consumer to purchase the decoy good.[18] Importantly, the brand manufacturer faces no restrictions regarding the advertized quality of the decoy option, $q_d \in \mathbb{R}_{\geq 0}$. The quality $q_b > 0$ of the good the brand manufacturer wants to sell is fixed and its production cost per unit amounts to c_b. The competitive fringe offers quality q_f at price $p_f = c_f$, where $0 < c_f < q_f < q_b < 2q_f$.

If the brand manufacturer offers a second product, a consumer's choice set now consists of three options: the fringe product, the brand product – which the brand manufacturer actually wants to sell, and the decoy good. Formally, $C = \{(q_f, c_f), (q_b, p_b), (q_d, p_d)\}$ and the reference good is $(\bar{q}, \bar{p}) = (\frac{q_f+q_b+q_d}{3}, \frac{p_f+p_b+p_d}{3})$. A crucial implication of having more than two options in the choice set is that salience now is option specific. In other words, it can be that quality is salient for one product and that price is salient for a different product.

A consumer's willingness to pay for a certain product is always higher if that product's quality – rather than its price – is salient. Therefore, from the brand manufacturer's perspective, it would be ideal to have quality salient for its own brand product and to have price salient for the competing fringe product. Hence, when choosing the price for its brand product and the specifics of the decoy good,

[16] For further investigation of the decoy effect see, for example, Josiam and Hobson (1995) or Bateman, Alistair and Poe (2008).

[17] For a more detailed analysis that also allows for consumer heterogeneity see Herweg, Müller and Weinschenk (2017). Apffelstaedt and Mechtenberg (2016) also investigate when retailers profit from offering a decoy good. In their model, a consumer's utility differs between the point in time when he makes purchasing plans and the point in time when he actually purchases. The consumer is affected by the purchasing environment only when being at a particular store. The decoy good draws the consumer's attention to a product with a higher markup than the product he intended to buy. Crucially, each retailer carries only the products of its own brand and therefore fully controls a consumer's consideration set at the point of sale.

[18] Regarding the first assumption, one might imagine that the cost of putting a photo-shopped picture of a not yet developed product variant together with some imaginary technical details on the brand manufacturer's website is close to zero. Regarding the second assumption, one might imagine the cost of re-arranging the production process to allow for a quality adjustment to be prohibitively high.

the brand manufacturer faces the following problem:

$$\max_{p_b,p_d,q_d} \quad p_b - c_b \tag{15}$$

subject to:

$$\sigma(q_b, \bar{q}) \geq \sigma(p_b, \bar{p}), \tag{SC$_b$}$$
$$\sigma(q_f, \bar{q}) \leq \sigma(p_f, \bar{p}), \tag{SC$_f$}$$
$$q_b - \delta p_b \geq \delta q_f - p_f, \tag{PC}$$
$$q_b - \delta p_b \geq \begin{cases} q_d - \delta p_d & \text{if } \sigma(q_d, \bar{q}) > \sigma(p_d, \bar{p}), \\ \delta q_d - p_d & \text{if } \sigma(q_d, \bar{q}) \leq \sigma(p_d, \bar{p}). \end{cases} \tag{DC}$$

The brand manufacturer maximizes its mark-up subject to four constraints. Firstly, it wants to orchestrate the market such that quality is salient for its own brand product – cf. salience constraint (SC$_b$) – and that price is salient for the fringe product – cf. salience constraint (SC$_f$). If the salience constraints are satisfied, a consumer prefers the brand product to the fringe product if the participation constraint (PC) holds. Finally, the brand manufacturer has to ensure that consumers do not prefer to buy the decoy good, which is the case if the decoy constraint (DC) is satisfied.

The best price for its product the brand manufacturer can hope for makes the participation constraint (PC) just bind and is thus given by

$$\hat{p}_b = \frac{q_b + c_f}{\delta} - q_f, \tag{16}$$

where $\hat{p}_b > c_f$. It remains to establish that we can find a specification of the decoy good such that the constraints (SC$_b$), (SC$_f$), and (DC) are satisfied. To this end, consider a decoy good with

$$\hat{q}_d \quad = 2q_f - q_b \qquad \text{and} \qquad \hat{p}_d = 2\hat{p}_b - c_f, \tag{17}$$

where $\hat{q}_d < q_f$ and $\hat{p}_d > \hat{p}_b$. For this specification of the decoy good, the reference good is given by $(\bar{q}, \bar{p}) = (q_f, \hat{p}_b)$. To see that both salience constraints (SC$_b$) and (SC$_f$) are satisfied, note that

$$\sigma(\hat{p}_b, \bar{p}) = \sigma(\hat{p}_b, \hat{p}_b) = \sigma(q_f, q_f) < \sigma(q_b, q_f) = \sigma(q_b, \bar{q})$$

and

$$\sigma(q_f, \bar{q}) = \sigma(q_f, q_f) = \sigma(p_f, p_f) < \sigma(p_f, \hat{p}_b) = \sigma(p_f, \bar{p}),$$

where, respectively, the first and third equalities hold by specification of the decoy good, the second equality holds by homogeneity of degree zero, and the strict inequality holds by ordering. Finally, with $\delta < 1$, a sufficient condition for the decoy good not to be purchased is that consumers consider the decoy good as inferior to the brand product, even if quality is salient for both the brand and the decoy good. Thus, the decoy constraint (DC) is satisfied if $q_b - \delta\hat{p}_b \geq \hat{q}_d - \delta\hat{p}_d$ or, equivalently, if $2(q_b - q_f) \geq -\delta(p_b - c_f)$. As $q_b > q_f$ and $\hat{p}_b > c_f$, this condition is always satisfied.

The profit of the brand manufacturer is given by

$$\pi_b^D = \left(\frac{q_b}{\delta} - q_f\right) - \left(c_b - \frac{c_f}{\delta}\right). \tag{18}$$

Note that $\pi_b^D > \max\{\pi_b^P, \pi_b^Q\}$. In words, it is strictly profitable for the brand manufacturer to extend its product line and to offer a decoy option. Moreover, the brand manufacturer now benefits from the salience bias of consumers. If consumers are homogeneous and rational, the brand manufacturer cannot benefit from offering more than one good. Thus, even if a decoy option could be offered, the maximal profit of the brand manufacturer if consumers are rational is $\pi_d^R = (q_b - q_f) - (c_b - c_f)$. As $\pi_b^D > \pi_b^R$, salient thinking relaxes competition and thereby allows the brand manufacturer to make abnormally high profits.

Proposition 3. *A brand manufacturer that competes against a fringe can always increase its profit by offering a decoy option. One decoy option that is optimal is* $(q_d, p_d) = (2q_f - q_b, 2\hat{p}_b - c_f)$.

The optimal decoy option is not uniquely determined; i.e., there is a continuum of decoy options that are optimal. All decoy goods that are optimal represent rather poor options that offer rather low quality at a rather high price. In particular, the decoy option we propose has a strictly higher price and a strictly lower quality than the two alternatives.[19]

5 Literature Overview

In this section, we review the literature on salient thinking. First, we present some further implications of salient thinking for consumer behavior that have not yet been discussed. Thereafter, we discuss the existing theoretical applications of salient thinking to models of industrial organizations.[20]

[19] The decoy good we derived has not the same characteristics as the decoy goods typically discussed in the literature. First, a typical decoy good is dominated by the target good; i.e., the target good is better in all dimensions. This is also true for the decoy good we derived. Second, the decoy good is neither dominated nor dominates the competitor's product; i.e., the decoy good is better than the competitors product in some dimensions and worse in others (Angner, 2012). This characteristic is not satisfied by the decoy good we derived because it is dominated by the fringe product.

[20] There are two further contributions that we are aware of, but do not discuss in detail, because they are either only distantly related to industrial organization or still in a rather preliminary state. Dertwinkel-Kalt (2016) introduces consumers that are salient thinkers into a model of health campaigns. Each consumer either buys a healthy or an unhealthy product. Dertwinkel-Kalt (2016) shows that the government can increase consumption of the healthy product with an information campaign which makes either the healthiness of the healthy product or the unhealthiness of the unhealthy product salient. Helfrich and Herweg (2016) introduce consumers who are salient thinkers into a model of retailing. The brand manufacturer of a high-quality product can decide whether its retailers are allowed to sell its brand product, next to at the own brick-and-mortar store, also at an online platform. The retailers also sell low-quality non-brand products. At the online platform, competition between retailers is intense and hence markups are low. Therefore, if the brand manufacturer wants to charge a relatively high wholesale price

5.1 Further implications of salient thinking for consumer behavior

In Sections 2 and 3, we presented the model of salient thinking as proposed by Bordalo, Gennaioli and Shleifer (2013b). In particular, we introduced the key properties of the salience function (i.e., ordering, diminishing sensitivity, homogeneity of degree zero) and then surveyed the most basic implications of salient thinking for choice behavior (i.e., salience being determined by the quality-price ratio, demand shifts due to uniform price increases, decoy effects). Next to these findings, Bordalo, Gennaioli and Shleifer (2013b) also show that if all elements of the choice set lie on a rational indifference curve, a salient thinker chooses the good with the highest quality-price ratio. Moreover, a salient thinker has a tendency to choose an extreme option – i.e., either the good with the highest quality or the good with the lowest price. Furthermore, Bordalo, Gennaioli and Shleifer (2013b) analyze situations where the reference good does not correspond to the average of the actual attribute values of the goods in the choice set, but also depends on the consumer's (price) expectations. They show that unexpectedly high prices lead to higher price sensitivity. This finding seems surprising at first glance, because we have shown that price sensitivity is lower if prices are (expectedly) higher. Moreover, they show that the marginal willingness to pay for quality is humped-shaped in the expected price.

In a recent working paper, Bordalo, Gennaioli and Shleifer (2015) extend their investigation of salience-driven consumer preferences by combining the basic model of salient thinking with a model of limited recall. According to this theory, informing a consumer about a hidden attribute may have the effect of enlarging the dimensionality of the choice set; i.e., after becoming informed about a hidden attribute, the consumer takes the hidden attribute into account which she may have neglected previously. As a direct consequence of this change in the choice set also the salience ranking of the different attributes for the goods in the choice set may be affected. For instance, informing the consumer about a hidden fee can make this hidden fee particularly salient such that the consumer tends to select the product with the lowest hidden fee after becoming informed. If this is the case, the consumer may overreact to new information. Bordalo, Gennaioli and Shleifer (2015) also characterize situations where the consumer underreacts to new information. These insights help to understand in which situations reminders are likely to be beneficial and under which circumstances reminders might backfire. Overall, a crucial difference to models that solely consider limited attention or limited recall is that a consumer's reaction to new information can be far from optimal in Bordalo, Gennaioli and Shleifer (2015).

for its product, then price is likely to be salient online and thus many consumers prefer the non-brand product. At the brick-and-mortar store, on the other hand, markups are high and thus even a relatively high wholesale prices does not lead to a price salient environment. This is the reason why a high-quality brand manufacturer may restrict the distribution channel of its retailers.

5.2 Direct implications of salient thinking for imperfect competition

In Bordalo, Gennaioli and Shleifer (2016) the model of salient thinking is incorporated into a duopoly model of price competition and quality choices similar to the seminal contribution by Shaked and Sutton (1982). First, each of two firms decides on the quality level of its product. Thereafter, for given quality levels, the two firms compete in prices. Crucially, the constant unit cost of production has, next to a quality-dependent part, also a quality-independent fixed component. This fixed-cost component allows Bordalo, Gennaioli and Shleifer (2016) to distinguish, irrespective of the quality level, between goods that are relatively cheap to produce and goods that are expensive to produce. As it turns out, the proper definition of equilibrium when applying the model of salient thinking to this strategic setting is anything but trivial. Loosely speaking, firms' best response functions, and thus the equilibrium outcome, are well-defined only if the "better" firm's preferred attribute is salient when a tie arises in the salience ranking or a consumer's valuation of the two goods. We circumvented this issue in our analysis of Section 4 by considering only one strategic player – the brand manufacturer – who competes against non-strategic players – the fringe. Bordalo, Gennaioli and Shleifer (2016) show that, depending on the quality-cost ratio, price or quality is salient in equilibrium. They call the former market situation *commoditized* and the latter *de-commoditized*. This observation is related to Proposition 1 in this text: Depending on the quality-cost ratio of the fringe, the brand manufacturer may prefer a quality salient or a price salient environment. Moreover, Bordalo, Gennaioli and Shleifer (2016) show that the quality provided in equilibrium, compared to the benchmark of rational consumers, is too low if the fixed-cost component is low and too high if the high-fixed cost component is high. Thus, there tends to be underprovision of quality for goods that are cheap to produce and overprovision of quality for goods that are expensive to produce. We reconfirmed the former observation in Proposition 2 of our analysis of the brand manufacturer's quality choice. Finally, Bordalo, Gennaioli and Shleifer (2016) apply the concept of salient thinking also to a model of financial innovations. Here, an investor chooses a security that is described by its mean return and its variance. These are the two attributes of the financial products. Bordalo, Gennaioli and Shleifer (2016) show that a broker may have incentives to create a security which is excessively risky if the investor is a salient thinker.

5.3 A model of sales with salient thinking consumers

Inderst and Obradovits (2015) analyze a model of sales and loss leading in which consumers' attention is limited in two dimensions: First, consumers only take into account a subset of all products when deciding where to shop. Second, consumers focus attention on particularly salient product attributes, by paying more attention to either product quality or product price. The first dimension of limited attention is analyzed extensively in the industrial organization literature on one-stop shopping and leads to a phenomenon known as loss leading; i.e., firms sell some products

below costs in order to attract consumers and thereby generate additional sales of more profitable products. Incorporating salient thinking as a second dimension of limited attention is a novelty in this branch of the literature.

In the model of Inderst and Obradovits (2015), consumers visit at most one shop, where they may buy a basket of products. Only a fraction of the consumers are "shoppers"; i.e., when deciding where to shop, they compare the retailers' offers – cf. Varian (1980). This comparison, however, is restricted only to the first product of the basket, which is referred to as product 1. There is a single manufacturer who provides product 1 with high quality q_h to the retailers, whereas a series of other manufacturers provides product 1 with low quality $q_l < q_h$. The per-unit production cost for high and low quality is c_h and c_l, respectively, where $c_l \leq c_h$. The quality of the other products in the basket is fixed and symmetric across all retailers. A consumer's utility from buying a product equals the product quality minus the product price. If the quality difference $\Delta_q := q_h - q_l$ exceeds the difference of the manufacturers' per-unit production costs $\Delta_c := c_h - c_l$, the high-quality variant of product 1 is called superior. Otherwise, the low-quality variant of product 1 is called superior. To maximize social surplus, only the superior variant of product 1 should be produced.

The timing of the market game is as follows: First, at each retailer, the manufacturers of the low-quality variant of product 1 and the single manufacturer of the high-quality variant of product 1 make simultaneous competing two-part tariff offers, consisting of a fixed fee and a per-unit wholesale price. Thereafter, retailers decide which manufacturer's offer to accept and what prices to charge from consumers. Finally, shoppers decide which retailer to visit (if any) and which products to purchase, whereas non-shoppers decide whether to visit their local retailer and which products to purchase.

In line with the existing literature, in the baseline model without salient-thinking consumers, all retailers supply the superior product in equilibrium. Thus, retailers' product choices depend only on the quality advantage of the high-quality product, Δ_q, in comparison to its cost disadvantage, Δ_c. In particular, the extent of one-stop shopping – which is measured by a retailer's profit from selling all products except product 1 to a consumer, $v = \sum_{i \in I \setminus \{1\}} (q^i - c^i)$ – plays no role for product choices. A higher extent of one-stop shopping, however, positively affects the high-quality manufacturer's profit if the high-quality product is superior and demand is elastic. Intuitively, a higher extent of one-stop shopping causes retailers to sell product 1 at a greater discount, which expands demand for that product. The high-quality manufacturer can then extract the incremental benefits from its superior product for a larger quantity.

The results change drastically if consumers are salient thinkers à la Bordalo, Gennaioli and Shleifer (2013b). With salient thinking consumers, superiority of the high-quality product is no longer sufficient for the existence of a high-quality equilibrium. To be precise, when the high-quality product is superior, $\Delta_q > \Delta_c$, there is no equilibrium where the high-quality product is offered by all retailers if (i) the degree of salient thinking is sufficiently strong (δ is low) and (ii) equilibrium prices of the high-quality product are low as either competition is intense (there are many

retailers or the fraction of shoppers among consumers is high) or the extent of one-stop shopping is large (v is high). The intuition for the potential non-existence of a high-quality equilibrium is as follows: Suppose that there is an equilibrium where all retailers sell the high-quality product at a relatively low price p_m because of intense competition or a large extent of one-stop shopping.[21] Now suppose that retailer n deviates and offers the low-quality product instead. Since the high-quality product is sold at a rather low price, the deviating retailer has to undercut this price only little in absolute terms to make the price salient. By inducing price salience, the low-quality retailer attenuates the quality difference between the products as for the consumers' decisions only the perceived quality difference $\delta\Delta_q$ matters. If the cost difference $\Delta_c := c_h - c_l$ is higher than the perceived quality difference $\delta\Delta_q$, which will be the case if the degree of salient thinking is strong, deviating to low quality is profitable for a retailer.

Thus, even if the high-quality product is superior and all retailers providing the high-quality product would be socially desirable, the high-quality equilibrium may not exist if consumers are salient thinkers. The non-existence of the high-quality equilibrium is more likely the larger is the extent of one-stop shopping. The intuition for this result is that a greater extent of one-stop shopping, i.e., a higher v, makes deviating to the low-quality product more profitable for a retailer. Moreover, Inderst and Obradovits (2015) show that if the high-quality equilibrium with salient thinking consumers does exist, an increase in the extent of one-stop shopping or in the degree retail competition reduces the profit of the high-quality manufacturer.

The analysis by Inderst and Obradovits (2015) nicely highlights the depth that salient thinking can add to models of consumer choice. It seems an empirical regularity that manufacturers complain about deep discounts on their products (even though these actually expand demand for their products) and that policymakers and consumer interest groups oppose deep discounts (even though consumers, all else equal, benefit from lower prices).[22] In particular, policymakers and consumer interest groups often fear that deep discounts cause reductions in product quality. While hard to reconcile with the baseline model, the model is perfectly in line with these empirical regularities if consumers succumb to salient thinking.

Some further insights seem worth mentioning. First, with salient thinkers the condition for the existence of the low-quality equilibrium is unchanged, compared to the case without salience.[23] Therefore, while high-quality products may be crowded out inefficiently when these are used for promotions and when competition is fierce or the extent of one-stop shopping is large, there is never an overprovision of high-quality products. Second, a policy that bans loss leading (i.e., below-cost pricing)

[21] Actually, the equilibrium is in mixed strategies. To understand the basic intuition, this is not important.

[22] For a discussion of these issues, see Inderst and Obradovits (2015). An empirical example where manufacturers complained about deep discounts was the sale of milk in the UK.

[23] The idea is that the deviating retailer has to make quality salient when offering the high-quality product, since otherwise it cannot recoup the cost difference Δ_c which is – by the superiority of the low-quality product – above the quality difference Δ_q. However, a strategy that makes quality salient is not profitable, since it requires that the deviating retailer charges a price that is only little above that of the low-quality product.

can affect efficiency only when consumers are salient thinkers. In this case, however, a ban of loss leading can actually backfire, i.e., foster a shift towards the provision of the less efficient, low-quality product. Third, under salient thinking, shoppers may end up with an overall inferior choice compared to non-shoppers, even though the former experience a larger choice set than the latter.

5.4 A model of competitive shrouding with salient thinking consumers

Inderst and Obradovits (2016) study a model of competition with salient thinking consumers in which firms impose hidden – i.e., shrouded – charges in the spirit of Gabaix and Laibson (2006). Two firms compete for a mass one of consumers, each of whom is interested in at most one unit of a certain product. First, both firms simultaneously and non-cooperatively choose their respective product's quality, where the quality of firm i's product can be either low ($q_i = q_l > 0$) or high ($q_i = q_h > q_l$). Firm i produces low quality at constant marginal cost $c_l > 0$ and high quality at constant marginal cost $c_h > c_l$, where $c_l < q_l$ and $c_h < q_h$. Thereafter, for given quality levels of the respective product, both firms simultaneously and non-cooperatively set their product price and their hidden charge. While firm i is unrestricted in the choice of its product's price p_i, its hidden charge h_i is bounded above by $h > 0$. This upper bound h, which plays a key role in the analysis of Inderst and Obradovits (2016), can be regarded as a reduced form modeling of consumer protection policy and its enforcement.[24]

Consumers are salient thinkers according to Bordalo, Gennaioli and Shleifer (2013b). In what follows, we focus on the extreme case of a maximum salience bias (i.e., $\delta = 0$) such that consumers ignore a good's non-salient attribute and prefer the product with the higher quality-price ratio.[25] Furthermore, as in Varian (1980), a fraction $\lambda \in (0,1)$ of the consumers is attentive and compares the offers of both firms, whereas the remaining fraction $1-\lambda$ of consumers only considers the offer of one of the two firms.

At the price-setting stage, it is optimal for each firm to set the maximum hidden charge. Hence, for given quality choices q_i and q_j of both firms and a given distribution over prices p_j for its competitor's product, firm i's expected profit from setting price p_i is

$$\pi_i = (p_i - c_i + h)\left[\frac{1-\lambda}{2} + \lambda \text{ Prob}\left(\frac{p_i}{q_i} < \frac{p_j}{q_j}\right)\right].$$

Here, the term $(p_i - c_i + h)$ captures the profit margin of firm i, $\frac{1-\lambda}{2}$ reflects the mass of non-attentive consumers who buy from firm i, and $\lambda \text{Prob}\left(\frac{p_i}{q_i} < \frac{p_j}{q_j}\right)$ represents the expected mass of attentive consumers who buy from firm i. The price equilibrium is in mixed strategies and Inderst and Obradovits (2016) show that, provided that firms offer different qualities, an increase in the upper bound h on the hidden charge

[24] For a discussion on the role of behavioral economics for antitrust policy, see Bailey (2015).

[25] Inderst and Obradovits (2016) show that their results remain qualitatively unchanged if δ is strictly positive but sufficiently low.

makes it more likely that price and not quality is salient in equilibrium. The idea is that firms lower their unshrouded product prices when higher hidden charges become feasible. In consequence, even though the relative price discount necessary to make the price salient remains unchanged, the absolute price discount necessary to make the price salient becomes lower, such that inducing price salience becomes less expensive for the low-quality firm.

When analyzing the firms' quality choices, Inderst and Obradovits (2016) concentrate on symmetric equilibria. If $q_l - c_l > q_h - c_h$, such that production of the low quality is socially efficient, the firms always choose to produce low-quality products. However, the firms may also choose to produce low-quality products if $q_l - c_l < q_h - c_h$, i.e., even if production of the high quality would be socially desirable. Regarding the intuition for the underprovision of quality in the latter case, due to salient thinking, a low-quality firm can attract many consumers by inducing the price – rather than its own inferior quality – to be salient. This strategy is indeed profitable for a low-quality firm, if sufficiently high hidden charges can be imposed on the consumers. Thus, if the maximum amount h of hidden charges is sufficiently high, then the inefficiently low quality is provided in equilibrium with strictly positive probability. Furthermore, such underprovision of quality becomes more likely in equilibrium as h increases and higher hidden charges become feasible. Interestingly, underprovision of quality is a problem that occurs particularly in markets that are competitive in the sense of having many attentive consumers, as only attentive consumers compare offers and can thus be attracted by low prices.

The authors also explore the case where firms can educate consumers, i.e., where each firm can make consumers aware of all firms' hidden charges by unshrouding its own hidden charge. While the high-quality firm indeed has a strong incentive to unshroud, there is no unshrouding on the equilibrium path.[26] Nonetheless, as long as firms do not benefit too much from exploiting consumers, i.e., for h not overly high, the threat of unshrouding effectively disciplines firms to make efficient quality choices.

Before we discuss how varies policy measures affect welfare, which the authors measure by the sum of firm profits and consumers' true utility, it is important to recognize that the attentive consumers ex-post regret their choices with positive probability in case price is salient, but never in case quality is salient.[27] Policy measures that reduce the firms' hidden charges – i.e., consumer protection policies which enforce higher standards of price transparency – are beneficial for welfare due to the following reasons. First, as explained above, it is then less likely that firms make inefficient choices regarding product quality. Second, consumer make then better choices since it becomes less likely that the price is salient in equilibrium and

[26] Unshrouding has two effects on the firms. First, firms lose their ability to exploit consumers. Second, since consumers are then aware of the firms' total prices and these differ relatively little (as both firms set the same charge), prices are less likely salient after unshrouding. While the first effect is detrimental to the profit of all types of firms, the second effect is beneficial for a firm with a superior quality.

[27] Interestingly, the extent of ex-post regret can be so large that attentive consumers are ex-ante worse off than non-attentive consumers, despite of having a larger choice that than the latter.

thus less likely that consumers ex-post regret their choices. Third, lower hidden charges have a particularly strong effect if firms can educate consumers and the charges are reduced to a level where the threat of unshrouding is effective, which disciplines firms to make efficient quality choices. In contrast, policies that induce more competition, in the sense of increasing the fraction of attentive consumers, can be detrimental for welfare. These policies can backfire by causing firms to make inefficient quality choices.

5.5 Second-degree price discrimination

The model of salient thinking is incorporated in a two-type screening model à la Mussa and Rosen (1978) by Adrian (2016). A monopolist offers a product line to a heterogeneous group of consumers. Absent salience distortions, a consumer's utility from good (q, p) is $u = \theta q - p$, where θ measures a consumer's strength of preference for quality. Specifically, $\theta \in \{\theta_l, \theta_h\}$ and $0 < \theta_l < \theta_h$. A share $\alpha \in (0, 1)$ of consumers has a high marginal utility of quality, i.e., $\theta = \theta_h$, whereas the remaining share $1 - \alpha$ of consumers has a low marginal utility of quality, i.e., $\theta = \theta_l$. The monopolist produces with a constant-returns-to-scale technology and the unit costs of production are increasing in the offered quality. Moreover, the monopolist can offer up to two products. If the consumers are salient thinkers, salience is determined by the products offered by the monopolist; i.e., the consideration set is $\mathcal{C} = \{(q_l, p_l), (q_h, p_h)\}$. Nevertheless, a consumer may decide not to purchase an item.

With rational consumers, the monopolist either offers the standard screening contract or serves only consumers of the high type θ_h. The latter case is optimal if and only if the share α of consumers of type θ_h is sufficiently large.

How does this result change if consumers are salient thinkers? A first important observation is that the same attribute is salient for all consumer types. To see this, recall that in the theory of Bordalo, Gennaioli and Shleifer (2013b) the salience of quality for a particular consumer is rooted in that consumer's subjective evaluation of quality, i.e., effective quality for a consumer of type θ is θq. Homogeneity of degree zero of the salience function then implies that the salience of quality is not specific to the consumer's type because $\sigma(\theta a, \theta \bar{a}) = \sigma(a, \bar{a})$. Moreover, with at most two products being offered, either quality or price is salient for both products.

The optimal contract now takes one of the following three forms: (i) a screening contract where both consumer types are served with different products, (ii) an exclusive contract where only consumers of type θ_h are served, and (iii) a pooling contract where both consumer types are served with the same product. When only one product is sold – i.e., under an exclusive or a pooling contract – the monopolist nevertheless offers a second product. The second product is a decoy good that renders quality salient such that all consumers have a higher willingness to pay. If there are only few consumers of type θ_h, then the pooling contract is optimal. For a moderate number of consumers of type θ_h, the screening contract is optimal. Finally, if there are many consumers of type θ_h, the exclusive contract is optimal.

Interestingly, under a screening contract it is impossible for the monopolist to

make quality salient. Jointly satisfying the participation constraint (PC_l) of consumer type θ_l and the incentive compatibility constraint (IC_h) of consumer type θ_F requires $q_h/q_l < p_h/p_l$ such that always price is salient.

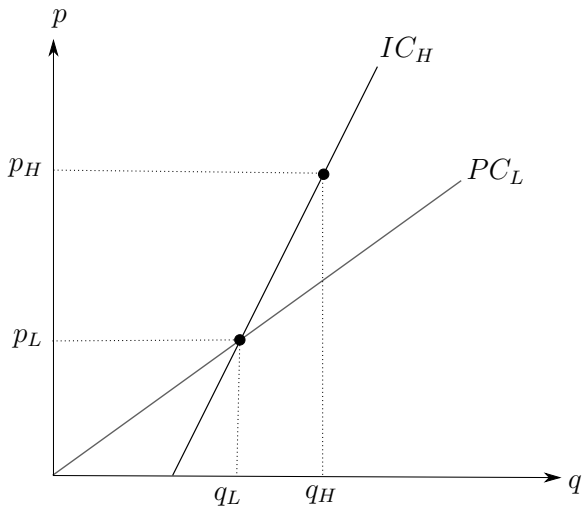

Figure 3: Screening contract.

This observation is illustrated in Figure 3. For the sake of argument, suppose that, as in the standard case, the participation constraint of consumer type θ_l and the incentive constraint of consumer type θ_h are binding. For menus satisfying these two constraints with equality and $q_h > q_l$, it always holds that $p_h/q_h > p_l/q_l$, which implies that price is salient. The fact that price is always salient under a screening contract makes this type of contract less profitable in comparison to the rational benchmark. The other two types of contracts, on the other hand, are more profitable compared to the rational benchmark because here quality is always salient.

6 Empirical support for the model of salient thinking

The model of salient thinking developed by Bordalo, Gennaioli and Shleifer (2013b) is in line with many observations regarding choice anomalies and marketing tactics. For example, the model can rationalize why individuals may think in relative rather than in absolute terms – a feature of human behavior that is nicely illustrated by the classic jacket-calculator experiment from Kahneman and Tversky (1984). Moreover, the model can account for violations of the axiom of *independence of irrelevant alternatives*, like compromise and decoy effects. The decoy effect is illustrated by the subscription example for *The Economist* by Ariely (2008). Experimental evidence regarding the compromise effect is provided by Tversky and Simonson (1993). Here, in one treatment, subjects could choose between a fair toaster for \$20 and good toaster for \$30. In the other treatment, subjects could also choose a very good toaster for \$50. While in the first treatment most subjects opted for the cheapest

toaster, in the second treatment most subjects bought the toaster of good quality at a price of \$30. In the first treatment, both qualities are similar and so price was salient, which made most subjects go for the cheapest option. Adding a high-quality toaster to the choice set shifts the focus away from price to quality. Now, more subjects were willing to pay a higher price for a somewhat better product. As we have outlined in Section 3, this behavior is perfectly in line with the model of salient thinking.

The model of salient thinking is also in line with the observed difference in the reaction of consumers to expected and unexpected price increases. A famous experiment regarding expected price differences is Thaler's (1985) beer example: Imagine that you are sunbathing at the beach on a very hot day. A friend offers to get you an ice-cold beer from the nearest place and she asks for your reservation price. In the first treatment, the nearest place to purchase a cold beer is a holiday resort. In the second treatment, it is a corner store. Most subjects displayed a higher willingness to pay for an ice-cold beer from the holiday resort, where prices are usually high, than from the corner store, where typically prices are rather low. In a field study, Hastings and Shapiro (2013) analyze how consumers react to (unexpected) changes in gasoline prices. They find that when gasoline prices rise, consumers substitute to lower octane gasoline. The extent of this switch, however, can hardly be rationalized by income effects, but is in line with the model of salient thinking if consumers expected the standard (average) price.

Besides this indirect or casual evidence, there is – to the best of our knowledge – only little direct evidence in support of the model of salient thinking so far. Two central predictions of the salience model are tested in an experimental investigation by Dertwinkel-Kalt et al. (2016). To understand the main idea of the experiment, consider the following story, which is highly similar to the motivating example given by Bordalo, Gennaioli and Shleifer (2013b) in the introduction. You are at a wine store and contemplating whether to purchase a *Grauburgunder* from Franconia in Germany or a *Pinot grigio* from Venetia in Italy. Both wines are made from the same grape, but you prefer the Grauburgunder: You think it is 50% better than the Pinot grigio. The Grauburgunder, however, costs €10 per bottle whereas the Pinot grigio costs only €5. Therefore, you purchase a bottle of the Pinot grigio.

Now, suppose that instead of being at a wine store you are at a nice restaurant that offers exactly the same two wines. The bottles are both marked up by €15, so the Grauburgunder costs €25 and the Pinot grigio €20. With the Grauburgunder being only 25% more expensive than the Pinot grigio, you decide to order a bottle of this fine Franconian wine.

Finally, imagine you are at the university canteen and it also offers these two wines. You are uncertain whether wine prices at a canteen are closer to prices at a wine store or at a restaurant. You figure out that the canteen charges the same prices as a restaurant. These high prices surprise you and make the attribute price fairly salient so that you opt for the cheaper Italian wine.

These three stories can be rationalized by salient thinking. A salient thinker is less price sensitive in a high-price environment (restaurant) than in a low-price environment (wine store). At the same time, however, a salient thinker reacts strongly to

unexpected high prices (canteen). Exactly these predictions of the model of salient thinking are tested in a controlled laboratory experiment by Dertwinkel-Kalt et al. (2016). The participants in the experiment had to purchase either fast (high quality) internet access or slow (low quality) internet access. During the experiment, the participants could use the purchased internet access at their disposal and they had no other tasks to fulfill. A few days prior to the experiment, participants received detailed information about the experiment, in particular, about the choice problem and the available options (speed and prices). The authors run three main treatments: a high-price treatment, a low-price treatment, and a treatment with uncertain prices. In the high-price treatment, the prices are €4,50 and €3,50 for the fast and the slow internet access, respectively. In the low-price treatment both prices are reduced by €3,00, so the price for fast and slow access is €1,50 and €0,50, respectively. In order to rule out any income effects, the show up fee is €15 in the high-price treatment and only €12 in the low-price treatment. In the treatment with price uncertainty, subjects did not know prior to the experiment whether they will face high or low prices, but they have been fully informed about the potential prices. In fact, participants of this treatment faced the same choices as participants of the high-price treatment.

A comparison of the high-price with the low-price treatment allows to test whether subjects are less price sensitive in a high-price than in a low-price environment. In the high-price treatment, 27 out of 59 subjects choose the fast internet connection, see Table 2. In the low-price treatment, only 16 out of 57 subjects choose the fast and more expensive option.

	Treatments		
	High Price	Low Price	Unexp. High Price
High Quality (fast)	45.8%	28.1%	26.4%
Low Quality (slow)	54.2%	71.9%	73.6%

Table 2: Experimental results by Dertwinkel-Kalt et al. (2016).

This difference is highly statistically significant. In the treatment with price uncertainty, 14 out of 53 subjects choose the fast internet access. These subjects effectively faced the same choice as the subjects in the high-price treatment but are clearly more price sensitive. This difference is also highly statistically significant.

These results confirm two central predictions of the theory of salient thinking. If prices are expected to be high, subjects focus more on quality and thus the share of subjects who choose a high-quality option at a high price is relatively large. If, on the other hand, prices are expected to be low and thus relative price differences are high, subjects focus more on prices and are more likely to choose a rather cheap option of low quality. Finally, if prices are high but this was not expected, then subjects strongly respond to these high prices and the majority tends to choose a rather cheap option of low quality.[28]

[28]In a field experiment where subjects could purchase a bagel with or without cream cheese, Azar

7 Conclusion

In this chapter, we presented the model of salient thinking as introduced by Bordalo, Gennaioli and Shleifer (2013b) and reviewed the model's most basic implications for consumer choice. Thereafter, we outlined a firm's best response – in terms of its price and quality choice and the design of its product line – to its customers being salient thinkers. We conclude this chapter by discussing potential venues for future research.

First, consumers' purchasing decisions are not only affected by the products available to them, e.g., the quality and price levels at a particular store. There is a huge literature in marketing and retailing pointing out that consumers are influenced by physical stimuli experienced at the point of purchase.[29] For instance, several studies find that music played in a store has an impact on sales and time spent at the store (Turley and Milliman; 2000). Investigating how marketing tactics that do not directly affect the consideration set influence price and quality salience is a fascinating topic for future research. These marketing tactics may reinforce the effects of salient thinking, i.e., decreasing δ in the model. It might also be the case that different marketing tactics crowd out each other so that salient thinking is less important if atmospheric cues are also used to affect customer behavior.

Secondly, in all applications discussed so far, consumers did not face any uncertainty when making their purchasing decisions. It is conceivable, however, that a consumer's evaluation of the products in question in many situations will be affected by uncertainty about some aspect of the economic environment. Financial commodities traded in stock markets almost inherently yield an uncertain return. In insurance markets, insurance companies essentially sell the promise to compensate the buyer of insurance for a potential loss, where the occurrence as well as the size of the loss are usually uncertain when the insurance contract is signed. And also in many commodity markets for experience goods, the actual match-value of a certain product to the consumer's taste often is uncertain before the consumption experience takes place. These examples hint at the importance of extending the model of salient thinking to the choice of products with risky attributes for IO related applications. Bordalo, Gennaioli and Shleifer (2012) propose a theory for how salient thinking affects the choice between risky options. Roughly speaking, when evaluating a particular lottery from a given set of lotteries, a salient thinker's attention is drawn to those states of nature in which the payoff of the lottery in question is most different from the average payoff across the consideration set in the respective state. States of nature with salient payoffs then are hypothesized to be overweighted by a salient thinker relative to their objective occurrence probabilities. As shown by Bordalo, Gennaioli and Shleifer (2012), this salience-induced probability weighting can explain various pieces of empirical evidence which are hard to reconcile with expected utility theory – e.g., different forms of the famous Allais'

(2010) did not find a statistically significant shift in demand when comparing the high-price with the low-price treatment. In fact, more subjects added the cheese (high quality) in the low-price treatment.

[29] For an early contribution on atmospheric effects see Kotler (1973).

paradox or preference reversals between evaluation modes like choosing and pricing.[30] So far, to the best of our knowledge, IO related applications of the concept proposed in Bordalo, Gennaioli and Shleifer (2012) are virtually absent from both theoretical and empirical analysis.[31] We believe that exploring this path seems a highly interesting venue for future work.[32]

Thirdly, it seems safe to say that strategic interaction between firms and/or consumers is at the very core of almost all IO models. Therefore, from a theoretical perspective, a very important question to address is how salient thinking shapes strategic considerations of economic actors and the resulting equilibrium outcome.[33] The identification of overarching patterns and systematic differences to alternative theories of consumer choice – be it standard or behavioral – seems very desirable with regard to organizing observed market outcomes and helpful for attributing these outcomes to their actual sources.

Finally, next to the model of salient thinking by Bordalo, Gennaioli, and Shleifer, other models of context-dependent choice have been proposed, with the main difference being embodied in the determination of the decision weights. For example, in the models of Bushong, Rabin and Schwarzstein (2015) and Kőszegi and Szeidl (2013), decision weights are not determined by comparison of an attribute's actual value to this attribute's average value in the choice set, but by the difference between that attribute's minimum and maximum value in the choice set. Hence, adding options with intermediate attribute values to an existing choice set will not affect decision weights in these models, but will affect salience-induced decision weights in Bordalo, Gennaioli, and Shleifer's model as the average attribute values in the choice set are affected. Thus, one might hope for careful manipulation of the choice set being capable of disentangling whether choices are driven by salient thinking, focusing, or relative thinking. An empirical investigation of which of these models is most suited to address questions related to consumer choice seems imperative to guide future theoretical IO related applications.

[30] Kontek (2016) critically points out that under the model in Bordalo, Gennaioli and Shleifer (2012) the certainty equivalent of a lottery may not be well defined and that monotonicity may be violated.

[31] One notable exception is the analysis of how salient thinking affects asset prices by Bordalo, Gennaioli and Shleifer (2013a), which shows that salient thinking can explain the growth-value puzzle and countercyclical variation in aggregate stock market returns.

[32] For example, Barseghyan et al. (2013) show that probability distortions play an important role in explaining actual insurance deductible choices, and that probability weighting as originated with prospect theory (Tversky and Kahneman, 1979) in this respect seems more important than disappointment aversion (Gul, 1991) or expectation-based loss aversion (Kőszegi and Rabin, 2006, 2007). As salience-induced probability weighting is qualitatively different from probability weighting under prospect theory, it seems worthwhile to investigate to what extent it is actually salient thinking that drives the observed insurance choices.

[33] On the most fundamental level, this relates to the question of equilibrium existence as modifications of the expected utility function may induce non-convexities or discontinuities that may call the existence of equilibrium into question. For example, Dato, Grunewald and Müller (2016) show that under choice-acclimating expectations according to Kőszegi and Rabin (2007) a Nash equilibrium may fail to exist even in most basic games.

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