

Lemon-Aid: Brand as a Signal for Quality – A Classroom Game

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Abstract

Lemon markets occur in situations when prior to purchase buyers are unable to observe the product and sellers consequently skim on quality. This phenomenon is potentially exacerbated when buyers and sellers trade in electronically mediated environments, where the product quality often cannot be assessed in advance of purchase. While economists explain the use of brands by firms in terms of monopolistic competition, marketers justify brands for performing various important value added functions. We describe a classroom exercise that tests whether the brand can serve as an effective signal of quality where asymmetric information prevails. Based on past experiments and games in economics it proposes a design for an online simulated posted-offer market institution to identify a lemons market.

Keywords: Adverse selection, asymmetric information, e-commerce, brand value

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Introduction

While economists explain the use of brands by firms in terms of monopolistic competition, marketers justify the functions of brands from both buyer and seller perspectives, as reduction and facilitation respectively. That is, for buyers, brands reduce search costs, psychological risk and perceived risk and for sellers, brands facilitate a range of activities, including identification and extension (Berthon, Hulbert and Pitt 1999). Most economists are familiar with the “lemons market” terminology created by Akerlof (1970) to explain what happens to markets when competitive pressure intensifies. The term “lemons” refers to products whose quality has deteriorated considerably, and so buyers become reluctant to pay high prices for products they expect to be of low quality. Buyers often cannot observe product quality prior to purchase, in which case sellers may unreasonably inflate prices. In extreme cases the market can then cease to exist (Holt and Sherman, 1999). Lemons markets are still a very relevant topic, and many researchers have studied their effects on various aspects of the business and marketing environments (e.g. Lim, 2000; Kessler, 2001; Levin, 2001).

We describe a simple classroom exercise that tests whether the brand can serve as an effective signal of quality where asymmetric information prevails. Based on past experiments and suggested games in economics (Miller and Plott, 1985; Lynch et al., 1986; Holt and Sherman, 1990; 1999), it proposes a design for an online simulated posted-offer market institution to identify a lemons market. An experiment (classroom game) is illustrated that explores the impact of the following three aspects of markets and branding: 1. Brand information manipulation—posting of brand and price, posting of price only, or optional posting of brand at extra cost. 2. The degree of brand differentiation. 3. The magnitude of difference in signal cost on the effectiveness of brand as a signal where asymmetric information prevails. In the first part of the exercise, sellers display full information, i.e. both brand and price are posted. In the second part only price is posted. In the third and final part of the exercise sellers have the option of either posting price only, or posting the brand as well but at extra cost.

Exercise Design

The design of the exercise is based on the contribution of Holt and Sherman (1999). This approach employs online trading to observe seller/buyer behavior dynamically, and analyzes seller/buyer decision-making where asymmetric information prevails. Our purpose is to explore the impact of information manipulation and seller/buyer interaction on the formation of the value of brand as an effective signal where asymmetric information prevails. This enables us to see how the function of brand fluctuates (1) according to which market conditions prevail, (2) according to the magnitude of difference in brand differentiation, and (3) signal cost.

We designed four experiments, labelled B1S1, B1S2, B2S1, and B2S2, each having different cost/value associated with brands. The instructions given to Buyers and Sellers respectively in game B1S1 are shown in the Appendix. These instructions are based on those used by Holt & Sherman (1999) in their classroom games. Similar instructions were used for the other games. Each experiment uses seven subjects (four buyers and three sellers) that are observed as they

undertake periods of online trading. The objective of the design is to explore, under the three market conditions of the experiment, both 1. The nature and use of information that the seller presents, i.e. posting of brand and price, posting of price only, or optional posting of brand at extra cost, and 2. The influence of the magnitude of difference between brand differentiation and signal costs on brand as an effective signal. If the difference between brand differentiation and signal costs associated with the brand is significant, the market will move to a separating equilibrium. If, however, the difference of the surplus associated with the signal costs is negligible, then a pooling equilibrium is likely to occur.

The exercise takes place in the market for laptop computers. We use real brand names to explore the impact of brand on seller/buyer behaviour (see Table 1). In experiment 1 (both in B1S1 and B1S2), the cost and value structure is associated with the laptop computer brands Twinhead, Acer and IBM, and there is relatively more variation in brand value to the buyer and cost to the seller. In simple terms, IBM is a far more prestigious and better-known brand than the other two. On the other hand, in experiment B2S1 and B2S2, the cost and value structure is associated with the laptop computer brands Compaq, IBM and Toshiba, and there is less difference between brand in terms of their value to the buyer and the cost to the seller. In simple terms, IBM is as prestigious and as well known a laptop computer brand as Compaq and Toshiba. Experiments B1SX and B2SX are designed to test what impact the magnitude of difference in brand value has on the brand as an effective signal. The experimental settings for the different signal costs of BXS1 and BXS2 are designed to test the impact the magnitude of the difference in the signal cost has on the effectiveness of brand as a signal.

Table 1 - The Experiments in terms of Brand Differentiation and Signal Cost

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

From the buyer's perspective, the post brand and price market situation is similar to the complete information market condition, whereas the post price only market situation resembles an incomplete information market condition. There are more challenges in exploring buyer behaviour and reaction to postings where some have signals and some do not. In this situation, namely optional posting of brand at extra cost for sellers, the buyer needs to make decisions with a mixed strategy. This involves making inferences based on two types of information provided by the seller: either the posted price only (uncertainty), or the additional signal of brand (certainty). We use rational expectation theory to venture some predictions with which to model agent behaviour and decision-making where information is incomplete.

The following basic assumptions are made about agent behaviour, available strategies, and game types: 1. All the players in the game know each other, understand the game rules and what strategies are available to them, as well as what the payoffs for all possible outcomes are. 2. All the players behave rationally. 3. Players make their moves in turn and are aware of any preceding moves made by other players. Within the three kinds of market conditions of our experiment, we are interested in whether brand serves as an indicator of high quality, or low quality. This is achieved by comparing the magnitude of difference in the expected value (buyer surplus) across the different market conditions created by brand information manipulation. Accordingly, we have adopted the buyer's surplus in a period of transaction as a construct of the value expected by the buyer in terms of transaction cost—the brand value to the buyer minus the selling price of the seller.

Running the Game

Prior to the commencement of the exercise it is necessary to set up a dedicated server and web site to facilitate seller and buyer activities. Start the game by dividing the class into 3 sellers and 4 buyers. If there are more than 7 people in a class, let them form 7 groups and let each group represent either a seller or a buyer. Assign a computer terminal to each individual/group, and make sure that the web site is already started up and the server is running well. Hand out the appropriate instructions, depending on which game is being played (BXSX). Explain the instructions to the class and answer any questions that they may have. It is imperative that everyone in the class understands what the rules of the game are. After the exercise has been explained, the instructor opens the market by making the first period active on the web site. Sellers then have the opportunity to choose their brand and price. When all the sellers are satisfied with their choices, the instructor opens the market to buyers who then have the opportunity to either buy the products they want, or make no purchase. When all the buyers are satisfied, the instructor announces the start of the next period. The exercise follows this procedure until all periods are completed. Usually 3 or 4 periods are needed to reach equilibrium.

Results, Analysis, and Conclusion

Twenty-four 50-minute sessions, involving 168 subjects, were conducted in the computer laboratories of a large business school. Mode 1 represents transactions for post brand and price market conditions and Mode 2 is used for post price only. As for the optional posting of brand at extra cost market conditions, there are two possible postings in a transaction period, namely price only and brand at extra cost. We use Mode 3 and Mode 4 to refer to these market conditions respectively. Additionally, for the purpose of conciseness, we used groups 1, 2, 3, and 4 to represent exercise settings B1S1, B1S2, B2S1, and B2S2 in the subsequent statistical analysis section.

We extracted all buyer surpluses (brand value for the buyer minus selling price) from the simulated online market, and ANOVA was performed on the data. The results are shown in Table 2. Post-hoc tests (Scheffe) were performed on each attribute level of the groups to examine the impact of each mode on the share of buyer surplus. These results are shown at the bottom of Table 2. The mean difference of share of buyer surplus between Mode 4 and Mode 3 represents the increasing share of buyer surplus due to signalling. In groups 1 and 2 large brand-value differentiations among the brands Twinhead, Acer, and IBM exist. Groups 3 and 4 have less differentiated brands, namely Compaq, IBM, and Toshiba. Two main observations can be made from the experiment and subsequent data analysis, and these are discussed below.

Table 2 - The Mean Share of Buyer Surplus

	High Brand Differentiation		Low Brand Differentiation	
	Group1	Group 2	Group 3	Group 4
	Large Signal Cost	Small Signal Cost	Large Signal Cost	Small Signal Cost
Mode 1	43%	47%	43%	50%
Mode 2	-71%	-123%	3%	15%
Mode 3	-56%	-181%	12%	-5%
Mode 4	38%	50%	31%	28%
F-Value	16.75	7.58	16.46	22.60
Sig. (2-side)	.000	.001	.000	.000
Post Hoc Test (Scheffe)				
Mode1 > Mode2	Significant	Significant	Significant	Significant
Mean difference	114%	170%	40%	35%
Mode 4 > Mode3	Significant	Significant	Not Significant	Significant
Mean difference	94%	231%	19%	33%

Firstly, there are significant differences between the post brand and price and post price only market conditions in terms of buyer surplus (see Mode1 > Mode2 at the bottom of Table 2). Furthermore, according to the post-hoc test, buyer surplus for revealed brand market conditions is higher than when the brand is hidden (see Mode1 > Mode2 and mean difference at the bottom of Table 2). Thus, where complete information prevails, brand functions as a quality indicator. In marketing terms, it performs the reduction function that helps the buyer to identify a specific product. It may reduce search cost, or it may assure product quality (reducing perceived risk), it may even confer status (reducing psychological risk).

Secondly, with modes 3 and 4 within groups 1 and 2, there are significant differences in terms of buyer surplus. Buyer surplus under post-brand-at extra-cost (Mode 4) market conditions is higher than in post-price-only (Mode 3) market conditions. There is no significant difference between modes 3 and 4 within group 3, but between modes 3 and 4 within group 4 a significant difference exists (see Mode 4 > Mode3 and mean difference at the bottom of Table 2). We deduce that the impact of information manipulation on buyer surplus depends on the magnitude of difference in brand differentiation and on signal costs.

For a situation where information is incomplete, and when the magnitude of difference in brand differentiation is less, as in groups 3 and 4, the effect of the signal is less noticeable. The relatively small mean difference of share of buyer surplus between Modes 4 and 3 in group 3 (19%) and group 4 (33%) implies that the effect of the signal is less noticeable compared to the higher brand differentiated markets in group 1 (94%) and group 2 (231%). This is because the seller has no incentive to reveal brand at extra cost to differentiate it from the other brands in the case of groups 3 and 4.

Obviously as signal cost decreases, the incentive for the seller to post brand at extra cost increases. We find that the mean difference of share of buyer surplus between Modes 4 and 3 in group 2 (231%) is higher than in group 1 (94%). In the same brand value system for groups 1 and 2, the lower the signal cost is for Mode 4 in group 2, the more incentive the seller has to post brand at extra cost as a way of differentiating himself from hidden brands, and thus maximizing profit. This situation also prevails in groups 4 (33%) and 3 (19%).

Accordingly, where information is incomplete, the magnitude of difference in brand differentiation and the signal cost influences the effectiveness of brand as a signal. A decrease

in the magnitude of difference of brand differentiation results in a decrease of the effectiveness of the signal. A decrease in signal cost results in a larger incentive for the seller to post brand at extra cost rather than post price only. While incomplete information market conditions brand is simply a quality indicator, the perceived loss of expected value by the buyer in incomplete market conditions implies the potential magnitude of brand value to the buyer. The amount by which the gain achieved through signalling outweighs the gain achieved without signalling can be a potential measure of brand value.

This note has outlined how a classroom game can be used to identify lemon markets. By simulating an online posted-offer market with brand as an optional signal, we have observed how the gap between a buyer's actual gain and expected gain due to the transaction cost is fixed where the brand is an effective signal. The magnitude of a specific brand's value to the buyer is relative to any other brands available in a dynamic market. This note provides some insights into the functioning of lemon markets, and demonstrates an experimental classroom exercise that shows how these markets function. It also provides some evidence for the inherent value that a brand name signifies to buyers about a product or service.

Appendix: Instructions to Participants

Buyers can earn money by making a purchase at a price that is below the value of the brand. Buyers can find this information in Table 1 of the buyers' instruction sheet. Sellers do not have access to this information. If a buyer does not make a purchase he/she earns \$0. A buyer's earnings are calculated as follows: $\text{Buyer Earnings} = \text{Value of brand purchased} - \text{seller's price}$. A Seller's earnings are calculated by taking away the cost to produce each brand/s from the price the product/s was sold. Sellers can find cost information in Table 1 of the sellers' instruction sheet. Sellers need to take into account whether it is the 1st or the 2nd unit to be sold during a period given that the 2nd unit costs more to produce. Buyers do not have access to this information. If a seller does not sell a unit he/she earns \$0. A seller's earnings are calculated as follows: $\text{Seller Earnings} = \text{Seller's price} - \text{cost of brand produced}$

Additional Instructions Provided to Buyers

This is a market with buyers and sellers. The sellers will begin by choosing a price and a brand. Buyers will then have a chance to buy from one of the sellers at the brand and price listed. Brands that cost more to produce are worth more to buyers and a table provided shows the value of each brand for buyers. Each buyer can only buy 1 unit during each period of selling. Each seller can sell up to 2 units during each period of selling but the second unit costs sellers \$1 more to produce on top of the initial cost.

Additional Instructions Provided to Sellers

This is a market with buyers and sellers. The sellers will begin by choosing a price and a brand. Brands that cost more to produce are worth more to buyers. Buyers will have a chance to buy from one of the sellers at the brand and price listed. The table provided shows the cost of the different brands for sellers. Each buyer can only buy 1 unit during each period of selling. Each seller can sell up to 2 units during each period of selling but the second unit costs sellers \$1 more to produce, on top of the initial cost. Unsold units are not produced and hence incur no cost.

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