Image concerns and the provision of quality*

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Abstract

Many consumers value a good not only for its intrinsic characteristics such as its quality but also for the image associated with buying it. A rational producer takes such image concerns into account and designs products accordingly. In this paper I study quality provision and pricing when some consumers care about their image while others do not. I show that heterogeneous image concerns induce product differentiation which is not driven by heterogeneous valuations for quality, in the sense that consumers with identical quality valuations buy products with different quality levels. This holds both for a monopolistic market and in a fully competitive setting. Under competition both average quality and market coverage are (weakly) higher than under monopoly. Surprisingly, higher concerns for the image of quality can even decrease quality provision in monopoly. By restricting the product space, monopoly allows for more efficient allocation of image and thus may yield higher welfare than competition.

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"People buy things not only for what they can do, but also for what they mean."
-Levy (1959)-

1 Introduction

Goods are valuable not only through their intrinsic characteristics but consumption also has a symbolic value (e.g. Campbell, 1995). As consumers express their preference for a certain type of production through their consumption decisions (The Economist, 2006; Ariely & Norton, 2009) the purchasing choice becomes a signal of a consumer's type. Consequently, each product is associated with an image which reflects the type of consumer who buys it. It is well-documented that consumers are willing to pay for this image (see e.g. Chao & Schor 1998; Charles *et al.* 2009; Heffetz 2011). Prominently, Toyota's hybrid car Prius sells well because consumers feel it "makes a statement about [them]" (Maynard, 2007). Regarding the Prius, Sexton & Sexton (2011)'s empirical analysis indicates that "consumers are willing to pay up to several thousand dollars to signal their environmental bona fides through their car choices." In this paper, I study the impact of such image concerns in markets. Specifically, I analyze quality provision and prices when individuals differ both in their valuations of quality and their desire for social image. I first solve for the optimal product line offered by a monopolist and then a perfectly competitive setting. This allows me to disentangle the effects of strategic consumer behavior from the effects due to the strategic behavior of a (monopolistic) producer.

Anecdotal evidence suggests that, indeed, product design strategically tailors to consumers' desires to be identified with certain characteristics. Advertisements play with product images. Examples include the German "Bionade", which was advertised as "the official beverage of a better world" (see e.g. Ullrich, 2007), and the soft drinks "ChariTea" and "LemonAid".[1] The latter two appeal to non-consumption values through a clever word play that links the name of the drink with charitable acts. Alternatively, the reader may think of expensive watches or cars (see Seabright, undated, for examples) or the wine market (Bruwer *et al.* , 2002). While conspicuous consumption is a well-researched behavior, little work investigates how the supply side reacts to consumers' signaling desires (but see Rayo 2003; Vikander 2011 and discussion in Section 2). To the best of my knowledge, I am the first to address the strategic implications of heterogeneous image concerns without restrictions on the correlation with intrinsic motivation.

[1] These two drinks are advertised with "Drinking helps!". See e.g. `http://www.lemon-aid.de/`.

In my analysis, I assume that some but not all consumers have a positive valuation for quality and that some but not all care about the image associated with a product. I do not impose any restriction on the correlation between the two interests. The relative frequency of image concerned consumers can be different for intrinsically (quality) motivated consumers than for those who do not care about quality. The image of a product emerges from the consumption decisions of individual consumers. It is the conditional expectation of a consumers type after purchases have been observed. Consumption is conspicuous in that it provides evidence of the personal characteristic "interest in quality".[2] Note that "quality" is very general here. Apart from its standard meaning, quality can for instance also be the extent to which production is environmentally friendly.

I first analyze a monopolistic market since this captures an essential aspect of status goods, namely their inimitability. I extend a monopolistic model of quality provision (Mussa & Rosen, 1978) to allow for both heterogeneity in preferences for quality and heterogeneity in image motivation on the consumer side. I study how the producer strategically adjusts product variety and prices in response to consumers' image concerns. Since in the long run, substitutes may evolve which also confer image, I complement the analysis with a fully competitive setting.

For the monopoly case, I find that heterogeneous image concerns distort quality provision while homogeneous image motivation does not. By introducing a lower-quality, lower-price product the producer can profitably screen consumers with respect to their willingness to pay a premium for image and increase market coverage. Fewer consumers decide in favor of a zero-quality outside good. There exist parameters such that total provision of quality decreases because the reduction in average quality outweighs the increase in market coverage. If image is very valuable the monopolist instead profits most from selling exclusively to consumers who value image in addition to quality. Market coverage and total quality provision decrease. Overall, the effects of image concerns on total provision of quality are non-monotone.

I contrast these results with findings from perfect competition where the results are driven by consumer preferences alone. The main finding is robust: heterogeneous image concerns induce product differentiation which is not driven by heterogeneous valuations for quality. If the value of image is sufficiently large relative to the valuation of quality, product differentiation is the equilibrium outcome with competitive firms. In contrast to

[2]Conspicuous consumption according to Veblen (1915, p.47) is the "specialized consumption of goods as an evidence of pecuniary strength". Here, "interest in quality" can be driven by wealth or expertise and thereby signaling this trait is equally valuable as signaling "pecuniary strength".

monopoly, a product with excessive quality is sold. Under monopoly, consumers who value both image and quality overpay for quality and thereby signal their quality valuation. This is impossible in competition since prices are driven down to marginal cost. Thus, in a competitive market, consumers who value both image and quality buy inefficiently high quality. Higher quality serves as a "functional excuse" to pay for image and separate from lower valuation consumers. However, this higher quality product is too expensive for purely image-motivated consumers even if sold at marginal cost. Purely image-motivated consumers pool with purely quality-concerned consumers on a product with first-best quality, i.e. the quality level of the high quality product in monopoly. Interestingly, I find that monopoly often yields higher welfare than competition. The reason is that by restricting the product space it allows for less wasteful signaling.

The model applies to a wide range of settings; wine, cars or watches as well as technological devices such as mobile phones or notebooks are sold in the presence of image concerns. Recently buying green or ethical has become conspicuous, the Prius being a popular example. To fix ideas, I illustrate the setup of the model and the main results within the framework of green consumption. The public good character of environmentally friendly production gives the problem another interesting twist.

Example: green consumption Suppose the production of a certain good exerts positive externalities on others, e.g. refraining from the use of hazardous inputs or using less polluting technology. Quality measures to which extent the production process creates such positive externalities. Some consumers value these externalities as such (intrinsic motivation due to altruism or warm glow of giving as in Andreoni (1989, 1990)) while some value products with positive externalities because they are connected to higher social esteem (image motivation as in Bernheim, 1994; Glazer & Konrad, 1996; Harbaugh, 1998).[3] My paper investigates how these image concerns affects the production process (i.e. the "quality") as well as prices in monopoly and competition.

The main results translate to the example of green consumption as follows. In monopoly, the first-best quality, i.e. the green quality which would be sold if image concerns were absent and preferences known, is always available.Product differentiation occurs through an additional green product with lower production standards. Propagating green production through the introduction of a lower quality product is a strategic choice by the monopolist to maximize profits. Even though this increases the market share of green production, it

[3]It does not matter whether intrinsic interest arises from externalities or from e.g. private health benefits. It is enough that some consumers derive intrinsic benefit from the green character of a product.

does not necessarily indicate social responsibility on the monopolist's part. Instead, the monopolist engages in strategic corporate social responsibility (Baron, 2001): he tailors his products to individuals' demand for responsible products for profit-maximizing reasons. In competition, green quality is available at a much lower price than in monopoly. Thus, consumers who only value image pool with all intrinsic buyers at the green quality which is first best, i.e. the high quality level in monopoly. This dilutes the image associated with this level of green quality. Those who value image and quality resort to green products with even higher standards to sustain the image of being the most environmentally responsible consumers. To summarize, my model predicts situations where (1) in monopoly, increases in image concerns increase the market size of green products but simultaneously decrease the quality of the average green product. (2) In competition, image concerns trigger sales of "greener" products and green production (weighted by standard) increases with image concerns.

These model predictions fit well with empirical observations. As consumers become more interested in social and environmental characteristics, supply responds to these preferences with corporate social responsibility becoming more and more widespread. The market for organic products grew on average by more than 14% per year between 1999 and 2007 (Sahota, 2009), and similarly Fairtrade sales experience two-digit annual growth rates in many European markets (Transfair.org, 2011). While the mainstreaming of responsible consumption seems to be welcome, critical voices lament a dilution of the underlying principles as products are tailored to a broader audience.[4] More recently, several actors in Fairtrade and organic production have introduced their own standards above the one implemented in mainstream retailing, as my model predicts for a competitive environment.[5,6]

The rest of the paper is structured as follows. I first discuss in more detail how my paper relates to other approaches in the literature and present empirical evidence on image concerns in Section 2. Then, I introduce the monopolistic model and discuss two benchmark cases (Section 3) before I analyze the full model in detail in Section 4. Section 5 analyses heterogeneous image concerns in a competitive market. I discuss welfare implications and

[4]See for instance Clark (2011) in Bloomberg Businessweek and Stevens (2011). Regarding the discussion about discounters engaging in Fairtrade sales see also`http://www.taz.de/!40673/`.

[5]See for instance `http://fair-plus.de/`, and Purvis (2008) on Fairtrade. For organic products, a number of voluntary agreements exist which enforce more stringent standards than e.g the certified organic standard of the European Union (see IFOAM, undated).

[6]Social responsible investing (SRI) has also grown rapidly since the late nineties and faster than investing in conventional assets under management with critical voices similarly calling in question the benefits (Haigh & Hazelton, 2004). For details on growth in SRI see (Social Investment Forum Foundation, 2010). Renneboog *et al.* (2008) provide an overview over academic research on SRI.

policy interventions separately for monopoly (Subsection 4.3) and competition (Subsection 5.2). Comparative statics are dealt with in Subsections 4.4 and 5.3, respectively. Section 6 discusses the interpretation of quality as a public good and analyzes a monopolistic market where the value of image is negative. I conclude in Section 7. Proofs which are not included in the main text are relegated to appendix A.

2 Theoretical approaches to and empirical evidence of image concerns

Image concerns in consumption have received broad coverage in economics (see e.g. Veblen, 1915; Ireland, 1994; Bagwell & Bernheim, 1996; Glazer & Konrad, 1996; Corneo & Jeanne, 1997) in sociology (see e.g. Campbell, 1995; Miller, 2009), psychology (e.g. Griskevicius *et al.* , 2010) and popular media (The Economist, 2010; Beckert, 2010). I employ the term image motivation or image concern for consumers' interest in an observer's inference about their type (for similar use see e.g. Ariely *et al.* , 2009).[7] Signaling motivation, status concern, or conspicuous consumption refer to the same phenomenon. In this section, I briefly discuss how my paper relates to the theoretical economics literature before I discuss empirical evidence for image concerns in consumption.

A classic conspicuous consumption model as in Corneo & Jeanne (1997) or Bagwell & Bernheim (1996) features two goods, only one of which is conspicuous and assumes that all consumers care about their images and can signal their types by adjusting their purchased quantity freely. In such a model, consumers typically consume inefficiently as they try to establish higher levels of status (Ireland, 1994). I depart from the existing literature in two important aspects. First, I restrict purchases to unit demand. Each consumer buys exactly one unit of one of the offered products, either one with positive quality from the monopolist or the zero-quality outside good.[8] Secondly, I assume that consumers differ in their image motivation as well as in their intrinsic interest in quality whereas in other models consumers differ only in one dimension. I discuss both points in turn.

Consumers in Bagwell & Bernheim (1996) and Corneo & Jeanne (1997) use consumed quantities as signals. If image is not related to wealth but to other traits, however, signaling via quantity is not a reasonable mechanism. The unit-demand assumption in my model

[7] Cabral (2005) suggests to use "reputation" for situations "when agents believe a particular agent to be something." The term "image" is more common in the relevant literature and thus used here.

[8] In particular with respect to food and clothes, which are necessary goods and purchased by (almost) everybody, this assumption seems a reasonable simplification.

forces the effect of image to show up in qualities. In the monopoly case, the producer decides on product offers and accordingly influences which images can be obtained.[9] In competition, consumers can freely choose quality but still are assumed to have unit demand so as to shut down signaling via consumed quantities.

Heterogeneity in image concerns yields interesting insights which are absent in one-dimensional models while keeping their results nested as special cases. Rayo (2003) extends a Mussa-Rosen type model of quality provision to allow for image motivation. For tractability reasons he assumes that marginal utility from quality and image are proportional to each other. This essentially reduces consumer heterogeneity to one dimension and precludes distortions in quality provision other than those well-known from the literature on one-dimensional screening. Pooling occurs if and only if the monopolist's marginal revenue function is somewhere decreasing in consumer type.[10] My model illustrates a different reason for pooling, namely that marginal utilities in both dimensions are not aligned. Selling to only image-motivated consumers requires to pool them with truly caring types. If image and quality concerns are perfectly positively correlated as in Rayo (2003), the hazard rate condition is trivially fulfilled and I do not get pooling either.

In Vikander (2011), all consumers care about status to the same degree but differ in their intrinsic preference for the good in question. A monopolist sells an exogenously given number of different varieties of a good which do not differ in quality but only in price and social status. The monopolist strategically designs advertising such as to exploit status concerns and price discriminate between consumers. Vikander (2011)'s predictions are consistent with findings from a special case in my model where everybody cares about image.[11]

By adding another preference parameter to a conspicuous consumption model, my paper contributes to the literature on two-dimensional screening. In contrast to classical models of quality provision in the line of Mussa & Rosen (1978) and Maskin & Riley (1984) the monopolist here faces a two-dimensional screening problem. Types are binary in both dimensions as in the introduction to two-dimensional screening by Armstrong & Rochet (1999). In contrast to Armstrong & Rochet (1999), image as the additional

[9]This also contrasts with models of prosocial behavior where individuals can choose their desired level of prosocial activity and thereby their signal freely (e.g. Bénabou & Tirole, 2006).

[10]This corresponds to a violation of the often made assumption that the hazard rate of the type distribution is increasing. In such a case pooling occurs also in the absence of image motivation. Bolton & Dewatripont (2004) discuss this phenomenon as "bunching and ironing" (p. 88ff).

[11]While Vikander (2011) needs knowledge about consumer types for targeted advertising, in my model consumer types are private and I do not consider explicit advertising.

product characteristic cannot be chosen freely in my model. The monopolist faces the additional restriction that image must be consistent with consumers' purchasing choices. The monopolist offers a product menu and lets consumers self-select (second-degree price discrimination). Through product offers the monopolist manipulates signaling possibilities and images in the market. In my model, pooling occurs generically and for reasons different from the bunching condition in standard screening models. Due to the heterogeneity in image concerns, allocating image is not a zero-sum game anymore. Pooling is then a tool to create value in the form of image to consumer types who value image but who by themselves do not contribute to a positive image.

Following an approach introduced by Geanakoplos *et al.* (1989) as "psychological games" I posit that reduced form utilities directly depend on beliefs of others. I do not model why consumers care about status. A possible mechanism to microfound an image or status concern is a matching technology as in Pesendorfer (1995), where agents are interested in signaling that they are "good" to increase their chances of interacting with other "good" agents in the future. Interacting with "good" types is supposed to give higher expected payoffs than interacting with "bad" types; this argumentation implicitly assumes that there is a consensus about what is "good" and what is "bad". Agents may then differ in image motivation because they engage in different types of interactions. Mailath & Postlewaite (2006) show how the value of an attribute (like quality here) can depend on social institutions (matching patterns) in a society.

While I model images as signals about a consumer's type, others model image as a consumption externality which depends only on the number of consumers (e.g. Pastine & Pastine, 2002; Buehler & Halbheer, 2012). In those models, image is not related to the average consumer type who buys a certain product but image is simply a function of the number of consumers who purchase the product. Also Amaldoss & Jain (2011) assume that a consumer's utility depends on how many other consumers buy the same product but they distinguish "snobs" (Leibenstein, 1950) who prefer to consume in a small group and followers who gain utility the more others consume the same product. The signaling model is more general: Corneo & Jeanne (1997) show that status concerns can induce a follower and a snob effect as in Leibenstein (1950).

On the empirical side, conspicuous consumption is well-documented. An early example is Chao & Schor (1998), who document conspicuous motives in the market for women's cosmetics. Survey data from Sweden points to image concerns in car purchases very generally (Johansson-Stenman & Martinsson, 2006). In a more recent contribution, Charles *et al.* (2009) show how expenditures on visible consumption depend on individuals position within a reference group as well as on the reference group's position in society. They find that richer individuals within a group have higher expenditures on visible goods. However, across groups, visible expenditures are higher in poorer groups, consistent with a higher need to signal. Heffetz (2011) provides further evidence on conspicuous consumption by exploiting differences in expenditure visibility for different goods.

With respect to green consumption, Sexton & Sexton (2011) find a large image premium for the Toyota Prius. Griskevicius *et al.* (2010) provide experimental evidence for the importance of image concerns in green consumption.[12] A survey by Vermeir & Verbeke (2006), which includes an experimental design, describes among others a consumer type who buys a sustainable product despite reporting a rather negative attitude towards it. These consumers report that their friends and family find it very important that they buy organic products. I interpret this as them caring about their image. Survey results from Bellows *et al.* (2008) show a significant share of people who report to strongly value organic production systems but who are underrepresented among the buyers of organic products. Another (small) group of consumers reports high probabilities of buying organic but values this production method relatively little. Both findings can be explained with heterogeneous image concerns as I will show in this paper.

The predictions for the monopoly case in this paper depend on how both motivations are correlated. If image concerns and intrinsic motivation are strongly positively correlated, this favors the provision of an exclusive good where purely intrinsically motivated buyers purchase the outside good. If they are negatively correlated, image building becomes more likely where a lower quality product is introduced. However, little research has investigated heterogeneity in image concerns. Neither the data by Bellows *et al.* (2008) nor the experimental situation of Vermeir & Verbeke (2006) are suited to analyze how intrinsic motivation and image concerns interact with each other. In related work (Friedrichsen & Engelmann, 2012), we conduct laboratory experiments to test whether intrinsically motivated individuals exhibit stronger or less pronounced image concerns when it comes to buying Fairtrade chocolate. We find evidence for a negative relationship, i.e. those who do not value Fairtrade chocolate intrinsically exhibit stronger image concerns.

[12] Image motivation is also an important determinant of prosocial behavior in experimental settings (Ariely *et al.* , 2009).

3 Quality provision and image concerns

3.1 The model

I consider a monopolist who sells products of potentially different quality to a heterogeneous population of consumers with unit mass. A product is a combination of quality and price and is in equilibrium associated with an image. Quality is chosen by the monopolist on a continuous scale and perfectly observable.

Consumers' utility depends positively on quality $s \in \mathbb{R}_{\geq 0}$ and image (or reputation) $R \in [0, 1]$, and negatively on price $p \in \mathbb{R}_{\geq 0}$ of a product. Consumers can differ in both, their interest σ in quality (intrinsic motivation) and their interest ρ in image (image motivation). The two-dimensional type (σ, ρ) is drawn from $\{0, 1\} \times \{0, 1\}$ with $\text{Prob}(\sigma = 1) = \beta$, $\text{Prob}(\rho = 1|\sigma = 1) = \alpha_s$, and $\text{Prob}(\rho = 1|\sigma = 0) = \alpha_n$. The resulting four different types of consumers are indexed by $\sigma\rho$; their frequencies are stated in Table 1. The parameter $\lambda > 0$ describes the value of image relative to the marginal utility from quality.[13] Utility takes the form:

$$U_{\sigma\rho}(s, p, R) = \sigma s + \rho\lambda R - p \tag{1}$$

The image R of consumer (σ, ρ) is the expectation of her quality preference parameter σ conditional on her purchasing decision. It reflects an outside spectator's (or the consumer mass') inference of a consumer's interest in quality. A formal definition of image follows with the equilibrium definition in Section 3.3.

Each consumer can choose a preferred product from the menu of quality-price offers or decide not to buy any of them. The latter case corresponds to obtaining the outside good of zero quality at a price of zero. Reservation utility is then equal to the utility derived from the image of non-buyers (=outside good buyers). The analysis remains essentially unchanged if buying an outside good with zero quality gives the same utility, say $\bar{a}$, for all consumers.

The **monopolist** offers a menu of products $\mathcal{M} \subset \mathbb{R}^2_{\geq 0}$ to maximize expected profit given that consumers self-select (second-degree price discrimination); due to privacy of consumer types perfect price discrimination is impossible. Voluntary participation is taken

[13] Alternatively I could allow for (σ, ρ) drawn from $\{0, \bar{\sigma}\} \times \{0, \bar{\rho}\}$ for arbitrary $\bar{\sigma}, \bar{\rho} > 0$. This is equivalent to my formulation with $\lambda = \frac{\bar{\rho}}{\bar{\sigma}}$. Since λ gives the relative weight on image concerns we can also rewrite the analysis with a weight $\gamma \in [0, 1]$ on image and a weight $1 - \gamma$ on quality such that we obtain the above formulation with $\lambda = \frac{\gamma}{1-\gamma}$.

		image concern		
		no	yes	
		$\rho = 0$	$\rho = 1$	$\sum$
quality concern	no: $\sigma = 0$	$(1-\beta)(1-\alpha_n)$	$(1-\beta)\alpha_n$	$(1-\beta)$
	yes: $\sigma = 1$	$\beta(1-\alpha_s)$	$\beta\alpha_s$	β

Table 1: Different consumer types and their frequencies.

care off by including the outside option $(0, 0)$ in the product menu.[14] The monopolist cannot choose image directly, but takes into account which image will be associated with each of his products in equilibrium.

I assume the unit cost to be linear in quantity sold and convex increasing in quality and $c(s) = \frac{1}{2}s^2$.[15]

3.2 The structure

The distribution of σ and ρ and the value of λ are common knowledge and so is the setup of the market interaction. Consumers privately learn their types. Quality is correctly perceived by consumers; cheating on quality is prevented e.g. through third-party verification or because it is obvious from inspection.

The timing is as follows (see also Figure 1):

(i) The monopolist offers a menu $\mathcal{M}$ of products. Qualities and prices are observed by all consumers.

(ii) Consumers learn their types.

(iii) All consumers simultaneously choose a product which maximizes utility for their type.

(iv) Images associated with each product are determined according to purchasing decisions and payoffs realize.

Since beliefs enter the payoffs of consumers and the monopolist, this is a psychological game (Geanakoplos *et al.* , 1989). Whenever in the following the term "game" is used this is to be understood as a "psychological game".

[14] I will sometimes refer to taking $(0, 0)$ as non-participation since this is the meaning of it. Strictly speaking all types participate by construction.

[15] I specify a functional form to obtain closed form solutions. The main results go through with constant unit costs. Details are available from the author upon request.

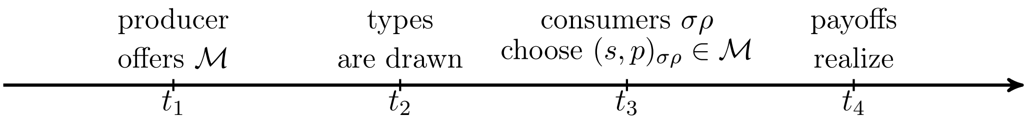

Figure 1: Timing

3.3 Equilibrium

In the presence of image-motivation the menu offered by the monopolist induces a game among consumers. Image-motivated consumers' payoffs depend on image and thereby on equilibrium play. Consumers form beliefs about which products other consumer types buy and take this into account when deciding on their purchases. Consumers who value image have an incentive to buy a product which they believe is bought by consumers with an intrinsic interest in quality since this signals caring about quality and is rewarded with a higher image. Whether or not a consumer cares about image does not influence her image directly but influences the choice of a product and can thereby indirectly impact on the image. Image depends on the partition of consumers on different products and thereby only indirectly on absolute product quality.

For every menu $\mathcal{M} \in \mathcal{P}(\mathbb{R}^2_{\geq 0})$ the choice function $b_{\mathcal{M}} : \{0,1\}^2 \to \mathcal{M}$ states which product $(s,p) \in \mathcal{M}$ is chosen by consumer type $\sigma\rho$.[16] For every menu $\mathcal{M}$ the belief function $\mu_{\mathcal{M}} : \mathcal{M} \to [0,1]$ assigns probabilities to a consumer having $\sigma = 1$ given that she buys a specific product (s,p) or does not participate. Beliefs are assumed to be identical for all consumers. Since there is a belief function for each menu, the same product occurring in different menus can be associated with different beliefs. In equilibrium the posterior belief and thereby images must be consistent with Bayes' rule, that is they must reflect the actual distribution of types. Given that a choice occurs with positive probability the posterior belief $\mu_{\mathcal{M}}$ from which we derive the image must fulfill

$$\mu_{\mathcal{M}}(s,p) = \frac{\sum_{\rho=0,1} \text{Prob}(1,\rho)\text{Prob}(b_{\mathcal{M}}(1\rho) = (s,p))}{\sum_{\sigma=0,1}\sum_{\rho=0,1} \text{Prob}(\sigma,\rho)\text{Prob}(b_{\mathcal{M}}(\sigma\rho) = (s,p))} \tag{2}$$

We can now state the equilibrium definition:

Definition 1. *Given any menu $\mathcal{M}$, an equilibrium in the consumption stage is a set of functions $b_{\mathcal{M}} : \{0,1\}^2 \to \mathcal{M}$ and $\mu_{\mathcal{M}} : \mathcal{M} \to [0,1]$ such that*

[16] For ease of notation and because I show below that mixed strategies are not optimal, I restrict attention to pure strategies here.

(i) $b_{\mathcal{M}}(\sigma\rho) \in argmax_{(s,p)\in\mathcal{M}} \sigma s + \rho\lambda R(s,p) - p$ *for* $\sigma, \rho \in \{0,1\}$ *(Utility maximization).*

(ii) $R(s,p,\mathcal{M}) = E[\sigma | b_{\mathcal{M}}(\sigma\rho) = (s,p)] = \mu_{\mathcal{M}}(s,p)$ *and* $\mu_{\mathcal{M}}$ *is defined in (2) if* (s,p) *is chosen with positive probability and* $\mu_{\mathcal{M}} \in [0,1]$ *otherwise (Bayesian Inference).*

An equilibrium of the complete game is given by a menu $\mathcal{M}$, a correspondence $b_{\mathcal{M}}$ and a belief function $\mu_{\mathcal{M}}$ such that among the feasible menus, $\mathcal{M}$ gives the highest profit to the producer for given consumer behavior and consumer behavior constitutes an equilibrium as defined in Definition 1.[17] I assume throughout that in case of multiple equilibria in the consumption stage, the preferred equilibrium of the monopolist is played.[18] To simplify notation, in the following I drop the argument $\mathcal{M}$ in the image unless this creates ambiguities. As noted by Rayo (2003), this equilibrium definition corresponds to a Perfect Bayesian Equilibrium in an extended game, where consumers are punished whenever their perceived image does not coincide with the Bayesian posterior.

3.4 Benchmark cases: nobody or everyone values image

This section presents two benchmark cases with heterogeneity in quality preferences only: First, no consumer cares about image and, second, all consumers care about image. Importantly, this shows that homogeneous image concerns do not influence the production of quality, whereas heterogeneous image concerns do, as will be shown in Section 4.

No image motivation Suppose a fraction β of consumers value quality ($\sigma = 1$) but none cares about her image, i.e. $\alpha_s = \alpha_n = 0$. Since there are only two consumer types, without loss of generality consider only menus with at most two different qualities s_0, s_1.

[17] With slight abuse of notation we do not distinguish between the set of offered products and the set of accepted products but denote both by $\mathcal{M}$. This is justified since the two sets can only differ in options not taken in equilibrium. If we assumed an ϵ cost for putting a product on the market, the monopolist would only offer products which would be accepted in equilibrium.

[18] Each consumer in the continuum is atomless so that individual deviations are not profitable. However, sometimes profitable collective deviations exist and lead to multiple equilibria. Qualitatively similar results hold up when we instead assume that, in every subgame, consumers coordinate on the equilibrium which maximizes consumer surplus. Computations become simpler and can be obtained from the author upon request. Interestingly, there exist cases, where consumers are worse off than if they had agreed to the monopolists' offer.

The monopolist offers a menu to solve[19]

$$
\begin{array}{lllll}
(3) & & \max_{(s_0,p_0),(s_1,p_1)} & \beta(p_1 - c(s_1)) + (1-\beta)(p_0 - c(s_0)) & \\
 & \text{s.t.} & (IC_{\sigma-\sigma'}) & \sigma s_\sigma - p_\sigma \geq \sigma s_{\sigma'} - p_{\sigma'} & \text{for all } \sigma, \sigma' \in \{0,1\}, \sigma \neq \sigma' \\
 & & (PC_\sigma) & \sigma s_\sigma - p_\sigma \geq 0 \quad \text{for all } \sigma, \sigma' \in \{0,1\} &
\end{array}
$$

Lemma 1. ***(No image motivation)*** *The equilibrium is separating and unique. Consumers obtain* $(s,p) = (1,1)$ *if they value quality and* $(0,0)$ *otherwise.*

Neither the quality consumer nor the unconcerned consumer obtain any rent; consumer surplus is equal to zero. The monopolist receives the entire surplus $\beta(s_1 - c(s_1)) = \frac{\beta}{2}$.

Homogeneous image motivation Suppose a fraction β of consumers value quality ($\sigma = 1$) and all consumers care about their images, i.e. $\alpha_s = \alpha_n = 1$. Recall that λ is the relative importance of image and image is the conditional expectation of a consumer's quality preference after the purchase of a product is observed.

The monopolist faces two types of consumers and without loss of generality we consider only menus in which the monopolist offers at most two qualities s_0, s_1. The monopolist now maximizes profits subject to incentive compatibility, participation constraints, and Bayesian Inference.

$$
\begin{array}{llll}
(4) & \max_{(s_0,p_0),(s_1,p_1)} & & \beta(p_1 - c(s_1)) + (1-\beta)(p_0 - c(s_0)) \\
 & \text{s.t.} & (IC) & \sigma s_\sigma + \lambda R(s_\sigma, p_\sigma) - p_\sigma \geq \sigma s_{\sigma'} + \lambda R(s_{\sigma'}, p_{\sigma'}) - p_{\sigma'} \\
 & & & \text{for } \sigma, \sigma' \in \{0,1\}, \sigma \neq \sigma' \\
 & & (PC) & \sigma s_\sigma + \lambda R(s_\sigma, p_\sigma) - p_\sigma \geq \lambda E[\sigma | (p,s) = (0,0)] \quad \text{for } \sigma \in \{0,1\} \\
 & & (BI) & R(s_\sigma, p_\sigma) = E[\sigma | b(\sigma) = (s_\sigma, p_\sigma)] \quad \text{for } \sigma \in \{0,1\}
\end{array}
$$

Lemma 2. ***(Homogeneous image motivation)*** *The equilibrium is separating and generally not unique. In the equilibrium preferred by the monopolist, consumers obtain* $(s,p) = (1, 1+\lambda)$ *if they value quality and* $(0,0)$ *otherwise.*

This is a simple extension of lemma 1. Homogeneous image motivation simply increases the utility of buying a product and thereby increases the price a monopolist can charge

[19]With full information and the ability to price-discriminate between consumers efficient qualities are s_0^*, s_1^* such that $c'(s_0) = 0$ and $c'(s_1) = 1$. This implies $s_0^* = 0$ and $s_1^* = 1$.

for it without changing the allocation of quality. The prize increase corresponds exactly to the image gain and, as in the absence of image motivation, aggregate consumer surplus is zero. The monopolist's profit is $\beta(\frac{1}{2}+\lambda)$. Image motivation increases the monopolist's profits by $\beta\lambda$.[20] In the following I say that the monopolist charges an **image-premium** if $p > s$. The image-premium is justified through the consumers' willingness to pay for the image associated with the product.

4 Monopoly with heterogenous image concerns

Suppose consumers differ in their marginal utility from quality $\sigma \in \{0,1\}$ and their marginal utility from image $\rho \in \{0,1\}$ and both are private information. Suppose further that the intensity of image concerns is positive, $\lambda > 0$, and common knowledge. To make the analysis interesting, I assume that all consumer types are present in the market.[21] Further, I assume the following tie-breaking rule for consumers who value quality but not image to facilitate the analysis.[22]

Assumption 1. *All consumer types occur with positive probability,* $\beta, \alpha_s, \alpha_n \in (0,1)$.

Assumption 2. *Consumers with* $\sigma = 1, \rho = 0$ *always buy* (s,p) *if indifferent with not participating, i.e. if* $U_{10}(s,p) = s - p = 0 = U_{10}(0,0)$.

The monopolist solves problem (5) below. I look for equilibria as defined in Subsection 3.3. In case of multiple equilibria, I select the equilibrium preferred by the monopolist.[23]

$$\begin{aligned}
(5) \qquad & \max_{\mathcal{M}} && \sum_{\sigma,\rho\in\{0,1\}} \sum_{(s,p)\in\mathcal{M}} \text{Prob}(\sigma,\rho)\text{Prob}(b_{\mathcal{M}}(\sigma\rho) = (s,p))(p - c(s)) \\
\text{s.t.} \quad & (IC_{\sigma\rho-\sigma'\rho'}) && \sigma s_{\sigma\rho} + \rho\lambda R(s_{\sigma\rho}, p_{\sigma\rho}) - p_{\sigma\rho} \geq \sigma s_{\sigma'\rho'} + \rho\lambda R(s_{\sigma'\rho'}, p_{\sigma'\rho'}) - p_{\sigma'\rho'} \\
& && \text{for } \sigma,\rho,\sigma',\rho' \in \{0,1\} \text{ and } (\sigma,\rho) \neq (\sigma',\rho') \\
& (PC_{\sigma\rho}) && \sigma s_{\sigma\rho} + \rho\lambda R(s_{\sigma\rho}, p_{\sigma\rho}) - p_{\sigma\rho} \geq \rho\lambda E[\sigma | b_{\mathcal{M}}(\sigma\rho) = (0,0)] \text{ for } \sigma,\rho \in \{0,1\} \\
& (BI) && R(s_{\sigma\rho}, p_{\sigma\rho}) = E_{\mu_{\mathcal{M}}}[\sigma | b = (s_{\sigma\rho}, p_{\sigma\rho})] \text{ for all } (s_{\sigma\rho}, p_{\sigma\rho}) \in \mathcal{M},\ \sigma,\rho \in \{0,1\} \\
& && \text{which are bought with positive probability in equilibrium}
\end{aligned}$$

[20] We have assumed that the monopolist chooses which equilibrium is played. If instead in each subgame, consumers coordinate to maximize consumer surplus, the price premium decreases to $\lambda(1-\beta)$ in equilibrium.

[21] Results for cases with fewer types are less interesting and available upon request.

[22] Results do not depend on this assumption. Details are available upon request.

[23] This amounts to having the monopolist maximize also over $\mu_{\mathcal{M}}$ in problem 5. See also Footnote 18.

In general, the equilibrium allocation of qualities in this problem differs from the allocation under full information and from the allocations without or with homogeneous image concern (see Subsection 3.4).

In the following, I essentially solve the model backwards. However, since beliefs about other consumer types' play enters the payoffs, I have to think through the game for different possible belief structures which pin down the final payoffs. Thus, in Subsection 4.1, I first identify potentially profitable consumer partitions in the consumption stage. In each such consumer equilibrium, the partition pins down equilibrium beliefs and allows to subsequently characterize the optimal menus which induce these equilibria. Finally, I compare profits across menus to determine the profit maximizing menu (Subsection 4.2). This together with optimal consumer behavior and Bayes-consistent beliefs constitutes an equilibrium of the complete game.

4.1 The consumption stage

In this section I prove the existence of an equilibrium in the consumption stage for every product offer and show that the monopolist will induce a pure-strategy equilibrium. This allows me to index price-quality-image combinations by $\sigma\rho$, where $\sigma\rho$ is the consumer type who buys the product in equilibrium. Finally, I show that only four types of pure-strategy equilibria in the consumption stage are consistent with profit maximization and characterize these. Without loss of generality I do not characterize other equilibria in the consumption stage.

It is easily verified, that the consumption stage has an equilibrium for every possible product offer.

Lemma 3. ***(Existence)*** *For each product offer of the monopolist there exists a (not necessarily pure-strategy) equilibrium in the consumption stage.*

It is easily verified, that for some product offers a pure-strategy equilibrium does not exist but a consumer type randomizes in equilibrium (see example 1). With a continuum of consumers, such a mixed strategy can be interpreted as shares of consumers of the same type choosing different actions with certainty. At the population level this corresponds to a mixed strategy.

Example 1. *Suppose the monopolist offers $\mathcal{M} = \{(0,0),(1,1)\}$ and $\lambda \in (1, \frac{\beta+\alpha_n(1-\beta)}{\beta})$. A pure-strategy equilibrium does not exist. Type 01 does better buying $(1,1)$ when none of his type buys. However, when all of his type buy $(1,1)$ he does better not buying.*

However, while mixed strategies are required to prove existence of equilibrium in every subgame (see Example 1), the following result shows that they can be ignored under profit maximization.

Proposition 1. *The profit maximizing menu contains at most two products and the non-participation option. Furthermore, under assumption 2 it induces an equilibrium in pure strategies in the consumption stage.*

For the proof, I first show that the monopolist offers at most two products and the non-participation option. Second, I identify equilibrium candidates with one or two products and non-participation which involve mixed strategies subject to Assumption 2. For each of them I show that the monopolist makes higher profit by offering a menu which induces consumers to play pure strategies.

Separating menus In a fully separating equilibrium, consumer types must be correctly identified with respect to their interest in quality since their purchases disclose their types. This prohibits purely image-motivated consumers from participating and thereby excludes them together with consumers interested in neither image nor quality. The attempt of separating all four consumer types from each other fails.

Corollary 1. *There is no equilibrium with a fully separating menu which is consistent with profit maximization.*

Proof. Suppose there is a separating equilibrium. All consumer types receive image utility according to their true types, $R_{11} = R_{10} = 1, R_{01} = R_{00} = 0$. Thus, unconcerned consumers as well as those who only value image are not willing to pay a positive price and thus $p_{00} = p_{01} = 0$. Since profit is decreasing in both s_{00} and s_{01}, this implies $s_{00} = s_{01} = 0$. Consumer types 01 and 00 obtain the same product contradicting full separation. Alternatively, this corollary follows from Proposition 1. □

Partially pooling menus Since full separation of the four consumer types does not occur in equilibrium according to Corollary 1 the equilibrium is a partially pooling menu.

To narrow down the set of equilibrium candidates, I first exclude all but four partitions of consumers on products as inconsistent with profit maximization. Second, I derive the prices and qualities which maximizes the monopolist's profit subject to the corresponding incentive compatibility and participation constraints *given* each of the four partitions.

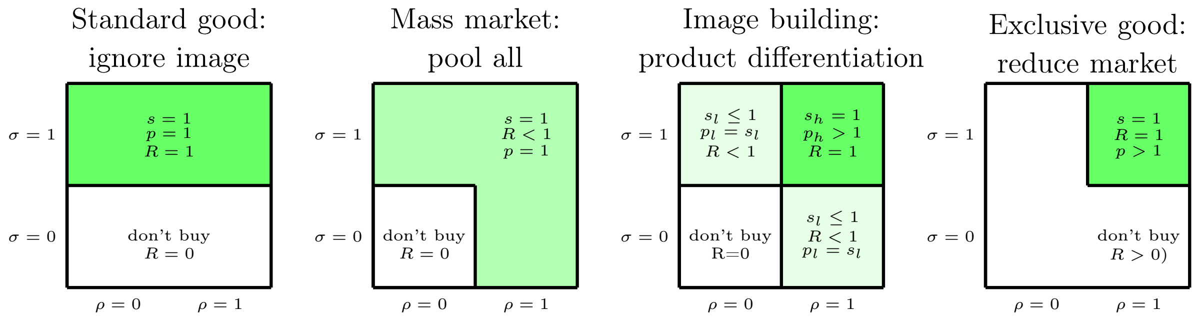

Figure 2: The four types of equilibria from Lemma A6 and Proposition 2.

Proposition 2. *In equilibrium the monopolist offers a standard good, a mass market, an image building menu, or an exclusive good, where the following holds:*

Standard good	*Consumers who value quality buy (s, p), others do not buy.*
Mass market	*Consumers who value quality or image buy (s, p), others do not buy.*
Image building	*Consumers who value either image or quality buy (s_L, p_L), those who value quality and image buy (s_H, p_H), others do not buy.*
Exclusive good	*Consumers who value image and quality buy (s, p), others do not buy.*

and $(s, p), (s_L, p_L), (s_H, p_H)$ are given in Lemmas A7, A8, A9, and A10.

The **standard good** menu is identical to the separating menu without image motivation; all quality-caring consumer buy whether or not they are also interested in image. In a **mass market** only ignorant consumers who do care about neither quality nor image are excluded and consumers who value at least one of the two characteristics buy the same product. This is the menu with the largest market coverage and no differentiation with respect to the level of quality or price. The **image building** menu has the same market coverage but offers two distinct products, a lower quality, lower price version for consumers who care about either image or quality and a premium version for image-motivated caring consumers, which offers higher quality and higher image at a higher price. If image motivation is large, the two products have the same quality and differ only in image and price. If the monopolist sells only this premium product, we call it **exclusive market**. If image motivation is large, the premium product has even higher quality than in the image building menu. An upward distortion in quality is required to justify a higher price and deter purely image motivated consumers from buying this product. The purchasing behavior of consumers is illustrated in figure 2.

4.2 Profit maximization

In the previous subsection, menus have been derived such that beliefs are consistent with Bayes' rule and consumers utility is maximal for the assigned product. It remains to show which menu maximizes profits. Using the characterization of products from Proposition 2 for given consumer partitions, I compute profit as a function of λ for each product offer. The profit functions have the following characteristics.

Lemma 4. *Profits in standard good, image building, and exclusive good have the following characteristics:*

(i) Π^S *is constant for* $\lambda < 1$ *and decreasing and concave for* $\lambda \geq 1$.

(ii) Π^I *is increasing and concave for* $\lambda < \frac{\alpha_n(1-\beta)+(1-\alpha_s)\beta}{(1-\alpha_s)\beta}$ *and linear increasing for* $\lambda > \frac{\alpha_n(1-\beta)+(1-\alpha_s)\beta}{(1-\alpha_s)\beta}$.

(iii) Π^E *is linear increasing.*

With the help of Lemma 4 we can now derive the optimal product offer for each distribution of preferences and each value of image.

Proposition 3. *There exist* $0 < \tilde{\lambda}_m \leq \tilde{\tilde{\lambda}}_m$ *such that the profit-maximizing equilibrium for a monopolistic producer is given by*

(i) a standard good if $\lambda \leq \tilde{\lambda}_m$.

(ii) an exclusive good if $\lambda \geq \tilde{\tilde{\lambda}}_m$.

If $\alpha_s > \frac{1}{3}$ *and* $\beta < \frac{3\alpha_s-1}{\alpha_s+\alpha_s^2}$ *and* $\alpha_n < \frac{\beta(1+\alpha_s(\beta+\alpha_s\beta-3))^2}{4\alpha_s(1-\beta)^2}$, $\tilde{\lambda}_m = \tilde{\tilde{\lambda}}_m$, *and no other menu is ever optimal.*

Otherwise, if $\tilde{\lambda}_m \leq \lambda \leq \tilde{\tilde{\lambda}}_m$ *the profit-maximizing equilibrium is image building product differentiation.*

Corollary 2. *The interval of* λ *where image building is optimal is empty only if image concerns and intrinsic motivation are positively correlated,* $\alpha_n < \alpha_s$.

Image motivation only matters if it is intense enough. For $\lambda \leq \frac{\alpha_n(1-\beta)+\beta}{\beta}$ profits with the exclusive good and profits from image building decrease in λ and while profits from standard good are constant. Thus, for λ small enough offering a standard good must be optimal. This is the same offer as in the absence of image motivation; since not all consumers value image, the monopolist cannot charge an image-premium (cf. Section 3.4).

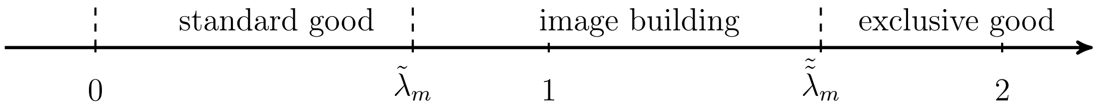

Figure 3: Equilibrium with monopoly for values of image λ.

When image motivation becomes more important, λ increases, the monopolist profits from modifying the menu. A comparison of profits as derived in the proof of Lemma 4 reveals that the exclusive good is optimal if the value of image is large enough. For intermediate values of image motivation, two products are sold and all consumers who value quality or image buy. One product is of high-quality and sells with an image-premium; the other is priced at the monopoly price for quality[24], can be of lower quality and has lower image. The introduction of the low quality into the market allows to "build image" and sell to more consumers as well as increase prices for those who value image and quality. When image motivation becomes even more important, the monopolist has an incentive to market a high-quality product exclusively to consumers who value both image and quality, so that the share of consumers buying high quality decreases as compared to the benchmark cases. It is important to note that the threshold values of λ depend on the distribution of parameters. For any given distribution, however, the equilibrium is Standard good - (Image building) - Exclusive good (for increasing λ).

Figure 3 illustrates the findings of Proposition 3. In addition, Figure 4 shows a typical example for how the equilibrium thresholds depend on the fraction of intrinsically motivated consumers and demonstrates the relevance of the image building menu.

4.3 Welfare in monopoly and with a minimum quality standard

An assessment of total welfare must assess total surplus and total costs. In the following I understand welfare as the sum of consumers' utility including image utility and producer's profits. I first derive the equilibrium which for a given set of parameters maximizes welfare. Then, I compare this with the equilibrium in monopoly provision. In general, the monopolist does not choose the market structure which would maximize welfare when image is valuable.

[24]This equals the marginal cost of increasing quality, s, and has to be distinguished from the unit cost $\frac{1}{2}s^2$. For $s < 2$ the monopoly price is greater than the unit cost such that the monopolist makes positive profits from selling.

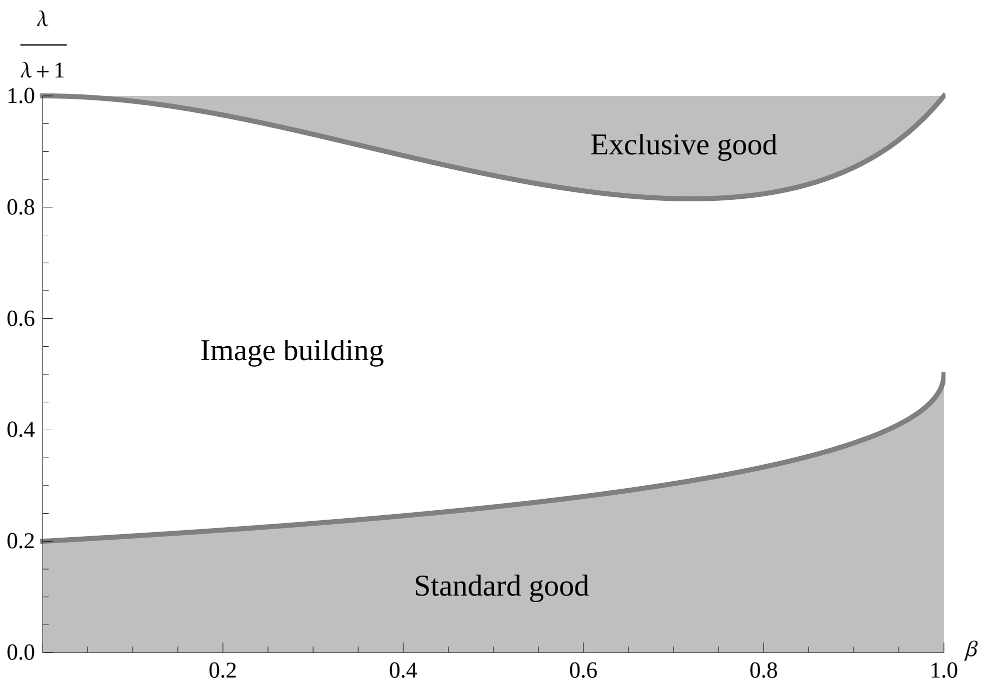

Figure 4: The equilibrium thresholds under monopoly for $\alpha_s = 0.5$ and $\alpha_n = 0.5$. The value of image is rescaled as $\frac{\lambda}{\lambda+1} \in [0, 1]$ which is the weight on image in the utility function.

Note that in my model, image cannot be allocated independently of quality since it depends on equilibrium behavior. When I derive the product offer which maximizes welfare, I therefore assume that offers have to fulfill incentive compatibility and individual rationality constraints. The possible offers are then the same as before (see Lemmas A7, A8, A9, and A10). While the monopolist maximizes appropriable rents, we maximize total rents when we maximize welfare. Which product offer maximizes welfare varies with the intensity of image motivation, analogous to Proposition 3 which gave the profit maximizing structure depending on image motivation. The result is illustrated in Figure 5.

Proposition 4. *Suppose $\alpha_n \leq \frac{1}{2}$ or $\beta \geq \frac{2\alpha_n - 1}{2\alpha_n - \alpha_s}$. There exist $0 < \tilde{\lambda}_w < 1$ such that the welfare-maximizing equilibrium is given by*

(i) a standard good if $\lambda \leq \tilde{\lambda}_w$.

(ii) image building if $\lambda \geq \tilde{\lambda}_w$.

Otherwise, there exist $0 < \tilde{\lambda}_w < 1$ and $2 < \tilde{\tilde{\lambda}}_w < \tilde{\tilde{\tilde{\lambda}}}_w$ such that the welfare-maximizing equilibrium is given by

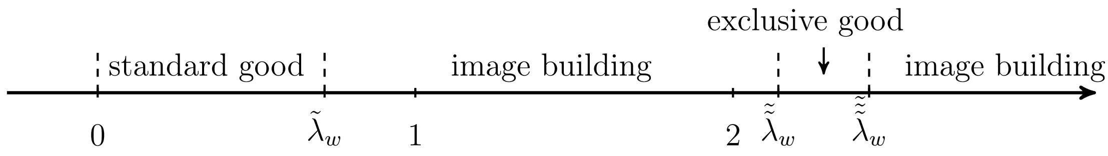

Figure 5: Welfare maximizing market structure for values of image λ.

(i) a standard good if $\lambda \leq \tilde{\lambda}_w$.

(ii) image building if $\tilde{\lambda}_w \leq \lambda \leq \tilde{\tilde{\lambda}}_w$ *or* $\lambda \geq \tilde{\tilde{\tilde{\lambda}}}_w$.

(iii) an exclusive good if $\tilde{\tilde{\lambda}}_w \leq \lambda \leq \tilde{\tilde{\tilde{\lambda}}}_w$.

In terms of welfare it is unambiguously clear that a standard good is optimal for low image concerns and image building is optimal for high image concerns. However, for some parameters, there exists an interval of image values such that offering an exclusive good maximizes welfare for all λ in this interval. It is noteworthy, that for exclusivity to maximize welfare, the marginal utility from image must be more than twice as high as the marginal utility from quality.[25]

Comparing the thresholds from Propositions 3 and 4 reveals that the monopolist systematically deviates from the welfare maximizing menu to maximize his share of the surplus.

Corollary 3. *Compared with the welfare maximizing solution, the monopolist offers a standard good too rarely. If* $\alpha_n \leq \frac{1}{2}$ *or* $\beta \geq \frac{2\alpha_n - 1}{2\alpha_n - \alpha_s}$*, he offers an exclusive good too often.*

Intuitively, the monopolist has larger incentives to switch to product differentiation to sell to purely image concerned consumers and profit from their willingness to pay for image. Thus, if the monopolist offers image building for some λ, he offers it for lower image motivation than the welfare maximizer. For larger image concerns, however, the image-premium which he can extract from consumers who value both quality and image makes the exclusive good more attractive. In image building, purely image concerned consumers get a rent for high values of image motivation which cannot be appropriated by the monopolist. The reason is that the production technology reaches its efficient level at $s = 1$ and thus

[25]Image utility might be considered a behavioral bias. If utility from image is ignored, the welfare maximizing product offer is the standard good for all values of image such that purely image concerned consumers can be deterred from purchases through high quality-price combinations (for $\lambda \leq 2$). If image becomes too valuable to profitably enforce a standard good ($\lambda > 2$), the exclusive good maximizes welfare without image utility. Details are available upon request.

it never pays off to sell quality levels above 1 to purely quality concerned consumers. However, the willingness to pay of purely quality concerned consumers determines also the prices which can be charged from purely image concerned consumers, which therefore cannot exceed 1.

The welfare maximizer does not care about who is getting this rent. For large image concerns, image building creates value by offering differentiated products which allow consumers to separate. Separation increases the value of image available in the market without additional cost (utility effect). Therefore, image building maximizes welfare for many sets of parameters. The monopolist, however, obtains higher profits from the exclusive good if the value of image is large enough since he can extract a larger share of the surplus in the exclusive good (profit effect). In general, exclusive good does not maximize welfare. However, for some sets of parameters, the profit effect dominates the utility effect such that an exclusive good maximizes welfare.

Compared to a standard good, the introduction of an additional product with intermediate quality and intermediate price in the image building regime solely serves to discriminate among different consumer types and transfers utility from consumers to the monopolist. Purely image-motivated consumers obtain zero rents in both cases but while they are excluded in a standard good case they create positive surplus to the monopolist in the image building menu. Furthermore, selling a low quality good decreases the information rent of the consumer who values image and quality. Both effects help to increase profits but the latter decreases consumer surplus. Thus, even if welfare maximizing, the image building menu never maximizes consumer surplus.

The model allows for the analysis of some common policy measures. The introduction of a minimum quality standard (MQS) which is intended to ensure all consumers get a high quality product can hurt consumers. With a binding minimum quality standard, the monopolist has to adjust the low quality upwards and the price for high quality downwards to achieve product differentiation; this benefits consumers. However, since the adjustments make product differentiation less profitable, the monopolist will resort to exclusive good and standard good for a larger set of parameters. Through this supply reaction, regulation can trigger decreases in consumer surplus and in welfare.

Lemma 5. *There exist parameters such that the introduction of a binding minimum quality standard in a monopolistic market decreases consumer surplus and welfare.*

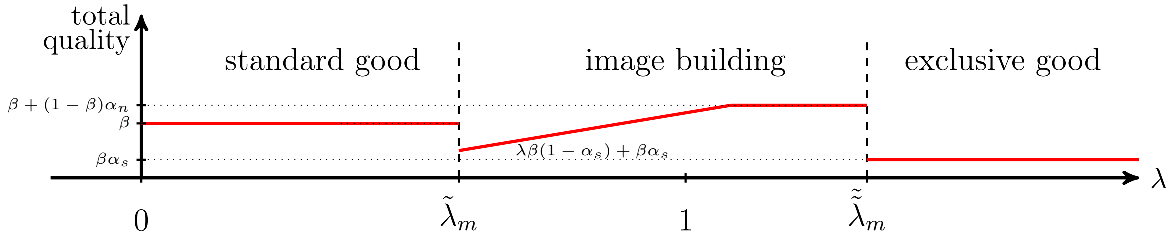

Figure 6: Total quality in monopoly. In the absence of image motivation, the first-best level of total provision is β.

4.4 Comparative statics in monopoly

In Subsection 4.2 I have characterized the provision of quality and the pricing for given distributions of image and quality concerns as a function of the value of image λ. When we combine this information with the fractions of consumers who buy each product, we can compute total quality in the market as illustrated in Figure 6. Comparative statics with respect to the value of image can be directly read-off from the Figure 6.

Corollary 4. *There exist parameters such that an increase in the value of image λ decreases the total provision of quality in monopoly.*

To complement the analysis, I now analyze how changes in the preference distribution influence the equilibrium provision of quality. [26] First, I discuss comparative statics for prices and qualities. Second, I investigate the implications for total provision of quality, which depends on the qualities sold to consumers as well as on the fractions of consumers who buy a given quality. Finally, I analyze how the prevalence of different equilibria is affected by changes in the preference distribution.

In Proposition 2, I have derived qualities and prices for each possible equilibrium. Using Proposition 3 we can then read off equilibrium qualities and prices corresponding to any preference distribution for any value of image. Obviously, price and quality in the standard good are independent of the preference distribution. In image building and exclusive good we observe the following.

Corollary 5. ***(Products)***
Suppose (s_L, p_L) and (s_H, p_H) are an image building menu with $p_H > p_L$.

[26] I only present the interesting cases here, additional findings are available upon request.

(i) If $\lambda < \frac{\alpha_n(1-\beta)+\beta}{\beta}$, s_L, p_L, p_H, and $p_H - p_L$ increase in β. Otherwise, only p_H and $p_H - p_L$ increase in β.

(ii) If $\lambda < \frac{\alpha_n(1-\beta)+(1-\alpha_s)\beta}{(1-\alpha_s)\beta}$, s_L and p_L decrease, and $s_H - s_L$, p_H, and $p_H - p_L$ increase in α_s and α_n. Otherwise, only p_H and $p_H - p_L$ increase α_s and α_n.

Suppose (s, p) is an exclusive good offer. Then, p increases in β and α_s, and is independent of α_n. Quality s is independent of preferences.

Increases in image concerns, whether for the intrinsically concerned or the unconcerned induce quality reductions and price increases. Whereas this increases profits, it makes individual consumers worse off. Increases in the share of intrinsically concerned consumers β yield increases in both quality (as long as it still below $s = 1$) and prices. The effects in product qualities also affect the total provision of quality. The following is directly read off from the derivatives of total quality (see Figure 6).[27]

Corollary 6. ***(Total quality)***

(i) Total provision of quality S in monopoly (weakly) increases in β and α_n.

(ii) In exclusive good, S increases in α_s.

(iii) In image building, S increases in α_s if $\lambda > 1$, weakly decreases in α_s otherwise.

Intuitively, for $\lambda < 1$, the contribution to total quality of selling the high quality product is greater than the contribution of the low quality product. For $\lambda > 1$, however, the quality of the low quality product is high enough such that the participation weighted contribution to total quality outweighs the contribution through the high quality product. Since increases in α_s decrease purchases as well as quality of this product, total quality decreases.

Having established comparative statics on total quality I now discuss how the prevalence of different types of equilibrium is affected by changes in the preference distribution. It follows trivially from Proposition 6 that thresholds in the competitive case are independent from the distribution of preferences. Thus, I concentrate on the monopoly case. Figure 4 has illustrated the equilibrium thresholds depending on the fraction of intrinsically motivated consumers for a specific example. The following proposition is more general.

[27] According to Proposition 3 we only have to consider standard good for $\lambda < 1$, image building, and exclusive good.

Proposition 5. ***(Equilibrium thresholds)*** *Monopoly offers (i) standard good more often if β increases, (ii) standard good less often if α_s or α_n increases, (iii) image building more often if α_n increases, and (iv) exclusive good less often if α_n increases.*

If the share of consumers increases who experience utility from quality directly, the non-distorting standard product is offered more often. However, if instead the fraction of consumers increases who have a signaling desire and buy a product only for its image, the standard good becomes less attractive to the producer. Distortions in quality provision in form of either image building or the exclusive good become more prevalent. The sign of the effects of an increase in image concerns among intrinsic buyers, α_s, on the relative prevalence of image building and exclusive good is ambiguous. Similarly, the effect of more intrinsically motivated buyers, β, on the prevalence of the exclusive good cannot be signed when $\tilde{\lambda}_m < \tilde{\tilde{\lambda}}_m$. If $\tilde{\lambda}_m = \tilde{\tilde{\lambda}}_m = \lambda_{SE}$, more intrinsically motivated buyers induce the monopolist to offer exclusive good less often.

5 Competition

As a product becomes more familiar more producers can credibly supply any desired quality level and a monopolistic market becomes less likely. In this section I illustrate that a main finding of the paper does not depend on the monopolistic setting: Heterogeneous image concerns promote product differentiation which is not driven by heterogeneous quality valuations, in a monopolistic as well as in a competitive market. A crucial difference is, however, that for image motivation large enough the equilibrium outcome with competition is that all consumers who value image or quality buy, whereas a monopoly would offer an exclusive good which is only bought by consumers who derive utility from image *and* quality. Moreover, the mechanism s of separation are different. Taking the quality level which would be sold in the absence of image concerns as a benchmark, product differentiation will occur through an additional product with higher quality in the competitive market (upward distortion). This is in contrast to the monopoly, where separation is induced through an additional product with lower quality (downward distortion).

Suppose that there are again four types of consumers with utilities and frequencies as specified in Section 3 and, as before, the production of quality s incurs unit costs of $c(s) = \frac{1}{2}s^2$ which are convex in quality. Suppose now that all qualities are available at different prices equal to or above the marginal cost of provision $p(s) \geq c(s) = \frac{1}{2}s^2$. This captures a situation of competition without actually modeling the interaction among producers.[28] The game reduces to all consumers simultaneously choosing a product $(s,p) \in \mathcal{M}$ to maximize utility. The set from which they choose is now given as

$$\mathcal{M} = \{(s,p) \in \mathbb{R}^2 | s \geq 0 \text{ and } p \geq \frac{1}{2}s^2\}.$$

The definition of an equilibrium is the same as for the consumption stage of the monopolistic model and given in Definition 1 in Section 3.4. Images are formed as an outside spectator would form them and must in equilibrium be consistent with actual choices of consumers. If we consider this spectator as a second player who moves after consumers have chosen products and who pays consumers in the form of image, this is a signaling game. The equilibrium is generally not unique. We therefore rely on a refinement in the spirit of the Intuitive Criterion by Cho & Kreps (1987).[29]

5.1 Competitive equilibrium

Suppose that all quality price combinations in $\mathbb{R}^2_{\geq 0}$ are available. Note first that unconcerned consumers who value neither image nor quality never buy. Furthermore, a consumer who values quality alone will not be influenced by image and will always buy the product which offers the best deal in terms of quality and price. Her utility is independent of beliefs and maximized at $(s,p) = (1, \frac{1}{2})$. Thus, the driving forces are the decisions of the two consumer types who care about image. Since unconcerned consumers always choose the outside good, the image of not buying is equal to zero unless any intrinsically motivated consumer also chooses this option.

For $\lambda < \frac{1}{2}$ purely image motivated consumers prefer $(0,0)$ over buying the product $(s,p) = (1, \frac{1}{2})$ even with the best image $R(1, \frac{1}{2}) = 1$. Since the choice of purely quality-concerned consumers is independent of beliefs, the image associated with product $(s,p) = (1, \frac{1}{2})$ is $R(1, \frac{1}{2}) = 1$. Thus, consumers who value image and quality also choose $(s,p) = (1, \frac{1}{2})$. For $\lambda < \frac{1}{2}$ this is the unique equilibrium.

[28] This assumption precludes multi-product firms which could otherwise cross-subsidize products.

[29] Formally, the model does not have a receiver of signals and therefore is not a proper signaling game. The refinement as in Cho & Kreps (1987) cannot be applied explicitly since it is formulated in terms of best responses. Here, no party acts upon the product choice. Still, since the image is a reduced form expression of an expected response, and all consumers choose their preferred product in response to the associated image, the same logic applies.

For $\lambda \geq \frac{1}{2}$, purely image-concerned consumers gain from buying $(1, \frac{1}{2})$ because of its image. In general equilibria are not unique anymore. We therefore analyze different classes of equilibria separately.

Single-product equilibria Consider equilibria such that unconcerned consumers do not buy, and all other consumer types pool on the efficient quality product $(1, \frac{1}{2})$.

Lemma 6. *There exists a partially pooling equilibrium where consumers who value quality or image all buy $(1, \frac{1}{2})$ with image $R(1, \frac{1}{2}) = \frac{\beta}{q(1-\beta)\alpha_n+\beta}$. Purely image-concerned consumers randomize between buying $(1, \frac{1}{2})$ with probability q and not buying at all with probability $1 - q$ where*

$$q = \begin{cases} 0 & \text{if } \lambda < \frac{1}{2} \\ (2\lambda - 1)\frac{\beta\alpha_s}{(2-\beta)\alpha_n} & \text{if } \frac{1}{2} \leq \lambda \leq \frac{1}{2}\frac{(1-\alpha_s)\beta+q\alpha_n(1-\beta)}{(1-\alpha_s)\beta} \\ 1 & \text{otherwise.} \end{cases} \tag{6}$$

For values of image up to one half, the efficient quality level $s = 1$ is sold to all consumers who care about quality and only to those. Those who do not value quality choose the outside option. Image does not manifest itself in changes in quality, price or purchasing behavior. Thus, I call this the **standard good** case. For higher values of image, purchasing this product also becomes attractive to purely image concerned consumers since it is associated with image $R(1, \frac{1}{2}) = 1$. However, as soon as purely image concerned consumers buy $(1, \frac{1}{2})$ with positive probability, the associated image decreases and makes purchasing this product less attractive. Thus, only a mixed strategy equilibrium exists, which I call **partial mainstreaming**. When image becomes even more valuable, consumers who only value image buy $(1, \frac{1}{2})$ with probability 1 since even the resulting image is worth more than the price of $\frac{1}{2}$. In such an equilibrium, **full mainstreaming**, only the efficient quality level $s = 1$ is sold and only unconcerned consumers do not buy. Mainstreaming in competition differs from the mass market in monopoly in so far as the product is priced at marginal cost here, whereas the monopoly charges the monopoly price.

Two-product equilibria Consider equilibria such that purely quality-concerned and purely image motivated consumers pool on the product $(1, \frac{1}{2})$ and consumers who value both quality and image separate from the two by buying another product (s', p'); unconcerned consumers choose $(0,0)$. When deriving these equilibria I allow for consumer types to randomize across different choices.

It is easy to see that there is no other type of separating equilibrium. Suppose consumers who value image and quality and purely image motivated consumers pooled on the same product. Under separation this must differ from $(1, \frac{1}{2})$ but has a lower image due to the purchases of purely image motivated consumers. Thus, consumers who value image and quality would always be better off by deviating to also purchasing $(1, \frac{1}{2})$.

We first note that if there are separating equilibria, they must involve real differences in quality of the products used to separate. Suppose to the contrary that two products (s,p), (s',p') form a separating equilibrium and $s = s'$. Separation requires that consumers who value image and quality buy a different product than purely image motivated consumers. But for $s = s'$ both prefer the same:

$$\begin{aligned} &U_{11}(s',p') > U_{11}(s,p) \;\Leftrightarrow\; s' + \lambda R(s',p') - p' > s + \lambda R(s,p') - p' \\ \Leftrightarrow\;\; &\lambda R(s',p') - p' > \lambda R(s,p) - p \;\Leftrightarrow\; U_{01}(s',p') > U_{01}(s,p) \end{aligned} \tag{7}$$

This is in contrast to the monopoly, where for high enough values of image, differentiation through price and image alone was sustainable.

Lemma 7. *For $\lambda > \frac{1}{2}$, we find $\varepsilon > 0$ such that the two products $(1, \frac{1}{2})$ and $(1+\varepsilon, \frac{(1+\varepsilon)^2}{2})$ form a separating equilibrium with $R(1+\varepsilon, \frac{(1+\varepsilon)^2}{2}) = 1$, $R(1, \frac{1}{2}) = \frac{\beta(1-\alpha_s)}{\beta(1-\alpha_s)+q(1-\beta)\alpha_n}$, $R(0,0) = 0$, where purely image-concerned consumers buy with probability q and*

$$q = \begin{cases} (2\lambda - 1)\frac{\beta\alpha_s}{(1-\beta)\alpha_n} & \text{if } \frac{1}{2} < \lambda \le \frac{1}{2}\frac{(1-\alpha_s)\beta + q\alpha_n(1-\beta)}{(1-\alpha_s)\beta} \\ 1 & \text{if } \lambda > \frac{1}{2}\frac{(1-\alpha_s)\beta + q\alpha_n(1-\beta)}{(1-\alpha_s)\beta} \end{cases} \tag{8}$$

I call such a product a **functional excuse**. Consumers who are willing to pay for both quality and image buy $(1+\varepsilon, \frac{(1+\varepsilon)^2}{2})$. They use excessive quality as a way to pay a higher price to signal that they value quality. Purely image-motivated consumers refrain from imitating them because the price of the high quality product exceeds the value of the associated image. Instead, they buy $(1, \frac{1}{2})$. This same product is also bought by consumers who only value quality so that the associated image is positive.

Equilibrium refinement There are generically many other separating equilibria. Furthermore, the pooling equilibrium from Lemma 6 also coexists with the separating one. I employ a refinement in the spirit of the Intuitive Criterion (IC) by Cho & Kreps (1987)

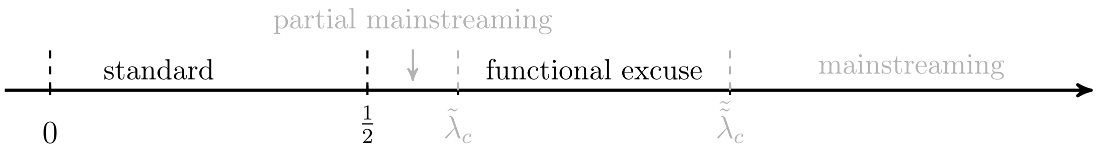

Figure 7: Equilibrium with perfect competition for different values of image λ. Equilibria marked in gray fail the Intuitive Criterion but would make consumers better off.

to obtain a unique equilibrium prediction.[30] It turns out that the refinement rules out image-premia, i.e. equilibria in which consumers who value both quality and image buy overpriced products to obtain an image by spending more money than necessary. Instead they buy excessive quality at marginal cost. Furthermore, it rules out pooling equilibria where purely image-concerned consumers buy quality. Figure 7 illustrates the result.

Proposition 6. *The equilibrium satisfying the Intuitive Criterion is unique. All products are sold at marginal cost and the equilibrium is*

(i) the standard good if $\lambda \leq \frac{1}{2}$.

(ii) functional excuse with $\varepsilon = \sqrt{2\lambda \frac{q(1-\beta)\alpha_n}{\beta(1-\alpha_s)+q(1-\beta)\alpha_n}}$ *if* $\frac{1}{2} < \lambda$.

In the proof, I first rule out other separating equilibria. Then, I rule out the pooling equilibrium for $\lambda > \frac{1}{2}$. For this, I show that there always exists $\varepsilon > 0$ such that type 11 profits from deviating to product $(1+\varepsilon, \frac{(1+\varepsilon)^2}{2})$ if he beliefs this to be associated with $R = 1$, while type 01 cannot profit from deviating to product $(1+\varepsilon, \frac{(1+\varepsilon)^2}{2})$ for any belief. According to the Intuitive Criterion, this product can only be associated with $R = 1$ since otherwise we would assign positive probability to a type who would never gain from choosing this product.

If the intensity of image motivation is small the equilibrium resembles the monopolistic **standard good** case: the efficient quality level $s = 1$ is sold to all consumers who care about quality. Those who do not value quality pick the outside option. This can be thought of as a conventional good without any quality component. If the value of image increases, purely image motivated consumers are attracted by the same product and thus separation becomes worthwhile for the consumer who values image and quality. Also under competition product differentiation within the quality segment occurs. Consumers who value both quality and image are willing to buy overly high quality since utility is

[30] Formally, my model is not a proper signaling game. See footnote 29.

realized from both image and quality; they use a **functional excuse** to separate from other consumers and obtain higher image. Product differentiation now features an upward distortion in quality: The lower quality product has the efficient quality level $s = 1$ and is bought by consumer who value either image or quality.[31] The high quality is chosen such that the product is not attractive for the purely image-motivated consumers due to its high marginal cost.[32] Recall from Proposition 3 that a monopolist in contrast achieves differentiation by offering a product with lower quality. This leads to lower average quality.

If the intensity of image motivation becomes very large, the upward distortion in quality becomes expensive. We find $\tilde{\tilde{\lambda}}$ that the consumer who values image and quality would in fact be better off by pooling on the lower quality product (**full mainstreaming**) for all $\lambda > \tilde{\tilde{\lambda}}$. However, this equilibrium fails the Intuitive Criterion. Similarly, we find $\tilde{\lambda} > \frac{1}{2}$ such that for all $\lambda \in (\frac{1}{2}, \tilde{\lambda})$, consumers who value image and quality are better off in pooling than in separation. Such a pooling equilibrium features partial participation by consumers who only value image (**partial mainstreaming**). It also fails the Intuitive Criterion.[33]

5.2 Welfare in competition and with a luxury tax

In this subsection, I compare monopoly and competition in terms of the welfare they provide (including utility from image). As I have discussed in Subsection 4.3, the monopolist does not always implement the welfare maximizing allocation. Competition, however, does in general not do better. The reason is that the monopoly can through its pricing stabilize separation while in competition, consumers use excessive quality to separate and improve their image. The former is often more efficient in that in yields higher welfare. In a competitive market, a luxury tax on excessive qualities can therefore improve welfare.

Corollary 7. *There generically exist parameters such that monopoly yields higher welfare than competition.*

Proof. The proof is by example.

[31]The participation probability of purely image concerned types is 0 for $\lambda < \frac{1}{2}$, $q_{sep}(\lambda) = (2\lambda - 1)\frac{((1-\alpha_s)\beta))}{(\alpha_n(1-\beta))}$ for $\frac{1}{2} \leq \lambda < \frac{1}{2}\frac{(1-\alpha_s)\beta+\alpha_n(1-\beta)}{((1-\alpha_s)\beta))}$, and 1 otherwise.

[32]Note that this result is driven buy the additivity of utility from image and quality. The convex cost of quality production exceeds the value of quality for every quality level above one and only consumers who in addition realize image utility are willing to pay the price.

[33]Details on the derivation of $\tilde{\lambda}$ and $\tilde{\tilde{\lambda}}$ are available upon request.

Example 2. *Suppose* $\lambda = 1$, $\beta = 0.5$, $\alpha_n = 0.5$, *and* $\alpha_s = 0.5$. *Then* $\tilde{\lambda}_m = .5 < \lambda < 6 = \tilde{\tilde{\lambda}}_m$. *Welfare from monopoly, which yields image building, is* 0.5625 *whereas welfare from competition, which yields functional excuse, is* 0.478553.

Example 3. *Suppose* $\lambda = 5$, $\beta = 0.65$, $\alpha_n = 0.55$, $\alpha_s = 0.55$. *Then* $\lambda > 4.58822 = \tilde{\tilde{\lambda}}_m$. *Welfare from monopoly, which yields an exclusive good is* 2.40443 *whereas welfare from competition, which yields functional excuse is* 2.32667.

Welfare in monopoly is continuous in λ for $\lambda \notin \{\tilde{\lambda}_m, \tilde{\tilde{\lambda}}_m\}$ and in competition welfare is continuous for $\lambda \neq \frac{1}{2}$. Thus, we find parameter constellations close to the examples such that welfare with monopoly is still higher than welfare with competition. $\square$

When competition leads to higher welfare than monopoly, it also leads to higher consumer surplus than monopoly but even if competition reduces welfare, consumers may still profit. We have seen that monopoly may lead to higher welfare under some circumstances. Thus, we again ask for the distributional effect behind this finding. It turns out that purely quality concerned consumers always benefit from competition. In contrast to this, there exist parameters such that consumers who value image are better off in monopoly than in competition.

Corollary 8. *Consumers who value quality benefit from competition.*

Purely image-concerned consumers either buy quality s at price $p = s$ or choose $(0, 0)$ in monopoly. Both yield zero surplus, whereas they receive surplus $\frac{1}{2}$ in competition from buying $(1, \frac{1}{2})$ for all λ. Consumers who value image and quality are also always better off with competition. The comparison of surplus in this case is more involved an can be found in the appendix.

The following example shows that not all consumers are better off with competition, though. There are parameter constellations, where consumers who value image but not quality are better off with monopoly.

Corollary 9. *There exist parameters such that consumers who value only image are better off in monopoly than in competition.*

Proof. The proof is by example.

Example 4. *Suppose* $\alpha_s = 0.625, \alpha_n = 0.25, \beta = 0.625$, *and* $\lambda = 1.5$. *Parameters are such that monopoly does not offer image building for any* λ *and* $\lambda > 0.4875 = \tilde{\tilde{\lambda}}_m$. *The surplus to purely image concerned consumers is* 0.576923 *in monopoly, which yields an exclusive good. The surplus is only* 0.571429 *in competition, where functional excuse obtains.*

Apart from jump points at $\lambda \in \{\tilde{\lambda}_m, \tilde{\tilde{\lambda}}_m, \frac{\alpha_n(1-\beta)+(1-\alpha_s)\beta}{(1-\alpha_s)\beta}\}$, the surplus to consumers who value only image, is continues in λ and is continues in other parameters. Thus, the result is generic. $\square$

We have just seen that image concerns distort qualities upwards in a competitive market. Thus, a minimum quality standard as analyzed for the monopoly case does not bite. However, if product differentiation prevails under competition, a tax on higher qualities can improve welfare. By increasing consumer prices above marginal costs, it allows consumers to achieve a high image at lower qualities which can be produced more efficiently.

Lemma 8. *In competition, we can design a luxury tax on excessive quality such that welfare strictly increases and consumer surplus remains unchanged.*

5.3 Comparative statics in competition

In Subsection 5.1 I have characterized the competitive equilibrium as a function of the value of image λ. From this, we can compute total quality in the market as illustrated in Figure 8. Total provision of quality depends on the qualities sold to consumers as well as on the fractions of consumers who buy a given quality. The following result is directly read-off from the figure:

Corollary 10. *Total provision of quality in competition increases in the value of image λ.*

Additionally, changes in the preference distribution affect products sold in competition as well as the total provision of quality. In the standard good, products and purchases are unaffected by the preferences distribution. Furthermore, as long as purely image concerned consumers randomize over choosing $(0, 0)$ and buying $(1, \frac{1}{2})$, the products in functional excuse and the total provision of quality are also independent of any changes in the preferences distribution.

Corollary 11. *Suppose competition yields a functional excuse equilibrium, where consumers who value image and quality buy (s, p). Then, s decreases in β and increases in α_s and α_n. Total provision of quality increases in α_s and α_n and is non-monotone in β.*

In the competitive market, the threshold between standard good and functional excuse is independent of the preferences distribution. Thus, in contrast to the monopoly case, the prevalence of different equilibria is unaffected by changes in the preference distribution.

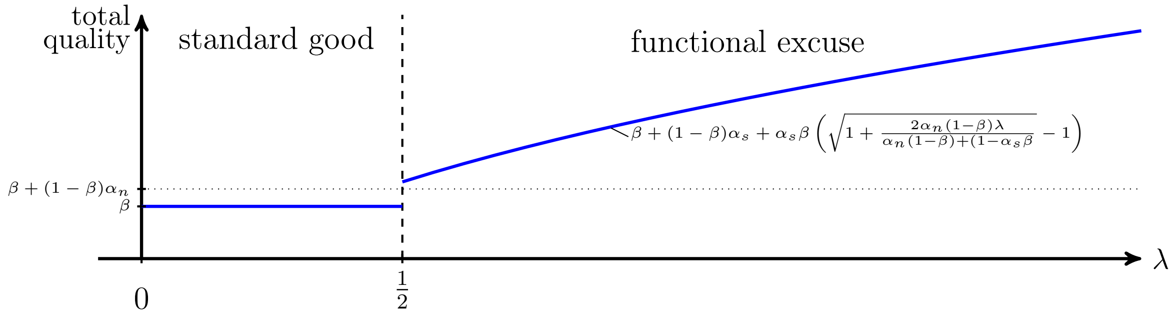

Figure 8: Total quality in the market with competition. In the absence of image motivation, the first-best level of total provision is β.

6 Extensions

My model applies to any context where the quality of a product matters and image concerns are relevant. The examples of Fairtrade and organic consumption have an additional feature. There, quality has a public good character since paying higher wages or paying for environmentally friendly production techniques does not only benefit the consumer directly but has positive externalities. In Subsection 6.1 I discuss how to incorporate quality with a public good character in my model. In some circumstances, quality of a product might be associated with a negative image if this quality dimension is not valued by the public. For instance, showing a taste for expensive jewelry can lead to reduced status in a neighborhood where equality is valued above all. Therefore, in Subsection 6.2 I analyze an extension of my model where I allow the value of image to be negative.

6.1 Quality as a public good

Frank (2005) discusses how “positional externalities cause large and preventable welfare losses” by inducing people to spend too much. In my paper, images lead to positional externalities and quality is a positional good in the sense of Frank (2005). If image motivated spending helps to provide a public good, like in ethical consumption, it is not pure waste of resources anymore and welfare effects become more complex. The pessimistic perspective of Frank (2005) on positional goods might have to be reconsidered.

Guided by the application to ethical consumption, in this subsection, I take a similar approach as Besley & Ghatak (2007) and interpret the purchase of quality as a private contribution to a public good through consumption. The monopolistic producer bundles the private consumption good with a contribution to the public good by engaging in responsible production methods. These are interpreted as quality here. Some consumers experience warm glow utility from purchasing such a good with the bundled contribution (for warm glow utility see e.g. Andreoni, 1990). Some experience utility from being seen as those who contribute (image utility). Some value both and other none of the two aspects. None of the consumers, however, takes into account that her individual purchase has an impact on the total provision of the public good. Suppose the public good has a social value of $\gamma > 0$.

Then, the efficient level of total quality provision is $\beta + \gamma$.[34]

Image concerns can help to move total consumption of quality closer to this target but can also drive it further away from it when image becomes too valuable. In general, efficient provision will not be reached with monopoly; provision under competition is in general higher than under monopoly but still not necessarily at the efficient level. The reason for this result is of course that–in contrast to the socially efficient level of provision– the market-based provision of quality is independent of the social value of quality. This finding is also evident in Figure 8: If the social value per unit of quality is γ, the socially efficient provision level is $\beta + \gamma$ which is constant in λ but in general different from the market-based levels of provision.

For products which have a public good character like Fairtrade or organic production, non-governmental organizations may try to "raise awareness" to foster their cause. However, "raising awareness" may have unintended consequences, depending on what it means. First, raising awareness can mean that public recognition increases and therefore the value of image, λ, increases. Second, raising awareness can mean that the number of intrinsically motivated consumers, β, increases. Finally, it can also mean that only the fraction of consumers who value image - α_s, α_n, whether or not they are concerned with quality - increases. Only the latter two affect the distribution of preferences. At first sight, one might guess that all effects will go in the same direction since they all increase the population-wide willingness-to-pay for quality. As has been shown in Subsection 4.4 this intuition is wrong; increases in image concerns can decrease the provision of quality.

[34] We abstract from distributional concerns here. Taking into account heterogeneity in warm glow but ignoring image utility implies individually efficient contribution levels of $s = \gamma$ for consumers with $\sigma = 0$ and $s = 1 + \gamma$ for individuals with $\sigma = 1$.

6.2 Interest in "quality" is seen badly

Suppose the model is as laid out in the monopolistic case in Section 4 but now image decreases utility. Being recognized as a consumer who values quality gives a negative image and this image is the more negative the better identified consumers preferences are from their consumption choice. Examples are goods where quality has a strong negative externality and its consumption is therefore seen as morally unacceptable. Imagine a preference for big, polluting cars. Being aware of the fact that showing this preference gives a negative image is likely to influence purchasing behavior and thus should also be reflected in the marketing strategy of the producer. Another way to interpret a negative value of image would be a social norm against showing off. Consumers might still value good quality but at the same time dislike being identified as those who are rich enough to afford it. The Scandinavian Jante Law seems to describe a pattern of group behavior consistent with this interpretation.

For simplicity of interpretation I will keep $\lambda > 0$ as a parameter of the intensity of image concerns and adjust the utility function to incorporate the negative value of image. Preferences are given by

$$U_{\sigma\rho}(s, p, \mathcal{M}) = \sigma s - \rho\lambda R(s, p, \mathcal{M}) - p. \tag{9}$$

It is clear that purely image concerned consumers cannot be attracted to buy at any positive price. Furthermore, consumers who intrinsically value quality but are aware of the consequences for their image, are not willing to pay as much for a given level of quality as consumers who do not care about image. The monopolist therefore has to decide only whether to offer a product which is accepted by both, consumers who only value image and consumers who additionally value quality, or whether to separate the two.

We know that only types with $\sigma = 1$ do buy at all and therefore any product $(s, p) \neq (0, 0)$ will obtain $R(s, p) = 1$. This implies that no differentiation in terms of image is possible. If both consumers participate, they do buy the same product. The monopolist's choice is about serving either one type or both types. Suppose first that only purely quality-concerned consumers are served. Then the participation constraint of consumers who only value quality must bind: $p_{10} = s_{10}$. The maximal profit in this case is at $s_{10} = 1$ with $\Pi = \frac{(1-\alpha_s)\beta)}{2}$.

Suppose instead that also image aware consumer buy. Then, the binding participation constraint is the one of consumers who value both quality and image: $p_{11} = s_{11} - \lambda$. The profit maximizing quality level is (as before) $s_{11} = 1$ and profits are $\Pi = (\frac{1}{2} - \lambda)(\beta)$. When we compare the two expressions we obtain the following result.

Proposition 7. *Suppose image exhibits a negative effect on utility.*

(i) For $\lambda > \frac{1}{2}\alpha_s$ only types who care about quality but not about image buy quality $s = 1$ at monopoly price $p = 1$.

(ii) For $\lambda \leq \frac{1}{2}\alpha_s$ both types who care about quality buy quality $s = 1$ at price $p = 1 - \lambda$ below the conventional monopoly price.

If being interested in quality has a negative image, the monopolist either reduces the price of quality or accepts to sell less than in the absence of image concerns. For small negative image concerns, the stigma of being interested in quality implies a lower price. Consumers who are indifferent with respect to image concerns profit from the existence of image concerned consumers through a lower price for both of them. For stronger negative image concerns, those who care about image choose the outside option. In this case, the product sold is identical to the one offered in the absence of image concerns.

An alternative view would not interpret image as a means of vertical dimension but instead take an identity perspective, where consumers are located on different value positions and try to find a product which matches their identity (Akerlof & Kranton, 2000). Based on the identity perspective, Chernev *et al.* (2011) investigate the limits of lifestyle branding from a marketing perspective and confirm that consumers use brands to express their identity or to reaffirm their beliefs. I can modify my model such that consumers derive utility from signaling their preference for quality instead of following a common norm of what is "good" behavior. Very intuitively, in this case the set of profitable product offers changes. Pooling on a positive quality level does not occur anymore. Instead, the monopolist profits from offering two products at opposite quality levels and charge an image premium on both of them.

7 Conclusion

In this paper I analyze quality provision and prices under the assumption that individuals differ in their valuation of quality as well as in their interest in social image. Assuming that consumers can derive utility from the quality of a product or the social image attached to it, I first solve for the optimal product line offered by a monopolist for any combination of the resulting four types of consumers. Then, I study a perfectly competitive setting and compare the two market structures with respect to welfare and quality provision.

When image concerns are sufficiently strong, ignoring image concerns does not maximize either welfare or monopoly profits but instead product offers are distorted to take consumers' signaling desire into account. Even though not justified by heterogeneous valuations of quality, different quality levels can be sold in equilibrium to accommodate heterogeneous image concerns. By introducing a low quality product, the monopolist creates value in the form of the associated image and thereby manages to sell to more consumers. However, to achieve this he might decrease total quality provision. In a competitive market, consumers' image concerns also induce differentiated product purchases. In contrast to the monopoly case, consumers use inflated quality as a functional excuse to separate from others and improve their image. Consequently, total quality provision increases. The competitive outcome of separation via inflated quality is in general less efficient than separation in monopoly which is induced through prices. Welfare as the sum of consumers surplus and profits is higher in monopoly than in competition for generic sets of parameters.

Contrary to what one might expect, image concerns do not always increase the provision of quality. Instead, monopoly tailors to image concerns by increasing prices for those consumers who are willing to pay a premium for the image in addition to the price for quality. Consequently, the potential of increasing quality provision through tailoring to image concerns are limited in a monopolistic market. Market power gives the producer an incentive to either enlarge the market but depress average quality or reduce the market and only increase prices. Thus, if quality is considered a public good, as seems reasonable when we talk about quality as representing working standards, environmentally friendly production methods, or other components of CSR, image concerns can be detrimental. If advertising these causes or campaigns to raise awareness do not increase consumers' intrinsic interest but only their image concerns, such publicity campaign can induce a reduction in the total provision of the public good. Under competition, quality provision is (weakly) higher than in monopoly and it never decreases when image concerns increase. Even though competition leads to higher total consumption of quality, it may still lead to lower welfare than monopoly when the cost of providing quality is taken into account.

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Appendix

A Proofs

To simplify notation in the proofs define

$$\lambda_1 := \frac{\alpha_n(1-\beta)+\beta}{\beta} \text{ and } \lambda_2 := \frac{\alpha_n(1-\beta)+(1-\alpha_s)\beta}{(1-\alpha_s)\beta}. \tag{10}$$

Furthermore, I will refer to unconcerned consumers as type 00, to purely image-motivated consumers as type 01, to purely quality-concerned consumers as type 10, and to consumers who value both quality and image as type 11. In the one-dimensional benchmarks, type 0 refers to consumers with $\sigma = 0$ and type 1 to consumers with $\sigma = 1$ and I will index participation and incentive constraints correspondingly.

A.1 Proof of Lemma 1

Proof. Suppose the monopolist offers a **separating** contract. Observe that PC_1 is fulfilled if IC_1 and PC_0 hold. I will solve the relaxed problem of maximizing 3 subject to IC_1 and PC_0 and verify ex post that the solution also fulfills IC_0 and PC_1. Note that in the relaxed problem the participation constraint of type 0 and the incentive compatibility constraint of type 1 bind at the optimum: $p_0 = 0 \cdot s_0 = 0$ and $p_1 = 1s_1 - (1-0)s_0 = s_1 - s_0$. Otherwise profit could be increased by raising p_0 or p_1 respectively without violating any constraint. The maximization problem becomes

$$\max_{s_0,s_1} \beta(s_1 - s_0 - \frac{1}{2}s_1^2) + (1-\beta)(-\frac{1}{2}s_0^2) \tag{11}$$

Taking derivatives and observing that qualities cannot be negative gives

$$\beta(1-s_1) = 0 \quad \Rightarrow \quad s_1^* = 1 \tag{12}$$

$$-\beta - (1-\beta)s_0 < 0 \quad \Rightarrow \quad s_0^* = 0 \tag{13}$$

Prices are

$$p_1^* = 1 \quad \text{and } p_0^* = 0. \tag{14}$$

The derived values also fulfill the participation constraint of type 1, PC_1, and the incentive compatibility constraint of type 0, IC_0, and thus are a solution to the fully constrained problem.

The profit corresponding to the separating menu is

$$\Pi^S = \frac{\beta}{2} > 0. \tag{15}$$

It is easy to see, that profit decreases if some of type 0 and 1 buy the same product. In a separating equilibrium, profits made per unit on type 1 are positive while those on type 0 are zero. In any separating equilibrium, some of type 1 do not buy the high quality product but pool with type 0 on the non-participation option, resulting in zero profit on these types. Profit goes down as compared to full separation.

Suppose there is full **pooling**, i.e. the same product (s, p) is bought by all consumers. Since all consumers participate, the most restrictive constraint is the participation constraint for the ignorant consumer which must bind at the optimum: $p = 0 \cdot s = 0$. Profit maximization gives $s^* = 0$ and $p^* = 0$. Thus, pooling on a product with positive quality does not occur but not offering any positive quality gives zero profit and cannot be optimal.

Therefore the only equilibrium is separating with products as derived above. $\square$

A.2 Proof of Lemma 2

Proof. Suppose a consumer is believed to be type 0 if he does not buy, $E[\sigma|(0,0)] = 0$. If type 0 is excluded and type 1 buys, $E[\sigma|(0,0)] = 0$ is the image required buy the Bayesian inference condition. For menus with full participation $E[\sigma|(0,0)]$ is out of equilibrium and therefore unrestricted. Assigning the image $E[\sigma|(0,0)] = 0$ to non-participation supports the proposed equilibrium. Depending on out of equilibrium beliefs there are other equilibria which assign a higher image to non-participation. This increases information rents and lowers profits. Since the focus is on equilibria preferred by the monopolist they can be ignored.

Suppose the monopolist offers a **separating** contract and that given this contract the preferred equilibrium of the monopolist is played. Due to separation $R_1 = 1$ and $R_0 = 0$. In analogy to the case without image motivation, by profit maximization type 0's participation constraint and type 1's incentive compatibility constraint bind: $p_0 = 0 \cdot s_0 + \lambda R_0 = 0$ and $p_1 = 1 \cdot s_1 - (1-0)s_0 + \lambda(R_1 - R_0) = s_1 - s_0 + \lambda$.

The maximization problem becomes

$$\max_{s_0, s_1} \beta(s_1 - s_0 + \lambda - \frac{1}{2}s_1^2) + (1-\beta)(-\frac{1}{2}s_0^2). \tag{16}$$

Taking derivatives and observing that quality cannot be negative gives

$$\beta(1 - s_1) = 0 \quad \Rightarrow \quad s_1^* = 1 \tag{17}$$

$$-\beta - (1-\beta)s_0 < 0 \quad \Rightarrow \quad s_0^* = 0. \tag{18}$$

Prices are

$$p_1^* = 1 + \lambda \quad \text{and } p_0^* = 0. \tag{19}$$

For the derived qualities, the participation constraint of type 1 and the incentive compatibility constraint of type 0 are fulfilled.

The profit corresponding to the separating menu is

$$\Pi^S = \frac{\beta}{2} + \beta\lambda > 0 \tag{20}$$

As in the absence of image motivation it is easy to see that profit decreases when there is imperfect separation since this could only mean that consumers of type 1 do not buy and those who do buy pay less since the image of non-participation is positive if type 1 does not buy.

Suppose there is full **pooling**, i.e. the same product (s,p) is bought by all consumers. Since all consumers participate, the participation constraint of type 0 is the strictest and thus binds: $p = 0 \cdot s + \lambda(\beta 1 + (1-\beta)0 - E[\sigma|(0,0)\}]) = \lambda(\beta - E[\sigma|(0,0)])$. This expression is greatest if a consumer is believed to be type 0 if she does not buy, $E[\sigma|(0,0)] = 0$. In this case profit maximization gives $s^* = 0$ and $p^* = \beta\lambda$. The corresponding profit is $\Pi^P = \beta\lambda < \Pi^S$. Profits are just shifted upwards by $\lambda\beta$ as compared to the situation without image motivation. The equilibrium offer is separating. If non-participation is associated with higher image out of equilibrium, profits will be even lower and thus pooling is not optimal. □

A.3 Proof of Lemma 3

Proof. Suppose the monopolist offers $\mathcal{M} \subset \mathbb{R}^2_{\geq 0}$. Denote by $(s,p)^*$ the product in $\mathcal{M}$ which maximizes $p-s$. Then type 10 buys this product. Note that unconcerned consumers who do value neither quality nor image, $\sigma = \rho = 0$ decide not to buy from the monopolist for any positive price. Thus, non-participation $(0,0)$ always occurs in equilibrium and its image is restricted by Bayes' rule.

Let beliefs be such that $R(s,p) = 0$ for all $(s,p) \in \mathcal{M}$ with $(s,p) \neq (s,p)^*$ and $R((s,p)^*) > 0$. Then, $(s,p)^* = b_{\mathcal{M}}(10) = b_{\mathcal{M}}(11)$. Furthermore, $(0,0) = b_{\mathcal{M}}(00)$.

Finally,

$$b_{\mathcal{M}}(01) = \begin{cases} (0,0) & \text{if } \lambda < R((s,p)^*)^{-1}p \\ \in \{(0,0),(s,p)^*\} & \text{if } \lambda = R((s,p)^*)^{-1}p \\ (s,p)^* & \text{if } \lambda > R((s,p)^*)^{-1}p \end{cases} \quad (21)$$

We distinguish two cases:

Case 1: Suppose $(s,p)^* \neq (0,0)$. Then, for $\lambda < \frac{\beta}{\beta+\alpha_n(1-\beta)}$ and for $\lambda > 1$, a pure strategy equilibrium in the consumer game exists. For $\lambda < \frac{\beta}{\beta+\alpha_n(1-\beta)}$, types 10 and 11 buy $(s,p)^*$ and type 00 and 01 do not buy. For $\lambda > 1$, types 10, 11, and 01 buy $(s,p)^*$ and type 00 does not buy. For $\frac{\beta}{\beta+\alpha_n(1-\beta)} \leq \lambda \leq 1$, a mixed strategy equilibrium exists, where types 10, 11 and fraction q of type 01 buy. Type 00 and fraction $(1-q)$ of type 01 do not buy. The mixing probability is given by $q = \frac{(\lambda-p)\beta}{p\alpha_n(1-\beta)}$.

Case 2: Suppose $(s,p)^* = (0,0)$. Then, the consumption stage has a pure strategy equilibrium in which no consumer buys but all choose $(0,0)$.

□

A.4 Proof of Proposition 1:

Proof. I first show in that the monopolist offers at most two products and the non-participation option. Second, I proof that randomization in one-product menus is not profitable (Lemma A2). Then, I show that in two-product menus, randomization between products is not profitable either (Lemma A3). Finally, I show, that randomization by type 01 or 11 in two-product menus is also not profitable (Lemmas A4 and A5). Note that randomization by type 10 has been excluded through assumption 2.

During the proof I will refer to Lemma A11, Proposition 2, and Proposition 3 (in order of appearance in main text) and Lemma A9 (in the appendix in the proof to Proposition 2). I am brief here and refer to the corresponding statements and proofs for the details.

Lemma A1. *The monopolist offers at most 2 products and the non-participation option* $(0,0)$.

Proof. Suppose the monopolist offers $(0,0)$, (s_L, p_L), (s_H, p_H), and there is a pure-strategy equilibrium in the consumer game, where type 00 takes $(0,0)$, type 10 and 01 take (s_L, p_L), and type 11 takes (s_H, p_H). I show (by contradiction) that the monopolist cannot increase profits by offering an additional product (s', p'). Note that to make this profitable, any type will randomize since otherwise, the previous offer was not optimal given the assumed consumer partition. Note further that the assumption of a pure-strategy equilibrium is without loss of generality since the following lemmas will show that randomization does not increase profits in the two-product menu.

(i) Suppose (s', p') is bought by a single type $\sigma\rho \in \{00, 01, 10, 11\}$ who randomizes over this and his original choice. If both products give the same per unit profit, offering an additional product does not increase profits. If the additional product gives higher per unit profit, the original offer was not optimal.

(ii) Suppose (s', p') is bought by types 11 and 10. Type 10 is indifferent if $p_L - p' = s_L - s'$, type 11 if $p_H - p' = s_H - s' + \lambda(R(s_H, p_H) - R(s', p')) = s_H - s'$; the latter equality follows from $R(s', p') = 1 = R(s_H, p_H)$. Together these imply $p_H = p_L + (s_H - s_L)$. The participation constraint of type 10, $p_L \leq s_L$, yields $p_H \leq s_H$ and $p' \leq s'$. In profit maximization both will bind and optimal quality choices are $s' = s_H$. But then also $p' = p_L$.

(iii) Suppose (s', p') is bought by types 11 and 01. By Lemmas A6 the monopolist would profit from offering the same product also to type 10. According to Lemma A9, this does not maximize profits either.

(iv) Suppose (s', p') is bought by types 10 and 01 and thus $R(s', p') \in (0, 1)$. Assume that $R(s', p') > R(s_L, p_L)$. Analogous to the derivation of Lemma A9, we obtain $s_L = \min\{\lambda(R(s_L, p_L) - R_0), 1\} \leq 1$ and $p_L = s_L$ as well as $s' = \min\{\lambda(R(s', p') - R(s_L, p_L)), 1\} \leq 1$ and $p' = s'$. Then, since costs are convex in s, profit from types 10 and 01 is concave in s and increases by offering only one product to types 01 and 10.

(v) Suppose (s', p') is bought by types $11, 10$ and 01. By Lemma A11 this mass market strategy is dominated. The original menu $(0,0)$, (s_L, p_L), (s_H, p_H) must yield higher profit.

The same arguments apply for offering several additional products. Since it is not profitable to introduce an additional product into the two-product menu, it is not profitable to offer even more products. □

Lemma A2. *Suppose the monopolist maximizes profits by offering one product* $(s, p) \neq (0,0)$*. Then, the offer induces a pure-strategy equilibrium in the consumer game.*

Proof. Suppose the monopolist offers $(s, p) \neq (0,0)$. Since otherwise profit is zero, at least some consumers of type 10 or type 11 buy (s, p) and $p > \frac{1}{2}s^2$.

(i) Suppose consumer type 11 buys (s, p) with probability q and $(0,0)$ with probability $1 - q$. For given price and quality, profit increases in q since $p - \frac{1}{2}s^2 > 0$. Further, the image associated with (s, p) (with $(0,0)$) increases (decreases) in q. Thus, the price which can be maximally charged increases in q. Therefore, the monopolist maximizes profit for $q = 1$. The same argument holds for type 10.

(ii) Suppose consumer type 01 buys (s, p) with probability q and $(0,0)$ with probability $1 - q$. Without loss of generality assume that type 11 and 10 buy (s, p) with probability 1 and type 00 chooses $(0,0)$.

Then, $R(s,p) = \frac{\beta}{q\alpha_n(1-\beta)+\beta}$ and $R(0,0) = 0$. Indifference requires

$$\lambda R(s,p) = p \Leftrightarrow q = \frac{\beta(\lambda - p)}{\alpha_n(1-\beta)p} \tag{22}$$

By the same arguments as in Lemma A9, we obtain the profit maximizing product as

$$(s,p) = \begin{cases} (\frac{\beta\lambda}{\beta+\alpha_n q(1-\beta)}, \frac{\beta\lambda}{\beta+\alpha_n q(1-\beta)}) & \text{if } \lambda < R(s,p)^{-1} \\ (1,1) & \text{else.} \end{cases} \tag{23}$$

The corresponding profit is increasing in q

$$\Pi = \begin{cases} \frac{1}{2}\beta\lambda\left(2 + \frac{\beta\lambda}{\alpha_n q(-1+\beta)-\beta}\right) & \text{if } \lambda < R(s,p)^{-1} \\ \frac{1}{2}(\beta + \alpha_n(q - q\beta)) & \text{else.} \end{cases} \quad \text{and} \quad \frac{\partial \Pi}{\partial q} > 0 \tag{24}$$

□

Suppose the monopolist offers a menu which maximizes profits within the set of offers that induce a pure-strategy equilibrium in the consumption stage. According to Proposition 2, the offer takes the form of an "image building" menu where types 00 choose $(0,0)$, types 10 and 01 buy (s_L, p_L), and type 11 buys (s_H, p_H) and $s_L \leq s_H$. To simplify notation, define $\Delta R = R(s_H, p_H) - R(s_L, p_L)$.

Furthermore, the following set of conditions will be helpful in subsequent derivations:

$$\begin{aligned}
&(\text{IC}_{10}) && s_H - p_H \leq s_L - p_L \\
&(\text{IC}_{01}) && \lambda R(s_H, p_H) - p_H \leq \lambda R(s_L, p_L) - p_L \\
&(\text{PC}_{01}) && \lambda R(s_L, p_L) - p_L \geq \lambda R(0,0) \\
&(\text{PC}_{10}) && s_L - p_L \geq 0 \\
&(\text{IC}_{11}) && s_H + \lambda R(s_H, p_H) - p_H \geq s_L + \lambda R(s_L, p_L) - p_L \\
&(\text{PC}_{11}) && s_H + \lambda R(s_H, p_H) - p_H \geq \lambda R(0,0)
\end{aligned}$$

The images $R(s_H, p_H)$, $R(s_L, p_L)$, and $R(0,0)$ will be stated separately in each case. Additional conditions which will be detailed where necessary. It is easily verified that PC_{11} is automatically fulfilled whenever the other constraints hold.

Lemma A3. *Suppose the monopolist maximizes profits by offering two products* $(s_L, p_L) \neq (s_H, p_H)$, $(s_i, p_i) \neq (0,0)$ *for* $i = L, H$. *Then, consumers do not randomize over* (s_L, p_L) *and* (s_H, p_H).

Proof. (i) Suppose type 10 buys (s_H, p_H) with probability q and (s_L, p_L) with probability $1-q$. Suppose that type 01 buys (s_L, p_L) and type 11 buys (s_H, p_H). Then $R(s_H, p_H) = 1$, $R(s_L, p_L) = \frac{(1-q)(1-\alpha_s)\beta}{(1-q)(1-\alpha_s)\beta+\alpha_n(1-\beta)}$, and $R(0,0) = 0$ and IC_{01}, IC_{11}, PC_{01}, and PC_{10} have to hold. Additionally, IC_{10} has to hold with equality to keep type 10 indifferent between the two products. From the two participation constraints PC_{10} and PC_{01} we obtain $p_L = \min\{s_L, \lambda R(s_L, p_L)\}$. By the same arguments as in Lemma A9 this implies

$s_L = \min\{1, \lambda R(s_L, p_L)\}$, and $s_L = p_L$. Then, from IC_{10} follows $s_H = p_H$. Using this in IC_{01} we obtain

$$s_H - s_L \geq \lambda \Delta R \tag{25}$$

If unconstrained, the monopolist would like to sell $s_L = s_H = 1$. Thus, (25) binds at the optimum and $s_H = s_L + \lambda\Delta R$. The corresponding profit is

$$\Pi = (q(1-\alpha_s)\beta + \alpha_s\beta)(s_L + \lambda\Delta R - \tfrac{1}{2}(s_L + \lambda\Delta R)^2) + ((1-q)(1-\alpha_s)\beta + \alpha_n(1-\beta))(s_L - \tfrac{1}{2}s_L^2) \tag{26}$$

with optimal quality choices

$$s_L = \max\{0, 1 - \frac{q(1-\alpha_s)\beta + \alpha_s\beta}{\beta + \alpha_n(1-\beta)}\lambda\Delta R\} < 1 \tag{27}$$

$$s_H = \begin{cases} \lambda\Delta R & \text{if } s_L = 0 \\ 1 + \frac{(1-q)(1-\alpha_s)\beta + \alpha_n(1-\beta)}{\beta + \alpha_n(1-\beta)}\lambda\Delta R & \text{if } s_L > 0 \end{cases} \tag{28}$$

For $s_L = p_L = 0$, types 11 and 10 buy $s_H = p_H = 1$ and type 01 pools with type 00 on the outside option $(0,0)$; no randomization takes place $q = 1$. For $\lambda < (\Delta R)^{-1}\frac{\alpha_n(1-\beta)+\beta}{q(1-\alpha_s)\beta+\alpha_s\beta}$, we obtain $s_L > 0$ and profit is

$$\Pi = \frac{1}{2}(\alpha_n(1-\beta) + \beta) - \frac{\alpha_n^2(1-\beta)^2(q(1-\alpha_s)\beta + \alpha_s\beta)\lambda^2}{2(\alpha_n(1-\beta) + (1-q)(1-\alpha_s)\beta)(\alpha_n(1-\beta)+\beta)} \tag{29}$$

Profit from (29) is maximal at $q = 0$; at the optimum, no randomization takes place.

(ii) Suppose type 01 buys (s_H, p_H) with probability q and (s_L, p_L) with probability $1-q$. Suppose further that type 10 buys (s_L, p_L) and type 11 buys (s_H, p_H). Then $R(s_H, p_H) = \frac{\alpha_s\beta}{q\alpha_n(1-\beta)+\alpha_s\beta}$, $R(s_L, p_L) = \frac{(1-\alpha_s)\beta}{(1-q)\alpha_n(1-\beta)+(1-\alpha_s)\beta}$, and $R(0,0) = 0$. Conditions IC_{10}, IC_{11}, PC_{01}, and PC_{10} have to hold. Additionally, IC_{01} has to hold with equality for type 01 to remain indifferent: $p_H = p_L + \lambda\Delta R$.

Note that this menu is only feasible as long as

$$R(s_H, p_H) \geq R(s_L, p_L) \Leftrightarrow q \leq \frac{\alpha_s\beta}{\alpha_s\beta + (1-\alpha_s)\beta}. \tag{30}$$

In analogy to the proof of Lemma A9, we find

$$p_L = \min\{\lambda R(s_L, p_L), s_L\} \text{ and } s_L = \min\{\lambda R(s_L, p_L), 1\}.$$

We have to distinguish two cases:

Case 1: Suppose $\lambda < R(s_L, p_L)^{-1}$. Then, $s_L = \lambda R(s_L, p_L) = p_L$. From IC_{01} we obtain $p_H = \lambda R(s_H, p_H)$ and from IC_{10} $s_H \leq \lambda R(s_H, p_H)$. Profit is increasing in s_H for $s_H \leq 1$. Thus, we obtain

$s_H = \min\{1, \lambda R(s_H, p_H)\}$. We plug in the derived values into the profit function and simplify profits:

$$(31) \qquad \Pi = \begin{cases} \beta\lambda + \frac{\left(q\alpha_n(1-\beta)((1-\alpha_s)\beta-\alpha_s\beta)\beta+\alpha_s\beta\left((1-\alpha_s)^2\beta^2+(\alpha_n(1-\beta)+(1-\alpha_s)\beta)\alpha_s\beta\right)\right)\lambda^2}{2((-1+q)\alpha_n(1-\beta)-(1-\alpha_s)\beta)(q\alpha_n(1-\beta)+\alpha_s\beta)} \\ \quad \text{if } \lambda < R(s_H,p_H)^{-1} \\ \frac{1}{2}\left(-q\alpha_n(1-\beta)+\alpha_s\beta(-1+2\lambda)+(1-\alpha_s)\beta\lambda\left(2-\frac{(1-\alpha_s)\beta\lambda}{(1-q)\alpha_n(1-\beta)+(1-\alpha_s)\beta}\right)\right) \\ \quad \text{if } R(s_H,p_H)^{-1} < \lambda < R(s_L,p_L)^{-1} \end{cases}$$

We maximize profit with respect to the probability q that type 01 buys (s_H, p_H) and obtain

$$(32) \qquad q^* = \begin{cases} \alpha_s \text{ if } \lambda < R(s_H,p_H)^{-1} \\ \frac{1}{2}\left(1+\frac{(1-\alpha_s)\beta\left(\alpha_n(1-\beta)+(1-\alpha_s)\beta+(1-\alpha_s)\beta\lambda^2\right)}{\alpha_n(1-\beta)(\alpha_n(1-\beta)+(1-\alpha_s)\beta)} - \sqrt{\frac{((\alpha_n(1-\beta)+(1-\alpha_s)^2\beta)^2+(1-\alpha_s)^2\beta^2\lambda^2)^2}{\alpha_n^2(1-\beta)^2(\alpha_n(1-\beta)+(1-\alpha_s)\beta)^2}}\right) \\ \quad \text{if } R(s_H,p_H)^{-1} < \lambda < R(s_L,p_L)^{-1} \end{cases}$$

Profit at q^* is

$$(33) \qquad \Pi = \begin{cases} \frac{1}{2}\beta\lambda\left(2-\frac{\beta\lambda}{\alpha_n(1-\beta)+\beta}\right) & \text{if } \lambda < R(s_H,p_H)^{-1} \\ \alpha_s\beta\left(-\frac{1}{2}+\lambda\right)+\frac{1}{2}(1-\alpha_s)\beta\lambda\left(2-\frac{(1-\alpha_s)\beta\lambda}{\alpha_n(1-\beta)+(1-\alpha_s)\beta}\right) & \text{if } R(s_H,p_H)^{-1} < \lambda < R(s_L,p_L)^{-1} \end{cases}$$

and never exceeds profit from a deterministic image building menu as derived in Lemma A9 as

$$(34) \qquad \Pi^I = \begin{cases} \frac{\beta\left(\alpha_n(1-\beta)(\alpha_s+2\lambda)+(1-\alpha_s)\beta\left(\alpha_s(1-\lambda)^2+(2-\lambda)\lambda\right)\right)}{2\alpha_n+2(1-\alpha_n-\alpha_s)\beta} & \text{if } \lambda \le \lambda_2 \\ \frac{1}{2}(\beta+\alpha_n(1-\beta))+\frac{\alpha_n\alpha_s(1-\beta)\beta\lambda}{(1-\alpha_s)\beta+\alpha_n(1-\beta)} & \text{otherwise} \end{cases}$$

Case 2: Suppose $\lambda \ge R(s_L, p_L)^{-1}$. Since $R(s_L, p_L) < R(s_H, p_H)$ this implies $\lambda > R(s_H, p_H)^{-1}$. Due to the quadratic cost function profit is decreasing in qualities s_i for $s_i > 1, i = L, H$. Therefore, the monopolist sets $s_L = s_H = 1$. This yields $p_L = 1$ and $p_H = 1 + \lambda\Delta R$. Profit is then

$$(35) \qquad \Pi = \frac{1}{2}(\alpha_n(1-\beta)+\beta) + \frac{\alpha_n(1-\beta)(-\alpha_s\beta+q\beta)\lambda}{(-1+q)\alpha_n(1-\beta)-(1-\alpha_s)\beta}$$

This profit is maximal at $q = 0$ and the monopolist does not profit from randomization.

(iii) It is easy to see that profits do not increase either if type 11 randomizes between the high and the low quality product. Suppose type 11 is indifferent between (s_L, p_L) and (s_H, p_H). If a fraction $1 - q$ of type 11 buys (s_L, p_L) this increases the associated image. However, if the monopolist increases p_L in response to the image increase, types 10 stop buying (s_L, p_L) unless he also increases s_L. But an increase in s_L makes the low quality product more attractive to type 11, thereby breaking the indifference of type 11.[35] Therefore, p_L and s_L remain unchanged. Having type 11 buy the low quality decreases profits since $p_H - \frac{1}{2}s_H^2 > p_L - \frac{1}{2}s_L^2$ due to the image-premium charged from type 11. □

[35] The monopolist can increase s_H to sustain indifference but this does quite obviously not increase profits either.

Lemma A4. *Suppose the monopolist maximizes profits by offering two products $(s_L, p_L) \neq (s_H, p_H)$, $(s_i, p_i) \neq (0,0)$ for $i = L, H$. Then, consumer type* 01 *does not randomize over (s_L, p_L) and $(0,0)$.*

Proof. Let q denote the probability that type 01 buys (s_L, p_L) and with $(1-q)$ he takes $(0,0)$. Suppose only type 11 buys (s_H, p_H). Then $R(s_L, p_L) = \frac{(1-\alpha_s)\beta}{(1-\alpha_s)\beta + q\alpha_n(1-\beta)}$ and $R(s_H, p_H) = 1$.

For type 01 to mix between (s_L, p_L) and $(0,0)$, PC_{01} has to bind. Together with PC_{10} this gives $s_L \geq \lambda R(s_L, p_L) = p_L$. Since quality is costly to produce the monopolist sets $s_L = \lambda R(s_L, p_L)$.

Using this in IC_{11} yields

$$p_H \leq p_L + s_H - s_L + \lambda \Delta R = s_H + \lambda \Delta R. \tag{36}$$

Under profit maximization constraint 36 binds. The monopolist maximizes profits by setting $s_H = 1$ and

$$(s_L, p_L) = (\lambda R(s_L, p_L), \lambda R(s_L, p_L)) \quad \text{and} \quad (s_H, p_H) = (1, 1 + \lambda \Delta R).$$

The corresponding profit increases in q:

(37)

$$\Pi = \tfrac{\alpha_s \beta}{2} + \tfrac{q\alpha_n(1-\beta)\alpha_s\beta\lambda}{(1-\alpha_s)\beta + q\alpha_n(1-\beta)} + (q\alpha_n(1-\beta) + (1-\alpha_s)\beta)\left(\tfrac{(1-\alpha_s)\beta\lambda}{(1-\alpha_s)\beta + q\alpha_n(1-\beta)} - \tfrac{(1-\alpha_s)^2\beta^2\lambda^2}{2(q\alpha_n(1-\beta) + (1-\alpha_s)\beta)^2}\right)$$

$$\frac{\partial \Pi}{\partial q} = \frac{\alpha_n(1-\alpha_s)(1-\beta)\beta^2(2\alpha_s + (1-\alpha_s)\lambda)\lambda}{2(\alpha_n q(1-\beta) + (1-\alpha_s)\beta)^2} > 0. \tag{38}$$

□

Lemma A5. *Suppose the monopolist maximizes profits by offering two products $(s_L, p_L) \neq (s_H, p_H)$, $(s_i, p_i) \neq (0,0)$ for $i = L, H$. Then, consumer type* 11 *does not randomize over any product and $(0,0)$.*

Proof. Let q denote the probability of type 11 buying (s_H, p_H) and by $(1-q)$ the probability of her choosing $(0,0)$. Denote by $\gamma_{10}^i, \gamma_{01}^i$ the fractions of the population which are of type 10 and 01, respectively, and buy product i for $i \in \{L, H\}$. The required indifference in PC_{11} implies

$$p_H = \lambda(R(s_H, p_H) - R(0,0)) + s_H = \lambda\left(1 - \tfrac{(1-q)\alpha_s\beta}{(1-q)\alpha_s\beta + (1-\beta)\alpha_n(1-\gamma_{01}^L - \gamma_{01}^H) + (1-\alpha_s)\beta(1-\gamma_{10}^L - \gamma_{10}^H)}\right) + s_H \tag{39}$$

The price p_H increases in q and so do per-unit profits from sales of (s_H, p_H). Furthermore, profits from selling (s_L, p_L) also increase in q since we derive (analogous to Lemma A9)

$$p_L = s_L = \min\{1, \lambda(\tfrac{(1-\alpha_s)\beta\gamma_{10}^L}{(1-\alpha_s)\beta\gamma_{10}^L + (1-\beta)\alpha_n\gamma_{01}^L} - \tfrac{(1-q)\alpha_s\beta}{(1-q)\alpha_s\beta + (1-\beta)\alpha_n(1-\gamma_{01}^L - \gamma_{01}^H) + (1-\alpha_s)\beta(1-\gamma_{10}^L - \gamma_{10}^H)})\} \tag{40}$$

and thus p_L and s_L increase in q. Finally, at the margin type 11 buying (s_H, p_H) contributes $p_H - \frac{1}{2}s_H^2 > 0$ to profits so that the monopolist looses from type 11 not buying directly. □

Thus, we have shown that randomization of types 01 or 11 is not profitable. By assumption 2 type 10 does not randomize. This completes the proof. □

A.5 Proof of Proposition 2

Proof. I first exclude all but four partitions of consumers on products as inconsistent with profit maximization in Lemma A6. Second, I derive the prices and qualities which maximizes the monopolist's profit subject to the corresponding incentive compatibility and participation constraints *given* each of the four partitions in Lemmas A7 to A10.For ease of exposition I introduce the names for the equilibrium candidates already in Lemma A6. Later, these names refer only to the equilibrium candidates which remain in Proposition 2.

Lemma A6. *If the monopolist maximizes profits, the equilibrium features one of the following four partitions of consumers ($s, s_L, s_H > 0$ and $p, p_L, p_H > 0$):*

Standard good	*Consumers who value quality buy (s, p), others do not buy.*
Mass market	*Consumers who value quality or image buy (s, p), others do not buy.*
Image building	*Consumers who value either image or quality buy (s_L, p_L), those who value quality and image buy (s_L, p_L), others do not buy.*
Exclusive good	*Consumers who value image and quality buy (s, p), others do not buy.*

Proof. First, we note that the menu from lemma 1 is an equilibrium candidate and offers strictly positive profit under heterogeneous image concerns. Thus, any other equilibrium candidate must offer strictly positive profit.

Second, the unconcerned consumer will never buy positive quality since she values neither quality nor image. Further, it is always profitable to sell positive quality to consumers who derive utility from both image and quality. Thus, no equilibrium candidate can pool these two types.

Third, the purely image-motivated consumer does not buy if her image is zero but she only buys if she is pooled with some of the intrinsically motivated consumers.

Finally, an equilibrium candidate can pool the purely image-motivated consumers with consumers who value both image and quality *only* if also consumers who intrinsically value quality but not the image buy the same product. Suppose to the contrary that the monopolist offers (s_P, p_P) to the two consumer types who value image, some product $(s_{10}, p_{10}))$ to purely quality concerned consumers and unconcerned consumers choose $(0, 0)$. We consider two separate cases.

(i) $(s_{10}, p_{10})) = (0, 0)$. Then, choosing $(0, 0)$ is associated with image $R(0, 0) = \frac{\beta(1-\alpha_s)}{(1-\beta)(1-\alpha_n)+\beta(1-\alpha_s)}$, whereas the product (s_P, p_P), chosen by consumers of types 11 and 01, is associated with image $R(s_P, p_P) = \frac{\beta\alpha_s}{(1-\beta)\alpha_n+\beta\alpha_s}$. The maximum price s_P which the monopolist can charge for s_P is given by the participation constraint for type 01. This requires $\lambda R(s_P, p_P) - p_P \geq R(0, 0)$. If this is fulfilled, the participation constraint for type 11 is automatically fulfilled. Thus, the profit maximizing prize is $p_P = \lambda(R(s_P, p_P) - R(0, 0))$ and is independent of quality. Since quality is costly to produce, the monopolist will set $s_P = 0$. The maximal profit from pooling types 01 and 11 is thus $\Pi^* = (\beta\alpha_s + (1-\beta)\alpha_n)\lambda(\frac{\beta\alpha_s}{(1-\beta)\alpha_n+\beta\alpha_s} - \frac{\beta(1-\alpha_s)}{(1-\beta)(1-\alpha_n)+\beta(1-\alpha_s)})$. Selling instead only to consumers who value image and quality allows to sell $(s, p) =$

$(1, 1+\lambda(1-\frac{\beta(1-\alpha_s)}{1-\alpha_s\beta})$ and obtain profits $\Pi^E = \beta\alpha_s(1+\lambda(1-\frac{\beta(1-\alpha_s)}{1-\alpha_s\beta})-\frac{1}{2})$. Thus,

$$\begin{aligned}
\Pi^E - \Pi^* &= \frac{\alpha_s\beta}{2} + \alpha_s\beta\lambda\left(1 - \frac{\beta(1-\alpha_s)}{1-\alpha_s\beta}\right) \\
&\quad -(\beta\alpha_s + (1-\beta)\alpha_n)\lambda\left(\frac{\beta\alpha_s}{(1-\beta)\alpha_n + \beta\alpha_s} - \frac{\beta(1-\alpha_s)}{(1-\beta)(1-\alpha_n) + \beta(1-\alpha_s)}\right) \\
&> \frac{\alpha_s\beta}{2} - \alpha_s\beta\lambda\frac{\beta(1-\alpha_s)}{1-\alpha_s\beta} + (\beta\alpha_s + (1-\beta)\alpha_n)\lambda\frac{\beta(1-\alpha_s)}{1-\alpha_s\beta} \\
&= \frac{\alpha_s\beta}{2} + (1-\beta)\alpha_n\lambda\frac{\beta(1-\alpha_s)}{1-\alpha_s\beta} \\
&> 0
\end{aligned}$$

Profit from only selling to consumers who value image and quality strictly dominates pooling them with consumers who only value image.

(ii) Suppose $(s_{10}, p_{10})) \neq (0,0)$. Then, consumers obtain images $R(0,0) = 0, R(s_P, p_P) = \frac{\beta\alpha_s}{(1-\beta)\alpha_n+\beta\alpha_s}$, and $R(s_{10}, p_{10}) = 1$. Incentive compatibility for purely quality concerned consumers requires

$$\begin{aligned}
& s_P - p_P = s_{01} - p_{01} && \leq s_{10} - p_{10} \\
\underset{R_P<1}{\Rightarrow}\quad & s_P + \lambda R_P - p_P = s_{11} + \lambda R_{11} - p_{11} && < s_{10} + \lambda - p_{10} = s_{10} + \lambda R_{10} - p_{10}
\end{aligned}$$

This violates incentive compatibility for consumers who value both image and quality.

□

Various offers of the monopolists could lead to the partitions identified in Lemma A6. To further restrict the set of equilibrium candidates, the following four lemmas characterize the offers which–for a given partition–give the highest profit.

The non-participation corresponds to a product $(0,0)$, the image of which might be positive. I index images, qualities, and prices within a menu by L and H to indicate that these values belong to, respectively, the 'low' and 'high' product, where the ranking is based on the image. By definition image is strictly monotonic and increasing from low to high. As shown below, prices must strictly increase but quality can be weakly increasing from low to high products.

Offering a **standard good (S)** means ignoring heterogeneity in image concern. The partition and the resulting product offer are the same as without image motivation (see Lemma 1).

Lemma A7. ***Standard good*** *Suppose $\lambda \leq 2$. In the standard good case, the monopolist maximizes profits by offering*

$$(s,p) = \begin{cases} (1,1) & \text{if } \lambda \leq 1 \\ (\lambda,\lambda) & \text{if } \lambda > 1 \end{cases} \tag{41}$$

If $\lambda > 2$ this equilibrium cannot be profitably sustained.

Proof. Denote the product offered by the monopolist by (s,p) with $s,p>0$ and the image corresponding to it by R. Both types of quality ignorant consumers 01 and 00 are not willing to pay for quality, do not buy and obtain an image of zero $R(0,0) = 0$. Consumer 10 who only values quality buys (s,p) if $s-p \geq 0$. Consumers 11 receive additional image utility and buy too. As profit increases in p, $s = p$. To prevent type 01 from buying this product, it has to fulfill $\lambda R(0,0) \geq \lambda R - p = \lambda R - s$. The monopolist chooses s to maximize $(\beta)(s - \frac{1}{2}s^2)$ such that $s \geq \lambda R = \lambda$. If the separation is sustained $R = 1$ and thus, $s = \max\{1, \lambda\}$. If image concern is more than twice as large as marginal utility from quality, $\lambda > 2$ a standard good menu is not feasible anymore. Hindering type 01 from buying would require a quality so high that profit must become negative. □

In a **mass market (M)** the monopolist offers one product which is bought by all consumers but type 00.

Lemma A8. ***Mass market*** *In the mass market case, the monopolist maximizes profits by offering*

$$(s,p) = \begin{cases} (\lambda R, \lambda R) & \text{if } \lambda \leq R^{-1} \\ (1,1) & \text{if } \lambda > R^{-1} \end{cases}. \tag{42}$$

Proof. Ignorant consumers of type 00 do not buy and receive image $R(0,0) = 0$. The remaining group has image $R = \frac{\beta}{\beta + \alpha_n(1-\beta)}$. Incentive compatibility for 01 and 10 requires $p \leq \min\{\lambda R, s\}$. If these hold, incentive compatibility for type 11 follows. Since profit is increasing in price and a higher p does not violate any other constraint,

$$p = \min\{\lambda R, s\} \tag{43}$$

I show in two steps that profit maximization requires $s \leq \min\{\lambda R, 1\}$. Since profit is increasing in s for $s \leq 1$ this implies $s = \min\{\lambda R, 1\}$.

Step 1: Show that $s \leq \lambda R$. Suppose to the contrary $s > \lambda R$. Consider an alternative product $(s', p') = (\lambda R, \lambda R)$ which offers lower quality at the same price. Incentive compatibility is still fulfilled and profit increases by $\Delta\Pi = (\beta + \alpha_n(1-\beta))(-\frac{1}{2}(\lambda R)^2 + \frac{1}{2}s^2)$. Since $s > \lambda R$ by assumption, $\Delta\Pi > 0$ contradicting optimality.

Step 2: Show that $s \leq 1$. From step 1 we know $s \leq \lambda R$ and therefore $p = s$. We distinguish two cases depending on the size of λ.

Case 1: Suppose $\lambda \leq R^{-1}$. In this case $\lambda R \leq 1$ and part 1 applies.

Case 2: Suppose $\lambda > R^{-1}$. Then, $\lambda R > 1$. The monopolist chooses s to maximize $(\beta + \alpha_n(1 - \beta))(s - \frac{1}{2}s^2)$ such that $s \leq \lambda R$. Since $\lambda R > 1$, the optimal high quality is the same as in an unconstrained maximization and thus $s = 1$. □

The **image building (I)** menu comprises two differentiated products with positive qualities.

Lemma A9. ***Image building*** *In the image building case, the monopolist maximizes profits by offering*

$$(s_L, p_L) = \begin{cases} (\lambda R_L, \lambda R_L) & \text{if } \lambda \leq R_L^{-1} \\ (1,1) & \text{if } \lambda > R_L^{-1} \end{cases} \tag{44}$$

$$(s_H, p_H) = \left(1, 1 + \lambda \frac{\alpha_n(1-\beta)}{(1-\alpha_s)\beta + \alpha_n(1-\beta)}\right). \tag{45}$$

Proof. Type 00 does not buy with image $R(0,0) = 0$. The group of 10 and 01 consumers has image $R_L = \frac{\beta(1-\alpha_s)}{(1-\alpha_s)\beta+\alpha_n(1-\beta)}$ and types 11 receive image $R_H = 1$. Incentive compatibility for type 11 requires

$$s_H + \lambda R_H - p_H \geq s_L + \lambda R_L - p_L \tag{46}$$

$$\Leftrightarrow \quad p_H \leq p_L + \lambda \frac{\alpha_n(1-\beta)}{(1-\alpha_s)\beta + \alpha_n(1-\beta)} + s_H - s_L \tag{47}$$

Participation of 10 and 01 requires $p_L \leq \min\{\lambda R_L, s_L\}$ and they do not prefer the high product if $s_L - p_L \geq s_H - p_H$ and $\lambda R_L - p_L \geq \lambda R_H - p_H$. Profit increases in p_H and all other constraints are relaxed if the price for high quality goes up. Thus, constraint 47 binds and $p_H = p_L + \lambda\frac{\alpha_n(1-\beta)}{(1-\alpha_s)\beta+\alpha_n(1-\beta)} + s_H - s_L$. Also $p_L = \min\{\lambda R_L, s_L\}$ since any increase in p_L will be compensated for by the same increase in p_H such that the other constraints continue to hold.

I show in two steps that profit maximization requires $s_L \leq \min\{\lambda R_L, 1\}$. Since profit is increasing in s for $s \leq 1$ this implies $s_L = \min\{\lambda R_L, 1\}$.

Step 1: Show that $s_L \leq \lambda R_L$. Suppose instead that $s_L > \lambda R_L$. Consider an alternative product $(s', p') = (\lambda R_L, \lambda R_L)$ which offers lower quality at the same price. Adjust the price of the high quality product by the same amount if necessary to ensure incentive compatibility. Profit increases by at least $\Delta\Pi = (\beta(1-\alpha_s) + (1-\beta)\alpha_n)(-\frac{1}{2}(\lambda R_L)^2 + \frac{1}{2}(s_L)^2)$. Since $s_L > \lambda R_L$, $\Delta\Pi > 0$. Any change in price and quality for type 11 will increases profits further but has been ignored here. Thus, the original product offer was not optimal.

Step 2: Show that $s_L \leq 1$. Part 1 implies that $s_L \leq \lambda R_L$ and therefore $p_L = s_L$. In this step we show that $s_L = 1 < \lambda R_L$ is optimal if $\lambda > R_L^{-1}$ and $s_L = \lambda R_L$ otherwise. We distinguish two cases depending on λ.

Case 1: Suppose $\lambda \leq R_L^{-1}$. In this case $\lambda R_L \leq 1$ and thus by part 1 the claim is true.

Case 2: Suppose $\lambda > R_L^{-1}$. Then, $\lambda R_L > 1$. We have $p_L = s_L$ and $p_H = \lambda\frac{\alpha_n(1-\beta)}{(1-\alpha_s)\beta+\alpha_n(1-\beta)} + s_H$. The monopolist chooses s_L, s_H to maximize

$$(\beta(1-\alpha_s) + (1-\beta)\alpha_n)(s_L - \frac{1}{2}s_L^2) + \beta\alpha_s(\lambda\frac{\alpha_n(1-\beta)}{(1-\alpha_s)\beta + \alpha_n(1-\beta)} + s_H - \frac{1}{2}s_H^2). \tag{48}$$

We find $s_L = s_H = 1$ and $p_L = 1 < 1 + \lambda\frac{\alpha_n(1-\beta)}{(1-\alpha_s)\beta+\alpha_n(1-\beta)} = p_H$. □

In the **exclusive market (E)** the monopolist sells a high quality (s, p) to consumers 11 interested in image and quality. The others do not buy.

Lemma A10. ***Exclusive market*** *In the exclusive good case, the monopolist maximizes profits by offering*

$$(s, p) = (1, 1 + \lambda\frac{1-\beta}{1-\alpha_s\beta}). \tag{49}$$

Proof. If we require 00, 01, and 10 to make the same choice, it must be that none of them buys since 00 will never buy. The groups image is positive, $R(0,0) = \frac{(1-\alpha_s)\beta}{1-\alpha_s\beta} < 1$. Type 11 has image $R_H = 1$. Incentive compatibility for 11 requires $p_H \leq s_H + \lambda(R_H - R_L) = s_H + \lambda\frac{1-\beta}{1-\alpha_s\beta}$. For 10 not to prefer 11's product requires $s_H \leq p_H$ and for 01 incentive compatibility requires $p_H \geq \lambda(R_H - R_L)$. Both are relaxed if p_H increases and profit goes up. Thus, $p_H = s_H + \lambda(R_H - R_L)$.

The profit maximization problem of the monopolist becomes

$$\max_{s_H} \Pi = \beta\alpha_s(s_H + \lambda\frac{1-\beta}{1-\alpha_s\beta} - \frac{1}{2}s_H^2) \tag{50}$$

The profit maximizing choice is $s_1^* = 1$ and $p_1 = 1 + \lambda\frac{1-\beta}{1-\alpha_s\beta}$. □

Lemmas A6, A7, A8, A9, and A10 together constitute the proof of Proposition 2. □

A.6 Proof of Lemma 4

Proof. The characteristics of product offers from Lemmas A7, A9, and A10 yield the following profit functions:

$$\Pi^S = \begin{cases} \frac{\beta}{2} & \text{if } \lambda \leq 1 \\ \beta\left(\lambda - \frac{\lambda^2}{2}\right) & \text{otherwise} \end{cases} \tag{51}$$

$$\Pi^M = \begin{cases} \frac{1}{2}\beta\lambda\left(2 - \frac{\beta\lambda}{\beta+\alpha_n(1-\beta)}\right) & \text{if } \lambda \leq \lambda_1 \\ \frac{1}{2}(\alpha_n(1-\beta)+\beta) & \text{otherwise} \end{cases} \tag{52}$$

$$\Pi^I = \begin{cases} \frac{\beta\left(\alpha_n(1-\beta)(\alpha_s+2\lambda)+(1-\alpha_s)\beta\left(\alpha_s(1-\lambda)^2+(2-\lambda)\lambda\right)\right)}{2\alpha_n+2(1-\alpha_n-\alpha_s)\beta} & \text{if } \lambda \leq \lambda_2 \\ \frac{1}{2}(\beta+\alpha_n(1-\beta)) + \frac{\alpha_n\alpha_s(1-\beta)\beta\lambda}{(1-\alpha_s)\beta+\alpha_n(1-\beta)} & \text{otherwise} \end{cases} \tag{53}$$

$$\Pi^E = \alpha_s\beta\left(\frac{1}{2} + \frac{(1-(1-\alpha_s)\beta-\alpha_s\beta)\lambda}{1-\alpha_s\beta}\right) \tag{54}$$

From this we derive

$$\frac{\partial\Pi^S}{\partial\lambda} = \begin{cases} 0 & \text{if } \lambda \leq 1 \\ \beta(1-\lambda) < 0 & \text{if } \lambda \geq 1 \end{cases}$$

$$\frac{\partial\Pi^I}{\partial\lambda} = \begin{cases} \frac{\beta(\alpha_n(1-\beta)+(1-\alpha_s)^2\beta(1-\lambda))}{\alpha_n+(1-\alpha_n-\alpha_s)\beta} > 0 & \text{if } \lambda \leq \lambda_2 \\ \frac{\alpha_n\alpha_s(1-\beta)\beta}{\alpha_n+(1-\alpha_n-\alpha_s)\beta} > 0 & \text{if } \lambda \geq \lambda_2 \end{cases}$$

$$\frac{\partial\Pi^E}{\partial\lambda} = \frac{\alpha_s(1-\beta)\beta}{1-\alpha_s\beta} > 0$$

and

$$\frac{\partial^2\Pi^S}{\partial\lambda^2} = \begin{cases} 0 & \text{if } \lambda \leq 1 \\ -\beta < 0 & \text{if } \lambda \geq 1 \end{cases}$$

$$\frac{\partial^2\Pi^I}{\partial\lambda^2} = \begin{cases} \frac{(1-\alpha_s)^2\beta^2}{-\alpha_n-(1-\alpha_n-\alpha_s)\beta} < 0 & \text{if } \lambda \leq \lambda_2 \\ 0 & \text{if } \lambda \geq \lambda_2 \end{cases}$$

$$\frac{\partial^2\Pi^E}{\partial\lambda^2} = 0$$

□

A.7 Proof of Proposition 3

Proof. Profits for the different offers are derived in the proof of Lemma 4. I first show that a mass market does not have to be considered further.

Lemma A11. *Offering a mass market product, i.e. a product which attracts all but the ignorant consumers, is never optimal for the monopolist.*

Proof. Profits with the image building menu are at least as high as they are in a mass market: $\Pi^I \geq \Pi^M$, where Π^M and Π^I.

Suppose $\lambda \leq \lambda_1$. Rearranging terms in the profit functions (as stated in the proof of Lemma 4) yields

$$\Pi^I - \Pi^M > 0 \tag{55}$$

$$\Leftrightarrow \quad \lambda^2 \tfrac{\alpha_s\beta^2(\alpha_n(2-\alpha_s)(1-\beta)+\beta-\alpha_s\beta)}{2(\alpha_n(1-\beta)+\beta)((1-\alpha_s)\beta+\alpha_n(1-\beta))} - \lambda\tfrac{(1-\alpha_s)\alpha_s\beta^2}{(1-\alpha_s)\beta+\alpha_n(1-\beta)} + \tfrac{\alpha_s\beta}{2} > 0 \tag{56}$$

The left-hand side is a quadratic equation in λ, the discriminant of which is negative since $\alpha_s, \alpha_n, \beta \in (0,1)$ by Assumption 1. Thus, the expression does not have a real root. Since the coefficient of the quadratic term is positive, the quadratic equation takes only positive values and $\Pi^I > \Pi^M$.

Suppose $\lambda_1 < \lambda \leq \lambda_2$.

$$\Pi^I - \Pi^M > 0 \tag{57}$$

$$\Leftrightarrow \quad -\lambda^2 \tfrac{((1-\alpha_s)\beta)^2}{2((1-\alpha_s)\beta+\alpha_n(1-\beta))} + \lambda\tfrac{((1-\alpha_s)\beta)^2+(1-\alpha_s)\beta\alpha_n(1-\beta)+\alpha_n(1-\beta)\alpha_s\beta}{(1-\alpha_s)\beta+\alpha_n(1-\beta)} - \tfrac{(1-\alpha_s)\beta+\alpha_n(1-\beta)}{2} > 0 \tag{58}$$

The quadratic equation on the left-hand side corresponds to a parabolic function in λ which opens downwards and has two roots, which enclose the interval $(\lambda_1, \lambda_2]$. Thus, for $\lambda_1 < \lambda \leq \lambda_2$, it takes only positive values and $\Pi^I > \Pi^M$.

Suppose $\lambda > \lambda_2$. It is obvious that that $\Pi^I > \Pi^M$.

□

Having established that a mass market menu does not have to be considered, I derive the two thresholds between the remaining offers.

Derivation of $\tilde{\lambda}_m$:

Suppose $\lambda \geq 1$. Then, Π^S is decreasing in λ and Π^M is increasing in λ, and at $\lambda = 1$ $\Pi^M > \Pi^S$. Since by Lemma A11 Π^M is never maximal this implies $\tilde{\lambda}_m < 1$ and standard good only maximizes profit if $\lambda \leq \tilde{\lambda}_m$.

Suppose $\lambda < 1$. Rearranging terms gives

$$\Pi^S \geq \Pi^I \Leftrightarrow 0 \leq \lambda^2 - \lambda\frac{2(\alpha_n(1-\beta)+(1-\alpha_s)^2\beta)}{(1-\alpha_s)^2\beta} + \frac{\alpha_n + (1-\alpha_s-\alpha_n)\beta}{(1-\alpha_s)\beta} \tag{59}$$

The right-hand side of 59 is a quadratic equation in λ which has the following two roots

$$\lambda^{(1),(2)} = 1 + \frac{\alpha_n(1-\beta)}{(1-\alpha_s)^2\beta} \pm \frac{\sqrt{\alpha_n(1-\beta)\left(\alpha_n(1-\beta)+(1-\alpha_s)^2(1+\alpha_s)\beta\right)}}{(1-\alpha_s)^2\beta} \tag{60}$$

It is easy to see that $\lambda^{(1)} < 1 < \lambda^{(2)}$. We have already shown that $\tilde{\lambda}_m < 1$ so that we have

$$\Pi^S \geq \Pi^I \Leftrightarrow \lambda \leq \lambda^{(1)} = 1 + \tfrac{\alpha_n(1-\beta)}{(1-\alpha_s)^2\beta} - \tfrac{\sqrt{\alpha_n(1-\beta)(\alpha_n(1-\beta)+(1-\alpha_s)^2(1+\alpha_s)\beta)}}{(1-\alpha_s)^2\beta} =: \lambda_{SI} \tag{61}$$

Rearranging terms also yields

$$\Pi^S \geq \Pi^E \Leftrightarrow \lambda \leq \frac{(1-\alpha_s)(1-\alpha_s\beta)}{2\alpha_s(1-\beta)} =: \lambda_{SE} \tag{62}$$

Standard good is optimal if and only if it gives higher profit than both image building and exclusive good. Thus, we define $\tilde{\lambda}_m := \min\{\lambda_{SE}, \lambda_{SI}\}$. Using the definitions from Equations 61 and 62 we compute

$$\lambda_{SE} \leq \lambda_{SI} \quad \Leftrightarrow \quad \alpha_s > \tfrac{1}{3} \text{ and } \beta < \tfrac{3\alpha_s-1}{\alpha_s+\alpha_s^2} \text{ and } \alpha_n \leq \tfrac{\beta(1+\alpha_s(\beta+\alpha_s\beta-3))^2}{4\alpha_s(1-\beta)^2} \tag{63}$$

and thus have

$$\tilde{\lambda}_m \quad := \quad \begin{cases} \frac{(1-\alpha_s)(1-\alpha_s\beta)}{2\alpha_s(1-\beta)} & \text{if 63 holds} \\ 1 + \frac{\alpha_n(1-\beta)}{(1-\alpha_s)^2\beta} - \frac{\sqrt{\alpha_n(1-\beta)(\alpha_n(1-\beta)+(1-\alpha_s)^2(1+\alpha_s)\beta)}}{(1-\alpha_s)^2\beta} & \text{otherwise} \end{cases} \tag{64}$$

Derivation of $\tilde{\tilde{\lambda}}_m$:
Suppose $\lambda \leq \lambda_2$.

$$\Pi^I \geq \Pi^E \Leftrightarrow 0 \geq \lambda^2 - \lambda 2\frac{\beta(1-\alpha_s) + (1-\beta)\alpha_n - \beta\alpha_s(1-\beta\alpha_s)}{\beta(1-\alpha_s)(1-\beta\alpha_s)} \tag{65}$$

The quadratic expression in λ on the right-hand side of (65) has two real roots:

$$\lambda^{(1)} = 0 \text{ and } \lambda^{(2)} = 2\frac{\beta(1-\alpha_s) + (1-\beta)\alpha_n - \beta\alpha_s(1-\beta\alpha_s)}{\beta(1-\alpha_s)(1-\beta\alpha_s)}. \tag{66}$$

It is $\Pi^I > \Pi^E$ if $\lambda \in [0, \min\{\lambda^{(2)}, \lambda_2\}]$. Define for later use

$$\lambda_{\text{IE,low}} := \lambda^{(2)} = 2\frac{\beta(1-\alpha_s) + (1-\beta)\alpha_n - \beta\alpha_s(1-\beta\alpha_s)}{\beta(1-\alpha_s)(1-\beta\alpha_s)} \tag{67}$$

Suppose now $\lambda \geq \lambda_2$. Rearranging terms yields

$$\Pi^I \geq \Pi^E \Leftrightarrow \lambda \leq \frac{1}{2}\frac{(\beta(1-\alpha_s) + (1-\beta)\alpha_n)^2(1-\beta\alpha_s)}{(1-\alpha_s)\beta^2\alpha_s(1-\beta)(1-\alpha_n)} =: \lambda_{\text{IE,high}} \tag{68}$$

From Lemma 4 Π^I is concave in λ for $\lambda \leq \lambda_2$, linear thereafter and Π^E is linear in λ for all values of λ. Furthermore, we see that $\Pi^E|_{\lambda=0} < \Pi^I|_{\lambda=0}$. Thus, Π^I crosses Π^E only once and from above.

This implies that the region of λ, where image building is optimal, is an interval or empty. The interval is empty if and only if Π^I crosses Π^E before it crosses Π^S (these are the cases where $\lambda_{SE} \leq \lambda_{SI}$).

Formally, this gives us the following

$$\lambda_{\text{IE,high}} \geq \lambda_2 \Rightarrow \lambda_{\text{IE,low}} \geq \lambda_2, \text{ and } \lambda_{\text{IE,low}} \leq \lambda_2 \Rightarrow \lambda_{\text{IE,high}} \leq \lambda_2 \\ \text{and } \lambda_{SE} \leq \lambda_{SI} \Rightarrow \lambda_{\text{IE,low}} \leq \lambda_{SI} \tag{69}$$

Using (69) and (63) which states the conditions under which $\lambda_{SE} \leq \lambda_{SI}$, we define

$$\tilde{\tilde{\lambda}}_m = \begin{cases} \lambda_{SE} & \text{if (63) holds} \\ \lambda_{\text{IE,low}} & \text{if } \lambda_{\text{IE,low}} \leq \lambda_2 \text{ and } \neg\text{(63) holds} \\ \lambda_{\text{IE,high}} & \text{if } \lambda_{\text{IE,high}} \geq \lambda_2 \text{ and } \neg\text{(63) hold} \end{cases} \tag{70}$$

□

A.8 Proof of Corollary 2:

Proof. Suppose $\alpha_s > \frac{1}{3}$ and $\beta < \frac{3\alpha_s - 1}{\alpha_s + \alpha_s^2}$ and $\alpha_n < \frac{\beta(1+\alpha_s(\beta+\alpha_s\beta-3))^2}{4\alpha_s(1-\beta)^2}$ so that by Proposition 3 image building is never optimal. Since $\frac{\beta(1+\alpha_s(\beta+\alpha_s\beta-3))^2}{4\alpha_s(1-\beta)^2}$ is increasing in β, we have

$$\alpha_n < \frac{(1+\alpha_s)(3\alpha_s - 1)^3}{16\alpha_s} \tag{71}$$

The proof is by contradiction. Suppose $\alpha_n \geq \alpha_s$. Then by (71) the following must hold

$$\frac{(1+\alpha_s)(3\alpha_s - 1)^3}{16\alpha_s} \geq \alpha_s \Leftrightarrow 27\alpha_s^4 - 34\alpha_s^2 + 8\alpha_s - 1 \geq 0 \tag{72}$$

However,

$$27\alpha_s^4 - 34\alpha_s^2 + 8\alpha_s - 1 = 27\alpha_s^2(\alpha_s^2 - 1) - 7\alpha_s(\alpha_s - 1) - 1 < 0 \tag{73}$$

□

A.9 Proof of Proposition 4

Proof. I compare welfare as the sum of profits and consumer surplus across different regimes. Using the equilibrium results from Propositions 2 and 3, welfare W in the different regimes is computed as

$$W^S = \begin{cases} \beta\left(\frac{1}{2}+\alpha_s\lambda\right) & \text{if } \lambda \leq 1 \\ \frac{1}{2}\beta(2+2\alpha_s-\lambda)\lambda & \text{if } 1<\lambda<2 \\ \text{n.a.} & \text{otherwise} \end{cases} \tag{74}$$

$$W^M = \begin{cases} \frac{1}{2}\lambda\frac{\beta(2\alpha_n(1-\beta)+\beta(2+2\alpha_s-\lambda))}{\beta+\alpha_n(1-\beta)} & \text{if } \lambda \leq \lambda_1 \\ \frac{1}{2}(\beta-\alpha_n(1-\beta))+\lambda\frac{\beta(\alpha_n(1-\beta)+\alpha_s\beta)}{\beta+\alpha_n(1-\beta)} & \text{otherwise} \end{cases} \tag{75}$$

$$W^I = \begin{cases} \lambda\beta+\frac{1}{2}(\alpha_s\beta-\frac{(1-\alpha_s)^2\beta^2\lambda^2}{(1-\alpha_s)\beta+\alpha_n(1-\beta)}) & \text{if } \lambda \leq \lambda_2 \\ \frac{1}{2}(\beta-\alpha_n(1-\beta))+\lambda\frac{\beta(\alpha_n(1-\beta)+(1-\alpha_s)\alpha_s\beta)}{(1-\alpha_s)\beta+\alpha_n(1-\beta)} & \text{otherwise} \end{cases} \tag{76}$$

$$W^E = \frac{1}{2}\alpha_s\beta+\lambda(\alpha_s\beta+\frac{\alpha_n(1-\alpha_s)(1-\beta)\beta}{1-\alpha_s\beta}) \tag{77}$$

Analogous to the derivation of the profit maximizing product offer, I derive the welfare maximizing offer and I obtain the following thresholds:

$$\tilde{\lambda}_w = 1+\frac{\alpha_n(1-\beta)}{(1-\alpha_s)\beta}-\sqrt{\frac{\alpha_n(1-\beta)((1-\alpha_s)\beta+\alpha_n(1-\beta))}{(1-\alpha_s)^2\beta^2}} \tag{78}$$

$$\tilde{\tilde{\lambda}}_w = \frac{2(1-\alpha_n+\beta(\alpha_n-\alpha_s))((1-\alpha_s)\beta+\alpha_n(1-\beta))}{(1-\alpha_s)\beta(1-\alpha_s\beta)} \tag{79}$$

$$\tilde{\tilde{\tilde{\lambda}}}_w = \frac{(1-\alpha_s\beta)\left(\alpha_n^2(1-\beta)^2-(1-\alpha_s)^2\beta^2\right)}{2(1-\alpha_n)\alpha_n(1-\alpha_s)(1-\beta)^2\beta} \tag{80}$$

Computations are available upon request. □

A.10 Proof of Corollary 3

Proof. Suppose $\alpha_s, \alpha_n, \beta$ are such that the monopolist offers image building for some value of image, i.e. $\tilde{\lambda}_m < \tilde{\tilde{\lambda}}_m$.

We can show that

$$\begin{aligned} \alpha_s\alpha_n(1-\beta) &< \sqrt{\alpha_n(1-\beta)\left(\alpha_n(1-\beta)+(1-\alpha_s)^2(1+\alpha_s)\beta\right)} \\ &\quad -(1-\alpha_s)\sqrt{\alpha_n(1-\beta)(\alpha_n+(1-\alpha_n-\alpha_s)\beta)} \end{aligned} \tag{81}$$

Further algebraic manipulation reveals

$$\begin{aligned} \alpha_s\alpha_n(1-\beta) &< \sqrt{\alpha_n(1-\beta)\left(\alpha_n(1-\beta)+(1-\alpha_s)^2(1+\alpha_s)\beta\right)} \\ &\quad -(1-\alpha_s)\sqrt{\alpha_n(1-\beta)(\alpha_n+(1-\alpha_n-\alpha_s)\beta)} \end{aligned} \tag{82}$$

$$\Leftrightarrow \quad \tilde{\lambda}_m < \tilde{\lambda}_w \tag{83}$$

where $\tilde{\lambda}_m$ is defined in Equation 64 and $\tilde{\lambda}_w$ is defined in Equation 78. Intermediate steps are dropped to shorten the exposition and are available upon request.

The second part of the claim is obvious. Whereas under monopoly, the interval where exclusive good is optimal is always non-empty, it may be empty under welfare maximization. Suppose now there is an interval of λ where exclusive good maximizes welfare. Then, since $\tilde{\tilde{\lambda}}_w < \infty$, there is always a value of image motivation high enough such that image building maximizes welfare, whereas the monopolist prefers the exclusive good. □

A.11 Proof of Lemma 5

Proof. Suppose the monopolist has to obey a MQS of $\underline{s} = 1$. The monopolist can still induce the same consumer partitions as before (see Lemma A6 in the proof of Proposition 2). Product offers in the standard good and the exclusive good are unaffected by the MQS. For the mass market, we adjust the derivation of the optimal product from Lemma A8 to take into account the MQS. The monopolist chooses $s = \max\{1, \min\{1, \lambda R\}\}$ and thus sets $s = 1$. Prices are adjusted such that incentive compatibility is fulfilled. The optimal product offer is

$$(s,p) = \begin{cases} (1, \lambda R) & \text{if } \lambda \leq R^{-1} \\ (1,1) & \text{if } \lambda > R^{-1} \end{cases} \tag{84}$$

For the image building menu, we adjust the proof from Lemma A9 to take into account the MQS. The monopolist chooses $s_L = \max\{1, \min\{1, \lambda R_L\}\}$ and thus sets $s_L = 1$. Incentive compatibility requires that the price for the high quality product is adjusted upwards. For $\lambda < R^{-1}$, the price for the low quality product lies below its quality since otherwise the purely image concerned consumer would not buy. This yields optimal product offers as

$$(s_L, p_L) = \begin{cases} (1, \lambda R_L) & \text{if } \lambda \leq R_L^{-1} \\ (1,1) & \text{if } \lambda > R_L^{-1} \end{cases} \tag{85}$$

$$(s_H, p_H) = \begin{cases} (1, \lambda) & \text{if } \lambda \leq R_L^{-1} \\ (1, 1 + \lambda(1 - R_L)) & \text{if } \lambda > R_L^{-1} \end{cases} \tag{86}$$

From this we compute profits for each consumer partition. For any set of parameters, the equilibrium with regulation is given by the offer which maximizes profits. Then, we compute consumer surplus for each equilibrium, and also welfare as the sum of consumers surplus and profit. We compare consumer surplus and welfare with regulation with the results obtained in Section 4.3. The proof is completed by Examples 5 and 6:

Example 5. *Suppose* $\left\{\alpha_n = \frac{3}{4}, \alpha_s = \frac{1}{48}, \beta = \frac{13}{64}, \lambda = 3\right\}$. *Then, with and without regulation, the monopolist offers an image building menu. The introduction of the MQS* $\underline{s} = 1$ *decreases profits from* 0.38484 *to* 0.208984 *but increases consumer surplus from* 0.00316994 *to* 0.054138. *The former effect is stronger: Welfare is* 0.38801 *without regulation and only* 0.263122 *with the MQS.*

Example 6. *Suppose* $\left\{\alpha_n = \frac{3}{4096}, \alpha_s = \frac{1}{224}, \beta = \frac{1}{4096}, \lambda = 2\right\}$. *The monopolist offers an image building menu without regulation but offers and exclusive good in the presence of the MQS* $\underline{s} = 1$. *Consumer* *surplus decreases from 5.4322966101377782*^-7 without regulation to 3.5647459099129006*^-7 with the MQS. Welfare decreases from* 0.000367686 *without regulation to 3.080728543069101`*^-6 with.*

□

A.12 Proof of Corollary 6

Proof. Total quality is computed from the equilibrium offers (see Propositions 2 and 3) as

$$S = \begin{cases} \beta & \text{if } \lambda \le \tilde{\lambda}_m \quad \text{(standard good)} \\ \beta\lambda - (\lambda-1)\beta\alpha_s & \text{if } \tilde{\lambda}_m < \lambda \le \min\{\lambda_2, \tilde{\tilde{\lambda}}_m\} \quad \text{(image building)} \\ \beta + (1-\beta)\alpha_n & \text{if } \lambda_2 < \lambda \le \tilde{\tilde{\lambda}}_m \\ \beta\alpha_s & \text{if } \lambda > \tilde{\tilde{\lambda}}_m \quad \text{(exclusive good)} \end{cases} \tag{87}$$

From this we read off

$$\frac{\partial S}{\partial \beta} = \begin{cases} 1 & \text{if } \lambda \le \tilde{\lambda}_m \\ \lambda(1-\alpha_s) + \alpha_s & \text{if } \tilde{\lambda}_m < \lambda \le \min\{\lambda_2, \tilde{\tilde{\lambda}}_m\} \\ 1-\alpha_n & \text{if } \lambda_2 < \lambda \le \tilde{\tilde{\lambda}}_m \\ \alpha_s & \text{if } \lambda > \tilde{\tilde{\lambda}}_m \end{cases} \tag{88}$$

$$\frac{\partial S}{\partial \alpha_n} = \begin{cases} 1-\beta & \text{if } \lambda_2 < \lambda \le \tilde{\tilde{\lambda}}_m \\ 0 & \text{otherwise} \end{cases} \tag{89}$$

$$\frac{\partial S}{\partial \alpha_s} = \begin{cases} 0 & \text{if } \lambda \le \tilde{\lambda}_m \text{ or } \lambda_2 < \lambda \le \tilde{\tilde{\lambda}}_m \\ -(\lambda-1) & \text{if } \tilde{\lambda}_m < \lambda \le \min\{\lambda_2, \tilde{\tilde{\lambda}}_m\} \\ \beta & \text{if } \lambda > \tilde{\tilde{\lambda}}_m \end{cases} \tag{90}$$

All derivatives are positive or zero except for $\frac{\partial S}{\partial \alpha_s}$, which is negative if $\lambda \le 1$ and image building is the equilibrium.

□

A.13 Proof of Proposition 5

Proof. Suppose image building does not occur. Then, $\tilde{\lambda}_m = \tilde{\tilde{\lambda}}_m = \lambda_{SE} = \frac{(1-\alpha_s)(1-\alpha_s\beta)}{2\alpha_s(1-\beta)}$ as defined in Equation 62. The derivatives are

$$\frac{\partial \tilde{\lambda}_m}{\partial \beta} = \frac{(1-\alpha_s)^2}{2\alpha_s(1-\beta)^2} > 0, \quad \frac{\partial \tilde{\lambda}_m}{\partial \alpha_s} = -\frac{1-\alpha_s^2\beta}{2\alpha_s^2(1-\beta)} < 0, \quad \frac{\partial \tilde{\lambda}_m}{\partial \alpha_n} = 0 \tag{91}$$

Suppose image building does occur, $\tilde{\lambda}_m < \tilde{\tilde{\lambda}}_m$ For $\tilde{\lambda}_m$ and $\tilde{\tilde{\lambda}}_m$ as defined in equations 64 and 70 we find

$$\begin{aligned}
(92) \qquad \frac{\partial \tilde{\lambda}_m}{\partial \beta} &= \frac{\alpha_n\left(2\alpha_n(1-\beta)+(1-\alpha_s)^2(1+\alpha_s)\beta-2\sqrt{\alpha_n(1-\beta)(\alpha_n(1-\beta)+(1-\alpha_s)^2(1+\alpha_s)\beta)}\right)}{2(1-\alpha_s)^2\beta^2\sqrt{\alpha_n(1-\beta)(\alpha_n(1-\beta)+(1-\alpha_s)^2(1+\alpha_s)\beta)}} > 0 \\
(93) \qquad \frac{\partial \tilde{\lambda}_m}{\partial \alpha_s} &= -\frac{\alpha_n(1-\beta)\left(4\alpha_n(1-\beta)+(1-\alpha_s)^2(3+\alpha_s)\beta-4\sqrt{\alpha_n(1-\beta)(\alpha_n(1-\beta)+(1-\alpha_s)^2(1+\alpha_s)\beta)}\right)}{2(1-\alpha_s)^3\beta\sqrt{\alpha_n(1-\beta)(\alpha_n(1-\beta)+(1-\alpha_s)^2(1+\alpha_s)\beta)}} < 0 \\
(94) \qquad \frac{\partial \tilde{\lambda}_m}{\partial \alpha_n} &= -\frac{(1-\beta)\left(2\alpha_n(1-\beta)+(1-\alpha_s)^2(1+\alpha_s)\beta-2\sqrt{\alpha_n(1-\beta)(\alpha_n(1-\beta)+(1-\alpha_s)^2(1+\alpha_s)\beta)}\right)}{2(1-\alpha_s)^2\beta\sqrt{\alpha_n(1-\beta)(\alpha_n(1-\beta)+(1-\alpha_s)^2(1+\alpha_s)\beta)}} < 0
\end{aligned}$$

Independent of whether $\tilde{\tilde{\lambda}}_m = \lambda_{\text{IE,low}}$ or $\tilde{\tilde{\lambda}}_m = \lambda_{\text{IE,high}}$, $\tilde{\tilde{\lambda}}_m$ increases in α_n.

$$(95) \qquad \frac{\partial \tilde{\tilde{\lambda}}_m}{\partial \alpha_n} = \begin{cases} 2\left(\frac{1}{\beta-\alpha_s\beta} - \frac{1}{1-\alpha_s\beta}\right) & \text{if } \tilde{\tilde{\lambda}}_m = \lambda_{\text{IE,low}} \\ \frac{(1-\alpha_s\beta)(2-\alpha_n(1-\beta)-(1+\alpha_s)\beta)(\alpha_n+(1-\alpha_n-\alpha_s)\beta)}{2(1-\alpha_n)^2(1-\alpha_s)\alpha_s(1-\beta)\beta^2} & \text{if } \tilde{\tilde{\lambda}}_m = \lambda_{\text{IE,high}} \end{cases} > 0$$

The signs of the derivatives of $\tilde{\tilde{\lambda}}_m$ with respect to α_s and β are ambiguous. We consider the different formula for $\tilde{\tilde{\lambda}}_m$ one after the other.

Case 1: $\tilde{\tilde{\lambda}} = \lambda_{IE,low}$

$$\begin{aligned}
(96) \qquad \frac{\partial \lambda_{\text{IE,low}}}{\partial \beta} &= \frac{2(1-\alpha_n)\alpha_s}{(1-\alpha_s\beta)^2} - \frac{2\alpha_n}{(1-\alpha_s)\beta^2} > 0 \quad \text{if } \frac{\alpha_s\beta^2-\alpha_s^2\beta^2}{1-2\alpha_s\beta+\alpha_s\beta^2} > \alpha_n \\
(97) \qquad \frac{\partial \lambda_{\text{IE,low}}}{\partial \alpha_s} &= \frac{2(1-\beta)\left(\alpha_n(1+\beta-2\alpha_s\beta)-\beta\left(1-\alpha_s^2\beta\right)\right)}{(1-\alpha_s)^2\beta(1-\alpha_s\beta)^2} > 0 \quad \text{if } \alpha_n > \frac{\beta-\alpha_s^2\beta^2}{1+\beta-2\alpha_s\beta}
\end{aligned}$$

Case 2: $\tilde{\tilde{\lambda}} = \lambda_{IE,high}$

$$\begin{aligned}
(98) \qquad \frac{\partial \lambda_{\text{IE,high}}}{\partial \beta} &= \frac{(\alpha_n+(1-\alpha_n-\alpha_s)\beta)\left((1-\alpha_s)^2\beta^2+\alpha_n(1-\beta)(2-\beta-\alpha_s\beta)\right)}{2(1-\alpha_n)(1-\alpha_s)\alpha_s(1-\beta)^2\beta^3} \\
(99) \qquad \frac{\partial \lambda_{\text{IE,high}}}{\partial \alpha_s} &= -\frac{(\alpha_n+(1-\alpha_n-\alpha_s)\beta)\left((1-\alpha_s)\beta\left(1-\alpha_s^2\beta\right)+\alpha_n(1-\beta)(1-\alpha_s(2-\alpha_s\beta))\right)}{2(1-\alpha_n)(1-\alpha_s)^2\alpha_s^2(1-\beta)\beta^2}
\end{aligned}$$

$$(100) \qquad \frac{\partial \lambda_{\text{IE,high}}}{\partial \beta} > 0$$

$$\text{if } \left(\alpha_n < \frac{1-2\alpha_s+\alpha_s^2}{1+\alpha_s} \text{ and } \frac{3\alpha_n+\alpha_n\alpha_s}{2(-1+\alpha_n+2\alpha_s+\alpha_n\alpha_s-\alpha_s^2)} + \frac{1}{2}\sqrt{\frac{8\alpha_n+\alpha_n^2-16\alpha_n\alpha_s-2\alpha_n^2\alpha_s+8\alpha_n\alpha_s^2+\alpha_n^2\alpha_s^2}{(-1+\alpha_n+2\alpha_s+\alpha_n\alpha_s-\alpha_s^2)^2}} < \beta\right)$$

$$\text{or } \left(\alpha_n = \frac{1-2\alpha_s+\alpha_s^2}{1+\alpha_s} \text{ and } \frac{2}{3+\alpha_s} < \beta\right)$$

$$\text{or } \left(\frac{1-2\alpha_s+\alpha_s^2}{1+\alpha_s} < \alpha_n \text{ and } \frac{3\alpha_n+\alpha_n\alpha_s}{2(-1+\alpha_n+2\alpha_s+\alpha_n\alpha_s-\alpha_s^2)} - \frac{1}{2}\sqrt{\frac{8\alpha_n+\alpha_n^2-16\alpha_n\alpha_s-2\alpha_n^2\alpha_s+8\alpha_n\alpha_s^2+\alpha_n^2\alpha_s^2}{(-1+\alpha_n+2\alpha_s+\alpha_n\alpha_s-\alpha_s^2)^2}} < \beta\right)$$

$$(101) \qquad \frac{\partial \lambda_{\text{IE,high}}}{\partial \alpha_s} > 0$$

$$\text{if } \frac{1}{2} < \alpha_s \text{ and } \beta < \frac{1-2\alpha_s}{-2\alpha_s+\alpha_s^2} \text{ and } \frac{\beta-\alpha_s\beta-\alpha_s^2\beta^2+\alpha_s^3\beta^2}{-1+2\alpha_s+\beta-2\alpha_s\beta-\alpha_s^2\beta+\alpha_s^2\beta^2} < \alpha_n$$

□

A.14 Proof of Lemma 6:

Proof. First note that there cannot be a partially pooling equilibrium at another product since purely quality-concerned consumers will always defect to buying $(1, \frac{1}{2})$. Also note that for $\lambda < \frac{1}{2}\frac{\alpha_n(1-\beta)+(1-\alpha_s)\beta}{(1-\alpha_s)\beta}$, purely image-concerned consumers must be indifferent between buying $(1, \frac{1}{2})$ and choosing $(0, 0)$. In equilibrium only a fraction q of the purely image-concerned consumers buy $(1, \frac{1}{2})$. The associated image is then $R(1, \frac{1}{2}, q) = \frac{\beta}{q(1-\beta)\alpha_n+\beta}$. The indifference condition for purely image-concerned consumers (image utility equals price) pins down its participation probability q and thereby the associated image uniquely:

$$\lambda \frac{\beta}{q(1-\beta)\alpha_n + \beta} = \frac{1}{2} \quad \Leftrightarrow \quad q = (2\lambda - 1)\frac{\beta\alpha_s}{(2-\beta)\alpha_n} \tag{102}$$

This participation probability is monotonically increasing in λ over $[\frac{1}{2}, \frac{1}{2}\frac{\alpha_n(1-\beta)+(1-\alpha_s)\beta}{(1-\alpha_s)\beta}]$. The decrease in image through increased participation of purely image-concerned consumers exactly balances the increase in the marginal value of image λ.

Images associated with all other products must be such that no consumer type wants to switch. This is ensured for instance by beliefs $\mu(s', p') = 0$ for all $(s', p') \neq (1, \frac{1}{2})$. $\square$

A.15 Proof of Lemma 7:

Proof. Suppose two products $(1, \frac{1}{2})$ and $(1+\varepsilon, \frac{(1+\varepsilon)^2}{2})$ constitute a partially separating equilibrium and only type 11 buys $(1+\varepsilon, \frac{(1+\varepsilon)^2}{2})$. Type 10 buys $(1, \frac{1}{2})$, type 01 buys $(1, \frac{1}{2})$ with probability q and chooses $(0, 0)$ with probability $1-q$, and type 00 chooses $(0, 0)$. Then beliefs on the chosen products are $\mu(0, 0) = R(0, 0) = 0$, $\mu(1, \frac{1}{2}) = R(1, \frac{1}{2}) = \frac{\beta(1-\alpha_s)}{\beta(1-\alpha_s)+q(1-\beta)\alpha_n}$, and $\mu(1+\varepsilon, \frac{(1+\varepsilon)^2}{2}) = R(1+\varepsilon, \frac{(1+\varepsilon)^2}{2}) = 1$. Suppose further, that the out-of-equilibrium beliefs are $\mu(s, p) = 0$ for all products which are not chosen.

We first verify that for $\varepsilon = \sqrt{1 + 2\lambda\frac{q(1-\beta)\alpha_n}{\beta(1-\alpha_s)+q(1-\beta)\alpha_n}} - 1$, this is indeed a separating equilibrium.

Type 10 prefers $(1, \frac{1}{2})$ over any other product independent of beliefs.

Note that the proposed equilibrium pins down beliefs as $R(1, \frac{1}{2}) = \frac{\beta(1-\alpha_s)}{\beta(1-\alpha_s)+q(1-\beta)\alpha_n}$ and $R(1+\varepsilon, \frac{(1+\varepsilon)^2}{2}) = 1$. Consumer type 01 indeed prefers $(1, \frac{1}{2})$ over $(1+\varepsilon, \frac{(1+\varepsilon)^2}{2})$ in the proposed equilibrium if

$$\begin{aligned}
& U_{01}(1, \frac{1}{2}, R(1, \frac{1}{2})) > U_{01}(1+\varepsilon, p_\varepsilon, R(1+\varepsilon, \frac{(1+\varepsilon)^2}{2})) \\
\Leftrightarrow \quad & \lambda\frac{\beta(1-\alpha_s)}{\beta(1-\alpha_s)+q(1-\beta)\alpha_n} - \frac{1}{2} > \frac{(1+\varepsilon)^2}{2} \\
\Leftrightarrow \quad & \frac{(1+\varepsilon)^2}{2} > \frac{1}{2} + \lambda\frac{q(1-\beta)\alpha_n}{\beta(1-\alpha_s)+q(1-\beta)\alpha_n} \\
\Leftrightarrow \quad & \varepsilon > \sqrt{1 + 2\lambda\frac{q(1-\beta)\alpha_n}{\beta(1-\alpha_s)+q(1-\beta)\alpha_n}} - 1 := \underline{\varepsilon}
\end{aligned} \tag{103}$$

This condition says that for ε too low, the price at which the product sells is so low, that also types 01 find it attractive and the separation breaks down.

Consumer type 11 prefers $(1+\varepsilon, \frac{(1+\varepsilon)^2}{2})$ over $(1, \frac{1}{2})$ if

$$
\begin{aligned}
& U_{11}(1, \frac{1}{2}, R(1, \frac{1}{2})) < U_{11}(1+\varepsilon, p_\varepsilon, R(1+\varepsilon, \frac{(1+\varepsilon)^2}{2})) \\
\Leftrightarrow \quad & 1 + \lambda \frac{\beta(1-\alpha_s)}{\beta(1-\alpha_s) + q(1-\beta)\alpha_n} - \frac{1}{2} < 1 + \varepsilon + \lambda - \frac{(1+\varepsilon)^2}{2} \\
\Leftrightarrow \quad & \frac{(1+\varepsilon)^2}{2} < \frac{1}{2} + \lambda \frac{q(1-\beta)\alpha_n}{\beta(1-\alpha_s) + q(1-\beta)\alpha_n} + \varepsilon \\
\Leftrightarrow \quad & \varepsilon < \sqrt{2\lambda \frac{q(1-\beta)\alpha_n}{\beta(1-\alpha_s) + q(1-\beta)\alpha_n}} := \bar{\varepsilon}
\end{aligned} \tag{104}
$$

This formalizes the intuition that for ε too large the price needed to recover the production cost exceeds consumer's willingness to pay for the product.

For $\lambda < \frac{1}{2}\frac{(1-\alpha_s)\beta + q\alpha_n(1-\beta)}{(1-\alpha_s)\beta}$, participation of type 01 is partial since the image of the low quality product under full participation is too low to compensate for the price of $\frac{1}{2}$. The participation probability q of type 01 is given by

$$
q = \begin{cases} (2\lambda - 1)\frac{\beta\alpha_s}{(1-\beta)\alpha_n} & \text{if } \frac{1}{2} < \lambda \leq \frac{1}{2}\frac{(1-\alpha_s)\beta + q\alpha_n(1-\beta)}{(1-\alpha_s)\beta} \\ 1 & \text{if } \lambda > \frac{1}{2}\frac{(1-\alpha_s)\beta + q\alpha_n(1-\beta)}{(1-\alpha_s)\beta} \end{cases} \tag{105}
$$

The following beliefs sustain $(1+\varepsilon, p_\varepsilon)$ as an equilibrium:

$$
\mu(s,p) = \begin{cases} 1 & \text{if } (s,p) = (1+\varepsilon, p_\varepsilon) \\ \frac{\beta(1-\alpha_s)}{\beta(1-\alpha_s) + q(1-\beta)\alpha_n} & \text{if } (s,p) = (1, \frac{1}{2}) \\ 0 & \text{else.} \end{cases} \tag{106}
$$

It follows with Equations 103 and 104 that there is a continuum of separating equilibria $(1+\varepsilon, \frac{(1+\varepsilon)^2}{2})$ such that $\varepsilon \in [\underline{\varepsilon}, \bar{\varepsilon}]$. □

A.16 Proof of Proposition 6:

Proof. The first claim is trivial. For $\lambda \leq \frac{1}{2}$, type 01 does not want to buy. THus, the image associated with $(1, \frac{1}{2})$ is equal to 1 and type 11 does need to separate to obtain a better image. Thus, the pooling equilibrium **standard good** is unique.

For the second part, suppose $\lambda > \frac{1}{2}$. I first show that among the separating equilibria there is a unique equilibrium which is consistent with the Intuitive Criterion. In this separating equilibrium $\varepsilon = \underline{\varepsilon}$. Then, I show that no pooling equilibrium is consistent with the Intuitive Criterion.

(i) The proof is by contradiction. Assume there is a separating equilibrium as derived in Lemma 7 with $\varepsilon > \underline{\varepsilon}$. Sustaining this equilibrium would require the belief on $(1+\underline{\varepsilon}, \frac{1+\underline{\varepsilon}}{2})$ to be sufficiently low. A necessary condition for "sufficiently low" is $\mu(1+\underline{\varepsilon}, \frac{1+\underline{\varepsilon}}{2}) < 1$. However, type 00 would do worse by buying $(1+\underline{\varepsilon}, \frac{1+\underline{\varepsilon}}{2})$ instead of choosing $(0,0)$ for any beliefs. Type 01 cannot profit from deviating to $(1+\underline{\varepsilon}, \frac{1+\underline{\varepsilon}}{2})$ for any belief $R(1+\underline{\varepsilon}, \frac{1+\underline{\varepsilon}}{2}) \in [0,1]$ by definition of $\underline{\varepsilon}$ (see the proof of Lemma 7, in particular Equation

104). Also type 10 is better off buying $(1, \frac{1}{2})$ than anything else, independent of beliefs. Only type 11 can strictly profit from deviating from $(1+\varepsilon, \frac{1+\varepsilon}{2})$ to $(1+\underline{\varepsilon}, \frac{1+\underline{\varepsilon}}{2})$. Thus, the only belief consistent with the Intuitive Criterion is $\mu(1+\underline{\varepsilon}, \frac{1+\underline{\varepsilon}}{2}) = 1$ for which type 11 is better off buying $(1+\underline{\varepsilon}, \frac{1+\underline{\varepsilon}}{2})$ than $(1+\varepsilon, \frac{1+\varepsilon}{2})$. Thus, any separating equilibrium with $\varepsilon > \underline{\varepsilon}$ fails the Intuitive Criterion.

The same argument goes through for all potentially separating equilibria, where $s = 1+\varepsilon$ and $p > \frac{1+\varepsilon}{2}$. The only separating equilibrium, which remains is $(1, \frac{1}{2})$ and $(1+\underline{\varepsilon}, \frac{(1+\underline{\varepsilon})^2}{2})$ with participation behavior and beliefs as defined above.

(ii) Consider a pooling equilibrium where type 01 buys $(1, \frac{1}{2})$ with probability q as defined in Equation 6 and with probability $1-q$ type 01 choose $(0,0)$. Then the image of the pooling product is $R(1, \frac{1}{2}) = \frac{\beta}{q(1-\beta)\alpha_n + \beta}$.

I show in the following that there always exists $\varepsilon > 0$ such that type 11 profits from deviating to product $(1+\varepsilon, \frac{(1+\varepsilon)^2}{2})$ if he beliefs this to be associated with $R = 1$, while type 01 cannot profit from deviating to product $(1+\varepsilon, \frac{(1+\varepsilon)^2}{2})$ for any belief. According to the Intuitive Criterion, this product can only be associated with $R = 1$ since otherwise we would assign positive probability to a type who would never gain from choosing this product.

Choose $\varepsilon > 0$ such that

$$\frac{\varepsilon}{2} < \lambda(1 - \frac{q(1-\beta)\alpha_n}{\beta(1-\alpha_s) + q(1-\beta)\alpha_n}) < \varepsilon + \frac{\varepsilon}{2}. \tag{107}$$

Then, for the product $(1+\varepsilon, \frac{(1+\varepsilon)^2}{2})$ the following holds: (a) For the most favorable belief $R(1+\varepsilon, \frac{(1+\varepsilon)^2}{2}) = 1$, type 11 gains from deviating to $(1+\varepsilon, \frac{(1+\varepsilon)^2}{2})$.

$$\lambda(1 - \frac{q(1-\beta)\alpha_n}{\beta(1-\alpha_s) + q(1-\beta)\alpha_n}) > \frac{\varepsilon}{2} \tag{108}$$

$$\Leftrightarrow \quad 1+\varepsilon - \frac{(1+\varepsilon)^2}{2} + \lambda > \frac{1}{2} + \lambda\frac{q(1-\beta)\alpha_n}{\beta(1-\alpha_s) + q(1-\beta)\alpha_n} \tag{109}$$

$$\Leftrightarrow \quad U_{11}(1, \frac{1}{2}, R(1, \frac{1}{2})) < U_{11}1+\varepsilon, \frac{(1+\varepsilon)^2}{2}, R = 1) \tag{110}$$

(b) Type 01 cannot gain from deviating to $(1+\varepsilon, \frac{(1+\varepsilon)^2}{2})$ even for the most favorable belief $R(1+\varepsilon, \frac{(1+\varepsilon)^2}{2}) = 1$.

$$\lambda(1 - \frac{q(1-\beta)\alpha_n}{\beta(1-\alpha_s) + q(1-\beta)\alpha_n}) < \varepsilon + \frac{\varepsilon}{2} \tag{111}$$

$$\Leftrightarrow \quad -\frac{(1+\varepsilon)^2}{2} + \lambda < -\frac{1}{2} + \lambda\frac{q(1-\beta)\alpha_n}{\beta(1-\alpha_s) + q(1-\beta)\alpha_n} \tag{112}$$

$$\Leftrightarrow \quad U_{01}(1+\varepsilon, \frac{(1+\varepsilon)^2}{2}, \mu = 1) < U_{01}(1, \frac{1}{2}, R(1, \frac{1}{2})) \tag{113}$$

□

A.17 Proof of Corollary 8

Proof. The first part is proven in the main text. For the second part, note that surplus to consumers who value image and quality in monopoly is

$$\text{CS}_{11}^{\text{mon}} = \begin{cases} \lambda & \text{if } \lambda < \tilde{\lambda}_m \\ \lambda \frac{(1-\alpha_s)\beta}{(1-\alpha_s)\beta+\alpha_n(1-\beta)} & \text{if } \tilde{\lambda}_m < \lambda < \tilde{\tilde{\lambda}}_m \\ \lambda \frac{(1-\alpha_s)\beta}{(1-\alpha_s)\beta+1-\beta} & \text{if } \lambda > \tilde{\tilde{\lambda}}_m \end{cases} \tag{114}$$

In competition, surplus to this consumer type is

$$\text{CS}_{11}^{\text{comp}} = \begin{cases} \lambda + \frac{1}{2} & \text{if } \lambda \leq \frac{1}{2} \\ \lambda + (s - \frac{s^2}{2}) & \text{if } \lambda > \frac{1}{2} \end{cases} \tag{115}$$

where

$$s = \begin{cases} \sqrt{2\lambda} & \text{if } \lambda < \frac{-\alpha_n-\beta+\alpha_n\beta+\alpha_s\beta}{2(-1+\alpha_s)\beta} \\ \sqrt{1+2\lambda\frac{(1-\beta)\alpha_n}{(1-\beta)\alpha_n+\beta(1-\alpha_s)}} & \text{otherwise} \end{cases} \tag{116}$$

Thus, for type 11 consumers monopoly surplus is highest in image building and competitive surplus is lowest in functional excuse with full participation of types 01. Therefore, we only evaluate this most extreme case.

$$\text{CS}_{11}^{\text{mon}} - \text{CS}_{11}^{\text{comp}} = \frac{1}{2} - \sqrt{1 + \frac{2\alpha_n(-1+\beta)\lambda}{-\alpha_n + (-1+\alpha_n+\alpha_s)\beta}} \leq 0 \text{ for all } \lambda > 0 \tag{117}$$

Since even in this case, competition yields higher surplus to types 11, they are always better off with competition. □

A.18 Proof of Lemma 8

Proof. Such becomes effective only when a product (s, p) with $s > 1$ is sold and thus does not affect one-product equilibria. Suppose we are in a two-product equilibrium. By Proposition 6 one of the two products has $s > 1$ and s is such that its marginal cost $MC(s)$ is just high enough to ensure that type 01 does not want to buy. Set the tax $t(\varepsilon) = MC(s) - \frac{1}{2} - \varepsilon$ on a product with quality $1 + \varepsilon$ for $0 < \varepsilon < 2$, and set it to $\bar{t} = 1$ for qualities greater than or equal to 2. Then, type 11 is better off by buying $(1 + \varepsilon, MC(1 + \varepsilon))$ and paying the tax then buying (s, p). Type 01 has no incentive to buy $(1 + \varepsilon, MC(1 + \varepsilon))$ but sticks to $(1, \frac{1}{2})$ and separation remains intact. Consumer surplus increases by $\alpha_s\beta(\varepsilon - \frac{1}{2}\varepsilon^2)$. Welfare increases by even more due to the tax income. □

A.19 Proof of Corollary 11

Proof. From Proposition 6 we know that in functional excuse

$$(s,p) = \left(\sqrt{1 + \frac{2\alpha_n(1-\beta)\lambda}{\alpha_n(1-\beta)+(1-\alpha_s)\beta}}, \frac{1}{2} + \frac{\alpha_n(1-\beta)\lambda}{\alpha_n(1-\beta)+(1-\alpha_s)\beta} \right) \tag{118}$$

if purely image concerned consumers buy $(1, \frac{1}{2})$ with probability one. From this we derive

$$\frac{\partial s}{\partial \beta} = \frac{-\frac{2\alpha_n(1-\alpha_n-\alpha_s)(1-\beta)\lambda}{(\alpha_n(1-\beta)+(1-\alpha_s)\beta)^2} - \frac{2\alpha_n\lambda}{\alpha_n(1-\beta)+(1-\alpha_s)\beta}}{2\sqrt{1+\frac{2\alpha_n(1-\beta)\lambda}{\alpha_n(1-\beta)+(1-\alpha_s)\beta}}} < 0 \tag{119}$$

$$\frac{\partial s}{\partial \alpha_s} = \frac{\alpha_n(1-\beta)\beta\lambda}{(\alpha_n(1-\beta)+(1-\alpha_s)\beta)^2\sqrt{1+\frac{2\alpha_n(1-\beta)\lambda}{\alpha_n(1-\beta)+(1-\alpha_s)\beta}}} > 0 \tag{120}$$

$$\frac{\partial s}{\partial \alpha_n} = \frac{-\frac{2\alpha_n(1-\beta)^2\lambda}{(\alpha_n(1-\beta)+(1-\alpha_s)\beta)^2} + \frac{2(1-\beta)\lambda}{\alpha_n(1-\beta)+(1-\alpha_s)\beta}}{2\sqrt{1+\frac{2\alpha_n(1-\beta)\lambda}{\alpha_n(1-\beta)+(1-\alpha_s)\beta}}} > 0 \tag{121}$$

With the separating products $(1, \frac{1}{2})$ and (s,p) as defined above, total quality provision in functional excuse is computed as

$$S_{\text{total}} = \alpha_n(1-\beta) + (1-\alpha_s)\beta + \alpha_s\beta\sqrt{1 + \frac{2\alpha_n(1-\beta)\lambda}{\alpha_n(1-\beta)+(1-\alpha_s)\beta}} \tag{122}$$

From this we obtain

$$\frac{\partial S_{\text{total}}}{\partial \beta} = 1 - \alpha_n - \alpha_s + \frac{\alpha_n(-1+\alpha_s)\alpha_s\beta\lambda}{(\alpha_n+\beta-(\alpha_n+\alpha_s)\beta)^2\sqrt{1+\frac{2\alpha_n(-1+\beta)\lambda}{-\alpha_n+(-1+\alpha_n+\alpha_s)\beta}}} \tag{123}$$

$$+\alpha_s\sqrt{1+\frac{2\alpha_n(-1+\beta)\lambda}{-\alpha_n+(-1+\alpha_n+\alpha_s)\beta}} \lesseqgtr 0 \tag{124}$$

$$\frac{\partial S_{\text{total}}}{\partial \alpha_s} = \frac{\alpha_n\alpha_s(1-\beta)\beta^2\lambda}{(\alpha_n(1-\beta)+(1-\alpha_s)\beta)^2\sqrt{1+\frac{2\alpha_n(1-\beta)\lambda}{\alpha_n(1-\beta)+(1-\alpha_s)\beta}}} + \beta(\sqrt{1+\frac{2\alpha_n(1-\beta)\lambda}{\alpha_n(1-\beta)+(1-\alpha_s)\beta}} - 1) > 0 \tag{125}$$

$$\frac{\partial S_{\text{total}}}{\partial \alpha_n} = 1 - \beta + \frac{\alpha_s\beta\left(-\frac{2\alpha_n(1-\beta)^2\lambda}{(\alpha_n(1-\beta)+(1-\alpha_s)\beta)^2} + \frac{2(1-\beta)\lambda}{\alpha_n(1-\beta)+(1-\alpha_s)\beta}\right)}{2\sqrt{1+\frac{2\alpha_n(1-\beta)\lambda}{\alpha_n(1-\beta)+(1-\alpha_s)\beta}}} > 0 \tag{126}$$

□