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Abstract

This paper generalizes the price discrimination framework of Mussa and Rosen (1978) by considering salience-driven consumer preferences in the sense of Bordalo et al. (2013b). Consumers with salience-driven preferences give a higher weight to attributes that vary more. This reduces the monopolist's propensity to treat different types of consumers differently. The paper's main result characterizes the conditions under which the monopolist induces consumers to focus on price rather than on quality.

JEL *classification*: D11, D42, D91, L11
Keywords: Salience, price discrimination, monopolist.

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1 Introduction

Evidence from field and laboratory experiments suggests that preferences can vary with the context (e.g. Kahneman et al., 1990; Simonson and Tversky, 1992). For example, introducing a dominated product might increase another product's demand, giving rise to the so-called decoy (Huber et al., 1982) and compromise (Simonson, 1989) effects. Such context effects cannot be explained by standard preferences since the presence of a product should leave consumer choice between the other products unaffected.

One possible way of explaining context effects is the assumption that consumers attach a higher weight to the attributes of a product that are salient and the salience of the attributes depends on the context.

There is evidence for the effect of salience on the weights given to different attributes. Chetty et al. (2009) find evidence that consumers underreact to changes in taxes if taxes are not salient. Hossain and Morgan (2006), studying the behavior of consumers on eBay, argue that shipping costs are less salient than opening bids. They show that consumers indeed react less to changes in shipping costs than to changes in opening bids. Recent results in neuroeconomics are consistent with the idea that attention modulates the weight given to different attributes (Hare et al., 2009; Fehr and Rangel, 2011). Marketing practitioners engage frequently in differentiating from their competitors' by drawing attention to certain attributes of their products (Zhou, 2008).

Evidence shows that salience depends on how much attributes vary within the choice set. Schkade and Kahneman (1998) consider the choice between living in California and the Midwest and show that individuals place a higher weight on attributes that differ strongly across these two options.

Imagine a supermarket offers two versions of whiskey. They are both single malt whiskeys but differ in their age, with higher age being associated with higher quality. The lower quality version is 12 years old while the higher quality whiskey was in the barrel for 18 years. They are offered for \$30 and \$40, respectively. A consumer values the younger version at 36 and the older version at 54. If the consumer has standard quasi-linear preferences, he prefers the older whiskey since it yields a higher utility. If a consumer has salience-driven preferences, the high quality difference attracts the consumer's attention. The older version is 50% more valuable than the younger version but it is only 30% more expensive. Since quality gets more attention, i.e. since quality is salient, the consumer gives a higher weight to this attribute which makes the older whiskey even more attractive. A couple of weeks later, the same consumer enters the supermarket and finds the two whiskeys are on sale. They are now offered at $15 and $25, respectively. The price difference and the quality difference are still the same. A consumer with standard preferences would again opt for the older whiskey. However, the difference in price now stings out. While the older version is still 50% more valuable, it is now 66.7% more expensive than the younger version. Price is salient to a consumer with salience-driven preferences and thus gets a higher weight. The consumer is not willing to pay the extra $10 anymore and buys the younger whiskey. In this whiskey example, the attention and weight a consumer gives to an attribute depends on whether an offer seems to be a good deal, i.e. has a good quality-price ratio.

Such behavior can be explained by the salience-driven preferences of Bordalo et al. (2013b). In an influential paper, they have proposed a model of salient thinking which incorporates these observations. In their model, consumers give a higher weight to more salient attributes of a product. The salience of an attribute depends on the difference of the attribute's value to the average value of the attribute within the choice set. This implies a context effect because each attribute's average value depends on all products that are offered. If products are defined by only two attributes, quality and price, the model provides the intuitive result that consumers' preferences are biased towards the product with the higher quality-price ratio.

Salient thinking becomes relevant as soon as there is more than one product in the market. Consequently, Bordalo et al. (2016) study the implications of salience-driven consumer preferences for competing firms. However, there is another situation in which several products may coexist. In a market with heterogeneous preferences, a monopolist may offer multiple products in order to separate different types of consumers. It remains an open question how a multi-product monopolist would react to salient thinking if consumers are heterogeneous in their valuation of quality.

Continuing with the example, consider a second type of consumer who has a higher valuation of whiskey. This type values the 12 years old whiskey at 40 and the 18 years old whiskey at 60. Being aware of the differences in valuations, the supermarket can adopt different strategies. He can try to pool both types of consumers either on the young or on the old version of whiskey. Alternatively, the supermarket can choose prices and qualities such that the high valuation type self-selects into buying the old whiskey, while the low type buys the young version. Finally, the supermarket can exclude the low type and only sell one version of the whiskey at a high price. When choosing its strategy, the supermarket has to take into account that the design of its products also influences whether its customers focus on the price or on the age of the whiskeys.

This paper is interested in a monopolist's optimal design of a product portfolio, taking into account its effect on the salience of attributes. It looks at the situation when two versions of the product are possible, e.g. 12 years old and 18 years old whiskey. If the monopolist decides only to sell one version of the product, he could additionally offer a "decoy", i.e. a second version of the product that manipulates consumer's focus without actually being sold. In a next step, I consider the possibility to offer more variants of the product.

In order to investigate the optimal strategy of a monopolist, I introduce the salience-driven consumer preferences of Bordalo et al. (2013b) into the standard monopolist price discrimination model of Mussa and Rosen (1978). A monopolist offers a product portfolio with products that are characterized by their qualities and prices. There are two types of consumers with different valuations of quality. As in Mussa and Rosen (1978), a consumer's valuation of quality is proportional to his type. Consumers have salience-driven preferences, i.e. they give a higher weight to the attribute which is salient. Following Bordalo et al. (2013b), when consumers compare two products, they give a higher weight to quality if and only if the high-quality product has a higher quality-price ratio. Giving a higher weight to quality increases a consumer's willingness to pay since they overestimate the quality. Focussing on price decreases the willingness to pay since it lets consumers overestimate the costs.

The first result of this paper is that in comparison with the benchmark case of consumers with standard preferences, we observe less separation if consumers have salience-driven preferences. Separation of consumers with salience-driven preferences is less profitable than if consumers had standard preferences. At the same time, profits from pooling and excluding low types increase. Assuming that the monopolist faces consumers with standard preferences thus overestimates his propensity to employ price discrimination. Furthermore, when separating consumers with salience-driven preferences, there is a "distortion at the top" in the sense that in case of separation, the monopolist offers a lower quality to the high type than he would if this type was alone in the market.

In a market with two products, the same attribute is salient for both products (Bordalo et al., 2013b). Generally, allowing for heterogeneous consumers entails the possibility that different types focus on different attributes. However, in the simple case of linear preferences as in Mussa and Rosen (1978), all consumers focus on the same attribute. Hence, it becomes a sensible question to ask under what conditions we will observe a price-salient or a quality-salient market.

Which attribute is salient relates directly to the optimal strategy of the monopolist. If there is separation in the market, consumers always focus on price. Separation is optimal for an intermediate range of heterogeneity and share of high types. If there is pooling or exclusion of low types in the market, consumers always focus on quality. This is optimal when heterogeneity is low and the share of high types is large or when heterogeneity is high and the share of high types is low.

For our whiskey example, this implies that a supermarket should optimally adapt the strategy to changes in valuations and share of high types. Assume that during the week, there are few high types. It would thus be optimal to pool the types on the older whiskey and offer the younger version with only a small reduction in price. The younger whiskey serves to attract consumers' attention towards quality. At the weekend, more consumers have a high valuation of alcoholic drinks, which makes it more profitable to separate. In order to separate the high and the low type, the supermarket makes the older whiskey relatively more expensive and the customers focus on the high price difference. Suppose that after a couple of weeks, the share of high value consumers has increased. This new development makes it more profitable for the supermarket to exclude the few low types and sell the older whiskey only to the high types. It decreases the difference in price, which makes consumers focus on quality.

If the monopolist can offer more products, he might be able to separate consumers while making quality salient. It turns out that it is not always possible to find three products which make the optimally separating products quality salient. However, if the monopolist is not restricted in the number of products, he can always induce quality salience in the market by offering multiple decoys. Hence, the model predicts separation with quality salience if development costs of such decoys are low and separation with price salience if development costs are high. As long as development costs are non-zero, the monopolist is less likely to separate than in the benchmark case with standard preferences.

Hence, this paper provides an explanation for the observation that there is little price discrimination even in settings in which we expect consumers to be heterogeneous as e.g. in cinemas or theaters (Huntington, 1993; Leslie, 2004). Pooling is more likely to be observed if there are many consumers with low valuation in the market and heterogeneity is not too high. This is in line with the observation that motels often only offer one category while hotels or airlines offer several categories in order to price discriminate (Hahn et al., 2018).

The rest of the paper is structured as follows. Section 2 reviews the literature on standard price discrimination and price discrimination when consumers have non-standard preferences. Section 3 presents the model, including a review of the salience model of Bordalo et al. (2013b). In Section 4, the benchmark with consumers with standard preferences is considered. Section 5 derives the optimal strategy of a monopolist facing consumers with salience-driven preferences and Section 6 presents some robustness results.

Section 7 concludes.

2 Related literature

2.1 Price discrimination with standard preferences

Price discrimination can be defined as the strategy to offer two or more similar goods at prices that are in different ratios to marginal costs (e.g. books in hardcover and in paperback) (Varian 1989, p.598). Such price discrimination can be observed in situations of imperfect information, i.e. when consumers have different types and a firm cannot directly observe these types. However, the distribution of these types is common knowledge. In order to maximize profits, a monopolist can offer several products and choose the design in such a way that different types of consumers choose different versions of the product. Price discrimination can occur for example in terms of quality, quantity or intertemporally.

One of the first papers studying this problem was Mussa and Rosen (1978). They consider a consumer's utility function $u(q, p; \theta) = \theta q - p$, where q is the quality and p the price of a product. Consumers differ in their valuation of quality θ. Mussa and Rosen (1978) solve the monopolist's problem and compare the offered products under monopoly with the offered products under competition. When there are only two types of consumers and the monopolist wants to separate, he offers the efficient quality to the type with the higher valuation, i.e. the same quality as under competition or perfect information. It is a very general result, that the consumer type with the highest valuation of quality faces a marginal price equal to marginal costs (Varian 1989, p.614). Such "no distortion at the top" is usually also true if interpreted as the same quality being offered to the highest type as if this type was alone in the market. However, this result does not hold if consumers exhibit salient thinking and the monopolist is restricted to two products. If separation is optimal, price is salient and the quality which is offered to the high type is lower than in the absence of the low type. If there was only the high type, the monopolist could offer products which make quality salient and would offer a higher quality.

In the case of two consumer types, the monopolist separates consumers with standard preferences with a high-quality product which has a lower quality-price ratio than the low-quality product. Considering salience-driven preferences, the separation of types also requires offering the higher quality product at a lower quality-price ratio. However, if the monopolist wants to pool both types on the high-quality product or exclude low types, it is optimal for him to offer the higher quality product at a higher quality-price ratio. This allows the monopolist to make consumers focus on quality.

2.2 Price discrimination with non-standard preferences

In recent years, a considerable literature on monopolistic price discrimination with consumers with non-standard preferences has developed. Typically, consumers exhibit some behavioral bias and the monopolist can try to exploit and benefit from this bias. In the case of context-dependent preferences, the monopolist has to take into account his influence on the context. The monopolist then often benefits from offering a "decoy", i.e. an additional product that is not meant to be sold but affects the attention of consumers.

Closest to this paper are papers which consider the monopolist's problem when the relative weights which consumers give to attributes depend on the attributes of the offered products. Consumers weight attributes according to a specific rule, i.e. there is no strategic attention allocation. Dahremöller and Fels (2015) assume that consumers give higher weights to attributes which they value strongly and which vary strongly in the choice set. Furthermore, the cost of considering an additional attribute increases in the number of considered attributes. They show how a monopolist benefits from offering different products even if consumers are homogeneous because it manipulates the expectations of consumers. Considering heterogeneous consumers, they restrict attention to the case in which the monopolist can only offer two products with attributes quality and price. If the optimal products separate the types, the type with high valuation of quality will focus on quality while the type with low valuation focuses on price. The monopolist will thus over-provide quality for the high type and under-provide quality for the low type. This is different to the results of this paper, which say that when the monopolist can only offer two products, separation implies that both types of consumers focus on price. The monopolist will therefore under-provide quality for both types compared to the quality he would offer to consumers with standard preferences. Given the definition of salience of Bordalo et al. (2013b) and linear preferences, it is impossible for the monopolist to make consumer types focus on different attributes. In contrast to that, Dahremöller and Fels (2015) assume that higher weight is given to attributes which have a high difference between highest and lowest type-specific value. This makes it possible that different types focus on different attributes.

Kőszegi and Szeidl (2013) develop a model with focus-weighted utility. Consumers focus and thus give more weight to attributes which have a greater range of consumption utility. The range is defined by the difference of the maximal and the minimal utility which an attribute in the choice set yields. Compared to Dahremöller and Fels (2015), the attention a consumer allocates to an attribute is independent of other attributes' characteristics. Wisson (2015) applies that model of focusing to the monopolist's problem. He finds that if focusing is strong enough, it widens the valuation gap between consumers. In equilibrium, the high type focuses on quality whereas the low type focuses on price. Incentive compatibility constraints do not bind in that case. The monopolist can offer the efficient product to high types and extract almost all surplus, while still serving the low types. In contrast to the case with standard preferences, separation now always dominates only serving high types and pooling is optimal in some situations. An additional insight of Wisson (2015) is that the monopolist does not benefit from offering a decoy in most cases. The difficulty not to make the decoy more desirable than the other products restricts the increase in profits. Again the predictions differ from my result that the monopolist separates with products which make price salient. Making quality salient for one type and price salient for the other type makes it easier to separate and increases profits. However, one of my results says that the monopolist would optimally want both types of consumers to focus on quality since this increases the willingness to pay. He would thus always try to offer decoys which implement this pattern of attention.

In the previous models by Dahremöller and Fels (2015), Kőszegi and Szeidl (2013) and Wisson (2015), the salience of attributes depends on the products in the choice set. The monopolist can influence salience by designing these products. In contrast, Zhou (2008) assumes that salience can directly be influenced by the monopolist. The monopolist can use advertising to draw attention towards some of the product's attributes.

This paper is related to a broader literature on monopolistic pricing in the presence of consumers with non-standard preferences. Carbajal and Ely (2012), Heidhues and Kőszegi (2004), Herweg and Mierendorff (2013), Hahn et al. (2018) and Karle and Möller (2017) consider a monopolist facing loss averse consumers. Hahn et al. (2018) find that loss aversion can explain why we observe pooling more often than expected. Similar to our model, price discrimination comes at a cost. Courty and Nasiry (2016) show how loss aversion can explain uniform/compressed pricing of different quality levels. Allowing the monopolist to offer decoys, our model predicts that he has an incentive to reduce price variance in order to make quality salient. Rotemberg (2011) finds the optimal products for fair consumers and DellaVigna and Malmendier (2004) let consumers discount hyperbolically. Esteban et al. (2007)'s consumers have self-control preferences in the sense of Gul and Pesendorfer (2001). Grubb (2009) lets his monopolist sell to overconfident consumers.

Salient thinking in the sense of Bordalo et al. (2013b) has been considered in other settings as e.g. competitive markets (Bordalo et al. 2016, Herweg et al. 2017) and asset markets (Bordalo et al., 2013a) or combined with limited attention (Inderst and Obradovits, 2015) and attribute shrouding (Inderst and Obradovits, 2016). Herweg et al. 2017 look at heterogeneous consumers in a setting with a brand manufacturer and a competitive fringe and show that the manufacturer benefits from introducing a decoy.

Alternative models of salience are developed e.g. by Kőszegi and Szeidl (2013), Loomes and Sugden (1982) and Gabaix and Laibson (2006).

2.3 Empirical evidence

The salience-driven preferences of Bordalo et al. (2013b) provide an explanation to several observations which are hard to explain by standard preferences. Some evidence on context effects and salience-driven preferences has been mentioned in the introduction. Additional evidence on context effects is provided for example by Thaler (1985). He finds that the willingness to pay for a bottle of beer depends on the shop in which the consumer buys it. Hastings and Shapiro (2013) report that when the price of gasoline increased, surprisingly many consumers switched to cheaper low-quality gasoline. Evidence that individuals focus on salient characteristics is shown e.g. by Barber and Odean (2008). They find that investors simplify a decision by choosing the salient option. A lot of research in political science has been done on the choice of candidates on a ballot. Ho and Imai (2008) find that being the first, and thus salient, candidate on the list improves the chances to be chosen. Chetty et al. (2009) show that consumers react more strongly to tax changes if taxes are salient. Finally, Dertwinkel-Kalt et al. (2017) find strong support for the implications of salience-driven preferences in a laboratory experiment.

It is difficult to find evidence on products which are offered only in order to manipulate the consumer choices since firms are usually reluctant to reveal their strategies. However, some evidence suggests that they actually do offer such decoys. Ariely (2008) runs an experiment in which he tests the offer of The Economist. He finds that the introduction of a third, dominated option increases the share of consumers choosing the expensive offer. Vikander (2010) considers Audi advertising a premium car in halftime of super bowl as an example of a firm offering a high-quality product at a high price to consumers who are not supposed to buy it. Eliaz and Spiegler (2011) explain that Apple concentrates the advertisement for its MacBook Air on the extreme feature of being very thin. This attracts consumers into the store where they learn that the MacBook Air has, for example, no DVD drive. Eliaz and Spiegler (2011) interpret the healthy food at McDonald's as a strategy to attract consumers with a healthy image, without the intention to sell it. These decoy products have in common that they are rather bad deals in the sense of a low quality-price ratio. While most of them are high-quality products which are offered at a high price, also low-quality products can serve as decoys. Heath and Chatterjee (1995) report a meta-analysis of evidence for the effect of low-quality decoys. Jahedi (2011) conducts lab experiments to show how bargains influence consumers' decisions. He finds evidence that participants rather buy a product if it is presented next to a less attractive offer. Facing consumers with salience-driven preferences, I find that the monopolist offers low-quality decoys whenever he wants to pool or to exclude the low types. Thereby, he can attract consumer attention towards quality.

3 Model

Following the seminal model by Mussa and Rosen (1978), consider a monopolist facing consumers with different valuations of quality.

There is a continuum of consumers. A share $\alpha \in (0,1)$ is of type H and a share $(1-\alpha)$ is of type L. Consumer i's experience utility from consuming a product with quality q and price p is given by quasi-linear preferences for $i = L, H$:

$$u_i(q,p) = \theta_i q - p, \tag{1}$$

where θ_i denotes the valuation of quality. The two types of consumers value quality differently with $\theta_H = 1$ and $\theta_L = \theta < 1$. With such preferences, the difference in types can be interpreted as difference in income and higher income increases the demand.[1]

The monopolist offers products with quality q and price p. The production technology exhibits constant returns to scale and production costs are increasing in quality at an increasing rate. For simplicity, assume that costs take the form $c(q) = \frac{1}{2}q^2$.[2] The monopolist's problem is to offer a product portfolio that maximizes his profit. Since the monopolist cannot observe the

[1] I will show in Section 6.3 that the results hold for any quasi-linear utility function $u(q,\theta_i) - p$, with $u(q,\theta_i)$ increasing and concave in q, increasing in θ_i and satisfying the single-crossing property (a type with higher valuation has a higher marginal utility of quality).

[2] In Section 6.4, I generalize the main results to any increasing, strictly convex cost function, i.e. any $c(q)$ with $c'(q) > 0$, $c''(q) > 0$ and $c(0) = 0$.

type of the consumer, he offers the same product portfolio to all consumers. Consumers observe all products that are offered. Since in Mussa and Rosen (1978) it is optimal for the monopolist to offer at most two products, I start with the assumption that the monopolist is restricted to two products. This restriction can be justified by high and increasing development costs. While the development costs of a second product can be covered by the additional profit, the development costs of a third product are for now assumed to be too high. Alternatively, one can think of products, where only two versions are possible. For example, there is typically only a first and a second class in the train. Books are offered with paperback or with hardcover. Food products have a standard and an organic version. In Section 6, I consider the monopolist's problem when he could offer three or more products.

Following Bordalo et al. (2013b), consumers have salience-driven preferences. If one attribute is more salient than the other, consumers give more weight to that attribute. Their decision utility $u^d(q,p)$ therefore differs from their experience utility. If quality is salient, price gets lower weight, characterized by the salience parameter $\delta \in (0,1]$. If price is salient, quality gets lower weight δ. A consumer of type $i = H, L$ thus considers the following decision utility[3]:

$$u_i^d(q,p) \quad = \quad \begin{cases} \theta_i q - \delta p & \text{if quality is salient} \\ \delta\theta_i q - p & \text{if price is salient} \\ \theta_i q - p & \text{if price and quality are equally salient.} \end{cases} \tag{2}$$

Which attribute gets more attention is not chosen by the consumer but is endogenously determined by the monopolist's choice of offered products. The salience of an attribute a depends on its distance to this attribute's value of a reference product. The reference product is defined by the average values of each attribute $\bar{a} = \frac{1}{N}\sum_j a_j$, where N is the number of products $(j = 1, .., N)$ in the consideration set. I assume that the consideration set consists of the products offered by the monopolist. Nevertheless, the consumer can always decide not to buy.[4] The salience of an attribute a is then given by the symmetric and continuous salience function $\sigma(a, \bar{a})$. There are two important

[3]For simplicity, I use the same utility function as Bordalo et al. (2016).

[4]This assumption differs from the assumption of Bordalo et al. (2013b). They consider the outside option to be part of the consideration set.

assumptions on this salience function: ordering and homogeneity of degree zero. Ordering means that a higher distance from an attribute to its average leads to a higher value of the salience function:

Assumption 1 (Ordering). *Let $\mu = sgn(a_j - \bar{a})$. Then for any $\epsilon, \epsilon' \geq 0$ with $\epsilon + \epsilon' > 0$, we have*

$$\sigma(a_j + \mu\epsilon, \bar{a} - \mu\epsilon') > \sigma(a_j, \bar{a}). \tag{3}$$

Intuitively, higher differences attract the attention more strongly. The second assumption captures the idea that the salience of an attribute is independent of its unit of measurement:

Assumption 2 (Homogeneity of degree zero).

$$\sigma(\alpha a_j, \alpha\bar{a}) = \sigma(a_j, \bar{a}) \quad \textit{for all} \quad \alpha > 0. \tag{4}$$

Assuming that the salience function is homogeneous of degree zero and satisfies ordering implies diminishing sensitivity for positive attribute levels. The same distance to the average leads to a lower salience at higher levels of a and $\bar{a}$:

Diminishing sensitivity: For any $a_j, \bar{a} \geq 0$ and all $\epsilon > 0$, we have

$$\sigma(a_j + \epsilon, \bar{a} + \epsilon) > \sigma(a_j, \bar{a}). \tag{5}$$

Diminishing sensitivity incorporates Weber's law into the salience function. Weber's law says that the perceived change in stimuli gets smaller at higher initial levels of the stimuli.

Considering only two attributes, quality and price, quality is salient for a product j and a consumer i if and only if the salience function is higher for quality than for price:

$$\sigma(\theta_i q_j, \theta_i \bar{q}) > \sigma(p_j, \bar{p}). \tag{6}$$

Price is salient if and only if $\sigma(\theta_i q_j, \theta_i \bar{q}) < \sigma(p_j, \bar{p})$ and price and quality are equally salient if and only if $\sigma(\theta_i q_j, \theta_i \bar{q}) = \sigma(p_j, \bar{p})$. In contrast to Bordalo et al. (2013b), consumers are heterogeneous in their valuation of quality. It is assumed that the salience of quality is defined by the subjective utility from quality $\theta_i q$ and not by objective quality q. However, it follows directly from the assumption of homogeneity of degree zero and the linearity of preferences that the value of the salience function is independent of the type of a consumer:

$$\sigma(\theta_i a_j, \theta_i \bar{a}) = \sigma(a_j, \bar{a}) \text{ for all } \theta_i > 0. \tag{7}$$

Whether a product's price or a product's quality is salient does therefore not depend on the type of the consumer. The same attribute is salient for all types and which attribute is salient thus constitutes a feature of the market under consideration.[5]

We can use Proposition 1 from Bordalo et al. (2013b) in order to determine which attribute is salient. Homogeneity of degree zero of the salience function implies that the salience of attributes is determined by the quality-price ratio of a product. Given a product (q_j, p_j) is neither dominated nor dominates the reference product $(\bar{q}, \bar{p})$, i.e. $(q_j - \bar{q})(p_j - \bar{p}) > 0$, then the advantage of that product (higher quality or lower price) is salient if and only if

$$\frac{q_j}{p_j} > \frac{\bar{q}}{\bar{p}}. \tag{8}$$

In the case of two products (q_H, p_H) and (q_L, p_L) with $q_H > q_L$ and $p_H > p_L$, the Proposition implies that quality is salient for both products if and only if

$$\frac{q_H}{p_H} > \frac{q_L}{p_L}, \tag{9}$$

whereas price is salient when the inequality is reversed. Quality is salient if and only if the quality-price ratio of the high-quality product is higher than the quality-price ratio of the low-quality product.

Without taking into account salient thinking, the monopolist will separate by offering the high-quality product at a higher price per quality. Price will

[5]This result relies on preferences being linear in the taste parameter θ. Hence, it also holds for experience utility given by $\theta_i u(q) - p$. If experience utility is equal to $u(q, \theta_i) - p$, different types might focus on different attributes.

then be salient, which reduces the willingness to pay of the consumers and might thus not be in the best interest of the monopolist. In the next section, I will derive this benchmark result when consumers have standard preferences.

4 Benchmark with standard preferences

The monopolist can offer two different products and induce types to separate or he can pool by selling the same product to both types. As a third option, he can exclude the low type from the market by offering a product(s) that only the high type is willing to buy. In this section, I will review the results from the model of Mussa and Rosen (1978) with two types of consumers and use it as a benchmark. In the following section, the optimal product portfolio for consumers with salience-driven preferences is determined in order to compare it with the benchmark.

If the monopolist wants to separate the two types, he has to take into account the participation constraints (PC) and the incentive compatibility constraints (IC). The monopolist's problem is

$$\begin{aligned}
\max_{p_H, p_L, q_H, q_L} \quad & \alpha(p_H - \frac{1}{2}q_H^2) + (1-\alpha)(p_L - \frac{1}{2}q_L^2) & \\
\text{s.t.} \quad & \theta q_L - p_L \geq 0 & PC_L \\
& q_H - p_H \geq 0 & PC_H \\
& \theta q_L - p_L \geq \theta q_H - p_H & IC_L \\
& q_H - p_H \geq q_L - p_L. & IC_H
\end{aligned}$$

It is well known that the participation constraint of the low type and the incentive compatibility constraint of the high type will be binding. The other two constraints are then redundant. The optimal products satisfy the first order conditions: $q_H^B = 1$ and $q_L^B = \theta - \frac{\alpha}{1-\alpha}(1-\theta)$. Profits from separation are $\pi_S^B = \frac{1}{2}\frac{1}{1-\alpha}(\theta^2 + \alpha - 2\alpha\theta)$, where I use the superscript B to denote the benchmark.

Such separation is possible only for $\theta \geq \alpha$ since the quality offered to low types must be non-negative. If the valuation of the low type is lower, the monopolist benefits from excluding the low type from the market and designing a product for high types only. The participation constraint of the high type is then binding. The following first order condition gives us the optimal product: $q_E^B = 1$. The monopolist's profits from exclusion are $\pi_E^B = \frac{1}{2}\alpha$.

If the monopolist decides to sell the same product to both types of consumers, the participation constraint of the low type is binding. The optimal pooling product is characterized by the first order condition: $q_P^B = \theta$. The monopolist's profits amount to $\pi_P^B = \frac{1}{2}\theta^2$.

Comparing the profits from the different strategies identifies the optimal strategy of the monopolist. I assume that the monopolist always separates when he is indifferent. The monopolist prefers separation to exclusion if and only if

$$\pi_S^B \geq \pi_E^B \Leftrightarrow (\theta - \alpha)^2 \geq 0. \tag{10}$$

The monopolist prefers separation to pooling if and only if

$$\pi_S^B \geq \pi_P^B \Leftrightarrow (1 - \theta)^2 \geq 0. \tag{11}$$

Both conditions are always fulfilled, so whenever separation is possible it is optimal for the monopolist. Finally, exclusion is preferred to pooling if and only if

$$\pi_E^B \geq \pi_P^B \Leftrightarrow \theta \leq \alpha^{1/2}. \tag{12}$$

In case of quadratic costs and consumers with standard preferences, the monopolist's optimal strategy is to separate if $\theta \geq \alpha$, and to exclude low types otherwise. The monopolist's optimal strategy is thus to always differentiate the consumers' types. Proposition 1 summarizes these results:

Proposition 1. *Given standard preferences, the optimal strategy of the monopolist can be characterized as follows:*

1. **Separation***: If $\theta \geq \alpha$, the monopolist separates with $q_H^B = 1$ and $p_H^B = \frac{1}{1-\alpha}[1+\theta^2-(1+\alpha)\theta]$, $q_L^B = \theta - \frac{\alpha}{1-\alpha}(1-\theta)$ and $p_L^B = \theta^2 - \frac{\alpha}{1-\alpha}\theta(1-\theta)$.*

2. **Exclusion***: If $\theta < \alpha$, the monopolist only serves high types with $q_E^B = 1$ and $p_E^B = 1$.*

If the valuation of the low types is high enough, it is optimal for the monopolist to sell to both types and design the products such that high and low types separate. The high type is offered the efficient quality while the low type's quality is distorted downwards to make sure the high type does not deviate to the low-quality product. If the valuation of quality of the low type is low, the monopolist does better by excluding low types and extracting the whole rent from high types. The monopolist still offers the efficient quality to high types, but can now ask for a higher price for the high-quality product.

5 Salience-driven consumer preferences

When consumers exhibit salience-driven preferences, the monopolist has to take into account how the design of his product portfolio affects the salience of the products' attributes. Participation and incentive compatibility constraints of the consumers depend on whether quality or price (or neither) is salient. The monopolist can again choose between separation, exclusion and pooling the two types of consumers. Considering these strategies separately, it turns out that there are direct relationships between the strategies and the salience of attributes. In the following subsections, these relationships between strategies and salience, the profits and the optimal products are derived.

5.1 Separation with quality salience

If consumers have salience-driven preferences, it seems intuitive that letting the two types focus on different attributes would make separation easier. However, we already found that it is impossible to design two products which make one type of consumer focus on quality and the other type focus on price. The monopolist can only "choose", by designing the products accordingly, whether consumers focus on quality or on price (or on neither). The consumers' willingness to pay is higher if quality is salient because it makes them discount, in relative terms, the payment they have to make. It therefore seems promising for the monopolist to make quality salient. In order to make quality salient, he has to design his products such that the high-quality version has a higher quality-price ratio:

$$\frac{q_H}{p_H} > \frac{q_L}{p_L}. \tag{13}$$

However, independent of the weight a consumer attaches to quality and price, the following holds: any two products which satisfy condition (13) cannot satisfy simultaneously the participation constraint and the incentive compatibility constraint of the low type. Making quality salient requires offering the higher quality at a lower price per quality. Since preferences are linear, a product with higher quality offered at a lower price per quality would be strictly preferred by the low type. Figure 1 shows that given a low-quality product (q_L, p_L) which the low type would accept, any higher quality product which makes quality salient is strictly preferred by the low type.

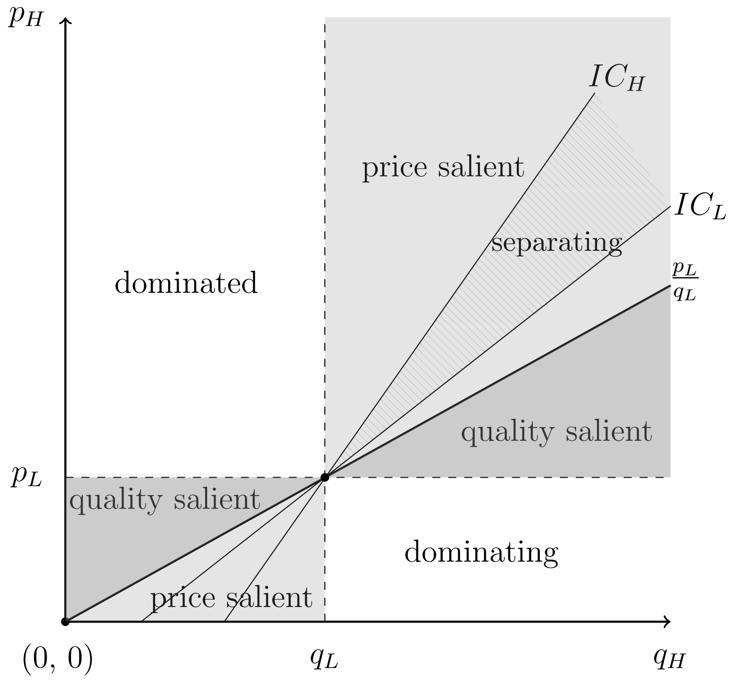

Figure 1: **Separating consumers with salience-driven preferences.** If the participation constraint of the low type is satisfied, the incentive compatibility constraint of the low type is steeper than the constant ratio line p_L/q_L. Then, any product which would separate the two types needs to have a higher price-quality ratio than product L and hence would make price salient.

Lemma 1. *Suppose there is a product* (q_L, p_L) *which satisfies the participation constraint of a consumer with utility* $u(q,p) = \theta q - \delta p$, $\delta \in (0,1]$. *Then, any product* (q_H, p_H) *with higher quality* $q_H \geq q_L$ *and higher price* $p_H \geq p_L$ *which makes quality salient, i.e.* $\frac{q_H}{p_H} > \frac{q_L}{p_L}$, *is strictly preferred to* (q_L, p_L).

Lemma 1 implies that it is impossible for the monopolist to separate consumers who focus on quality with two products which indeed make quality salient. The same is true if consumers are focusing on price or on neither of the attributes. Hence, the monopolist cannot separate consumers with two products which make quality salient. The proof can be found in the Appendix.

5.2 Separation with price salience

The analysis in the previous section has shown that the monopolist is not able to separate consumers with products which make quality salient. Furthermore, I show in the Appendix that the monopolist would never separate with products which induce neutral salience. It remains to check whether the monopolist can and wants to separate consumers while making price salient. Price is salient if and only if the quality-price ratio of the low-quality product is higher than the quality-price ratio of the high-quality product. Figure 1 shows that any higher quality product which satisfies the conditions for separation lies in the area of price salience, given the incentive compatibility constraint of the low type is not binding. Therefore, any separating products will induce price salience. In order to find the optimal products for the monopolist, we have to solve the profit maximization problem of the monopolist given price salience. The monopolist faces the participation and incentive compatibility constraints of consumers who give a higher weight to prices:

$$
\begin{aligned}
&\delta\theta q_L - p_L \geq 0 && PC_{LP}\\
&\delta q_H - p_H \geq 0 && PC_{HP}\\
&\delta\theta q_L - p_L \geq \delta\theta q_H - p_H && IC_{LP}\\
&\delta q_H - p_H \geq \delta q_L - p_L. && IC_{HP}
\end{aligned}
$$

Redefining types as $\theta'_L = \delta\theta$ and $\theta'_H = \delta$, it is clear that the problem can be solved in the standard way. In the optimum, the participation constraint of the low type and the incentive compatibility constraint of the high type are binding: $p_L = \delta\theta q_L$ and $p_H = \delta(q_H - q_L) + \delta\theta q_L$. The participation constraint of the high type and the incentive compatibility constraint of the low type are then redundant. The monopolist maximizes his profits:

$$\max_{q_H, q_L} \ \alpha[\delta(q_H - q_L) + \delta\theta q_L - \frac{1}{2}q_H^2] + (1-\alpha)[\delta\theta q_L - \frac{1}{2}q_L^2]. \tag{14}$$

The first order conditions define the optimal qualities. The optimal prices are then determined by the binding participation constraint of the low type and the binding incentive compatibility constraint of the high type:

$$q_H = \delta, \tag{15}$$

$$q_L = \delta\theta - \frac{\alpha}{1-\alpha}\delta(1-\theta), \tag{16}$$

$$p_H = \delta^2 \frac{1}{1-\alpha}[1 + \theta^2 - (1+\alpha)\theta], \tag{17}$$

$$p_L = \delta^2\theta^2 - \frac{\alpha}{1-\alpha}\delta^2\theta(1-\theta). \tag{18}$$

The optimal separating products given price salience indeed satisfy the price salience condition:

$$\frac{q_H}{p_H} < \frac{q_L}{p_L} \Leftrightarrow 0 < \frac{(1-\theta)^2}{\delta\theta[1-\theta+\theta(\theta-\alpha)]}. \tag{19}$$

The condition $\theta \geq \alpha$ is again necessary for separation to exist and be possibly optimal because first, the monopolist cannot offer products with negative quality and second he would make zero profit on low types if $\theta < \alpha$ and then prefers to exclude them (see Section 5.3).

Similar to the benchmark case with standard preferences, there is no distortion at the top given price salience. The low quality is distorted downwards relative to the efficient price-salient quality in order to discourage the high types from deviating. When interpreting the "no distortion at the top" result as quality being the same as when the consumer type was alone in the market, the results change compared to the benchmark case. I show in Section 5.3 that if the high type was alone in the market, the monopolist would be able to make quality salient and would offer a higher quality in order to benefit from the high willingness to pay. The presence of the low type makes price salience necessary and reduces the quality offered to the high type.

Compared to the benchmark case, the willingness to pay of consumers who focus on price is lower. The quality offered to consumers with salience-driven preferences is therefore lower, discounted by the salience parameter δ. The monopolist's profit from separating consumers is then:

$$\pi_S = \delta^2 \frac{1}{2} \frac{1}{1-\alpha}(\theta^2 + \alpha - 2\alpha\theta). \tag{20}$$

If salience becomes more important, i.e. if δ decreases, profits decrease.

Taking into account the salience of the consumers, it turns out that a monopolist cannot separate with quality salience and separating with neutral salience is never optimal. The monopolist only separates with products that make price salient.

Proposition 2. *If it is optimal for a monopolist to separate consumers, he separates by use of a product portfolio which makes price salient.*

Proposition 2 shows that if consumers have salience-driven preferences, separation comes at a cost. In order to separate, the monopolist uses a product portfolio which makes price salient and decreases the willingness to pay of the consumers. This has a negative effect on his profits from separation.

5.3 Exclusion

If the monopolist excludes the low types, he offers a product (q_E, p_E) which satisfies the participation constraint of the high types but not of the low types. The willingness to pay for the product of the high type is highest when its quality is salient. Therefore, the monopolist could benefit from offering a second product (q_D, p_D) which makes quality salient. This second product is offered as a decoy, in the sense that it draws consumers' attention towards quality but is not meant to be sold. Hence, the decoy must be designed such that quality becomes salient and both types do not choose to buy it. Given the exclusion product (q_E, p_E) satisfies the participation constraint of the high type, Lemma 1 (with $\theta = 1$) implies that it is impossible to use a higher quality product as a decoy. Any higher quality product which makes quality salient would be preferred by the high type. In contrast to that, Lemma 2 below shows that any lower quality product with $q_D < q_E$ and $p_D < p_E$ which makes quality salient would not be preferred by the high type.

Lemma 2. *Suppose there is a product (q_E, p_E) which satisfies the participation constraint of a consumer with utility $u(q, p) = q - \delta p$, $\delta \in (0, 1]$. Then, any product (q_D, p_D) with lower quality $q_D \leq q_E$ and lower price $p_D \leq p_E$ which makes quality salient, i.e. $\frac{q_D}{p_D} < \frac{q_E}{p_E}$, is strictly dominated by (q_E, p_E).*

The proof of Lemma 2 can be found in the Appendix. In order to make sure that the low type does not buy the decoy, his participation constraint must be taken into account. The exclusion product does not satisfy the participation constraint of the low type: $\frac{q_E}{p_E} < \theta$. Any lower quality product which makes quality salient does not satisfy the participation constraint either, since $\frac{q_D}{p_D} < \frac{q_E}{p_E} \Rightarrow \frac{q_D}{p_D} < \theta$.

All products in the shaded area in Figure 2 satisfy the conditions for a decoy, i.e. $\frac{q_D}{p_D} < \frac{q_E}{p_E}$, $q_D < q_E$ and $p_D < p_E$. Such an area always exists. Consider e.g. a product $(x, p_E - \epsilon)$ with $0 < x < q_E$. There always exists a sufficiently small $\epsilon > 0$ such that $\epsilon < \frac{p_E}{q_E}(q_E - x)$, which implies quality salience.

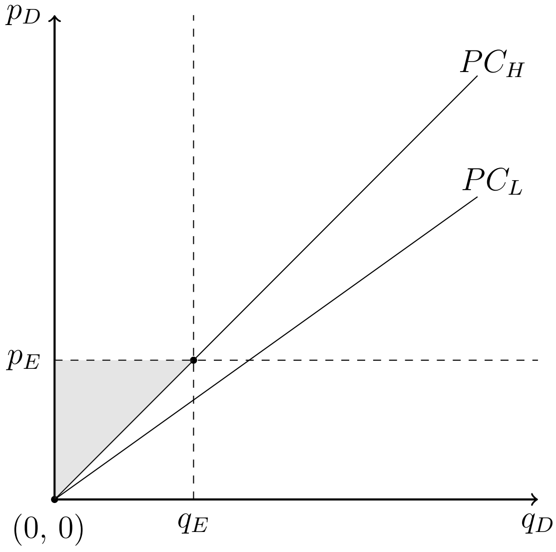

Figure 2: **Possible decoys given exclusion product** (q_E, p_E)**.** For any product E which makes the participation constraint of the high type binding, there exists an area (gray) with products that have a lower price, a lower quality and a lower quality-price ratio than product E. The lower quality and the lower quality-price ratio imply that neither of the consumer types would prefer a product in that area.

If the exclusion product (q_E, p_E) satisfies the participation constraint of the high type, the monopolist always finds a low-quality decoy that makes quality salient. He can thus choose the exclusion product in order to maximize his profits, only considering the participation constraint of the high type given quality is salient. The participation constraint of the high type will be binding $p_E = \frac{1}{\delta} q_E$. The monopolist maximizes his profit:

$$\max_{q_E} \ \frac{1}{\delta} q_E - \frac{1}{2} q_E^2. \tag{21}$$

The optimal quality is defined by the first order condition and the optimal price is determined by the binding participation constraint of the high type:

$$q_E = \frac{1}{\delta}, \qquad\qquad p_E = \frac{1}{\delta^2}. \tag{22}$$

The monopolist will offer the efficient quality for high types who focus on quality. The monopolist's profit from exclusion is

$$\pi_E = \frac{1}{\delta^2}\frac{1}{2}\alpha. \tag{23}$$

If salience becomes more important, consumers give a higher relative weight to quality in case of quality salience. The monopolist's profit from exclusion increases.

Proposition 3. *The monopolist always excludes low types by use of a product portfolio that makes quality salient.*

If consumers have salience-driven preferences, the monopolist can increase the consumers' willingness to pay by excluding low types and making quality salient. Exclusion thus entails the advantage of making quality salient. The decoy which is offered together with the exclusion product needs to have the following characteristics:

$$0 \leq q_D < \frac{1}{\delta}, \qquad\qquad \frac{1}{\delta}q_D < p_D < \frac{1}{\delta^2}. \tag{24}$$

As it is typical for decoys, it is a "bad deal", i.e. it has a lower quality-price ratio than the product which is meant to be sold.

5.4 Pooling

If the monopolist pools the two types, he would again want to offer an additional product (q_D, p_D) as a decoy to make quality salient. Since the pooling product satisfies the participation constraint of both consumer types, Lemma 1 and Lemma 2 can be applied for both consumer types. Given the pooling product (q_P, p_P), Lemma 1 implies that all high-quality products that make quality salient would be preferred by both types and hence cannot be used as a decoy. Lemma 2, in contrast, says that any lower quality product with $q_D < q_P$ and $p_D < p_P$ which makes quality salient is not preferred by consumers. Thus it is sufficient to show that there always exists a lower quality product which makes quality salient. Given (q_P, p_P), all products in the shaded area in Figure 3 are of lower quality and have a lower quality-price ratio. They can thus be used as decoys.

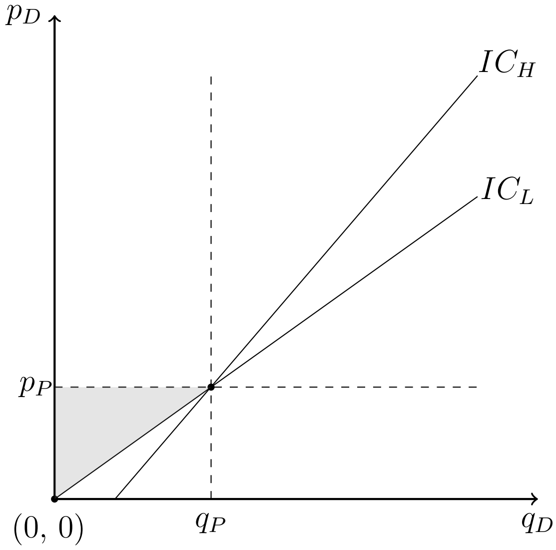

Figure 3: **Possible decoys given pooling product (q_P, p_P).** For any product P which would pool the two types, there exists an area (gray) with products that have a lower price, a lower quality and a lower quality-price ratio than product P. The lower quality and the lower quality-price ratio imply that neither of the consumer types would prefer a product in that area.

Again, such an area always exists. Consider e.g. a product $(x, p_P - \epsilon)$ with $0 < x < q_P$. There always exists an $\epsilon > 0$ such that $\epsilon q_P < p_P(q_P - x)$, which implies quality salience.

It is always possible to find a decoy that makes quality salient when pooling. Therefore, the monopolist can choose the pooling product only considering the participation constraints of both types given quality is salient. The participation constraint of the low type is more restrictive and will thus be binding $p_P = \frac{1}{\delta}\theta q_P$. The monopolist maximizes his profit:

$$\max_{q_P} \quad \frac{1}{\delta}\theta q_P - \frac{1}{2}q_P^2. \tag{25}$$

The first order condition and the binding participation constraint of the low type determine the optimal product:

$$q_P = \frac{1}{\delta}\theta, \qquad\qquad p_P = \frac{1}{\delta^2}\theta^2. \tag{26}$$

The monopolist will offer the efficient quality for low types who focus on quality. Consumers' willingness to pay is higher if they overvalue quality. Quality and price are therefore higher than in the case of consumers with standard preferences. The monopolist's profits from pooling amount to

$$\pi_P = \frac{1}{2}\frac{1}{\delta^2}\theta^2. \tag{27}$$

A stronger distortion of weights compared to the benchmark case imply that consumers have a higher willingness to pay in case of quality salience. The monopolist's profit from pooling increases in the strength of salience.

Proposition 4. *The monopolist always pools by use of a product portfolio that makes quality salient.*

Salient thinking of consumers enables the monopolist to increase their willingness to pay. In the same way as exclusion, pooling thus comes at the benefit of making quality salient. Given the pooling product, the monopolist offers a decoy with:

$$0 \leq q_D < \frac{1}{\delta}\theta, \qquad\qquad \frac{1}{\delta}\theta q_D < p_D < \frac{1}{\delta^2}\theta^2. \tag{28}$$

In the case of pooling and of exclusion, the monopolist benefits from offering a second product with lower quality and lower price. Since the exclusion product has higher quality and price than the pooling product, the decoy can also have higher attribute values in this case. Decoys are used to make quality salient and therefore only appear if they successfully do so. There are no decoys when we observe price salience.

5.5 Optimal strategy

In the last subsections, I derived the monopolist's strategies and the profits he can achieve by applying them. The monopolist can choose to separate by use of a product portfolio which makes price salient. Alternatively, he can exclude the low types or pool both types by use of product portfolios which make quality salient. The monopolist's profits given each strategy are:

$$\text{Separation: } \pi_S = \frac{1}{2}\frac{1}{1-\alpha}\delta^2(\theta^2+\alpha-2\alpha\theta) \tag{29}$$

$$\text{Exclusion: } \pi_E = \frac{1}{2}\frac{1}{\delta^2}\alpha \tag{30}$$

$$\text{Pooling: } \pi_P = \frac{1}{2}\frac{1}{\delta^2}\theta^2. \tag{31}$$

In order to find the optimal strategy given the valuation θ and the share of high types α, the monopolist compares these profits. When the monopolist decides between separation with price salience and pooling with quality salience, he prefers separation if and only if the relative valuation of low types is low enough:

$$\pi_S \geq \pi_P \Leftrightarrow \theta \leq \frac{\delta^2\sqrt{\alpha^2\delta^4+\alpha(1-\alpha-\delta^4)}-\alpha\delta^4}{1-\alpha-\delta^4} \equiv \hat{\theta}_1(\alpha). \tag{32}$$

The difference $\pi_S - \pi_P$ is decreasing in θ. Hence, it is positive if and only if θ is not too high. In the benchmark case, separation was always preferred to pooling. However, in the presence of salient thinking, separation requires consumers to focus on price which reduces the profit. In contrast to that, the profit from pooling increases since quality is salient which makes consumers willing to pay more. Therefore, there is now a range of high valuations for which pooling is the optimal strategy when consumers exhibit salience-driven preferences.

Comparing the profits from pooling and exclusion, the monopolist prefers to exclude if and only if the valuation of the low type is not too high:

$$\pi_E \geq \pi_P \Leftrightarrow \theta \leq \alpha^{1/2} \equiv \hat{\theta}_2(\alpha). \tag{33}$$

Salient thinking of consumers does not change the payoff-comparison between pooling and excluding. Both strategies make quality salient which increases profits by the same factor.

Finally, the difference $\pi_S - \pi_E$ increases in θ whenever $\alpha \leq \theta$, i.e. whenever separation is possible. Hence, there is a third threshold for the valuation of the low type $\hat{\theta}_3(\alpha)$:

$$\pi_S \geq \pi_E \Leftrightarrow \theta \geq \alpha + \alpha^{1/2}(1-\alpha)^{1/2}\left(\frac{1}{\delta^4} - 1\right)^{1/2} \equiv \hat{\theta}_3(\alpha). \qquad (34)$$

For valuations above this threshold, separation is preferred to exclusion. Given salient thinking of consumers, the profits from exclusion increase if δ decreases, while the profits from separation decrease. It is thus less likely than in the benchmark case that the monopolist prefers separation, i.e. $\hat{\theta}_3(\alpha) \geq \alpha$.

Proposition 5 uses the three thresholds and provides a formal description of the monopolist's optimal strategy:

Proposition 5. *The optimal strategy of the monopolist given salience-driven preferences can be characterized as follows:*

1. **Separation***: If* $\hat{\theta}_1 \geq \theta \geq \hat{\theta}_3$*, the monopolist separates with products L and H:* $q_H = \delta$ *and* $p_H = \delta^2 \frac{1}{1-\alpha}[1+\theta^2-(1+\alpha)\theta]$, $q_L = \delta\theta - \frac{\alpha}{1-\alpha}\delta(1-\theta)$ *and* $p_L = \delta^2\theta^2 - \frac{\alpha}{1-\alpha}\delta^2\theta(1-\theta)$*. Price is salient for both products.*

2. **Exclusion***: If* $\theta \leq \min[\hat{\theta}_2, \hat{\theta}_3]$*, the monopolist only serves high types with product E:* $q_E = \frac{1}{\delta}\alpha$ *and* $p_E = \frac{1}{\delta^2}\alpha$*. He additionally offers a decoy D:* $0 \leq q_D < \frac{1}{\delta}$ *and* $\frac{1}{\delta}q_D < p_D < \frac{1}{\delta^2}$*. Quality is salient for both products.*

3. **Pooling***: If* $\theta \geq \max[\hat{\theta}_1, \hat{\theta}_2]$*, the monopolist serves both types of consumers with product P:* $q_P = \frac{1}{\delta}\theta$ *and* $p_P = \frac{1}{\delta^2}\theta^2$*. He additionally offers a decoy D:* $0 \leq q_D < \frac{1}{\delta}\theta$ *and* $\frac{1}{\delta}\theta q_D < p_D < \frac{1}{\delta^2}\theta^2$*. Quality is salient for both products.*

Figures 4 and 5 show the optimal strategy for varying shares of high types α and relative valuations θ. Consumers with standard preferences ($\delta = 1$) are separated if $\theta \geq \alpha$. In all other cases, the monopolist excludes the low types.

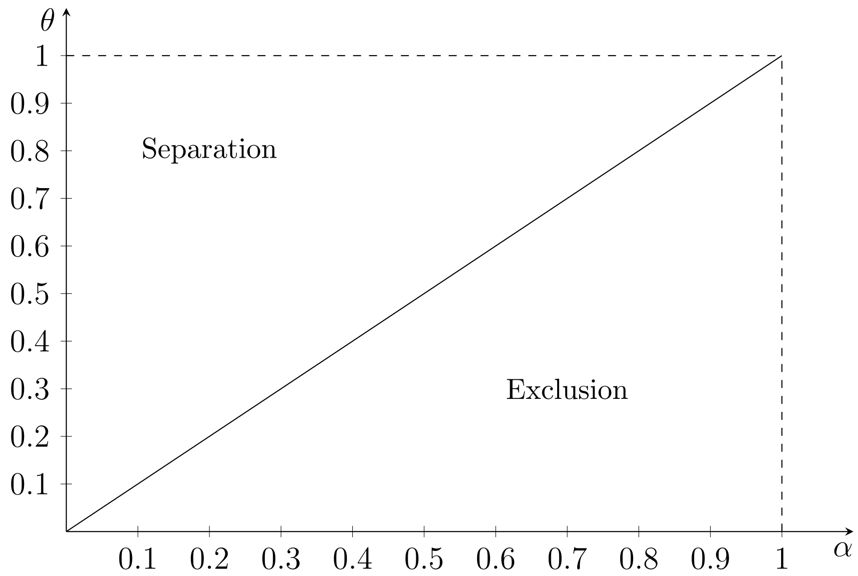

Figure 4: **Optimal strategy of monopolist if consumers have standard preferences, i.e. $\delta = 1$.** A monopolist maximizes profits by separating consumers if heterogeneity and the share of high types are low, and excluding low types otherwise.

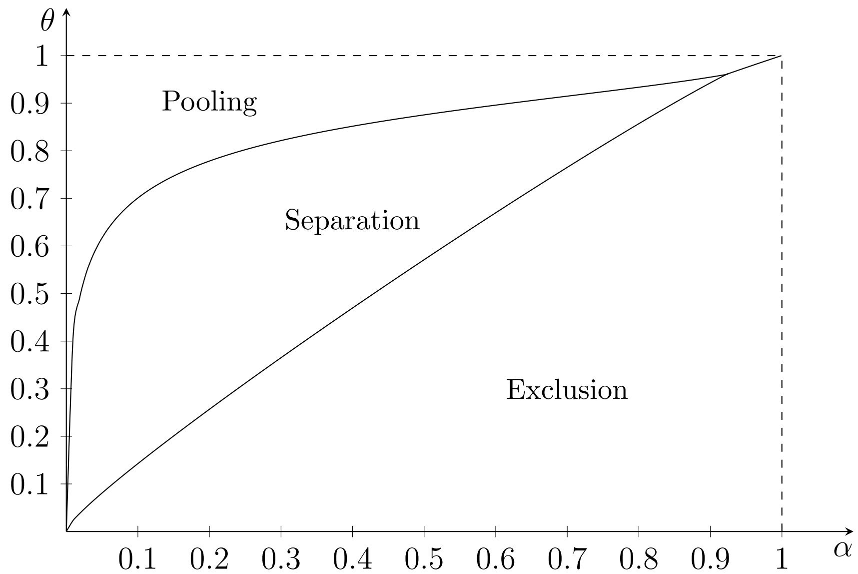

Figure 5: **Optimal strategy of monopolist if consumers have salience-driven preferences, i.e. $\delta < 1$.** A monopolist maximizes profits by pooling consumers if heterogeneity and the share of high types are low, and excluding low types if heterogeneity and the share of high types are high. Separation is optimal for an intermediate range of heterogeneity and share of high types.

If salience becomes stronger, i.e. δ decreases, the costs of price salience in the separation case become more severe, while the gains of quality salience with pooling and excluding increase. It follows that the monopolist will choose separation less often if consumers have salience-driven preferences.

If salience is strong enough $[\delta < \hat{\delta}(\alpha) \equiv 0.841(1 + \alpha^{\frac{1}{2}})^{\frac{1}{4}}]$, separation is always dominated by exclusion or pooling. This follows from the fact that given $\delta < \hat{\delta}(\alpha)$, exclusion and pooling are preferred to separation at $\hat{\theta}_2$, i.e. where exclusion and pooling are equally beneficial. For $\theta < \hat{\theta}_2$, exclusion is preferred to separation because profits from separation decrease if θ decreases, while profits from exclusion remain constant. For $\theta > \hat{\theta}_2$, profits from pooling are higher that profits from separation since profits from pooling increase faster in θ. Hence, a range in which separation is optimal exists if and only if $\delta \geq \hat{\delta}(\alpha)$. While the monopolist never sells the same product to both types of consumers with standard preferences (i.e. he never pools), pooling is optimal given salience-driven consumer preferences if the valuation of the low type is high.

As shown earlier, both types of consumers focus on the same attribute. It is thus of interest how the characteristics of a market determine the attribute on which consumers focus.

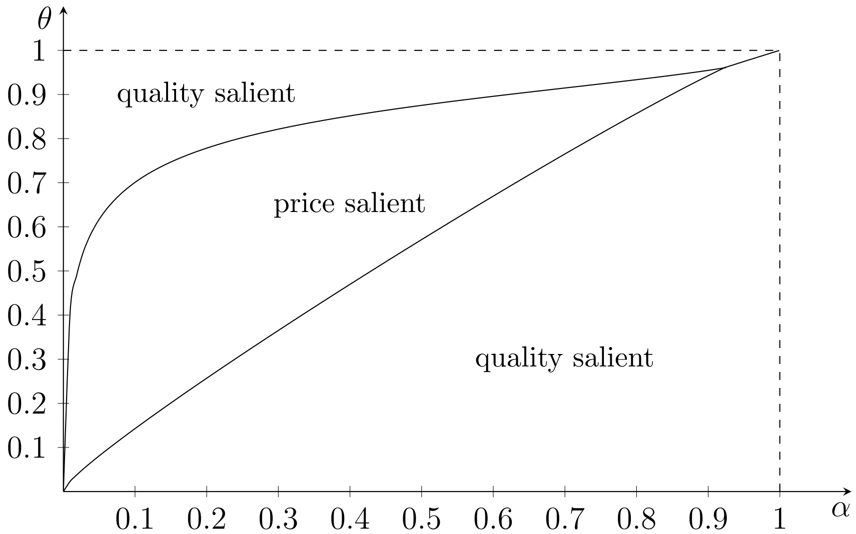

Figure 6: **Salience in a monopolistic market.** Price is salient in a market with intermediate heterogeneity and an intermediate share of high types.

Which attribute is salient relates directly to the strategy of the monopolist. Figure 6 shows which attribute is salient depending on the share of high types and the valuation of low types. Due to the direct relation between strategy and salience, Proposition 5 gives us some insights on when price salience can be observed:

Corollary 1. *Suppose that $\delta \in (\hat{\delta}(\alpha), 1]$. Whether we observe a quality- or a price-salient market depends on the distribution of types and their degree of heterogeneity. Quality is salient in markets with low heterogeneity and low share of high types and in markets with high heterogeneity and high share of high types. Price is salient in markets with intermediate heterogeneity and intermediate share of high types.*

If salience becomes stronger, the monopolist is more likely to induce quality salience. In a quality salient market, the consumers overestimate the value which the products will give to them. The monopolist benefits from this misperception and achieves higher profits. In a price salient market, the consumers underestimate the value of the products. The lower willingness to pay reduces the return on quality for the monopolist and induces him to provide lower quality.

The theory presented predicts that the monopolist will always offer two products. Whenever consumers focus on quality, the low-quality product is a decoy and not actually sold. The high-quality product is then a "better deal" in the sense that it is offered with a quality discount relative to the low-quality product. When consumers focus on price, the monopolist is separating the types and the high-quality product is a "bad deal", i.e. it is offered with a quality premium. The range for which separation with price salience and a quality premium is optimal becomes small if salience gains importance. As Maskin and Riley (1984), we can interpret quality as quantity. Salience-driven consumer preferences then provide an explanation for why quantity premia are rare in reality. Gerstner and Hess (1987) studied the pricing of a supermarket and found that only 1.7% of the packages were offered with a quantity premium. Kokovin et al. (2008) observe that some expensive liquor and expensive chocolate is offered with quantity premia. Verboven (1999) claims that many products, e.g. cars and hotel rooms, are offered with extra options that seem to be overpriced. For these products, we would predict separation with price salience if the monopolist is restricted to only two variants.

The model also provides an explanation for the observation that, when several products are offered, the price often varies with quality less than expected (Orbach and Einav, 2007; Courty and Nasiry, 2016; Richardson and Stähler, 2016; DellaVigna and Gentzkow, 2017). A monopolist who faces consumers with salience-driven preferences has to take into account that a high price difference attracts consumers' attention towards the price. Whenever he pools or excludes the low types, he thus offers two products with a small price difference in order to make consumers focus on quality.

6 Robustness

So far, the analysis restricted attention to a monopolist who could not offer more than two products. Avoiding price salience in case of separation requires the development and introduction of at least one additional product. The optimal strategy of a monopolist thus depends on how costly it is to develop additional decoys. Without development costs, it turns out that it is always possible to make quality salient by offering enough decoys. Assuming that there are non-zero development costs, the result holds that the monopolist will be less likely to separate than when consumers had standard preferences.

In this section, I first assume that there are no development costs and allow for a third product. It turns out that there are situations in which the monopolist cannot find a third product that would make the optimally separating products quality salient. However, he can always offer a decoy that makes the high-quality product quality salient and the low-quality product price salient. Whenever separation is optimal, the monopolist benefits from using such a decoy. This suggests that whenever there is separation, there will be at least one decoy offered.

In a second step, I keep the assumption of no development cost but let the monopolist offer as many decoys as he wishes. I can show that it is then always possible to separate optimally with quality salience.

If there were some development costs per decoy, the monopolist would face a trade-off between the gain from more beneficial salience and the development costs. Thus, in a situation in which separation would be optimal, the predictions of the salience of attributes and of the number of decoys depends on development costs. If development costs are high, we expect to observe no decoys and price salience (and less separation than in the benchmark case). If development costs are low, the monopolist would offer decoys and a quality salient product portfolio. As in the case of two products, we would only observe decoys if quality is salient for at least one of the products that are sold. If price is salient for both products, the decoys were useless and should thus not be offered.

Finally, I show the robustness of the results of Section 5 for a general utility function and a general cost function.

6.1 Three products

The restriction that the monopolist can offer at most two products makes it impossible to separate the types and make quality salient at the same time. However, the monopolist might consider offering a third product as a decoy. With a decoy, the monopolist can influence the salience of the attributes while separating with two other products. Quality becomes salient if the decoy increases the variation in quality sufficiently.

I assume that it is impossible to offer a product with negative quality. It can then be shown that when offering the optimal separating products given quality salience (q_H^q, p_H^q) and (q_L^q, p_L^q), it is not always possible to find a decoy which induces such salience. Thus, the monopolist cannot always reach the optimal quality salience profit under separation. This suggests that there will be less separation in the case of salience-driven preferences compared to the benchmark even when a third product could be offered without development costs.

Proposition 6. *Given the optimal products for separation with quality salience, it is impossible for the monopolist to make quality salient with a single decoy with non-negative quality if* $\alpha > 2\theta - 1$ *and* $\theta < \delta^2$*.*

The lower bound on the share of high types is derived from the condition that the decoy must have non-negative quality. If the share of high types is high, the quality of product L is rather low and the decoy needs to have a very low quality in order to bring more variation in the quality dimension. The threshold is increasing in the valuation of the low type. A higher valuation increases the quality of the low type's product and makes it more likely to find a decoy with non-negative quality that increases quality variation sufficiently. Together with the condition $\theta < \delta^2$, the lower bound on α is sufficient to imply that all high-quality decoys would be preferred by the high type.

In order to derive the conditions on the share of high types and the low type's valuation, we first have to determine the optimal products given quality salience. The derivation is analogous to the case in which both products are price salient. The incentive compatibility constraints imply that $q_H \geq q_L$. The incentive compatibility constraint of the high type and the participation constraint of the low type are binding. This makes the incentive compatibility constraint of the low type and the participation constraint of the high type redundant. Hence, the optimal products given quality salience are:

$$q_H^q = \frac{1}{\delta}, \tag{35}$$

$$q_L^q = \frac{1}{\delta}\theta - \frac{1}{\delta}\frac{\alpha}{1-\alpha}(1-\theta), \tag{36}$$

$$p_H^q = \frac{1}{\delta^2}\frac{1}{1-\alpha}[1+\theta^2-(1+\alpha)\theta], \tag{37}$$

$$p_L^q = \frac{1}{\delta^2}\theta^2 - \frac{1}{\delta^2}\frac{\alpha}{1-\alpha}\theta(1-\theta). \tag{38}$$

I now derive the conditions on the share of high types and the low types valuation. Given the three products H, L and D, the average quality is $\bar{q} = \frac{q_H+q_L+q_D}{3}$ and the average price is $\bar{p} = \frac{p_H+p_L+p_D}{3}$. We can consider the quality-price space for the decoy D to determine its consequences on the salience of the attributes of products L and H. Proposition 1 of Bordalo et al. (2013b) can be applied if $(q-\bar{q})(p-\bar{p}) > 0$. It then tells us that for product $k = H, L$, quality is salient if and only if

$$q_k \gtrless \bar{q} \ , \quad p_k \gtrless \bar{p} \quad \text{with} \quad \frac{q_k}{p_k} \gtrless \frac{\bar{q}}{\bar{p}}. \tag{39}$$

For product k, this implies that quality is salient if and only if the decoy is such that

$$p_D \gtrless q_D \frac{p_k}{q_k} + q_{-k}\left(\frac{p_k}{q_k} - \frac{p_{-k}}{q_{-k}}\right) \equiv \bar{p}_k \quad \text{with} \quad q_k \gtrless \bar{q} \quad \text{and} \quad p_k \gtrless \bar{p}. \tag{40}$$

The symmetry of the salience function further allows us to determine the salience of attributes for products with $(q-\bar{q})(p-\bar{p}) < 0$. By definition, quality is salient if and only if

$$\sigma(q,\bar{q}) > \sigma(p,\bar{p}) \underbrace{=}_{symmetry} \sigma(\bar{p},p).$$

Homogeneity of degree 0 of the salience function then gives us a condition for quality salience which is similar to the condition in the previous case:

$$\sigma\left(\frac{q}{\bar{q}},1\right) > \sigma\left(\frac{\bar{p}}{p},1\right) \Leftrightarrow \frac{q}{\bar{q}} \gtrless \frac{\bar{p}}{p} \quad \text{when} \quad q \gtrless \bar{q} \quad \text{and} \quad p \lesseqgtr \bar{p}. \tag{41}$$

In our case of three products, this implies that quality is salient for product k if the price of the decoy satisfies

$$p_D \lesseqgtr \frac{9q_k p_k}{q_k + q_{-k} + q_D} - p_k - p_{-k} \equiv \bar{\bar{p}}_k \quad \text{with} \quad q_k \gtrless \bar{q} \quad \text{and} \quad p_k \lesseqgtr \bar{p}. \tag{42}$$

Conditions (40) and (42) as well as the conditions for $q_k \gtrless \bar{q}$ and $p_k \gtrless \bar{p}$ allow us to partition the quality-price space. In Figure 7, I do so for the case in which

$$\frac{q_H}{p_H} < \frac{q_L}{p_L} \quad \text{with} \quad q_H > q_L \quad \text{and} \quad p_H > p_L, \tag{43}$$

since this is always true for the optimal separating products given the same attribute is salient for product L and H. If the decoy (q_D, p_D) lies in the gray area, the high-quality product H's quality is salient. In the dotted area, product L's quality is salient.

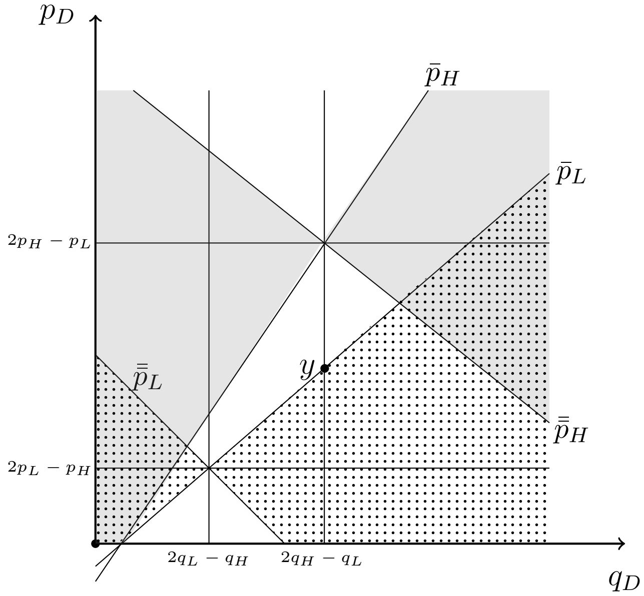

Figure 7: **Possible decoys to make both products' quality salient.** Quality is salient for product L if and only if product D lies in the dotted area. Quality is salient for product H if and only if product D lies in the gray area.

In order to make quality salient for both products L and H, we need a decoy where the two areas overlap. Additionally, if it should serve as a decoy, it must not be preferred by neither of the types of consumers. We can derive sufficient conditions under which such a decoy does not exist.

Lemma 3. *Given separating products* (q_H, p_H) *and* (q_L, p_L)*, quality is never salient for both products if* $2q_L - q_H < q_D < 2q_H - q_L$.

The proof can be found in the Appendix. Lemma 3 implies that a low-quality product can only serve as a decoy if it has quality $q_D \leq 2q_L - q_H$. Given the optimal products for quality salience, this implies that there exists no low-quality decoy with non-negative quality if the share of high types is high:

$$0 > 2q_L^q - q_H^q \Leftrightarrow \alpha > 2\theta - 1 \equiv \bar{\alpha}_1(\theta). \tag{44}$$

This condition is always fulfilled if $\theta < \frac{1}{2}$. Note that $\theta < 1$ implies that there is always a range of α for which separation is possible but no decoy exists: $\alpha \in [2\theta - 1, \theta]$.

The high-quality decoys all have non-negative quality since they must have $q_D > 2q_H - q_L > 0$. However, since we cannot increase the price too much without drawing attention towards the price, consumers might prefer to buy the high-quality decoy. I define product y as the product with quality $q_y = 2q_H^q - q_L^q$ and the price $p_y = \bar{p}_L(q_y)$. Consider situations in which the high type prefers product y to the optimal quality salient product H even if product y was price salient (this implies he would also prefer the decoy if its quality was salient):

$$q_H^q - \delta p_H^q < \delta q_y - p_y. \tag{45}$$

This condition is true if and only if the share of high types is high enough:

$$\alpha > \frac{(1-\theta)\theta\delta + (2\theta - \delta^2)(2-\theta) - 1}{(1-\delta)(\delta+\theta)} \equiv \bar{\alpha}_2(\theta, \delta), \tag{46}$$

and the valuation of the low type is not too high:

$$\theta < \frac{1+\delta+\delta^2}{2+\delta}. \tag{47}$$

From (40), we know that if $q_D > q_y$, a necessary condition for product L to be quality salient is $p_D < \bar{p}_L(q_D)$. Furthermore, given price salience, product y lies on the indifference curve $p_D = \delta q_D - U_y$ with $U_y = \delta q_y - p_y$. If $\theta < \delta^2$, the indifference curve is steeper in q_D than $\bar{p}_L$, so if type H prefers a price salient product y over a quality salient product H, he would also prefer any other high-quality decoy that makes quality salient, even if its price was salient. $\theta < \delta^2$ implies that (47) is satisfied and thus (46) and $\theta < \delta^2$ are sufficient conditions for the non-existence of a high-quality decoy.

The threshold $\bar{\alpha}_1(\theta)$ together with the condition $\theta < \delta^2$ implies that $\bar{\alpha}_1(\theta) > \bar{\alpha}_2(\theta, \delta)$. Hence, we found sufficient conditions and no decoy exists if $\alpha > \bar{\alpha}_1(\theta)$ and $\theta < \delta^2$.

Since exclusion and pooling always allow for quality salience, the trade-off between strategies is the same as in the benchmark case whenever a decoy can be found. However, in situations in which no decoy can be found, the monopolist cannot separate and make quality salient for both optimally separating products. The monopolist has to choose an alternative strategy if he wants to separate, as for example adapt products such that a decoy exists or choosing a decoy that makes type H focus on quality and type L focus on price etc.[6] These strategies give lower profits than separation with optimally separating products given quality salience. Hence, separation is again costly and will possibly not be chosen as often as in the benchmark case even if we abstract from development costs for a third product.

It is always possible for the monopolist to find a decoy which makes the high-quality product quality salient and the low-quality product price salient given the monopolist's optimal products for such salience. Whenever separation with price salience is the optimal strategy given the restriction of two products, the strategy to make product H quality salient is possible and yields higher profits.

Proposition 7. *The monopolist always benefits from offering a decoy product.*

The proof is in the Appendix. If the high-quality product becomes quality salient, the monopolist can increase p_H and benefit from the higher willingness to pay of the high type. The monopolist will thus always offer a decoy when separating consumer types. If it is optimal to make product H quality salient and product L price salient, this decoy has an intermediate quality and price but a low quality-price ratio. As shown before, the monopolist also benefits from decoys when he optimally excludes or pools.

6.2 Multiple decoys

While the monopolist is not always able to induce quality salience with a single decoy, it might be possible with multiple decoys. It turns out that the monopolist can always make separating products quality salient if he can offer enough decoys.

Proposition 8. *The monopolist can separate while making quality salient for the separating products. In addition to the optimally separating products*

[6] The determination of the optimal strategy of the monopolist in this case is left to future work.

(q_H^q, p_H^q) and (q_L^q, p_L^q), he can offer $\hat{d}$ decoys with

$$q_D = 0 \quad and \quad p_D = \frac{1}{\hat{d}}\left[\frac{(\hat{d}+2)^2 q_L^q p_L^q}{q_H^q + q_L^q} - p_L^q - p_H^q\right],$$

where $\hat{d}$ is the smallest integer greater than or equal to

$$\underline{d} \equiv (q_H^q + q_L^q)\left(\frac{p_H^q}{p_L^q q_H^q q_L^q}\right)^{\frac{1}{2}} - 2.$$

This is a sufficient condition.

To get these insights, I define an M-decoy, which is determined by all decoys offered. The attribute values of the M-decoy are defined as the sum of the attribute values of the single decoys i, $i = 1, ..., d$: $q_M = \sum_{i=1}^{d} q_i$ and $p_M = \sum_{i=1}^{d} p_i$. We can draw the graph with the sum of the decoy-qualities on the horizontal and the sum of the decoy-prices on the vertical. In the same way as for one decoy, we can then determine the areas in which the M-decoy must lie to make quality salient for the products (q_H^q, p_H^q) and (q_L^q, p_L^q). If

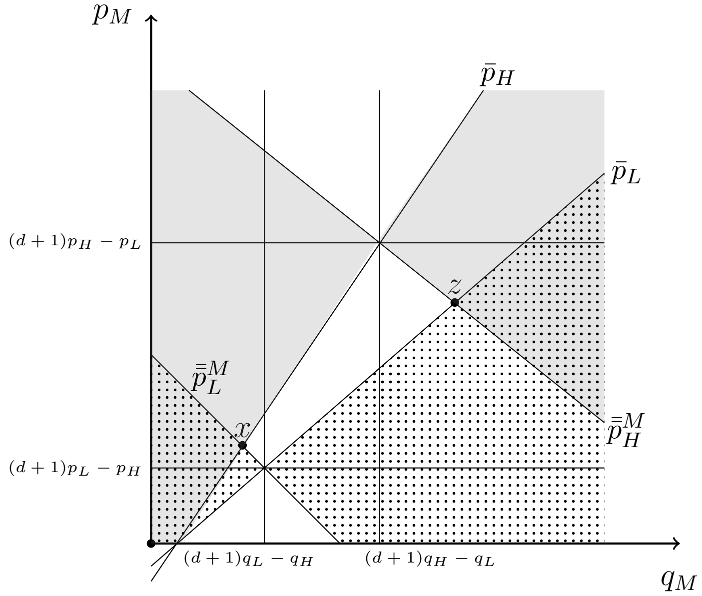

Figure 8: **Possible M-decoys that make both products quality salient.** Quality is salient for product L if and only if product M lies in the dotted area. Quality is salient for product H if and only if product M lies in the gray area.

$(q_k - \bar{q})(p_k - \bar{p}) > 0$, for product $k = H, L$, quality is salient if and only if the M-decoy is such that

$$p_M \gtrless \bar{p}_k(q_M) \text{ with } q_k \gtrless \bar{q} \text{ and } p_k \gtrless \bar{p}. \quad (48)$$

If $(q_k - \bar{q})(p_k - \bar{p}) < 0$, quality is salient for product k if and only if the price of the M-decoy satisfies

$$p_M \lessgtr \frac{(d+2)^2 q_k^q p_k^q}{q_{-k}^q + q_k^q + q_M} - p_k^q - p_{-k}^q \equiv \bar{\bar{p}}_k^M(q_M) \text{ with } q_k \gtrless \bar{q} \text{ and } p_k \lessgtr \bar{p}. \quad (49)$$

In order to make quality salient for both products H and L, the M-decoy has to lie in the gray and dotted area in Figure 8, i.e. either $q_M < (d+1)q_L - q_H$ and $\bar{p}_H(q_M) < p_M < \bar{\bar{p}}_L^M(q_M)$ or $q_M > (d+1)q_H - q_L$ and $\bar{\bar{p}}_H^M(q_M) < p_M < \bar{p}_L(q_M)$.

Product x is the low-quality M-decoy with the highest quality:

$$p_x = \arg\max \tilde{q} \quad \text{with} \quad \tilde{q} = \min\left\{\bar{p}_H^{-1}(q), \bar{\bar{p}}_L^{M-1}(q)\right\}. \quad (50)$$

While the inverse of $\bar{p}_H(q)$ is increasing in p_x, the inverse of $\bar{\bar{p}}_L^M(q)$ is decreasing in p_x. Hence, the minimum is maximized if the two arguments are equalized and we get the following expressions for product x:

$$p_x = (d+2)\left(\frac{q_L^q}{q_H^q} p_H^q p_L^q\right)^{\frac{1}{2}} - p_H^q - p_L^q, \quad (51)$$

$$q_x = (d+2)\left(\frac{p_L^q}{p_H^q} q_H^q q_L^q\right)^{\frac{1}{2}} - q_H^q - q_L^q. \quad (52)$$

These values are always such that

$$q_x \leq (d+1)q_L^q - q_H^q \quad (53)$$

and

$$(d+1)p_L^q - p_H^q \leq p_x \leq (d+1)p_H^q - p_L^q \quad (54)$$

and thus, quality is indeed salient for both products.

Adding more decoys increases the quality of product x. Thus, more decoys make it more likely that it has non-negative quality. The number of decoys d must be higher than $\underline{d}$ to guarantee the decoys have non-negative quality:

$$q_x \geq 0 \Leftrightarrow d \geq \underline{d} = (q_H^q + q_L^q) \left(\frac{p_H^q}{p_L^q q_H^q q_L^q} \right)^{\frac{1}{2}} - 2. \tag{55}$$

The lowest integer that is higher than $\underline{d}$ is thus a sufficient number of decoys.

In order to make sure that both types would not prefer the single decoys, we can use zero quality for the M-decoy. Zero quality and a positive price for the M-decoy makes sure that the single decoys would also have zero quality and a positive price, which would give negative utility to consumers.

We know that $(d+1)q_L^q - q_H^q > q_x > 0$ and this implies that $\bar{\bar{p}}_L^M(0) > (d+1)p_L^q - p_H^q$. From conditions (48) and (49), we know that quality is then salient for both products L and H either if $(d+1)p_H^q - p_L^q > \bar{\bar{p}}_L^M(0)$ and $\bar{p}_H(0) < p_M < \bar{\bar{p}}_L^M(0)$ or if $(d+1)p_H^q - p_L^q < \bar{\bar{p}}_L^M(0)$ and $p_M < \min[\bar{\bar{p}}_L^M(0), \bar{\bar{p}}_H^M(0)] = \bar{\bar{p}}_L^M(0)$. Hence, the highest price we can ask for that still makes quality salient for both products given $q_M = 0$ is determined by $\bar{\bar{p}}_L^M(0)$:

$$p_M(q_M = 0) = \frac{(d+2)^2 q_L^q p_L^q}{q_H^q + q_L^q} - p_L^q - p_H^q. \tag{56}$$

This price is increasing in d and thus always positive for $d \geq \underline{d}$ since

$$p_M(q_M = 0)|_{\underline{d}} = (p_H^q \frac{q_L^q}{q_H^q} - p_L^q) = \frac{q_L^q(q_H^q - q_L^q)(1-\theta)}{q_H^q} > 0. \tag{57}$$

Condition (55) is sufficient but might not be necessary, since there could be a high-quality M-decoy. If we assume there is an upper bound on quality $\hat{q}$, the assumption implies that the single decoys cannot have quality higher than $\hat{q}$, i.e. $q_M \leq d \cdot \hat{q}$. From the high-quality M-decoys which make quality salient for H and L, product z is most likely to satisfy this condition:

$$p_z = \arg\min \tilde{q}' \quad \text{with} \quad \tilde{q}' = \max\left\{ \bar{p}_L^{-1}(q), \bar{\bar{p}}_H^{M-1}(q) \right\}. \tag{58}$$

Since the two inverse functions move in opposite directions when changing p, the maximum in minimized if they are just equal. Given the optimal products, the lowest high-quality decoy has quality

$$q_z = (d+2) \left(\frac{p_H^q}{p_L^q} q_H^q q_L^q \right)^{\frac{1}{2}} - q_H^q - q_L^q. \tag{59}$$

These values are always such that

$$q_z \geq (d+1)q_H^q - q_L^q \tag{60}$$

and

$$(d+1)p_L^q - p_H^q \leq p_z \leq (d+1)p_H^q - p_L^q \tag{61}$$

and thus, quality is indeed salient for both products.

If we use it as M-decoy, the quality of each decoy q_D must be feasible to produce:

$$\begin{aligned} q_D = \frac{q_z}{d} &\leq \hat{q} \\ \Leftrightarrow \hat{q} &\geq \frac{d+2}{d}\left(\frac{p_H^q}{p_L^q} q_H^q q_L^q\right)^{\frac{1}{2}} - \frac{1}{d}(q_H^q + q_L^q). \end{aligned} \tag{62}$$

The RHS is increasing in d:

$$\frac{\partial \frac{q_z}{d}}{\partial d} = -\frac{1}{d^2}\left[2\sqrt{\frac{q_H}{\theta}(q_H - (1-\delta)q_L)} - q_H - q_L\right] < -\frac{1}{d^2}(q_H - q_L) < 0. \tag{63}$$

Hence, $d > 1$ will not fulfill the restriction whenever $d = 1$ does not, i.e. whenever the upper bound on quality is low:

$$\hat{q} < 3\left(\frac{p_H^q}{p_L^q} q_H^q q_L^q\right)^{\frac{1}{2}} - q_H^q - q_L^q. \tag{64}$$

Therefore, condition (55) is necessary and sufficient to make quality salient if the monopolist wants to separate with the optimal products L and H and there is an upper bound on quality $\hat{q} < q_z(d=1)$. Without the upper bound on quality, (55) is sufficient but might not be necessary.

6.3 General utility function

Given the salience of an attribute is determined by the subjective utility from quality rather than the objective quality, the result that a monopolist is less prone to separate if he faces consumers with salience-driven preferences does not depend on the linearity of preferences. Consider consumers with experience utility that is nonlinear in the taste parameter θ_i, i.e. $u(q, \theta_i) - p$, with $u(q, \theta_i)$ increasing and concave in q and satisfying the single crossing property, i.e. the marginal utility of quality increases in θ_i. With such experience utility, different types might focus on different attributes. Given two products (q_L, p_L) and (q_H, p_H), with $q_H > q_L$ and $p_H > p_L$, a consumer i focuses on quality if and only if

$$\frac{u(q_H, \theta_i)}{p_H} > \frac{u(q_L, \theta_i)}{p_L}. \tag{65}$$

I show in the following that the monopolist again always separates with products that make both consumer types focus on price, while he excludes and pools with a decoy that implies quality salience.

Similar to Lemma 1, the monopolist cannot separate the types without making the low type focus on price. Consider a consumer with utility function $\gamma u(q, \theta_i) - \omega p$, with $\gamma \in (0, 1]$ and $\omega \in (0, 1]$,[7] and two products L and H with $q_H \geq q_L$ and $p_H \geq p_L$. It is impossible to make type L focus on quality while satisfying his participation and his incentive compatibility constraint. Assume (q_L, p_L) satisfies the participation constraint of type L, i.e. $\gamma u(q_L, \theta_L) - \omega p_L \geq 0$. If the monopolist wants to separate, the high-quality product has to satisfy

$$p_H \geq \frac{\gamma}{\omega}[u(q_H, \theta_L) - u(q_L, \theta_L)] + p_L. \tag{66}$$

In order to make quality salient, the high-quality product has to satisfy

$$p_H < \frac{u(q_H, \theta_L)}{u(q_L, \theta_L)} p_L. \tag{67}$$

To find such a product is possible if and only if

$$\frac{u(q_H, \theta_L)}{u(q_L, \theta_L)} p_L > \frac{\gamma}{\omega}[u(q_H, \theta_L) - u(q_L, \theta_L)] + p_L \Leftrightarrow \frac{p_L}{u(q_L, \theta_L)} > \frac{\gamma}{\omega}, \tag{68}$$

which violates the participation constraint PC_L. Hence, it is impossible to separate consumers and induce type L to focus on quality. Separating with no attribute being salient for the low type is possible but would imply

[7] Note that $\gamma = 1$ and $\omega = \delta$ captures quality salience while $\gamma = \delta$ and $\omega = 1$ captures price salience and $\gamma = 1$ and $\omega = 1$ is equivalent to neutral salience. Hence, the following analysis shows that separation results in type L focusing on price in all three cases.

that the monopolist optimally offers the same product to both consumers. The neutral salience condition $p_H = p_L \frac{u(q_H,\theta_L)}{u(q_L,\theta_L)}$ and the IC_L given neutral salience together imply that $p_L \geq u(q_L, \theta_L)$. Considering the PC_L given neutral salience, it follows that $p_L = u(q_L, \theta_L)$ and thus $p_H = u(q_H, \theta_L)$. It is then profit-maximizing for the monopolist to offer the same product to both types. However, this strategy is always dominated by pooling with a decoy that makes quality salient (we see later in this section that pooling with quality salience is always possible).

While type L thus necessarily focuses on price whenever separation is optimal, the monopolist could design the products such that quality is salient for type H. However, quality salience requires the price of the high-quality product to be rather low. It turns out that this restriction on the price p_H is so strong, that the monopolist prefers to increase the price and let type H focus on price too. To see this, note that type H focuses on quality if and only if the price p_H is not too high:

$$p_H < \frac{u(q_H, \theta_H)}{u(q_L, \theta_H)} p_L. \tag{69}$$

Inducing quality salience for the high type is beneficial if and only if the quality salience condition (69) is less restrictive than the IC_H given price salience, i.e. if and only if

$$\delta[u(q_H, \theta_H) - u(q_L, \theta_H)] + p_L < \frac{u(q_H, \theta_H)}{u(q_L, \theta_H)} p_L \Leftrightarrow \delta < \frac{p_L}{u(q_L, \theta_H)}. \tag{70}$$

This is never true since condition (70) violates the participation constraint of type L. Similarly, inducing neutral salience for type H is not optimal, since it requires

$$p_H = \frac{u(q_H, \theta_H)}{u(q_L, \theta_H)} p_L. \tag{71}$$

Replacing the strict inequalities in (70) with weak inequalities shows that this condition is again more restrictive than the IC_H given price salience. Hence, the result that the monopolist separates with price salient products and thus separation is less beneficial than in the benchmark case holds for more general utility functions.

When the monopolist wants to exclude low types or pools, it is again possible to offer a decoy that makes quality salient for both types. I prove the existence of such decoys in the Appendix. Since separation comes at a cost while pooling and exclusion benefit from quality salience, it follows that the monopolist is less likely to separate consumers with salience-driven preferences.

Considering the trade-off between pooling and exclusion, nothing changes when consumers have salience-driven preferences. When the monopolist pools, he chooses the quality in order to maximize $u(q_P, \theta_L) - \frac{1}{2}q_P^2$. When he wants to exclude the low types, he offers the quality that maximizes $\alpha[u(q_E, \theta_H) - \frac{1}{2}q_E^2]$. Since $\theta_L \to \theta_H$ implies that $q_P \to q_E$, pooling is preferred to exclusion if the valuations do not differ too much and the share of high types α is low.

If the salience of quality is determined by the objective quality, the results from Section 5 rely on the linearity of the indifference curves in quality. Each indifference curve then only cuts the constant ratio line once, which is important for Lemma 1. With decreasing marginal utility of quality, a higher quality product with higher quality-price ratio would not necessarily be preferred by the consumers.

6.4 General cost function

It is possible to show that the results from Section 5 hold for all cost functions with $c'(q) > 0$ and $c''(q) > 0$. The proofs of the Lemmas are independent of the monopolist's cost. The monopolist's possible strategies are thus still to separate with price salience, exclude or pool with quality salient products. Price salience decreases the willingness to pay of a consumer compared to the benchmark case. Therefore, separation will be less profitable in case of salience-driven consumer preferences. To show this, consider the profit of separation with price salience, where q_H^* and q_L^* are the profit-maximizing qualities given δ:

$$\pi_S(\delta) = \alpha[\delta(q_H^* - q_L^*) + \delta\theta q_L^* - c(q_H^*)] + (1 - \alpha)[\delta\theta q_L^* - c(q_L^*)]. \tag{72}$$

If salience becomes weaker, i.e. δ increases by $\Delta\delta$, the monopolist can increase the price p_H by $\Delta\delta[(q_H^* - q_L^*) + \theta q_L^*]$ and price p_L by $\Delta\delta\theta q_L^*$, which strictly increases his profits and leaves the salience of attributes unchanged. Additionally, the monopolist could adapt the qualities of the products he offers, but he would do so only if it was profitable. The profit of separation thus strictly increases if salience becomes weaker.

In contrast, quality salience increases the willingness to pay and exclusion and pooling become more profitable. The maximal profit of exclusion given salience parameter δ amounts to

$$\pi_E(\delta) = \alpha[\frac{1}{\delta}q_E^* - c(q_E^*)]. \tag{73}$$

If salience becomes stronger, i.e. δ decreases by $\Delta\delta$, the monopolist can increase price p_E by $\left[\frac{1}{\delta-\Delta\delta} - \frac{1}{\delta}\right] q_E^*$ and the high type would still be willing to buy it given its quality is still salient. In Section 5.3, we showed that the monopolist can indeed always find a decoy that makes product E quality salient whenever product E satisfies the participation constraint. Therefore, stronger salience strictly increases the monopolist's profit. Adapting q_E could additionally increase the profit.

The maximal profit of pooling given salience parameter δ amounts to

$$\pi_P(\delta) = \frac{1}{\delta}\theta q_P^* - c(q_P^*). \tag{74}$$

If salience becomes stronger, i.e. δ decreases by $\Delta\delta$, the monopolist can increase price p_P by $\left[\frac{1}{\delta-\Delta\delta} - \frac{1}{\delta}\right] \theta q_P^*$ and both types still buy product P given quality is still salient. From Section 5.4, we know there is a decoy that makes quality salient given a pooling product that satisfies the participation constraints. Hence, stronger salience strictly increases profits and adapting q_P could even increase these gains.

Profits from exclusion and pooling thus strictly increase in the strength of salience, while the profit from separation decreases. There is again a cost of separation and a benefit to exclusion and to pooling. In case of salience-driven preferences and two products on offer, the parameter range for which the monopolist chooses to separate the consumer types is smaller.

7 Conclusion

In this paper, I investigate the effect of salient thinking of consumers on the prevalence of (monopolistic) price discrimination. In my model, a monopolist faces consumers with salience-driven preferences who are heterogeneous in their valuation of quality. When designing his products, the monopolist has to take into account the products' influence on the salience of their attributes. Consumers give a higher weight to the attribute which varies more within the choice set. In the case of two types of consumers, it turns out that a monopolist is less likely to price discriminate when consumers have salience-driven preferences.

The optimally separating products always induce price salience, which reduces the willingness to pay of the consumers. If the monopolist is restricted to offer two products, he can thus not avoid price salience when separating. When excluding low types or pooling, the monopolist can offer a decoy that lets consumers focus on quality.

Allowing the monopolist to offer more products, he might be able to induce quality salience also when separating by additionally offering decoy products. It turns out that this is always possible if the monopolist can offer sufficiently many decoys. Whenever it is costly to develop such decoys, the monopolist is less likely to separate than in the case of consumers with standard preferences.

Future research should concentrate on characterizing the complete optimal strategy of the monopolist given more than two versions of a product are possible. Furthermore, one could introduce an exogenous offer by another firm. If this offer yields negative utility to the consumers, the monopolist can increase his prices. At a higher level of prices, it is less likely that the same price difference induces price salience and the monopolist might be able to separate with products that induce quality salience.

It would also be interesting to test empirically whether indeed consumers focus on price if the monopolist separates. Furthermore, one could test whether a monopolist always offers products with the intention to influence attention. This should be more likely to be observed if development costs of decoys are low.

8 Appendix

8.1 Proof of Lemma 1

Consider two products L and H with $q_H \geq q_L$ and $p_H \geq p_L$. Assume (q_L, p_L) satisfies the participation constraint $\gamma q_L - \omega p_L \geq 0$, with $\gamma \in (0,1]$ and $\omega \in (0,1]$:

$$\gamma q_L - \omega p_L \geq 0 \tag{75}$$

$$\Rightarrow \frac{p_L}{q_L} \leq \frac{\gamma}{\omega} \tag{76}$$

$$\Rightarrow \frac{p_L}{q_L}(q_H - q_L) \leq \frac{\gamma}{\omega}(q_H - q_L) \tag{77}$$

$$\Leftrightarrow \frac{\gamma}{\omega} q_L - p_L \leq \frac{\gamma}{\omega} q_H - q_H \frac{p_L}{q_L}. \tag{78}$$

Quality salience ($p_H < q_H \frac{p_L}{q_L}$) implies:

$$\Rightarrow \frac{\gamma}{\omega} q_L - p_L < \frac{\gamma}{\omega} q_H - p_H \tag{79}$$

$$\Leftrightarrow \gamma q_L - \omega p_L < \gamma q_H - \omega p_H. \tag{80}$$

The product (q_H, p_H) is strictly preferred by the consumer.

This lemma shows that both types would prefer product H, independent of which attribute is salient. Considering the low type, $\gamma = \theta$ and $\omega = \delta$ captures the case of quality salience, $\gamma = \theta$ and $\omega = 1$ captures the case of neutral salience and $\gamma = \delta\theta$ and $\omega = 1$ captures the case of price salience. Considering the high type, $\gamma = 1$ and $\omega = \delta$ captures the case of quality salience, $\gamma = 1$ and $\omega = 1$ captures the case of neutral salience and $\gamma = \delta$ and $\omega = 1$ captures the case of price salience.

8.2 Separation with neutral salience

If quality salience and separation is not possible, the monopolist can try to separate while keeping salience neutral. Salience is neutral, i.e. consumers give equal weights to quality and price, if the two quality-price ratios are equal. The monopolist then takes into account the participation constraints and the incentive compatibility constraints of the benchmark case.

The IC_L and the neutral salience condition $p_H = \frac{q_H}{q_L} p_L$ imply that $p_L \geq \theta q_L$. Together with the participation constraint of the low type, this means that $p_L = \theta q_L$ and hence $p_H = \theta q_H$.

The monopolist therefore maximizes profits:

$$\max_{q_H, q_L} \ \alpha(\theta q_H - \frac{1}{2} q_H^2) + (1 - \alpha)(\theta q_L - \frac{1}{2} q_L^2). \tag{81}$$

It follows that the optimal product is the same for both types, i.e. the monopolist would pool the types. Even though there exist two products with which the monopolist can separate the types and make no attribute salient, such separation is dominated by pooling with neutral consumers. I show in Subsection 5.4 that the monopolist can always pool with quality salience. Pooling with neutral consumers is thus always dominated.

8.3 Proof of Lemma 2

Consider two products E and D with $q_E \geq q_D$ and $p_E \geq p_D$. Assume (q_E, p_E) satisfies the participation constraint $\gamma q_E - \omega p_E \geq 0$:

$$\Rightarrow \frac{p_E}{q_E} \leq \frac{\gamma}{\omega} \tag{82}$$

$$\Rightarrow \frac{p_E}{q_E}(q_E - q_D) \leq \frac{\gamma}{\omega}(q_E - q_D) \tag{83}$$

$$\Leftrightarrow \frac{\gamma}{\omega} q_D - q_D \frac{p_E}{q_E} \leq \frac{\gamma}{\omega} q_E - p_E. \tag{84}$$

Quality salience ($p_D > q_D \frac{p_E}{q_E}$) implies:

$$\Rightarrow \frac{\gamma}{\omega} q_D - p_D < \frac{\gamma}{\omega} q_E - p_E \tag{85}$$

$$\Leftrightarrow \gamma q_D - \omega p_D < \gamma q_E - \omega p_E. \tag{86}$$

This lemma shows that both types would strictly prefer product E, independent of which attribute is salient. Considering the low type, $\gamma = \theta$ and $\omega = \delta$ captures the case of quality salience, $\gamma = \theta$ and $\omega = 1$ captures the case of neutral salience and $\gamma = \delta\theta$ and $\omega = 1$ captures the case of price salience. Considering the high type, $\gamma = 1$ and $\omega = \delta$ captures the case of quality salience, $\gamma = 1$ and $\omega = 1$ captures the case of neutral salience and $\gamma = \delta$ and $\omega = 1$ captures the case of price salience.

8.4 Proof of Lemma 3

Given separating products (q_H, p_H) and (q_L, p_L), quality is never salient for both products if $2q_L - q_H < q_D < 2q_H - q_L$.

Consider $q_D \in [2q_L - q_H, 2q_H - q_L]$.

- *Case 1*: $p_D < 2p_L - p_H$

  Product H cannot be quality salient since quality salience would require $p_D > \bar{p}_H$. This is impossible with $p_D < 2p_L - p_H$ because then $\bar{p}_H > 2p_L - p_H$ whenever $q_D > 3\frac{q_H}{p_H}p_L - q_H - q_L$ which is true for our range of q_D and any separating products, i.e. if $\frac{q_H}{p_H} < \frac{q_L}{p_L}$.

- *Case 2*: $2p_L - p_H < p_D < 2p_H - p_L$

  Product H's quality is salient if $p_D > \bar{p}_H$ and product L's quality is salient if $p_D < \bar{p}_L$. It is impossible to satisfy both conditions since $\bar{p}_H > \bar{p}_L$ whenever $\frac{q_H}{p_H} < \frac{q_L}{p_L}$, which is true for any separating products.

- *Case 3*: $p_D > 2p_H - p_L$

  Product L cannot be quality salient since quality salience would require $p_D < \bar{p}_L$. This is impossible with $p_D > 2p_H - p_L$ since $\bar{p}_L < 2p_H - p_L$ whenever $q_D < 3\frac{q_L}{p_L}p_H - q_H - q_L$ which is true for our range of q_D and any separating products, i.e. if $\frac{q_H}{p_H} < \frac{q_L}{p_L}$.

8.5 Proof of Proposition 7

Optimal separating products if quality is salient for product H and price is salient for product L

Maximization problem of the monopolist:

$$\begin{aligned}
\max_{p_H, p_L} \quad & \alpha(p_H - \frac{1}{2}q_H^2) + (1-\alpha)(p_L - \frac{1}{2}q_L^2) & \\
\text{s.t.} \quad & \delta\theta q_L - p_L \geq 0 & PC_L \\
& q_H - \delta p_H \geq 0 & PC_H \\
& \delta\theta q_L - p_L \geq \theta q_H - \delta p_H & IC_L \\
& q_H - \delta p_H \geq \delta q_L - p_L & IC_H
\end{aligned}$$

The PC_L and the IC_H imply that the PC_H is redundant. The incentive compatibility constraints imply that $q_H \geq \delta q_L$. Increasing p_H increases profits, so the IC_H will be binding. The IC_L then becomes redundant. Increasing p_L increases profits until the PC_L is binding.

$$\max_{q_H, q_L} \ \alpha[\frac{1}{\delta}q_H - q_L(1-\theta) - \frac{1}{2}q_H^2] + (1-\alpha)[\delta\theta q_L - \frac{1}{2}q_L^2] \tag{87}$$

$$\text{s.t.} \quad q_H \geq \delta q_L \tag{88}$$

The monopolist can choose q_L and q_H optimally:

$$q_L^{qp} = \delta\theta - \frac{\alpha}{1-\alpha}(1-\theta) \quad \text{and} \quad q_H^{qp} = \frac{1}{\delta}. \tag{89}$$

These optimal qualities always satisfy the condition $q_H \geq \delta q_L$, since we always have $q_H \geq 1$ and $q_L \leq 1$.

Since I assume that qualities are non-negative, the maximization problem has a corner solution, $q_L^{qp} = 0$, if the valuation of the low type is too low:

$$\theta \leq \frac{\alpha}{\delta(1-\alpha)+\alpha} \equiv \hat{\theta}_4(\alpha). \tag{90}$$

However, the monopolist is then better off by excluding the low type.

Existence of decoy that makes quality salient for product H and price salient for product L

First note that given such salience, the IC_L implies that $p_H \geq \theta(\frac{1}{\delta}q_H - q_L) + \frac{1}{\delta}p_L$. Together with the PC_L it thus follows that $\frac{p_H}{q_H} > \frac{1}{\delta}\theta$. Furthermore, we know from PC_L that $\frac{p_L}{q_L} \leq \delta\theta$. Thus, it must be that any separating products given such salience are such that

$$\frac{q_H}{p_H} < \frac{q_L}{p_L}. \tag{91}$$

Further, we found that the optimal products derived above are always such that $q_H \geq q_L$ and $p_H \geq p_L$ since $p_H = \frac{1}{\delta}q_H - q_L + \frac{1}{\delta}p_L \geq p_L$. Given the optimal products, we want to find a decoy which makes quality salient for product H and price salient for product L. We thus need a decoy such that the following holds:

$$\frac{\bar{q}}{\bar{p}} < \frac{q_H}{p_H} < \frac{q_L}{p_L}, \tag{92}$$

$$q_L < \bar{q} < q_H, \tag{93}$$

$$p_L < \bar{p} < p_H. \tag{94}$$

For the decoy, this implies it has to lie in the hatched area in Figure 9, where

$$p_D > q_D\frac{p_H}{q_H} + q_L\left(\frac{p_H}{q_H} - \frac{p_L}{q_L}\right), \tag{95}$$

$$2q_H - q_L > q_D > 2q_L - q_H, \tag{96}$$

$$2p_H - p_L > p_D > 2p_L - p_H. \tag{97}$$

Consider for example the product $q_D = q_L$ and $p_D = 2p_H - p_L - e$. It easily satisfies conditions (96) and (97) when $e \to 0$. Furthermore, it satisfies (95) for $e \to 0$:

$$2p_H - p_L - e > q_L\frac{p_H}{q_H} + q_L\left(\frac{p_H}{q_H} - \frac{p_L}{q_L}\right) \Leftrightarrow e < 2p_H\left(1 - \frac{q_L}{q_H}\right). \tag{98}$$

Without determining which attribute is salient for the decoy, it is enough to show that both types would not buy it even if it was quality is salient. The high type does not prefer the decoy if and only if

$$q_D - \delta p_D < \; q_H - \delta p_H \tag{99}$$

$$\Leftrightarrow e < p_H - p_L + \frac{1}{\delta}(q_H - q_L). \tag{100}$$

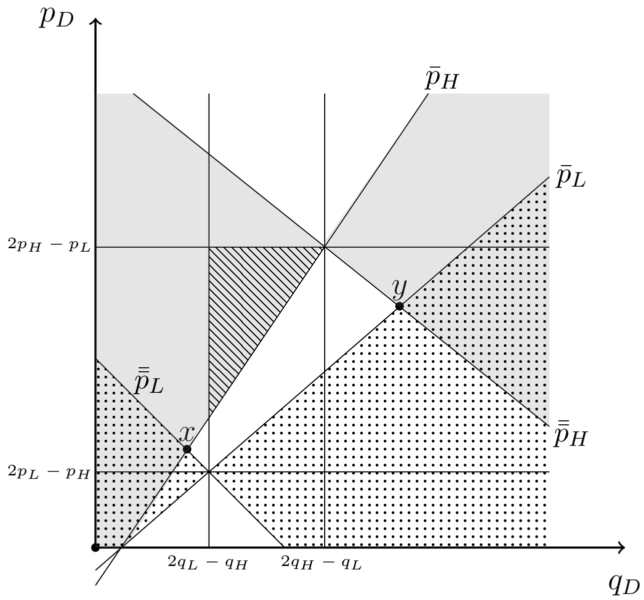

Figure 9: **Possible decoys to make consumers focus on the quality of product H and on the price of product L.** Quality is salient for product L if and only if product D lies in the dotted area. Quality is salient for product H if and only if product D lies in the gray area. In the hatched area, quality is salient for product H and price is salient for product L.

The low type does not prefer the decoy if

$$\theta q_D - \delta p_D < \delta\theta q_L - p_L \tag{101}$$

$$\Leftrightarrow e < 2p_H - p_L\left(\frac{1}{\delta}+1\right) - \theta q_L\left(\frac{1}{\delta}-1\right). \tag{102}$$

Plugging in the optimal products, the RHSs of (100) and (102) are strictly positive and thus there exists an $e \to 0$ for which neither of the types prefers the decoy. To see this for the RHS of (102), note that it is strictly increasing in α:

$$\frac{\partial RHS}{\partial \alpha} = \frac{(1-\theta)(\delta^2\theta + (2-2\theta)\delta + \theta)}{\delta(1-\alpha)^2} > 0, \tag{103}$$

and already positive at $\alpha = 0$:

$$RHS|_{\alpha=0} = \frac{2}{\delta^2} - \theta^2\delta^2 + (2\theta^2 - 2\theta)\delta - \theta^2 > 0, \tag{104}$$

since $RHS|_{\alpha=0}$ is strictly decreasing in θ:

$$\frac{\partial\, RHS|_{\alpha=0}}{\partial \theta} = -2\delta^2\theta - 2\delta(1-\theta) - 2\theta(1-\delta) < 0, \tag{105}$$

and still positive at $\theta = 1$:

$$RHS|_{\alpha=0,\theta=1} = \frac{2}{\delta^2} - \delta^2 - 1 > 0. \tag{106}$$

Hence, there always exists a decoy that makes quality salient for product H and price salient for product L.

Comparison with profit from separation with price salient products

The monopolist prefers to separate with a decoy if

$$\pi_S^{qp} - \pi_S \geq 0. \tag{107}$$

This difference is decreasing in δ and equal to zero at $\delta = 1$:

$$\frac{\partial[\pi_S^{qp} - \pi_S]}{\partial\delta} = -\frac{\alpha[(1-2\theta+(2-\alpha)\theta^2)\delta^4 + \theta(1-\theta)(1-\alpha)\delta^3 + (1-\alpha)]}{(1-\alpha)\delta^3}. \tag{108}$$

(Note that the expression in the square brackets is decreasing in α and positive at $\alpha = 1$). Hence, whenever both forms of separation exist, the monopolist prefers to induce the high-quality product to be quality salient.

Existence of separation

We can show that whenever separation with price salience would be preferred to exclusion or pooling with a decoy, separation with quality-price salience would also be possible since: $\hat{\theta}_2(\alpha) \geq \hat{\theta}_4(\alpha)$, for all $\alpha \in [0,1]$ and all $\delta \in (0,1]$. To see this, note that the difference $\hat{\theta}_2(\alpha) - \hat{\theta}_4(\alpha)$ strictly decreases in δ and is equal to zero at $\delta = 1$:

$$\frac{\partial[\hat{\theta}_2(\alpha) - \hat{\theta}_4(\alpha)]}{\partial\delta} = -\frac{2\alpha^{1/2}(1-\alpha)^{1/2}}{(\frac{1}{\delta^4}-1)^{1/2}\delta^5} + \frac{\alpha(1-\alpha)}{[\delta(1-\alpha)+\alpha]^2} < 0 \tag{109}$$

$$\Leftrightarrow T \equiv 4[\delta + (1-\delta)\alpha]^4 - \alpha(1-\alpha)\delta^6(1-\delta^4) > 0. \tag{110}$$

T is positive since it is positive at $\delta = 0$ $[T(\delta = 0) = 4\alpha^4]$ and strictly increasing in δ:

$$\begin{aligned}\frac{\partial T}{\partial\delta} =& 16[\delta^3(1-\alpha)^3 + 2\alpha^2\delta(1-\alpha)(1-\delta) + \alpha^2\delta(1-\alpha) \\ &+ \alpha^3(1-\delta^2) + 2\alpha\delta^2(1-\alpha)^2] + 10\alpha\delta^9 + \alpha\delta^2(16-6\delta^3) > 0.\end{aligned} \tag{111}$$

8.6 Proofs with a general utility function

The proof that price is salient for both types whenever the monopolist optimally separates is presented in the main text. I show here that there always exists a decoy that makes quality salient when the monopolist pools or excludes low types.

Exclusion. The optimal excluding product given quality salience (q_E, p_E) satisfies the participation constraint of type H given quality is salient, i.e. $u(q_E, \theta_H) - \delta p_E \geq 0$. Consider a product (q_D, p_D) with $p_D = p_E - \epsilon$ and $q_D \in (0, q_E)$ that satisfies the following conditions:

- It is strictly dominated for type L given quality salience:

$$\epsilon < \frac{1}{\delta}u(q_E, \theta_L) - \frac{1}{\delta}u(q_D, \theta_L). \tag{112}$$

- It is strictly dominated for type H given quality salience:

$$\epsilon < \frac{1}{\delta}u(q_E, \theta_H) - \frac{1}{\delta}u(q_D, \theta_H). \tag{113}$$

- It induces quality salience for type L:

$$\epsilon < p_E \left[1 - \frac{u(q_D, \theta_L)}{u(q_E, \theta_L)}\right]. \tag{114}$$

- It induces quality salience for type H:

$$\epsilon < p_E \left[1 - \frac{u(q_D, \theta_H)}{u(q_E, \theta_H)}\right]. \tag{115}$$

Since the RHSs for all four conditions are strictly positive, there always exists an $\epsilon \to 0$ such that they are all satisfied.

Pooling. The optimal pooling product given quality salience (q_P, p_P) satisfies the participation constraint of type L given quality is salient, i.e. $u(q_P, \theta_L) - \delta p_P \geq 0$. Consider a product (q_D, p_D) with $p_D = p_P - \epsilon$ and $q_D \in (0, q_P)$ that satisfies the following conditions:

- It is strictly dominated for type L given quality salience:

$$\epsilon < \frac{1}{\delta}u(q_P, \theta_L) - \frac{1}{\delta}u(q_D, \theta_L). \tag{116}$$

- It is strictly dominated for type H given quality salience:

$$\epsilon < \frac{1}{\delta}u(q_P, \theta_H) - \frac{1}{\delta}u(q_D, \theta_H). \tag{117}$$

- It induces quality salience for type L:

$$\epsilon < p_E\left[1 - \frac{u(q_D, \theta_L)}{u(q_P, \theta_L)}\right]. \tag{118}$$

- It induces quality salience for type H:

$$\epsilon < p_E\left[1 - \frac{u(q_D, \theta_H)}{u(q_P, \theta_H)}\right]. \tag{119}$$

Since the RHSs for all four conditions are strictly positive, there always exists an $\epsilon \to 0$ such that they are all satisfied.

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