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Interdependent Preferences and Status:

A Taxonomy of Demand

C. Anthony Bush, Ph.D.
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A model of consumer behavior is presented, where preferences are interdependent and status is maximized. Through continually varying tastes, responses of consumers, to changes in prices, advertising of firms, and their expectations (perceptions) of expenditures of individuals in higher social classes, are expansive. For any good a decrease in price can result in an increase or a decrease in the quantity demanded. Equilibrium prices are proven to exist. It is shown that traditional utility maximization can only be the behavior of individuals in the highest social class or the behavior of individuals who have no expectations of status or social standing. A specific functional form is derived where variables reflecting preference interdependence are included. Finally, under certain conditions, entrepreneurs will enter an industry where economic profits are zero.

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Introduction

In a society of social classes, interdependent preferences suggest that perception of higher social class consumption patterns influence the consumption decisions of lower social classes. Veblen (1899) presented a comprehensive analysis of consumption as an activity that demonstrates an individual's status or pecuniary standing in society. This paper contains an alternative mathematical interpretation or formulation of Veblen's framework, where consumers and producers are modeled.

In the model consumers maximize their status by selecting levels of expenditures on various goods. Changing tastes are determining factors in the model. The status maximizing first order conditions simply require that every dollar spent on any good yield the same marginal status to the consumer. A result from the model is that status maximizing behavior does not uniformly result in downward sloping demand curves. The quantity demanded of a good can increase with a price increase of the good. For specific tastes, a lowering of price will result in a reduced quantity demanded. Indeed, a complete taxonomy of demand is presented. In addition, it is shown that traditional independent preference utility maximization is consistent with the behavior of the absolute social elite or with behavior of individuals without perception of social standing. Finally, the Stone-Geary Status ("SGS") functional form is presented for future empirical investigation.

Joining the analysis of Veblen with the work of Bertrand (1883) market prices are derived. It is shown that, at equilibrium prices, firms are exposed to risk. In addition, it is shown that, under certain conditions, firms will enter and industry, where economic profits are zero.

The paper is divided into six sections. Section 1 contains a review of the relevant literature. The interpretation of Veblen is in section 2. Section 3 features the complete taxonomy of demand. In section 4, equilibrium prices are shown to exist. Section 5 is the presentation of the relationship between status maximization and standard utility maximization. In section 6, the SGS functional form is suggested for empirical investigation.

Literature

In the neoclassical theory of consumer behavior, a consumer's demand functions are the result of the consumer maximizing an ordinal utility function of goods subject to a budget constraint. Prices and income of the consumer are given. Preferences of consumers are independent and tastes are given. North (1990) indicates that informal and formal rules i.e., culture shapes choices. Clearly, interdependent preferences are embedded with the concept or construct of culture. Duesenberry (1949) remarks that Jovens and Marshall commented on the interdependence of preferences but did not present formal analysis.

Veblen (1899) presented a comprehensive historical, sociological, and economic analysis of tastes and interdependent preferences. At the core of Veblen's analysis is the comparison of efficiency of persons in a community and the symbolic representation of that efficiency. "Wherever circumstances or traditions of the life lead to habitual comparisons of one person with another in point of efficiency, the instinct of workmanship works out in an emulative or invidious comparison of persons."[1]

In Veblen's historical analysis, demonstration of efficiency is represented in the trophies of the hunt or booty of the successful raid. Later, demonstration of efficiency is represented by the accumulation of property which symbolizes the honorable and reputable characteristic of prowess and prepotence. Veblen argued that wealth "itself [became] honorable and conferred honor on its possessor." [2] However, wealth must be demonstrated. Thus, besides the physical benefits of consumption, an individual consumes goods and services to demonstrate or evidence worth or pecuniary strength which is the source of esteem and reputability in his/her community. The consumption of goods is an invidious distinction (conspicuous consumption). In addition, the institutions of pecuniary reputability and evidencing pecuniary strength through consumption of goods penetrates all classes (groups) of the social scale. " With members of each stratum accepting as their ideal of decency the scheme of life in vogue in the next higher stratum and with members of each stratum bending their energies to live up to the ideal."[3] Interdependent preferences are fully consistent with

Veblenian invidious comparisons and conspicuous consumption.

Examining the effects of interdependent preferences on consumption and savings, Duesenberry (1949) formulates the hypothesis that " ... impulses to increase expenditures for one individual depends entirely on the ratio of his expenditures to the expenditures of those with whom he/she associates." [4] For the static consumption case, Duesenberry's (1949) utility index is a function of the ratio of the ith individuals consumption expenditure to a weighted average of the consumption expenditures of other individuals. However, neither expenditure or demand functions are derived.

Referring to Veblen's work, Tintner (1960) assumes that the direct utility function of each individual is a function of the quantity of goods consumed by every individual in the society. Tintner derives the income elasticity of market demand and price elasticities of market demand. Tintner's analysis does not reflect the spirit of Veblen's analysis in that the invidious class relationships are not explicitly treated. In addition, explicit functional forms are not suggested.

In the paper of Basmann et al. (1988) and the paper of Hayes et al. (1992) interdependent preferences are assumed to be implied in Veblen's hypothesis of conspicuous consumption. Their interpretation of Veblen is such that consumers gain utility from paying higher prices for goods. In both papers, the Generalized Fecher-Thurstone direct utility function is maximized subject to a budget constraint. Prices and income are given. Expenditure equations were derived, and logarithms of expenditure ratios were estimated. Using post-WWII expenditure data for the United States, Basmann's estimates support their interpretation of conspicuous consumption. Analyzing EEC countries, Hayes et al. provided results supporting their interpretation of Veblen effects.

Model

Overview of the Economy

In the economy there are n goods, and there are $l_i > 2$ firms producing homogeneous good i, $i = 1, \ldots, n$. Each firm l, $l = 1, \ldots l_i$, producing good i faces the same constant returns to scale production function. There is no joint production of goods. In the economy, each firm produces one good. Following Bertrand (1883), let p_{li}, $l = 1, \ldots, l_i$, $i = 1, \ldots, n$ be the price firm l charges its customers for homogeneous good i. In addition, it is assumed that all firms advertise (market) in the belief (perhaps a mistaken belief) that advertising reduces the variability of sales. The economy contains Z consumers, where $Z > \sum_{i=1}^{n} l_i$.

Status Maximization

The reduction of Veblen's analysis to utility gained from payment of higher prices is narrow. Pecuniary strength and its' demonstration through consumption is symbolic of prowess, exploit, and efficiency. In addition, the foundation of conspicuous consumption is the invidious pecuniary comparison of persons. Consumers decisions on expenditures would reflect their perception or expectation of expenditures of other individuals in the community and would not just reflect the high price of goods. In the tradition of Veblen, any consumer's expenditures would reflect an ideal consumption. The consumer's expenditure behavior would emulate the class next above it in the social scale.

> ...the standard of expenditure which commonly guides our efforts is not average, ordinary expenditure already achieved; it is the ideal consumption that lies beyond our reach.... The motive is emulation - the stimulis of an invidious comparison which prompts us to out do those with whom we are classing ourselves ...that is to say our standard of decency in expenditures, as in other ends of emulation, is set by the usage of those next above us in reputability. [5]

In Veblen (1899) and (1919), it is clear that, for all individuals in all social classes, the drive for higher status results in the pursuit of higher income.

To build an alternative mathematical interpretation of interdependent preferences with Veblen effects, insights of Samuelson (1945) and Duesenberry (1949) are utilized. We assume that consumer z, $z = 1, \ldots, Z$, has a status-utility function that is defined on combinations of expenditures, and consumer z's status-utility function is a continuously differentiable function.

In the society, invidious comparisons of persons are made. An individual's status-utility function is parameterized by his/her perception and/or expectation of the expenditures of individuals in the next higher social class. Since income is a good proxy for social class, an individual's expenditure on any good is influenced by his/her perception of expenditure on the good by individuals in the next higher "income bracket." The perception and/or expectation of an individual can be influenced by a variety of factors or parameters such as advertising and the law.[6] Suppose that individual z is in a social class, and suppose that I^{+z} is the minimum income or average income of individuals in the next higher social class. Let ADV_i be the advertising spent by firms to promote good i. Define $f_i^{(z)}(I^{+z}, ADV_i)$ to be individual z's perception and/or expectation of the expenditure on good i of a typical individual in the next higher social class. Let $v_i^{(z)}$ be consumer z's expenditure on the ith good. Consumer z's status function is

$$\begin{aligned} SU^{(z)} &= SU^{(z)}(v_1^{(z)}, v_2^{(z)}, \ldots, v_n^{(z)};\ min\{p_{11}, \ldots, p_{l_1 1}\}, \ldots,\ min\{p_{1n}, \ldots, p_{l_n n}\}, \\ &\quad \Gamma^{(z)}, f_1^{(z)}(I^{+z}, ADV_1), \ldots, f_n^{(z)}(I^{+z}, ADV_n)), \end{aligned}$$

where $\Gamma^{(z)}$ is a vector of parameters. The function $f_i^{(z)}(I^{+z}, ADV_i),\ i = 1, \ldots, n$ and price $p_{li},\ l = 1, \ldots, l_i,\ i = 1, \ldots, n$ are parameters of the status function. We assume that $SU^{(z)}$ is quasi-concave in variables $v_1^{(z)}, v_2^{(z)}, \ldots, v_n^{(z)}$.

Consumers z's problem is to choose expenditures, $(v_1^{(z)}, v_2^{(z)}, \ldots, v_n^{(z)})$, that maximizes $SU^{(z)}$ subject to the constraint $v_1^{(z)} + \ldots + v_n^{(z)} = M^{(z)}$, where $M^{(z)}$ is the income of consumer z.

Given the existence of equilibrium prices (Section 6), consumer z's optimization conditions are derived. (Superscripts are repressed.) Forming the lagrangian $L = SU + \lambda(M - v_1 - v_2 \ldots - v_n)$.

The first order conditions are

$$\begin{aligned} \frac{\partial L}{\partial v_i} = \frac{\partial SU}{\partial v_i} - \lambda &= 0, \; i = 1, \ldots, n \\ \frac{\partial L}{\partial \lambda} = M - v_1 - v_2 \ldots - v_n &= 0 \end{aligned}$$

Thus,

$$\frac{\partial SU}{\partial v_i} = \frac{\partial SU}{\partial v_j}$$

Simply stated, the increase in status from an infinitesimal increase in expenditures on good i must equal the increase in status from an infinitesimal increase in expenditures on good j. (Every cent spent on any good brings the same marginal status to the consumer.) The first order conditions require that the marginal status rate of substitution between expenditures on good i and good j be equal to the rate that expenditures (dollars) are actually interchangeable.[7]

Examining the border Hessian

$$| A | = \begin{vmatrix} SU_{11} & SU_{12} & \ldots & SU_{1n} & -1 \\ SU_{21} & SU_{22} & \ldots & SU_{2n} & -1 \\ \vdots & \vdots & \ldots & \vdots & \vdots \\ SU_{n1} & SU_{n2} & \ldots & SU_{nn} & -1 \\ -1 & -1 & \ldots & -1 & 0 \end{vmatrix} > 0$$

The second order conditions require that the lower order border Hessian determinants rotate in sign, i.e.,

$$\begin{vmatrix} SU_{11} & SU_{12} & -1 \\ SU_{21} & SU_{22} & -1 \\ -1 & -1 & 0 \end{vmatrix} > 0, \begin{vmatrix} SU_{11} & SU_{12} & SU_{13} & -1 \\ SU_{21} & SU_{22} & SU_{23} & -1 \\ SU_{31} & SU_{32} & SU_{33} & -1 \\ -1 & -1 & -1 & 0 \end{vmatrix} < 0, \ldots$$

Taxonomy of Demand

With status maximization tastes are changing as prices characteristic of goods, invidious perceptions of the expenditures of the next higher social class, and advertising change. Changing tastes imply that the traditional hypothesis of downward sloping demand curves is not uniformly valid.

First, we examine v_i as p_i changes. Totally differentiating the first order conditions and only allowing the price of the ith good to vary, we have

$$\begin{bmatrix} SU_{11} & SU_{12} & \ldots & SU_{1n} & -1 \\ SU_{21} & SU_{22} & \ldots & SU_{2n} & -1 \\ \vdots & \vdots & \ldots & \vdots & \vdots \\ SU_{n1} & SU_{n2} & \ldots & SU_{nn} & -1 \\ -1 & -1 & \ldots & -1 & 0 \end{bmatrix} \begin{bmatrix} dv_1 \\ dv_2 \\ \vdots \\ dv_n \\ d\lambda \end{bmatrix} = \begin{bmatrix} -\frac{\partial SU_1}{\partial p_i} dp_i \\ \vdots \\ -\frac{\partial SU_2}{\partial p_i} dp_i \\ \vdots \\ -\frac{\partial SU_n}{\partial p_i} dp_i \\ 0 \end{bmatrix}$$

Dividing the system by dp_i and, then, allowing $dp_i \to 0$, we have

$$\begin{bmatrix} SU_{11} & SU_{12} & \dots & SU_{1n} & -1 \\ SU_{21} & SU_{22} & \dots & SU_{2n} & -1 \\ \vdots & \vdots & \dots & \vdots & \vdots \\ SU_{n1} & SU_{n2} & \dots & SU_{nn} & -1 \\ -1 & -1 & \dots & -1 & 0 \end{bmatrix} \begin{bmatrix} \frac{\partial v_1}{\partial p_i} \\ \frac{\partial v_2}{\partial p_i} \\ \vdots \\ \frac{\partial v_n}{\partial p_i} \\ \frac{\partial \lambda}{\partial p_i} \end{bmatrix} = \begin{bmatrix} -\frac{\partial SU_1}{\partial p_i} \\ \vdots \\ -\frac{\partial SU_2}{\partial p_i} \\ \vdots \\ -\frac{\partial SU_n}{\partial p_i} \\ 0 \end{bmatrix}$$

Since $\mid A \mid > 0$, we have

$$\frac{\partial v_i}{\partial p_i} = \left(\Sigma_{j=1}^{n} \frac{-\partial SU_j}{\partial p_i} \times A_{ji} \right) / \mid A \mid,$$

where A_{ji} is the coffactor of a_{ij}. If

$$\left(\Sigma_{j=1}^{n} \frac{-\partial SU_j}{\partial p_i} \times A_{ji} \right) \quad > \ (<) \quad 0, \tag{0.1}$$

then $\frac{\partial v_i}{\partial p_i} > \ (<)\ 0$. Thus, when there is an increase in price of good i, the direction of the quantity demanded depends on the budget allocation to good i prior to the increase in price and whether the rate of change in marginal status, when the price of good i increases, is positive or negative , i.e., (0.1). This is demonstrated for two goods: good 1 and good j ($j = 2$). For good 1,

$$\frac{\partial v_1}{\partial p_1} > \ (<)\ 0 \ if \ \left(\frac{\partial SU_1}{\partial p_1} - \frac{\partial SU_2}{\partial p_1} \right) \quad > \ (<) \quad 0$$

We present a taxonomy of demand for the possible signs of $\left(\frac{\partial SU_1}{\partial p_1} - \frac{\partial SU_2}{\partial p_1} \right)$. However, the actual sign of $\left(\frac{\partial SU_1}{\partial p_1} - \frac{\partial SU_2}{\partial p_1} \right)$ is an empirical question.

CLASS 1: When the price of good 1 increases, the change in marginal status from good one is positive.

<u>Case 1</u>

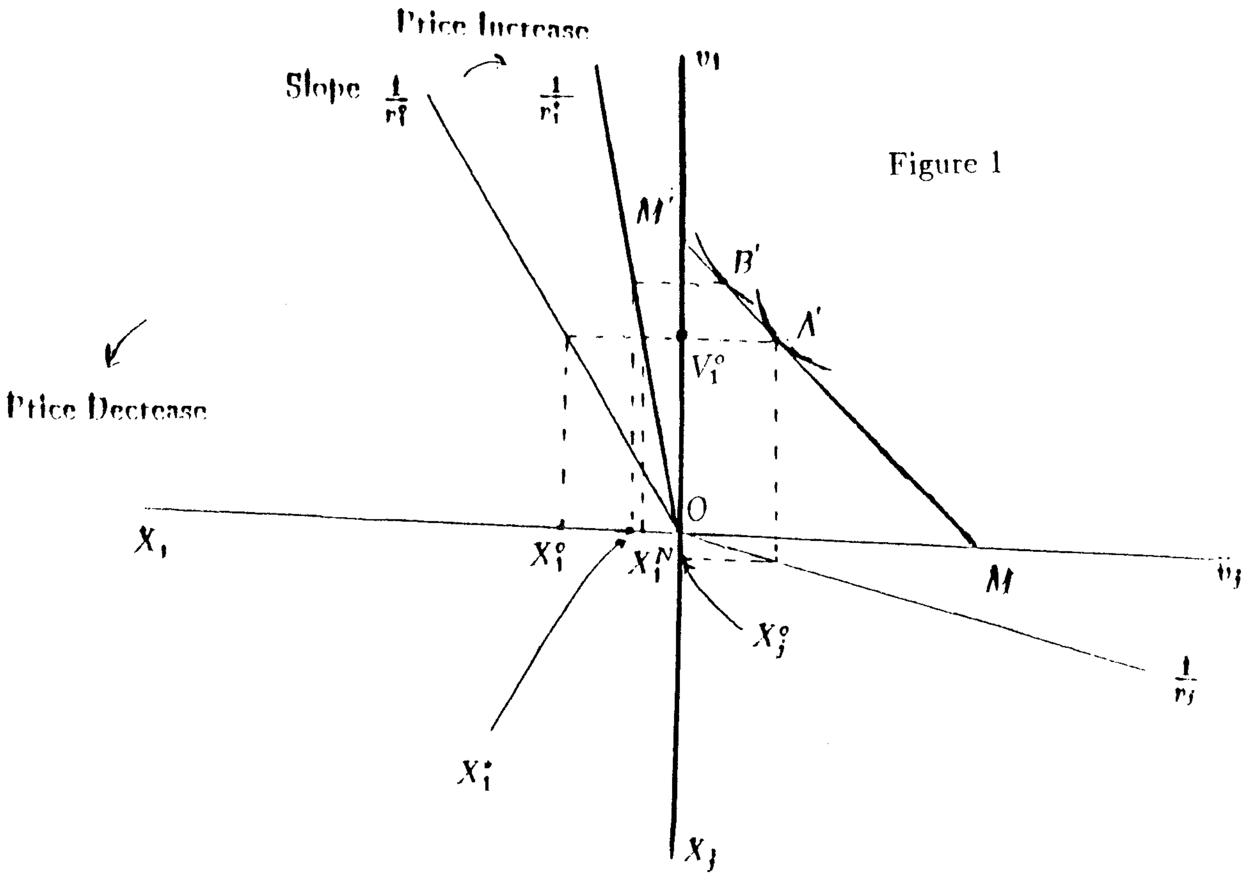


Figure 1

In Figure 1, the line MM' is the budget line, where M (income) = M'. The slope of MM' is $\frac{dv_1}{dv_j} = -1$. At A' a status indifference curve is tangent to the budget line and status is maximized. After determining the optimal combination of expenditures, the quantity demanded is determined residually by use of price ray ($O\frac{1}{p_1^o}$) which has slope $\frac{1}{p_1^o}$. Suppose that, at price p_1^o, the expenditure on good 1 is V_1^o. Now, suppose that the price increases to p_1^*. Since $\left(\frac{\partial SU_1}{\partial p_1} - \frac{\partial SU_2}{\partial p_1}\right) > 0$, which implies $\frac{\partial v_1}{\partial p_1} > 0$, the consumers optimal expenditure on good 1 lies above V_1^o for the higher price p_1^*. Thus, for any optimal expenditure combination along the line segment $M'A'$ (changed tastes), the quantity demanded is less than the initial quantity demanded X_1^o. For an optimal expenditure combination B', the quantity demanded is X_1^*. The quantity demanded decreased with a price increase, however the quantity demanded will not fall below X_1^N, the socially tolerable minimum for consumer B. In addition, the quantity demanded of good $j = 2$ is lower than X_j^o.

Case 2

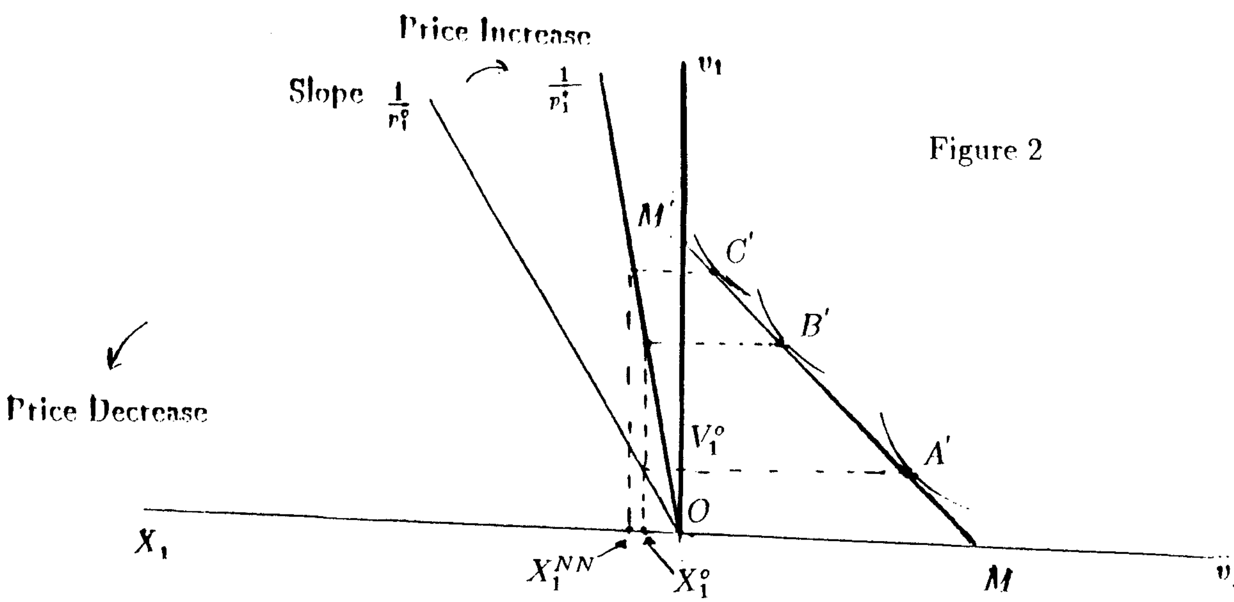
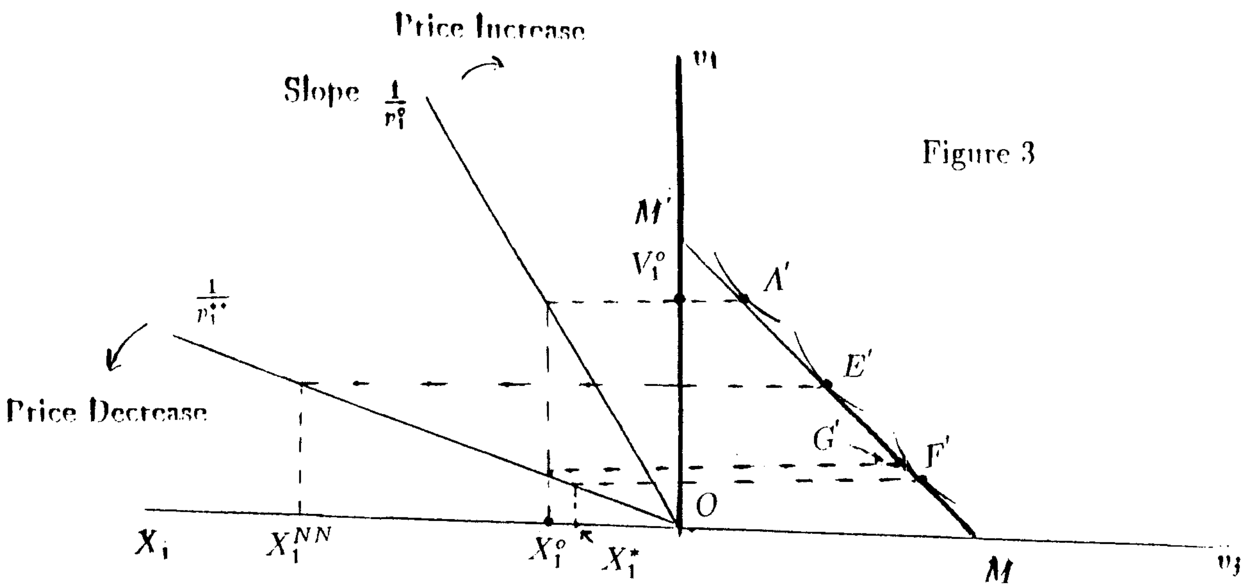


Figure 2

Using Figure 2, suppose that, at price p_1^o, the expenditure on good 1 is V_1^o

and the quantity demanded is X_1^o. Again, suppose that the price increases to p_1^*. Now, $\left(\frac{\partial SU_1}{\partial p_1} - \frac{\partial SU_2}{\partial p_1}\right) > 0$ which implies $\frac{\partial v_1}{\partial p_1} > 0$. For changed tastes leading to an optimal expenditure combination along line segment $A'B'$, the quantity demanded decreases as in case 1. However, for changed tastes that result in an optimal expenditure combination along line segment $B'M'$, the quantity demanded is greater than X_1^o. For expenditure combination C', the quantity X_1^{NN} is demanded, and $X_1^{NN} > X_1^o$. Thus, an increase in price results in an increased quantity demanded

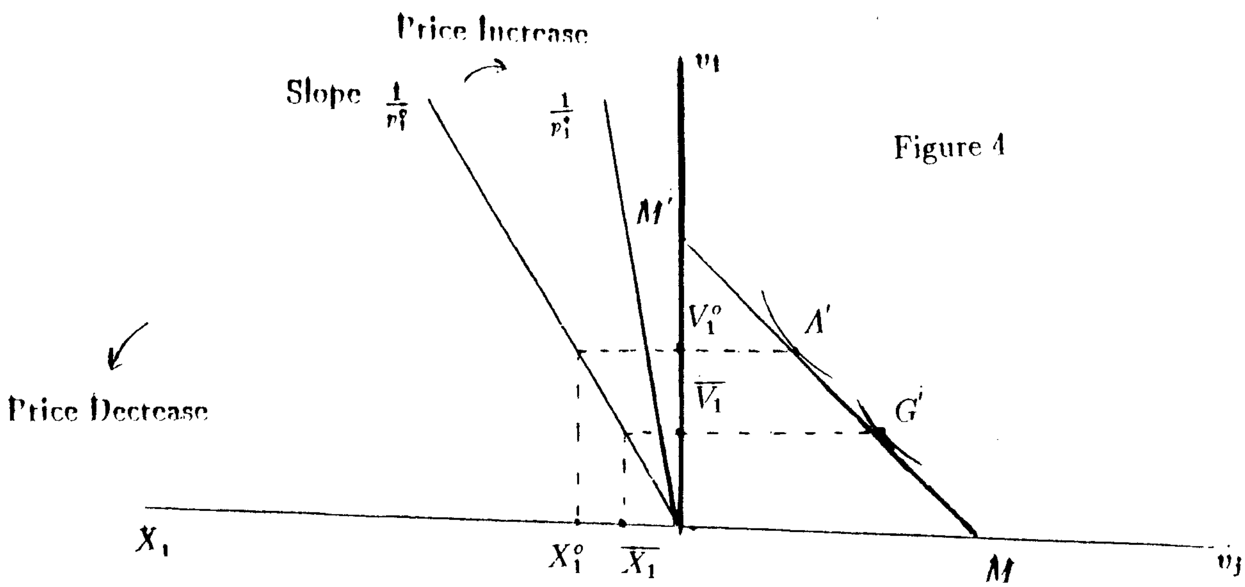
<u>Case 3</u>



Turning to Figure 3, suppose that, at price p_1^o, the expenditure on good 1 is V_1^o and the quantity demanded is X_1^o. If $\left(\frac{\partial SU_1}{\partial p_1} - \frac{\partial SU_2}{\partial p_1}\right) > 0$ then $\frac{\partial v_1}{\partial p_1} > 0$, and at a lower price p_1^{**}, the optimal expenditure on good 1 is below V_1^o. For changed tastes leading to an optimal expenditure combination along line segment $A'G'$, the quantity demanded is greater than X_1^o. For a status maximizing expenditure combination E', the quantity demanded is X_1^{NN}. The quantity demanded increased with a price decrease. However, if tastes change such that the optimal expenditure combination is on line segment $G'M$, then the quantity demanded at the lower price p_1^{**} is less than X_1^o. For an optimal expenditure combination F', the quantity demanded is X_1^* which is less than X_1^o . Thus, for a price decrease the quantity demanded decreased.

CLASS 2: When the price of good 1 increases, the change in marginal status from expenditures on good 1 is negative.

<u>Case 4</u>



In Figure 4, the initial price and quantity demanded are p_1^o and X_1^o. The initial expenditure on good 1 is V_1^o. If $\left(\frac{\partial SU_1}{\partial p_1} - \frac{\partial SU_2}{\partial p_1}\right) < 0$ then $\frac{\partial v_1}{\partial p_1} < 0$. At a higher price p_1^*, the optimal expenditure on good 1 is below V_1^o. Changing tastes lead to an optimal expenditure combination along line segment $A'M$. For expenditure combination G', the expenditure is $\overline{V_1}$. At price p_1^*, the quantity demanded is $\overline{X_1}$ which is less than X_1^o. In this case, an increase in price results in a decline in the quantity demanded.

<u>Case 5</u>

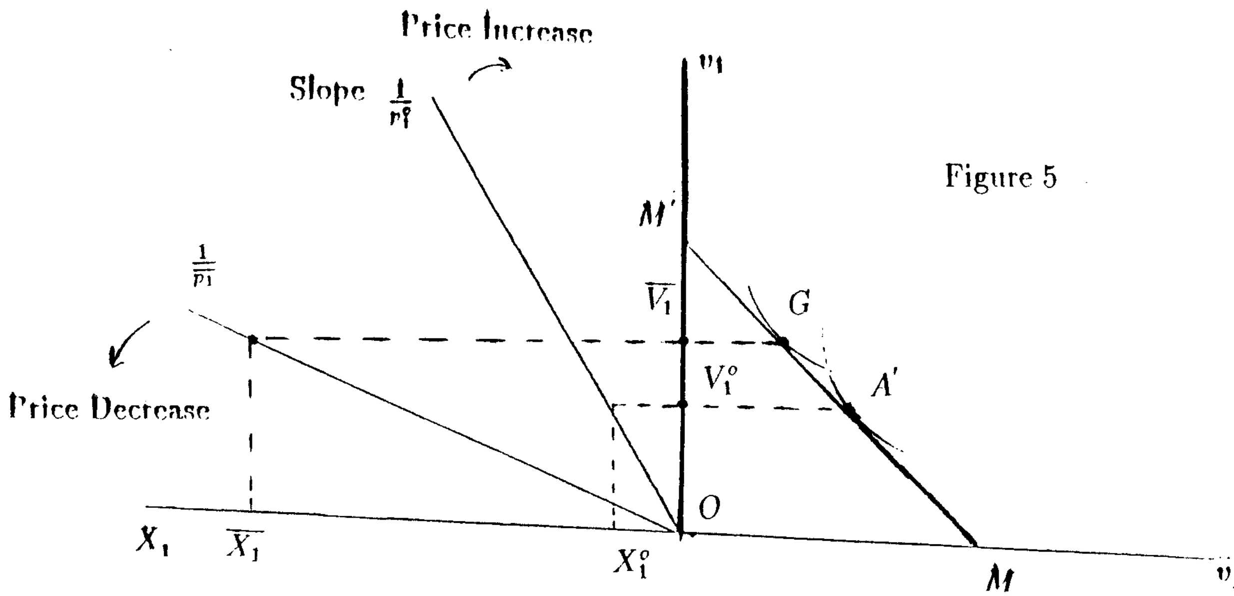


Figure 5

Using Figure 5, suppose that, at price p_1^o, the initial expenditure is V_1^o. The quantity demanded is X_1^o. If $\left(\frac{\partial SU_1}{\partial p_1} - \frac{\partial SU_2}{\partial p_1}\right) < 0$ then $\frac{\partial v_1}{\partial p_1} < 0$. At a lower price $\overline{p}_1$, the optimal expenditure on good 1 is above V_1^o. Changing tastes lead to an optimal expenditure combination along line segment $A'M'$. For expenditure combination G with expenditure $\overline{V}_1$. At price $\overline{p}_1$, the quantity demanded is $\overline{X}_1$ which is greater than X_1^o. Thus, for a decline in price the quantity demanded increased.

It is obvious that an increase in income, M, of consumer z will result in a higher level of status.

CLASS 3: Changes in the minimum or average income of the next higher social class.

The effects of interdependent preferences arise from consumer z's perception of expenditures of consumers in the next higher social class. Perception or expectation of expenditures are a function of the minimum or average income of the higher social class, I^+, and advertising expenditures. Analyzing the impact of the change in the minimum or average income of a representative consumer from the next higher social class we have

$$\frac{\partial v_i}{\partial I^+} = \left[\Sigma_{j=1}^{n} A_{ji} \left(\Sigma_{k=1}^{n} - \frac{\partial SU_j}{\partial f_k}\frac{\partial f_k}{\partial I^+}\right)\right] / \mid A \mid$$

When the minimum or average income of individual from the next higher social class changes, the change in the marginal status of consumer z is $\Sigma_{j=1}^{n} A_{ji} \left(\Sigma_{k=1}^{n} - \frac{\partial SU_j}{\partial f_k}\frac{\partial f_k}{\partial I^+}\right)$. Expenditures will increase (decrease) if

$$\Sigma_{j=1}^{n} A_{ji} \left(\Sigma_{k=1}^{n} - \frac{\partial SU_j}{\partial f_k}\frac{\partial f_k}{\partial I^+}\right) > (<) \; 0 \qquad (0.2)$$

Case 6

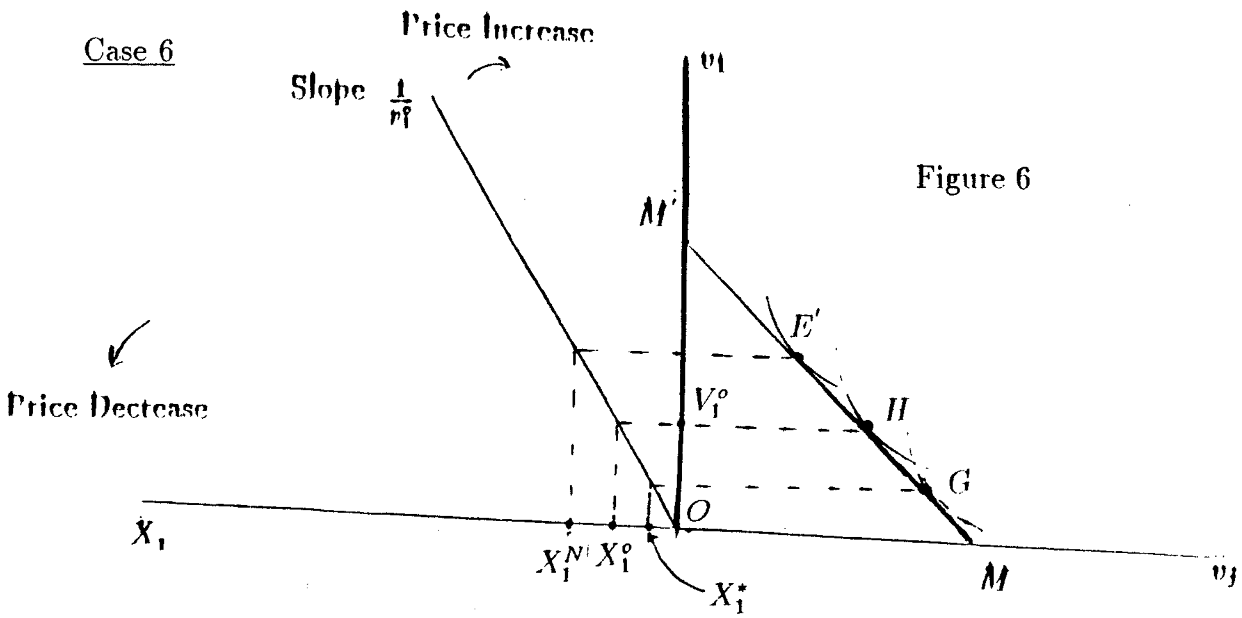


Figure 6

The sign of (0.2) is an empirical issue. However, for the two goods (Figure 6), suppose that V_1^o and X_1^o are consumer $z's$ status maximizing expenditure level on good 1 and quantity demanded of good 1 prior to an increase in the minimum or average income of the social class of Mr. Jones, who is a representative consumer from the next higher social class. If $\left(\Sigma_{k=1}^{2}\frac{\partial SU_1}{\partial f_k}\frac{\partial f_k}{\partial I^+}\right) - \left(\Sigma_{k=1}^{2}\frac{\partial SU_2}{\partial f_k}\frac{\partial f_k}{\partial I^+}\right) > 0$, then $\frac{\partial v_1}{\partial I^+} > 0$. With an increase in I^+, changing tastes lead to an optimal expenditure combination along line segment HM'. If the optimal expenditure combination is point E', the quantity demanded is X_1^N which is greater than X_1^o. Here, a rise in Mr Jones income, leads to a increase in consumer z's expenditures on good 1 due to his/her expectations of Mr Jones' expenditure and the underlying desire for status.

<u>Case 7</u>

In Figure 6, V_1^o and X_1^o are consumer $z's$ status maximizing expenditure level on good 1 and quantity demanded of good 1 prior to a decrease in the minimum or average income of individuals in the next higher social class. If $\left(\Sigma_{k=1}^{2}\frac{\partial SU_1}{\partial f_k}\frac{\partial f_k}{\partial I^+}\right) - \left(\Sigma_{k=1}^{2}\frac{\partial SU_2}{\partial f_k}\frac{\partial f_k}{\partial I^+}\right) > 0$, then $\frac{\partial v_1}{\partial I^+} > 0$. With a decrease in I^+, altered tastes result in an optimal expenditure combination along line segment HM. If the optimal expenditure combination is point G, the quantity demanded is X_1^* which is less than X_1^o. Here, the perception of Mr. Jones' reduced expenditures on good 1, result in reduced expenditures and quantity demanded by consumer z.

<u>Case 8</u>

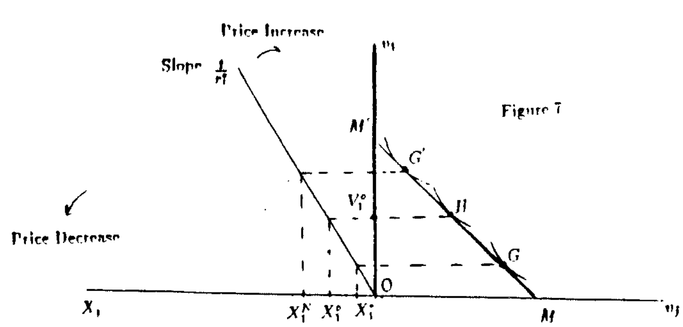


Figure 7

Using Figure 7, V_1^o and X_1^o are consumer $z's$ status maximizing expenditure level on good 1 and quantity demanded of good 1 prior to an increase in the minimum or average income of Mr. Jones' social class. If $\left(\Sigma_{k=1}^{2} \frac{\partial SU_1}{\partial f_k} \frac{\partial f_k}{\partial I^+}\right) - \left(\Sigma_{k=1}^{2} \frac{\partial SU_2}{\partial f_k} \frac{\partial f_k}{\partial I^+}\right) < 0$, then $\frac{\partial v_1}{\partial I^+} < 0$. With an increase in I^+ revised tastes result in an optimal expenditure combination along line segment HM. If the optimal expenditure combination is point G, the quantity demanded is X_1^* which is less X_1^o. Here, the perception of Mr. Jones' expenditures on good 1 associated with a rise in the average income of Mr. Jones' social class, result in reduced expenditures and quantity demanded by consumer z.

Case 9

In Figure 7, V_1^o and X_1^o are consumer $z's$ status maximizing expenditure level on good 1 and quantity demanded of good 1 prior to a decrease in the minimum or average income of Mr. Jones' social class. If $\left(\Sigma_{k=1}^{2} \frac{\partial SU_1}{\partial f_k} \frac{\partial f_k}{\partial I^+}\right) - \left(\Sigma_{k=1}^{2} \frac{\partial SU_2}{\partial f_k} \frac{\partial f_k}{\partial I^+}\right) < 0$, then $\frac{\partial v_1}{\partial I^+} < 0$. With a decrease in I^+, changed tastes result in an optimal expenditure combination along line segment HM'. If the optimal expenditure combination is point G', the quantity demanded is X_1^N which is greater than X_1^o. Here, the perception of Mr. Jones' expenditures on good 1 associated with a decline in the average income of Mr. Jones' social class, result in increased expenditures and quantity demanded by consumer z.

CLASS 4: Changes in advertising on good i.

Advertising is treated analogously to a change in I^{+}. Thus,

$$\frac{\partial v_i}{\partial ADV_i} = \Sigma_{j=1}^{n} A_{ji} \left(\Sigma_{k=1}^{n} - \frac{\partial SU_j}{\partial f_k} \frac{\partial f_k}{\partial ADV_i} \right) / \mid A \mid$$

Thus,

$$\frac{\partial v_i}{\partial ADV_i} > \ (<)\ 0 \ if \ \Sigma_{j=1}^{n} A_{ji} \left(\Sigma_{k=1}^{n} - \frac{\partial SU_j}{\partial f_k} \frac{\partial f_k}{\partial ADV_i} \right) \ > \ (<) \ \ 0 \qquad (0.3)$$

<u>Case 10</u>

Given an increase in advertising on good 1, the change in marginal status of consumer z is positive, i.e.,

$$\Sigma_{j=1}^{n} A_{j1} \left(\Sigma_{k=1}^{n} - \frac{\partial SU_j}{\partial f_k} \frac{\partial f_k}{\partial ADV_1} \right) > 0$$

This implies $\frac{\partial v_1}{\partial ADV_1} > 0$, and, for a constant price of good 1, p_1^o the quantity demanded must increase (decrease) as advertising on good 1 increases (decreases).

<u>Case 11</u>

Given an increase in advertising on good 1, the change in marginal status of consumer z is negative, i.e.,

$$\Sigma_{j=1}^{n} A_{j1} \left(\Sigma_{k=1}^{n} - \frac{\partial SU_j}{\partial f_k} \frac{\partial f_k}{\partial ADV_1} \right) < 0$$

This implies $\frac{\partial v_1}{\partial ADV_1} < 0$, and, for a constant price of good 1, p_1^o the quantity demanded must decrease (increase) as advertising on good 1 increases (decreases). Focusing on cigarettes, one might think of status that is associated with tastes of healthiness (popularity of jogging and fitness centers) and public service announcements against smoking.

Equilibrium Prices and Firms

In this model, traditional demand curves for individuals and the market are not formed. Entrepreneurs of firms simply regard sales as random variables. Sales of firms are random because consumers face uncertainty. Given perfect information on prices and no transportation costs, consumers must also decide where to spend. Consumers' choices of firms to patronize are made in accordance with consumer convenience in daily routine and with the degree of uncertainty in daily events.

We have assumed that all firms advertise under the belief advertising reduces the variability of sales by reminding consumers of the existence of the firm. Interpreting Veblen (1919), capital and labor employed in advertising (marketing), are embedded in the constant returns to scale production function. The unit of output, from the production of good i, is a *salable* good with specific characteristics, including shape, color, material composition, and consumer outreach through advertising (marketing) per unit for the period.

An entrepreneur must decide what price to charge and how much to produce. As a consumer, any entrepreneur is aware that consumers purchase from any firm with least price for good i, $i = 1 \ldots, n$. To show the existence of equilibrium prices, we examine decisions of firms.

DEFINITION 1: Define an equilibrium price vector as a set of prices $(p_1, \ldots, p_n)$ such that consumers maximize status and firms have selected Nash equilibrium prices.

LEMMA 1: Firm l, $l = 1, \ldots, l_i$, which produces good i, will select (charge) a Nash equilibrium price equal to the unit cost (i.e., marginal cost) c_i of good i.

proof:

Since there are constant returns to scale in the production of good i, there is a constant unit (marginal) cost, denoted c_i, for firm l, $l = 1 \ldots, l_i$. (We assume that firms negotiate a rental rate for capital and a wage rate for labor in competitive factor markets.) [8] Since entrepreneurs of firms are aware that consumers will purchase from the firm with the least price for homogeneous good i, Bertrand price competition forces any firm that produces good i to set the price of good i at marginal cost c_i. If any firm establishes a price above marginal cost c_i, the firm will sell nothing. If any firm sells below marginal cost c_i, the firm will incur losses and not survive. Q.E.D.

PROPOSITION 1: The price vector $P^* = (p_1, \ldots, p_n) = (c_1, \ldots, c_n)$ is an equilibrium price vector.

proof:

In industry i, $i = 1, \ldots, n$, firms of that industry face the same unit (marginal) c_i, $i = 1, \ldots, n$. By Lemma 1, P^* is a Nash equilibrium price vector. Given P^*, consumers maximize status. Q.E.D.

We assume that any entrepreneur has a known prior probability belief on sales which is a continuous random variable with finite mean and variance. We assume that any entrepreneur will minimize the expected value of squared losses.

PROPOSITION 2: Suppose that the entrepreneur of firm l in industry i has prior probability beliefs such that $Eq_{is}^l < \infty$ and $\sigma_{li}^2 = Var(q_{is}^l) < \infty$, where q_{is}^l is random sales. If expected squared losses are minimized, then 1) the firm's actual output, q_i^{apl}, will equal expected sales, $E(q_{is}^l)$; 2) the firm is exposed to risk equal to the product of the variance of sales and unit cost squared; and 3) risk is reduced by a reduction in unit cost or the reduction in the variance of sales.

proof:

Minimization implies

$$\min_{q_i^{apl}} \quad E(q_i^{apl} - q_{is}^l)^2$$

This implies

$$q_i^{apl*} = q_i^{apl} = E(q_{is}^l)$$

Now risk is

$$\begin{aligned} E(c_i q_i^{apl*} - p_i q_{is}^l)^2 &= c_i^2 E(-1)^2 (E(q_{is}^l) - q_{is}^l)^2 \\ &= c_i^2 E(q_{is}^l - E(q_{is}^l))^2 \\ &= c_i^2 \sigma_{li}^2 \end{aligned}$$

It is obvious that the reduction of unit cost or the variance of sales reduces risk.

Q.E.D.

PROPOSITION 3: Let (K_j, L_j) denote the optimal combination of capital and labor used in the production of a unit of good j, $j = 1, \ldots, n$, and suppose that $c_i > c_j$, $i \neq j$ and $j = 1, \ldots, n$. Suppose that constant returns to scale technologies are such that $(K_i, L_i) > (K_j, L_j)$, $i \neq j$ and $j = 1, \ldots, n$. Assume that all firms in industry i earn zero economic profits or incur losses. If any entrepreneur expects sales of quantity and risk associated with the production of good i to be strictly Pareto dominant to expected sales of quantity and risk from any other production activity, then 1) the entrepreneur will enter sector i and 2) the entrepreneur will earn zero profits or make a loss.

proof:

Let ε be any entrepreneur considering entering sector i, and ε has prior probability beliefs on the sales of each respective production activity in the economy. Now, ε is simultaneously a consumer who continually seeks status and who maximizes status given income. Obviously, the greater ε's income the greater is the status of ε. But, income arises from rental of capital and/or wages from labor. Now, $Eq_{is}^{\varepsilon} > Eq_{js}^{\varepsilon}$ and $c_i^2\sigma_{\varepsilon i}^2 < c_j^2\sigma_{\varepsilon j}^2$, $i \neq j$ and $j = 1, \ldots, n$. Upon entry, ε's actual output is equal to Eq_{is}^{ε} with minimum risk. Upon entry, their would be greater incomes from the production of good i with less risk. Therefore, ε will enter and produce good i to gain the greater status from the greater income.

To prove 2) recognize that after entry $p_{\varepsilon i} = c_i$. If actual sales are equal to expected sales, which is actual output, profits are zero. If actual sales are less than expected sales losses are incurred. Q.E.D.

Interpretation of Traditional Utility Maximization

The quantity demanded of good i is $x_i, i = 1, \ldots, n$, and let $X = (x_1, \ldots, x_n)$. Let $P = (p_1, \ldots, p_n)$.

DEFINITION 2: Define Ψ to be a class of status functions such that $SU = H(P)U(X; g_1(I^+, ADV_1; p_1), \ldots, g_n(I^+, ADV_n; p_n))$, where $g_i(I^+, ADV_i; p_i)$ is a function giving consumer z's perception and/or expectation of the quantity consumed of good i of an individual from the next higher social class, and where $H(P) > 0$. The function U is quasi-concave. (The g's enter U as parameters).

PROPOSITION 4: If consumer A is in the absolute elite social class (there does not exist a next higher social class) and consumer A has a Class Ψ status function, then the commodity bundle consumed as a result of maximizing status and the commodity bundle consumed as a result of maximizing a neoclassical utility function coincide.

proof:

Maximizing status implies maximizing SU subject to $v_1 + \ldots + v_n = M$. Since SU is in Ψ and since A is in the absolute elite social class, $g_i(I^+, ADV_i; p_i) = 0$, $i = 1, \ldots, n$, and $SU = H(P)U(X)$. Since P is given, maximizing status implies

$$max\ SU = H(P)U(X)$$

$$subject\ to\ p_1x_1 + \ldots + p_nx_n \;=\; M$$

where $p_ix_i = v_i,\ i = 1, \ldots n$. Thus, maximizing status is reduced to maximizing $U(x_1, \ldots, x_n)$ subject to $p_1x_1 + \ldots + p_nx_n = M$, since SU is a monotonic transformation of U. Q.E.D.

Stone-Geary Status ("SGS") Functional Form

We assume that the consumers perception of expenditures of consumers in the next higher social class can be erroneous. Errors in perception are measured by random variables. Thus, let

$$SU = \Pi_{i=1}^{n} \left(v_i - \gamma_i p_i - \alpha_i I^+ - \alpha_o - \zeta_i\right)^{\beta_i},$$

where $\Sigma_{i=1}^{n}\beta_i = 1,\ \Sigma_{i=1}^{n}\alpha_i = 1,$, and $\alpha_o, \gamma_1, \ldots, \gamma_n$ are parameters. The random variables $\zeta_1, \ldots, \zeta_n$ account for errors in perception, where $E\zeta_i = 0$ and $Var(\zeta_i) < \infty$. For good i, a consumers perception or expectation of the marginal budget share on good i of a consumer in the next higher social class is $\alpha_i,\ i = 1, \ldots, n$. Here, $f_i(I^+, ADV_i) = \alpha_i I^+ + \alpha_o + \zeta_i,\ i = 1, \ldots, n$

Maximizing

$$SU = \Pi_{i=1}^{n} \left(v_i - \gamma_i p_i - \alpha_i I^+ - \alpha_o - \zeta_i\right)^{\beta_i}$$

subject to $v_1 + \ldots + v_n = M$ implies

$$v_i = \alpha_i^o + \Sigma_{i=1}^{n} a_{ij} p_j + \alpha_i^* I^+ + \xi_i,$$

where $\alpha^* = \alpha_i - \beta_i$ and $a_{ii} = (1 - \beta_i)\gamma_i$. The coefficent $a_{ij} = -\beta_i\gamma_j$. The error term ξ_i is a function of the random variables $\zeta_1, \ldots, \zeta_n$. The intercept term is the constant coefficent α_i^o.

Conclusion

When a consumer's perception or expectation of the consumption expenditures of a higher social class influence his/her expenditure decisions, the consumer maximizes status by requiring every dollar spent on any good yield the same marginal status. However, status maximizing behavior will not uniformly result in downward sloping demand curves. The quantity demanded can increase with a price increase. For specific tastes, a decrease in price will result in a reduced quantity demanded. Given the social class of a consumer, an increase in the minimum or average income of the next higher social class will result in an increase or a decrease in the quantity demanded. For every sign of crucial expressions, a complete taxonomy of demand has been presented. The SGS functional form is suggested as a starting point for empirical work.

FOOTNOTES

1. Thorstein Veblen, *Theory of the Leisure Class* (New York: MacMillan Company, 1899), 15-16.

2. Ibid., 29.

3. Thorstein Veblen, *Theory of the Leisure Class* (New York: MacMillian Company, 1899).

4. James S. Duesenberry, *Income Saving and the Theory of Consumer Behavior* (Massachusetts: Harvard University Press, 1949), 32.

5. Veblen, 103-104.

6. Dollars spent to enforce laws related to specific products are examples.

7. Gift giving is regarded as a status enhancing activity. "Altruistic" donations are the result of status maximization.

8. The capital market and labor market are competitive. Owners of capital and/or labor establish prices. Firms employ *least priced* capital and *least priced* labor. For firm l, which produces good i, costs are: $cost = min\{r_1, \ldots, r_Z\}K_{li} + min\{w_1, \ldots, w_Z\}L_{li}$, where K_{li} is the quantity of capital of firm l which produces good i. The quantity of labor of firm l, which produces good i, is L_{li}. The price r_j is rental rate that agent j proposes to provide the services of her capital, $j = 1, \ldots, Z$, and $Z \geq \sum_i^n l_i$. Agent j proposes to provide her labor services for wage rate w_j. With perfect information on prices, competition drives the rental rate down to $r^* > 0$. Competition in the labor market drives the price down to $w^* > 0$.

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