A THEORY OF CONSPICUOUS CONSUMPTION

Anchada Charoenrook* and Anjan Thakor**

* The Owen Graduate School of Management, Vanderbilt University, 401 21st Avenue South, Nashville, TN 37203, Email: anchada.charoenrook@owen.vanderbilt.edu

** John E. Simon Professor of Finance, Olin School of Business, Washington University in St. Louis, 1 Brookings Drive, St. Louis, MO 63130-4899.
A THEORY OF CONSPICUOUS CONSUMPTION

Abstract-This paper explains why some goods are purchased for conspicuous consumption at prices significantly above producers’ marginal costs. Moreover, it also explains the choice of goods that qualify for “conspicuous consumption” status. These results are obtained by modeling conspicuous consumption as a signaling game in which wealthy individuals signal their wealth to society in order to obtain higher social status. Conspicuous consumption is constrained by a discrete cost of display. This cost can be interpreted as arising from limited physical space, limited time for display, or both. We show that signaling by consuming a high-priced good can arise under general single-crossing property assumptions. We also derive the conditions under which consumers signal using price rather than quantity. Results show that the higher the cost of display, the more likely is the consumer to signal by purchasing high-price conspicuous goods. Moreover, the lower the free display space and time available, the higher the equilibrium price of the conspicuous-consumption good. Finally, it is shown that goods with higher variability of innate consumption utility in the cross-section of consumers are accepted as conspicuous goods at higher prices that those with lower variability.

Key words: Game theory, Signalling game, Asymmetry of information

JEL classification code: C70, M37
A THEORY OF CONSPICUOUS CONSUMPTION

“If you have to ask how much it costs, you can’t afford it.”

Anonymous

1. INTRODUCTION

Conspicuous consumption is generally regarded as the purchase of expensive “luxury” goods whose functional advantage, if any, over their “non-luxury” counterparts is insufficient to warrant the price premium. The demand for these goods is hard to explain. Yet, over the last decade, the market for these goods has experienced tremendous growth, being recently estimated at over $60 billion (see Dubois and Duquesne (1993) and Cuneo (1996))\(^1\). Furthermore, such goods are often supported by high levels of producer advertising that promotes them as “status symbols” for wealthy people. The purpose of this paper is to explain various aspects of this conspicuous consumption phenomenon.

A behavioral explanation for conspicuous consumption was provided by Veblen (1899) in his famous theory of “the leisure class”. In his words, “In order to gain and hold the esteem of men, it is not sufficient merely to possess wealth or power. The wealth or power must be put in evidence, for esteem is only rewarded on evidence.” Veblen suggested that one possible way to provide evidence of wealth was through conspicuous consumption. Following Veblen, we define a conspicuous good as a good whose consumption is visible by everyone in the economy. The “Veblen effect,” hereafter also referred to as conspicuous consumption, is the act of conspicuously consuming and displaying a good purchased at a significantly higher price than the producer’s

\(^1\) These goods include perfume, watches, shoes, luxury cars, wine, champagne, clothes, etc.
Veblen’s conjecture raises two important questions: (1) Is it possible to develop a formal theory with rational behavior in which conspicuous consumption credibly signal wealth and enhances social status in an equilibrium with free entry by producer? (2) Which goods qualify for conspicuous consumption? Three strands of the literature have tried to provide answers to the first question. The first assumes that an individual’s utility is directly increased by paying a higher price (see Bruan and Wicklund (1989) and Creedy and Slottje (1991)). However, this approach fails to explain why individuals prefer high prices, and is not entirely consonant with Veblen’s view that individuals want luxury goods for status rather than any intrinsic satisfaction from paying high prices. The second explains the demand for monopolistically-supplied fashion goods (Pesendorfer (1995)). But it cannot explain why conspicuous goods exist in a competitive market, such as the markets for luxury cars or watches.

The third strand formalizes Veblen’s intuition in the context of signaling through conspicuous consumption as a means to elevate social status. What is different here is the assumptions that firms are in a competitive market and utility is a direct function only of social status and not of price. Although price can enhance social status in equilibrium, this relation is derived rather than assumed. However, generalizing Veblen effects in a plausible signaling model of conspicuous consumption in a competitive market is not easy since the expenditure on high-priced conspicuous goods could be made instead on consuming large quantities of other similar goods purchased at producers’ marginal cost. In fact, in the simplest models of conspicuous consumption (e.g. Ireland (1992)), the standard single-crossing-property assumption of signaling models is satisfied, but above-marginal-cost prices for goods do not come about in equilibrium. In an important con-
tribution, Bagwell and Bernheim (1996) also confirm that Veblen effect does not arise when the single-crossing-property holds, but it does arise when the utility function satisfies a more restrictive “tangency condition.” The restrictive nature of this condition is recognized by Bagwell and Bernheim who noted: “Indeed, the conditions require to generate Veblen effects may strike the reader as implausible” (Bagwell and Bernheim (1996), p. 364). 2.

The second question regarding which goods qualify for conspicuous consumption has not been addressed. Thus, our objectives in this paper are twofold. First, we wish to examine if the first question about conspicuous-consumption-based signaling in a market with free entry can be answered in the affirmative without violating the single crossing-property condition. Second, we wish to explore the characteristics of goods that are chosen for conspicuous consumption. We study conspicuous consumption by using a two-stage signaling game and derive the price-consumption relationship endogenously. 3. We depart from the existing literature by formally recognizing that the act of consuming conspicuously requires display space which is limited, costly, and lumpy. This allows us to address both our goals.

To see the basic ideas in our theory, suppose Mr. Jones has suddenly come upon a lot of wealth and would like to raise his social status by credibly communicating this to others. If consumption is how Mr. Jones wishes to signal his wealth, he will have to make this consumption conspicuous. This requires physical space and social opportunities for displaying the consump-

2. Bagwell and Bernheim give three examples that would generate the tangency conditions. They include 1. personal bankruptcy, 2. tax deductible expenses for high-priced luxury goods, 3. the utility of the consumer includes some added value to “acting rich.” None of these are characteristics of the luxury-goods market or its participants.

3. Another paper dealing with pricing in reputation-goods markets is Becker (1991). Becker’s work is tangential to ours in that he seeks to explain why restaurant owners or sports organizers do not increase their prices and reduce demand when there is excess demand. Becker’s explanation is that there is value to purchasing things that are sought after by a large number of people, i.e., customers flock to a popular restaurant because they see a lot of other customers there.
tion; we refer to the combination of these two as display units. Since the display units available to Mr. Jones are naturally limited, he incurs display costs. For example, Mr. Jones can drive only one Mercedes-Benz car at a time or display only a limited number in his garage. He can increase his garage space, but this is costly. Moreover, just increasing his garage space may not suffice. Mr. Jones also needs social interaction opportunities that allow others to observe his conspicuous consumption. Such opportunities are limited by time constraints, and may be expensive to expand. Finally, social norms may constrain the amount of time available for displaying conspicuous consumption or the number of conspicuous goods purchased. Beyond a point, conspicuous consumption may be considered rather garish --or even boorish-- and may fail to improve social status.

Now, Mr. Jones recognizes that the display cost function he faces has discrete jumps, i.e., it is a step function. For instance, in order to display a conspicuous good, a physical space large enough to accommodate at least one whole unit of the good is required. When a conspicuous good is discrete, the display cost is also discrete. Moreover, when a conspicuous good is infinitely divisible, such as wine, the good is generally sold in discrete quantities, such as a glass or a bottle of wine. Thus, it may cost Mr. Jones the same amount to display consumption of any number of the first \( N \) units of a conspicuous good, but the \( N+1^{st} \) unit may incur a significant added cost since conspicuous goods as well as display units are lumpy. Fine wine comes only in bottles, and displaying even one bottle requires a wine rack placed in a visible place in the house or a wine cellar that Mr. Jones will be sure to tell his friends about. The smallest wine rack available may have a display capacity of ten bottles, so it costs just as much to display ten bottles as it does to display

4. The existing literature (Bagwell and Bernheim (1996)) sidesteps display limitations by arguing that one can always add more expensive conspicuous goods in the space and time available, e.g., use an Armani suit with a Rolex watch while driving a Mercedes-Benz. However, the following are worth noting: 1) If a consumer with finite resources expends sufficiently large wealth on conspicuous consumption, then binding constraints on the time and space to display this consumption are inevitable. 2) Different conspicuous goods have different display unit requirements. They should not be treated as perfect substitutes. 3) In many cases, additional display space can be purchased at a cost, e.g., the consumer can acquire additional parking space at a price.
one. However, to go from ten to one hundred bottles may require a small wine cellar, and this will cost much more than a wine rack.

How much Mr. Jones’ social status increases depends on the signal emitted by his total expenditure on conspicuous consumption rather than on the quality or quantity of the goods purchased. Mr. Jones’ choice problem thus involves two alternatives. One is to buy a large quantity of a non-conspicuous good priced at marginal cost. In this case, he avoids paying a premium on every unit, but he must buy a lot of units to attain a desired total expenditure level, which drives up the display cost.

The other alternative is to buy conspicuous goods at above marginal cost. This means paying a premium on every unit, but purchasing fewer units to reach the desired total expenditure while paying a lower display cost. In choosing between these two alternatives, Mr. Jones must therefore trade off the higher display cost in the first alternative against the higher price of the conspicuous good in the second. That is, Mr. Jones will prefer to stock his wine cellar with “cheap” (price equals marginal cost) wine if the cost differential between a wine cellar and a wine rack is relatively low, and will prefer to display ten bottles of “expensive” (price significantly above marginal cost) wine if a wine cellar costs sufficiently more than a rack. In the latter case, a signaling equilibrium involving the purchase of a conspicuous good arises even when nothing more than the single-crossing-property condition is satisfied.

In this framework, there is a duality between signaling through the display unit and signaling through the good that is displayed. What is important is that the cost attributes of the display unit affect whether the good displayed in it is a conspicuous good, and its price. A contribution of our research is to show that the inclusion of the display cost associated
with “showing off” consumption can supplant the difficult-to-justify tangency condition of Bagwell and Bernheim (1996) in rationalizing conspicuous consumption. The use of a display cost function with discrete jumps is also a departure from the “money burning” signaling models in the dividend literature (e.g. Bernheim (1991)). These models require the cost functions of the signal-sender of different types to cross at least once over the range of the function. Unlike our analysis, the wealth-dissipating equilibrium in these models arise only as a result of the violation of the single-crossing-property condition.

A second distinguishing contribution of our work is that we explore the characteristics that determine which goods qualify for signaling-motivated conspicuous consumption. Since a particular display cost may be associated with many goods, which good is chosen for conspicuous consumption in equilibrium and at what price? This question is not addressed in any of the existing studies. To understand this, consider two goods: wine and bottled water. It is natural to imagine that there is greater cross-sectional variability when it comes to how much intrinsic utility rational people get from drinking wine than from drinking water. Suppose the cross-sectional distribution of utilities for a bottle of water has a monetary equivalent of a uniform distribution of [2,5] and for a bottle of wine it is [0.5,400]. And consider three people whose intrinsic utilities of consuming water and wine respectively are the following: Mr. Jones (3,400), Mr. Smith (2,300), and Ms. Lane (5,200). Suppose that in the spirit of our earlier discussion about boorishness in conspicuous consumption, there is a chance that any of these people is “crazy” (irrational), and there is no social status accorded to such people, no matter how wealthy they are. This means that

5. As an example, although some may be able to afford both, many people may have to choose between building a very large house and building a smaller house that is decorated with expensive furnishings in order to signal their wealth.

6. This indeterminacy is acknowledged by Bagwell and Bernheim (1996) who state: “Thus our theory does not explain which durable conspicuous goods households will choose as signals.”
anyone willing to pay more than $5 for a bottle of water or more than $400 for a bottle of wine will be viewed as being irrational and forego social status.

Suppose these three people wish to spend $4,000 each on something that they can drink, and want their expenditure to signal their wealth. Each person’s total utility is realized from the intrinsic utility of drinking and the social status from displaying consumption. And suppose the utility obtained from this social status has a monetary value of $100. When a bottle of wine is priced at $400, Mr. Jones and Mr. Smith will signal by purchasing ten bottles wine. But Ms. Lane will buy generic water and wine at her reservation utility prices, and will not display her consumption. That is, she will not signal because the price per bottle of wine she has to pay to avoid paying the display cost and still signal is $400, which is larger than the total utility she receives from its intrinsic utility value plus its signaling benefits. Bottled water will not be used for conspicuous consumption at prices above $5.

We analyze the general case and show that goods with higher upper bounds of the cross-sectional variability in the associated “innate” consumption utilities (unrelated to signaling motives) are accepted as conspicuous goods at higher prices than those with lower upper bounds. When goods have the same utility mean, goods with higher cross-sectional variability (utility spread) are chosen. To maximize their rents, producer firms are more likely to promote goods with higher utility spreads for conspicuous consumption. We also show that conspicuous consumption should be greater in economies with larger cross-sectional wealth disparities. Thus, in addition to rationalizing conspicuous consumption, the analysis generates testable predictions that could be used to refute the model.

The predictions of our model seem to be in line with anecdotal evidence, although their
merits can ultimately be judged only through careful empirical analysis. First, it is not hard to find examples of the result that price can be a powerful signal of exclusivity for those who engage in conspicuous consumption to advertise their wealth. For example, Waldman and Sherer (1997), in describing conspicuous consumption in Thailand, quote a Thai businessman, Mr. Surapong: “When you are a businessman, if you can afford expensive things, that means you have good credit. A businessman should have a Rolex, a good car, nice clothes.” Another example is provided by the *Economist* (1993), “Priced at FFr 1,150 ($215), the Hermes silk scarf, favored by such upmarket icons as Queen Elizabeth, is no bargain. No matter. In the week before Christmas, one is sold every 24 seconds.” In providing numerous other examples of conspicuous consumption, the *Economist* (1993) noted that “the essence of a luxury good is its exclusivity...[r]etailers can damage a glamorous good’s reputation by selling it too cheaply.”

Second, there also seem to be examples of our result that the greater the restrictions on the space and time available for displaying conspicuous consumption, the higher is the equilibrium price of the good. Due to space limitations, one needs to purchase a “certificate of entitlement” before one can buy a car in Singapore, and there are restrictions on the number of cars one can own. Our model predicts that luxury cars should sell at higher prices there than in the U.S., for example. The anecdotal evidence supports this.

Third, our result that goods with high utility spreads are more likely to qualify for conspicuous consumption is echoed in the following quote from the *Economist* (1993, p.98), “... because watches are the one sort of luxury good that has what the marketers at Cartier smilingly describe as a ‘functional alibi’."

Finally, our model also suggests that conspicuous consumption should be greater in econo-
mies with larger wealth disparities cross-sectionally. This implies greater conspicuous consumption in Southeast Asia than in Sweden. For example, the Crossborder Monitor (1996) states, “In Taiwan, growth in private consumption will be led by luxury goods.”

The remainder of this paper is organized as follows. Section 2 describes the basic model. In Section 3, we present the analysis of the signaling equilibrium. Section 4 contains our examination of what determines which good qualifies for conspicuous consumption. Section 5 concludes.

2. THE MODEL

In our model, the economy has three agents: firms that produce the product, consumers, and social contacts. The game is divided into two stages. In the first stage, which corresponds to period zero, firms produce goods and set their prices per unit quality of goods in a competitive market. Unless explicitly stated otherwise, the word “price” is used synonymously with price per unit quality, and the word nominal price is the monetary price of the good. The second stage is a three-period signaling game. The consumer is a sender who has private information about his type which corresponds to his wealth and future cash flow. In the first period, given the products and their prices, the consumer chooses the consumption bundle (expenditure level and price of each good) that maximizes his utility. The consumption level and the price of conspicuous goods are observable to the public, and constitute the consumer’s signal. In the second period, upon observing the signal, the social contact chooses a response, represented by social status given to the consumer. In the third

7. For example, Waldman and Sherer (1997) describe conspicuous consumption in Thailand with the following: “The code of consumption is as strict for university students, most of whom have never earned a baht in their lives. Many Thai parents will defer needed family purchases, Thais say, to ensure their children’s social status. “What you buy for your kids enhances your reputation,” says Mr. Natayada, the anthropologist.”

8. Marketing Week (1996) states that “After Japan, Korea is one of Asia’s richest markets with over 40 million consumers reaching for middle-class material goals. In the first 7 months of this year, imports of luxury goods, such as passenger sedans, consumer electronics and cosmetics reached $3.77 billion, or 43.8% of imported consumer goods. Additionally, foreign cars have achieved visibility on the streets for the first time.”
period, the game ends and the social contact obtains a fraction of the consumer’s future cash flow. Thus, this is a game in which the privately-informed consumer moves first, and the \emph{a priori} uninformed social contact responds. A description of the game is summarized in Table 1, and the economic agents are described in the following subsections.

\textbf{Table 1 goes here}

\section*{2.1. The producer firms}

Firms produce the (non-conspicuous) \emph{standard} good Z and the \emph{conspicuous} good X. The goods X and Z are functionally identical except that the consumption level of good X, which includes its nominal price, quality, and the amount consumed, is publicly observable, but the consumption level of Z is observed only privately by the consumer. Firms produce their products under the same production technology, sell their products to consumers in a competitive market, and maximize their profits, given the market structure. Denote the nominal price (not price per quality) and the quality of good X by $P$ and $q$, respectively. The price (per quality) is $p \equiv \frac{P}{q}$. Let the marginal cost of producing either X or Z be $p$. Since the firms compete under the usual conditions that produce an equilibrium price equal to marginal cost for the standard good, the price of Z is $p$. The price of the conspicuous good X is denoted by $p > 0$, and $p \in [p, \tilde{p}]$. For ease of exposition, $\tilde{p}$ is assumed to be a large, but finite number.

\section*{2.2 The consumer}

There are two types of consumers, $i$, the high type and the low type, denoted by H and L respectively, $i \in \{H, L\}$. The high type is endowed with current resources $R_H$ and with an equal amount of future cash flow in period 3. Similarly, the low type is endowed with an equal
amount of resources and future cash flow of $R_L$, where $R_H > R_L$. The prior probability that a consumer is of type $H$ is $\theta \in (0, 1)$, and this is common knowledge. The consumer himself is the only one who knows his type precisely.

Each consumer allocates his current resource to the consumption of goods $Z$ and $X$. The consumption decision variables of the consumer are: (1) the quantity of good $X$, denoted by $\hat{x}$, (2) the price per unit quality of $X$, denoted by $p$, (3) the quantity of good $Z$, denoted by $\hat{z}$, and (4) the quality of both goods which are equal and is denoted by $q$. Only $\hat{x}$, $p$, and $q$ are public information. It is assumed that the quantity and the quality of a good are substitutable in a multiplicative manner such that the utility function depends only on their products $x \equiv \hat{x}q$ and $z \equiv \hat{z}q$. If either quantity or quality is zero, the consumer receives no utility consuming it.

The utility function of a consumer $i$ is given by

$$W_i(x, p, z, \rho) = U(x, xp, z, R_i) + \rho(xp) - C(x) + \beta[R_i - D(i, xp)] \quad \forall i \in \{H, L\} \quad (1)$$

where $U$ is the direct utility of consuming goods $x$ and $z$ respectively, with

$$\frac{\partial}{\partial x}U(x, xp, z, R_i) > 0 \quad \forall z, R_i, xp, \quad \frac{\partial}{\partial (xp)}U(x, xp, z, R_i) < 0 \quad \forall x, R_i, z,$$

and $\frac{\partial}{\partial z}U(x, xp, z, R_i) > 0 \quad \forall x, R_i, xp$. $U$ is increasing in $R_i$. The total expenditure on good $X$ is $\hat{x}P = \frac{x}{q} \times pq = xp$, and we define $s \equiv xp$. The function $\rho(s)$ is the social status that the consumer obtains from signaling his wealth through the total expenditure on conspicuous goods $s$, with $\rho' > 0$. $C(x)$ is the (display unit) cost that arises from consuming conspicuously. This cost is described in detailed in a later section. $\beta \in (0, 1)$ is the discount factor, and $D(i, xp)$ is the benefit that the social contact receives in return for associating with the consumer. The consumer enjoys $R_i - D$, the difference
between the cash flow \( R_i \) and the benefit, \( D \), accruing to the social contact. Throughout, we shall use the convention that \( A(B) \) means \( A \) is a function of \( B \), and \( A[B] \) or \( A\{B\} \) means \( A \) is multiplied with \( B \).

Each consumer respects the resource constraint \( z_p + s \leq R_i \). Since \( U \) is strictly increasing in \( z \), the resource constraint holds with equality, and we can write

\[
W_i(s, \rho, p) = U\left(\frac{s}{p}, s, \frac{R_i - s}{p}, R_i\right) + \rho(s) - \beta[R_i - D(i, s)] \quad \forall i \in \{H, L\} \quad , (2)
\]

### 2.3 Social contacts

Social contacts are representative agents who capture the interaction between society and the signaling consumer. A social contact provides the consumer with social status, \( \rho \), in period 1, in exchange for a payoff \( D(i, s) \) that the social contact receives in period 3. ‘Social status’ for the consumer can include the opportunity to meet affluent people that may lead to business collaborations, networking, preferential treatment by society, or tangible assets. The social contact does not observe the consumer’s wealth directly but can observe the consumer’s consumption choice. Given this, the social contact maximizes her expected profit in a competitive market (there are potentially many social contacts) and earns zero profit in equilibrium.

\[
\rho(s) = \mu(H|s)D(H, s) + \mu(L|s)D(L, s) \quad , (3)
\]

where \( \mu(i|s) \) is the social contact’s assessment of the probability that a consumer is of type \( i \) given that she observes the consumer displaying a consumption level \( s \). We assume that the payoff to the social contact equals a constant \( \gamma < 1 \) of the consumer’s future cash flow. Hence,

\[
D(i, s) = R_i \gamma s = k_i s \quad , \text{where } k \text{ is a constant dependent on the consumer’s type. This linearity}
\]
restriction helps us to endogenously derive $\rho(s)$ rather easily. From (3), we have that:

$$\rho(s) = D(H, s) = k_H s, \text{ if } \mu(H|s) = 1,$$

$$\rho(s) = D(L, s) = k_L s, \text{ if } \mu(H|s) = 0,$$

$$\rho(s) = D(A, s) = k_A s, \text{ if } \mu(H|s) \in (0, 1),$$

(4)

where, $k_A = \gamma[\mu(H|s)R_H + \mu(L|s)R_L]$, the subscript $A$ denotes the average, and $k_H > k_A > k_L$. This function is consistent with Veblen’s assertions that social status is an increasing function of both the wealth of an individual and the amount of wealth he displays; thus, $\rho(s)$ increases with both wealth and consumption.

2.4 The display cost

The display unit is an increasing function of the quantity and the quality of a good. The higher the number of goods, the larger the physical space it requires for display. Also, higher-quality goods sometimes have higher depreciation rates that suggest a higher display cost per unit time. The display cost is a step function. For the first $N$ display units of $X$ there is zero display cost, and then for $x \in (N, 2N)$, it costs a constant $M$ to use the next $N$ display units of good $X$. Then for $x>2N$, it costs another $M$ to use the next $N$ display units, and so on. The cost of display as a function of $x$ is shown in Figure 1. In the limit, where one unit of display equals the display requirement of the good itself, $N = 1$. In general, $N \in \{1, 2, \ldots, \bar{N}\}$ and $\bar{N}$ is finite.

Figure 1 goes here

The display cost is modeled as the sum of $J$ step functions $\Psi(x)$, of height $M$, as
where $\Psi(x)$ is defined as

$$\Psi(x-x_0) = \begin{cases} 
0 & \text{for } x \leq x_0 \\
1 & \text{for } x > x_0
\end{cases}.$$  

The derivative of $\Psi(x)$ exists, and it is a delta function $\delta(x)$ \(^9\). Figure 1 shows the cost of display function and its corresponding derivative. $\delta(x-jN)$ tends to infinity at $jN$ for all $j=1,...,J$. This cost function can be economically interpreted as follows. Suppose we have a block of display units which can accommodate only $N$ display units of goods ($N < \infty$). And suppose additional use of $N$ display units can be purchased at a fixed cost $M$. Then the marginal cost of display, which is equivalent to $\delta(x)$, equals zero for display units 1 through $N$ and it is large and tends to infinity for unit $N+1$. The marginal cost of display of unit $N+2$ is again zero until it reaches $2N$.

### 3. CHARACTERIZATION OF EQUILIBRIA

#### 3.1 Characterization of the isoutility curve and further assumptions

1) It is assumed that the single-crossing-property holds. Therefore, the slope of the isoutility curve for a given price, obtained from differentiating (2) and using (4), is

$$\frac{dp}{ds} = \frac{1}{[1-\beta]k_i} \left[ -\frac{\partial}{\partial s} U(\frac{s}{p}, \frac{R_i - s}{p}, R_j) + \frac{1}{p \partial s} C(x) \right], \quad \forall i \in \{H, L\}$$

which is steeper for type L than for type H, since $k_H > k_L$. We also assume that signaling is possi-

---

9. The delta function is shifted to $x_0$ by shifting its argument. For instance, $\delta(x-x_0)$ is a delta function at $x_0$. Further discussion of the delta function is provided in Zemanian (1987).
ble at all expenditure and price levels, i.e., $\frac{d\rho}{ds} > 0$ and $\frac{d^2\rho}{ds^2} \geq 0 \quad \forall s, p$.

2) It is assumed that the wealth of type H is high enough such that, given the number of goods he optimally consumes in a signaling equilibrium, the consumer type H needs to acquire at least one unit of display. Since $N$ is finite, there always exist $R_L$ and $R_H$ such that this condition is satisfied.

3) For tractability, it is assumed that at his optimal signaling equilibrium, type H requires 1 additional unit of display.

*Figure 2* illustrates the isoutility curves. The dotted lines represent the isoutility curves when there are no display costs. The solid lines represent the isoutility curves with display costs. Since it costs $M$ to display any number of goods higher than $N$, type H’s isoutility curve is discontinuous and displays a jump of size $M$ at $x=N$ or $s = pN$. The slope approaches infinity and is undefined at $s = pN$. Type H’s isoutility curve is continuous otherwise.

*Figure 2 goes here*

### 3.2 The definition of equilibrium

A sequential equilibrium is a quintuple $(s, p, m, r, \mu)^{10}$ such that:

1) The privately-informed consumer moves first by choosing a strategy $m$ that picks an expenditure level $s$ corresponding to each price $p$ to maximize the consumer’s utility and satisfy the incentive compatibility constraints that neither type of consumer covets the allocation of the other.

2) The social contact chooses the best-response function $\rho(s)$ to maximize her expected profit,

---

10. Consumer $i$’s strategy, denoted by $m_i$, is a mapping $m_i : \{H, L\} \rightarrow R_+ \times [\bar{p}, \tilde{p}]$ where $i \in \{H, L\}$, $s \in R_+$, $p \in [\bar{p}, \tilde{p}]$. The social contact’ belief is $\mu(i|s)$, and her strategy is denoted by $r$, which is a mapping $r : [0, 1] \times R_+ \rightarrow R_+$, where $\mu \in [0, 1], s \in R_+$. 

given her initial beliefs $\mu(i|s)$ and the consumer’s strategy $m$.

3) Given consumers’ strategies $m$, a price $p$ is chosen to maximize the expected profits of perfectly competitive producers.

We reduce the set of equilibria using the Cho and Kreps (1987) Intuitive Criterion.

### 3.3 Analysis of the symmetric information case

The consumer has 2 choice variables: price and quantity. In the symmetric information case, there is no value in signaling and the utility of a consumer is decreasing in price, therefore he prefers to purchase at the lowest price possible, $p$. Given this fixed price, each consumer maximizes expected utility subject to his resource constraint and consumes at his first best. We define $s_L^o$ and $s_H^o$ to be the first best choices of consumer L and H, respectively (Figure 2). Given the consumer’s demand, producers compete in a Bertrand game and set prices at marginal cost in equilibrium.

### 3.4 Analysis of the asymmetric information case

For a separating equilibrium to exist, there must be a set of parameter values for which the two types do not want to mimic each other. Given our assumption that the single-crossing-property condition holds, it is more costly for type L to signal his type than it is for type H. A separating equilibrium consists of type L obtaining his first best and type H signaling at a level where type L does not wish to imitate. Suppose, for the moment, that there is no display cost. Then, since utility is decreasing in price, both the high and the low types will choose to purchase $X$ at $p$. To preclude mimicry, the high type must consume at an expenditure level greater or equal to $s_H^o$. 
where $s_H$ is the point at which the isoultility curve of type L through his first-best solution intersects the best-response function of the social contact, given that the social contact believes that the consumer is of type H$^{11}$. Formally, $s_H$ solves

$$W_L(s_H, \rho_H(s), p) = W_L(s'_L, \rho_L(s), p) ,$$

where $\rho_L(s)$ and $\rho_H(s)$ are the values of the social status enjoyed by the consumer when the social contact believes the consumer is of type L and type H respectively (Figure 2).

However, when there is a display cost and the total expenditure exceeds $s_H$, two subgame equilibria may exist. One is an equilibrium in which some consumers signal with a large quantity of goods priced at producers’ marginal cost and pay the display cost. In this separating equilibrium, type H simply consumes enough of the good such that it is not optimal for type L to mimic. The utility of type H is lowered by the display cost he incurs. The second is an equilibrium in which type H signals by consuming a smaller quantity of conspicuous goods at an above-marginal-cost price. This smaller quantity consumed economizes on the display cost. Even though utility is decreasing in price, type H prefers a higher price because the accompanying decline in utility is less than the decline in utility from spending the display cost $M$, when $M$ is sufficiently large. Lemmas 1 and 2 in Appendix A separately consider these two possible equilibria in the signaling subgames. Proposition 1 below establishes the equilibrium for the entire game and the conditions under which type H chooses to signal at a price higher than marginal cost.

---

$^{11}$ It is assumed that the proportion of consumer type H in the economy is small such that the $\rho_A(s)$ does not cross type H’s isoultility curve through $(s_H, p''')$, where $p'''$ is defined below. Under this assumption, no pooling equilibrium where both types signal with equal amounts of expenditure on conspicuous good X exists.
We define the lowest price at which the consumer needs no more than $N$ units of display to conspicuously consume at the expenditure level $s_H$ as $p''_{12}$. At any price higher than or equal to $p''$, the consumer avoids paying an additional display cost in order to consume at the expenditure level $s_H$, and at prices below $p''$ the consumer pays a display cost.

**Proposition 1:** The separating equilibrium of the entire game is the following. The social contact's beliefs and strategies are:

if $s < s_H$ then the consumer is type L, and the strategy is $\rho(s) = \rho_L(s)$, and

if $s \geq s_H$ then the consumer is type H, and the strategy is $\rho(s) = \rho_H(s)$.  \[8\]

The strategies of the consumer and the producer firms are:

(i) If the direct utility of consuming at the expenditure level $s_H$ of type H at price $p$ minus the display cost exceeds the direct utility of consumption at price $p''_{13}$, then both consumer types L and H purchase the conspicuous good at price $p$. Consumer H spends $s_L^0$ on the conspicuous good, and consumer H spends $s_H$ on the conspicuous good. All firms produce conspicuous good X and sell it at marginal cost $p$, earning no rents.

(ii) If the direct utility of consuming at the expenditure level $s_H$ of type H at $p''$ exceeds the direct utility of consumption at $p$ minus the display cost, then consumer H spends $s_H$ on the conspicuous good X and purchases it at price $p'' > p$. Consumer L spends $s_L^0$ on the conspicuous good X and

12. Formally, $p'' \equiv \lim_{\theta \to 0} \frac{s_H + \theta}{N}$, where $\theta > 0$.

13. This condition is $U(s_H, R_H, p'') \leq U(s_H, R_H, p) - M$. 

20
and purchases it at price \( p \). Firms produce two brands of good \( X \): the economical brand which sells at \( p \), and the conspicuous brand which sells at \( p'' \). Firms earn positive rents.

**Proof:** see Appendix A.

In both equilibria in Proposition 1, it is optimal for type \( H \) to signal his wealth by expending at least \( s_H \), which is the level that type \( L \) does not want to mimic. Given this, type \( L \) consumes his first best choice. Applying the Cho and Kreps (1987) Intuitive Criterion eliminates all possible equilibria with consumption levels above \( s_H \). The question for type \( H \) is whether he should expend \( s_H \) by consuming a large number of goods at producer’s marginal cost and incur the display cost to purchase an additional display unit or whether he should buy the conspicuous good at the price \( p'' \) which is just high enough for him to expend \( s_H \) on a lower number of goods such that he can avoid purchasing additional display space.

When the display cost is low such that the direct utility of consuming at the expenditure level \( s_H \) of type \( H \) at price \( p \) minus the display cost exceeds the direct utility of consumption at price \( p'' \), then consumer type \( H \) signals with a large number of conspicuous goods purchased at producer’s marginal cost. This equilibrium is illustrated in *Figure 3*.

*Figure 3 goes here*

On the other hand, when the display cost is high such that the direct utility of consuming at the expenditure level \( s_H \) of type \( H \) at price \( p \) minus the display cost is lower than the direct utility of consumption at price \( p'' \), then type \( H \) will purchase the conspicuous good at \( p'' \), which is higher than the producers’ marginal cost. Firms produce two brands of conspicuous good: the
economical brand which is purchased by type L at \( p \), and the conspicuous-consumption brand which is purchased by type H at \( p'' \). Since the “price” defined in the analysis is price per unit of quality, and the quality variable is arbitrary, firms earn positive rents, \( p'' - p \), for any quality of good \( q \). This equilibrium is illustrated in Figure 4.

**Figure 4 goes here**

Proposition 1 shows that conspicuous consumption arises when the display cost is high because purchasing high-price goods enables the consumer to allocate to conspicuous consumption the wealth needed for signaling without incurring an excessively high display cost. Proposition 1 also implies that a specific demand structure arises in equilibrium: no demand at prices in between \( p'' \) and \( p \), or higher than \( p'' \). Thus, consumers do not want to buy conspicuous goods when their prices are lowered permanently. This is consistent with the observed market demand for luxury goods\(^{14}\). In the high-price equilibrium, firms may compete for market share without lowering price by using up their rents on advertising or other promotional initiatives.

The number of free display units and the display costs associated with each type of good are typically different and they cannot readily substitute for each other. For instance, suppose Mr. Jones is considering wearing an Armani suit, a pair of Gucci shoes, a Movado watch, and smoking a Cuban cigar. He cannot either substitute smoking more Cuban cigars for wearing shoes, or wearing two pair of shoes and not smoking. Hence, the signaling problem of a consumer with large enough wealth can be divided into maximization problems over compartments of display units that can display goods that share the same display cost functions.

\(^{14}\) Such example is the quote by a marketing manager “Our customers do not want to pay less. If we halved the price of all our products, we would double our sales for six months and then we would sell nothing” from *The Economist* (1993 p. 96).
Thus, the first relevant issue is to compare price premia due to conspicuous consumption of goods that require different display units. Since \( p' \) is inversely related to the number of display units available in the initial endowment \( (N) \), the smaller the number of endowed display units, the higher the equilibrium price. Our analysis suggests that goods with higher restrictions on their display units and higher additional display costs will be purchased at a higher premium prices relative to their producers’ marginal costs compared to goods with lower display unit restrictions. Single-display-unit goods such as cars or watches will have a larger premium than multiple-display-unit goods such as wine. One does not change watches or cars during a social event, but one can display a collection of wine bottles. The second relevant issue is to identify which goods, among those with the same display cost, are more likely to arise as conspicuous goods in equilibrium. This is examine in the next section.

4. WHICH GOODS QUALIFY FOR CONSPICUOUS CONSUMPTION?

This section pushes the analysis further by examining the following question: among goods with identical display unit requirements, what characteristic determines which good is accepted as a conspicuous good? For instance, a high-quality bottle of spring water has display requirements comparable to those of a bottle of fine wine, and yet only the latter qualifies as a conspicuous good. A rolled-up $100 bill occupies the same space as a Cuban cigar. So why is it more socially “acceptable” to smoke a $100 cigar than to roll up $100 of money and burn it to signal wealth?

A possible explanation is that the utility of “commodity” goods, such as money, is common knowledge, whereas the utility of consuming conspicuous goods varies in the cross-section of consumers, and its idiosyncratic value is privately known to each consumer. This leads to the
acceptance of goods with higher cross-sectional variability in consumer utility as conspicuous goods at higher prices than those with lower variability, when both goods have the same cross-sectional mean utility and distribution function. The model in this section fleshes out this basic idea by comparing conspicuous goods with different cross-sectional utility variances. The analysis relies on the premise that rational consumers maximize their utility, and visible deviations from utility-maximizing behavior--such as paying a lot for a good that has a known low utility for all consumers--lead to diminished social status. The consumer’s preference for one conspicuous good over another requiring the same display units is thus determined endogenously. The factors that limit the price of a conspicuous good are also examined.

4.1 The model

This section extends the model of Section 2 in three aspects. First, a good X2 is added to the economy. All three goods Z, X1, and X2 are functionally perfect substitutes of identical quality and with identical display costs. The levels of consumption of X1 and X2 are commonly observable by all, but the consumption level of the good Z is observable only to the consumer. The intrinsic utilities of consuming Z and X1 are identical for every consumer and across all consumers, and this value is common knowledge. The utility of consuming X2 differs in the cross-section of consumers, and its distribution is common knowledge. But a particular consumer’s utility from consuming X2 is privately known only to the consumer.

Second, we introduce a small probability of an irrational consumer, i.e., someone whose behavior is inexplicable on utility-maximization grounds. An irrational consumer can only be identified through his behavior. This is a mechanism that limits the kinds of behavior that qualify for conspicuous consumption in equilibrium to be only rational ones which are based on utility maxi-
mization. In the model, there is an ex ante probability, $\pi$, that a consumer is irrational; $\pi$ is very small, $\theta \gg \pi > 0$ ($\theta$ is the proportion of type H consumers in the economy). The consumption choice of an irrational consumer is not necessarily utility maximizing, and therefore may result in a decline in his future cash flow. Without lost of generality, we assume that the future cash flow of an irrational consumer is zero.

We restrict the social contact’s belief about consumer irrationality. If there exists at least one consumer in the economy for whom it is optimal to engage in the observed conspicuous consumption at the prevailing market price, then the social contact must believe she is observing a (rational) utility-maximizing consumer. Otherwise, the social contact believes with probability one that the consumer is irrational. Given this belief, the social contact maximizes her expected profit and chooses her best-response function $\rho(s)$ as

$$\rho(s) = \begin{cases} D(H, s) = I(W)k_Hs, & \text{if } \mu(H | s) = 1 \\ D(L, s) = I(W)k_Ls, & \text{if } \mu(H | s) = 0 \end{cases},$$

$$\rho(s) = D(A, s) = I(W)k_As, \text{ if } \mu(H | s) \in (0, 1), \text{ and } k_H > k_A > k_L,$$  \hspace{1cm} (10)

where

$$I(W) = \begin{cases} 1 \text{ if the consumer is rational} \\ 0 \text{ if the consumer is irrational} \end{cases}, \text{ and } k_A \text{ is given in (4)}.$$

Third, a consumer’s private information has two dimensions: his wealth and his utility from consuming good X2. Thus, each consumer is labeled with a two-dimensional index $(i, j)$, where $i$ represents the wealth of the consumer, $i \in \{L, H\}$, and $j \in [i, j]$ represents the utility of consuming X2. We let the intrinsic utility function of consumer $(i, j)$ be
where \( x_i \equiv q x_i \), and \( p_i \equiv \frac{P_i}{q} \). \( x_i \) and \( P_i \) denote the quantity and nominal price of good \( X_i \) respectively. \( q \) denotes the quality which is the same for all goods. The consumption level on good \( i \) is \( s_i \equiv P_i x_i = p_i x_i \). The function \( G \) is the direct utility from consumption where

\[
\frac{\partial G}{\partial x_1}, \frac{\partial G}{\partial x_2}, \frac{\partial G}{\partial z} > 0 \quad \text{and} \quad \frac{\partial G}{\partial s_1}, \frac{\partial G}{\partial s_2} < 0.
\]

\( \forall x_1 + x_2 + z, s_1, s_2 \). \( I(s_2 > 0) \) is an indicator function which equals 1 if the consumption of \( X_2 \) is positive, and equals 0 otherwise. The cross-sectional variation in the utility of consuming good \( X_2 \) is represented by \( \zeta(j) \), uniformly distributed over \([-u,u]\), where \( u \) is a positive constant. That is,

\[
u = \zeta(j) > \zeta(j) > \zeta(j) = -u \quad \forall j \in [i,j].\]

The cross-sectional mean of the consumption utility of \( X_1 \) and \( X_2 \) are the same; the utility of \( X_2 \) is mean-preserving relative to the utility of \( X_1 \). But the consumption utility of \( X_2 \) varies among consumers with variance \( u^2 \), while the consumption utility of \( X_1 \) is constant for all consumers.

Since \( U \) is increasing in \( z \), the resource constraint is binding,

\[
z = \frac{R_i - s_1 - s_2}{p_i}.
\]

The total utility is

\[
W_{i,j}(s_1, s_2, p_1, p_2, \rho(s_1 + s_2)) = \\
G_i\left(\frac{s_1}{p_1} + \frac{s_2}{p_2} + \frac{R_i - s_1 - s_2}{p}, s_1, s_2\right) + (1 - \beta)\rho(s_1 + s_2) - C\left(\frac{s_1}{p_1} + \frac{s_2}{p_2}\right) + \zeta(j)I(s_2 > 0) + \beta R_i
\]
C is the display cost function defined in Section 2.4, and \( \rho(s_1 + s_2) \) is the social status which depends on the total expenditure on conspicuous goods.

4.3 Analysis of equilibria

It will be shown that, under plausible conditions, X2 will sell at a higher premium (above marginal cost) than X1. The detailed formal analysis which includes the statements and proofs of all the Lemmas and the proofs of the propositions stated in this section is relegated to Appendix B. The logical description of the analysis and the main results are presented here.

Definitions and observations:

1) Let \( s_L^o \) be the first-best expenditure level that maximizes total utility in (12) for type L.

2) As in Section 3, let \( s_H \) denotes the intersection between the utility curve of type L through his first-best expenditure level and the best-response function of the social contact, given that she believes that the consumer is of type H.

3) Define \( p_1(i, z) \) to be the price of X1 for which the utility of consuming only X1 equals the utility of consuming only Z at the expenditure level \( s_H \) for the type i consumer. Since \( R_H > R_L \), we have \( p_1(H, z) > p_1(L, z) \). It is also assumed that \( p_1(L, z) \geq p_2 \).

4) Define \( p_2(i, z) \) to be the price at which the utility of the consumer with the highest utility from consuming X2 at the expenditure level \( s_H \) equals the utility of consuming only Z. Since \( R_H > R_L \), then \( p_2(H, z) > p_2(L, z) \).

A reference consumer is defined as a consumer who is either of the following: 1) indifferent between consuming either X1 or X2 when they are preferred over good Z, or 2) indifferent between X2 and Z when only X2 is preferred over Z, or 3) indifferent between X1 and Z when
only X1 is preferred over Z. The reference consumer depends on the price ratio of X1 over X2. A consumer-specific constant $\alpha_{i,j}$ is defined to be the price ratio $p_1/p_2$ that makes a consumer $(i,j)$ a reference consumer.

Two observations are required to derive the equilibria. First, for each consumer $(i,j)$ the utility from consuming X2, $\zeta(j)$, is constant. Thus, for a given price pair $p_1$ and $p_2$ a consumer chooses to consume only one kind of good, either good X1, X2, or Z. At a price pair $p_1$ and $p_2$ such that X1 and X2 are preferred over Z, those consumers whose utilities from consuming X2 are higher than the reference consumer’s will consume only X2, whereas others will consume only X1. At a price pair $p_1$ and $p_2$ such that only X2 is preferred over Z, those consumers whose utilities from consuming X2 are higher than the reference consumer’s will consume only X2, whereas others will consume only Z. At a price pair $p_1$ and $p_2$ such that only X1 is preferred over Z, those consumers whose utilities from consuming X1 are higher than the reference consumer’s will consume only X1, whereas others will consume only Z (Lemma 3 in Appendix B).

Second, since the variation in the utility $\zeta(j)$ is positive for some consumers H, at expenditure level $s_H$ the utility of type H with the highest utility of consuming only X2 is larger than that of consuming only X1, $p_2(H, z) > p_1(H, z)$.

To determine what good consumers chose for conspicuous consumption, it is assumed that the cost of display is high such that conspicuous consumption always arises. Following the analysis in Section 3, a conspicuous good will be demanded at $p''$, the price at which the consumer avoids paying a display cost. Since both goods X1 and X2 have the same display cost functions,
both goods will be demanded at $p_1 = p_2 = p''$. Proposition 2 establishes the equilibria when the
demand price falls within three different regions: $p_1(H, z) > p'' > p$, $p_2(H, z) > p'' \geq p_1(H, z)$, and $p > p'' \geq p_2(H, z)$.

**Proposition 2:** Suppose

1. The highest utility of consuming $X_2$ among all type $L$ consumers is less than or equal to the
smallest utility from consuming $X_2$ among all type $H$ consumers$^{15}$.

2. The display cost is large ($M \to \infty$) and the fraction of type $H$ consumers ($\theta$) is small.

**The following equilibria exist:**

**The social contact’s beliefs are:** if a consumer purchases $X_1$ or $X_2$ at prices less than or equal to
$p_1(H, z)$ and $p_2(H, z)$ respectively, then the consumer is rational ($I(W)=1$) and the best
response set of the social contact is given by equations (8) and (9); otherwise the consumer is
irrational ($I(W)=0$) and obtains no social status.

**The consumer’s strategies and the firms’ strategies are:**

(i) When $p_1(H, z) > p'' > p$:

Consumer type $H$ signals with price consuming at $(s_H, p'')$, and consumer type $L$ consumes at
$(s_L^o, p)$. For both types, consumers whose utility of consuming $X_2$ is larger than that of the reference consumer of respective types consumes $X_2$; others consumes $X_1$.

For each good $X_1$ and $X_2$, firms produce an economic brand which sells at $p$ and a conspicuous
brand which sells at $p''$.

$^{15}$ This is the condition $W_{H, f}(X_2, s_H, p'', \rho_H(s)) \geq W_{L, f}(X_2, s_L^o, p, \rho_L(s))$. It is required in the separating equilibrium to distinguish between type $L$ consumers with very high innate utility of consuming $X_2$ and type $H$ consumer with very low utility of consuming $X_2$. 

(ii) When $p_2(H, z) > p'' \geq p_1(H, z)$:

Consumer type $H$ whose utility of consuming $X_2$ is larger than that of the reference consumer $H$ signals consuming $X_2$ at $(s_H, p'')$; otherwise he does not signal and consumes $Z$. Consumer type $L$ consumes at $(s_L, p)$). He consumes $X_2$ if his utility from consuming $X_2$ is larger than that of the reference consumer $L$; otherwise he consumes $Z$.

Firms produce good $Z$ (non-conspicuous good) which sells at $p$. They produce an economic brand and a conspicuous brand of good $X_2$ which sells at $p'$ and $p''$, respectively.

(iii) When $\bar{p} > p'' \geq p_2(H, z)$:

There exists no signaling equilibrium. Firms produce only the non-conspicuous good $Z$.

**Proof**: see Appendix B.

The intuition is as follows. Because the cost of display is high, it is optimal for type $H$ to signal by purchasing conspicuous goods at price $p''$ above marginal cost as stated in Proposition 1. Given this, consider case (i) where the intrinsic properties of the conspicuous goods and the available time/space for display are such that $\bar{p} < p'' < p_1(H, z)$. In this region the consumer’s consumption is always viewed as rational by the social contact, so the best-response function of the social contact is the same as that in Proposition 1. Since the utility of consuming $X_2$ to a consumer is private information and the best-response function of the social contact is not affected by the consumer’s choice between goods $X_1$ and $X_2$, the consumer treats $X_1$ and $X_2$ identically as potential signaling devices. Hence, the signaling consumption level for $X_1$, $(s_H, p'')$, is the same as that for $X_2$. The consumer’s choice of the good depends only on the direct utility contribution.
of a particular consumption. Since the reference consumer is by definition a consumer who is indifferent between consuming X1 or X2, all consumers whose utilities from consuming X2 are larger than the utility of the reference consumer of respective types prefer to consume X2.

In case (ii), when \( p_2(H, z) > p'' \geq p_1(H, z) \), it is no longer optimal for type H to signal with X1. However, because of the cross-sectional variation in the utility from consuming X2, it is still optimal for some consumers type H with high values of the innate cross-sectional utility of consuming X2 to signal using X2. In this case, the reference consumer H is indifferent between consuming X2 and Z. Thus all type H consumers whose utilities from consuming X2 are higher than that of the reference consumer H will consume X2, and the rest will not signal and consume only Z. Consumer type L consume at their first best \( (s^0_L, p) \). Since \( p'' > p_1(H, z) > p_1(L, z) \), consumers type L will not consume X1 at \( p'' \), but will chose between consuming X2 and Z. Consumers whose utilities from consuming X2 are higher than that of the reference consumer L will consume X2, and the rest will consume only Z. In case (iii) in which the price is so high that it is not optimal for even the consumer type H with the highest utility of consuming X2 to signal, no other consumer will.

For a separating equilibrium to exist, the highest utility of consuming X2 among all type L consumers must be less than or equal to the smallest utility from consuming X2 among all type H consumers (the first condition in Proposition 2). This bound derives from the condition that the highest utility of type L who consumes X2 should not overlap with the lowest utility of type H who consumes X2.

**Proposition 3:** Goods with higher cross-sectional variability in the utility that consumers attach
to consuming them are accepted as conspicuous goods at higher prices than those with lower variability.

**Proof:** Since $p_1(H, z)$ and $p_2(H, z)$ depends on the upper bound of the cross-sectional variability in the utility and the consumption utility of X2 is mean-preserving with respect to the consumption utility of X1, Proposition 3 follows immediately from Proposition 2.

These results have many implications. First, goods with higher cross-sectional variability in the consumption utilities are accepted as conspicuous goods at higher prices than those with lower variability when both have the same mean utility. To maximize their rents, producer firms are more likely to promote goods with higher cross-sectional variability for conspicuous consumption. Thus, we should expect to see as conspicuous-brand goods things such as expensive cigars -- where the innate utility of consumption varies from those who truly enjoy smoking to those who find it somewhat distasteful but do it solely for social-status reasons-- or fine wine. The utilities people associate with consuming these items are likely to be highly idiosyncratic, and thus vary quite a bit in the cross-section of consumers.

Second, the greater the innate utility variation in the cross-section of consumers, the higher the possible equilibrium price. However, since fewer individuals can afford to signal at higher prices, the demand decreases as price increases.

Third, the condition that the highest utility of consuming X2 among all type L consumers must be less than or equal to the smallest utility from consuming X2 among all type H consumers limits the cross-sectional innate utility variation of the conspicuous good, given a level of wealth differences among consumers. Thus, we should expect to see higher level of conspicuous consumption in an economy with a large cross-sectional wealth imbalance than in an economy with
equally-distributed wealth. Some of the “nuveau-riche” consumption patterns in the emerging economies of Asia and eastern Europe --where there are large wealth disparities-- suggest that this may well be true.\footnote{For example, Waldman and Sherer (1997) write: “In the 1990s, urban Thais have been among the world’s most voracious consumers, quadrupling their monthly credit card spending during the past six years, according to Thailand’s central bank. The buying binge, on borrowed baht, fueled a boom in luxury imports the likes of which few countries with per-capita income of just $3,300 a year have ever seen: big Mercedes, Haute couture, Cuban cigars, French wines, the latest cell phones. It has been dizzying, one of the world’s great spending sprees.”}

5. CONCLUSION

This paper explains why some goods are purchased for conspicuous consumption at prices significantly above producer’s marginal costs even with no barriers to entry into the market. Our explanation relies on modeling conspicuous consumption as a signaling game in which wealthy individuals consume conspicuously as a way to signal their wealth to society in order to gain higher social status. We recognize that signaling-motivated consumption must be conspicuous and the very act of consuming these goods has a cost attached to it. This cost comes from limited physical space and display opportunities (display units) and naturally exhibits discrete jumps. We showed that a competitive signaling equilibrium with price can arise in a utility-maximizing framework in which the single-crossing-property condition holds.

Our analysis generates the following results and implications.

• The higher the cost of display, the greater is the set of conditions in which consumers signal by consuming conspicuously at prices above producers’ marginal cost.

• The higher the limitations in the display units available, the higher is the premium above producers’ marginal cost of the equilibrium price of the conspicuous good. Single-display goods such as cars or watches and high-quality goods have higher restrictions on the display
units than multiple-display goods such as wine.

- Producers prefer to promote goods with higher limitations in the display units because they obtain higher rents, other things equal.
- Goods with higher variability of innate utility of consumption in the cross-section of consumers are accepted as conspicuous goods at higher prices than goods with lower variability with comparable mean utilities.
- Conspicuous consumption should be greater in economies that have greater cross-sectional wealth disparities.

The analysis raises some significant issues. First, it shows that producers in even a priori competitive industries can earn supranormal profits, and that this is possible even when consumers are rational, utility-maximizing individuals. Second, our analysis points to the goods that are most likely to generate such profit opportunities for producers, shedding light on the economics of the multibillion-dollar luxury goods industry. Third, our analysis suggests a possible way to address a long-standing puzzle in financial signaling models. It has often been argued that the choice of the signal in dissipative signaling models is fairly arbitrary, and that the chosen signal could just as well be supplanted by the act of literally burning money (Daniel and Titman (1995)). Our analysis suggests that literally burning money will not work as a signal because nobody would think that a rational person should derive any utility from doing so.
REFERENCES


*Marketing Week*, Nov. 8, 1996, “Korea Plots the Path to Riches,” p. 28.


<table>
<thead>
<tr>
<th>Time period</th>
<th>Events</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Firms produce goods and set price $p \in [p, \tilde{p}]$ in a competitive market.</td>
</tr>
<tr>
<td>1</td>
<td>The consumer chooses his consumption bundle (consumption and price levels of goods). The social contact observes only the price and consumption levels of conspicuous goods.</td>
</tr>
<tr>
<td>2</td>
<td>The social contact gives social status benefits to consumer.</td>
</tr>
<tr>
<td>3</td>
<td>The social contact obtains her payoff from associating with the consumer.</td>
</tr>
</tbody>
</table>

Table 1: Events

Figure 1: Display cost and its derivative.
Figure 2: Isoultility curves and the social contact’s reaction functions in the symmetric information case. The solid lines represent isoultility curves when there is display cost. The dotted lines represent isoultility curves in the case when there is no display cost.

Figure 3: Asymmetric information case. Equilibrium in the subgame where type H chooses \( p \in [p_l, p^*] \). Type H signals using goods at the producers’ marginal cost at \( (s_H, p) \), requiring an additional display unit. Type L consumes at his first-best at \( (s_L, p) \).
Figure 4: Asymmetric information case. Equilibrium in the subgame where type H chooses $p \in [p^*, \bar{p}]$. Type H signals with goods priced above the producers’ marginal cost at $(s_H, p^*)$. Type L consumes at his first-best at $(s_L, \bar{p})$. 
Appendix A: Proof of Proposition 1.

**Lemma 1:** In the signaling subgame when the price choices are \( p \in [\tilde{p}, \tilde{p}] \) and \( p \in [\underline{p}, p''] \) for types L and H respectively, the equilibrium is as follows. The social contact’s beliefs and strategies are: equations (8) and (9). The consumer’s strategies are: type L consumes at \((s_L^\alpha, \underline{p})\), and type H consumes at \((s_H, \underline{p})\). The utility of type H at this equilibrium is

\[
W_H(s_H, \rho_H(s), \underline{p}) = U \left( \frac{s_H}{\underline{p}}, \frac{R_H - s_H}{\underline{p}}, R_H \right) + \left[ 1 - \beta \right] k_H s_H - M.
\]

**Proof:**

Given beliefs in (8) and (9), the best response of the social contact is:

\[
\rho(s) = \begin{cases} 
D(H, s) = k_H s & \text{for } s \geq s_H \\
D(L, s) = k_L s & \text{for } s < s_H
\end{cases}
\]  \quad (13)

Consider the consumer type L. Since utility is decreasing in price, the constraint \( p \in [\tilde{p}, \tilde{p}] \) is binding at \( \underline{p} \). Type L is correctly identified in the separating equilibrium and achieves his first-best \( s_L^\alpha \) which solves

\[
Max_{s} W_L(s, \rho(s), p) = U \left( \frac{s}{\underline{p}}, \frac{R_L - s}{\underline{p}}, R_L \right) + \left( 1 - \beta \right) k_L s + \beta R_L,
\]  \quad (14)

Next, consider type H. For every price \( p < p'' \), the consumer needs additional display space to consume at the expenditure level \( s_H \). Type H pays the display cost for the entire price range \( p \in [\underline{p}, p''] \). Since the utility function \( W_H(s, \rho(s), p) \) is decreasing in \( p \), the constraint is binding at \( \underline{p} \). Thus, type H solves
Max \( s \) 

\[
W_H(s, \rho(s), p) = U\left( \frac{s_H}{p}, s_H, R_H - s_H, R_H \right) + [1 - \beta]p(s) - M 
\]

subject to \( W_H(s, \rho_H(s), p) \geq W_H(s_L^\rho, \rho_L(s), p), \) and

\[
W_L(s_L^\rho, \rho_L(s), p) \geq W_L(s, \rho_H(s), p), \text{ and equation (14)}.
\]

By construction of \( s_H \), and since \( W \) is decreasing in \( s \),

\[
W_L(s_L^\rho, \rho_L(s), p) = W_L(s_H, \rho_H(s), p) > W_L(s, \rho_H(s), p) \quad \forall s > s_H.
\]

Since the isoultility curve of type L is steeper than that of type H, and by construction of \( s_H \),

\[
W_H(s_H, \rho_H(s), p) > W_H(s_L^\rho, \rho_L(s), p).
\]

From (16), the set of beliefs in (8) and (9) is consistent with the Cho and Kreps Intuitive Criterion as applied to this game. The consumption choices \((s_L^\rho, p)\) for type L and \((s, p)\) \quad \forall s > s_H \quad \text{for type H} are eliminated by the Cho and Kreps Intuitive Criterion. Hence, the equilibrium is type L consumes \((s_L^\rho, p)\), and type H consumes \((s_H, p)\). ■

**Lemma 2:** In the signaling subgame when the price choices are \( p \in [\tilde{p}, \bar{p}] \) and \( p \in [p'', \bar{p}] \) for types L and H respectively and when \( W_H(s_H, \rho_H(s), p'') > W_H(s_H, \rho_H(s), p) \), the equilibrium is as follows if the high-price-signaling condition holds: The social contact’s beliefs and strategies are as before: equations (8) and (9). The consumer’s strategies are: type L consumes at \((s_L^\rho, p)\) and type H consumes at \((s_H, p'')\). The utility of type H at this equilibrium is

\[
W_H(s_H, \rho_H(s), p'') = U\left( \frac{s_H}{p''}, s_H, R_H - s_H, R_H \right) + [1 - \beta]k_Hs_H.
\]
**Proof:**

The best-response function of the social contact remains as in equation (13) since it only depends on the total expenditure $s$ and not directly on price. Consumer type L maximizes his utility and obtains his first-best consumption choice. The isoutility curve corresponding to the choice of consumption of type L and the best-response function of the social contact intersect at $s_H$ (Figure 4).

When $p \in [p'', \tilde{p}]$, type H does not need additional display space, and since $W$ is decreasing in price, the constraint $p \in [p'', \tilde{p}]$ holds at $p = p''$. A consumer type H solves

$$
\text{Max}_{s} \quad W_H(s, \rho(s), p'') = U\left(\frac{s_H}{p''}, s_H, \frac{R_H - s_H}{p''}, R_H\right) + [1 - \beta] \rho(s) - 0 ,
$$

subject to $W_H(s, \rho_H(s), p'') \geq W_H(s_L, \rho_L(s), \tilde{p})$, and

$$W_L(s_L^0, \rho_L(s), \tilde{p}) \geq W_L(s, \rho_H(s), p'') \quad \text{and equation (13)}.
$$

By construction of $s_H$, since $W$ is decreasing in $s$ and in $p$, and $p'' > \tilde{p}$, we have

$$W_L(s_L^0, \rho_L(s), \tilde{p}) = W_L(s_H, \rho_H(s), \tilde{p}) > W_L(s, \rho_H(s), p'') \quad \forall s > s_H .
$$

Since the isoutility curve of type L is steeper than that of type H, and by construction of $s_H$,

$$W_H(s_H, \rho_H(s), \tilde{p}) > W_H(s_L^0, \rho_L(s), \tilde{p}) .
$$

Assuming that $W_H(s_H, \rho_H, p'') > W_H(s_H, \rho_H, \tilde{p})$, then we have

$$W_H(s_H, \rho_H, p'') > W_H(s_L^0, \rho_L(s), \tilde{p}) .
$$

By equation (19), the set of beliefs in (8) and (9) satisfy the Cho and Kreps Intuitive Criterion.

The consumption choices $(s_L^0, \tilde{p})$ for type L and $(s, p'') \forall s > s_H$ for type H are eliminated by the
Cho and Kreps Intuitive Criterion. Hence, the only surviving equilibrium is L consumes at \((s^0_L, p^0)\)
and H consumes at \((s^0_H, p'')\). ■

**Proof of Proposition 1:**
From Lemmas 1 and 2, consumer H chooses to consume \(s_H\) at price \(p''\) if

\[
W_H(s_H, \rho(s), p) = U\left(\frac{s_H}{p''}, s_H, \frac{R_H - s_H}{p''}, R_H\right) + [1 - \beta]k_H s_H - M
\]  

(22)

\[
< W_H(s_H, \rho(s), p'') = U\left(\frac{s_H}{p''}, s_H, \frac{R_H - s_H}{p''}, R_H\right) + [1 - \beta]k_H s_H .
\]

This reduces to

\[
U\left(\frac{s_H}{p}, s_H, \frac{R_H - s_H}{p}, R_H\right) - M < U\left(\frac{s_H}{p''}, s_H, \frac{R_H - s_H}{p''}, R_H\right) .
\]  

(23)

Otherwise, consumer H chooses to consume \(s_H\) at price \(p\). ■

**Appendix B: Analysis of the Propositions in Section 4.**

**Formal definition of the reference consumer**

For consumer of type \((i, j)\), let \(\alpha_{i,j}\) be the ratio of the price of X1 to that of X2 such that the maximum intrinsic utility from consuming only X1 or Z equals that of the maximum utility from consuming X2 or Z. That is, from (11)

\[
max\{G_i(s_1/\alpha_{i,j} p_2, s_1, 0), G_i(z, 0, 0)\} = max\{G_i(s_2/p_2, 0, s_2) + \zeta(j), G_i(z, 0, 0)\} .
\]  

(24)
Thus, each consumer corresponds to a number \( \alpha_{i,j} \). Define a reference consumer of type \( i \) to be a consumer whose \( \alpha_{i,j} \) equals the price ratio \( p_1/p_2 \). Let \((L, j_o)\) and \((H, j_o)\) denote the reference consumers type L and H respectively. Therefore, when \( p_1 = p_2 = p'' \) the reference consumer is one who has \( \alpha_{i,j_0} = 1 \).

**Analysis of equilibria**

**Lemma 3:** Each consumer chooses to consume either \( X_2, X_1, \) or \( Z \), but not a combination of them.

**Proof:**

When the price pair \( p_1 \) and \( p_2 \) is such that goods \( X_1 \) and \( X_2 \) are preferred over \( Z \). If a consumer type H with \( \alpha_{H,j} \geq \alpha_{H,j_0} \left( \alpha_{H,j} < \alpha_{H,j_0} \right) \) purchases any amount \( y>0 \) of good \( X_2 \) (\( X_1 \)), he can obtain higher utility by buying \( y \) of \( X_1 \) (\( X_2 \)) instead since the utility of consuming \( X_1 \) (\( X_2 \)) is higher than \( X_2 \) (\( X_1 \)) for individuals with \( \alpha_{H,j} \geq \alpha_{H,j_0} \left( \alpha_{H,j} < \alpha_{H,j_0} \right) \). When the price pair \( p_1 \) and \( p_2 \) is such that goods \( X_2 \) and \( Z \) are preferred over \( X_1 \). If a consumer type H with \( \alpha_{H,j} \geq \alpha_{H,j_0} \left( \alpha_{H,j} < \alpha_{H,j_0} \right) \) purchases any amount \( y>0 \) of good \( X_2 \) (\( Z \)), he can obtain higher utility by buying \( y \) of \( Z \) (\( X_2 \)) instead since the utility of consuming \( Z \) (\( X_2 \)) is higher than \( X_2 \) (\( Z \)) for individuals with \( \alpha_{H,j} \geq \alpha_{H,j_0} \left( \alpha_{H,j} < \alpha_{H,j_0} \right) \) at this price. When the price pair \( p_1 \) and \( p_2 \) is such that goods \( X_1 \) and \( Z \) are preferred over \( X_1 \). If a consumer type H with \( \alpha_{H,j} \geq \alpha_{H,j_0} \left( \alpha_{H,j} < \alpha_{H,j_0} \right) \) purchases any amount \( y>0 \) of good \( Z \) (\( X_1 \)), he can obtain higher utility by buying \( y \) of \( X_1 \) (\( Z \)) instead since the utility of consuming \( X_1 \) (\( Z \)) is higher than \( Z \) (\( X_2 \)) for individuals with \( \alpha_{H,j} \geq \alpha_{H,j_0} \left( \alpha_{H,j} < \alpha_{H,j_0} \right) \) at this price. The same argument is true for consumer type L. Thus, given a price pair \( p_1 \) and \( p_2 \) a
consumer chooses to purchase only one type of good. ■

**Lemma 4:** \( p_2(H, z) > p_1(H, z) \)

**Proof:** From (12), \( W_{H,j}(0, s_H, p_1, p_2, \rho(s)) = W_{H,j}(s_H, 0, p_1, p_2, \rho(s)) + u \). Since \( u \) is positive and \( W \) is decreasing in price, \( p_2(H, z) > p_1(H, z) \). ■

**Proof of Proposition 2:**

(i) When \( p_2(H, z) > p_1(H, z) > p'' > p \), both \( X_1 \) and \( X_2 \) can be consumed rationally. Hence the best response of the social contact is given in (10) for \( I(W) = 1 \). Since \( M \) is large, it is not optimal for type \( H \) to purchase additional display space. Thus, if he signals, he does so using price rather than quantity. To differentiate from type \( L \), type \( H \) needs to consume conspicuous goods at levels equal or higher than \( s_H \). Since the utility is decreasing in price, type \( H \) always purchases at \( p'' \).

Both goods \( X_1 \) and \( X_2 \) have the same display cost, thus \( p_1 = p_2 = p'' \). From Lemma 3, both consumers type \( H \) and \( L \) consume either \( X_1 \) or \( X_2 \) and not both. Therefore, let \( W_{i,j}(X_m, s, p, \rho(s)) \) denote the total utility of consumer \((i, j)\) who consumes \( s \) of good \( X_m \) (\( m=1,2 \)) at price \( p \) and obtains \( \rho(s) \) amount of social status. Type \( H \) then solves

\[
\max_{s, m} \quad W_{H,j}(X_m, s, p'', \rho(s))
\]

subject to

\[
(W_{H,j}(X_1, s, p'', \rho_H(s)) \geq W_{H,j}(X_1, s_L^o, p, \rho_L(s)) \quad \text{and} \quad W_{L,j}(X_1, s_L^o, p, \rho_L(s)) \geq W_{L,j}(X_1, s, p'', \rho_H(s))
\]

\[\text{(IC1)}\quad W_{H,j}(X_1, s, p'', \rho_H(s)) \geq W_{H,j}(X_1, s_L^o, p, \rho_L(s)) \quad \text{and} \quad W_{L,j}(X_1, s_L^o, p, \rho_L(s)) \geq W_{L,j}(X_1, s, p'', \rho_H(s))\]
(IC2) \[ W_{H,j}(X_1, s, p', \rho_H(s)) \geq W_{H,j}(X_2, s^o_L, p', \rho_L(s)) \quad \text{and} \]
\[ W_{L,j}(X_2, s^o_L, p', \rho_L(s)) \geq W_{L,j}(X_1, s, p', \rho_H(s)) \quad . \]

(IC3) \[ W_{H,j}(X_2, s, p'', \rho_H(s)) \geq W_{H,j}(X_1, s^o_L, p, \rho_L(s)) \quad \text{and} \]
\[ W_{L,j}(X_1, s^o_L, p, \rho_L(s)) \geq W_{L,j}(X_2, s, p'', \rho_H(s)) \quad . \]

(IC4) \[ W_{H,j}(X_2, s, p'', \rho_H(s)) \geq W_{H,j}(X_2, s^o_L, p, \rho_L(s)) \quad \text{and} \]
\[ W_{L,j}(X_2, s^o_L, p, \rho_L(s)) \geq W_{L,j}(X_2, s, p'', \rho_H(s)) \quad . \]

The constraints (IC1) and (IC2) are the incentive compatibility (IC) conditions for the case where type \( H \) chooses \( X_1 \) and type \( L \) chooses \( X_1 \) or \( X_2 \), respectively. The constraints (IC3) and (IC4) are IC conditions for the case where type \( H \) chooses \( X_2 \) and type \( L \) chooses \( X_1 \) or \( X_2 \) respectively. We show that the equilibrium in Proposition 2 satisfies (25).

Consider the case (i) when \( p < p'' < p_1(H, z) \).

**Case 1:** \( \alpha_{H,j} \geq 1 \) and \( \alpha_{L,j} \geq 1 \); both types \( H \) and \( L \) choose \( X_1 \). Since \( M \to \infty \), this is identical to the case (ii) in Proposition 1. Therefore, the equilibrium in Proposition 2 satisfies the maximization in (25) and IC1.

**Case 2:** \( \alpha_{H,j} \geq 1 \) and \( \alpha_{L,j} < 1 \); type \( H \) chooses \( X_1 \) and type \( L \) chooses \( X_2 \).

Recall that \( (i, j_o) \) denotes the reference consumer type \( i \) \( (\alpha_{L,j_o} = 1) \) who is indifferent between choosing \( X_1 \) of \( X_2 \). For all consumer type \( L \) who chooses \( X_2 \)
\[ W_{L,j}(X_2, s^o_L, p, \rho_L(s)) \geq W_{L,j_o}(X_2, s^o_L, p, \rho_L(s)) = W_{L,j}(X_1, s^o_L, p, \rho_L(s)) \forall \alpha_{L,j} < 1 \quad . \]

(26)
By construction of \( s_H \) and since \( W \) is decreasing in price and \( p'' > p \), for type H we obtain

\[
W_{L,j}(X1, s^o_L, p, \rho_L(s)) = W_{L,j}(X1, s_H, p, \rho_H(s)) > W_{L,j}(X1, s_H, p'', \rho_H(s)) \quad .
\] (27)

From (26) and (27), we have

\[
W_{L,j}(X2, s^o_L, p, \rho_L(s)) \geq W_{L,j}(X1, s_H, p'', \rho_H(s)) \quad \forall \alpha_{L,j} < 1 \quad .
\] (28)

For type H that chooses X1, since

\[
W_{H,j}(X1, s_H, p'', \rho_H(s)) > W_{H,j}(X2, s_H, p'', \rho_H(s)) \quad \forall \alpha_{H,j} \geq 1 \quad ,
\] (29)

and by the assumption that \( W_{H,j}(X2, s_H, p'', \rho_H(s)) \geq W_{L,j}(X2, s_L^o, p, \rho_L(s)) \) (this is condition 1 in Proposition 2) and since the isoutility of type L is steeper than that of type H, we have

\[
W_{H,j}(X1, s_H, p'', \rho_H(s)) \geq W_{H,j}(X2, s_L^o, p, \rho_L(s)) \quad \forall \alpha_{H,j} \geq 1 \quad .
\] (30)

From equations (28) and (30), the equilibrium in Proposition 2 satisfies the maximization in (25) and (IC2). Other equilibria above \( s_H \) are eliminated by the Cho and Kreps Intuitive Criterion.

**Case 3:** \( \alpha_{H,j} < 1 \) and \( \alpha_{L,j} \geq 1 \); type H chooses X2 and type L chooses X1.

Since the isoutility curve of type L is steeper than that of type H,

\[
W_{H,j}(X2, s_H, p'', \rho_H(s)) \geq W_{H,j}(X1, s_L^o, p, \rho_L(s)) \quad \forall \alpha_{H,j} < 1 \quad .
\] (31)

Consider type L who chooses X1. By construction of \( s_H \) and since \( W \) is decreasing in price,

\[
W_{L,j}(X1, s_L^o, p, \rho_L(s)) = W_{L,j}(X1, s_H, p, \rho_H(s)) \geq W_{L,j}(X2, s_H, p'', \rho_H(s))
\]

\[
\forall \alpha_{L,j} \geq 1 \quad .
\] (32)

From equation (31) and (32), the equilibrium in Proposition 2 satisfies the maximization in (25) and (IC3). Other equilibria above \( s_H \) are eliminated by the Cho and Kreps Intuitive Criterion.
**Case 4:** $\alpha_{H,j} < 1$ and $\alpha_{L,j} < 1$, Both type H and type L choose X2.

At equal prices, utility of consuming only X2 equals the utility of consuming only X1 plus $\zeta(j)$:

$$W_{L,j}(X2, s_L^o, p, \rho_L(s)) = W_{L,j}(X1, s_L^o, p, \rho_L(s)) + \zeta(j). \quad (33)$$

By construction of $s_H$ and since $W$ is decreasing in price,

$$W_{L,j}(X1, s_L^o, p, \rho_L(s)) = W_{L,j}(X1, s_H, p_H(s)) > W_{L,j}(X1, s_H, p'', \rho_H(s)) \quad . \quad (34)$$

We also have that

$$W_{L,j}(X2, s_H, p'', \rho_H(s)) = W_{L,j}(X1, s_H, p'', \rho_H(s)) + \zeta(j). \quad (35)$$

From (33), (34), and (35),

$$W_{L,j}(X2, s_L^o, p, \rho_L(s)) > W_{L,j}(X2, s, p'', \rho_H(s)) \quad . \quad (36)$$

Since $M$ is large and because the isoutility curve of type L is steeper than that of type H, we have

$$W_{H,j}(X2, s_H, p'', \rho_H(s)) \geq W_{H,j}(X2, s_L^o, p, \rho_L(s)) \quad \forall \alpha_{H,j} < 1 \quad . \quad (37)$$

From equations (36) and (37), the equilibrium in Proposition 2 satisfies the maximization in (25) and (IC4). Other equilibria above $s_H$ are eliminated by the Cho and Kreps Intuitive Criterion.

Therefore, the strategy of consumer type H in Proposition 2 satisfies the maximization in equation (25) and all of its constraints. The producer firms play a Bertrand game and maximize their profits, given the demands of the consumer. They arrive at the strategy given in Proposition 2.

Consider the case (ii) when $p_2(H, z) > p'' \geq p_1(H, z)$. Since $p'' \geq p_1(H, z)$, consumer type H never signals with X1. Consider good X2. For a consumer type H with $\alpha_{H,j} \geq 1$, his utility of consuming X2 is less than his utility of consuming Z at consumption level $s_H$. Since, $\theta$ is
small, there exists no pooling equilibrium in which type H and type L consume at equal amounts of expenditure. Hence, a consumer type H with $\alpha_{H,j} \geq 1$ consumes Z and does not signal. Since $p_2(H, z) > p''$, there exists at least one consumer type H whose utility of consuming X2 is higher than his utility of consuming Z ($\alpha_{H,j} < 1$); thus, he signals with X2. Therefore a consumer type H with $\alpha_{H,j} < 1$ consumes X2 at $(s_H, p'')$. For consumer type L, since $p'' > p_1(H, z) \geq p_1(L, z)$, consumers whose utility of consuming X2 is higher than his utility of consuming Z ($\alpha_{H,j} < 1$); consume X2 at $(s_L^o, p)$, others consume Z at $(s_L^o, p)$.

Consider case (iii) when $\bar{p} > p'' \geq p_2(H, z)$. Since $p'' \geq p_2(H, z)$ no type H consumer wants to consume X1 or X2 at $p''$. Since $\Theta$ is small, therefore there is no pooling equilibrium with type L. Hence, type H does not signal at all, and we have no signaling equilibria. ■