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## An Analysis of the Impact of Social Factors on Purchase Behavior

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Wilfred Amaldoss and Sanjay Jain

## Abstract

Consumers purchase conspicuous goods to satisfy not just material needs but also social needs such as prestige. In an attempt to meet these social needs, marketing managers of conspicuous goods like cars, perfumes, and watches employ several strategies to highlight the exclusivity of their products. These strategies include using exclusive distribution, charging high prices, and limiting production. Further, marketing textbooks suggest that the demand curve for prestige goods could be upward sloping and therefore firms should not set prices which are “too low”. In this paper we examine whether the desire for exclusivity can lead to an upward-sloping demand curve. We also investigate how social factors such as the desire for exclusivity and conformity affect prices and firms’ profits. To analyze these issues, we develop a model of conspicuous consumption using the rational expectations framework. We consider two different market structures: monopoly and duopoly. Our results show that the desire for exclusivity can lead to an upward-sloping demand curve when there is a segment of consumers who are (weakly) conformists. The impact of exclusivity and conformity on prices and profits varies with the market structure. Interestingly, an increase in perceived functional differentiation of products consumed by snobs could decrease firms’ profits and prices. In the laboratory, we observe an upward sloping demand curve for snobs, in both the monopoly and duopoly setting. We also track consumer’s expectations, and find on average that subjects’ beliefs are consistent with the observed outcome and the rational expectations equilibrium solution.

**KEYWORDS:** Game Theory, Experimental Economics, Consumer Behavior, Rational Expectations, Prestige Pricing

# **An Analysis of the Impact of Social Factors on Purchase Behavior**

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Working Paper, 2002

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# 1 Introduction

It is generally accepted in marketing that the decision to purchase a “conspicuous” product depends not only on the material needs satisfied by the product, but also on social needs such as prestige (see for example Belk 1988, Grubb and Grathwohl 1967). Recognizing such social needs, marketers of conspicuous goods employ several strategies to highlight the exclusivity of their product. For example, in an effort to maintain its exclusive image, Ferrari promises not to produce more than 4300 vehicles every year, despite a more than two-year waiting list for its cars (Betts 2002). The strategy of limiting production quantity is also practiced in categories such as coins, watches and jewelry. Alternatively, firms use exclusive distribution channels to restrict the availability of their products. For instance, fearing that wide availability could hurt its exclusive image, Christian Dior sued supermarkets for carrying its products (Marketing Week, July 3, 1997).<sup>1</sup> These strategies are in part driven by the belief that some consumers would find a product less valuable if it is widely available, and that exclusivity will enable the firm to charge a high price and earn higher profits.<sup>2</sup> Indeed in marketing textbooks, it is suggested that the demand curve for prestige goods is upward-sloping for some range and therefore firms should not price their products “too low” (see for example, Berkowitz et al. 2000, Pereault and McCarthy 2000).

One potential sociological explanation for the upward slope in the demand curve for prestige goods is that consumers could use these goods to impress others of their relative wealth (Coleman 1990).<sup>3,4</sup> However, Corneo and Jeanne (1997a) show that under a signaling framework the desire for exclusivity always leads to a downward-sloping curve. Interestingly,

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<sup>1</sup>Luxury good manufacturers are also advised not to sell their products over the internet since this will dilute their image (Marketing, August 24, 2000).

<sup>2</sup>Research has shown that rarity of products can increase the perceived value of products even for items such as cookies (see Worchel, Lee and Adewole 1975).

<sup>3</sup>Adam Smith says that “with the greater part of rich people, the chief enjoyment of riches consists in the parade of riches, which in their eyes is never so complete as when they appear to possess those decisive marks of opulence which *nobody* can possess but themselves (c.f. Heilbroner 1986, p. 190).

<sup>4</sup>There are two other explanations which could explain the presence of an upward-sloping demand curve. The first reason is that consumers use price to infer quality, especially when it is difficult to determine quality by inspection (Zikmund and d’Amico 2000, p.624). Using a signaling model, Milgrom and Roberts (1986) show that firms might strategically use prices to help consumers make inferences about the quality of experience goods. There is also some empirical evidence which supports the association of price and quality (see for example Rao and Monroe 1989). The second reason is that certain goods (called “Giffen Goods”) are so inferior that the income effect is larger than the substitution effect. In reality, the likelihood of such goods is viewed with skepticism as the share of expenditure on a good in comparison to total spending is likely to be so small that income effect would be negligible (Hicks 1946, Heiner 1974). It is even argued that the Giffen paradox will vanish, if we allow consumers to buy a price insurance (Barzel and Suen 1992). In contrast to these approaches, our focus is on *social influences* on consumer demand.

their analysis reveals that an upward-sloping demand curve can be observed only if the consumers are followers.<sup>5</sup> Followers are consumers who prefer to conform with the society and derive more utility from a product if it is purchased by more people (Ross, Bierbrauer and Hoffman 1976, Jones 1984). Conformism is seen in products such as garments.<sup>6</sup>

The purpose of this paper is to examine whether consumer's desire for exclusivity can lead to an upward-sloping demand curve. Further, we wish to examine how the optimal prices and firms' profits are impacted by the social needs of consumers. Toward this goal, we develop a model of conspicuous consumption using the rational expectations framework. We capture consumers' desire for exclusivity and conformity by allowing the utility derived from a product to depend not only on its intrinsic value but also on consumption externality. Consistent with the classic work of Leibenstien (1950), we model *snobs* as consumers whose utility from a product decreases as more people consume the same product. For example, a BMW in every driveway could dilute the value of the car to potential buyers (cf. Bagwell and Bernheim 1996).<sup>7</sup> In a similar fashion, we model *followers* as consumers whose utility from a product increases as more people consume the product (see Becker 1991 for a similar formulation).<sup>8</sup> For instance, often teenagers view MTV because their friends watch it (Sun and Lull 1986). We also see evidence of conformism in the purchase of books, toys and garments.

We begin our analysis by examining a monopoly. Our analysis suggests that if the market is comprised of only snobs then the demand curve is downward sloping, and firm's profits decline as snobbish behavior increases. If the market is comprised of only followers, again the stable demand curve is downward sloping, but firm's profits increase as the degree of conformity increases. Interestingly, we find that if the market includes both snobs and

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<sup>5</sup>The intuition for the result is as follows. Consider the case where the signaling value of a good is fixed. In this situation, an increase in price must be associated with a reduction in demand. Therefore, for the demand curve to be upward sloping the signaling value has to increase sufficiently with increased consumption, in order to offset the classical effect of price on demand. Therefore, in a signaling framework an upward sloping demand curve is possible only when the consumers are followers (see Corneo and Jeanne (1997a) for details).

<sup>6</sup>The innate desire to conform is often used to explain the persistence of social customs. Similar arguments are also advanced to explain participation in trade unions (Naylor and Cripps 1993), and fair wages (Romer 1984). An alternative explanation for conformism is herd behavior caused by Bayesian learning (Bikchandani et al. 1992). See Frank (1985) for a discussion of the socio-biological bases of human needs such as desire for exclusivity and conformity.

<sup>7</sup>See also Nagel and Holden (2002, p.92) who say that exclusivity adds to the objective value of a product.

<sup>8</sup>Leibenstein (1950) uses the term bandwagon effect to describe what we call the follower-effect. We prefer to use the terms followers and conformist (Bagwell and Bernheim 1996) since bandwagon effects are often associated with adoption in large blocks (see for example Farrell and Saloner 1985).

followers, then it is possible for the snobs to have an upward-sloping demand curve.<sup>9</sup> We also show that the common belief that exclusivity leads to higher prices is not always valid. We find some corroborating evidence for these results in an empirical study of visible status goods purchased by women (Chao and Schor 1998).

Later we examine the implications of snobbism and conformism in the context of a duopoly catering to two segments of consumers, namely snobs and followers. Again, the demand curve for followers, as well as the total market, is downward sloping. Yet the demand curve for snobs could be upward sloping. We also find that cross-price effects for snobs can be negative. Further, in contrast to the monopoly case, we show that snobbism can actually lead to higher prices and profits. This result is consistent with some of the marketing strategies designed to make a product exclusive. Interestingly, the degree of perceived functional differentiation of products consumed by snobs could decrease equilibrium firm profits and prices.

Our model makes several interesting predictions, and there is some support for our results in Chao and Schor's study. It would be useful if we can more comprehensively test our rational expectations model of conspicuous consumption. However, it is not easy to objectively measure expectations in a field setting. Consequently, it is difficult to assess whether decision makers shape their behavior on the basis of rational expectations (Leiderman 1980, Dwyer 1981, and Mishkin 1981). But in a controlled laboratory setting it is possible to track both the behavior and beliefs of decision makers. Hence we subject our model predictions to a laboratory test.

In Study 1, we trace the demand curve for snobs and followers in a monopoly setting. In Study 2, we tested the predictions of our model for the duopoly case. In both studies, we used a within-subject design with two price points so that we can trace the demand curve for each segment of market. The experimental results are qualitatively consistent with the model predictions for both snobs and followers. In particular, we find that the demand of snobs increases as price increases.

In both studies, we also tracked each individual subject's expectation of the demand from trial to trial. To the best of our knowledge, our empirical investigation is the first one to track both expectations and the outcomes in a rational expectations game (see Sunder

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<sup>9</sup>In fact, we can observe an upward-sloping demand curve for snobs even if there is a segment of consumers whose utilities are unaffected by consumption externalities. In other words, the result goes through if the market is comprised of snobs and consumers who are (weakly) conformists.

1995 for a survey of experimental research on rational expectations models). On average, the expectations are closely aligned with the actual outcomes and the equilibrium solution. But we see variations in the expectations of individual subjects. These two experimental studies show that upward sloping demand curves are indeed observable among snobs, even for products that have *neither* quality differences *nor* any signal value. Furthermore, we find some support for the rational expectations framework at the aggregate level.

**Related Literature and Contributions.** Our work is related to the literature on conspicuous consumption. Marketing researchers have for long studied the role of products as a means of self expression (see for example Belk 1988, Grubb and Grathwohl 1967). This research has identified the existence two competing social needs among consumers: a need for uniqueness and a countervailing need for similarity (Brewer 1991, Fromkin and Snyder 1980). Further, there is evidence that these two traits influence consumer choices (Lynn 1991, Snyder 1992, Simonson and Nowlis 2000). These traits form the basis of what we refer to as the desire for exclusivity and conformity. This stream of research, however, does not examine how these traits affect the aggregate demand or firm behavior. Rather the focus is on describing the psychological and social underpinnings of consumers' decisions.

There is also a body of research in economics which has attempted to incorporate social aspects in a formal economic analysis. Liebenstein (1950) drew the attention of economists to the importance of social factors in consumption (see also Veblen 1899). Becker (1991) used conformism to explain why similar restaurants might eventually experience vastly different sales pattern. He showed that in equilibrium the demand curve for followers could be upward sloping, though the equilibrium is not stable. There are several signaling models on conspicuous consumption. For instance, Bernheim (1994) showed that when status is sufficiently important relative to intrinsic utility, then many individuals conform to a single standard of behavior, despite heterogeneous underlying preferences. Bagwell and Bernheim (1996) and Corneo and Jeanne (1997a) argued that conspicuous consumption is a consequence of the desire of consumers to signal their wealth. However, Corneo and Jeanne (1997a) find that the demand curve for a conspicuous product is downward sloping for snobs. The intuition for this result is that if more consumers buy the good, then the signal value of the good must decrease for snobs. Consequently, the firm needs to decrease prices in order to increase demand, implying a downward-sloping demand curve. Thus, they show that under a signaling framework, snobbish behavior cannot lead to an upward-sloping demand curve. Another

stream of research which studies consumption externality is the research on network goods (see for example, Besen and Farrell 1994, Katz and Shapiro 1994). However, the motivation for consumption externality in this literature is technological, rather than social.

Our research is different from the prior research in several important ways. First, unlike the behavioral literature in marketing, our focus is on developing a formal utility-based model to examine the implications of social influences on consumer demand and firms' prices and profits. Second, in contrast to the signaling models in economics, we model snobs and followers using a consumption externality. Third, unlike the extant literature we show that snobs can have an upward-sloping demand curve and also examine the equilibrium prices and profits in both a monopoly and a duopoly. Fourth, we empirically demonstrate the existence of an upward sloping demand curve for snobs. Finally, unlike prior experimental research, we investigate both the actions and beliefs of the subjects. This enabled us to test both the consequences as well as the assumptions of the rational expectations model.

The rest of the paper is organized as follows. In §2, we describe our model of conspicuous consumption in the case of a monopoly. In §3, we extend the model to consider a duopoly. In §4, we discuss our empirical investigation. We conclude our paper in §5.

## 2 Model

We begin our theoretical analysis by examining a monopoly. We first consider the case where the market is comprised of only snobs. Next, we examine the polar case where the market only consists of followers. Finally, we study a market that includes both snobs and followers. There are two reasons for this sequence of analyses. First, it allows us to compare our results with the prior literature which has primarily focused on only one of these segments at a time. Second, this sequential approach helps us to better appreciate the impact of each of these market segments on firm's demands, prices and profits, and also understand how the coexistence of both these groups alters the results. In §3, we analyze the case of a duopoly in order to understand how competition changes these results.

### 2.1 Monopoly: Snobs Only

First consider the case where the market consists of only snobs. Snobs value exclusivity, and consequently the utility derived from a product depends not only on its base value, but also on the expected number of people who will buy the product. Thus, the expected (indirect)



utility of purchasing a product is given by:

$$U(x^e, p) = v - p - g(x^e) \quad (1)$$

where  $v$  is the base valuation,  $p$  is the price for the product, and  $x^e$  is the expected number of buyers. Assume that  $g(0) = 0$ ,  $g(x^e) > 0 \forall x^e > 0$ ,  $g(1) < \infty$ , and  $g'(\cdot) > 0$ . These conditions ensure that the product is less valuable as more people buy it. We assume that each consumer only buys at most one unit of the conspicuous good at a time. This assumption is tenable for many conspicuous goods such as cars. Suppose that  $v$  is distributed across the populations according to a continuous distribution  $F(\cdot)$ , and normalize the total number of consumers to 1. We assume that  $F(\cdot)$  is common knowledge. Hence, the number of consumers who will buy the product is given by:

$$x = 1 - F(p + g(x^e)) \quad (2)$$

We assume that each consumer has the same expectation about the expected number of people who will buy the product. Further, these expectations are rational, implying that they are correct in equilibrium. Such assumptions are fairly common in the literature (see for example Becker 1991, Katz and Shapiro 1985, Rajiv, Dutta and Dhar 2002). Therefore, we assume that:

$$x - x^e = 0 \quad (3)$$

Using (2) and (3) we can derive the rational expectations equilibrium. The relevant equation is:

$$\Lambda_1(x) = x - 1 + F(p + g(x)) = 0 \quad (4)$$

Equation 4 implicitly describes the demand  $x(p)$  under the rational expectations condition.

We first consider the issue of existence and uniqueness of  $x(p)$ .

**Lemma 1** *There exists a unique and stable rational expectations equilibrium that satisfies (4).*<sup>10</sup>

Proof of all the results are in Appendix A.

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<sup>10</sup>The concept of stability that we use is due to Samuelson (1983) who considers a tâtonnement process and examines the stability of the linear-approximation system. This concept has been widely used in general equilibrium theory (see for example Takayama 1985 for a discussion) and game theory (see for example Reinganum 1985).

### Effect on Slope of the Demand Curve

Let us now study how the demand curve is affected by consumer's desire for exclusivity.

Using the implicit function theorem we obtain:

$$\frac{\partial x(p)}{\partial p} = -\frac{\frac{\partial \Lambda_1(x)}{\partial p}}{\frac{\partial \Lambda_1(x)}{\partial x}} = -\frac{f}{1 + fg'} < 0 \quad (5)$$

Thus, we have the following result:

**Proposition 1** *If the market consists of snobs, then under a rational expectations equilibrium the demand curve is downward sloping.*

In order to appreciate the intuition for this result, let us see how a unit change in price affects a consumer's expected utility from buying the product. We have:

$$\frac{\partial U}{\partial p} = -1 - g'(x^e) \frac{\partial x^e}{\partial p} \quad (6)$$

Note that if the consumer expects  $\partial x^e / \partial p$  to be negative, then for a sufficiently large  $g'(\cdot)$  it is possible that the consumer's utility is increasing in price. This outcome, however, implies that as the price increases, the total number of consumers who will buy the product would increase - thus giving rise to an upward sloping demand curve. Such a reasoning could potentially form the basis of naïve intuition. Note, however, that for this intuition to be valid it is necessary that the consumer expects the demand curve to be downward sloping. Indeed, it is natural to form such an expectation based on every day observations in the demand pattern of fast moving consumer goods.

Now let us examine the implications of the consumer forming rational expectation. If utility increases with price, then demand is likely to grow with price. But from (6) we know that if  $\partial x^e / \partial p > 0$  then consumer utility must be decreasing in price, irrespective of the size of  $g'(\cdot)$ . Thus, if consumers expect an upward sloping demand curve, the realized demand curve would be downward sloping. Hence, such an expectation is not rational. The only situation which is consistent with the rational expectations condition is that the expected demand curve is downward sloping and the consumer's utility is decreasing in price.

The arguments made above highlight the importance of rational expectations for Proposition 1. If consumers' expectations are not rational it is possible to have an upward sloping demand curve, but not when they form rational expectations. In the empirical section, we will examine the validity of both the rational expectations assumption and its consequences.<sup>11</sup>

<sup>11</sup> We derived Proposition 1 using the implicit function theorem (which requires local differentiability). The continuity assumptions were useful to prove uniqueness and existence of rational expectations equilibrium.

## Impact on Profits

Now we consider the monopolist's profit and examine how it is affected by the presence of snobs. Without any loss in generality we assume that the marginal cost of the product is zero. The profit function is:

$$\Pi(p) = x(p)p \quad (7)$$

We assume that the profit function is concave in price, and we will focus on situations where there is an interior solution. In order to evaluate the impact of the snobbish behavior on prices and profits, we define  $g(\cdot) = \lambda_1 \tilde{g}(\cdot)$  where  $\tilde{g}(\cdot) > 0$  and  $\tilde{g}' > 0$ . Thus, as  $\lambda_1$  increases snobbish behavior becomes more prominent.

We have the following result:

**Proposition 2** *Firm's profits decrease as snobbishness increases.*

It is commonly believed that manufacturers of luxury good items earn supra-normal profits, and the reason for this is intimately related to consumers' desire for exclusivity. Our result shows that at least in a monopoly setting with rational consumers this is not true. To understand the reason for this result, note that as snobbishness increases, the demand decreases. This is because each additional sale exerts a negative externality on the sale of other units. Consequently, the firm sells less as snobbish behavior increases. On using the Envelope theorem, we have:

$$\frac{\partial \Pi^*}{\partial \lambda_1} = p \frac{\partial x}{\partial \lambda_1} < 0 \quad (8)$$

Thus, firm's profits are hurt by the negative impact of snobbish behavior on the demand.

Now, let us examine how the optimal prices are impacted by snobbishness. As snobbishness increases, the total demand tends to decrease. However, increase in snobbishness can also make the consumer less price sensitive which tends to increase price. It can be seen that the sign of  $\partial p^* / \partial \lambda_1$  is the same as the sign of:

$$\frac{\partial^2 \Pi}{\partial p \partial \lambda_1} = \frac{\partial x}{\partial \lambda_1} + p \frac{\partial^2 x}{\partial p \partial \lambda_1} \quad (9)$$

The first term on the left hand side of the above equation, represents how the demand changes as snobbishness increases. This term is always negative. It implies that in order to sell additional units the firm needs to decrease its price more as snobbishness increases. The second

But as our discussion of the intuition using equation 6 shows, the proof would go through even if  $F(\cdot)$  was not continuous. Also, it is easy to see that the arguments would hold even if demand was discrete. For example, in the empirical section we consider a discrete version of this model.

term however tends to be positive because as the desire for exclusivity increases, consumers usually become less price sensitive. The combined effect of these two terms is ambiguous. In the case of uniform  $f(\cdot)$  and linear  $g(\cdot)$  these two effects completely counterbalance each other, and the prices are independent of the degree of snobbishness! However, this is not a general result. Note that this ambiguous result is in contrast to some claims that products associated with desire for exclusivity would be higher priced (see for example Groth and McDaniel 1993). These claims are sometimes based on the fact that desire for exclusivity can make consumers less price sensitive. However, as (9) shows this effect is counteracted by the negative demand-effect of snobbishness which tends to reduce price. In fact, it is easy to construct examples, where the prices decrease as the snobbishness increases.

Taken together the results of this section show that in a monopoly setting the following two claims may not be consistent with rational expectations: 1) snobs have an upward sloping demand curve, and 2) the desire for exclusivity always leads to higher prices. Also, the results bring into question the use of some marketing strategies like limited or exclusive distribution which are presumably designed to increase the image of exclusivity and attract the snobs. Our results show that at least in a monopoly setting such strategies need not lead to higher prices and could reduce firm profits.

## 2.2 Monopoly: Followers Only

Now consider the polar case where consumers are not looking for exclusivity, but like to follow others. The expected (indirect) utility of such a consumer is given by:

$$U(x^e, p) = v - p + h(x^e) \quad (10)$$

where  $h(0) = 0$ ,  $h(1) < \infty$ ,  $h(\cdot) \geq 0$  and  $h' > 0$ . Using the approach as discussed before, it immediately follows that the relevant equation which describes consumer demand under rational expectations is:

$$\Lambda_2(x) = x - 1 + F(p - h(x)) = 0 \quad (11)$$

Next we address the issues of existence, stability and uniqueness.

**Lemma 2** *There exists a rational expectation equilibrium which satisfies (11). Furthermore, the equilibrium is unique if and only if  $1 - h'f > 0$  at any equilibrium point. If there exists a unique equilibrium, then it is also stable.*

### Effect on Slope of the Demand Curve

Using the implicit function theorem and (11) it follows that:

$$\frac{\partial x}{\partial p} = \frac{-f}{1 - h'f} \quad (12)$$

If we consider situations in which there is a unique solution then it follows that  $\partial x/\partial p < 0$ . As the lemma shows, if  $1 - h'f > 0$  at  $x^*$  then the solution is necessarily stable. Therefore, a unique and stable rational expectations equilibrium would necessarily have downward sloping demand curve. In fact, using the lemma and (12), we have the following:

**Lemma 3** *If there exists an equilibrium with  $x'(p) > 0$  then there also exists another stable equilibrium in which  $x'(p) < 0$ .*

It is useful to contrast this results with that of Becker (1991) who also shows that an upward-sloping demand curve is possible in the context of pricing of restaurant services. However, the graphical example that he uses to depict such a possibility, involves multiple solutions, and the equilibrium at which the demand curve is upward sloping is unstable. Further, consistent with our results, we note that in Becker's example there also exists a stable equilibrium in which the demand curve is downward sloping. Summarizing, we have:

**Proposition 3** *If the equilibrium is unique then the demand curve in the case of followers is downward-sloping.*

It is useful to understand the intuition for this result using the framework that we employed for the case of snobs. We have:

$$\frac{\partial U}{\partial p} = -1 + h'(x^e) \frac{\partial x^e}{\partial p} \quad (13)$$

If the consumer expects  $\partial x^e/\partial p$  to be negative, then the consumer's expected utility is necessarily decreasing in price. Consequently, in this case there would exist a downward-sloping demand curve that is consistent with expectations. But if the consumer expects  $\partial x^e/\partial p$  to be positive and  $h'(\cdot)$  is large enough, then consumer's expected utility can increase as price rises. This implies that for large enough  $h'(\cdot)$  the demand curve can be potentially upward-sloping, even when we impose the rational expectations condition. However, the uniqueness and/or stability condition imposes limits on the size of  $h'(\cdot)$ , and it turns out that in a unique, stable equilibrium  $h'(\cdot)$  is bounded in such a way that it rules out the

possibility of an upward-sloping demand curve. Thus in contrast to snobs, it is possible for followers to have an upward sloping demand curve. However, to the extent that we are likely to observe only stable equilibria in the market, we should only observe downward-sloping demand curve in markets characterized by follower behavior.

### Impact on Profits

In order to examine how conformity affects firm profits, let  $h \equiv \lambda_2 \tilde{h}$  where  $\tilde{h} > 0$  and  $\tilde{h}' > 0$  and  $\lambda_2$  is a constant. Assume that the profit function is concave and consider the situation in which there is an interior solution. We have:

**Proposition 4** *Profits are increasing as the degree of conformity increases.*

This finding is in direct contrast to the result we obtained in the case of snobs. But this result is consistent with the observation that some firms employ marketing strategies to create a bandwagon effect for their products. Often such companies are able to charge high prices and make higher than normal profits.<sup>12</sup> To understand the intuition note that each additional unit that the firm sells exerts a positive externality on the sale of other units. Consequently, as the degree of conformism increases, the total sales and thereby the total profits are higher.

Now, let us consider the impact of conformism on prices. As in the case of snobs, there are two effects that we need to consider. The first effect, is the demand-effect which tends to increase price since the value of the product increases with each additional sale. Thus, the firm has less incentive to decrease prices. However, as in the case of snobs, there is another effect: the effect of conformism on price-sensitivity. Usually, consumers tend to become more price-sensitive as conformism increases. These two effects tend to counteract each other. For the case where we have uniform  $f(\cdot)$  and linear  $h(\cdot)$ , the two forces balance out, and thus conformism has no effect on prices! Nevertheless, in more general cases the overall effect is ambiguous, and prices can be higher in the presence of followers.

<sup>12</sup>For example, Corneo and Jeanne (1997b) discuss the case of a French company which introduced an object called POG which were plastic disks with little usefulness or aesthetic quality. However, with some clever marketing campaign the company started a craze among French children for POGs. The company sold more than 15 million POGs in a month, at a price which far exceeded the production cost.

## 2.3 Monopoly: Both Snobs and Followers

So far, we have seen that the demand function for snobs is always downward sloping, while those of followers could potentially be upward sloping. However, if there exists a unique rational expectations equilibrium, in both cases we must have a downward sloping demand curve. These results suggest that neither conformity nor snobbishness alone is enough to induce an upward sloping demand curve. Now, we consider the case when the market is comprised of two types of buyers: snobs and followers. Let the value distribution for the followers be given by  $F_1$  and let  $x$  represent the number of followers who buy the product, where  $0 \leq x \leq 1$ . Similarly,  $F_2$  and  $y$  are the corresponding parameters for the snobs, where  $0 \leq y \leq 1$ .<sup>13</sup> Therefore, using an approach which is consistent with the single-segment analysis, the relevant equations are:

$$x = 1 - F_1(p - h(x^e + y^e)) \quad (14)$$

$$y = 1 - F_2(p + g(x^e + y^e)) \quad (15)$$

where  $g(\cdot)$  and  $h(\cdot)$  are defined as before except that now we require  $h(2) < \infty$  and  $g(2) < \infty$  since the total market potential is now normalized to 2.<sup>14</sup>

On imposing the rational expectations condition, we have the following system of equation which defines the demand:

$$x - 1 + F_1(p - h(x + y)) = 0 \quad (16)$$

$$y - 1 + F_2(p + g(x + y)) = 0 \quad (17)$$

Next we address the issue of existence, uniqueness and stability.

**Lemma 4** *There exists a rational expectations equilibrium. Furthermore, if  $1 - h'f_1 > 0$  at the equilibrium point, then the equilibrium is unique and stable.*

<sup>13</sup>Note that we are assuming that the size of the snob segment is the same as that of the follower segment. A more general model could incorporate different segment sizes. However, this would only complicate the presentation of the results without altering the qualitative nature of any of our results.

<sup>14</sup>An alternate formulation would be to assume that snobs dislike followers adopting the product and therefore  $g(x^e + y^e)$  should be replaced by  $g(x^e)$ . Also, it is possible that followers look at the snobs as their aspirational group and therefore,  $h(x^e + y^e)$  should be replaced by  $h(y^e)$ . The formulation that we have chosen is closer to earlier single-segment analysis, and therefore is useful in highlighting how the presence of followers affects the equilibrium outcome. Further, this alternate formulation is consistent with the notion of reference groups and less so with the notions of exclusivity and conformity, which is the main focus of this paper. Finally, this alternate formulation would require consumers to have more precise estimates of segmentwise demand, which may be even more difficult. Nevertheless, the qualitative implications of our results would remain unchanged if we use this alternate formulation.

We will assume that  $1 - h'f_1 > 0$ , and therefore focus on the unique, stable rational expectations equilibrium.

### Effect on Slope of the Demand Curve

Using the implicit function theorem and Lemma 4 we have the following result:

**Proposition 5** *At the unique, stable rational expectations equilibrium, the total demand curve and the demand curve for the followers is downward sloping. However, the demand curve for the snobs is upward sloping if  $f_1(h' + g') > 1$ .<sup>15</sup>*

This at least provides one potential reason as to why upward sloping demand curve seems to be empirically associated with snobs and not with followers. *This is because the demand curve for the snobs can be upward sloping at the optimal price. But this cannot be true for the followers.* The result shows that upward-sloping demand curve is more likely to be observed as the conformist effect or the exclusivity effect increases.<sup>16</sup> That is,  $\partial y/\partial p$  increases as  $h'(\cdot)$  or  $g'(\cdot)$  increases. Further, the result highlights that the upward-sloping demand curve for snobs is likely to be observed, only when the market includes a group of consumers whose utilities do not exhibit negative consumption externality. That is, there is a group of consumers who are (weakly) conformists. Note that our result contradicts the claim of Liebenstein (1950) who argues that the demand curve for snobs would always be downward sloping. Nevertheless, the result is consistent with anecdotal and empirical evidence.

We see support for our results in the study of Chao and Schor (1998). They find that the overall demand curve for conspicuous items like women's cosmetics is downward sloping. However, they find that the demand for cosmetics like lipsticks, mascara and eyeshadow increase with price for college educated women. To the extent that these women are more likely to be status conscious and desire exclusivity, these results are consistent with our theoretical results. Interestingly, the demand curve for women who have not graduated from college is downward sloping as we would expect. Finally, they also find that non conspicuous

<sup>15</sup>In particular, the comparative statics are (detailed derivations are in Appendix A):

$$\frac{\partial x}{\partial p} = \frac{-f_1(1 + f_2(g' + h'))}{1 - h'f_1 + f_2g'}; \quad \frac{\partial y}{\partial p} = \frac{-f_2(1 - f_1(h' + g'))}{1 - h'f_1 + f_2g'}; \quad \frac{\partial}{\partial p}(x + y) = \frac{-(f_1 + f_2 + 2f_1f_2g')}{1 - h'f_1 + f_2g'}$$

<sup>16</sup>It is however important to note that the result does not *require* the presence of followers. In particular, the demand curve for snobs could be upward sloping even if  $h' = 0$  i.e., there exists a segment of consumers whose utility is unaffected by the choices of other consumers.



products like facial cleanser exhibit downward sloping demand curves for all segments. This is also consistent with our results.<sup>17</sup>

Let us understand why the presence of both followers and snobs leads to a result which is quite different from the one we observed in the case of only snobs or only followers. Let us first consider a consumer who is a snob. The change in expected utility of such a consumer with price is given by:

$$\frac{\partial U_s}{\partial p} = -1 - g'(x^e + y^e) \frac{\partial}{\partial p}(x^e + y^e) \quad (18)$$

If we impose the uniqueness or the stability condition, the consumer expects the total demand curve to be downward-sloping. In such a situation, it is possible that if  $g'(\cdot)$  is large enough, the consumer's expected utility is increasing in price. Consequently, under a stable rational expectations equilibrium, we could observe an upward-sloping demand curve for the snobs. Notice that it is the presence of followers which makes it possible for us to observe an upward-sloping demand curve for snobs. This is because the presence of followers allows for the possibility that the total demand decreases as price increases. This drop in demand makes the product attractive to the snobs, and for sufficiently large  $g(\cdot)$ , snobs are more likely to buy the product as price increases.

Now consider the case of a consumer who is a follower. We have:

$$\frac{\partial U_f}{\partial p} = -1 + h'(x^e + y^e) \frac{\partial}{\partial p}(x^e + y^e) \quad (19)$$

It is clear that if the consumer expects the total demand curve to be downward sloping, then the consumer's expected utility is decreasing in price, regardless of  $h(\cdot)$ . Consequently, the demand curve for the followers is downward sloping.

### Impact on Profits

Now, let us examine how firm's profits are impacted by the behavior of followers and snobs. Let  $g \equiv \lambda_1 \tilde{g}$  and  $h \equiv \lambda_2 \tilde{h}$ , and assume that the profit functions are concave. We focus on the case with an interior solution. We have the following result:

**Proposition 6** *Firms's profits are always decreasing in snobbishness and increasing in conformism.*

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<sup>17</sup>For example, the price coefficient for lipsticks, equals -0.19 for women with high school diploma. But for women with college degree the price coefficient is +0.117. However, the overall price coefficient is -0.157. Chao and Schor (1998) also find that the correlation between quality and price in this category is zero. Therefore, price could not be a credible signal of quality in this case. Similar results were also observed in the case of mascara and eyeshadow.

The result is consistent with those obtained in the pure snobs and pure follower cases and the intuition is similar. Again, the effect of snobbishness and conformism on prices is ambiguous, as the demand effect and the price-sensitivity effect tend to counteract each other. In the next section, we will examine how competition affects this result.

### 3 Competition

We now consider the case of a duopoly and examine how the presence of snobs and followers affects the demand equations and also the equilibrium prices. We model competition by assuming that there are two symmetric firms located on the two ends of a Hotelling line. Our assumption of symmetry allows us to focus on the impact of exclusivity and conformity on demand, prices and profits, while ruling out product quality differences as a potential explanation for the equilibrium outcomes. We allow for two segments of consumers: followers and snobs, each with unit demand. The expected utility that a follower located at  $\theta$  receives from buying firm 1's product is:

$$U_1^f(\theta) = v + h(x_1^e + y_1^e) - t_1\theta - p_1 \quad (20)$$

where  $h(\cdot)$  is the conformity function,  $h(\cdot) > 0, h'(\cdot) > 0$ ,  $p_1$  is the price for Product 1,  $v$  is the base valuation and  $t_1$  represents the psychological cost of moving from one's ideal point. Finally,  $x_1^e$  and  $y_1^e$  are the consumer's expectation of the number of followers and snobs who will buy Product 1. The expected utility that a follower receives from purchasing Product 2 is given by:

$$U_2^f(\theta) = v + h(x_2^e + y_2^e) - t_1(1 - \theta) - p_2 \quad (21)$$

The follower who is indifferent between the two products is defined by  $\theta_f$ , which is given by:

$$\theta_f = \frac{t_1 + h(x_1^e + y_1^e) - h(x_2^e + y_2^e) - p_1 + p_2}{2t_1} \quad (22)$$

We assume that  $v$  is sufficiently high so that the consumer will buy one of the two products. This assumption, which is fairly common in models using the Hotelling framework, allows the market to be fully served (see for example, Fudenberg and Tirole 2000). Let  $F_1(\cdot)$  be the value distribution for followers. Then the number of followers who will buy product 1 is given by:

$$x_1 = F_1(\theta_f) \quad (23)$$

For the consumer who is a snob the utility of buying Product 1 is given by:

$$U_1^s(\theta) = v - g(x_1^e + y_1^e) - t_2\theta - p_1 \quad (24)$$

where  $g(\cdot)$  is the snob function,  $g(\cdot) > 0, g'(\cdot) > 0$  and  $t_2$  represents the disutility of moving from one's ideal point. We allow for the possibility that followers and snobs could potentially have different strength of preferences. In other words,  $t_1$  and  $t_2$  could be different. The expected utility that a snob receives from purchasing Product 2 is given by:

$$U_2^s(\theta) = v - g(x_2^e + y_2^e) - t_2(1 - \theta) - p_2 \quad (25)$$

The snob who is indifferent between products 1 and 2 is defined by  $\theta_s$ , which is easily seen to be:

$$\theta_s = \frac{t_2 - g(x_1^e + y_1^e) + g(x_2^e + y_2^e) - p_1 + p_2}{2t_2} \quad (26)$$

Let  $F_2(\cdot)$  be the value distribution for snobs. Then the number of snobs who will buy Product 1 is given by:

$$y_1 = F_2(\theta_s) \quad (27)$$

The rational expectations conditions are:

$$x_1^e = x_1 \quad (28)$$

$$y_1^e = y_1 \quad (29)$$

Equations (23), (27), (28) and (29) describe the rational expectations equilibrium. The following result addresses the issue of existence, uniqueness and stability.

**Lemma 5** *There exists a rational expectations equilibrium. Furthermore, if  $g(\cdot)$  and  $h(\cdot)$  are linear and  $f_1 h_1' / t_1 < 1$  where  $h_1' = h'(x_1 + y_1)$  then the equilibrium is unique and stable.*

Note that the condition included in the lemma is similar to the one used in the monopoly case. We will assume that the conditions assumed in the lemma for uniqueness and stability hold.

### Own Price and Cross Price Effects

Using the implicit function theorem we have the following result:

**Proposition 7** *If conditions of Lemma 5 hold, then the demand curve for followers and the total demand curve is downward sloping in own price. However, the demand curve for snobs are upward sloping in own price if  $f_1(g'_1 + h'_1) > t_1$ . Furthermore,  $\partial x_1/\partial p_2 > 0$  and  $\partial(x_1 + y_1)/\partial p_2 > 0$  while  $\partial y_1/\partial p_2 < 0$  if  $f_1(g'_1 + h'_1) > t_1$  where  $g'_1 = g'(x_1 + y_1)$  and  $h'_1 = h'(x_1 + y_1)$ .<sup>18</sup>*

This result is consistent with the finding in the monopoly case, and the intuition is similar. This result highlights that, when the snob effect is large enough, a decrease in price by a firm can increase the demand from snobs for its competitor's product.

### Impact on Prices and Profits

Now, we can examine the competitive situation in which both firms independently choose prices. We look for pure strategy Nash equilibrium prices. In the following lemma, we have the conditions that ensure existence, uniqueness and stability of the Nash equilibrium.

**Lemma 6** *If  $f_1$  and  $f_2$  are uniform and the conditions of Lemma 5 hold, then there exists a unique, symmetric and stable pure strategy Nash equilibrium in prices.*

The assumption that  $f_1$  and  $f_2$  are uniform is sufficient for the existence of a unique equilibrium, though not necessary.<sup>19</sup> Nevertheless, these conditions make the comparative static analysis easier. In our model, we allow  $f_1$  and  $f_2$  to be different. In other words, we allow for the possibility that the distribution of valuation for followers and snobs could differ. For example, we allow for the possibility that snobs have a higher base valuation for the products than followers or vice-versa. With this setup, we can now examine how the equilibrium profits and prices are affected by snobbishness and conformity. Using an approach similar to the monopolist case we have:

**Proposition 8** *The equilibrium prices and profits are decreasing in conformity and increasing in snobbishness.*

<sup>18</sup>For example, the comparative statics for the effect of  $p_1$  show that (details are in Appendix A):

$$\frac{\partial x_1}{\partial p_1} = \frac{-f_1}{2t_1|J|} \left[ 1 + \frac{f_2(g'_1 + h'_1)}{t_2} \right]; \quad \frac{\partial y_1}{\partial p_1} = \frac{f_2}{2t_2|J|} \left[ -1 + \frac{f_1(g'_1 + h'_1)}{t_1} \right]; \quad \frac{\partial(x_1 + y_1)}{\partial p_1} = - \left( \frac{1}{2|J|} \right) \left[ \frac{f_1}{t_1} + \frac{f_2}{t_2} \right]$$

where:  $|J| = 1 + f_2g'_1/t_2 - f_1h'_1/t_1$ .

<sup>19</sup>For example, a weaker condition which ensures that the solutions are unique and stable is that  $|\partial^2\Pi/\partial p_i^2| > |\partial^2\Pi_i/\partial p_i\partial p_j|$  and  $\partial^2\Pi/\partial p_i^2 < 0$ . Intuitively, these conditions require that the profit functions are concave and that own price effects are stronger than cross price effects. Such conditions on the reduced form profit functions hold for a wide variety of models.

This result is in direct contrast to the finding in the monopoly case. It is commonly believed that exclusive products are likely to be more expensive. Our results establish the conditions under which this common belief might hold. In contrast to the monopoly case, we find that in the presence of competition snobbish behavior leads to higher profits. This result provides some justification for the use of marketing strategies which are intended to create an exclusive image for a product.

The reason for this result can be understood by noting how conformity and snobbishness change the complexion of competition. First, consider the case of conformity. As the number of consumers who buy Product 1 increases, the value of the product increases for the followers *and* therefore the relative value of Product 2 decreases. This implies that a unit reduction in price by firm 1 affects its total demand in two ways. First, since firm 1's product becomes relatively more attractive than firm 2's product, the demand for Product 1 increases. Second, as the consumers can rationally expect the demand for Product 1 to increase, the value of the product for the followers increases, and therefore consumers find it even more attractive to buy Product 1. Thus, as the degree of conformity increases, firms are lured to cut prices. The ensuing price competition causes the equilibrium prices to drop.

It is also useful to understand why this result is in contrast to the observations in the monopoly case. In the monopoly situation, the firm is trying to attract the marginal consumer who is indifferent between buying and not buying. The value of the outside good is fixed at zero. Consequently, as the conformity increases the value of the product increases, enabling the firm to extract a higher surplus from the consumers. However, in the case of competition, consumers retain some surplus and the value of an outside option for the consumers is not fixed (since both firms are strategic). Thus, while conformism increases consumer utility and helps them draw more surplus, it encourages more intense competition to attract consumers and consequently hurts firms.

Now, let us consider the case when the degree of snobbishness in the market increases. As consumers become more snobbish, if firm 1 decreases its prices it expects to get more consumers. However, this increase in demand reduces the value of the product for the snobs, and they are less likely to buy the product. Therefore, as the degree of snobbishness increases, reducing prices becomes less attractive to both the firms. The consequent reduction in price competition helps firms to charge higher prices and make more profits.

Let us now examine how changes in  $t_1$  and  $t_2$  affect the equilibrium prices and profits. We have:

**Proposition 9** *As  $t_1$  increases, equilibrium prices and profits are increasing. However, if  $f_1(g'_1 + h'_1) > t_1$  then equilibrium prices and profits are decreasing in  $t_2$ .*

The parameter  $t_i$  moderates the impact of price on consumer's demand for the products. In the usual case, an increase in  $t_i$  can be interpreted as equivalent to a decrease in price-sensitivity.<sup>20</sup> Therefore, the first part of the proposition implies that as price sensitivity among followers reduces, firms' prices and profits increase. This makes intuitive sense.

However, surprisingly this result does not always hold for the case of snobs. As the second part of the proposition implies, when the snob effect is large enough, an increase in  $t_2$  can actually reduce prices and profits. To understand this result, first note that under the condition specified in the proposition the demand curve for snobs is upward sloping. In this case, as  $t_2$  increases snobs become more price sensitive.<sup>21</sup> Therefore, if the snob effect is large enough, an increase in  $t_2$  intensifies the price competition. Consequently, in such a case both firms charge lower prices and make lower profits.

The parameter  $t_i$  can also be interpreted as the degree of perceived functional differences between the product (see Iyer and Soberman 2000). In particular, as  $t_i$  increases the perceived functional differences between products increases.<sup>22</sup> Hence, the above proposition implies that while promoting conspicuous goods to snobs, managers should be cautious in stressing functional differences between the products. Rather a more profitable strategy may be to promote the exclusivity of their products. This is consistent with the observed advertising for goods ranging from perfumes to luxury cars.

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<sup>20</sup>More formally, we usually have  $\frac{\partial}{\partial t_1} \left( \frac{\partial x_1}{\partial p_1} \right) > 0$ . This can also be rewritten as  $\frac{\partial}{\partial t_1} \left( \left| \frac{\partial x_1}{\partial p_1} \right| \right) < 0$  since the demand curve is downward sloping.

<sup>21</sup>Mathematically, we have  $\frac{\partial}{\partial t_2} \left( \frac{\partial y_1}{\partial p_1} \right) < 0$ . Note that as in the case of followers (see footnote 20), we still have  $\frac{\partial}{\partial t_2} \left( \left| \frac{\partial y_1}{\partial p_1} \right| \right) < 0$ . The reason for the difference in impact on price-sensitivity is due to the fact that now the demand curve is upward sloping. See Appendix A for formal proofs.

<sup>22</sup>To see this, note that in the absence of price differences and social considerations, as  $t$  increases, a consumer's strength of preference for the product that is closer to his ideal point, increases. Therefore, consumers find it more difficult to switch from their preferred product as  $t$  increases. In other words, as  $t$  increases the degree of perceived functional differences between two products increases.

## 4 Empirical Investigation

The theoretical analysis makes an important prediction: snobs might actually buy more if the price is higher – implying that the demand curve could be upward sloping. This result depends on individuals forming rational expectations. With little reflection, we can see that it is not easy for individuals to form *correct* expectations: the expectations that shaped the decisions of individuals should be identical with ensuing aggregate behavior. Indeed, the current evidence on rational expectations is mixed. Studies comparing forecasts made by subjects of stochastic variables against the actual outcomes suggest that people might not be good at forming rational expectations (Schmalensee 1976, Garner 1982, Williams 1987, Smith et al. 1988). However, there is also some evidence which supports the rational expectations model. For example, experimental assets markets seem to converge toward the predictions of rational expectations equilibria (see Sunder 1995 for a survey). However, in these markets the beliefs that guided actions were not tracked. Consequently, we have no knowledge of expectations in these markets. It is also not clear whether the results of asset market studies are generalizable to retail markets, which are generally less efficient (Smith 1982 and Holt 1995). Thus it would be useful to test our model in a laboratory setting, where we can track both actions and expectations. Such an investigation will add to our understanding of the rational expectations model of conspicuous consumption, over and above the support we see in the empirical study of Chao and Shor (1998).

The empirical work addresses two key questions:

1. *Do snobs buy more as price increases?* In our laboratory test, snobs purchased more when price was increased. We first tested for this demand pattern in a monopoly where the market comprised of both snobs and followers. The results are consistent with the model predictions. Later we tested the model prediction in a more complex decision making context, where subjects have to choose between two alternative products. Again, the market comprised of both snobs and followers. The results of the duopoly are also in keeping with the model prediction. In addition to finding strong support for the qualitative predictions of the model, we have moderate support for the point predictions. Relatedly, theory predicts that the demand curves for followers and the total market should be down sloping, and we also find support for this claim.
2. *Are the expectations of subjects consistent with the rational expectations model?* Prior

experimental literature has not attempted to explore whether the beliefs of economic agents conform to rational expectations model. Thus, an answer to this question is a useful addition to our knowledge of behavior in games. We tracked the beliefs that guided the purchase decisions of subjects in every trial of the experiment. On average, the expected demand is consistent with the actual demand and the rational expectations equilibrium predictions. It is useful to note that we observe variations in the behavior of individual behavior, implying that the model prediction survives at the aggregate level rather than the individual level.<sup>23</sup>

The experimental investigation is presented in two parts. Study 1 examines the behavior of subjects in a monopoly setting. Whereas, Study 2 tests the model predictions in a more complex duopoly setting.

#### 4.1 Study 1: Monopoly

**Empirical Model** Our analytical model assumes continuous distribution in values. It is difficult to validate such a model in a laboratory setting with a small sample of subjects. However the analytical results do not crucially depend on the continuity assumption as can be seen in the discussion of the intuition for the results and footnote 11. Hence, we use a discrete distribution of valuations. As expected, the results using this discrete distribution are similar to those for a continuous distribution. The principal advantage of this discrete distribution is that it is testable with a population of twenty subjects. The approach of testing a continuous model using a discrete version is common in experimental economics (e.g., Smith 1982). Table 1 presents the distribution of valuations for ten snobs (labeled Type A buyers in our experiment) and ten followers (Type B buyers in our experiment).<sup>24</sup> We used  $g(z) = 0.5z$  and  $h(z) = 0.6z$ . The resulting equilibrium demands for the snobs, the followers and the total market are shown in Figure 1. We see that the demand curve for snobs is (weakly) upward sloping, while it is (weakly) downward sloping for followers and the total market. In our experiment, we use two price points to trace the slope of the demand curve.

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<sup>23</sup>Similar observation has been made in several experimental games (e.g., O'Neill 1987, Rapoport and Boebel 1992).

<sup>24</sup>We named the two types of buyers as Type A and Type B buyers, rather than as snobs and followers, so that the behavior of subjects is purely guided by the negative and positively externality captured in our model.



–Insert Table 1 –

–Insert Fig. 1 –

**Subjects.** The subjects who participated in the experiment were business school students. They were paid a show-up fee of \$5 in addition to monetary reward contingent on their performance. All transactions were in an experimental currency called “francs” that were converted into US dollars at the end of the experiment.

**Experimental Design.** We used a within-subject design with two levels of prices: 5.9 and 6.9 francs. Using these two price points we trace the changes in demand among snobs and followers. We ran two groups comprised of twenty subjects each. In Group 1 the price was low in the first thirty trials and high in the next thirty trials. In Group 2 the order of price presentation was reversed.

**Procedure.** In our experiment subjects played the role of buyers, while the computer played the role of seller. The instructions that we provided to the subjects are in Appendix B. In keeping with the spirit of the complete information theoretical model, subjects were informed of  $g(z)$ ,  $h(z)$ , and the value distribution.

**Seller:** We simulated the retail market environment, where a seller posts price and promises to supply its product to all buyers who are willing to pay the posted price (see Smith 1982 and Holt 1995 for a discussion on posted prices market, and its implications for market efficiency). In this posted-price market, buyers cannot negotiate the price with the seller.

**Buyers:** Each subject was randomly assigned to play the role of either a Type A or Type B buyer.

Type A buyers: Type A buyers value the product *less*, when more people own the product. Consequently, the actual value of the product systematically drops below the base value when more people choose to buy the product. For example, consider the Type A buyer whose base valuation for the product is 9.5 francs. If a total of five Type A and Type B buyers purchase the product, the actual value of the product will fall to 7 francs (that is,  $9.5 - 0.5 \times 5 = 7$ ).

Type B buyers: The Type B buyers value the product *more*, when more people own the product. Hence, the actual value of the product rises above the base value when more people choose to buy the product. For example, consider the Type B buyer whose base valuation is 2 francs. If a total of five Type A and Type B buyers purchase the product, the actual

value of the product will increase to 5 francs (that is,  $2 + 0.6 \times 5 = 5$ ).

At the commencement of each trial, subjects were endowed with 7 francs so that they have sufficient funds to pay for the product if they decide to buy it. Consistent with our theoretical model, subjects were informed of their valuation, the distribution of valuations and the price of the product. The type of a subject, the total number of subjects, and the base valuations remained fixed in all trials.

In every trial, each subject had to decide whether or not to purchase the product. Subjects were asked to provide demand projections. Then using these demand projections, the computer showed the expected value of the product. Subjects could revise their demand projections, and obtain new estimates of the likely value of the product. We used the demand projections to track the expectations that guide the decisions of the subjects.

After all the buyers made their decisions, the computer counted the total number of subjects who purchased the product. Then based on the total number of subjects who bought the product, the actual value of the product for each subject was assessed. The payoff to a subject who bought the product is: endowment + actual value of the product - price paid. The subjects who did not buy the product kept the endowment. At the end of every trial, each subject was informed of the number of Type A and Type B buyers who purchased the product, and the payoff for the trial.

In order to make subjects familiar with the structure of the game, they were allowed to play three practice trials for which they received no monetary reward. After thirty trials of the game, the price of the product was changed. At the end of sixty trials, the experiment concluded. Then subjects were paid according to their cumulative earnings, debriefed, and dismissed.

#### 4.1.1 Results.

In this section we assess the descriptive power of the rational expectations equilibrium. We begin our analyses by examining the quantity demanded by snobs and followers. Thereafter, we investigate the expectations that could have guided the behavior of our subjects. Overall, the experimental results are consistent with the qualitative predictions of the model. We observe an upward-sloping demand curve for Type A buyers (snobs), and a downward-sloping demand curve for Type B buyers. On average, the expected demand is also consistent with the rational expectations equilibrium solution. However, we see variations in the beliefs and actions of individual subjects.

**Analysis of Demand.** Table 2 presents the mean quantity demanded by the two types of buyers, and the corresponding equilibrium predictions. The empirical results are consistent with the qualitative predictions of the equilibrium solution. However, we see some departures from the point predictions of model. Also, there is a significant trend in the demand pattern over the several iterations of the game.

Qualitative Predictions. The model makes four qualitative predictions. First, in theory the demand for the product among Type A buyers (snobs) should grow as the price increases. The average demand was 1.53 units, when the product was priced 5.9 francs. But when the price increased to 6.9 francs, the demand rose to 3.57 units. We can reject the null hypothesis that these demand levels are the same ( $F_{(1,118)} = 92.83, p < 0.0001$ ). We obtain similar results in each of the two groups. In Group 1, the average demand grew from 1.33 to 3.43 units, as the price rose from 5.9 to 6.9 francs, and this difference in demand is significant ( $F_{(1,58)} = 94.25, p < 0.0001$ ). In Group 2, the mean demand correspondingly increased from 1.93 to 3.7 units ( $F_{(1,58)} = 27.66, p < 0.0001$ ).

Second, in equilibrium the followers should demand less as the price increases. In actuality, the average demand of Type B buyers across the two groups declined from 9.12 to 3.08 units, when the price rose from 5.9 to 6.9 francs. This shift in demand is significant ( $F_{(1,118)} = 573.31, p < 0.0001$ ). We see similar results at the level of individual groups. In Group 1, on average the demand dropped from 9.03 to 2.9 units ( $F_{(1,58)} = 749.48, p < 0.0001$ ). In Group 2 the demand declined from 9.2 to 3.26 units, as the price increased ( $F_{(1,58)} = 171, p < 0.0001$ ).

Third, the model predicts that the overall demand should fall as price increases. The mean actual demand dropped from 10.65 to 6.65 units, when price rose from 6.9 to 5.9. This change in average demand is significant ( $F_{(1,118)} = 199.93, p < 0.0001$ ). We obtain similar results in each of the two groups (Group 1:  $F_{(1,58)} = 134.81, p < 0.0001$ ; Group 2:  $F_{(1,58)} = 89.67, p < 0.0001$ ).

Fourth, when the price is 5.9 francs, followers should demand the product more than snobs. Consistent with this prediction, the followers demanded on the average 9.12 units across both groups. On average, snobs demanded only 1.53 units. A paired comparison of the units demanded by snobs and followers reveals that the observed difference in demands is significant ( $t = 42.15, p < 0.0001$ ). We observe similar results in both Group 1 and Group 2. In Group 1, the average demand of followers was 9.03, and it is more than the 1.13 units

demanded by snobs ( $t = 45.10, p < 0.0001$ ). In Group 2, the followers and snobs bought on the average 9.2 and 1.93 units, respectively ( $t = 23.69, p < 0.0001$ ).

Finally, when the price is 6.9 francs, snobs should demand more than followers. On average across the two groups, snobs and followers bought 3.56 and 3.08 units, respectively. We cannot reject the null hypothesis that these quantities are the same ( $t = 1.5, p > 0.13$ ). On closer examination, we note that the difference in demand is marginally significant in Group 1, but not in Group 2. In Group 1, the mean quantity purchased by snobs and followers is 3.43 and 2.9 units, respectively ( $t = 1.97, p < 0.058$ ). Whereas in Group 2, snobs and followers purchased 3.7 and 3.26 units ( $t = 0.73, p > 0.2$ ).

–Insert Table 2 –

Distribution of Demand. The equilibrium solution provides unique point predictions about demand. But the actual demand varies over the several trials of the experiment. Fig 2 presents the empirical distribution of demand for the product among snobs and followers. The model predicts that if the price is 5.9 francs, then one snob should buy the product. Over the sixty trials across the two groups, the actual quantity demanded ranges from 0 to 4, with  $mean = 1.53$ ,  $median = 2$ , and  $mode = 2$ . But if the price rises to 6.9 francs, then in theory four snobs should buy the product. We observe that the actual demand ranges from 1 to 6, with  $mean = 3.56$ ,  $median = 4$ , and  $mode = 4$ .

In equilibrium, the followers should demand ten units when the price is 5.9 francs. The actual demand ranged from 7 to 10 units, with  $mean = 9.11$ ,  $median = 9$ , and  $mode = 9$ . If the price is increased to 6.9 francs, then in theory the demand should drop to 2 units. The observed demand ranged from 0 to 8 units, with  $mean = 3.08$ ,  $median = 3$ , and  $mode = 2$ . This suggests that, though the observed behavior is consistent with the qualitative predictions of the model, there are departures from the point predictions of the equilibrium solution.

–Insert Fig. 2 –

Trends in Demand. In the analyses discussed above we have aggregated the demand across groups and trials, and it could mask the trends in demand. In Fig. 3 we present the moving average for blocks of five trials. These block means were computed across the two groups. Statistical analysis of the block means suggests that followers evince significant trend in demand, when the price was 6.9 francs ( $F_{(5,20)} = 9.76, p < 0.0001$ ), but only a marginal trend when the price was 5.9 francs ( $F_{(5,20)} = 2.34, p < 0.08$ ). The trends in

the demand pattern of snobs is much weaker. It is marginally significant at 6.9 francs ( $F_{(5,20)} = 2.87, p < 0.05$ ), and not significant at 5.9 francs ( $p < 0.2$ ). This suggests that we observe some learning in the experiment although it seems to be very weak in some cases.

–Insert Fig. 3 –

Variation by Valuation. Whether or not a subject buys the product depends on her base valuation and the expected number of people likely to buy the product. In equilibrium, each player should play a pure strategy, and it changes with the base value of the product. For instance, when the price is 5.9 francs then only the Type A buyer with a base value of 11.4 francs should buy the product. All others should not buy the product. On the other hand, when price is 6.9 francs, then only the Type A buyers with the four top base valuations should buy the product. Fig. 4 presents the number of trials in which the different Type A buyers purchased the product. The players are arranged in the ascending order of their base valuations. Hence, player 1 has the lowest base valuation, and player 10 has the highest valuation. We see that subjects did not always play the predicted strategies. Yet the aggregate behavior is directionally consistent with the model prediction. We observe similar behavior among Type B buyers as well.

–Insert Fig. 4 –

**Analysis of Expectations.** Thus far we have examined how the purchase behavior conforms to the rational expectations equilibrium solution. In every trial of the experiment, we asked subjects to guess the likely number of Type A and Type B buyers who might purchase the product. Now using these demand projections, we can explore whether the expectations of our subjects are consistent with the outcomes and the equilibrium solution. Table 3 presents the mean expected demand, along with the rational expectations equilibrium solution.<sup>25</sup> It is reassuring to observe that the expected demand is in keeping with the observed outcomes and the qualitative predictions of the model. But there is a wide variation in expectations. Further, we discern a trend in the expectation over the several trials of the game.

Qualitative Predictions. In keeping with the theory, our subjects expected snobs to buy more when the price was high. Across the two groups, the mean expected demand of snobs increased from 1.63 to 3.38 units as the price rose from 5.9 to 6.9 francs ( $F_{(1,2398)} = 853.65, p < 0.0001$ ). On the other hand, followers were expected to buy less as the price

<sup>25</sup>Each subject forecast the number of Type A and Type B buyers who will purchase the product. The mean expected demand is computed by averaging the expectations of all the subjects.

rose. The average expected demand dropped from 8.08 to 3.52 units as the price increased ( $F_{(1,2398)} = 2126.39, p < 0.0001$ ). The changes in expected demand follow a similar pattern within each group. Finally, consistent with theory, the mean aggregate demand was expected to drop as price increased ( $F_{(1,2398)} = 554.01, p < 0.0001$ ). The results are similar within each group.

The model assumes that expectations are correct. That is, the actual demand and the expected demand are the same. Indeed, the mean observed demand and the expected demands are similar. When the price was 6.9 francs, the average actual and expected total demand were 6.65 and 6.89 units, respectively. We can not reject the null hypothesis that these demands are the same ( $t = 0.11, p > 0.2$ ). When the price dropped to 5.9 francs, the actual and expected demand were on average 8.45 and 9.11 units, respectively. Again, we can not reject the null hypothesis that these demands are the same ( $t = 0.39, p > 0.2$ ).

Distribution of Expectations. Fig. 5 shows the distribution of expected demand across the two groups. In equilibrium, one snob should buy if the price is 5.9 francs. The expectations range from 0 to 10, with *mean* = 1.63, *median* = 1 and *mode* = 1. In theory, the demand should be four units, if the price is increased to 6.9 francs. We note that the expectations range from 0 to 10, with *mean* = 3.38, *median* = 3, and *mode* = 4. Thus, though the expectations vary widely, they conform to the qualitative predictions of the model.

–Insert Fig. 5 –

Our subjects expected all the way from none to all the followers to buy the product at both prices. Yet, as before, the distributions of expectations is qualitatively consistent with the equilibrium solution. If price is 5.9 all followers should buy. The corresponding expectations followed a distribution with *mean* = 8.86, *median* = 9, *mode* = 9. But if the price is 6.9 then two followers should buy. The expectations were distributed with *mean* = 3.51, *median* = 3, and *mode* = 3.

Trends in Expectations. Fig. 6 traces the trend in expected demand over blocks of five trials. An analysis of variance suggests that the block means are significantly different for snobs (Price = 5.9:  $F_{(5,780)} = 66.79, p < 0.001$ ; Price = 6.9:  $F_{(5,780)} = 4.35, p < 0.001$ ). The results are similar with followers.

Study 1 shows that the behavior of financially motivated individuals is directionally consistent with the predictions of the rational expectations equilibrium. However, we see variations in the demand from trial to trial as well from player to player. Further, the beliefs

of our subjects are qualitatively consistent with the observed outcomes and the equilibrium predictions.

## 4.2 Study 2: Duopoly

### Empirical Model.

As in Study 1, we developed a discrete version of our theoretical model so that it is testable with a population of 20 subjects. The valuations for snobs (Type A buyers) and followers (Type B buyers) for each of the two products is presented in Table 4. We used  $g(z) = 0.5z$  and  $h(z) = 0.6z$ . The resulting equilibrium demands for snobs, followers and the total market are presented in Figure 7. It is easy to see that the demand curve for snobs is upward sloping for some range whereas the demand curve for followers and the total market is always downward sloping. As in Study 1, we will trace the demand curves using two price-points.

– Insert Table 4 –

–Insert Fig. 7–

**Subjects.** A fresh set of forty students were recruited for this study. As in Study 1, all the subjects were business school students. They were paid a show-up fee of \$5 in addition to monetary reward contingent on their performance. On average subjects earned approximately \$15.

**Experimental Design.** In this experiment there are two sellers with each selling a different product. Like before, our goal was to trace the changes in demand among snobs and followers. Therefore, we considered two different price points for Product 1, but kept the price of Product 2 constant at 6 francs. We manipulated the prices within-subject. In each session of the experiment ten subjects labeled Type A buyers played the role of snobs. Another another set of ten subjects labeled Type B buyers played the role of followers. We ran two groups comprised of twenty subjects each. In Group 1 the price of Product 1 was 5 francs in the first thirty trials and 7 francs in the next thirty trials. In Group 2, we reversed the order of prices.

**Procedure.** The procedure for this experiment closely follows the structure discussed in Study 1, except that now buyers have to choose among two products. The instructions that we provided to the subjects are in Appendix C.

**Seller.** Seller 1 sells Product 1, while Seller 2 sells Product 2. These sellers post their

prices, and promise to supply the products to all buyers who are willing to pay the posted prices. The buyers cannot negotiate the price with the sellers, and the computer played the role of sellers. As in Study 1, the computer played the role of sellers.

**Buyers.** Each subject had to decide whether to buy Product 1 or Product 2. The Type A buyers are the snobs, whereas the Type B buyers are the followers.

**Type A buyers.** Each buyer has a base value for Product 1 and another base value for Product 2, and these base values remained fixed throughout the experiment. The base values for Product 1 and Product 2 are as discussed in the empirical model. The base values were not the same for all buyers. Further, the base values for Product 1 and 2 were different for the same subject. Type A buyers value the product less when more people own the product. Consequently, the actual value of the product systematically drops below the base value when more people choose to buy the product.<sup>26</sup>

**Type B buyers.** Type B buyers value the product more when more people own the product. Thus, the actual value of the product rises above the base value when more people choose to buy the product.<sup>27</sup>

At the commencement of each trial, subjects were endowed with 7 francs so that they have sufficient funds to pay for the product if they want to buy it. Besides, they were informed of their valuations for the two products, the distribution of valuations and the price of the products. The type of a subject, the total number of subjects, and the base valuations remained fixed in all trials.

In every trial, each subject had to decide whether to buy Product 1 or Product 2. Subjects

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<sup>26</sup>For example, consider the purchase decision of Type A buyer 2 whose base value for Product 1 is 21.5 and the base value for Product 2 is 18.5 francs. Let the price of Product 1 be 5 francs, and that of Product 2 be 6 francs. If only a total of 11 Type A and Type B buyers purchase Product 1, the actual value of the product will fall to 16.5 francs (that is,  $21.5 - 0.5 \times 11 = 16$ ). Consequently, the net gain from purchasing Product 1 is 11 francs (actual value-price =  $16 - 5 = 11$ ). On the other hand, as total of 9 (that is,  $20 - 11 = 9$ ) Type A and Type B buyers are purchasing Product 2, the actual value of that product is 15.5 francs for this particular buyer (that is,  $18.5 - 0.5 \times 9 = 14$ ). Therefore, on purchasing Product 2 this buyer would gain 8 francs (actual value-price =  $14 - 6 = 8$ ). In this case it is profitable for the buyer to purchase Product 1. Note the actual value of a product changes with the total numbers of people purchasing that product.

<sup>27</sup>For example, consider the purchase decision of Type B buyer 9 whose base value for Product 1 is 18.4 and the base value for Product 2 is 21.6 francs. Let the price of Product 1 be 5 francs, and that of Product 2 be 6 francs. If only a total of 11 Type A and Type B buyers purchase Product 1, the actual value of the product will rise to 28 francs (that is,  $18.4 + 0.6 \times 11 = 25$ ). Consequently, the net gain from purchasing Product 1 is 20 francs (actual value-price =  $25 - 5 = 20$ ). On the other hand, as total of 9 (that is,  $20 - 11 = 9$ ) Type A and Type B buyers are purchasing Product 2, the actual value of that product is 27 francs for this particular buyer (that is,  $21.6 + 0.6 \times 9 = 27$ ). Therefore, on purchasing Product 2 this buyer would gain 21 francs (actual value-price =  $27 - 6 = 21$ ). Thus it is profitable for this buyer to purchase Product 2. Note the actual value of a product changes with the total numbers of people purchasing that product.



were asked to provide demand projections. Then using these forecasts, the computer showed the expected value of the products. Subject could revise their demand projections, and obtain new estimates of the likely value of the products. We used the demand projections to track the beliefs of our subjects.

After all the buyers have made the decisions, the computer counted the total number of subjects who purchased Product 1 and Product 2. Then based on the total number of subjects who bought these products, the actual values of the products for each subject was assessed. The payoff to a subject who bought a product is: endowment + actual value of the product - price paid. At the end of every trial, each subject was informed of the number of Type A and Type B buyers who purchased the product, and the payoff for the trial.

To familiarize subjects with the structure of the game they were allowed to play in three practice trials. Thereafter, they played sixty actual trials. After thirty actual trials of the game, the price of the Product 1 was changed. At the end of the experiment, the subjects were paid according to their cumulative earnings, debriefed, and dismissed.

#### 4.2.1 Results.

We first examine the demand for Product 1 among snobs and followers. Then we investigate the expectations that could have influenced the observed patterns in demand. We observe in this study an upward-sloping demand curve for Type A buyers (snobs), and a downward-sloping demand curve for Type B buyers. Further, the mean expected demand is also consistent with the equilibrium solution. However, we see individual-level differences in the beliefs and actions of subjects.

**Analysis of Demand.** Table 5 presents the mean observed demand in each of the two groups, along with the corresponding theoretical predictions.

Qualitative Predictions. As predicted by theory, the snobs purchased more Product 1 as price increased. The mean demand of Type A buyers grew from 3.93 to 5.53 units, as the price rose from 5 to 7 francs. This change in demand for Product 1 is significant ( $F_{(1,118)} = 36.74, p < 0.0001$ ). When we examine the behavior within each group, we obtain similar results. In Group 1, the average demand for Product 1 shifted from 4.07 to 5.63 units among Type A buyers ( $F_{(1,58)} = 14.95, p < 0.001$ ). In Group 2, the corresponding demand increased from 3.8 to 5.43 units ( $F_{(1,58)} = 22.72, p < 0.001$ ).

–Insert Table 5 –

According to theory, followers should buy less if the price increased. Across the two

groups, the mean demand significantly dropped from 7.6 to 2.92 units as the price changed from 5 to 7 francs ( $F_{(1,118)} = 265.02, p < 0.0001$ ). The fall in demand is significant in each of the two groups. In Group 1 the mean demand slipped from 8.77 to 3.4 units ( $F_{(1,58)} = 218.71, p < 0.001$ ), and correspondingly in Group 2 the mean demand fell from 6.43 to 2.43 units ( $F_{(1,58)} = 168.25, p < 0.001$ ).

In equilibrium, the overall demand should fall as price increases. The observed demand pattern is consistent with this prediction ( $F_{(1,118)} = 90.04, p < 0.0001$ ). We obtain similar results in each of the two groups (Group 1:  $F_{(1,58)} = 91.61, p < 0.0001$ ; Group 2:  $F_{(1,58)} = 42.44, p < 0.0001$ ).

If the price is 7 francs, more snobs should buy Product 1. Empirical evidence supports this prediction. On average Type A buyers bought 5.53 units, whereas followers purchased only 2.92 units ( $t = 8.7, p < 0.0001$ ). If the price is 5 francs, then more followers should purchase Product 1. At the low price, followers bought 7.6 units on average, while snobs purchased 3.93 units ( $t = 11.11, p < 0.0001$ ). The results are similar when we examine the demand pattern within each group.

Distribution of Demand. The rational expectations equilibrium make point predictions about the demand for Product 1 among snobs and followers. The actual demand, however, varies over the several trials of the experiment. Fig. 8 shows the frequency distribution of demand over the sixty trials across the two groups. In equilibrium, three snobs should buy the product if the price is 5 francs. We notice that the actual demand for Product 1 ranges from 1 to 7, with  $mean = 3.93$ ,  $median = 4$ , and  $mode = 3$ . But if the price increases to 7 francs, theory predicts that seven snobs should buy the product. The observed demand ranges from 2 to 8, with  $mean = 5.53$ ,  $median = 6$ , and  $mode = 6$ .

According to the model, followers should demand 9 units when the price is 5 francs. In Fig. 8, we see that the actual demand ranges from 2 to 10 units, with  $mean = 7.6$ ,  $median = 7.5$ , and  $mode = 6$ . If the price rises to 7 francs, then theory predicts that the demand should fall to 1 unit. The actual demand ranged from 0 to 6 units, with  $mean = 2.91$ ,  $median = 3$ , and  $mode = 2$ . As in Study 1, we find that the quantity demanded by subjects varies widely over the several trials of the game, though the mean demands are qualitatively consistent with equilibrium predictions.

–Insert Fig. 8 –

Trends in Demand. Fig. 9 presents the running average for blocks of five trials. We

find that both snobs and followers evince significant trend in demand when the price is low ( $p < 0.01$ ), but not at the high price ( $p > 0.2$ ).<sup>28</sup> Thus, as in the monopoly case, the evidence for learning is mixed.

–Insert Fig. 9 –

Variation by Valuation. According to theory, each player should play a pure strategy. Fig. 10 presents the number of trials in which the different Type A and Type B buyers purchased the product. This graph presents the results collapsed over the two groups. We see that individuals do not always play the same pure strategy. Yet, the overall demand pattern is directionally consistent with the model prediction.

–Insert Fig. 10 –

**Analysis of Expectations.** Now we examine how well the expectations of our subjects conforms to the equilibrium solution and the actual outcome. For this analysis, we use the demand projections that subjects provided at the beginning of every trial. Table 6 shows the mean expected demand and the corresponding equilibrium prediction. The mean expected demand conforms to the qualitative predictions of the model. On closer examination, we see much variation in the distribution of expectations. Further, the expected demand seems to shift toward equilibrium solution over the several iterations of the game.

Qualitative Predictions. More snobs should buy Product 1, if its price rises from 5 to 7 francs. We notice that the expected demand of snobs rose from 4.45 to 5.63 units when the price increased ( $F_{(1,2398)} = 342.27, p < 0.0001$ ). On the other hand, fewer followers should buy Product 1 as the price increases. Indeed, the average expected demand declined from 7.31 to 3.48 units as the price increased ( $F_{(1,2398)} = 2504.73, p < 0.0001$ ). Further, as predicted by theory, the expected aggregate demand fell as price increased ( $F_{(1,2398)} = 1001.23, p < 0.0001$ ). The pattern of expectations within each group also follow the model predictions.

In equilibrium, the actual demand and the expected demand should be same. We find support for this assumption. When the price was five francs, the actual and expected total demand were on average 11.53 and 11.77 units. We can not reject the null hypothesis that these demands are the same ( $t = 0.12, p > 0.2$ ). On average, the actual and expected demand were 8.45 and 9.11 units when the price was seven francs. Again, we can not reject the null hypothesis that these demands are the same ( $t = 0.37, p > 0.2$ ).

<sup>28</sup>The ANOVA results when price is 5 francs are as follows: Snobs –  $F_{(5,20)} = 4.54, p < 0.01$ ; Followers –  $F_{(5,20)} = 6.28, p < 0.01$

Distribution of Expectations. Over the several iterations of the game, we see much variations in the expectations of individual subjects. Fig. 11 presents the distribution of expected demand across the two groups. According to theory, three snobs should buy the product if the price is 5 francs. We see that the expectations were distributed with  $mean = 4.45$ ,  $median = 4$  and  $mode = 4$ . If the price is increased to 7 francs, then seven snobs should buy the product. The reported expectations were distributed with  $mean = 5.62$ ,  $median = 6$ , and  $mode = 5$ . Similarly, the distribution of the expected demand of followers is directionally consistent with predictions of the model.

–Insert Fig. 11 –

Trends in Expectations. Fig. 12 traces the trend in expectations over blocks of five trials. We can visually discern trends in the expectations of our subjects. An analysis of variance confirms that the block means are significantly different for the expected demand of snobs (Price = 5:  $F_{(5,780)} = 26.80, p < 0.001$ ; Price = 7:  $F_{(5,780)} = 14.72, p < 0.001$ ). It is interesting to note that in first block of trials the snobs were expected to buy more when the price was less. But this inconsistent expectation was revised over the course of the game. The trend in the expected demand of followers is also significant (Price = 5:  $F_{(5,780)} = 30.37, p < 0.001$ ; Price = 7:  $F_{(5,780)} = 24.54, p < 0.001$ )

## 5 Conclusion

This paper was motivated by a desire to understand the impact of social factors on conspicuous consumption. Toward this goal, we developed a parsimonious model of conspicuous consumption using the rational expectations framework. Our theoretical and empirical investigation provides useful insights on a few questions about conspicuous consumption.

1. *Would consumers buy a conspicuous product more as price increases, even if the product has neither quality difference nor signal value?* We show that in a market comprised of both snobs and followers, the demand curve of snobs could be upward sloping. But the demand curve of followers and the total market is always downward sloping. The intuition for this result is that snobs prefer a higher priced product if they expect the overall demand to be lower at the higher price, and such an expectation will be rational only if the followers have a downward-sloping demand curve. Hence, in a market comprised of only either snobs or followers the demand curve is downward

sloping. It is useful to note that our result does not rely on *signaling* either product quality or wealth of consumers.<sup>29</sup>

Consistent with our findings, Chao and Shor (1998) report that the demand for visible women's cosmetics grows as price increases in a sub-segment of the market, though the overall demand curve has a downward slope. Moving beyond this correlational support, we see in the laboratory study that price increase causes demand to increase among snobs. In both monopoly and duopoly setting, subjects who value exclusivity bought more as price increased. Our findings offer a potential explanation for the upward-sloping demand curve seen in marketing textbooks (e.g., Berkovitz et al. 2000, Perreault and McCarthy 2000).

2. *Does consumers' desire for exclusivity or conformity lead to higher firm profits?* The answer is contingent on the market structure. In a monopoly, the desire for exclusivity hurts firm's profits, as each additional unit of sale exerts a negative externality on the sale of the product to other snobs in the market. However, conformism improves firm profits because of its positive effect on demand.

In a duopoly, the desire for exclusivity improves equilibrium profits. In this case, as the price of a product falls it attracts more buyers, and thereby makes the product less appealing to the snobs. Thus, firms are less inclined to cut prices as snobbishness increases. The resulting softening of price competition increases firm profits. In contrast, conformism encourages price competition and reduces firm profits.

3. *What should be the communication focus for marketing conspicuous products?* Contrary to some of our intuition, we find that increased perceived differentiation of conspicuous products might actually reduce equilibrium prices and profits. Therefore, it might be profitable for managers to focus their communication efforts on highlighting the exclusivity of their products rather than the functional differences. Indeed, this is consistent with the observed advertising for luxury products such as Ferrari and Christian Dior.

4. *What is the descriptive validity of our model of conspicuous consumption, which is based on a rational expectations framework?* To the best of our knowledge, our study

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<sup>29</sup>In fact, an explanation based on signaling status cannot account for an upward-sloping demand curve for snobs (see Corneo and Jeanne 1997a).

is the first to track both beliefs and outcomes in the context of a rational expectations game. In our studies, we find the subjects' expectations are on average consistent with the observed outcome and also consistent with the rational expectations equilibrium. Thus our empirical analysis makes a useful contribution to the experimental literature on rational expectations models.

There are several avenues for future research. In our theoretical analysis, we only considered one marketing mix variable, namely price. In practice, advertising and promotion play an important role in marketing conspicuous products. Therefore, it would be useful to explore how these marketing mix variables influence the demand for conspicuous goods. Furthermore, it would be interesting to investigate how the market structure affects equilibrium levels of advertising and promotion for such goods. In our empirical investigation, we found that on average the beliefs and actions of subjects were consistent with the rational expectations equilibrium solution. However, there was substantial variation at the individual level. Future research can examine how individuals come to conform with the theory (see Camerer and Ho 1999 for a discussion of learning in games).

### References

- Bagwell, L., D. Bernheim (1996) "Veblen Effects in a Theory of Conspicuous Consumption," *American Economic Review*, 86, 349-373.
- Barzel, Y. and W. Suen (1992) "The Demand Curves For Giffen Goods are Downward Sloping," *Economic Journal*, 102, 896-905.
- Belk, R. (1988) "Possessions and the Extended Self," *Journal of Consumer Research*, 15, 2, 139-168.
- Becker, G. (1991) "A Note on Restaurant Pricing and Other Examples of Social Influences on Price," *Journal of Political Economy*, 99, 5, 1109-1116.
- Berkovitz, E., R. Kerin, S. Hartley (2000) *Marketing*, 6th edition, Irwin/McGraw Hill, p.387.
- Besen, S and J. Farrell (1994) "Choosing How to Compete: Strategies and Tactics in Standardization," *Journal of Economic Perspectives* 8,2, 117-131.
- Betts, P. (2002) "National Hero Bearing the Burden of Success," *Financial Times*, April 11.
- Bikhchandani, S., D. Hirshleifer and I. Welch (1992) "A Theory of Fads, Fashion, Custom, and Cultural Change as Informational Cascades," *Journal of Political Economy*, 100, 5, 992-1026.
- Brewer, M. (1991) "The Social Self: On Being the Same and Different at the Same Time," *Personality and Social Psychology Bulletin*, 17, 475-482.
- Camerer, C. F., and Ho, T.-H (1999) "Experience-weighted attraction learning in games," *Econometrica*, 87, July, 827-874.
- Chao, A. and J. Schor (1998) "Empirical Tests of Status Consumption: Evidence from Women's Cosmetics," *Journal of Economic Psychology*, 19, 107-131.
- Corneo, G. and O. Jeanne (1997a) "Conspicuous Consumption, Snobbism and Conformism," *Journal of Public Economics*, 66, 55-71.
- Corneo, G. and O. Jeanne (1997b) "Snobs, Bandwagons and the Origin of Social Customs in Consumer Behavior," *Journal of Economic Behavior and Organization*, 32, 333-347.
- Dasgupta, P. and E. Maskin (1986) "The Existence of Equilibrium in Discontinuous Economic Games I: Theory," *Review of Economic Studies*, 53, 1, 1-26.
- Dierker, E. (1974) "Two Remarks on the Number of Equilibria of an Economy," *Econometrica*, 40, 951-953.
- Dwyer, G. (1981) "Are Expectations of Inflation Rational? Or, is Variation of the Expected Real Interest Rate Unpredictable," *Journal of Monetary Economics*, 8, 59-84.
- Farrell, J. and G. Saloner (1985) "Standardization, Compatibility and Innovation" *RAND Journal of Economics* 16, Spring, 70-83.
- Frank, R. (1985) "The Demand for Unobservable and other Non Positional Goods," *American Economic Review*, 75, 101-116.
- Fromkin, H. and C. Snyder (1980) "The Search for Uniqueness and the Valuation of Scarcity," in *Social Exchange: Advances in Theory and Research*, ed. K. Gergen et al., NY: Plenum, 57-75.
- Fudenberg, D. and J. Tirole (2000) "Customer Poaching and Brand Switching," *RAND Journal of Economics*, 31, 4, 634-657.
- Garner, C. (1982) "Experimental Evidence on the Rationality of Intuitive Forecasters," *Research in Experimental Economics*, 2, 113-128.

- Groth, J. and S. McDaniel (1993) "The Exclusive Value Principle," *Journal of Consumer Marketing*, 10, 1, 10-16.
- Grubb, E. and H. Grathwohl (1967) "Consumer Self-Concept, Symbolism and Market Behavior: A Theoretical Approach," *Journal of Marketing*, 31, 22-27.
- Heiner, R. (1974) "A Reformulation of the Law of Demand," *Economic Enquiry*, 12, 577-583.
- Hicks, J. (1946) *Value and Capital*, Oxford University Press.
- Holt, C. (1995) "Industrial Organization: A Survey of Experimental Literature," in *The Handbook of Experimental Economics*, Ed.s J. Kagel and A. Roth, p.361.
- Iyer, G. and D. Soberman "Markets for Product Modification Information," *Marketing Science*, 19, 3, 203-225.
- Jones, S. (1984) *Economics of Conformism*, Oxford: Blackwell.
- Katz, M. and C. Shapiro (1994) "Systems Competition and Network Effects," *Journal of Economic Perspectives* 8,2, 93-115.
- Kolstad, C. and L. Mathiesen (1987) "Necessary and Sufficient Conditions for Uniqueness of a Cournot Equilibrium," *Review of Economic Studies*, 54, 681-690.
- Leibenstein, H. (1950) "Bandwagon, Snob, and Veblen Effects in the Theory of Consumer Demand," *Quarterly Journal of Economics*, 64, 183-207.
- Leiderman, L. (1980) "Macroeconomic Testing of Rational Expectations and Structural Neutrality in the United States," *Journal of Monetary Economics*, 6, 69-82.
- Lynn, M. (1991) "Scarcity Effect on Value: A Quantitative Review of the Commodity Theory Literature," *Psychology and Marketing*, 8, 43-57.
- Milgrom, P. and J. Roberts (1986) "Price and Advertising Signals of Product Quality," *Journal of Political Economy*, 94, 796-821.
- Milnor, J. (1965) *Topology From the Differentiable Viewpoint*, Princeton University Press, Princeton, N.J.
- Mishkin, F. (1981) "Are Market Forecasts Rational?" *American Economic Review*, 71, 295-306.
- Nagel, T., and R. Holden (2002), *The Strategy and Tactics of Pricing*, Prentice Hall, USA.
- Naylor, R. and M. Cripps (1993) "An Economic Theory of the Open Shop Trade Union," *European Economic Review*, 37, 1599-1620.
- O'Neill, B. (1987), "A Non-metric Test of the Minimax Theory of Two-person Zerosum Games," *Proceedings of the National Academy of Science*, 84, 2106-2109.
- Perreault, W. and E. McCarthy (2000) *Essentials of Marketing: A Global Approach*, 8th Edition, Irwin/McGraw Hill, p. 410.
- Rajiv, S., S. Datta and S. Dhar (2002) "Asymmetric Store Positioning and Promotional Advertising Strategies: Theory and Evidence," *Marketing Science*, 21, 1, 74-96.
- Rapoport, A. and R. B. Boebel (1992), "Mixed Strategies in Strictly Competitive Games: A Further Test of the Minimax Hypothesis," *Games and Economic Behavior*, 4, 261 - 283.
- Rao, A. and K. Monroe (1989) "The Effect of Price, Brand Name, and Store Name on Buyers' Perceptions of Product Quality: An Integrative review," *Journal of Marketing Research*, 26, 351-357.
- Reinganum, J. (1985) "Innovation and Industry Evolution," *Quarterly Journal of Economics*, February, 81-99.



- Romer, D. (1984) "The Theory of Social Custom: A Modification and Some Extensions," *Quarterly Journal of Economics*, 98, 717-727.
- Rosen, R. (1991) "Research and Development with Asymmetric Firm Sizes," *RAND Journal of Economics*, 22,3, 411-429.
- Ross, L., G. Bierbrauer and S. Hoffman (1975) "The Role of Attribution Processes in Conformity and Dissent: Revisiting the Asch Situation," *American Psychologist*, 31, 148-157.
- Samuelson, P. (1983) *Foundations of Economic Analysis*, Enlarged Edition, Harvard University Press.
- Schmalensee, R. (1976) "An Experimental Study of Expectation Formation," *Econometrica*, 44, 17-41.
- Simonson, I. and S. Nowlis (2000) "The Role of Explanations and Need for Uniqueness in Consumer Decision Making," *Journal of Consumer Research*, 27, 49-68.
- Smith, V. (1982) "Markets as Economizers of Information: Experimental Investigation of Hayek's Hypothesis," *Economic Inquiry*, 20, 165-179.
- Smith, V., G. Suchanek and A. Williams (1988) "Bubbles, Crashes and Endogenous Expectations in Experimental Spot Asset markets," *Econometrica*, 56, 1119-1151.
- Snyder, C. (1992) "Product Scarcity by Need for Uniqueness Interaction: A Consumer Catch-22 Carousel?" *Basic and Applied Social Psychology*, 13, 9-24.
- Sun, W. and J. Lull (1986) "The Adolescent Audience for Music Videos and Why they Watch," *Journal of Communication*, 36, 1, 115-125.
- Sunder, S. (1995) "Experimental Assets Markets: A Survey," in *The Handbook of Experimental Economics*, Eds. J. Kagel and A. Roth, Princeton University Press.
- Takayama, A. (1985) *Mathematical Economics*, 2nd edition, Cambridge University Press.
- Veblen, T. (1899) *The Theory of Leisure Class: An Economic Study of Institutions*, Unwin Books, London.
- Williams, A. (1987) "The Formation of Price Forecasts in Experimental Markets," *Journal of Money, Credit and Banking*, 19, 1-18.
- Worchel, S., J. Lee and A. Adewole (1975) "Effects of Supply and Demand on Ratings of Object Value," *Journal of Applied Social Psychology*, 32, 906-914.
- Zikmund, W. and M. d'Amico (1998) *Marketing*, 6th Edition, South-Western College Publishing.

**Table 1: Value Distribution for the Empirical Model – Study 1 (Monopoly)**

	$S_1^A$	$S_2^A$	$S_3^A$	$S_4^A$	$S_5^A$	$S_6^A$	$S_7^A$	$S_8^A$	$S_9^A$	$S_{10}^A$
Type A	2	3	4	5	6	9.5	10.1	10.6	11.2	11.4
	$S_1^B$	$S_2^B$	$S_3^B$	$S_4^B$	$S_5^B$	$S_6^B$	$S_7^B$	$S_8^B$	$S_9^B$	$S_{10}^B$
Type B	0.1	0.2	0.5	0.55	0.7	1.5	2	2.5	3.5	5

**Note:**  $S_j^i$  refers to Subject  $j$  of type  $i$ .

**Table 2: Mean Demand – Study 1 (Monopoly)**

	Type A Buyers (Snobs)				Type B Buyers (Followers)			
Price	Actual Demand			Prediction	Actual Demand			Prediction
	Group 1	Group 2	Both		Group 1	Group 2	Both	
5.9	1.33	1.93	1.53	1	9.03	9.2	9.12	10
6.9	3.43	3.70	3.57	4	2.90	3.26	3.08	2

**Table 3: Mean Expected Demand – Study 1 (Monopoly)**

	Type A Buyers (Snobs)				Type B Buyers (Followers)			
Price	Expected Demand			Prediction	Expected Demand			Prediction
	Group 1	Group 2	Both		Group 1	Group 2	Both	
5.9	1.40	1.86	1.63	1	8.82	7.35	8.08	10
6.9	3.56	3.20	3.38	4	3.17	3.86	3.52	2

**Table 4: Value Distribution for the Empirical Model– Study 2 (Duopoly)**

		$S_1^A$	$S_2^A$	$S_3^A$	$S_4^A$	$S_5^A$	$S_6^A$	$S_7^A$	$S_8^A$	$S_9^A$	$S_{10}^A$
Type A	Product 1	22	21.5	21	20.4	20.2	19.8	19.6	19.2	18.8	18
	Product 2	18	18.5	19	19.6	19.8	20.2	20.4	20.8	21.2	22
		$S_1^B$	$S_2^B$	$S_3^B$	$S_4^B$	$S_5^B$	$S_6^B$	$S_7^B$	$S_8^B$	$S_9^B$	$S_{10}^B$
Type B	Product 1	23	21.4	20.8	20.4	20	19.6	19.2	18.8	18.4	17.6
	Product 2	17	18.6	19.2	19.6	20	20.4	20.8	21.2	21.6	22.4

**Note:**  $S_j^i$  refers to Subject  $j$  of type  $i$ .

**Table 5: Mean Demand – Study 2 (Duopoly)**

	Type A Buyers (Snobs)				Type B Buyers (Followers)			
Price	Actual Demand			Prediction	Actual Demand			Prediction
	Group 1	Group 2	Both		Group 1	Group 2	Both	
5	4.07	3.80	3.93	3	8.77	6.43	7.60	9
7	5.63	5.43	5.53	7	3.40	2.43	2.92	1

**Table 6: Mean Expected Demand – Study 2 (Duopoly)**

	Type A Buyers (Snobs)				Type B Buyers (Followers)			
Price	Expected Demand			Prediction	Expected Demand			Prediction
	Group 1	Group 2	Both		Group 1	Group 2	Both	
5	4.72	4.18	4.45	3	8.33	6.29	7.31	9
7	5.73	5.53	5.63	7	3.80	3.16	3.48	1

Figure 1

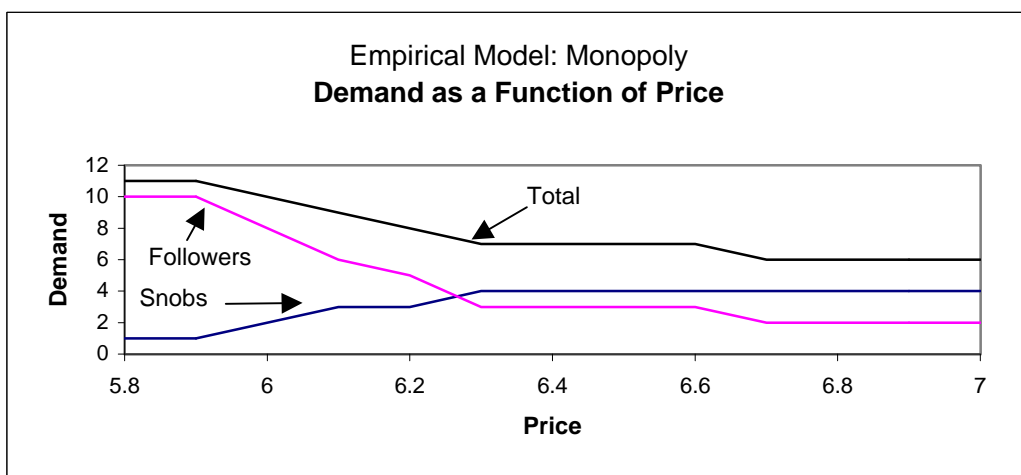


Figure 2

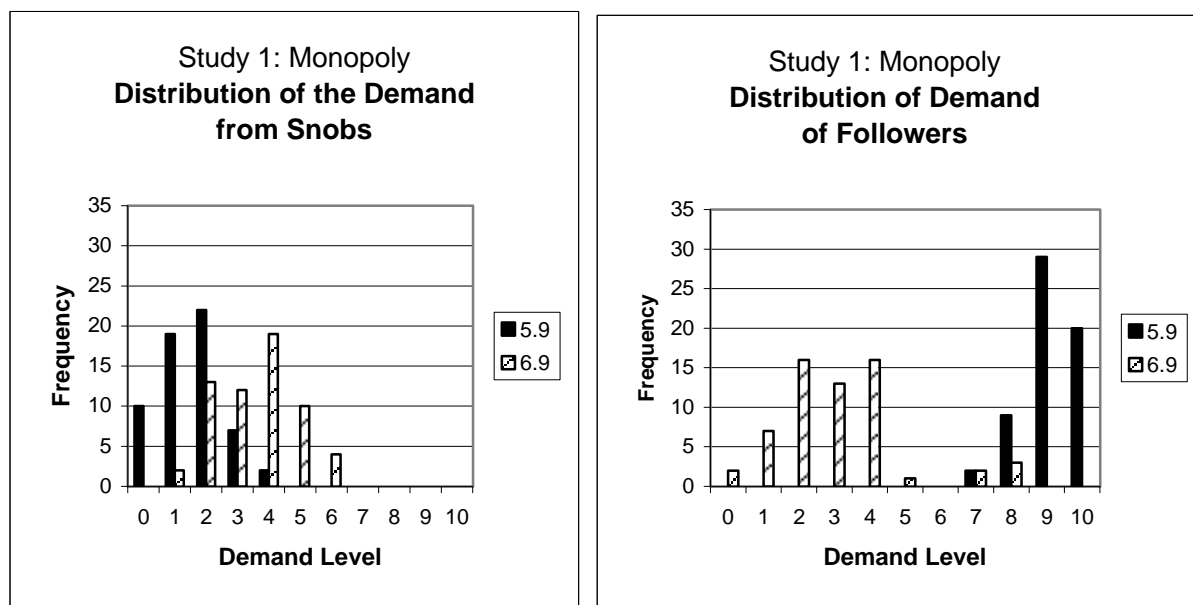


Figure 3

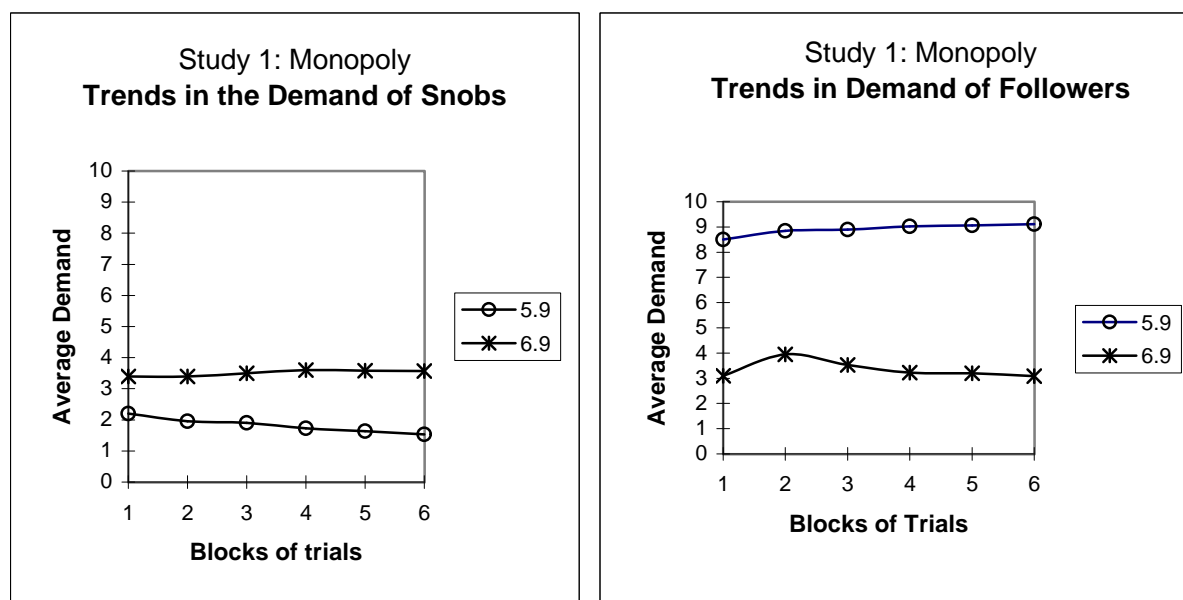


Figure 4

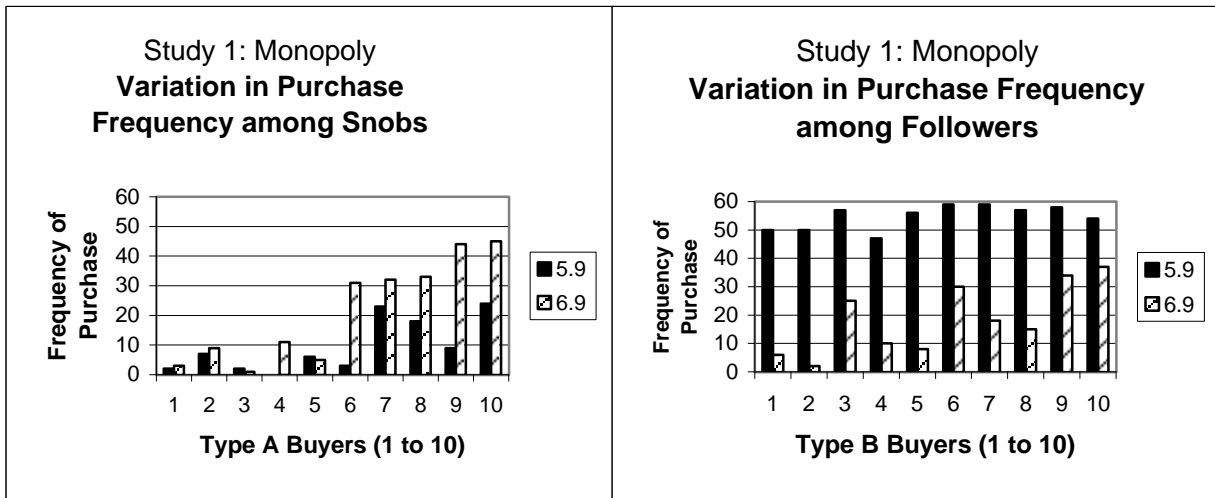


Figure 5

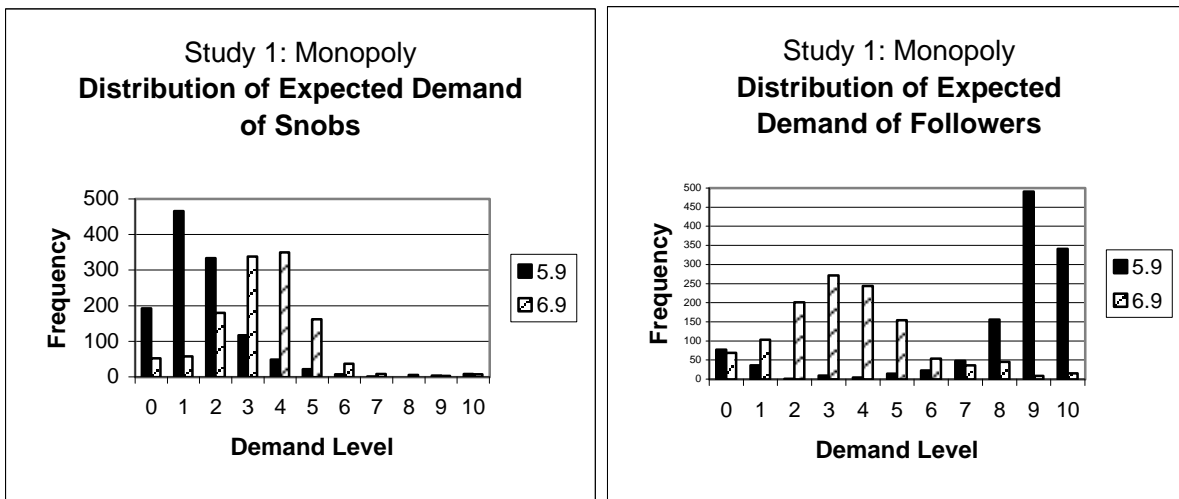


Figure 6

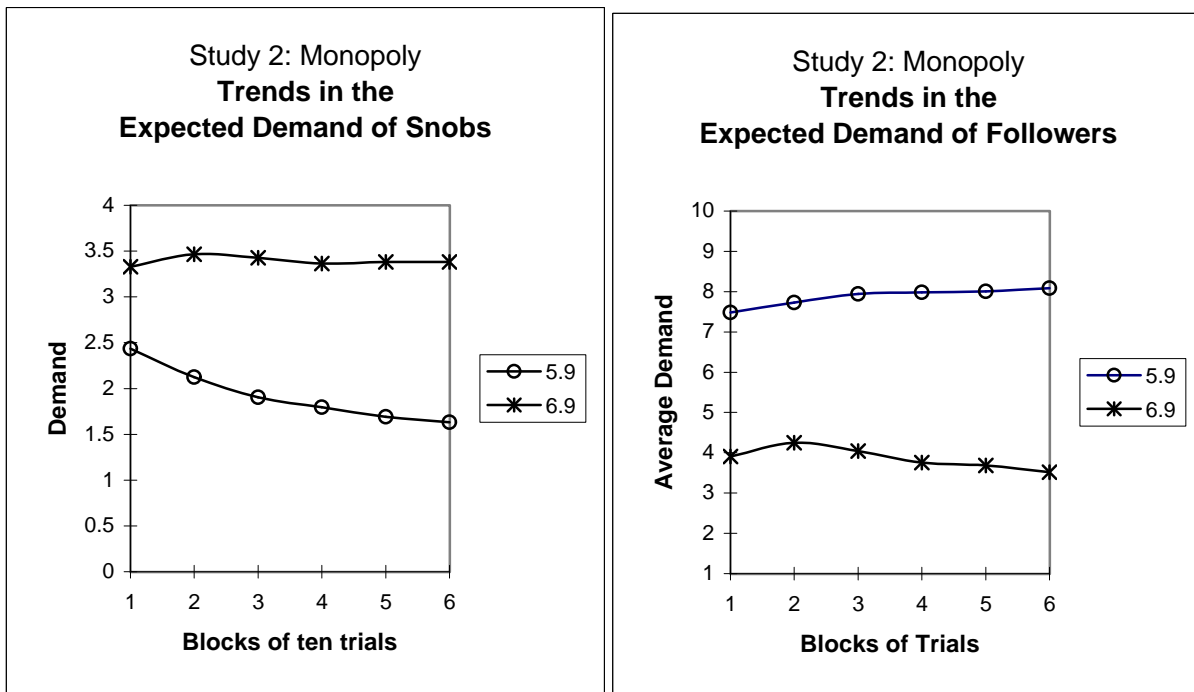


Figure 7

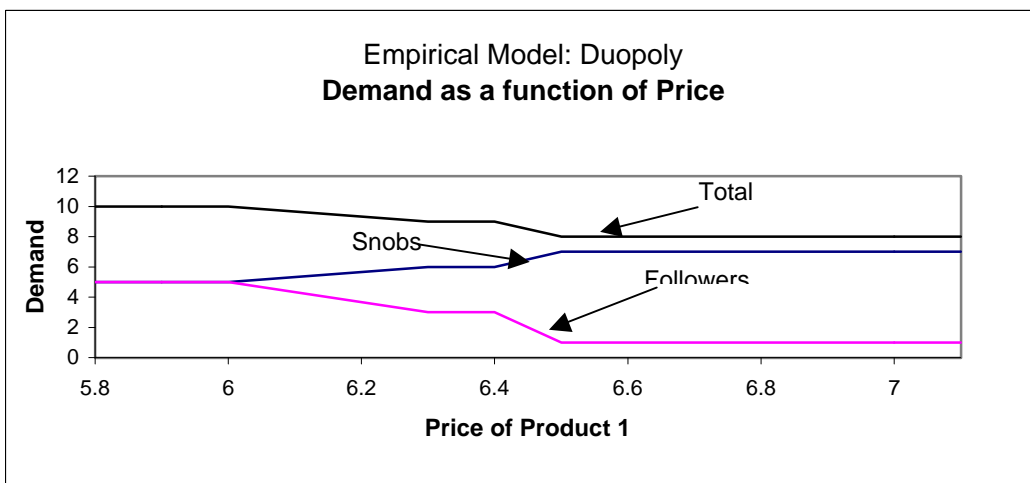


Figure 8

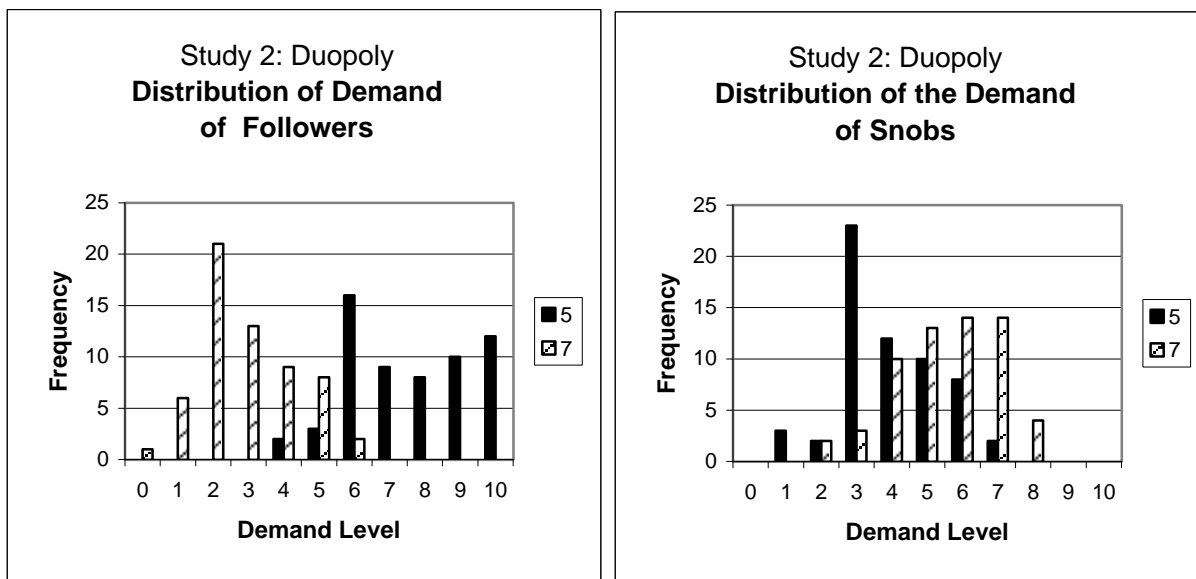


Figure 9

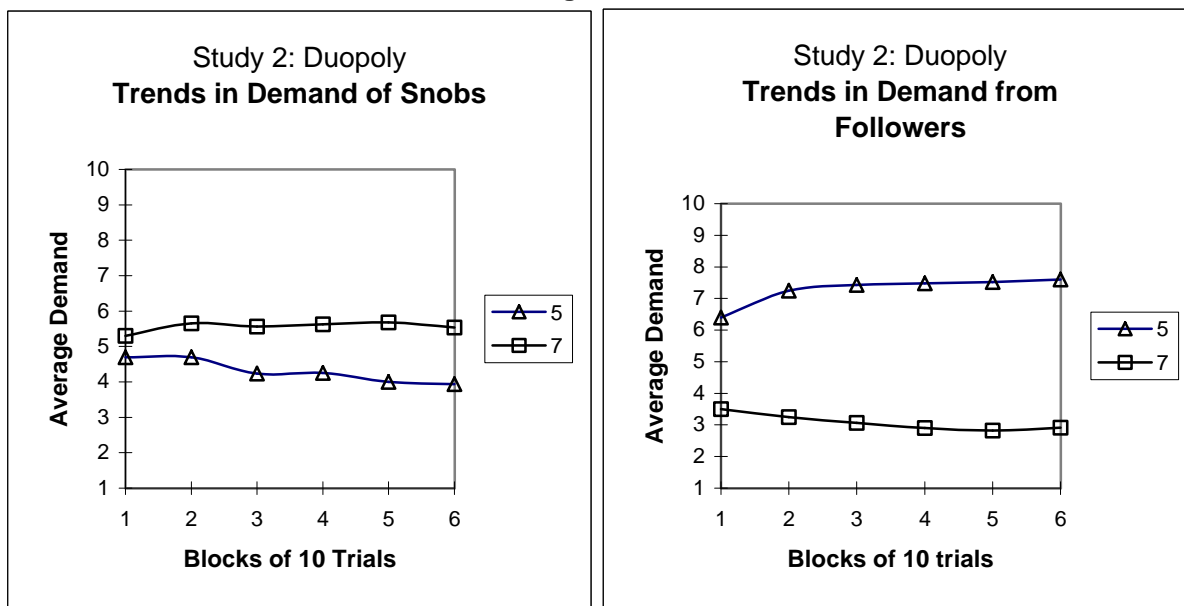


Figure 10

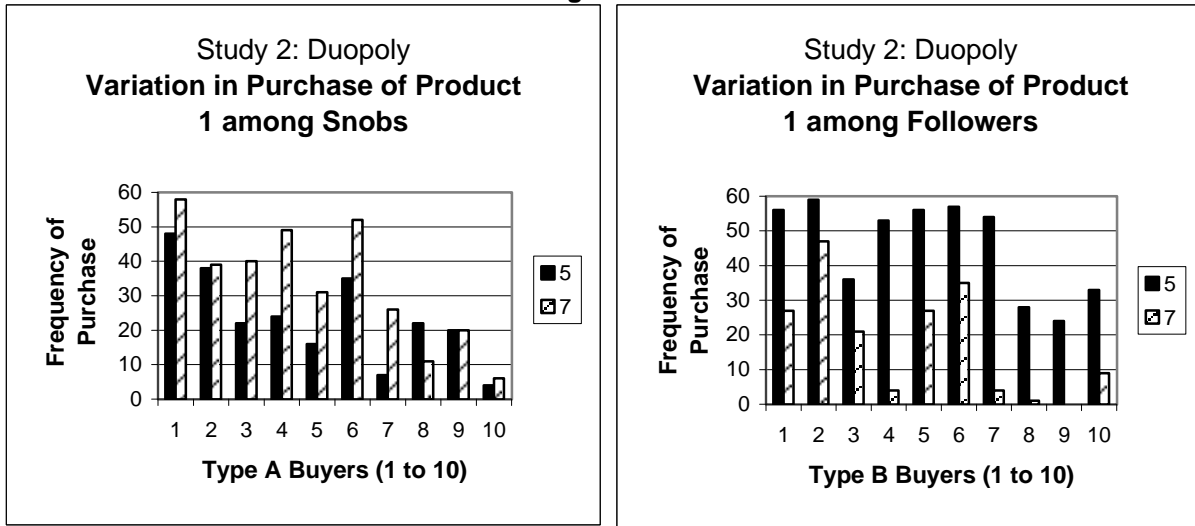


Figure 11

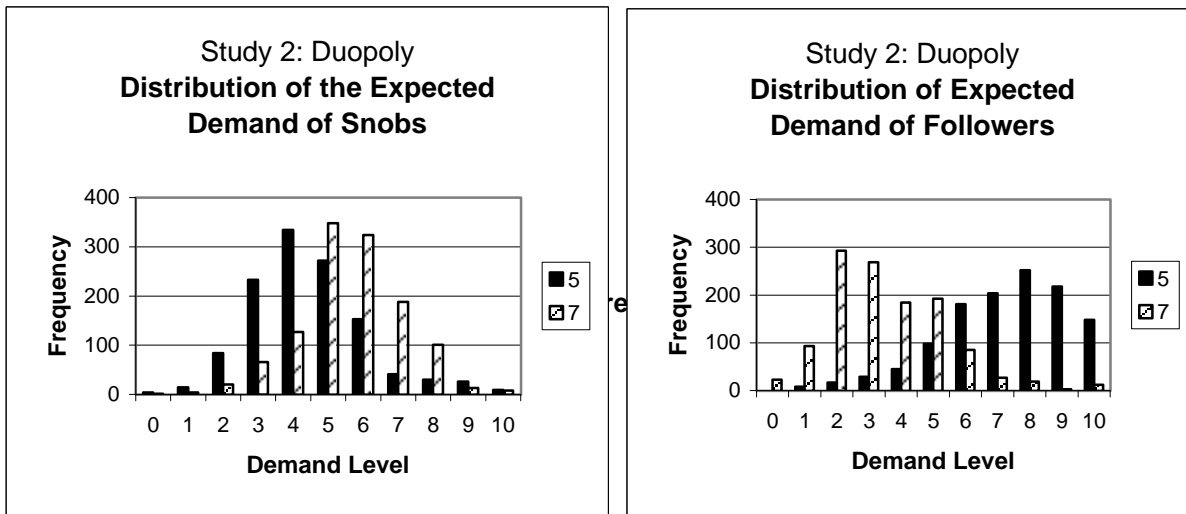


Figure 12

