Street Credibility for Sale: a Theory of Branding

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This paper proposes that branding strategies are often employed by companies to signal not only the quality of a good but also the characteristics of consumers of the good. It examines the particular case of connoisseur goods, which are those whose quality can be observed by some consumers but not by others. However, all consumers may derive a benefit from being thought able to observe the quality of such goods. Depending on the way in which such preferences are modelled, there may exist multiple equilibria in which goods are considered superior purely because the belief that they are superior makes them trade at a higher price due to demand from consumers who wish to signal that they prefer the superior good (this is termed "emulation demand"). A model with one monopolistically produced good and one competitive good is developed, then a model with duopoly in which prices are higher in equilibrium with emulation demand than without emulation demand. Welfare consequences and implications for public policy are briefly discussed.

1 Introduction

"[Tom] had discovered a great law of human action, without knowing it - namely, that in order to make a man or a boy covet a thing, it is only necessary to make the thing difficult to attain. If he had been a great and wise philosopher, like the writer of this book, he would now have comprehended that Work consists of whatever a body is obliged to do, and that Play consists of whatever a body is not obliged to do. And this would help him to understand why constructing artifical flowers or performing on a treadmill is work, why rolling tenpins or climbing Mont Blanc is only amusement. There are wealthy gentlemen in England who drive four-horse passenger coaches twenty or thirty miles on a daily line in the summer, because the privilege costs them considerable money; but if they were offered wages for the service, that would turn it into work, and then they would resign" - Mark Twain, ***The Adventures of Tom Sawyer****, pp.23-24.*

"The pleasure of paying dearly for something is a pleasure for which one pays dearly" - Georges Perec, ***Les Choses****.*

Branding is an activity to which the world's companies devote billions of dollars a year, and it is designed to convey information not just about the products they sell but about the people who buy them. When they buy goods and services people are not just acquiring useful inputs into a psychological production process. They are also sending signals, to each other and to themselves, about the kinds of people they are, or would like people to think they are. Expensive clothes are designed not just to look pleasing to the eye but also to look, well, expensive. Cosmetics are designed not just to make people look younger than they are but also to help them believe they are younger than they look. Drinks, furniture, jewellery, cigarettes, lifestyle accessories all, are marketed so as to make people think that buying them secures membership of a group of people who are younger, cooler, hipper, richer, more successful, or more beautiful than would be possible without them.

To most people this is an obvious fact about modern life, but for skeptics some examples may help.

- Levi's jeans sell for substantially higher prices in Europe than in the United States, even allowing for differences in the average cost of consumer products. This is because the branding strategy is different: in

the US Levi's are a solid workaday product, while in Europe they are more exotic, redolent of the adventurous West. Note that these two branding strategies do not convey any different information about the physical qualities of the product; they merely signal (probably untruthfully) that the products are worn by a different clientele.

- Citroen use the model Claudia Schiffer to market the Xsara car in Europe, but with a subtly different strategy in different countries. In Britain, where supermodels are thought incapable of driving cars let alone knowing about them her pictures are used simply to gain the consumer's attention, while in France it is implied that the Xsara is actually her car of choice (implausible though it seems that she might prefer it to a Porsche). By buying the car consumers can buy into at least part of her lifestyle.

- In the 1960s Rolls-Royce put out an advertisement with the slogan "You won't want this car". It went on to talk about how the car concerned was far too sophisticated, luxurious and expensive to be suitable for the reader of the advertisement, and was evidently designed to provoke the reader into buying the car in order to prove the advertisement wrong - wrong about the reader, that is, not about the car. Something similar, albeit with less gravitas, is implied by the recent marketing campaign for the Ford Ka: under the headline "Isn't it a bit too sophisticated for you?", female readers are warned "prepare yourselve for your girlfriends' reaction".

- Stella Artois lager is sold with the slogan "reassuringly expensive".

- Advertisements for Bacardi rum sell a lifestyle, implying both certain personal characteristics (youth, beauty etc.) and an income compatible with spending large amounts of time in the Caribbean (without, of course, being a native of the region). Purchasing Bacardi sends a signal from the consumer to herself about the first, and to others about the second.

- Branded pharmaceuticals sell for prices two or three times as high as unbranded products that are, and are widely known to be, chemically identical (see Scott-Morton, 2000).

- Until the advent of quartz technology, expensive watches were advertised as more reliable timekeepers than cheap ones. Now that reliability is cheap, advertisers of expensive watches go to great lengths to advertise their dependence on mechanical (i.e. unreliable) technology.

- Diamonds, a kind of pebble with a crystalline structure made of carbon, are sold for high prices to people most of whom are incapable without expert assistance of distinguishing them from artificial substitutes not just at the time of purchase but forever after. Although they are supremely durable goods ("forever") only a tiny proportion are held for resale, so the motivation for purchase must involve a signal sent by the purchase decision itself.

- A report by the advertising agency Young and Rubicam, reported in the Financial Times of 1 March 2001, claims that "brands are the new religion. People turn to them for meaning". The same article goes on to cite a report in 2000 by the agency Fitch, pointing out that many people flock to IKEA instead of to church on Sunday, that 12,000 people have been married at Disney World since 1991, and the there is an increasing demand for Harley-Davidson coffins at burials in the United States.

So can we understand what kinds of signal are being sent by consumers of products branded in this way? One type of signal is best understood as a signal by the consumer to herself. An explanation of such a phenomenon is beyond the scope of this paper, but in principle one could imagine two main kinds of rationale. One, which is compatible with modern evolutionary psychology, is that individuals may have within themselves multiple centres of cognition and reasoning (see Dennett, 1995; Pinker, 1998) which find it valuable sometimes to communicate through the external world rather than internal neural channels, perhaps because internal communication suffers from a lack of credibility. I tell myself I am rich, good-looking and successful; to silence the skepticism of my inner voice I behave in ways that make it seem more likely to myself that I am indeed rich, good-looking and successful. Another explanation is that consumers may find out about their own characteristics through consumption decisions: I do not know how fit I am until I go to the gym, I do not know whether I like caviar till I try it, and so on. I shall have nothing further to say about such motivations here, though in my

view they are an important part of many consumption decisions if rarely the whole part.

Instead I want to concentrate on a different type of signal, one sent by the consumer to other people. Without loss of generality we can describe it as a signal about the consumer's type, broadly interpreted. There is a solid scientific basis for thinking that human beings (like most animals that reproduce sexually) have evolved to value signalling not just those characteristics that deter predators (strength, toxicity and so on) but also characteristics whose only value comes from their being valued by others. The mechanism by which this has evolved is known as sexual selection. Suppose some females are sexually attracted to some arbitrary characteristic (pointed ears, say). A male with pointed ears, who has a greater than average probability of passing on the gene for pointed ears to his offspring, will therefore increase the likelihood of his male children's being successful in attracting mates. He will therefore be more likely than a male without pointed ears to ensure that the female's genes are passed on to future generations, including the gene for being attracted to pointed ears. Thus a characteristic and a tendency to be attracted to that characteristic may co-evolve.

In addition, the mechanism of sexual selection will confer a selective advantage on genes that enable an animal to signal the possession of a characteristic without actually possessing it. The result is that some characteristics that were once signals of independently desirable but not immediately visible characteristics, such as strength, ability to outwit predators or resistance to disease, may evolve into characteristics that are desired in their own right even when the accuracy of the original signal has decayed. The classic example of this is the peacock's tail, which probably began as an incidental sign of the strength and health of the male possessing it, came to be sexually attractive to females, and then evolved beyond the point at which it ceased to be a reliable signal of strength and health. A mutation that enabled a peacock to divert resources from its tail into strength and health would die out because its bearer, though stronger and healthier, would fail to attract a mate.

As far as branding is concerned we can distinguish in principle between signals that are sent by the particular good or service purchased, and signals that are sent by the terms of the purchase - in particular by the price at which the good trades. (In practice, however, many branding strategies try to incorporate the terms of the purchase into the perceived characteristics of the product, as appears most clearly in the Stella Artois example.) Buying

rum (even cheap rum) may send a signal about the consumer's tastes and lifestyle. Buying expensive rum when a cheaper variety is available sends a more complex signal, either about the consumer's tastes or about the consumer's income, or more precisely about the consumer's marginal rate of substitution between additional quality and additional income. A consumer who chooses the more expensive variety may be signalling that she has a low marginal utility of income (and is therefore rich) or that she has a high marginal utility of additional quality (and is therefore refined, tasteful and discriminating, all characteristics that sexual selection has favoured).

This paper concentrates on the second of these signals by modelling goods that I shall call "connoisseur goods". These are defined as goods for which there exist perfect or near-perfect substitutes in the opinion of some consumers but only imperfect substitutes in the opinion of others[1]. Some consumers genuinely derive more utility from the connoisseur good than from the substitute, even without any signalling value. Others derive no more utility from the good itself, but may derive some utility from being thought to prefer the connoisseur good. For example, some consumers may be unable to tell the difference between champagne and cava. They may, however, be prepared to pay a higher price for champagne than for cava because they value being thought capable of telling the difference. If cava were the good that signalled connoisseurship, they might be willing for identical reasons to pay more for cava. This motive we shall call "emulation". As will be seen, it implies the possibility of multiple equilibria in which either champagne or cava may trade for a higher price because of a belief that its consumers are connoisseurs, a believe retrospectively validated by the higher price at which it trades.

The model will abstract away from differences in income: it will be tastes, not incomes that drive the results derived here. One consequence of this is that the model can be interpreted either in terms of vertically differentiated goods (those differentiated by quality), so that the purchase price is an intrinsic part of the signal conveyed, or in terms of horizontally differentiated goods, where the characteristics of the purchasers are intrinsic to the signal and the price is incidental. This implies, among other things, that the motivation for vertical and horizontal differentiation may be very similar,

[1]Note that according to this definition both the good and its substitute are connoisseur goods. This is deliberate, as will be seen below. One good may trade for a higher price than the other, but this is endogenous to the model, not a part of the definition.

a fact obscured by the traditional tendency in the literature to treat these phenomena differently. Vertical differentiation is standardly defined to exist when one product is preferred to another by all consumers whenever the price differential between them is small enough, and in standard models implies a strict asymmetric ordering: if good A is of higher quality than good B, good B cannot be of higher quality than good A. In the model presented here, however, the ranking of goods by all consumers may be reversed purely by a change in the beliefs about which of the two signals connoisseurship, so that in one equlibrium of the model A is (by standard definitions) of higher quality than B while in another equilibrium B is of higher quality than A.

It is evident that branding can also perform the function of signaling information about the characteristics of the product itself, and nothing in this paper should be interpreted as a denial of this evident fact. It has, however, been treated extensively in the literature (see Milgrom & Roberts, 1986). Other approaches have been formalised (see Becker & Murphy, 1993, which treats advertising and goods as complementary inputs into a single metautility function, or Becker et.al., 2000), though none to my knowledge have treated the source of benefit from branding as membership of the club of the informed. The literature on herd behaviour (see Banerjee, 1992) also tends to treat the herding motive as informational - that is, as based upon a signal about some consumption or investment opportunity that exists independently of the consumer groups concerned.

In the simple initial model I shall treat one good as supplied competitively, so that its price is exogenous. This is to focus attention on the decision of the supplier of the second good, which is supplied monopolistically. Section 2 of the paper will set out the basic model and present four ways of capturing equilibrium in the market for connoisseur goods. The specification of equilibrium involves, first, an assumption about the way in which consumers form beliefs about nature of the superior good: are their beliefs formed independently of market conditions, with equilibrium then a condition of consistency between their beliefs and market conditions? Or are their beliefs explicitly contingent, both in and out of equilibrium, on the conditions of market exchange (specifically the price of the goods concerned), with equilibrium determined as no more than a simple equality of demand and supply? Secondly, how sophisticated are consumers' beliefs: do they simply assume that the higher priced good is superior, or is their belief probabilistic, and dependent on the likely proportion of informed and uninformed consumers purchasing each good? The four ways of capturing equilibrium arise from the

combination of these two pairs of assumptions. Section 3 demonstrates the potential existence of multiple equilibria under two of these four specifications of equilibrium. Section 4 extends the model briefly to duopoly. Section 5 discusses the results and concludes the paper.

2 The Model

There are two goods, 1 and 2. They can be produced at marginal costs c_1 and c_2 respectively.

There is a continuum of consumers with unit weight. Each wishes to make a purchase of a maximum of a single unit of either good 1 or good 2. All consumers have identical willingness to pay of $a \geq c_1$ for good 1. Good 1 is produced competitively at price $p_1 = c_1$, so all consumers are guaranteed a surplus of $a - c_1$ through consumption of this good.

A proportion α are informed, and can tell the difference between the two goods. Their willingness to pay for good 2 is distributed uniformly on the interval $[a_L, a_H]$, with $a_H > a \geq a_L$. To ensure an interior solution we assume that at least some informed consumers have a willingness to pay exceeding the marginal cost of production by more than $a - c_1$, i.e. that

$$a_H - (a - p_1) > c_2 \tag{1}$$

The remaining proportion $1 - \alpha$ of consumers are uninformed, and have a willingness to pay of a for the two goods indifferently.

We denote by q_U the demand for good 2 from uninformed consumers and by q_I the demand for good 2 from informed consumers, with total demand given by $q = q_I + q_U$. In the absence of any emulation motive, the demand for good 2 at price p_2 is given by the consumers with surplus greater than $a - p_1$, namely

$$\begin{aligned}
q_U &= (1-\alpha) \text{ for } p_2 < p_1 \\
q_U &= 0 \text{ for } p_2 \geq p_1 \\
q_I &= \alpha \text{ for } p_2 < a_L - (a - p_1) \\
q_I &= \alpha \left(\frac{a_H - (a - p_1) - p_2}{a_H - a_L} \right) \text{ for } a_H - (a - p_1) > \ p_2 \geq a_L - (a - p_1) \\
q_I &= 0 \text{ for } p_2 \geq a_H - (a - p_1)
\end{aligned}$$

A monopolist supplying good 2 would seek to maximise

$$\pi_2 = (p_2 - c_2)(q_U + q_I)$$

Provided $c_2 < c_1$, for small α the monopolist will set a price just below p_1 to capture all uninformed consumers. If α is large enough the monopolist will price so as the capture the informed consumers only, choosing a price to satisfy the first order conditions

$$\alpha\left(\frac{a_H - (a - p_1) - p_2}{a_H - a_L}\right) - (p_2 - c_2)\frac{\alpha}{a_H - a_L} = 0 \tag{2}$$

which yields a solution

$$p_2 = \frac{c_2 + a_H - (a - p_1)}{2} \tag{3}$$

provided

$$\frac{c_2 + a_H - (a - p_1)}{2} > c_1 \tag{4}$$

We already know from equation 1 that the expression on the right hand side of 3 is strictly greater than c_2.

We now consider the effect of introducing emulation demand. Assume consumers would value being thought capable of telling the difference between the goods, though to different degrees. Uninformed consumers have a willingness to pay for this that is uniformly distributed on $[0, b_U]$. Informed consumers have a willingness to pay equal to b_I.

How does emulation affect demand and equilibrium? We assume that consumers have beliefs about the way in which their choices signal their ability to distinguish between the goods. Specifically they have beliefs about which of the goods is *superior*, and therefore acts as a signal of their connoisseurship. We shall distinguish between *exogenous* and *endogenous* beliefs, and between *simple* and *sophisticated* beliefs as follows:

- exogenous beliefs are not contingent on the price of the goods. They are beliefs which consumers form about the interpretation of the signal sent by their purchase of the goods concerned; these beliefs must be validated in equilibrium but will not necessarily be true out of equilibrium. An example is the belief "champagne is the superior good".

- endogenous beliefs are explicitly contingent on the price of the goods, and are assumed to be accurate out of equilibrium as well as in equilibrium. An example is the belief "whichever good is more expensive is the superior good".

- simple beliefs are of the zero-one kind and assume the purchase decision signals that the consumer either is or is not informed. An example is the belief "champagne is the superior good. Since it will be more expensive, by purchasing it I can signal that I can tell the difference between it and cava". In equilibrium simple beliefs are correct if and only if the good believed to be superior trades at a higher price than the other.

- sophisticated beliefs are probabilistic, and recognise that since the purchasers of a product may be of both types, the purchase decision only implies a certain probability that the consumer is informed. An example is the belief "champagne will be purchased by a higher proportion of informed consumers than cava, though some uninformed consumers may also purchase it. By purchasing it I can therefore increase the likelihood in the minds of others that I am an informed consumer". In equilibrium sophisticated beliefs are validated if and only if the actual proportion of consumers purchasing the good concerned is equal to the proportion believed to do so by the consumer.

These two distinctions give rise to four types of belief structure in the model, each with its corresponding equilibrium solution. The table below shows the equilibrium conditions associated with each belief structure:

Belief type	**Simple**	**Sophisticated**
Subject of belief	Identity of superior good	Prop. informed buyers of good 2
Exogenous		
Belief	Good i	Proportion is number r
Equilibrium condition	$p_i > p_j$ & markets clear	$\frac{q_I}{q} = r$
Endogenous		
Belief	Good i iff $p_i > p_j$	Proportion is function $r(p_2)$
Equilibrium condition	Markets clear	$\frac{q_I}{q} = r(p_2)$ & markets clear

3 Equilibrium

3.1 Simple exogenous beliefs

Here it is straightforward to show that the identity of the good believed to be superior induces a shift in the demand curve, which may give rise to multiple equilibria. Specifically we can state

Proposition 1 *If consumers hold simple exogenous beliefs, and either i) α and b_I are sufficiently large or ii) α is sufficiently small and b_U sufficiently large then a) there exists an equilibrium in which good 2 is believed to be the superior good; b) there is a range of values for $c_2 < c_1$ there may exist another equilibrium in which good 1 is believed to be the superior good; c) in this second equilibrium the monopolist makes strictly lower profits than in the first equilibrium.*

The proof is in the appendix, but Figure 1 provides a simple and intuitive explanation. The presence of an emulation motive creates two demand curves, corresponding to the difference beliefs about the superior good. Each associated marginal revenue curve may therefore cut the marginal cost curve at a different point, and provided the appropriate price is consistent with the original belief each may constitute an equilibrium.

3.2 Simple endogenous beliefs

Here instead of a demand curve that shifts according to the content of the belief, the endogenous belief induces a stable but discontinuous demand curve, with the discontinuity at $p_2 = p_1$.

Proposition 2 *If consumers hold simple endogenous beliefs, and either i) α and b_I are sufficiently large or ii) α is sufficiently small and b_U sufficiently large then there exists a unique equilibrium in which $p_2 > p_1$ and therefore good 2 is perceived to be the superior good.*

Figure 2 provides an illustration of the single discontinuous demand curve for this case. Both of the equilibrium prices from Proposition 1 continue to satisfy the first order conditions, but the fact that beliefs are now endogenous gives the monopolist the ability to choose between them by its choice of price. Since profits are strictly larger when good 2 is believed to be superior the monopolist will always choose this equilibrium.

3.3 Sophisticated exogenous and endogenous beliefs

A more sophisticated account of the willingness to pay is based on the idea that consumers might signal the probability of their belonging to the informed group, subject to the constraint that other consumers have correct beliefs about the proportion of informed consumers purchasing each good. Exogenous beliefs must be correct in equilibrium, endogenous beliefs vary correctly with the price. This probability of belonging to the informed group, for a consumer purchasing good 2, is simply $\frac{q_I}{q_I+q_U}$, while for a consumer purchasing good 1, it is $\frac{\alpha-q_I}{1-q_I-q_U}$. We can suppose that an informed consumer is willing to pay B times the difference between the ex post probability that he is informed, conditional on his purchasing the relevant good, and the corresponding unconditional probability. This "signal value" of purchase is therefore equal to

$$s = \frac{q_I}{q_I + q_U} - \alpha \tag{5}$$

and therefore $b_I = B.s$. Uninformed consumers have a willingness to pay distributed uniformly on a range $[0, \beta Bs]$, where β may be greater or less than unity.

Total demand for good 2 can therefore be written as

$$Q = q_I + q_U = \alpha \left(\frac{a_H + b_I - (a - p_1) - p_2}{a_H - a_L} \right) \tag{6}$$

$$+(1-\alpha) \left(\frac{p_1 + b_U - p_2}{b_U} \right) \tag{7}$$

and the question naturally arises whether this may also give rise to multiple equilibria. A closely related question is whether demand curve 6 contain a positively sloped portion when the dependence of b_I and b_U on p_2 is taken into account. We can state

Lemma: For sufficiently large α and B and sufficiently small β, $\frac{\partial Q}{\partial p_2} > 0$

From this follows

Proposition 3 *For sufficiently large α and B and sufficiently small β, when consumers have sophisticated exogenous beliefs there exists a range of values of c_2 for which there exists an equilibrium with $p_2 > p_1$ and an equilibrium with $p_2 < p_1$.*

The Proposition follows trivially from the lemma, since the existence of a positively sloped portion of the demand curve implies that there exists some marginal cost curve at which marginal revenue is multi-valued. Figure 3 illustrates. But by the same reasoning as in Proposition 2 we know that this will not survive the assumption of endogenous beliefs. The monopolist makes higher profits in the equilibrium with $p_2 > p_1$ and therefore will always use its price to choose this outcome.

4 Duopoly

There are two firms, producing rival varieties i and j of a certain good at identical marginal cost c, one located at each end of a line of unit length, which can be interpreted as located in characteristics space. Consumers form a continuum of unit mass along this line. Each consumer consumes one and only one unit of the good, and chooses between the rival varieties according to the price and the distance of the consumer from the firm supplying the variety in question. As before, a proportion α of the consumers are informed; they have a cost $t^I.d$ of buying from a firm located at distance d. The remainder $1-\alpha$ are (comparatively) uninformed. They have a cost $t^U.d$ of buying from a firm located at distance d, and it is reasonable to suppose that $t^U < t^I$ (both are strictly positive to avoid corner solutions). Consumers choose the variety that minimises total cost, including the sum of price and the distance cost. In the absence of emulation demand this yields a total demand for variety i equal to:

$$Q_i = q_i^I + q_i^U = \frac{\alpha}{2}\left[1 + \frac{(p_j - p_i)}{t^I}\right] + \frac{(1-\alpha)}{2}\left[1 + \frac{(p_j - p_i)}{t^U}\right]$$

which has the following derivative with respect to p_i:

$$\frac{\partial Q_i}{\partial p_i} = -\left[\frac{\alpha}{2t^I} + \frac{1-\alpha}{2t^U}\right]$$

Emulation demand is modelled as follows. Informed consumers have an additional willingness to pay for variety i of $B\left[\frac{q_i^I}{\alpha} - \frac{q_i^U}{1-\alpha}\right]$, while uninformed consumers have a willingness to pay of $\beta B\left[\frac{q_i^I}{\alpha} - \frac{q_i^U}{1-\alpha}\right]$. The additional willingness to pay for variety j is symmetric and represented by

$B\left[\frac{q_j^I}{\alpha} - \frac{q_j^U}{1-\alpha}\right] = B\left[\frac{q_i^U}{1-\alpha} - \frac{q_i^I}{\alpha}\right]$ and $\beta B\left[\frac{q_j^I}{\alpha} - \frac{q_j^U}{1-\alpha}\right] = \beta B\left[\frac{q_i^U}{1-\alpha} - \frac{q_i^I}{\alpha}\right]$ respectively. We assume that $B < \frac{1}{2t^I}$ to ensure an interior solution. This means that the demand for variety i including emulation demand is given by:

$$\begin{aligned} Q_i &= q_i^I + q_i^U = \frac{\alpha}{2}\left[1 + \frac{(p_j - p_i)}{t^I}\right] + \frac{(1-\alpha)}{2}\left[1 + \frac{(p_j - p_i)}{t^U}\right] \\ &\quad + \frac{B}{4}\left(\frac{\alpha}{t^I} + \frac{\beta(1-\alpha)}{t^U}\right)\left[\frac{q_i^I}{\alpha} - \frac{q_i^U}{1-\alpha}\right] \end{aligned} \tag{8}$$

from which we can show the following:

Proposition 4 *For $\alpha > 0$, the presence of emulation demand raises the price in symmetric duopoly equilibrium with sophisticated endogenous beliefs above the price without emulation demand to an extent that is decreasing in β and increasing in B for $\beta < \frac{t^I}{t^U}$. The prices with and without emulation demand are equal if $B = 0$.*

5 Discussion

We have seen from the results of the basic model that the desire on the part of consumers to signal that they can tell the difference between goods may lead to multiple equilibria in which either good 1 or good 2 trades at a higher price, depending on the beliefs that consumers have about which is superior. In the case of simple exogenous beliefs, it may even happen that the good which is perceived to be superior is not intrinsically preferred by any of the informed consumers. It may happen that the proportion of informed consumers in the population is small or negligible. A good may come to have a reputation as a superior good even though few people know how to tell the difference between it and any other, and those who do, don't much care for it. The presence of sophisticated beliefs, however, ties the equilibrium possibilities more closely to the underlying degree of information. For the desire for emulation to create multiple equilibria there must exist significant numbers of informed consumers in the population. Interestingly, although

these consumers do not necessarily have to care much for the good concerned they have to care about signalling that they are informed (they have to care for this more than the uninformed consumers do). Mere herd behaviour on the part of both informed and uninformed is not enough, unless the informed herd significantly more than the uninformed.

A second important feature of these results is that monopoly profits vary discontinuously between equilibria, giving the monopolist large incentives to invest in persuading consumers of the superiority of its own goods. The large sums invested by companies in branding strategies are easy to understand in this context. We have also seen that the presence of endogenous beliefs enables the monopolist to choose between equilibria, indicating that anything a monopolist can do to make the superiority of a good *explicitly* dependent on its price will help it to avoid low-profit outcomes. We should therefore not be surprised to find branding strategies which make high prices out to be a virtue rather than a regrettable necessity.

In the case of the duopoly model where both firms are behaving strategically, we see that the presence of sophisticated endogenous beliefs enables them to support a higher non-cooperative price. In effect the presence of emulation demand acts to mimic product differentiation, or switching costs (see Klemperer, 1995). Firms know that lowering the price will attract fewer customers since emulation demand will fall even though ordinary demand increases. The extent of this effect depends both upon the strength of emulation demand (parameterised by B) and the *relative* strength of emulation demand by the informed and uninformed. If the uninformed care more about being perceived as informed their behaviour will diminish the signalling value of the purchse.

What do these results imply for consumer welfare? First, note that equilibria with exogenous beliefs may not be efficient, and those with endogenous beliefs typically will not be efficient. This has nothing to do with any doubts about the status of emulation demand: welfare from emulation may be just as valid as welfare from any other source. Rather, it has to do with the fact that consumers' beliefs affect the welfare of other consumers. When beliefs are exogenous this gives rise to a co-ordination problem among consumers. When beliefs are endogenous this means that firms impose externalities on each other's customers when they choose prices. A firm will be able to raise prices higher in the presence of emulation demand than without it, since the additional willingness to pay comes from its customers' belief about the greater superiority of the more expensive product; but this belief comes at

the expense of the customers who continue to buy the rival product whose perceived quality has now declined.

The fact that equilibria may be inefficient, and that prices may be manipulated by firms that have invested in brand identification, does not of course imply that there is any straightforward public policy intervention that can improve matters. Competition authorities cannot measure the strength of emulation demand, beyond suspecting that it exists. Brand creation is not just about emulation, nor is the informational role of advertising wholly empty. Trying to soften brand rivalry based on emulation might easily do more harm than good. However, this conclusion underlines the fact that brand creation remains a poorly understood phenomenon whose nature, and whose consequences for welfare and public policy, are a fitting subject for further research.

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7 Appendix

7.1 Proof of Proposition 1

The first-order conditions for profit-maximization depend on whether consumers expect good 1 or good 2 to signal expertise. The demand curves can be written as the sum of demand from informed and uninformed consumers. If good 1 is believed to be superior the demand curve for good 2 from informed consumers is

$$\begin{aligned} q_I &= \alpha \text{ for } p_2 < a_L - (a - p_1) - b_I && (9) \\ q_I &= \alpha \left(\frac{a_H - b_I - (a - p_1) - p_2}{a_H - a_L} \right) \\ \text{for } a_H - (a - p_1) - b_I &> p_2 \geq a_L - (a - p_1) - b_I && (10) \\ q_I &= 0 \text{ for } p_2 \geq a_H - (a - p_1) - b_I \end{aligned}$$

while that from uninformed consumers is

$$\begin{aligned} q_U &= (1 - \alpha) \text{ for } p_2 < p_1 - b_U && (11) \\ q_U &= (1 - \alpha) \left(\frac{p_1 - b_U - p_2}{b_U} \right) \\ \text{for } p_1 &> p_2 \geq p_1 - b_U && (12) \\ q_U &= 0 \text{ for } p_2 \geq p_1 \end{aligned}$$

If good 2 is believed to be superior the demand curve for good 2 from informed consumers is

$$\begin{aligned} q_I &= \alpha \text{ for } p_2 < a_L - (a - p_1) + b_I && (13) \\ q_I &= \alpha \left(\frac{a_H + b_I - (a - p_1) - p_2}{a_H - a_L} \right) \\ \text{for } a_H - (a - p_1) + b_I &> p_2 \geq a_L - (a - p_1) + b_I && (14) \\ q_I &= 0 \text{ for } p_2 \geq a_H - (a - p_1) + b_I \end{aligned}$$

while that from uninformed consumers is

$$\begin{aligned} q_U &= (1 - \alpha) \text{ for } p_2 < p_1 && (15) \\ q_U &= (1 - \alpha) \left(\frac{p_1 + b_U - p_2}{b_U} \right) \\ \text{for } p_1 + b_U &> p_2 \geq p_1 && (16) \\ q_U &= 0 \text{ for } p_2 \geq p_1 + b_U \end{aligned}$$

To prove part a), we take first order conditions for a profit maximum given the demand curves 13 and 15. These conditions can be written as follows:

$$\begin{aligned} & \alpha\left(\frac{a_H + b_I - (a - p_1) - p_2}{a_H - a_L}\right) + (1-\alpha)\left(\frac{p_1 + b_U - p_2}{b_U}\right) \\ = \;& (c_2 - p_2)\left[\frac{(\alpha - 1)}{b_U} - \frac{\alpha}{a_H - a_L}\right] \end{aligned} \tag{17}$$

which we re-arrange to find

$$p_2 = \frac{c_2}{2} + \frac{\alpha\left(\frac{a_H + b_I - (a - p_1)}{a_H - a_L}\right) + (1-\alpha)\left(\frac{p_1 + b_U}{b_U}\right)}{2\left[\frac{\alpha}{a_H - a_L} + \frac{(1-\alpha)}{b_U}\right]} \tag{18}$$

In equilibrium p_2 must strictly exceed p_1 given that consumers believe good 2 to be superior. This requires the second term on the right hand side to be large, which will occur for sufficiently large α and b_I, or sufficiently large $(1-\alpha)$ and b_U, which completes the proof of part a). For part b), note that when consumers believe good 1 to be superior, the first order conditions for p_2 are identical to 18 with the signs on b_I and b_U reversed. Setting $p_2 < p_1$ as required in equilibrium yields

$$c_1 > \frac{c_2}{2} + \frac{\alpha\left(\frac{a_H - b_I - (a - p_1)}{a_H - a_L}\right) - (1-\alpha)\left(\frac{p_1 - b_U}{b_U}\right)}{2\left[\frac{\alpha}{a_H - a_L} - \frac{(1-\alpha)}{b_U}\right]} \tag{19}$$

which completes the proof of b). □

7.2 Proof of Proposition 2

Instead of two demand curves corresponding to different beliefs as in Proposition 1 there is a single demand curve with a discontinuity, composed as follows of the sum of demand from uninformed and informed consumers. The demand for good 2 from uninformed consumers is given by

$$\begin{aligned} q_U &= (1-\alpha) \text{ for } p_2 < p_1 - b_U \\ q_U &= (1-\alpha)\left(\frac{p_1 - p_2}{b_U}\right) \text{ for } p_1 > p_2 \geq p_1 - b_U \\ q_U &= (1-\alpha)\left(\frac{p_1 + b_U - p_2}{b_U}\right) \text{ for } p_1 + b_U > p_2 \geq p_1 \\ q_U &= 0 \text{ for } p_2 \geq p_1 + b_U \end{aligned}$$

The demand from informed consumers is given by

$$\begin{aligned}
q_I &= \alpha \text{ for } p_2 < a_L - (a - p_1) - b_I \\
q_I &= \alpha \left(\frac{a_H - b_I - (a - p_1) - p_2}{a_H - a_L} \right) \text{ for } p_1 > p_2 \geq a_L - (a - p_1) \\
q_I &= \alpha \left(\frac{a_H - (a - p_1) - p_2}{a_H - a_L} \right) \text{ for } p_1 = p_2 \\
q_I &= \alpha \left(\frac{a_H + b_I - (a - p_1) - p_2}{a_H - a_L} \right) \text{ for } a_H - (a - p_1) > p_2 > p_1 \\
q_I &= 0 \text{ for } p_2 \geq a_H + b_I - (a - p_1)
\end{aligned}$$

The existence of equilibrium follows from part a) of Proposition 1, since the demand curve is locally the same under exoengous and endogenous beliefs. Uniqueness follows from local uniqueness (which follows from the linear demand assumption) and from part c) of proposition 1. Any other price satisying the first order conditions with $p_2 < p_1$ would yield strictly lower profits to the monopolist and would therefore not be chosen.

7.3 Proof of Lemma 3

The derivative of demand with respect to the price of good 2 is

$$\begin{aligned}
\frac{\partial (Q)}{\partial p_2} &= -\frac{\alpha}{a_H - a_L} - \frac{(1-\alpha)}{b_U} + \frac{\partial \left[\alpha b_I + (1-\alpha) b_U\right]}{\partial p_2} \\
&= -A + B \left[\alpha + \beta - \alpha\beta\right] \frac{\partial s}{\partial p_2} \qquad (20)
\end{aligned}$$

Differentiating 5 yields

$$\frac{\partial s}{\partial p_2} = \frac{Q \frac{\partial q_I}{\partial p_2} - q_I \frac{\partial Q}{\partial p_2}}{Q^2} \qquad (21)$$

Now taking the derivative of informed demand, we have

$$\frac{\partial q_I}{\partial p_2} = -\frac{\alpha}{a_H - a_L} + \alpha B \frac{\partial s}{\partial p_2} \qquad (22)$$

Substituting 22 into 21 yields

$$\frac{\partial s}{\partial p_2} = -\frac{\alpha}{(Q - \alpha B)(a_H - a_L)} - \frac{q_I \frac{\partial Q}{\partial p_2}}{Q(Q - \alpha B)} \qquad (23)$$

which can in turn be substituted into 20 to yield an expression for the derivative of total demand:

$$\frac{\partial(Q)}{\partial p_2} = \frac{\left[-\frac{\alpha}{a_H - a_L} - \frac{(1-\alpha)}{\beta B}\right] - B\left[\alpha + \beta - \alpha\beta\right]\left[\frac{\alpha}{(Q-\alpha B)(a_H - a_L)}\right]}{1 + B\left[\alpha + \beta - \alpha\beta\right]\frac{q_I}{Q(Q-\alpha B)}} \tag{24}$$

A necessary condition for 24 to have a positive solution is that $Q - \alpha B < 0$, since the numerator and denominator of the expression must either both be positive or both be negative. Therefore that α and B must be sufficiently large. However, this is not sufficient since values large enough to make the denominator negative may make the numerator negative as well. For this not to occur it is sufficient that the expression $\frac{(1-\alpha)}{\beta B}$ be large and therefore that β be small. □

7.4 Proof of Proposition 4

For the equilibrium price in the model with emulation demand to be higher than that without emulation demand, it is necessary that 1) emulation demand affect the slope of each firm's residual demand function and 2) that the demand function be steeper than that without emulation demand. For 1) it is necessary that there be endogenous sophisticated beliefs, while for 2) it is necessary and sufficient (given 1) that

$$\frac{B}{4}\left(\frac{\alpha}{t^I} + \frac{\beta(1-\alpha)}{t^U}\right) > 0 \tag{25}$$

and that

$$\frac{\partial}{\partial p_i}\left[\frac{q_i^I}{\alpha} - \frac{q_i^U}{1-\alpha}\right] > 0 \tag{26}$$

Given that $\alpha > 0$, the left hand side of 25 is non-negative, and is strictly positive if $B > 0$. Rearranging 8 yields

$$\left[\frac{q_i^I}{\alpha} - \frac{q_i^U}{1-\alpha}\right] = \frac{\frac{1}{2}\left[1 + \frac{(p_j - p_i)}{t^I}\right] - \frac{1}{2}\left[1 + \frac{(p_j - p_i)}{t^U}\right]}{\left(1 - \frac{B}{4}\left[\frac{1}{t^I} - \frac{\beta}{t^U}\right]\right)} \tag{27}$$

so that

$$\frac{\partial}{\partial p_i}\left[\frac{q_i^I}{\alpha} - \frac{q_i^U}{1-\alpha}\right] = \frac{\left(\frac{1}{t^U} - \frac{1}{t^I}\right)}{2 - \frac{B}{2}\left[\frac{1}{t^I} - \frac{\beta}{t^U}\right]} \tag{28}$$

where the numerator is positive because of the hypothesis that $t^I > t^U$. The expression $\left[\frac{1}{t^I} - \frac{\beta}{t^U}\right]$ is likewise positive for $\beta < \frac{t^I}{t^U}$, so the numerator is decreasing in B (and increasing in β). Thus for $B < \frac{1}{2t^I}$, the expression 26 is positive, increasing in B and decreasing in β. □