

School of Marketing

**An Experimental Study of Brand Signal Quality
of Products in an Asymmetric Information
Environment**

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the award of the Degree of Doctor of Philosophy
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Declaration

This thesis contains no material which has been accepted for the award of any other degree or diploma in any university.

To the best of my knowledge and belief this thesis contains no material previously published by any other person except where due acknowledgment has been made.

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ABSTRACT

Previous research regarding the effectiveness of signalling via brand name has focused on when and how any brand-building cost incurred, will be rewarded by future profit. In contrast to this seller-incentive perspective, this study examines how the buyer interprets the signal via brand name, the effectiveness of signalling via brand name in terms of buyer value perspective, and how the buyer's reaction toward the signal impacts on the seller's decision to adopt the signalling strategy. Signalling theory and concepts from consumer-based branding research are used to suggest how to evaluate the effectiveness of signalling via brand name in the context of the consumer market, wherein information is asymmetric. Findings from online trading experiments, using the methodology of experimental economics, demonstrate that the function of brand fluctuates according to which market conditions prevail for brand and price, the extent of brand differentiation, and the magnitude of brand-building cost. This suggests an alternative way to measure the value of a brand to the buyer.

CHAPTER 1

INTRODUCTION

With the advent of the Internet, a buyer has access to more information than ever before, a situation that might lead an economist to conclude that the buyer is thus better informed than ever before. An extreme, but commonly expressed, view is that brand equity could eventually disappear altogether in the face of buyers simply choosing to go on-line to find the lowest available price, a phenomenon known as cost transparency (Sinha 2000). However, there is considerable asymmetry in terms of what the Internet means to the buyer and seller. For example, the seller is far more capable of leveraging technology than is the buyer, and such inequality of resources amounts to a condition of information asymmetry, a condition in which the playing field is decidedly tilted in favour of one player: in this instance, the corporate seller (Kannan et al., 1998; Kivetz and Simonson 2000; Prabhaker 2000).

Asymmetric information problems cannot simply be attributed to the technology of the media. Such problems are the result of opportunistic behaviour and, as long as such behaviour exists, there will be people who ensure that certain information is kept private in pursuit of vested interests (Molho 1997; Williamson 1993). It has been claimed that signalling can be a useful countermeasure to information asymmetry. That is, signalling can help the buyer make choices in adverse selection conditions (Eisenhardt 1989; Mishra et al., 1998).

As already mentioned, researchers in the information economics field have

paid considerable attention to how signal correlates to the seller's incentive; or in other words, when and how the cost incurred by utilizing signalling can be recouped from future profit (Spence 1973; Miller and Plott 1985). In addition, the means for reaching signalling equilibrium has been a central issue in economics (Riley 2001). In the marketing discipline, the question of whether or not such variables as price, warranty, and brand name can serve as signals has been investigated (Purohit and Srivastava 2001). However, the findings of most of these studies have simply been explained using signal theory rather than utilized to enhance the basis of the theory itself for the purposes of prediction. In the particular field of marketing, there has been little research into the connection between signal theory and the scant empirical data relating to the function of brand and pricing behaviour (Erdem and Swait 1998; Kirmani and Rao 2000). Most of what has been asserted to date regarding the price-quality relationship has been based upon the premise that the buyer views price and brand name as cues for making cognitive inferences rather than as signals from which to make rational decisions.

A brand name can convey information about unobservable quality when false claims will result in intolerable economic losses. Thus, a branded product is probably of higher quality than an unbranded one and that brand can therefore serve as an effective signal of unobserved quality (Erdem and Swait 1998; Rao et al., 1999). Since our aim is to understand more about the function of brand where asymmetric rather than perfect information conditions prevail, our particular objective is to employ the concepts and methodology of signal theory and buyer-based brand equity to explore when the brand might be an effective signal in term of the buyer's value perspective. But while our focus will be on how the buyer interprets the signal, we shall not leave the seller's interests out of our considerations.

The theoretical bases of the study are variously derived from Spence's job

market model (Spence 1973, 1974), from consideration of the differential effect on the buyer's response to brand (Keller 1993), from the notion of how effective signals are for the quality-sensitive segment of the population (Kirmani and Rao 2000), and from certain other concepts of the function of brand (Berthon et al., 1999). In light of this body of research, we propose a conceptual model to examine signalling via brand in a consumer market in which conditions of asymmetric information prevail. We support our investigation with a series of propositions that set out when and how brand may be a signal of product quality, with particular attention paid to the question of value for the buyer rather than incentive for the seller. Specifically, the research questions concern:

- how the buyer interprets signal via brand and how effective that signalling is in terms of value for the buyer,
- how the buyer's reaction to brand as signal impacts on the seller's decision to adopt signalling strategy and on his pricing behaviour and
- what function brand has for the buyer in asymmetric information conditions.

As for the research methodology, we designed an online simulated posted-offer market institution for the classroom in order to test the above questions, basing our approach on certain previous experimental games from the field of economics (Miller and Plott 1985; Lynch et al., 1986; Holt and Sherman 1990, 1999). Our model resembles a "lemon market" in that it typifies the adverse selection situation that results from asymmetric information conditions (Akerlof 1970). The experimental game is designed to illustrate the impact of the following three aspects of marketing and branding on the effectiveness of brand as a signal where asymmetric information prevails:

- Brand information manipulation (three kinds of postings):
 1. Brand and price,
 2. Price only,
 3. Optional brand at extra cost.
- The degree of brand differentiation.
- The magnitude of difference in signal cost

We then discuss the theoretical implications of signal theory in the consumer market and describe the function of brand in conditions of both complete and incomplete information relative to the interests of both the seller and the buyer. Finally, we acknowledge the limitations of the methodology and suggest areas for further research.

CHAPTER 2

CONCEPTUAL BACKGROUND

2.1 Signalling Theory

A possible solution to adverse-selection problems in conditions of asymmetric information is the use of signals, which are actions that one transaction party can choose to reveal true quality to the other. Signalling theory originates from the information economics discipline, in particular the study of buyers and sellers interacting in conditions of asymmetric information (Spence 1973). The validity of the theory rests on its success for making predictions, based on the assumption of rational buyers and sellers. A rational buyer, in the form of an individual consumer, expects a rational seller, in the form of a corporate producer, to honour the implicit commitment transmitted by a signal, because failing to honour the commitment is perceived by the buyer to be economically unwise (Rao et al., 1999; Kirmani and Rao 2000). That is, if low quality sellers attempt to claim high quality of product, the signalling cost and future profit would be forfeit when the true quality is revealed after purchasing. Thus, the buyer rationally infers that only a high quality seller would adopt a signalling strategy.

Let us imagine that the buyer is faced with two kinds of sellers: one with a high-quality product and one with a low-quality product. For such a situation, therefore, there can be two possible transaction scenarios, what economists call separating equilibrium and pooling equilibrium (Spence 1974). With separating equilibrium, the different cost and profit ratios associated with a specific strategy

allow the above two sellers to adopt different signalling strategies. With pooling equilibrium, however, in the event that the market incentives associated with cost and profit are weak; both sellers will have no choice but to adopt the same signalling strategy. In the second scenario, the buyer cannot tell the difference between the high- and low-quality sellers. Thus, a signal is effective only when it is associated with separating equilibrium i.e., the kind that enables the buyer to choose between product quality levels.

2.2 When and How Signalling Works – an Example of a Job Market Model

In a job market, an employer who has to decide whether or not to appoint an applicant is hard pressed to know about, even to guess at, certain facts about the prospective employee, for example, his potential productivity. In this situation, the employer is the uninformed party for whom the factor “productivity” is private/unobserved information, whereas the prospective employee is the informed party for whom productivity is public/observed information. However, the employer may receive a signal from the job applicant, such as the applicant’s education level, from which he can make conjectures about the potential employee’s productivity. The signalling mechanism in this instance only works if the informed party, the applicant, chooses education level as the means of maximizing net return, defined as the cost of the education relative to the wages on offer. It is an option for the uninformed party, the employer, to make a competitive wage offer in the belief that an educated employee will probably be more productive than an uneducated one, and by so doing, to test his belief. In this situation, education level can function as a signal that effectively reveals the level of potential productivity. As for how the signal works, it is a question of defining how and when a signal reaches equilibrium. Overall, whether education level is an effective signal depends both on the size of the education cost and the size of the segment of appropriately educated employees in the

population. The key constructs for analysing the job market are summarized in the Job Market Model column in Table 1.

Table 1

The Job Market Model and the Consumer Market Model Compared

	Job Market Model	Consumer Market Model
Unobserved/Private Information	Productivity	Product Quality
Observed/Public Information	Education Level	Brand Name
Induced Signalling Cost	Education Cost	Brand Building Cost
Informed Party	Employee	Seller
Uninformed Party	Employer	Buyer
When the Signal Works		
Informed Party / Signalling	Choosing education level that maximizes net return, given the signalling cost and the wages on offer	Choosing brand building activities that maximize net return, given brand building cost and future sales and profits
Uninformed Party / Confirmation of Beliefs	Educated employees are probably more productive than uneducated ones	Branded products are probably of higher quality than unbranded ones
What the Signal Reveals	Education level can therefore function as an effective signal of unobserved productivity	Brand name can therefore function as an effective signal of unobserved quality
How the Signal Works	<ol style="list-style-type: none"> 1. Incentive Compatible Mechanism 2. Self-Selection Constraints 3. Signalling Equilibrium 	
Factors Influencing the Equilibrium	<ol style="list-style-type: none"> 1. The size of education cost 2. The size of the highly productive employee segment in the population 	<ol style="list-style-type: none"> 1. The size of brand building cost and future profits (Rao et al., 1999) 2. The size of the quality-insensitive segment in the market (Kirmani and Rao 2000)

2.3 The Utility of Brand as a Signal When Information is Asymmetric

Brand management has recently begun to receive renewed mention in the marketing literature, and more attention is now being paid to the meaning and measurement of 'brand equity' (Aaker 1991, 1992; Keller 1993). There is no general agreement, however, about how to define the term "brand." In that absence, researchers have chosen to measure it in terms of function, that is, to examine what activities it facilitates for the buyer or the seller. In those terms, brand is seen on the one hand as something that facilitates identification and extension for the seller and on the other as something that reduces search cost and psychological and/or perceived risks for the buyer (Berthon et al., 1999).

The literature mentions two approaches to brand equity: the first from the cognitive psychology perspective and the second from the perspective of information economics. Viewed from the first of these perspectives, brand equity amounts to the sum of the buyer's perceptions about the performance, personality, and the presence of a product or service. Accordingly, the major purpose of branding in the cognitive psychology approach is to create buyer-based brand equity, which is defined as the strong, unique, and favourable brand associations that have differential effects on buyer responses to the marketing of a brand (Keller 1993). However, this approach ignores the impact of the transaction cost incurred during the search for information and from examining post-transactions where information is asymmetric. It also ignores the strategic interactions among sellers. It is especially true in the Net economy that information manipulation (i.e., whether brand information is hidden or revealed) and strategic interactions (signalling, signal jamming, and screening) are exaggerated. Aaker (1991, 1992) proposes that brand equity provides value for buyers by facilitating the information process, and by increasing confidence i.e., that brand equity must exist before the perceived risk and

the information cost are reduced. Viewed from the second perspective, that of information economics, from transaction cost considerations, it is *reduction* that drives brand equity and is what underlies it (Erdem and Swait 1998). That is because it helps the buyer identify a specific product, it thus reduces the search cost; because it assures product quality, it thus reduces perceived risk; and because it confers status and prestige, it thus reduces psychological risk (Berthon et al., 1999).

In the discipline of information economics, research into signalling has tended to focus on the questions of incentive for the seller and how to reach equilibrium (Riley 2001). In terms of marketing, a buyer does not know what the seller knows and can make an inference only from what information the seller chooses to signal (Kirmani and Rao 2000). The buyer uses that signal before purchase to infer whether a product or service is of high or low quality. Thus, the function of the signal here is to help resolve the buyer's selection problem in the face of potential deception by an unscrupulous seller (Boulding and Kirmani 1993).

Traditional ways of viewing the effects of such forms of information as advertising and price have emphasised the role of information acquisition, integration, and retrieval in the consumer's judgment and choice (Nelson 1970, 1974). Where information is asymmetric, the research suggests that the buyer is likely to rely on simple heuristics, or cues, to assess product quality (Johnson and Levin 1985; Kivetz and Simonson 2000; Ross and Creyer 1992; Zhang and Markman 1998). Among the commonly studied marketing signals in the literature are (i) brand name (e.g., Aaker 1996; Maheswaran et al., 1992; Erdem and Swait 1998), (ii) price (e.g., Rao and Monroe 1996; Wolinsky 1983), (iii) advertising (e.g., Kihlstrom and Riordan 1984; Kirmani 1990, 1997; Milgrom and Roberts 1986), (iv) store name or retailer reputation (e.g., Chu and Chu 1994), and (v) warranties (e.g., Boulding and Kirmani 1993; Lutz 1989; Padmanabhan and Png 1995; Shimp and

the information cost are reduced. Viewed from the second perspective, that of information economics, from transaction cost considerations, it is *reduction* that drives brand equity and is what underlies it (Erdem and Swait 1998). That is because it helps the buyer identify a specific product, it thus reduces the search cost; because it assures product quality, it thus reduces perceived risk; and because it confers status and prestige, it thus reduces psychological risk (Berthon et al., 1999).

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Bearden 1982). A potentially limiting factor to the value of much of the research about quality perception has been that the different cues and their effects have been studied in isolation, whereas in most assessments of quality, multiple cues are in play. Certain researchers have tried to take that multiplicity into account by examining a marketing mix as a signal of product quality (Dawar and Parker 1994; Degeratu et al., 2000; Dodds et al., 1991; Grewal et al., 1998; Purohit and Srivastava 2001; Rao and Monroe 1989). These perspectives can be supplemented with newer ones from the emerging field of information economics (Kirmani and Rao 2000).

The ability to build and maintain a strong brand image depends, in part, on consistency in brand communications (Aaker 1996; Park et al., 1986). Management of the image must not only ensure consistency in the brand's positioning over time, but also that each part of the marketing mix reinforces that positioning. That is, the brand's positioning must be supported by product characteristics as well as by the advertising message, price, and the choice of distribution outlets. Thus, when the seller adopts brand as a signal, that signal is a compound of all the past and present marketing mix strategies and marketing activities that the seller has embodied in the brand (Aaker 1996; Keller 1993). Therefore, adopting brand as a signal seems to be a good choice instead of examining the entire market mix.

2.4 When and How Brand Serves as an Effective Signal

A buyer in the consumer market can find it hard to measure product quality before purchase. In such a scenario, the buyer is the uninformed party for whom

product quality is private/unobserved information, whereas the seller is the informed party for whom product quality is public/observed information. The buyer can use the signal transmitted from the seller, such as brand name, to judge the product's quality. But this action works only in the case of high-quality sellers willing to reveal brand information so as to maximize net return in the hope of recouping the signal cost (brand building cost) from future profit, and then only if a buyer believes that the quality of a branded product is higher than that of an unbranded one. Given these conditions, brand name can function as an effective signal for revealing product quality.

As for how the signal works, the question is one of defining how and when a signal reaches equilibrium. Overall, whether brand name works as a signal depends on the size of the signalling cost (brand building cost) and on the size of the segment of quality-insensitive consumers in the market. This question is explored further in the following sections. We argue that the degree of brand differentiation fundamentally affects the size of the quality-insensitive segment. The essential constructs relevant to an analysis of the job market are summarized in the Consumer Market Model column in Table 1.

The key to understanding how signalling equilibrium is reached is simply stated: the market provides an incentive mechanism. It is this mechanism that allows the informed party to provide the uninformed party with truthful information at extra cost. The seller and the buyer can both then adopt self-selection constraints to reach Nash equilibrium, which is that both parties can choose a strategy of "best response" to the other party (Kreps 1990). Thus, in the job market example, the strategy to adopt education-level as a signal is open to the applicant, by which he maximizes his net return relative to the wages on offer and the signalling cost (induced education cost). In the consumer market, the strategy to adopt brand name as a signal is open to

the high-quality seller, by which he maximizes his net return relative to future profits as well as past brand building costs. Table 1 presents a summarized comparison of how signalling theory can be applied to both job and the consumer markets.

The use of signalling via brand has recently begun to receive some empirical scrutiny. Erdem and Swait (1998) argue that, because sellers using branding invest in building brand equity, prior expenditures must be recouped from future sales. The argument also runs that the low-quality seller will lose any investment because future profit will not accrue once true quality is revealed. In addition, Rao, Qu, and Ruekert (1999) propose that the brand's ability to signal quality depends on the size and vulnerability of the investment in brand reputation and future profits. It may be concluded from these findings that whether brand is an effective signal or not depends on the ratio of the cost of brand building to profit and future sales. Accordingly, on the basis of signal theory, the buyer should rationally infer that only a seller who offers a brand is credible because false claims would lead to a financially unattractive outcome to the seller.

CHAPTER 3

CONCEPTUAL MODEL AND HYPOTHESES

Research in the information economics field has produced findings concerning signal cost in relation to incentive, i.e., whether signal cost can be justified in the light of future profit. Certain researchers have concluded that the lower the signal cost incurred, the more profit incentive the seller has to adopt rather than not adopt signalling (Spence 1973; Miller and Plott 1985). In situations where brand serves as a signal in the consumer market, brand building cost is just such an issue of incentive (Rao et al., 1999).

However, marketers justify the functions of brands from both buyer and seller perspectives, as facilitation and reduction respectively. That is, for sellers, brands facilitate a range of activities, including identification and extension, while for buyers; brands reduce search costs, psychological risk and perceived risk (Berthon et al., 1999). The findings regarding the utility of brand name as a signal from the single aspect of seller's incentive perspective, however, neglecting the buyer's reaction to signalling, does not help an understanding of the function of brand to the buyer where information is asymmetric. In short, research as regards the interests of only one of the parties in a transaction is not very helpful. Furthermore, little empirical evidence is known to us about the value of brand to the buyer when asymmetric information rather than complete information prevails. What does the buyer have to gain or lose when choosing between a branded and an unbranded product? How does the buyer interpret or react to brand when used as signal? Giving balanced attention to all of these is essential for an understanding of the function of brand for the buyer where

information is asymmetric. Thus, we propose to explore in this study:

- How the buyer interprets signal via brand and how effective that signalling is in terms of value for the buyer.
- How the buyer's reaction to brand as signal impacts on the seller's decision to adopt signalling strategy and on his pricing behaviour.
- What function brand has for the buyer in asymmetric information conditions?

Many aspects of signal theory are difficult, if not impossible, to test empirically, in particular the subtle question of determining whether signalling is effective and to what extent (Levy and Lazarovich-Porat 1995). The definition of effectiveness varies according to the experimental environment and the context of the research question i.e., the kinds of parties in a transaction change with the kind of transaction and the kind of information signalled accordingly. Thus, a signal about the education level of a prospective employee in a job market and a signal about brand in a consumer market both serve to reveal something to do with quality to an otherwise uninformed party. Thus, a variety of models and methods have been developed to fit the research need, for example, the labour market (Spence 1973, 1974), limit pricing model (Milgrom and Roberts 1982), and price advertising model (Wolinsky 1983; Milgrom and Roberts 1986; Bagwell and Riordan 1991; Zhao 2000). For our study, the other central issue is how to measure the effectiveness of signalling via brand in terms of its value for the buyer in the consumer market.

3.1 The Value of Brand for the Buyer When Information is Asymmetric

Certain researchers have attempted to measure the value of customer-based equity by such variables as the consideration set, perceived quality, preferences, and satisfaction with branded products (Aaker 1992; Keller 1993). Others have used financial measurement methods, by which buyers are asked say what they would be willing to pay for two similar, competing products, one a branded product and the other a generic product (Crimmins 2000). In our study, we take the buyer's reaction to signalling via brand and explore it as an instance of rational behaviour rather than perception. Hence, we measure the value of brand for the buyer in financial terms. However, the main distinction with the previous measurement in terms of finance is that we conduct the measurement in conditions of information asymmetry rather than in conditions of complete information. In addition, Keller (1993) proposes the notion of 'differential effect.' This means that customer-based brand equity involves comparing the consumer's reaction to the marketing mix for a brand or service with their reaction to the same marketing mix for a fictitiously named or unnamed version of the product or service (i.e., the differential effect between instances when brand name is and is not available).

We combine the advantages of two main streams of measuring the effectiveness of brand as a signal and its value for the buyer in conditions of asymmetric information. Accordingly, we define the effectiveness of signalling via brand for the buyer as the difference between the expected value and the actual gain when brand information is or is not available i.e., the difference in gain for the buyer between buying a branded and an unbranded product. However, what distinguishes Keller's (1993) approach and ours is that he compares the difference in gain between buying a named and unnamed version (the same products offered by the same seller), whereas we compare the difference in gain between a branded and an unbranded

product (different products offered by different sellers).

3.2 Factors Influencing the Effectiveness of Signalling for the Buyer

In our study, we define the effectiveness of signalling for the buyer as the difference in gains between buying a branded product and an unbranded one. Therefore, we propose that the more effective the signalling, the more significant the gains to the buyer. To be more specific, the gain for the buyer is the value of the product minus the sale price. In the following sections, we examine two factors: the first is the differential effect of the value of brand for the buyer and the other is the profit incentive for the seller. We show how they constitute the effectiveness of brand as a signal for the buyer and seller respectively. We draw on signal theory and notions from consumer-based brand equity and, in Figure 1, present the conceptual constructs and relationships that determine the effectiveness of signalling via brand in terms of value for the buyer. BS, SSS, and BSS in Figure 1 denote, respectively, (1) the buyer's reaction to the seller's manipulation of brand and price, (2) seller-to-seller behaviour appropriate to a brand-differentiated market, and (3) the buyer's interpretation of a branded product in a brand-differentiated market. The notations, b1, b2, b3, s1, and s2, are the hypotheses proposed in the following section

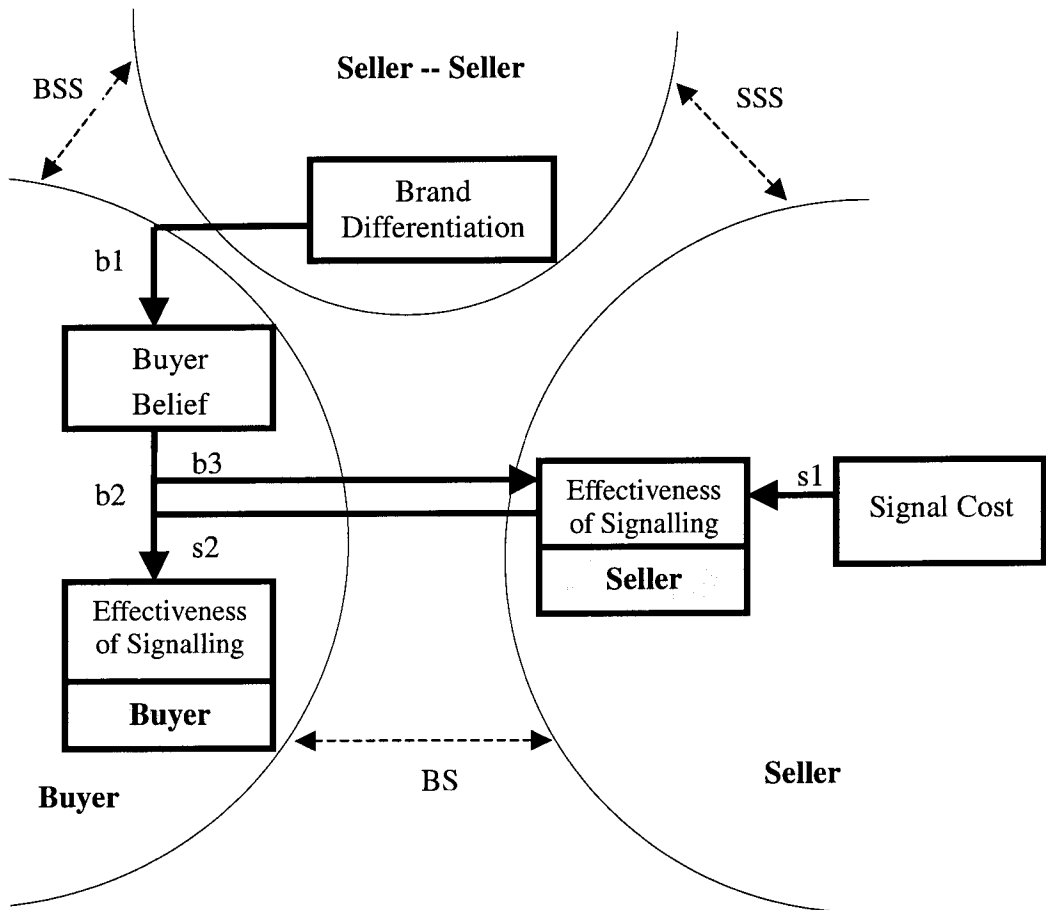


Figure 1. Integrated View of Signalling in the Consumer Market

3.3 The Differential Effect of the Value of Brand for the Buyer

First, we state that the seller's interest in signalling will be in the size of signal cost as an aspect of incentive and the buyer's interest will be in the differential effect of the value of brand. We argue that this differential effect consists of the potential loss or risk the buyer faces when offered the wrong quality level of product quality in a market in which brand information is absent. Hence, the quality of an unbranded product is less believable for the buyer and the differential benefit between buying a branded and an unbranded product is greater when the market is highly brand differentiated. In this case, the effectiveness of signalling for the buyer is significant. This leads us to propose two hypotheses about brand differentiation and the effectiveness of signalling for the buyer.

H_{b1}. The more brand differentiation there is in the market, the less belief the buyer has in the quality of an unbranded product.

H_{b2}. The less the buyer's belief in the quality of an unbranded product, the more effective brand is as a signal for the buyer.

Second, when Kirmani and Rao (2000) and Zhao (2000) state that it is the size of signal cost that determines whether signalling is effective or not, they are still prepared to attribute some of the effectiveness to the size of the segment of quality-insensitive buyers in the market, at least as far as the impact of the buyer's reaction to the seller's signalling strategy is concerned. A relatively small quality-sensitive

segment is less attractive to the low-quality seller, and therefore the high-quality seller can use signals that yield current profit. Conversely, a large quality-sensitive segment increases the benefit from false claims of high quality, which suggests that high-quality sellers should delay using signals that yield profit until a later stage (i.e., to limit the low-quality seller's tendency to make a killing in the early stages of the marketing process). Previous arguments highlight the importance of the impact of buyers' reactions to the brand name on the decision to be made by high-quality sellers as regards whether to adopt a signalling strategy or not.

There is little empirical evidence about the effectiveness of signalling for the buyer. Where brand is used as a signal, it is the seller that determines the cost of the signal, as part of brand-building cost. As for the quality-insensitive segment of the market, it is important to find what factors determine its size and so further test the hypothetical bases of signal theory from the buyer's standpoint. What we propose is that the segment's size depends on brand differentiation. It is the case that the seller governs brand-building cost, but brand differentiation is the consequence of the strategic interaction among multiple sellers that yields differential effects of value regarding brands for the buyer. According to hypothesis H_{b1} , the more brand differentiation there is in the market, the less conviction the buyer has as to the quality of an unbranded product. We further propose that the lower the buyer's conviction in the quality of the unbranded product, the smaller the quality-insensitive segment. Therefore, we argue that the smaller the segment is, the more incentive the high-quality seller has to adopt a signalling strategy because they are more likely to profit from it. This leads us to hypothesize:

H_{b3}. The lower the buyer's belief in the quality of an unbranded product, the more effective brand is as a signal for the seller.

The differential effect of the value of brand in signalling is summarised in hypotheses H_{b1} , H_{b2} , and H_{b3} . The main sources from which they are derived are consumer-based brand equity and signal theory. The next factor we now examine, the role of the profit incentive for the seller in signalling, is derived from the information economics discipline.

3.4 The Profit Incentive for the Seller

The existence of asymmetric information in a transaction can constitute an undesirable state of affairs in that there are possibilities for opportunistic behaviour, otherwise known simply as 'lying' and 'cheating,' on the part of the advantaged party. Although parties enjoying an informational advantage do not always behave this way, they more often than not do so if they perceive something to be gained from it (e.g., a better price for a second-hand car) (Molho 1997). Not every purchase of an unbranded product means a negative outcome for the buyer. Let us imagine two possible scenarios for a consumer considering buying an unbranded product. Some such products can be of high-quality, while others can be of low-quality, despite perhaps being just as highly priced.

What we do in our study and our distinguishing contribution is to identify the two kinds of sellers involved here, namely sellers of low- and high-quality unbranded goods, neither of whom choose to adopt signalling. The examination of the difference between them helps to pinpoint precisely what regulates the size of the gain to be realized from buying an unbranded product. With this information, we can determine the difference in value for the buyer between a branded and an unbranded product i.e., the effectiveness of signalling for the buyer. If an unbranded product is offered by a

high-quality seller with no brand building, it is still possible for the buyer to end up with the value of a high-quality product. However, the purchase of an unbranded product on offer from a high-quality seller does not preclude the presence of any effect from the difference in benefit between buying branded and unbranded products. If, however, the situation is that most of what is on offer is from low-quality sellers offering highly priced unbranded products, the overall gain the buyer can expect from unbranded products is relatively low. The reason for the low gain is not due to any actions on the part of the high-quality seller, however, but that of the low-quality seller. When most of the unbranded products on offer are from low-quality sellers, comparatively, the difference in gains between purchasing branded and unbranded products will be significant. Therefore, the effectiveness of signalling for the buyer is significant. If, however, the situation is that most of the unbranded products on offer are from high-quality sellers, the difference in the expected gain from unbranded and branded products will not be very significant. In that case, signalling is relatively ineffective.

In sum, if the signalling cost incurred will be reimbursed from future profit, the high-quality seller will tend to invest in a branded product market. Thus, the proportion of high-quality products in the unbranded product market will be relatively small. Consequently, the average gain from buying unbranded products will be much lower. Continuing the line of the above argument, we summarize the impact of the size of signal cost on the effectiveness of the signal for the buyer in the shape of the following hypotheses:

H_{s1}. The lower the signalling cost, the more effective brand is as a signal for the seller.

H_{s2}. *The more effective brand is as a signal for the seller, the more effective brand is as a signal for the buyer.*

3.5 Pricing Behaviour Where Brand Serves as a Signal of Quality and Asymmetric Information Prevails

Although the literature on price-perceived quality relationships is substantial (Janiszewski and Lichtenstein 1999; Rao and Monroe 1996; Tellis and Wernerfelt 1987; Urbany et al., 1997; Waldman 1996; Zeithaml 1988) and economic model research on price as a signal (Milgrom and Roberts 1986; Bagwell and Riordan 1991; Zhao 2000) is rich, the *empirical* literature on price as a signal is sparse (Kirmani and Rao 2000). The research from experimental economics (Miller and Plott 1985; Holt and Sherman 1990) also considers price in terms of a condition of quality as an index to measure the effectiveness of signalling.

The kind of pricing behaviour this study is mainly concerned with is the distinction between the prices posted by the high-quality seller offering branded products, those posted by the high-quality seller offering unbranded products, and those posted by the low-quality seller offering unbranded products. The thinking behind pricing behaviour is that if signalling via brand name is effective, then mimetic behaviour on the part of the opportunist via price is inhibited. As a result, the difference between prices posted by the high-quality seller offering branded and unbranded products is significant. This leads us to define the measure of pricing behaviour in this study as the distinction between the prices of branded products posted by the high-quality seller, those of unbranded products posted by the high-quality seller, and those of unbranded products posted by the low-quality seller. By observing pricing behaviour thus defined, we could provide mutual proof of the effectiveness of signalling in terms of buyer value in the conceptual model.

On the basis of the assumption and deductions from signalling theory, this study proposes the following two hypotheses to explain pricing behaviour where brand signals product quality and where information is asymmetric:

H_{p1}. The lower the signalling cost, the more significant the difference between the prices of branded products of high quality and unbranded products of high quality

H_{p2}. The higher the brand differentiation in the market, the more significant the difference between the prices of branded products of high quality and unbranded products of low quality

On the basis of a series of hypotheses, before we set out when and how brand may be taken as an effective signal of product quality, we here summarize all the definitions of what actually constitutes effectiveness for the seller on the one hand and for the buyer on the other.

First, effectiveness of signalling for the seller is the gain from brand building (offering branded products) that outweighs any gain from not brand building (offering unbranded products) (Kirmani and Rao 2000). Second, effectiveness of signalling for the buyer is the difference in expected value and actual gain when brand information is available and when it is not (i.e., the gains when purchasing branded products outweighs those when purchasing unbranded products). Third, the buyer belief is the degree to which the buyer believes that the unbranded product will be of high quality. Last, pricing behaviour is the distinction of prices between branded products and unbranded products. The four key definitions, and the

interaction between these factors, are summarized in the Definition and Function columns respectively, in Table 2.

Table 2

Defining the Terms Used in the Signalling Model for the Consumer Market

Term	Definition	Function
Effectiveness of signalling for the seller	Payoff (brand building) – Payoff (no brand building)	Function (buyer belief, signalling cost)
Effectiveness of signalling for the buyer	Payoff (branded product) – Payoff (unbranded product)	Function (buyer belief, effectiveness of signalling for the seller)
Buyer Belief	Probability (The quality of unbranded product is high)	Function (brand differentiation)
Pricing Behaviour	Price (brand product) – Price (unbranded product)	Function (brand differentiation, signalling cost)

CHAPTER 4

METHODOLOGY

We based the design for the experiment on methodology derived from information economics and experimental economics (Davis and Holt 1993; Miller and Plott 1985; Lynch et al., 1986; Holt and Sherman 1990, 1999; Tung and Marsden 2000). The approach here differs from that of pen-and-pencil survey methods, which give only a snapshot of buyer's perceptions, in that we used online experiments to observe the following: the buyer's reaction to signals, decision-making over signalling strategy on the seller's part, and the gain realised by both buyers and sellers if trading in conditions of information asymmetry when the information in question is brand. Our purpose is to explore in those conditions what impact: 1) information manipulation (where brand and price are hidden or revealed) has on the buyer's interpretation of the value of brand, and 2) the interaction between sellers and buyers (signalling and screening) has on the seller's pricing behaviour.

4.1 The Methodology of Experimental Economics

It has been customary to use statistical data from "natural" markets to evaluate economic theories. However, this data can often be quite inadequate for such purposes because events taking place in real markets are unpredictable and often only one-off. In recent decades, it has become the practice to use experimental methods under controlled laboratory conditions for such evaluation, thus creating an important bridge between theory and observation. Plott (1991) proposed that economics will

increasingly become an experimental science.

The chief advantages that scientific laboratory methods offer are that they are replicable and they offer control (Davis and Holt 1993). By arranging the laboratory environment to satisfy as many structural assumptions of a theory as possible, its implications can be tested to known possible limits. In this way, experiments help foster a dialogue between the theorist and the empiricist, an exchange that forces the theorist to specify models that conform to observable variables and that forces the data collector to be precise and resourceful in achieving the desired control. It must be admitted, however, that there are critics of experimental marketplace studies of this kind who claim that such methods lack realistic application (i.e., external validity) or that the results they generate rely too much on artificial manipulation (Rao et al., 1999; Davis and Holt 1993).

Overall, the advantages of such experimentation in this field are decisively beneficial, although the new methods should complement rather than replace other empirical techniques (Smith 1989; Plott 1986, 1991). That is, data gathered from laboratory situations should be compared to so-called real world data for fit and any discrepancy explained.

4.2 Behaviour Focus versus Psychology Focus

The power of the signalling framework lies in its potential for making predictions based on a single behavioural assumption, that being that both sellers and buyers will act rationally. On that assumption, the researcher will look at how the buyer will react to the seller's activity in a given market condition, which is to say the

approach is market-focused. However, the market-focussed approach can not determine whether or not the buyer makes inferences, nor, if he does so, what psychological processes might be in play. This aspect, the psychological research paradigm, is psychology-focused and has to do with the mental processes of the buyer as he reacts to the seller's activity (Boulding and Kirmani 1993).

Most game-theory studies assume that a recipient interprets a signal in the way intended by the sender; few studies have attempted to document the different messages that signals can carry relative to the context in which they are received (Prabhu and Stewart 2001). We base our approach on this behaviour assumption and focus our attention on the buyer's reaction to information manipulation in the form of brand signal. A key difference between how purchase decisions are evaluated from the perspective of information economics and of cognitive psychology is the assumption of perfect information. We are aware that pen-and-pencil surveys are only snapshot measurements of buyer perception, which are quite inadequate for describing the dynamic nature of information manipulation and the strategic interaction between sellers and buyers. For that reason, we chose to borrow methods from experimental economics and to use simulations of information-manipulated market conditions. We use these to observe how brand functions as a quality indicator and as an effective signal, and then we measure how that function changes according to which marketing condition is in play as well as to the size of brand differentiation and of signal cost.

4.3 Experimental Design

We approached the design task with an eye on certain experiments in economics (Davis and Williams 1986; Miller and Plott 1985; Lynch et al., 1986; Holt and Sherman 1990, 1999) and thus we designed an online simulated posted-offer

(take-it-or-leave-it) market institution to identify a 'lemon market' that is, the typically adverse selection conditions that arise with information asymmetry (Akerlof 1970; Kessler 2001; Levin 2001; Lim 2000) wherein brand is the signal used.

Although our model resembles a retail market in many respects we find that it is still valid for modelling the buying and selling behaviour of a consumer market. We use its framework of online trading in asymmetric information conditions to observe traders' behaviour that is, the buyer's reaction and the seller's decision making and to analyse when and how brand serves as an effective signal.

Brand Information Manipulation

We employ three kinds of market conditions for testing the impact of brand differentiation and the size of signal cost on brand as an effective signal, as shown in Table 3. The first condition is post brand and price that is, a market in which the seller posts brand and price and the buyer must take it or leave it. The second is post price only that is, a market in which the seller posts only the price associated with a specific brand (with the brand information remaining unseen by the buyer). The third is a combination of the first two that is, a market in which the seller has the option of paying an extra fee to post brand and reveal product quality or of posting price only. The second condition is typical of a market in which information is asymmetric, and the third contains an incentive mechanism for the higher quality seller to reveal true information via brand at extra cost.

Table 3

The Designed Experiments for Varied Market Conditions

Experimental Environment		Online			
Market Condition		Posted-offer Market			
1	Post-Brand-and-Price	B1S1	B1S2	B2S1	B2S1
2	Post-Price-Only				
3	Optional-Post-Brand-at-Extra-Cost				

Manipulated Variables

Brand Differentiation: In experiments B1S1 and B1S2 the cost and value structure are associated with the Twinhead, Acer, and IBM brands of laptop computers, and it is notable that there is relatively more variation in brand value for the buyer and in cost for the seller. On the other hand, in experiments B2S1 and B2S2 the cost and value structure are associated with the Compaq, IBM, and Toshiba brands of laptop computers, and there is less difference between brands in terms of value for the buyer and cost for the seller.

Signal Cost: The experimental settings for exploring the difference (i.e., the size) in signal cost between BXS1 (higher) and BXS2 (lower) are designed to test what impact the difference has on the effectiveness of brand as a signal. The four experimental settings are shown in Table 4.

Table 4

The Experiments in Terms of Brand Differentiation and Signal Cost

Brand Differentiation (B)	High	Low
Extra Signal Cost (S)	(Twinhead, Acer, IBM)	(Compaq, IBM, Toshiba)
High	B1S1	B2S1
Low	B1S2	B2S2

NOTE: 'B' and 'S' represent brand differentiation and extra signal cost respectively. 'B1' and 'B2' represent high and low brand differentiation market and 'S1' and 'S2' represent high and low extra signal cost to the seller respectively.

Dependent Variable

Effectiveness of Signalling for the Seller: We measured the difference in surplus for the high-quality seller between adopting and not adopting brand as a signal. The decisions to adopt or not were based on the transaction success record, which showed that the seller had chosen to post brand and price at extra cost and to post price only at no extra cost (the third market condition).

Effectiveness of Signalling for the Buyer: We adopted the buyer's surplus in a transaction period as a construct for the actual gain. Therefore, the measure of the effectiveness of signalling for the buyer is the difference in surplus for branded and unbranded products, based on the transaction success record in the third market condition.

Intermediary Variable

Buyer Belief: The measure of the buyer's belief is the difference in surplus for the buyer, based on the transaction success record for brand and price (the first market condition) and for price only (the second market condition).

4.4 Assumptions about Buyer and Seller Behaviour

The following assumptions are made about the behaviour of the game players, the available strategies, and the types of games:

- The players all know each other and understand the game rules and what strategies are available to them as well as what all the possible payoffs are (Davis and Holt 1993; Dixit and Skeath 1999; Kreps 1990).
- The players all behave rationally. In doing so, they choose between activities that will either maximize benefit or minimize cost (Plott 1986). It is assumed that they consistently pursue their individual value systems and that they are perfect calculators and flawless followers of their best strategies. Some will argue that certain players may be severely restricted by the speed at which they can calculate and by the limits of patience while performing long calculations. However, computer programs for solving quite complex games are readily available, and all our players were provided with software that automatically performed all calculations perfectly (Dixit and Skeath 1999).
- Players make their moves in turn and are aware of any preceding moves made by other players. Since we are dealing with a posted-offer market, our game belongs to a class of sequential equilibrium games that involve strategic situations in which there is a strict order of play (Fudenberg and Tirole 1991; Kreps and Wilson 1982; Selten 1975). We therefore take account of the dynamic interaction and self-interested behaviour that occurs when information is asymmetric.
- The designed trading program being used in this study provides an automated calculation and prompts users in order to prohibit the violation of trading rules and require that the subject behave rationally.

4.5 On-line Game

The following describes the set-up, the participants, and the procedure for the experimental online market trading game.

Participants and set-up

The game players were 168 second-year Marketing students in the business school of a large university during July and August 2001. The second-year student here all had taken basic economic and marketing courses. The instructor divided the players into twenty-four groups of seven players, three of whom were designated as sellers and four as buyers. A dedicated server and web site for trading activities had been set up and a computer terminal assigned to each group for this purpose. To be sure that the rules were understood and followed before initiating any trading activity, the instructor distributed sheets relevant to the particular market condition in play, (BXSX) instructions to the players, and took questions (see Appendices for instruction sheets).

The trading occupied twenty-four 50-minute sessions. Each session was devoted to one of four different experimental settings, two concerning brand differentiation (High, Low) and two concerning signalling cost (High, Low). These settings are denoted by B1S1, B1S2, B2S1, and B2S2

In each session, all groups experienced the three kinds of market conditions (i.e., post brand and price, price only, and optional post brand at extra cost). For each condition, three or four transaction periods were allowed so that in all a session comprised a minimum of nine and a maximum of twelve transaction periods. The opening and closing of the market conditions and the transaction periods were all called by the instructor. The game occupies two phases, a pilot and a main phase. Thus this study began with a pilot test with subjects participating in one session under each setting for a total of four experimental settings including B1S1, B1S2, B2S1, and B2S2. Thereafter, we arranged a main phase that included five sessions under each setting to complete the series of exercises. Ten minutes of each session was allowed for introducing trading rules and for a question and answer session.

Procedure

Each session of the game began with the instructor opening the first market condition on the web site. He then opened the first transaction period by inviting all the sellers in the groups to post their brand and price. That done the instructor then opened the market to the buyers in the groups by inviting them to choose whether to buy the products on offer or to make no purchase. The instructor then closed the first transaction period and opened the second. This sequence was repeated with the second, the third, and perhaps the fourth transaction period. Usually three or four periods were needed to reach equilibrium in the market before it was closed (Holt and Sherman 1999).

The instructor then opened the second market condition, with sellers posting price only, and a sequence exactly the same as for the first condition was repeated. However, once the instructor opened the market, the buyer saw only the prices and the number associated with the seller but no brand information. The instructor then

opened the third market condition. Here, the sellers had two posting options (to post price and brand both at extra cost or to post price only at no extra cost). The procedure was the same as for the preceding two conditions. However, the buyer might thus be faced with a choice of two offers: brand and price or price only. The buyer could try to maximize earnings only on the basis of the available information.

This completes all the trading activity in the game. On completion of the session, all the players reviewed and discussed the results and drew conclusions. These conclusions are illustrated in Results below, using the data gathered from the experimental game.

CHAPTER 5

RESULTS

5.1 The Effectiveness of Signalling

Operational Definition of Measures

What we chose to focus on, irrespective of the market condition in play, was what difference in gain there was from branded and unbranded products for the buyer on the one hand and the seller on the other. This was achieved by comparing the difference that manipulation of brand and price made in each condition. Accordingly, for the buyer, we adopted his surplus as the gain in value of the product minus the selling price, and for the seller, we adopted his surplus as the gain in the selling price minus the production cost.

First, the measure of buyer's belief here is the difference in the buyer's surplus, based on the transaction success record with brand and price (the first market condition) and with price only (the second market condition). It was also used to examine the impact of brand differentiation on his belief about the quality of unbranded products.

Second, the measure of the effectiveness of signalling by brand for the buyer was used to test the impact of both his belief and the effectiveness of signalling for the seller on the value for the buyer. So, the measure here was the difference in his

surplus for branded and unbranded products, based on the transaction success record in the third market condition.

Third, the measure of the effectiveness of signalling by brand for the seller was used to test the impact of both the buyer's belief and the size of the signal cost on his earnings. So, the measure here was the difference in his surplus for branded and unbranded products, based on the transaction success record in the third market condition.

The Results of Measures

First, we extracted the buyers' surplus and calculated the mean for it in the first two market conditions, classified as [A], [B] in Table 5. The transactions in the third condition were sub-classified as [C_{b1}], [C_{b2}] and [C_{s1}], [C_{s2}], which, for the buyer, represent the mean surplus between buying branded and unbranded products and, for the seller, between offering branded and unbranded products.

Second, to determine the mean difference in surplus, one-way analysis of variance (ANOVA) was used to test for significant differences in the buyer's belief and in the effective of signalling for the buyer and the seller. The results are shown in [A]-[B], [C_{b1}]-[C_{b2}], and [C_{s1}] - [C_{s2}] respectively.

Third, post-hoc tests (Scheffe) were performed on each attribution level of the experimental groups to discern where significant differences occurred in order to examine the hypothesis. The results of the post-hoc tests are shown at the bottom of Table 5.

Table 5
Mean and Mean Difference in Buyer and Seller Surplus

		<i>Brand Differentiation</i>			
		High		Low	
		<i>Signal Cost</i>			
		High	Low	High	Low
		B1S1	B1S2	B2S1	B2S2
Mean of Buyer Surplus		[1]	[2]	[3]	[4]
[A] Brand and Price Market Condition		0.41	0.55	0.43	0.52
[B] Price Only Market Condition		-0.71	-1.23	0.03	0.15
[C] Optional Post Brand at Extra Cost or Post price Only Market Condition					
Mean of Buyer Surplus					
	[C _{b1}] Purchasing Branded Product	0.31	0.35	0.23	0.27
	[C _{b2}] Purchasing Unbranded product	-0.54	-2.28	-0.01	-0.18
Mean of Seller Surplus					
	[C _{s1}] Offering Branded Product	0.69	0.65	0.77	0.73
	[C _{s2}] Offering Unbranded Product	0.62	0.00	0.80	0.00
Dependant Variable					
[A] - [B] Buyer Belief		1.12	1.78	0.40	0.37
[C _{b1}] – [C _{b2}] Effectiveness of Signalling for Buyer		0.85	2.63	0.24	0.45
[C _{s1}] – [C _{s2}] Effectiveness of Signalling for Seller		0.07	0.65	-0.03	0.73
Hypothesis for Test	Dependant Variable	Independent Variable		Post hoc Test (Scheffe)	Result of Test
H _{b1}	[A]-[B]	Brand Differentiation		[1]+[2] > [3]+[4]	Support
H _{b2}	[C _{b1}]-[C _{b2}]	Buyer Belief		[1]+[2] > [3]+[4]	Support
H _{b3}	[C _{s1}]-[C _{s2}]	Buyer Belief		[1]+[2] > [3]+[4]	Reject
H _{s1}	[C _{s1}]-[C _{s2}]	Signal Cost		[2]+[4] > [1]+[3]	Support
H _{s2}	[C _{b1}]-[C _{b2}]	Effectiveness of Signalling for Seller		[2]+[4] > [1]+ [3]	Support

Testing the Hypotheses

H_{b1}. The greater the brand differentiation there is in the market, the less belief the buyer has in the quality of an unbranded product.

That is, the more highly the market differentiates brand, the more the buyer perceives a loss when he gets erroneous product quality relative to price. In that situation, the buyer's belief in the quality of a posting with no brand information is lower. As predicted, the results for this hypothesis show that the more differentiated the market is (i.e., B1S1 and B1S2), the greater the buyer's gains achieved when brand information is available than not (M=1.12 and 1.78 vs. M=0.40 and 0.37), F=32.808, p < 0.01, see row [A]-[B] Buyer Belief in Table 5). Also see Hypothesis H_{b1} [1]+[2] > [3]+[4], as shown in the bottom row of the Table 5.

H_{b2}. The lower the buyer's belief in the quality of an unbranded product, the more effective brand is as a signal for the buyer.

That is, the less belief the buyer has in a price-only posting, the more effective signalling is for him. As the [C_{b1}] – [C_{b2}] Effectiveness of Signalling for Buyer row in Table 5 shows, the lower the belief the buyer has in the market (i.e., B1S1 and B1S2), the more effective signalling is for him compared to instances wherein his belief in the market is greater, i.e., B2S1 and B2S2, (M=0.85 and 2.63 vs. M=0.24 and 0.45), F=13.322, P < 0.01. Also see Hypothesis H_{b2} [1]+[2] > [3]+[4], as shown in the bottom row of the Table 5.

H_{b3}. The lower the buyer's belief in the quality of an unbranded product, the

more effective brand is as a signal for the seller.

That is, the less belief the buyer has in a price-only posting, the more effective signalling is for the seller. We acknowledge that testing this hypothesis is difficult. The difference in the effectiveness of signalling for the seller in lower buyer belief markets (i.e., B1S1 and B1S2) is not significant compared with the high buyer belief markets i.e., B2S1 and B2S2, ($M=0.07$ and 0.65 vs. $M=-0.03$ and 0.73), $F=30.731$, $p<0.01$ (see row $[C_{s1}] - [C_{s2}]$ Effectiveness of Signalling for the Seller in Table 5).

H_{s1}. The lower the signalling cost, the more the effective brand is as a signal for the seller.

That is, the lower the signal cost, the more incentive the seller has to reveal brand at extra cost. As predicted, the result here shows that the less signal cost the experiment incurs (i.e., B1S2 and B2S2), the more effective signalling is ($M=0.65$ and 0.73 vs. $M=0.07$ and -0.03), $F=30.731$, $p < 0.01$ (see the $[C_{s1}] - [C_{s2}]$ Effectiveness of Signalling for Seller row in Table 5). Also see Hypothesis $H_{s1} [2]+[4] > [1]+[3]$, as shown in the bottom row of the Table 5.

H_{s2}. The more effective brand is as a signal for the seller, the more effective brand is as a signal for the buyer.

That is, B1S2 and B2S2 are markets with a high incentive for the seller. They make signalling more effective for the buyer than B1S1 and B2S1, which are markets with low incentive for the seller ($M=2.63$ and 0.45 vs. $M=0.85$ and 0.24),

$F=57.837$, $p < 0.01$ (see $[C_{b1}] - [C_{b2}]$ The Effectiveness of Signalling for Buyer in Table 5. Also see Hypothesis H_{s2} $[2]+[4] > [1]+[3]$, as shown in the bottom row of the Table 5.

5.2 Pricing Behaviour

Operational Definition of Measures

The focus in the three market conditions was in turn on the difference in price for branded products from high-quality sellers, for unbranded products from high-quality sellers, and for unbranded products from low-quality sellers. This was achieved by comparing the difference in the prices associated with certain levels of quality posted by sellers across those markets.

The Results of the Measures

First, the mean prices for both branded and unbranded products from high-quality sellers, as well as those for unbranded products from low-quality sellers, are shown as [A], [B], [C] in Table 6 below. Second, the mean difference in the prices was calculated by performing ANOVA on the data for branded and unbranded products offered by high-quality sellers, and for branded product offerings by high-quality sellers and unbranded product offerings by low-quality sellers. These are shown as [A]-[B] and [A]-[C] in Table 6. Third, post-hoc tests (Scheffe) were performed on each attribute level of the experimental groups to examine Hypotheses H_{p1} and H_{p2} , as shown at the bottom of the Table 6.

Table 6
The Mean and Mean Difference in Prices of Branded and Unbranded Products

		<i>Brand Differentiation</i>			
		High		Low	
		<i>Signal Cost</i>			
		High	Low	High	Low
		B1S1	B1S2	B2S1	B2S2
The Mean Price		[1]	[2]	[3]	[4]
[A] Branded Product of High Quality		7.94	7.72	7.86	7.74
[B] Unbranded Product of High Quality		7.17	6.10	7.70	6.83
[C] Unbranded Product of Low Quality		6.62	6.90	7.75	7.67
Dependent Variables					
[A]-[B] Branded and Unbranded Products of High Quality		0.77	1.62	0.16	0.91
[A]-[C] Branded Products of High Quality and Unbranded Products of Low Quality		1.32	0.82	0.11	0.08
Hypothesis for Test	Dependant Variable	Manipulated Variable	Post hoc Test (Scheffe)		Result of Test
H_{p1}	[A]-[B]	Signal Cost	[2]+[4] > [1]+[3]		Support
H_{p2}	[A]-[C]	Brand Differentiation	[1]+[2] > [3]+[4]		Support

Testing the Hypotheses

H_{p1}. The lower the signalling cost, the more significant is the difference between prices of branded products of high quality and unbranded products of high quality.

Hypothesis H_{p1} states that the lower the signalling cost the more the prices for branded and unbranded products posted by the high-quality seller differ. As predicted, the result in the [A]-[B] High Quality Branded and Unbranded Products row shows that the lower the signal cost incurred by the high-quality seller (i.e., B1S1 and B2S1), the more the prices for high-quality products with and without signalling differ (M=1.62 and 0.91 vs. M=0.77 and 0.16), F=10.394, P <0.05 (also see Hypothesis H_{p1} [2]+[4] > [1]+[3], as shown in the bottom row of the Table 6).

H_{p2}. The greater the brand differentiation in the market, the more significant the difference between the prices of branded products of high quality and unbranded products of low quality.

Hypothesis H_{p2} states that the more that brand is differentiated, the more the prices for high-quality branded and low-quality unbranded products differ. The result in the [A]-[C] High Quality Branded and Low Quality Unbranded Products row shows that the more brand is differentiated, B1S1 and B1S2, the more the prices for high-quality products with signalling and for low-quality products with false signalling differ, compared with the less brand differentiated B2S1 and B2S2 (M=1.32 and 0.82 vs. M= 0.11 and 0.08), F=10.394, P<0.05 (see also Hypothesis H_{p2} [1]+[2] > [3]+[4], as shown in the bottom row of the Table 6).

CHAPTER 6

DISCUSSION

6.1 The Effectiveness of Signalling

The Differential Effect of the Value of Brand for the Buyer

First, there are significant differences in terms of buyer surplus between the brand and price posting and the price only posting market conditions. In addition, the surplus in the revealed brand market condition is higher than when brand is hidden, as the positive values in the [A]-[B] row in Table 5. The test results from hypothesis H_{b1} show that when the buyer is offered the wrong product, i.e., not the quality desired in a highly brand-differentiated market in which brand information has not been revealed, he readily perceives the potential loss or risk, and is thus less likely to believe in the quality of unbranded products.

Second, the third market condition provides high quality sellers with an incentive to reveal brand, i.e., information about the quality of the product, at extra cost. The results here show that in a brand-differentiated market, where the buyer is less ready to believe in the quality of unbranded products, he gains significantly more from buying branded rather than from unbranded products, as hypothesis H_{b2} predicts.

Third, the buyer belief does not significantly influence the effect of signalling for the seller. Even though the results here are not as predicted, they are still worth further discussion. In our conceptual model of signalling in the consumer market,

how effective signal is for the seller is determined either by signal cost or buyer belief, but not by both equally. The other possible reason that causes such experimental result is that a lack of sufficient experimental settings made the outcome foreseeable. What we have is the influence of the former (signal cost) outweighing the latter (buyer belief). However, the results for pricing behaviour suggest that in a high brand-differentiated market, there is a significant price difference between high quality branded products and low quality unbranded products. Therefore, we conclude that the differential effect of brand value for the buyer inhibits the opportunistic selling of low quality unbranded products at high prices more than it does the sale of high quality unbranded products. So, in this case, the high quality sellers' decision on whether to offer branded or unbranded products is governed by the factor of brand building cost. However, we can not exclude the effect of the buyer's interpretation of brand value, i.e., the differential effect of brand value on the seller's signalling strategy, particularly with regard to false signalling from low quality sellers, as H_{p2} predicts.

The Profit Incentive for the Seller

First, the results of examining what effect the size of signalling has on the seller are as predicted and consistent with findings from Miller and Plott (1985). Hypothesis H_{s1} states in effect that a lowering of signal cost by the high quality product seller means a corresponding increase in the effectiveness of signalling.

Second, the less signal cost (brand building cost) incurred, the more the high quality sellers choose to adopt signalling (brand building), and as a result, the number of high quality sellers present in the unbranded market decreases. In other words, the average gain from buying unbranded products is much lower when low quality sellers dominate the unbranded market. Accordingly, as hypothesis H_{s2} predicts, the gain

from buying branded products is significantly higher than from unbranded products when the brand building cost is much smaller.

Research to date has focussed on what effect the size of signal cost has on signalling in terms of profit incentive for the seller. Our results confirm what hypothesis H_{s1} states, which is that the signal cost/profit ratio is indeed an important part of the seller's decision to adopt signalling. However, the explanation that we offer here for viewing signalling phenomena from the buyer's perspective complements research done elsewhere which has been mainly been concerned with the seller's perspective. That is, increased numbers of high quality sellers offering branded products, due to the smaller brand building cost, have an effect on the buyer's reaction to both branded and unbranded products. In other words, when the volume of high quality branded products is greater than high quality unbranded products (i.e., the number of high quality sellers offering branded products is greater than those offering unbranded products), the number of informed buyers increases. Such an increase inhibits mimetic behaviour on the part of those selling low quality products at high prices.

6.2 Pricing Behaviour

First, the results of testing hypothesis H_{p1} suggest that where brand-building cost is worth meeting out of future profit, the high quality seller tends to charge higher prices and gains the competitive advantage of differentiation. Second, as hypothesis H_{p2} predicts, in a market in which brand is highly differentiated, the buyer's interpretation of brand value and his reaction to brand signal inhibits mimetic pricing behaviour on the part of the low quality sellers.

The preceding finding is consistent with those from Bagwell and Riordan (1993) and Zhao (2000) to the effect that high prices are an efficient means of signalling. However, where we differ from them is that we classify two types of sellers offering unbranded products, i.e., high quality and low quality, two types of opportunist behaviour and two forces that determine pricing behaviour. The distinguishing factor that influences prices for high quality products, both branded and unbranded, is brand building cost. Another is the differential effect of the value of the brand to the buyer in a certain brand-differentiated market, which influences the difference in prices between high quality branded and low quality unbranded products.

CHAPTER 7

CONCLUSIONS

7.1 The Experimental Findings

The aim of this study has been to apply the bases of signalling theory and contributions from consumer-based branding research to exploring the utility of the brand as a signal when asymmetric information conditions prevail. Of particular interest has been measuring how effective the signal is for the buyer and observing the seller's pricing behaviour when brand serves as a signal of product quality in asymmetric information market conditions. Our experimental results allow us to conclude that:

First, there are two forces that drive the effectiveness of signalling via brand and the pricing behaviour of sellers in asymmetric information conditions. The first is the degree of brand differentiation in the market. That factor results from combining the strategic interaction among sellers concerning product differentiation and the effect of the differential value of brand for the buyer. The second factor is one governed by the seller alone, namely brand-building cost (signal cost).

Few studies have been concerned with testing signalling theory explicitly at the

consumer level (Boulding and Kirmani 1993). Most game-theorists have assumed that recipients interpret signals in the way the sender wishes. But to what extent have they inquired into how signals can vary in meaning according to the context in which they are found (Prabhu and Stewart 2001)? Have they made a priority of examining at the same time both the buyer's interpretation and/or reaction and the seller's incentive? We do not believe that they have, so the focus of our effort has been on measuring what effect the brand as a signal has when the high quality seller uses it to inform the buyer about quality. Findings from signalling theory and other efforts in consumer-based branding research will help in this task of improving understanding of the brand as a signal in the consumer market.

Second, in a highly product-differentiated market, the buyer's interpretation of brand value lowers his conviction about the quality of unbranded products. In other words, an enlargement of the segment of quality-sensitive buyers in the market indicates that the buyer is willing to pay higher prices for branded products, which in turn enlarges the prospect of future profit for the seller and thus his incentive to offer such products.

Our study provides a platform for testing the effectiveness of the brand as a signal from a buyer's side experimental examination, thus bridging the gap between empiricism, in the form of evidence generated from the marketing discipline, and theory, in the form of models generated from theoretical economics. Kirmani and Rao (2000) examine what role the effect of the quality-sensitive segment has in the seller's decisions on signalling, i.e., in deciding what to do about the buyer's perceptions of quality and reactions to signals. What we have done is to make an empirical examination of the effect of the buyer's reaction to and interpretation of the brand as a signal. Further, although there has been abundant research into the

price/quality relationship, the empirical literature on price as a signal is rather sparse (Kirmani and Rao 2000). So, as well as looking at how effective the signal is for the buyer, we have also sought to provide empirical evidence about pricing behaviour when the brand signals product quality and asymmetric information conditions prevail.

Although our conclusions may agree with work by Bagwell and Riordan (1993) and by Zhao (2000), the research context is not the same. Bagwell and Riordan see high prices as an efficient means of signalling because any consequent drop in the sales chart means that low-cost low quality products are suffering the most. Zhao argues that high quality sellers will reduce advertising outlay (signal cost) and raise prices rather than lower prices from their respective level under complete information. Our focus is on the utility of the brand as a signal rather than on advertising outlay. Further, we explore not only the price difference between high quality branded and high quality unbranded products but also the price difference between high quality branded and low quality unbranded products.

We also suggest that while signal cost affects the price difference between products with and without signalling from high quality sellers, it is the differential effect of brand value that determines the price difference between products from high quality sellers with signalling and low quality sellers with false signalling. That is, taking into account the buyer's interpretation of brand value in a brand-differentiated market and his reaction to signal improves our understanding of signalling phenomena and pricing behaviour in the consumer market.

Third, where future profit can reimburse brand-building cost, the high quality seller tends to adopt signalling and offers high quality

branded products at higher prices, thus gaining competitive advantage from brand differentiation. In addition, the greater the volume of branded products available in the market, the lower the average value of the unbranded products available. In that situation, the utility of brand signal is greater. In economics terms, the greater the presence in the market of sellers of high quality branded products, the lower the presence of uninformed buyers. Consequently, opportunistic behaviour in the form of false signalling from sellers of low quality products at high prices is significantly inhibited.

With this improved understanding of how the buyer interprets brand value and reacts to signal via brand in a market in which brand is highly differentiated, we underline the importance of the differential effect of brand value for the buyer in the seller's decision whether or not to offer brand. To bridge the gap between the theoretical (signalling theory) and the empirical (studies of consumer-based brand equity in marketing), we propose that the measures of the effect of signalling should be evaluated from the buyer's perspective. As such a perspective allow us to re-explore whether the size of signal cost also plays an important role in determining signal effectiveness for the buyer instead of for the seller. We propose that the more attractive it is for the high quality seller to offer a branded product, the less the buyer's average gain from buying unbranded products and, as a result, the less effective the signal is for him. Therefore, we suggest an alternative explanation for the impact of signal cost on signal effectiveness to sellers. We propose that an increase in the number of high quality sellers who adopt signalling leads to a drop in the number of informed buyers. In this way, opportunistic behaviour, in the form of false signalling from low quality sellers, is inhibited. So, we re-explain signalling phenomena by taking a new look at how buyers are informed due to the fact that many more branded products in the market can account for the impact of signal cost on signal effectiveness.

With the preceding arguments in mind, we next discuss the implications for signalling theory, consumer-based branding research, and pricing behaviour when asymmetric information conditions prevail.

7.2 Theoretical Implications

7.2.1 Signalling Theory

First, research to date has shown that signal cost influences whether or not a high quality seller adopts a signalling strategy (Miller and Plott 1985). For him, this cost is a question of incentive. If the cost/benefit ratio is high, the incentive to signal brand to the buyer is strong (Riley 2001). However, not many have addressed how buyers interpret such a signal in a consumer market from the perspective of behavioural outcome rather than the psychological process (Prabhu and Stewart 2001). Our study uses the buyer's value to measure signal effectiveness. Our view is that, except for the size of signal cost, the buyer's interpretation of brand value and his reaction to brand signal both play an important part in the seller's decision to adopt signalling. We suggest that in a market where brands are comparatively highly differentiated, the buyer's reaction is to subject unbranded products to greater scrutiny. In those circumstances, the segment of quality-insensitive buyers decreases. As a result of that decrease, the high quality seller can justify investing in the cost of brand building as something that will be met out of future profit which, we suggest, should be seen as a gain for both buyer and seller jointly. For the seller, future profit is a question of what is to be gained in the long term from ensuring the value of the branded product for the buyer, rather than simply what gain the benefit/signal cost ratio will provide in the short term.

In game-theory terms, general signalling equilibrium is reached when the gain for the seller from signalling outweighs the gain from not signalling (i.e., the incentive to signal pays off) (Kreps 1990; Riley 2001). However, we are also concerned with the gain for the buyer through signalling compared with not signalling via brand name. Even though our study does not establish signalling equilibrium from the perspective of the seller's incentive, it is obvious that equilibrium should consider the buyer's gain through signalling via brand name from the perspective of consumer-based brand equity research.

Accordingly, when the market has fewer "lazy" buyers, and is one in which brand is highly differentiated, then the high quality seller has greater incentive to reveal truthful information via brand at extra cost. Not only is the benefit/signal ratio strong enough for the seller, the effect of signalling via brand for the buyer is also significant. To conclude our discussion of the effectiveness of signalling for both buyer and seller jointly, we suggest that while reaching signalling equilibrium via the seller's incentive is one way of judging when signalling is effective, measuring the gain in value for the buyer is another way of judging how effective the signalling is.

Second, the results from our signalling model of the consumer market allow us to claim that such signalling involves three related behavioural factors, namely, (1) the buyer's reaction to the seller's manipulation of brand and price, (2) seller-to-seller behaviour appropriate to a brand differentiated market, and (3) the buyer's interpretation of a branded product in a brand-differentiated market. This triangular relationship is highlighted by the dashed lines shown in BS, SSS, and BSS in Figure 1. The implications of signalling strategy for the seller's survival in the consumer market are: how to reduce signal cost (brand building investment); how to

differentiate a product via brand (brand differentiation); and how to manipulate the information (brand and price) intended to reach the buyer.

7.2.2 Consumer-Based Branding

The findings and analyses presented in the preceding sections allow us to draw a number of important conclusions for consumer-based branding research.

- Three forces drive market equilibrium dynamically in a market where brand may be a surrogate for product quality, namely brand differentiation, price, and brand building cost.
- While in complete information market conditions brand is simply a quality indicator, the loss in value that the buyer experiences in incomplete market conditions underlines the potential importance of brand value for him.
- Brand value is relative to the competition and varies according to what information is available to buyers. Thus, in information economics terms, information manipulation and strategic interaction between sellers and sellers and buyers changes dynamically.

The role of brand in reducing the risk perceived by the buyer, thereby increasing or assuring the expected value to him, may in turn be a factor that drives brand equity. The difference in gain from buying branded rather than unbranded products can be a potential measure of brand value for the buyer.

Our results also demonstrate the role of brand as a reduction mechanism (Berthon et al., 1999). The model of the simulated online posted-offer market with brand as an optional signal has revealed how the difference between the buyer's expected value and actual gain due to the information/transaction cost is fixed at the point where brand becomes an effective signal. The size of a specific brand's value for the buyer is relative to any other brands available on offer in a dynamic market. Applying signalling theory to the consumer market, we find that the function of brand fluctuates according to prevailing market conditions, the differences that brand differentiation creates, and brand building cost. For the buyer, the function of brand in complete information conditions is to act as a quality indicator and, where information is incomplete, to reduce search cost, psychological risk and perceived risk, all of which are reductions that ensure the buyer's expected value.

As for the seller, the function of brand in complete information conditions is to facilitate a range of activities, such as identification and differentiation, whereas in incomplete information conditions it enforces the utility of marketing activities that brand facilitates. As to consideration of warranties as a signal, Boudling and Kirmani (1993) and Purohit and Srivastava (2001) all state that between high-credibility and low-credibility sellers, high warranty benefits only the former. In other words, the relative credibility of brand and brand value for the buyer determine the effectiveness of marketing activities associated with brand (Ippolito 1990).

The fact that the seller gains more from signalling than otherwise can be a measure of signal effectiveness with which to evaluate cost/profit (i.e., signal cost relative to future profit). The seller can use that ratio to decide whether investment will be reimbursed out of profit. This can be achieved, for example, by creating a basic level of differentiation to prevent a product from becoming a commodity subject to "noise" (mimicry of brands by pricing behaviour) (Berthon et al., 1999).

Even in incomplete information conditions, when the high quality seller cannot fully exploit the advantage (Zhao 2000), a signalling strategy at least allows him to retain the utility that brand provides, as long as brand differentiation and building cost remain effective.

Williamson (1975, 1993) suggests that transaction costs should include both the direct cost and the possible opportunistic cost based on two behavioural assumptions (i.e., bounded rationality and opportunism) and the two key dimensions of transactions (i.e., asset specificity and uncertainty). Behind the transaction cost, the brand as a signal conveys information from seller to buyer and the ability of brand to signal unobservable quality is based on the potential loss of prior brand equity – related investments in reputation (Erdem and Swait 1998). Unlike cognitive psychology, information economics, which is based on transaction costs, explicitly considers both symmetric and asymmetric information conditions of the market (Molho 1997; Rindfleisch and Heide 1997). It stresses the role of credibility as the main determinant of consumer-based brand equity. While some approaches to measuring the value of customer-based equity include customer consideration, perceived quality, preference, and satisfaction with the branded product, this kind of brand equity is measured by the differentiated effect of the branded product to the buyer in terms of financial measurement. Aaker (1996) suggests that brand equity provides the buyer with value by facilitating the information process, and increasing confidence. However, from the transaction cost angle, *reduction* is what drives and underlies brand (Erdem and Swait 1998; Berthon et al., 1999).

Compared to other studies of consumer-based brand equity research, ours can be said to be an empirical undertaking, based on transaction cost and financial measurement. It explores the function of brand and brand value for the buyer in asymmetric information conditions, which is in contrast to research based on

psychology and perception. These considerations give us reason to suggest that while the market can serve as an information-disseminating mechanism (Kirmani and Rao 2000), brand can be seen as a transaction cost-reducing mechanism.

7.2.3 Pricing Behaviour

Using the dichotomies of brand/no brand signalling, and where the product is of a high or low price to construct the simple 2x2 matrix in Figure 2, enables the identification of four corporate pricing behaviours. What follows these behaviours are described and their implication is discussed.

Our experimental results for pricing behaviour show that in the more effective signalling market, the high quality seller tends to take advantage of both lower brand building costs and higher brand differentiation to raise prices and enforce the competitive advantage of differentiation, thus assuming the role of Leader (see Figure 2). That is, the leader exploits that lower costs and higher price to distinguish himself from the Follower (see Figure 2), a high quality seller who does not indulge in brand building. Such behaviour uses brand to create a basic level of differentiation that prevents the product from becoming a commodity, in a manner analogous to brand facilitating premium pricing (Berthon et al., 1999).

On the other hand, in markets that are less brand-differentiated, the high quality seller either lowers the price and increases the volume of goods to enlarge his market share or tries to eliminate the false-quality seller via brand signalling, thus assuming the role of Skimmer (See Figure 2).

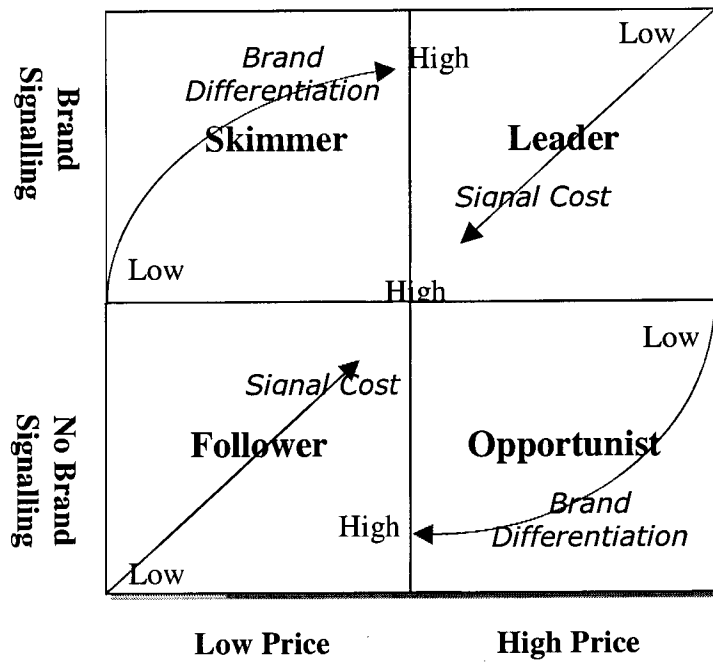


Figure 2. Pricing Behaviour under Signalling Phenomena

The prevailing mimicry that occurred in the experiments was such that the price posted by the high quality seller in complete information conditions was exactly the same or a little below that posted by the low quality seller in incomplete information conditions or by the high quality seller in non-signalling conditions. This mimetic behaviour of 'adding noise' is an attempt by the low quality seller to jumble high and low quality postings and thus dupe the unwise or incautious buyer; that is, the low quality seller assumes the role of Opportunist (shown in Figure 2). Nevertheless, a market in which brand is more highly differentiated provides the high quality seller with an incentive to use brand signal to remove the noise and regain the utility of the marketing activities that brand facilitates.

The power of signalling theory lies in its ability to make predictions on the single assumption of rational behaviour on the part of both the buyer and the seller (Boulding and Kirmani 1993). According to it, whether the seller chooses the role of follower or opportunist depends on signal effectiveness. For example, if the signal cost is low and brand differentiation is high, then the high quality seller chooses the role of either skimmer or leader (signalling strategy). If not, then the role is that of either follower or opportunist (non-signalling strategy).

Even in the real world, there is abundant evidence of bounded rationality in pricing behaviour, which indicates that sellers may use price as a tool associated with brand to enlarge the market share or to destroy competition (Pitt et al., 2001). However, the repetitive game type of the posted-offered market (over time in a variety of market conditions) could be designed to take the strategic interaction into account for the phenomenon of pricing competition, if the function of the signal is to act as a strategic tool for the seller to send the message to competitors rather than as a

simple mechanism to inform the buyer about quality. In sum, our study provides an empirical platform that facilitates dialogue between theoretical prediction and realistic outcomes regarding pricing behaviour when asymmetric information conditions prevail.

CHAPTER 8

LIMITATIONS AND FURTHER RESEARCH

First, experimental approaches to examining marketplace phenomena are often criticized for lacking in concern for external validity (Rao et al., 1999). The limited number of experimental settings we designed made it difficult to fully examine on continuous and dynamic linear relationships. It follows that the experimental results are also susceptible to the criticism that the paucity of the settings makes for foreseeable outcomes or that the outcomes are the result of artificially strong manipulation.

Second, throughout our experiments we considered only one category of product, notebook computers, and so might find it difficult to generalize. Another factor is that the nature of the product may also influence whether or not the signalling is effective. For example, signalling is most useful for products whose quality is unknown before but unambiguous after purchase (Kirmani and Rao 2000).

Third, there is certainly scope for further research of signalling theory into the links between the buyer's perceptions and behaviour.

Fourth, we were not able in this study to establish signalling equilibrium in game-theory terms (Brandts and Holt 1992; Cho and Kreps 1987; Dixit and Skeath 1999). Furthermore, even though we provide empirical measures of signal

effectiveness for the seller and the buyer, it would be interesting to explore that effectiveness further, in terms of the signal cost/benefit ratio that is due to signalling (Rao et al., 1999; Riley 2001).

However, the study has at least provided (1) a platform for further research into signalling theory from the viewpoint of economics and into the function of brand from the viewpoint of marketing, (2) a dialogue between theoretical prediction and empirical outcomes.

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APPENDICES

APPENDIX 1

BUYER INSTRUCTIONS FOR EXPERIMENT B1S1

This is an online posted-offer market for buyers and sellers trading in notebooks. We begin the game in the first market condition, *post brand and price*, by inviting the seller to look at a specially designed Web page that features a choice of three brands of notebook machines (Twinhead, Acer, IBM), all having the same specifications, each at a designated price. We gather their decisions and reveal them on screen to all the game participants. We then invite the buyer to purchase a notebook on the seller's posted terms of brand and price. Table 1.1, below, shows what money value the three brands have for the buyer.

Table 1.1

The Value to the Buyer

	Twinhead	Acer	IBM
Buyer Value	\$4.00	\$8.80	\$13.60

(The Price of Unit is \$1,000, i.e., \$4.00 means \$4,000)

The buyer may buy only 1 "unit" of the notebook. A buyer's earnings are calculated as the difference between the value and the purchase price:

$$\text{Buyer earnings} = \text{value of the brand purchased} - \text{seller's price}$$

The earnings for a buyer that does not make a purchase are \$0.

In the second market condition, price only, the seller still chooses to post brand and price. However, once the instructor opens the market, the buyer sees the prices and the number associated with the seller, but no brand information.

In the third market condition, optional post brand at extra cost, a seller wishing to reveal brand information must meet extra cost. The buyer might thus face a choice of two offers, brand and price or price only. The buyer can try to maximize earnings on the basis of the available information.

It is usual to allow three to four transactions periods for each market condition which is subject to the time limitation. The payoff/gain of purchasing in each transaction periods would be calculated automatically and shown on your screen at the bottom of the left hand side.

APPENDIX 2

SELLER INSTRUCTIONS FOR EXPERIMENT B1S1

This is an online posted-offer market for buyers and sellers trading in notebooks. The game begins with the instructor opening the market in the first market condition, post brand and price, and invites the seller first to look at a specially designed Web page that features a choice of three brands of notebooks (Twinhead, Acer, IBM), all with the same specifications, at designated prices. The seller is then invited to choose one of these. The instructor then collects the seller decisions and reveals (i.e. posts) them on screen to all the participants. Then, the buyer is invited to purchase from one of the sellers one of the brands at the price as posted; a higher number in Table 2.1 associated with brand means costs more to produce. The table below shows you the cost of producing the various brands.

Table 2.1

The Cost to the Seller

	Twinhead	Acer	IBM
Cost to Seller of 1 st Unit	\$1.40	\$4.60	\$11.00
Cost to Seller of 2 nd Unit	\$2.40	\$5.60	\$12.00
Added Signal Cost to 1 st Unit	\$1.00	\$1.50	\$2.00
Added Signal Cost to 2 nd Unit	\$2.00	\$2.50	\$3.00

(Price of Unit is \$1,000, i.e. \$1.40 means \$1,400)

The seller, you may sell up to 2 units during a transaction period. The first

row of Table 2.1, shows the cost of the 1st unit that the seller may sell in a transaction period, and the second row, the cost of the 2nd unit. Unsold units are not produced and hence incur no cost. The seller earns money by making one or more sales at a price higher than the above mentioned unit cost. These earnings are calculated as the sum of the earnings on the units actually sold:

$$\text{Seller earnings} = \text{seller's price} - \text{cost of producing the brand}$$

A seller who does not make a sale in a period earns \$0.

In the second market condition, posted price only, the seller is invited to choose a brand and price to be posted as an offer. However, once the instructor opens the market, the buyer sees only the prices along with seller's identification number, but no brand information.

In the third market condition, posted brand is optional for sellers. The seller may choose to reveal brand name, but if so, is obliged to add some signal cost for the 1st and 2nd units, as third and fourth rows in Table 2.1 show.

It is usual for a market condition to contain at least three, and sometimes four, transactions periods, which is subject to the time limitation. The payoff/gain of purchasing in each transaction periods would be calculated automatically and shown in your screen at the bottom of left hand side.

APPENDIX 3

BUYER INSTRUCTIONS FOR EXPERIMENT B1S2

This is an online posted-offer market for buyers and sellers trading in notebooks. We begin the game in the first market condition, *post brand and price*, by inviting the seller to look at a specially designed Web page that features a choice of three brands of notebook machines (Twinhead, Acer, IBM), all having the same specifications, each at a designated price. We gather their decisions and reveal them on screen to all the game participants. We then invite the buyer to purchase a notebook on the seller's posted terms of brand and price. Table 3.1, below, shows what money value the three brands have for the buyer.

Table 3.1

The Value to the Buyer

	Twinhead	Acer	IBM
Buyer Value	\$4.00	\$8.80	\$13.60

(The Price of Unit is \$1,000, i.e., \$4.00 means \$4,000)

The buyer may buy only 1 "unit" of the notebook. A buyer's earnings are calculated as the difference between the value and the purchase price:

$$\text{Buyer earnings} = \text{value of the brand purchased} - \text{seller's price}$$

The earnings for a buyer that does not make a purchase are \$0.

In the second market condition, price only, the seller still chooses to post brand and price. However, once the instructor opens the market, the buyer sees the prices and the number associated with the seller, but no brand information.

In the third market condition, optional post brand at extra cost, a seller wishing to reveal brand information must meet extra cost. The buyer might thus face a choice of two offers, brand and price or price only. The buyer can try to maximize earnings on the basis of the available information.

It is usual to allow three to four transactions periods for each market condition which is subject to the time limitation. The payoff/gain of purchasing in each transaction periods would be calculated automatically and shown on your screen at the bottom of the left hand side.

APPENDIX 4

SELLER INSTRUCTIONS FOR EXPERIMENT B1S2

This is an online posted-offer market for buyers and sellers trading in notebooks. The game begins with the instructor opening the market in the first market condition, post brand and price, and invites the seller first to look at a specially designed Web page that features a choice of three brands of notebooks (Twinhead, Acer, IBM), all with the same specifications, at designated prices. The seller is then invited to choose one of these. The instructor then collects the seller decisions and reveals (i.e. posts) them on screen to all the participants. Then, the buyer is invited to purchase from one of the sellers one of the brands at the price as posted; a higher number in Table 4.1 associated with brand means costs more to produce. The table below shows you the cost of producing the various brands.

Table 4.1

The Cost to the Seller

	Twinhead	Acer	IBM
Cost to Seller of 1 st Unit	\$1.40	\$4.60	\$11.00
Cost to Seller of 2 nd Unit	\$2.40	\$5.60	\$12.00
Added Signal Cost to 1 st Unit	\$0.50	\$1.00	\$1.50
Added Signal Cost to 2 nd Unit	\$1.50	\$2.00	\$2.50

(Price of Unit is \$1,000, i.e. \$1.40 means \$1,400)

The seller, you may sell up to 2 units during a transaction period. The first row of Table 4.1, shows the cost of the 1st unit that the seller may sell in a transaction

period, and the second row, the cost of the 2nd unit. Unsold units are not produced and hence incur no cost. The seller earns money by making one or more sales at a price higher than the above mentioned unit cost. These earnings are calculated as the sum of the earnings on the units actually sold:

$$\text{Seller earnings} = \text{seller's price} - \text{cost of producing the brand}$$

A seller who does not make a sale in a period earns \$0.

In the second market condition, posted price only, the seller is invited to choose a brand and price to be posted as an offer. However, once the instructor opens the market, the buyer sees only the prices along with seller's identification number, but no brand information.

In the third market condition, posted brand is optional for sellers. The seller may choose to reveal brand name, but if so, is obliged to add some signal cost for the 1st and 2nd units, as third and fourth rows in Table 4.1 show.

It is usual for a market condition to contain at least three, and sometimes four, transactions periods, which is subject to the time limitation. The payoff/gain of purchasing in each transaction periods would be calculated automatically and shown in your screen at the bottom of left hand side.

APPENDIX 5

BUYER INSTRUCTIONS FOR EXPERIMENT B2S1

This is an online posted-offer market for buyers and sellers trading in notebooks. We begin the game in the first market condition, *post brand and price*, by inviting the seller to look at a specially designed Web page that features a choice of three brands of notebook machines (Twinhead, Acer, IBM), all having the same specifications, each at a designated price. We gather their decisions and reveal them on screen to all the game participants. We then invite the buyer to purchase a notebook on the seller's posted terms of brand and price. Table 5.1, below, shows what money value the three brands have for the buyer.

Table 5.1

The Value to the Buyer

	Twinhead	Acer	IBM
Buyer Value	\$7.50	\$9.00	\$10.00

(The Price of Unit is \$1,000, i.e., \$4.00 means \$4,000)

The buyer may buy only 1 "unit" of the notebook. A buyer's earnings are calculated as the difference between the value and the purchase price:

$$\text{Buyer earnings} = \text{value of the brand purchased} - \text{seller's price}$$

The earnings for a buyer that does not make a purchase are \$0.

In the second market condition, price only, the seller still chooses to post brand and price. However, once the instructor opens the market, the buyer sees the prices and the number associated with the seller, but no brand information.

In the third market condition, optional post brand at extra cost, a seller wishing to reveal brand information must meet extra cost. The buyer might thus face a choice of two offers, brand and price or price only. The buyer can try to maximize earnings on the basis of the available information.

It is usual to allow three to four transactions periods for each market condition which is subject to the time limitation. The payoff/gain of purchasing in each transaction periods would be calculated automatically and shown on your screen at the bottom of the left hand side.

APPENDIX 6

SELLER INSTRUCTIONS FOR EXPERIMENT B2S1

This is an online posted-offer market for buyers and sellers trading in notebooks. The game begins with the instructor opening the market in the first market condition, post brand and price, and invites the seller first to look at a specially designed Web page that features a choice of three brands of notebooks (Twinhead, Acer, IBM), all with the same specifications, at designated prices. The seller is then invited to choose one of these. The instructor then collects the seller decisions and reveals (i.e. posts) them on screen to all the participants. Then, the buyer is invited to purchase from one of the sellers one of the brands at the price as posted; a higher number in Table 6.1 associated with brand means costs more to produce. The table below shows you the cost of producing the various brands.

Table 6.1

The Cost to the Seller

	Twinhead	Acer	IBM
Cost to Seller of 1 st Unit	\$2.00	\$2.50	\$3.00
Cost to Seller of 2 nd Unit	\$3.00	\$3.50	\$4.00
Added Signal Cost to 1 st Unit	\$1.00	\$1.50	\$2.00
Added Signal Cost to 2 nd Unit	\$2.00	\$2.50	\$3.00

(Price of Unit is \$1,000, i.e. \$1.40 means \$1,400)

The seller, you may sell up to 2 units during a transaction period. The first

row of Table 6.1, shows the cost of the 1st unit that the seller may sell in a transaction period, and the second row, the cost of the 2nd unit. Unsold units are not produced and hence incur no cost. The seller earns money by making one or more sales at a price higher than the above mentioned unit cost. These earnings are calculated as the sum of the earnings on the units actually sold:

$$\text{Seller earnings} = \text{seller's price} - \text{cost of producing the brand}$$

A seller who does not make a sale in a period earns \$0.

In the second market condition, posted price only, the seller is invited to choose a brand and price to be posted as an offer. However, once the instructor opens the market, the buyer sees only the prices along with seller's identification number, but no brand information.

In the third market condition, posted brand is optional for sellers. The seller may choose to reveal brand name, but if so, is obliged to add some signal cost for the 1st and 2nd units, as third and fourth rows in Table 6.1 show.

It is usual for a market condition to contain at least three, and sometimes four, transactions periods, which is subject to the time limitation. The payoff/gain of purchasing in each transaction periods would be calculated automatically and shown in your screen at the bottom of left hand side.

APPENDIX 7

BUYER INSTRUCTIONS FOR EXPERIMENT B2S2

This is an online posted-offer market for buyers and sellers trading in notebooks. We begin the game in the first market condition, *post brand and price*, by inviting the seller to look at a specially designed Web page that features a choice of three brands of notebook machines (Twinhead, Acer, IBM), all having the same specifications, each at a designated price. We gather their decisions and reveal them on screen to all the game participants. We then invite the buyer to purchase a notebook on the seller's posted terms of brand and price. Table 7.1, below, shows what money value the three brands have for the buyer.

Table 7.1

The Value to the Buyer

	Twinhead	Acer	IBM
Buyer Value	\$7.50	\$9.00	\$10.00

(The Price of Unit is \$1,000, i.e., \$4.00 means \$4,000)

The buyer may buy only 1 "unit" of the notebook. A buyer's earnings are calculated as the difference between the value and the purchase price:

$$\text{Buyer earnings} = \text{value of the brand purchased} - \text{seller's price}$$

The earnings for a buyer that does not make a purchase are \$0.

In the second market condition, price only, the seller still chooses to post brand and price. However, once the instructor opens the market, the buyer sees the prices and the number associated with the seller, but no brand information.

In the third market condition, optional post brand at extra cost, a seller wishing to reveal brand information must meet extra cost. The buyer might thus face a choice of two offers, brand and price or price only. The buyer can try to maximize earnings on the basis of the available information.

It is usual to allow three to four transactions periods for each market condition which is subject to the time limitation. The payoff/gain of purchasing in each transaction periods would be calculated automatically and shown on your screen at the bottom of the left hand side.

APPENDIX 8

SELLER INSTRUCTIONS FOR EXPERIMENT B2S2

This is an online posted-offer market for buyers and sellers trading in notebooks. The game begins with the instructor opening the market in the first market condition, post brand and price, and invites the seller first to look at a specially designed Web page that features a choice of three brands of notebooks (Twinhead, Acer, IBM), all with the same specifications, at designated prices. The seller is then invited to choose one of these. The instructor then collects the seller decisions and reveals (i.e. posts) them on screen to all the participants. Then, the buyer is invited to purchase from one of the sellers one of the brands at the price as posted; a higher number in Table 8.1 associated with brand means costs more to produce. The table below shows you the cost of producing the various brands.

Table 8.1

The Cost to the Seller

	Twinhead	Acer	IBM
Cost to Seller of 1 st Unit	\$2.00	\$2.50	\$3.00
Cost to Seller of 2 nd Unit	\$3.00	\$3.50	\$4.00
Added Signal Cost to 1 st Unit	\$0.50	\$1.00	\$1.50
Added Signal Cost to 2 nd Unit	\$1.50	\$2.00	\$2.50

(Price of Unit is \$1,000, i.e. \$1.40 means \$1,400)

The seller, you may sell up to 2 units during a transaction period. The first row of Table 8.1, shows the cost of the 1st unit that the seller may sell in a transaction

period, and the second row, the cost of the 2nd unit. Unsold units are not produced and hence incur no cost. The seller earns money by making one or more sales at a price higher than the above mentioned unit cost. These earnings are calculated as the sum of the earnings on the units actually sold:

$$\text{Seller earnings} = \text{seller's price} - \text{cost of producing the brand}$$

A seller who does not make a sale in a period earns \$0.

In the second market condition, posted price only, the seller is invited to choose a brand and price to be posted as an offer. However, once the instructor opens the market, the buyer sees only the prices along with seller's identification number, but no brand information.

In the third market condition, posted brand is optional for sellers. The seller may choose to reveal brand name, but if so, is obliged to add some signal cost for the 1st and 2nd units, as third and fourth rows in Table 8.1 show.

It is usual for a market condition to contain at least three, and sometimes four, transactions periods, which is subject to the time limitation. The payoff/gain of purchasing in each transaction periods would be calculated automatically and shown in your screen at the bottom of left hand side.