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ADVERTISING AS INFORMATION:

MATCHING PRODUCTS TO BUYERS*

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Kyle Bagwell and Garey Ramey

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*Northwestern University and University of California, Dan Diego.

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Abstract

We consider communication of quality via cheap talk and dissipative advertising, when consumers have heterogeneous tastes for quality. For search goods, cheap talk communicates quality when fixed costs are roughly constant across quality levels, while if fixed costs vary greatly with quality, then firms having the higher–fixed–cost quality level use dissipative advertising. Further, product differentiation (generically) cannot occur in the absence of advertising. For experience goods, quality can be communicated by cheap talk in a range where low–quality firms have greater fixed costs, and low–quality firms use dissipative advertising if their fixed costs are greater still.

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* Northwestern University and University of California, San Diego.

1. Introduction

In a classic paper, Nelson (1974) explores how sellers communicate the quality of their products through advertising. Advertised quality claims can succeed in directly communicating quality only when sellers do not have an incentive to misrepresent quality, as when advertisements simply explain what the function of the product is. Other aspects of quality, such as how well the product performs the function, may be more profitably misrepresented. Nelson emphasizes that opportunities for misrepresentation are pervasive with respect to *experience attributes* of a product, that is, quality attributes that a consumer cannot observe prior to purchase. In contrast, Nelson argues that incentives to misrepresent *search attributes*, which are verifiable prior to purchase, are low, and as a consequence search attributes can typically be communicated directly.

In this paper we take issue with Nelson's contention that sellers gain little by mispreresenting search attributes. Our argument has two components. First, many commonly–advertised search attributes involve precisely the same kind of subjective quality comparisons that Nelson observes in the advertising of experience goods. For example, retail sellers of carpets and rugs, furniture, and hardware make vague claims as to "high quality, low prices, great selection" in their advertisements; auto dealers promise low–pressure sales tactics and high–performance test drives; grocers laud the freshness of their produce and meats; etc. Because buyers face search costs, sellers may gain by luring customers with false quality claims, even if the customers can verify the claims prior to purchase.

Second, buyers often vary in their valuation of quality, and in such cases advertising performs the task of matching products to buyers. Sellers have an incentive to misrepresent quality precisely to the extent that they gain by inducing mismatches. As we demonstrate below, direct communication of search attributes is feasible only when gains

from mismatching are small, which in turn depends systematically on structural characteristics of the market. Further, when direct communication fails, dissipative or "money–burning" advertising, which Nelson links to indirect communication of experience attributes, becomes necessary for communicating search attributes.

We develop a model in which there are two classes of buyers, with one class preferring high–quality, high–price products relatively more than the other class. Firms choose whether or not to enter the market, and if they enter they select the qualities and prices of their products, along with "cheap talk" quality announcements and observable dissipative advertising expenditures. Quality announcements represent attempts at direct communication, while dissipative expenditures allow for indirect communication. Consumers observe the number of entering firms as well as each firm's quality claim and advertising expenditures, and then each consumer visits the firm that is expected to offer his most preferred quality–price pair. Consumers observe quality and price after they visit their preferred firm but before they make purchases, so that quality is a search attribute. The model abstracts from repeat business effects by assuming only a single period of trading.

In this setting, it is easy to see why costless claims will not always suffice to communicate quality, contrary to Nelson's intuition. Suppose that market conditions are such that when consumers are correctly matched, high– and low–quality firms earn roughly equal profits per customer. If high– and low–quality firms also obtain similar market shares per firm, then a firm that uses its quality claim to misrepresent its quality simply trades consumers that prefer its quality for consumers that do not, with no substantial change in its total number of customers. This exchange is likely to be unattractive to the firm, so that it has an incentive to report quality correctly. Here direct communication suffices to reveal quality.

In contrast, suppose that firms selling one quality level capture significantly more

market share per firm than firms selling the other quality level. In this case, firms with the low–market–share quality level can gain by misrepresenting themselves as having the high–market–share quality level, since the added numbers of customers offset any losses from failure to attract the consumers that most prefer its quality. Thus direct communication cannot reveal quality when per–firm market shares are greatly unequal across quality levels, and in such cases dissipative advertising must be used to communicate quality indirectly. Importantly, per–firm market shares are linked fundamentally to the levels of fixed costs associated with the product qualities.

Our analysis generates the following specific predictions:

Result 1. If firms suffer losses from failure to provide customers with their preferred quality, then direct communication of search attributes is possible if and only if fixed costs are sufficiently similar across quality levels. More generally, direct communication cannot occur unless the *gross rate of return* received by firms for providing an increase in quality is greater for consumers with stronger quality preference.

Result 2. If fixed costs are widely dissimilar across qualities, then dissipative advertising is necessary for communication of search attributes, and moreover dissipative advertising is associated with the quality level having the highest fixed costs. Thus dissipative advertising will tend to be associated with larger–scale firms. Note that if low quality entails higher fixed costs, then it is *low–quality* firms that use dissipative advertising; this may explain why large–scale retailing warehouses appear to spend more on advertising than smaller–scale service–oriented outlets.

Result 3. Equilibria may be completely uninformative as to search attributes. Importantly, (generically) only one quality level is provided in uninformative

equilibria, so that advertising must (almost always) be informative in order for both quality levels to exist in the market. This supports Nelson's prediction (1975, p. 225) that product differentiation increases when advertising is informative.

This paper also considers the implications of matching products to buyers for the communication of experience attributes. Nelson (1974) argues that direct communication of experience attributes is generally infeasible, and that indirect communication via dissipative advertising can occur in three cases: (1) high–quality sellers have lower marginal costs, and thus greater incentives to raise current sales via advertising; (2) high–quality sellers benefit more from repeat business, which increases the future returns from current sales; and (3) advertising serves to match consumers to their preferred products, when there is heterogeneity of consumer preferences. The first two cases have been carefully explored in past literature on experience goods (Kihlstrom and Riordan (1984), Milgrom and Roberts (1986), Schmalensee (1978)), with the basic conclusion being that when advertising is informative, high advertising is associated with high quality.

Fundamentally different results emerge when advertising matches products to buyers, however. We adapt our model to the experience–good case, and we make the assumption that marginal costs are higher for high–quality products. The following predictions are obtained:

Result 4. Suppose quality is an experience attribute.

(a) Direct communication can suffice only if the fixed costs of low–quality firms are larger than those of high–quality firms, but not too much larger, while if low–quality fixed costs are very large, then low–quality firms communicate quality through dissipative advertising. Dissipative advertising is never used by high–quality firms.

(b) If high quality has larger fixed costs than low quality, then only low–quality firms enter the market.

Our results offer an explanation for some recent empirical findings on the connection between advertising expenditures and product quality. Empirical research shows that advertising typically bears a positive relationship to quality, but the relationship is not strong and is often reversed.[1] For example, Tellis and Fornell (1988, p. 70) conclude:

> For consumers, advertising cannot be used as a guide to either high or low quality. Though a more heavily advertised brand may be of better quality, the relationship between advertising and quality, albeit positive, is not large enough for advertising to be a good indicator of quality.

In light of our results, these mixed findings can be interpreted as reflecting the matching function of advertising in the presence of heterogeneous buyers. The use of advertising to communicate high quality depends on the structure of fixed costs, as well as whether quality entails search or experience attributes and whether repeat business is important. Our results show that quality–signaling need not entail dissipative advertising for either search or experience attributes, and further that in certain cases dissipative advertising might actually be used to signal low quality.

In related work, Lazear (1991) has studied the incentives of a single seller to use misleading cheap talk to influence the search decisions of heterogeneous buyers. Cheap–talk equilibria as defined here (generically) do not exist in Lazear's setting, and

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[1] See Archibald, Haulman and Moody (1983), Farris and Buzzell (1979), Lambin (1976), Marquardt and McGann (1975), Rotfeld and Rotzoll (1976) and Tellis and Fornell (1988). Further, Kirmani (1990) and Kirmani and Wright (1989) report experimental results showing that subjects infer high quality from moderate levels of advertising, but low quality is inferred if advertising levels are high.

alternate forms of communication equilibria are not considered. The use of credible price and quality announcements to influence product–to–buyer matching has been analyzed by Grossman and Shapiro (1984) and Meurer and Stahl (1990). Bagwell and Ramey (1992a, 1992b) study the role of dissipative advertising in communicating search attributes that derive from coordination economies, including lower prices, greater variety and higher quality; matching products to buyers does not arise in these papers since consumers are assumed to be homogeneous.

The paper is organized as follows. Section 2 introduces the model, and Section 3 analyzes the direct communication of search attributes. Indirect communication through dissipative expenditures is studied in Section 4, while Section 5 considers uninformative equilibria. Communication of experience attributes is taken up in Section 6, and Section 7 concludes.

2. Model

Let there be a large number of consumers and potential entrant firms. Consumers vary in their tastes, while firms may vary in the quality of their products. Consumer tastes, represented by t, may take on two values: $t = R$ denotes consumers with "refined" tastes, while $t = P$ denotes consumers with "plain" tastes. The number of consumers of type t is given by $m^t > 0$, $t = R,P$. Firms' product quality, written v, may also take on two values, either $v = H$, for "high" quality, or $v = L$, for "low" quality. The number of firms selling each quality level is endogeneously determined by free entry.

We adopt a version of the demand structure considered by Gabzewicz and Thisse (1979, 1980), Shaked and Sutton (1982, 1983) and Greenstein and Ramey (1991): Let $U(q,p,t,v)$ give the utility of a consumer with tastes t, who purchases q units at price p of a product having quality v. Assume $U_{qq} < 0$, $U_p < 0$ and $U_{qp} < 0$, and let U be uniquely

maximized in q by D(p,t,v) which is strictly positive for all t and v.[2] Assume further that total and marginal utility are strictly greater for high quality, i.e. $U(q,p,t,H) > U(q,p,t,L)$ and $U_q(q,p,t,H) > U_q(q,p,t,L)$ for all q, p and t. Note that the latter inequality implies $D(p,t,H) > D(p,t,L)$ for all p and t.

Let the maximized level of utility be denoted by:

$$U^*(p,t,v) \equiv U(D(p,t,v),p,t,v)$$

Assume that, for all p, t and v:

$$(1) \qquad \frac{-\partial U^*(p,R,v)/\partial v}{\partial U^*(p,R,v)/\partial p} > \frac{-\partial U^*(p,P,v)/\partial v}{\partial U^*(p,P,v)/\partial p}$$

(1) states that refined consumers have greater willingness to trade off higher prices for higher quality than do plain consumers. Thus when confronted with any given pair of prices for high and low quality, refined consumers will strictly prefer the high–quality product when plain consumers at least weakly do.

Let the variable cost function for a firm that supplies q units of quality v be $c^v q$, where $c^H > c^L$; the latter restriction means that high quality products have higher marginal costs. If a firm of quality v chooses price p, then its profits from selling to a single consumer of class t are given by:

$$\Pi(p,t,v) \equiv (p - c^v)D(p,t,v)$$

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[2] Our results are unaffected by the alternate specification that D(p,t,v) is strictly positive for $p < \bar{p}(t,v)$ and zero for $p \geq \bar{p}(t,v)$.

We assume that Π is uniquely maximized by $p^*(t,v)$; let $\Pi^*(t,v)$ give the maximized profit level from selling to a single class t consumer. Note that $\Pi^*(t,v) > 0$ for all t and v since $D(c^v,t,v) > 0$ under our assumptions. Maximized profits from capturing s consumers of class t are $s\Pi^*(t,v)$.

While (1) ensures that refined consumers have relatively stronger preference for high quality, this does not mean that demand and cost conditions are such that refined consumers prefer high quality, and plain consumers prefer low quality, at the prices that firms are willing to charge. To guarantee this, we assume also that:

$$U^*(p^*(R,H),R,H) > U^*(p^*(P,L),R,L) \tag{2a}$$

$$U^*(p^*(P,L),P,L) > U^*(p^*(R,H),P,H) \tag{2b}$$

In other words, consumers prefer to segment themselves between high and low quality when firms choose profit–maximizing prices.[3]

We now spell out the structure of trading. Price and quality are both assumed to be search attributes of a product, i.e. consumers must visit a firm before they can observe the firm's price and quality level. Note in particular that this specification departs from most previous models of product quality, where either the quality of every firms' product is directly observable, or quality is an experience attribute.[4] Market trading will proceed according to the following three stages:

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[3] Observe that implicit in (2b) is the condition $p^*(R,H) > p^*(P,L)$, i.e. the price of a high–quality product sold refined consumers must be strictly greater than the price of a low–quality product sold to plain consumers; if this condition did not hold, then plain consumers would certainly prefer to purchase the high–quality product with its lower price.

[4] Wolinsky (1983) develops a model in which consumers observe a noisy signal of quality prior to purchase, so that quality combines search and experience aspects. Bagwell and Ramey (1992a, Section 5) posit that quality is a search attribute chosen by the firm and consider whether price or advertising can signal quality. In Section 6 below we will consider the case of quality as an experience attribute.

Stage 1. The potential entrant firms simultaneously decide whether to enter the market or stay out. Firms that stay out can take no further actions and earn zero profits.

Stage 2. Firms observe one another's Stage 1 entry decisions, and then simultaneously choose qualities, prices, quality claims and advertising expenditures, denoted respectively by v, p, v^C and A. v and v^C are chosen from {H,L}, while p and A are chosen from $\mathbb{R}_+$.[5] A firm choosing quality v incurs a sunk fixed cost of $F^v > 0$.

Stage 3. Consumers observe the quality claims and expenditures of each entering firm, but not their quality or price choices. Each consumer then chooses a single firm to visit. After visiting a firm, a consumer observes the quality and price choices of that firm, and he purchases as many units as desired at the given quality and price.

The key features of this trading game are: (1) Price and quality can both be observed prior to purchase; thus a firm with quality v faces the demand curve D(p,t,v) for every type t consumer that visits it. (2) In contrast, prior to search consumers can observe only quality claims and advertising expenditures.[6] Since consumers desire to visit firms that sell their preferred quality, the possibility arises that consumers use observed advertising in order to correctly match themselves with their preferred firms. (3) The firms themselves determine their quality levels, and moreover free entry determines the number of firms that enter at each quality level.

In making this specification of the trading structure, we have imposed two basic

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[5] It is possible to allow firms to accompany the quality claim with a "cheap talk" price claim, which does not imply a price commitment, without altering the results.

[6] We have specified that price information is unavailable prior to search in order to simplify the analysis and highlight the role of advertising in matching products to buyers. In Bagwell and Ramey (1992a) we consider price and advertising as joint signals of quality when quality is a search attribute, and we show that advertising may continue to be essential for credible communication of quality.

simplifying assumptions: (1) No firm can sell both quality levels, so there can be no multi–product firms. This assumption is reasonable if quality provision entails significant indivisibilities, e.g. if quality involves the "shopping environment" of a retail store, in which case it may be impossible to provide both high and low quality. Further, we have assumed implicitly that all units purchased by a consumer must be of the same quality level, so that it is not possible to purchase both high– and low–quality units. It is straightforward in principle to extend our analysis to incorporate multi–product firms and multi–quality consumption bundles, but in the present paper we have chosen to focus on the simpler specification. (2) Consumers can make only a single search, and thus a firm becomes a monopolist with respect to all consumers that visit it. Our results would be maintained under the alternate specification that consumers make multiple sequential searches at some nonzero cost per search, as long as the cost of search is high relative to a consumer's net benefit from purchasing his preferred product.

3. Direct Communication of Search Attributes

a. Existence of Cheap Talk Equilibria

In this section we will consider equilibria in which quality claims alone suffice to communicate the quality level to consumers; we refer to such equilibria as *cheap–talk equilibria.*[7] We will focus on cheap–talk equilibria in which all entering firms choose $A = 0$.[8] In equilibrium firms announce their qualities truthfully; according to (1) and (2a–b), refined consumers will visit firms that claim $v^C = H$, and plain consumers will visit firms that claim $v^C = L$. We assume throughout that consumers of a given taste class are evenly

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[7] Contributions to the general theory of cheap–talk equilibria include Crawford and Sobel (1982) and Farrell (1990).

[8] Equilibria in which quality claims serve to credibly communicate quality might also involve strictly positive advertising, supported by consumers' threat that they will not visit any firm that reduces its advertising from the equilibrium level.

divided among firms that claim their preferred quality.

Let us first consider whether firms have the incentive truthfully to reveal quality in Stage 2 when n^H high–quality and n^L low–quality firms have entered in Stage 1. A claim of $v^C = H$ will capture $s^H = m^R/n^H$ refined consumers, and a claim of $v^C = L$ will capture $s^L = m^P/n^L$ plain consumers. A cheap–talk equilibrium arises if and only if the following *incentive–compatibility conditions* are satisfied:

$$s^H\Pi^*(R,H) \geq s^L\Pi^*(P,H) \tag{3a}$$

$$s^L\Pi^*(P,L) \geq s^H\Pi^*(R,L) \tag{3b}$$

(3a) indicates that high–quality firms do not wish to lie by claiming low quality, thereby capturing s^L plain consumers, while (3b) states that low–quality firms do not wish to lie in order to capture s^H refined consumers. Here we have assumed that firms ignore the effect of their own announcement on the per–firm sales of firms making that announcement, e.g. a high–quality firm does not take account of the fact that it captures only $m^P/(n^L + 1)$ plain consumers by lying. This assumption makes sense if n^H and n^L are large.

It is reasonable to suppose that firms profit more when they provide a given class of consumers with the consumers' preferred quality, i.e. there exist mutual gains from correct matching. In particular, we assume the following:

$$\Pi^*(R,H) > \Pi^*(R,L) \tag{4a}$$

$$\Pi^*(P,L) > \Pi^*(P,H) \tag{4b}$$

(4a) states that a given refined consumer is most profitably served when high quality is provided, while (4b) indicates that a plain consumer is most profitably served with low quality. We will refer to (4a–b) as the *sorting conditions*, in that they will provide firms

with an incentive to correctly match products to buyers.

In the next subsection we will discuss the sorting conditions in greater detail. For now, let us consider the existence of cheap–talk equilibria when the sorting conditions hold. For given s^L, let $\underline{s}^H(s^L)$ and $\bar{s}^H(s^L)$ be defined by:

$$\underline{s}^H(s^L)\Pi^*(R,H) = s^L\Pi^*(P,H) \tag{5a}$$

$$s^L\Pi^*(P,L) = \bar{s}^H(s^L)\Pi^*(R,L) \tag{5b}$$

In (5a), $\underline{s}^H(s^L)$ is defined as the minimum value of s^H that can satisfy (3a) for the given value of s^L. Thus high–quality firms are willing to reveal themselves truthfully if and only if $s^H \geq \underline{s}^H(s^L)$. Similarly, $\bar{s}^H(s^L)$ is defined in (5b) as the maximum value of s^H that can satisfy (3b) for the given s^L, so that low–quality firms are truthful if and only if $s^H \leq \bar{s}^H(s^L)$. Clearly $\underline{s}^H$ and $\bar{s}^H$ are strictly increasing functions, with $\underline{s}^H(0) = \bar{s}^H(0) = 0$.

Now note that the sorting conditions imply $\underline{s}^H(s^L) < \bar{s}^H(s^L)$, which may be seen as follows:

$$\underline{s}^H(s^L)\Pi^*(R,L) < \underline{s}^H(s^L)\Pi^*(R,H) = s^L\Pi^*(P,H) < s^L\Pi^*(P,L) \tag{6}$$

The first inequality in (6) follows from (4a), while the second inequality follows from (4b). (6) implies that the low–quality firm is willing to tell the truth when $s^H = \underline{s}^H(s^L)$, so it follows that $\bar{s}^H(s^L) > \underline{s}^H(s^L)$. Thus we have a cheap–talk equilibrium if and only if $s^H \in [\underline{s}^H(s^L), \bar{s}^H(s^L)]$. Although direct communication is feasible for a nonempty range of s^H and s^L, it becomes infeasible when the per–firm market share of firms selling one quality level becomes significantly greater than that of firms selling the other quality level. For example, if $s^H < \underline{s}^H(s^L)$, then claiming low quality gives high–quality firms sufficient

numbers of plain consumers to offset the relative unprofitability of mismatched quality.[9]

We now consider whether a cheap–talk equilibrium can be sustained when n^H and n^L are determined by free entry. As with the incentive compatibility conditions, we make the assumption that firms regard themselves as atomistic when they make their Stage 1 decisions, so that they ignore the effects of their own entry and quality choices on s^H and s^L. Similarly, we will assume that no firm imagines that its Stage 1 entry decision triggers a shift away from the cheap–talk equilibrium; that is, firms regard themselves as *strategically anonymous* as far as determination of the equilibrium for Stages 2 and 3.

It follows that when (3a) and (3b) hold, a firm can earn maximum profit of $s^H\Pi^*(R,H)$ by entering with high quality, while entering with low quality gives maximum profit of $s^L\Pi^*(P,L)$. Free entry then implies that s^H and s^L must satisfy:

$$s^H\Pi^*(R,H) - F^H = 0 \tag{7a}$$

$$s^L\Pi^*(P,L) - F^L = 0 \tag{7b}$$

By inverting (7b), we can obtain the number $s^L(F^L)$ of customers per low–quality firm when the entry cost is F^L; clearly this function is strictly increasing and $s^L(0) = 0$. Let the the functions $\underline{F}^H(F^L)$ and $\bar{F}^H(F^L)$ be defined by:

$$\underline{s}^H(s^L(F^L))\Pi^*(R,H) - \underline{F}^H(F^L) = 0 \tag{8a}$$

$$\bar{s}^H(s^L(F^L))\Pi^*(R,H) - \bar{F}^H(F^L) = 0 \tag{8b}$$

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[9] Suppose $\Pi^*(R,H) = \Pi^*(P,L)$, i.e. profits per correctly–matched consumer are equal for high and low quality. Then we have $\underline{s}^H(s^L) < s^L < \bar{s}^H(s^L)$, and so direct communication is feasible if and only if per–firm market shares for the two quality levels are sufficiently close. This is the situation discussed in the introduction; more generally, incentive compatibility requires that per–firm market shares are greater for the quality level that yields smaller profits per customer.

(8a) defines $\underline{F}^H(F^L)$ as the level of F^H such that free entry in the high–quality market gives $s^H = \underline{s}^H(s^L(F^L))$ customers per firm. Thus when s^H and s^L are determined by free entry, $F^H = \underline{F}^H(F^L)$ means that (3a) will hold with equality. It follows that free entry is consistent with $s^H \geq \underline{s}^H(s^L)$ if and only if $F^H \geq \underline{F}^H(F^L)$. Analogously, $\overline{F}^H(F^L)$ is defined in (8b) as the level of F^H such that (3b) holds with equality under free entry, and we have $s^H \leq \bar{s}^H(s^L)$ if and only if $F^H \leq \overline{F}^H(F^L)$. Note that $\underline{F}^H$ and $\overline{F}^H$ are strictly increasing functions, with $\underline{F}^H(0) = \overline{F}^H(0) = 0$. Further, it is easy to see that $\underline{s}^H(s^L(F^L)) < \bar{s}^H(s^L(F^L))$ implies $\underline{F}^H(F^L) < \overline{F}^H(F^L)$.

Note finally that when $F^H = F^L$, free entry implies:

$$s^H\Pi^*(R,H) = F^H = F^L = s^L\Pi^*(P,L) > s^L\Pi^*(P,H)$$

where the inequality follows from (4b); thus free entry ensures that (3a) is automatically satisfied when $F^H = F^L$. Similarly, from (4a) it follows that free entry ensures satisfaction of (3b) when $F^H = F^L$. This completes the proof of:

Proposition 1. There exist strictly increasing functions $\underline{F}^H(F^L)$ and $\overline{F}^H(F^L)$, with $\underline{F}^H(0) = \overline{F}^H(0) = 0$ and $\underline{F}^H(F^L) < F^L < \overline{F}^H(F^L)$ for $F^L > 0$, such that a cheap–talk equilibrium exists if and only if $F^H \in [\underline{F}^H(F^L), \overline{F}^H(F^L)]$.

Figure 1 gives an illustration of $\underline{F}^H$ and $\overline{F}^H$. In Region 2 of the figure, we have $F^H \in [\underline{F}^H(F^L), \overline{F}^H(F^L)]$, which implies $s^H \in [\underline{s}^H(s^L), \bar{s}^H(s^L)]$; in this case free entry is consistent with satisfaction of the incentive compatibility conditions, and a cheap–talk equilibrium arises for the three–stage model. Direct communication suffices to reveal quality in this region. In Region 1, in contrast, we have $F^H > \overline{F}^H(F^L)$, which gives $s^H >$

$\bar{s}^H(s^L)$; in this case entry of low–quality firms drives s^L below the point at which their incentive compatibility condition can be satisfied. Thus a cheap–talk equilibrium cannot actually be sustained in the ensuing stages. Similarly, in Region 3 we have $F^H < \underline{F}^H(F^L)$, and thus $s^H < \underline{s}^H(s^L)$, so that entry by the high–quality firms leads to violation of their incentive compatibility constraint.

Consequently, the existence of a cheap–talk equilibrium, even under the sorting conditions, holds only for a subset of the possible entry costs. This reflects the fact that incentive compatibility can be satisfied only if the size differential between high– and low–quality firms is not too great; if sizes are widely disparate, then firms in the smaller–size market have an incentive to lie in order to obtain the larger number of customers. Size disparities are brought about by disparities in sunk entry costs: if F^H is much larger that F^L, for example, then under free entry s^H will be much larger than s^L, and firms can earn positive profit by entering the high–quality market via the "dishonest" strategy of incurring the cost F^L and claiming high quality.

Further, when F^H and F^L are sufficiently close together, free entry necessarily brings s^H and s^L into the region where direct communication is feasible. This follows from the fact that the profit differential between high and low quality becomes small when F^H and F^L are close; since firms profit from providing a given class of buyers with their preferred quality, it follows that the profits from capturing buyers through misrepresentation are less than the profits from making a correct match with buyers of either class. Thus the feasibility of direct communication is closely linked to the difference in fixed costs between high and low quality.

b. Analysis of the Sorting Conditions

The fundamental reason why quality information can directly communicated is that high–quality firms have a stronger preference for the high–quality market than do

low–quality firms, as reflected by the sorting conditions. Let us now take a closer look at these conditions in terms of the underlying structure of the model. To do this it is convenient to conceive of the quality level v as being distributed on the real line, with H > L; D(p,t,v) and c^v are increasing in v. The profits from selling high vs. low quality to a given class t consumer may be written:

$$\Pi^*(t,H) - \Pi^*(t,L) = \tag{9}$$

$$\int_L^H [(p^*(t,v) - c^v) \frac{\partial D(p^*(t,v),t,v)}{\partial v} - \frac{dc^v}{dv} D(p^*(t,v),t,v)]dv$$

The first term in the integrand is a positive *demand effect* which captures the fact that higher quality raises demand at every given price. The second term is a negative *cost effect* that reflects the higher variable costs associated with high quality. For (4a) to hold, the demand effect must dominate for t = R, i.e. refined consumers must possess demand curves that are very sensitive to quality. In contrast, for (4b) to hold, the demand curves of plain consumers must be relatively insensitive to quality.

More generally, either the demand or the cost effect may dominate for both taste classes, in which case either (4b) or (4a), respectively, may fail to hold. Direct communication can still occur in such cases if refined consumers remain relatively attractive for high–quality firms. It is easy to see that (3a–b) can be possibly satisfied if and only if:

$$\frac{\Pi^*(R,H)}{\Pi^*(R,L)} \geq \frac{\Pi^*(P,H)}{\Pi^*(P,L)} \tag{10}$$

That is, the *gross rate of return* from providing a quality increase to refined consumers must be greater, at least weakly, than the gross rate of return from plain consumers. If (10) holds, then $\underline{s}^H(s^L) \leq \bar{s}^H(s^L)$ and there is a nonempty range of s^H and s^L that satisfy (3a–b), while if (10) fails, then (3a–b) cannot hold for any s^H and s^L. Note that under (10), at least one of (4a) or (4b) must hold, i.e. direct communication cannot occur unless firms profit from providing consumers' preferred quality for at least one taste–class.

If (10) holds and either (4a) or (4b) are violated, then it is possible that cheap–talk equilibria exist for a nonempty range of F^H and F^L, but fail to exist for $F^H = F^L$, in contrast to Proposition 1. This can occur, for example, when firms have a very strong preference to sell low quality to both taste–classes, and at the same time refined consumers are slightly more profitable than plain consumers at each quality level. We have $\Pi^*(P,L) > \Pi^*(R,H)$ under these conditions, so that free entry implies $s^H > s^L$ when $F^H = F^L$; (3b) is then violated due to $\Pi^*(R,L) > \Pi^*(P,L)$. In special cases such as these, large disparities in fixed costs will continue to rule out existence of cheap–talk equilibria, but very small disparities rule out existence as well; direct communication is feasible only in an intermediate range.

4. Indirect Communication via Disspative Advertising

When direct communication does not suffice to reveal search attributes, it becomes necessary for firms to use dissipative advertising in order to communicate quality information indirectly. An equilibrium of this kind will be called an *advertising equilibrium*. It turns out that the quality level associated with relatively greater fixed costs, whether high quality or low quality, uses dissipative advertising in advertising equilibria.

We can derive an advertising equilibrium in which quality information is signaled, even though $F^H < \underline{F}^H(F^L)$, which implies nonexistence of the cheap–talk equilibrium. In

this advertising equilibrium it is the *low–quality* firms that choose positive advertising. The advertising equilibrium is composed of an advertising level A^L together with a rule that maps firms' advertising levels to consumer inferences of quality: consumers infer that whatever number of firms have entered the market, a given firm's quality is low if the firm chooses $A \geq A^L$, and quality is high if the firm chooses $A < A^L$. Clearly all firms will choose either $A = A^L$ or $A = 0$ when faced with this inference rule. Assuming that the incentive compatibility constraints are satisfied, the free–entry conditions now become:

$$s^H \Pi^*(R,H) - F^H = 0 \tag{11a}$$

$$s^L \Pi^*(P,L) - F^L - A^L = 0 \tag{11b}$$

Thus s^H is determined exactly as in (7a) above, but now s^L is strictly higher than the level given by (7b) as a consequence of the higher fixed cost of entering the low–quality market.

Are (11a) and (11b) consistent with the incentive compatibility conditions? For high–quality firms, incentive compatibility becomes:

$$s^H \Pi^*(R,H) \geq s^L(F^L + A^L)\Pi^*(P,H) - A^L \tag{12}$$

where $s^L(F^L + A^L)$ expresses the value of s^L that satisfies (11b) as a function of the total fixed cost in the low–quality market. Note that at $A^L = 0$, this inequality reduces to the incentive compatibility condition (3a) of the cheap–talk equilibrium, which is violated when $F^H < \underline{F}^H(F^L)$. From the sorting condition (4b), however, it follows that the right–hand side of (12) is *strictly decreasing* in A^L; this may be seen by noting that (11b) implies:

$$\frac{\partial s^L}{\partial A^L} = \frac{1}{\Pi^*(P,L)}$$

Thus differentiating the right–hand side of (12) with respect to A^L gives:

$$\frac{\partial s^L}{\partial A^L}\Pi^*(P,H) - 1 = \frac{\Pi^*(P,H)}{\Pi^*(P,L)} - 1 < 0$$

where the strict inequality follows from (4b). It follows that (12) holds necessarily for sufficiently large A^L; we may define $\underline{A}^L > 0$ as the minimum level of A^L that satisfies (12).

Now consider incentive compatibility for the low–quality firms. Since $F^H < \underline{F}^H(F^L)$ implies $F^H < \overline{F}^H(F^L)$, we have, for all A^L:

$$s^L(F^L + A^L)\Pi^*(P,L) - A^L = F^L = s^L(F^L)\Pi^*(P,L) > s^H\Pi^*(R,L)$$

where the latter inequality follows from $F^H < \overline{F}^H(F^L)$; thus for all A^L, incentive compatibility is satisfied for the low–quality firms. This proves:

Proposition 2. If $F^H < \underline{F}^H(F^L)$, then there exists an advertising equilibrium in which low–quality firms choose advertising $A^L \geq \underline{A}^L > 0$ and high–quality firms choose zero advertising.

Proposition 2 establishes that an advertising equilibrium exists when $F^H < \underline{F}^H(F^L)$, which is the case where cheap–talk equilibria cannot be sustained because the low–quality market becomes too attractive to high–quality firms under free entry. In the advertising equilibrium, low–quality firms must advertise at strictly positive levels to attract plain

consumers. Because of the added fixed costs in the low–quality market, there is a reduction in the number of low–quality firms, and a corresponding increase in sales per low–quality firm, that exactly offsets the advertising expense; thus the incentive compatibility condition for low–quality firms is the same as in the cheap–talk equilibrium. Further, the sorting condition (4b) assures that high–quality firms place relatively lower value on the greater numbers of plain consumers per low–quality firm, and as a consequence the low–quality market becomes less attractive to them. For sufficiently high A^L, the low–quality market becomes so unattractive to high–quality firms that they prefer to claim high quality.

A parallel analysis is possible for the case $F^H > \bar{F}^H(F^L)$, in which the dishonesty of low–quality firms rules out the cheap–talk equilibrium. In this case it is the high–quality firms that choose positive advertising, and the sorting condition (4a) ensures that the high–quality market becomes unattractive for low–quality firms when the level of high–quality advertising is sufficiently large. Following closely along the lines of Proposition 2, we have the following:

Proposition 3. If $F^H > \bar{F}^H(F^L)$, then there exists an advertising equilibrium in which high–quality firms choose advertising $A^H \geq \underline{A}^H > 0$ and low–quality firms choose zero advertising.

From Propositions 1–3 we may conclude that either a cheap–talk or an advertising equilibrium exists for every specification of fixed costs; thus under the sorting conditions it is always possible to communicate quality. Figure 1 illustrates how fixed costs determine the pattern of direct and indirect communication: in Region 3 low–quality firms have relatively greater fixed costs, and in this region it is low–quality firms that advertise in positive amounts. In contrast, high–quality firms have relatively higher fixed costs in

Region 1, and in this region it is the high–quality firms that advertise. Thus the quality level having the higher fixed costs is the one that must do the advertising; further, it is easy to see that larger amounts of advertising are needed as the difference between fixed costs rises.

Cheap talk by itself fails to be credible when the market with relatively high fixed costs can be more profitably entered via the dishonest strategy. This strategy is feasible because consumers cannot observe the fixed costs that firms actually incur. Advertising expenditures serve as an observable way to raise fixed costs in the high–fixed–cost market, and under the sorting conditions the dishonest strategy becomes unattractive once this observable component of fixed costs becomes sufficiently large.

5. Uninformative Equilibria

We turn now to equilibria in which consumers cannot infer quality information from observed quality claims and advertising expenditures. The main result of this section is that for nearly all specifications of the fixed costs, only one quality level will be provided in equilibrium; thus communication of quality information is generically necessary, as well as sufficient, in order that both quality levels are provided in equilibrium.

An uninformative equilibrium arises in Stage 2 when both high– and low–quality firms make the same choices of v^C and A. Since refined and plain consumers cannot distinguish between high– and low–quality firms, they divide themselves evenly among the population of entering firms. If $n = n^H + n^L$ gives the total number of entering firms, then the average profits per consumer of a quality–v firm with price p are given by:

$$\Pi(p,v) \equiv (p - c^v) \frac{m^R D(p,R,v) + m^P D(p,P,v)}{m^R + m^P}$$

This profit function differs from the earlier one in that firms now draw their customers from both taste–classes. Let $p^*(v)$ maximize the new profit function, and let $\Pi^*(v)$ give the maximized profit level. The indirect utility function U^* continues to be defined as in Section 2.

We now derive a Stage 2 uninformative equilibrium for the case in which n firms have entered in Stage 1. Each entering firm obtains a 1/n share of each taste–class. Suppose consumers form the *a priori* conjecture that $\hat{n}^H$ high–quality and $\hat{n}^L$ low–quality firms have entered in Stage 1. Let (v^C,A) denote the equilibrium decisions of each entering firm. Equilibrium expected utility for taste–t consumers is given by:

$$\frac{\hat{n}^H}{n} U^*(p^*(H),t,H) + \frac{\hat{n}^L}{n} U^*(p^*(L),t,L)$$

Suppose an entering firm deviates to some $(\tilde{v}^C,\tilde{A}) \neq (v^C,A)$. Consumer beliefs conditional on this off–equilibrium–path event are specified as follows: If $U^*(p^*(L),t,L) \geq U^*(p^*(H),t,H)$ for a taste–t consumer, then the consumer infers that the deviating firm has chosen high quality, while if $U^*(p^*(H),t,H) \geq U^*(p^*(L),t,L)$ the consumer infers that the deviating firm has chosen low quality. Further, consumers do not infer anything new about nondeviating firms' quality choices, i.e. firms that continue to choose (v^C,A) are believed to have chosen high quality with probability $\hat{n}^H/n$.[10] Based on these inferences, an expected–utility–maximizing consumer response is not to visit the deviating firm. Thus the deviation to $(\tilde{v}^C,\tilde{A})$ yields profits of $-\tilde{A}$, and deviation will be unattractive as long as

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[10] Under this specification of off–equilibrium path beliefs, consumers of different tastes may end up forming different beliefs. This would violate the consistency criterion of Kreps and Wilson (1982), which requires that all agents form off–equilibrium–path beliefs from a common fully–mixed strategy sequence. This is not a serious concern in the present game, however, since the divergent beliefs do not create any conflict with the principle of backward–induction rationality. Alternatively, we may simply posit that all consumers infer that a deviating firm has chosen some common, very high price

$\Pi^*(v)(m^R + m^P)/n - A > 0$. Since $\Pi^*(v) > 0$ for both v, and also there is an upper bound to the possible n that can occur in a free entry equilibrium, it follows that we have a pooling equilibrium if A is not too large.

Consider finally the Stage 1 decisions. In the current context, strategic anonymity means that each firm imagines that the pooling equilibrium (v^C, A) will arise irrespective of its own entry and quality decision. Let $\bar{n}^v$ be defined by:

$$\Pi^*(v)\frac{m^R + m^P}{\bar{n}^v} - A - F^v = 0$$

Suppose $\bar{n}^H < \bar{n}^L$; then free entry for low–quality firms implies:

$$\Pi^*(L)\frac{m^R + m^P}{n} - A - F^L = 0$$

or $n = \bar{n}^L$ in equilibrium. But then we have:

$$\Pi^*(H)\frac{m^R + m^P}{\bar{n}^L} - A - F^H < \Pi^*(H)\frac{m^R + m^P}{\bar{n}^H} - A - F^H = 0$$

and so no firm chooses to enter with high quality. Thus when $\bar{n}^H < \bar{n}^L$, only low–quality firms will enter the market when pooling equilibria arise in Stage 2. Similarly, when $\bar{n}^H > \bar{n}^L$ only high–quality firms enter the market, while both qualities may enter if $\bar{n}^H = \bar{n}^L$. This proves:

Proposition 4. An uninformative equilibrium at (v^C, A) exists if A is sufficiently small. If $\bar{n}^H < \bar{n}^L$, then only low–quality firms enter the market; if $\bar{n}^H > \bar{n}^L$, then only

high–quality firms enter the market; and if $\bar{n}^H = \bar{n}^L$, then the market may be arbitrarily divided between high– and low–quality firms, subject to $n^H + n^L = \bar{n}^H$.

Proposition 4 establishes that except for the nongeneric case $\bar{n}^H = \bar{n}^L$, only a single quality level will be offered in an uninformative equilibrium. This occurs because high– and low–quality firms share the same customer base in uninformative equilibria, so that free entry forces out the less–profitable quality level. Because quality is not communicated, the less–profitable quality level cannot exploit the "niche" implied by the difference in consumer tastes. Further, because quality is a search attribute, either of the quality levels may end up dominating the market; in particular, when $\bar{n}^H > \bar{n}^L$ the usual "lemons" result is reversed, and high quality forces out low quality. In general, uninformative equilibria imply that the market will be dominated by the quality level that has relatively lower fixed costs, where the fixed–cost threshhold is sensitive to variable costs and consumer valuation of quality.

6. Quality as an Experience Attribute

In the preceding sections, consumers' search decisions were based on quality conjectures formed from observed quality claims and advertising expenditures, but the purchase decisions that followed search were based on the actual quality levels. If we instead specify that quality is an experience attribute, then both the search and purchase decisions must be based on conjectured quality rather than actual quality. This modification has the important effect that firms profit most by providing low quality to refined consumers, since the consumers cannot revise their quality conjecture should quality be reduced. As a consequence, high–quality firms never use dissipative advertising, although communication of quality through either cheap talk or dissipative advertising by low–quality firms remains possible.

Let v^B denote consumers' beliefs about a firm's quality, as distinguished from the firm's actual quality level v. For a firm of quality v, the profit from selling to a single taste–t consumer who conjectures quality v^B is given by:

$$\Pi(p,t,v^B,v) \equiv (p - c^v)D(p,t,v^B)$$

Let $p^*(t,v^B,v)$ denote the profit–maximizing price and $\Pi^*(t,v^B,v)$ the maximized profit level. Note that $\Pi^*(t,H,v) > \Pi^*(t,L,v)$ for all t and v, since consumers demand more when they believe quality is high, while $\Pi^*(t,v^B,H) < \Pi^*(t,v^B,L)$ for all t and v^B, since high–quality products are more costly.

In a cheap–talk equilibrium, consumers infer v from v^C, i.e. $v^B = v^C$. As before we will focus on cheap–talk equilibria in which firms choose A = 0. Further, we will suppose that consumers infer nothing from observed prices once they have learned the quality from quality claims, i.e. prices are not distorted by consumers' threats to change their quality conjectures once they have visited a firm. It follows that in equilibrium, firms will choose the profit–maximizing prices associated with their customer bases, and because of (1) and (2a–b) we can restrict attention to the case in which refined consumers visit firms that claim high quality, and plain consumers visit firms that claim low quality.[11]

Let us first consider the incentive compatibility condition for high–quality firms in a Stage 2 cheap–talk equilibrium. By claiming low quality, the firm can capture s^L plain consumers; further, since the subsequent price choice does not modify consumers' beliefs, the dishonest strategy yields the greatest profits when the firm also sets $p = p^*(P,L,H)$.

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[11] Consumers do not revise their quality conjectures based on observed prices, because cheap–talk equilibria are defined to be equilibria in which conjectures are formed solely on the basis of quality claims. It is possible to consider hybrid equilibria in which visitation decisions are based on quality claims, but quality conjectures can be altered when prices depart from anticipated levels; the analysis of such equilibria would be a bit more complex, but our basic results would continue to hold.

Thus incentive compatibility for the high–quality firms becomes:

$$s^H \Pi^*(R,H,H) \geq s^L \Pi^*(P,L,H) \tag{13a}$$

Similarly, incentive compatibility for the low–quality firms is:

$$s^L \Pi^*(P,L,L) \geq s^H \Pi^*(R,H,L) \tag{13b}$$

Since Π^* is strictly greater for $v^B = H$ than for $v^B = L$, it follows that (13a) is weaker than (3a), and also (13b) is stronger than (3b); thus the functions $\underline{s}^H(s^L)$ and $\bar{s}^H(s^L)$ are both shifted downward relative to the search–good case of Section 3. This reflects the fact that an inference of high quality becomes more valuable when quality is an experience attribute, because high–quality demand is forthcoming even when quality is in fact low.

The sorting conditions (4a) and (4b) no longer suffice to assure existence of cheap–talk equilibria, since consumers cannot alter their quality conjectures prior to purchase when quality is misrepresented. In the present case, the following inequality is necessary and sufficient for existence of cheap–talk equilibria to be possible:

$$\frac{\Pi^*(R,H,H)}{\Pi^*(R,H,L)} \geq \frac{\Pi^*(P,L,H)}{\Pi^*(P,L,L)} \tag{14}$$

(14) states that the gross rate of return from an increase in quality is greater for refined consumers; note that both sides of (14) represent losses, since an increase in quality serves only to raise costs. From (14) we have $\underline{s}^H(s^L) \leq \bar{s}^H(s^L)$, and cheap–talk equilibria are possible for a nonempty range of per–firm market shares.

The functions $\underline{F}^H(F^L)$ and $\bar{F}^H(F^L)$ may be defined as in the search–good case, and

$\underline{F}^H(F^L) \leq \overline{F}^H(F^L)$ when (14) holds. Cheap–talk cannot communicate experience attributes when $F^H = F^L$, however. This may be seen as follows:

$$\overline{F}^H(F^L) = \bar{s}^H(s^L(F^L))\Pi^*(R,H,H) < \bar{s}^H(s^L(F^L))\Pi^*(R,H,L) = s^L(F^L)\Pi^*(P,L,L) = F^L$$

where the inequality follows from the fact that reducing quality only lowers costs without affecting conjectures. It follows that $F^H < F^L$ is necessary for existence of cheap–talk equilibria in the experience good case. Therefore we have:

Proposition 5. Suppose quality is an experience attribute. There exist strictly increasing functions $\underline{F}^H(F^L)$ and $\overline{F}^H(F^L)$, with $\underline{F}^H(0) = \overline{F}^H(0) = 0$ and $\underline{F}^H(F^L) \leq \overline{F}^H(F^L) < F^L$ for $F^L > 0$, such that a cheap–talk equilibrium exists if and only if $F^H \in [\underline{F}^H(F^L), \overline{F}^H(F^L)]$.

If $F^H < \underline{F}^H(F^L)$, so that free entry gives high–quality firms an incentive to misrepresent quality, then advertising equilibria in which low–quality firms advertise may be defined as in Section 4. The incentive compatibility condition for high–quality firms becomes:

$$s^H\Pi^*(R,H,H) \geq s^L\Pi^*(P,L,H) - A^L \tag{15}$$

and free entry implies:

$$\frac{\partial s^L}{\partial A^L}\Pi^*(P,L,H) - 1 = \frac{\Pi^*(P,L,H)}{\Pi^*(P,L,L)} - 1 < 0$$

Thus (15) holds for sufficiently large A^L. As before, incentive compatibility for low–quality firms is satisfied for all A^L as long as $F^H \leq \bar{F}^H(F^L)$. We may conclude that advertising equilibria with positive advertising for low–quality firms exist when $F^H < \underline{F}^H(F^L)$; Proposition 2 continues to hold as stated for the experience–good case.

If $F^H > \bar{F}^H(F^L)$, however, there do not exist advertising equilibria with advertising by high–quality firms: because $\Pi^*(R,H,L) > \Pi^*(R,H,H)$, an increase in advertising by high–quality firms makes the high–quality market even more attractive to low–quality firms, i.e. in the incentive compatibility condition for low–quality firms that corresponds to (15), the right–hand side is strictly increasing in the high–quality advertising level. Intuitively, the zero–profit condition for high–quality firms requires an expansion of the high–quality market share when high–quality advertising is increased; this expansion, however, results in even greater profits for low–quality firms that choose the higher advertising level, since low–quality firms can serve consumers at lower unit costs, while consumers continue to demand as if quality were high. Thus high–quality firms never advertise when quality is an experience attribute.[12]

From the preceding analysis we may conclude that informative equilibria cannot arise when $F^H > \bar{F}^H(F^L)$. Uninformative equilibria in which high–quality firms enter are a possibility for $F^H \in (\bar{F}^H(F^L), F^L)$. Once $F^H \geq F^L$, however, then there is only one possible equilibrium outcome, in which low–quality firms take over the market. This may be seen as follows: low–quality firms always have the option of imitating the advertising and pricing decisions of high–quality firms, and thus obtaining the same inference v^B as do high–quality firms; this mimicking strategy gives profits to low–quality firms that are strictly greater than the equilibrium profits of high–quality firms, since both variable costs

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[12] Kihlstrom and Riordan (1984) establish a similar result: in their model, dissipative advertising cannot signal high quality when high–quality firms have greater marginal costs and there are no direct links between sales in initial periods and profits from repeat business.

and fixed costs are lower for low–quality firms. Thus when $F^H \geq F^L$, high quality is driven from the market in any equilibrium. This constitutes a version of Akerlof's (1970) "lemons" result that allows for the possibility of communicating quality: low–quality firms are always more willing to enter than high–quality firms, no matter what information about quality might be conveyed by quality claims, advertising, price, or other signals.[13]

Note finally that the sorting condition (14) is less plausible in the experience–good case than are the comparable conditions for search goods, for the following reason: for experience goods, the gross loss rate for raising quality is greater when a firm sells more units, since the cost increase from higher quality is proportional to sales. Further, the most reasonable assumption is that demand is greater for refined consumers who conjecture high quality than for plain consumers who conjecture low quality; at the very least, demand is raised by the conjecture of high quality. Under this assumption, (14) is actually reversed, and cheap–talk equilibria do not exist. Note that advertising equilibria in which low–quality firms advertising continue to exist for $F^H < \min \{\underline{F}^H(F^L), \bar{F}^H(F^L)\}$, whether or not (14) holds.

7. Conclusion

When consumers possess heterogeneous tastes and quality information is imperfect, the problem of matching products to buyers arises. In this context, firms may have an incentive to misrepresent quality in their advertising, even if quality is a search attribute, since mismatches may lead to an increase in market share. Direct communication via quality claims can succeed in bringing about correct matching if fixed costs do not vary much with quality; market shares then remain approximately constant whether or not

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[13] Ramey (1986) develops this result in the context of quality signaling by a monopolist, where quality investments by the monopolist serve to increase the probability of favorable quality realizations. In that model, the monopolist chooses the minimum quality investment in every equilibrium, even in separating equilibria where the quality realization is fully communicated.

firms are correctly matched. If instead fixed costs vary greatly with quality, then dissipative advertising by firms having the high–fixed–cost quality level becomes necessary in order to communicate quality. Thus, depending on the nature of fixed costs, the matching of products to buyers may require cheap talk only, or costly advertising expenditures by only high–quality firms, or costly advertising expenditures by only low–quality firms.

We also formally consider Nelson's claim that advertising provides the information that is needed to support greater product differentiation in the market; our model confirms this conjecture for search goods. Finally, fixed costs are again of paramount importance for the communication of experience attributes: cheap talk can suffice to communicate quality in a range where low–quality firms have greater fixed costs, while low–quality firms use dissipative advertising to communciate quality if their fixed costs are greater still.

In general, our results establish an important role for advertising as a means of coordinating the purchases of consumers with heterogeneous tastes, for both search and experience goods. Depending on market characteristics, direct communication may occur, or indirect communication via dissipative advertising may be undertaken by either high– or low–quality firms. Thus we do not predict any strong, systematic correlation between advertising expenditures and quality, which is consistent with the findings of the empirical literature.

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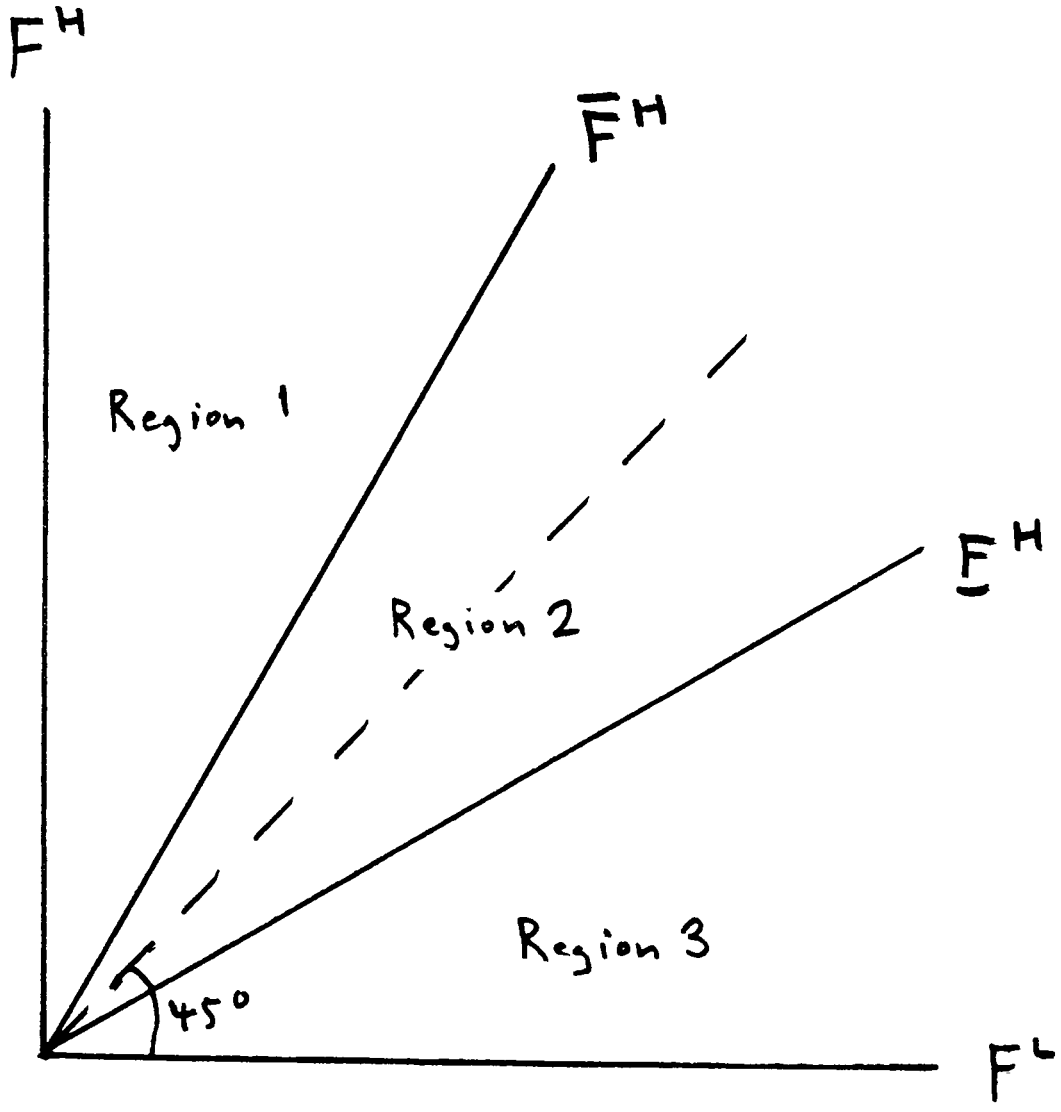

Figure 1

Fixed Costs and Cheap Talk Equilibria