THE BUYER'S RESPONSE TO "VERTICAL,, QUALITY CHANGES

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I. INTRODUCTION

In this paper we attempt to explore how the buyer responds to «vertical» quality changes. Our exploration mag be of interest to both producer and consumer groups since as Murphy, [4, p. 42], notes there is observed «increasing interest in and awareness of the problem of product quality, (hence), if the market provision of product quality is to be fully understood, it is essential that we correctly identify the relationship between quality and consumer demand» and investigate how quality changes may affect the buyer's welfare. Dealing with the same problem, Spence [6], parameterizes demand equations directly with a quality variable and he shows that the relationship between demand and product quality is positive[1]. The problem however may not be as easy if one considers that Buyers perseptions of quality are heterogeneons. Different buyers perceive quality differently. Abbott, [1, p. 129], labels such differences as «vertical», «horizontal», and «innovational». In his words : «Consider vertical the quality of change or comparisson which may properly be described in terms of «more» or «less». Two things distinguish this kind : (a) the «more» of any two qualities is considered preferable by virtually all consumers and (b) it entails greater cost. Therefore an upward (or downward) vertical change in quality unaccopanied by a change in price gives the consumer more (or less) for his money

1. In his work product demand is D (P,Q) and the inverse demand P(X,Q), where P, Q, and X are the price, quality and product respectively.

than before. Consider horizontal those differences about which there is no clear-cut agreement. Two things distinguish this type : (a) different people will evaluate dissimilar qualities in different ways, and (b) cost differences, if any, are purely incidental. The existence of this category depends on the fact that people differ in their circumstances, values, and tastes. Consider innovational those changes which are considered improvements by most or all consumers, yet involve no increase in cost or else are judged superior in spite of whatever additional cost is involved, so that the new quality displaces the old. This kind of quality change, associated with progress, least to «improved» rather than «more» quality.

We believe that a complete study of the buyer's response to quality changes must involve all of Abbott's quality concepts. In this paper we only concentrate on the «vertical» concept leaving the other two to future research.

Two economists, Paroush [5] and Murphy [4], have quantified Abbott's «vertical» concept. In Paroush's argument consumers are assumed as buyers of products which are composed of many commodities. For instance when the consumer buys X in a supermarket, in reality he doesn't only buy X but also the container Y within which X is carried. With $R = X + Y$, where X, Y are complements, the ratio X/R has been called by Paroush quality. Murphy departs from Lancaster's [2] characteristic approach to consumer demand and he calls quality «the number of characteristics forthcoming or embodied in the purchase of each market good[2]». With C and Z standing for characteristics and market good respectively, the ratio C/Z is Murphy's quality.

Given these two definitions of quality, namely $Ql = X/R$ and $Q2 = C/Z$, where Ql and Q2 are Paroush's and Murphy's qualities correspondingly one could assume that the utility (U) of a representative buyer depends on a commodity X and its characteristic C, or U(X.C), Since $X = Q1R$ and $C = Q2Z$ the utility function may be written as U(Q1R, Q2Z). According to Murphy such an «approach holds a number of distinct advantages over direct parameterization. It offers heuristic attraction by treating price and quality changes systematically, thus avoiding the economist's general tendency to attribute more efficacy to price than to nonprice competition[3]».

2. [4, p. 42].

3. [4, p. 42].

In what follows we shall show, first, that the relationship between quality and demand depends on the elasticity of demand;[4] second, that manipulation of quality may improve the buyer's welfare. In section II a utility maximization process is outlined and with the help of comparative statics it is shown that demand and quality of a product are related positively (negatively) if demand is elastic (inelastic). Section III proceeds with a diagrammatic analysis and section IV presents a summary thereafter.

II. THE UTILITY MAXIMIZATION PROCESS

The utility of a representative buyer is assumed to depend on a commodity X, vital for his well being, and its characteristic C, with X and C being normal. Thus U= U(X,C) or, as it was argued in the previous section, since X= Q1R and C = Q2Z,

$$U = U(Q1R, Q_2Z) \tag{1}$$

(1) may maximized subject to 1= PxX+PcC, where I, Px, and Pc, stand for income, price of X, and price of C respectively. Px and Pc may be regarded as «implicit prices[5]» and be written as Px = Pr/Q] and Pc = Pz/Q2. These implicit prices imply that Pr=PxQ1 and Pz=PcQ2. Income, therefore, may be assumed as being allocated on R and Z, given their corresponding prices. Thus the Langrangian for utility maximization may be set as follows :

$$L=U(Q1R,Q2Z)+k(I-PrR-PzZ) \tag{2}$$

Our objective is to find dR/dQl and dZ/dQ2 and then relate them to the elasticity of demand for R and Z respectively.

The first order conditions[6] for profit maximization may be derived by partially differentiating (2) with respect to R, Z, and k, (Subscripts stand for partial derivatives).

4. We assume that the demand curve is negatively sloped.
5. The concept of «implicit prices» has been introduced by Leland [3].
6. We assume that the second order conditions hold.

$$Lr = Q1Ux - kPr = 0 \tag{3}$$

$$Lz = Q2Uc - kPz = 0 \tag{4}$$

$$Lk = I - PrR \sim PzZ = 0 \tag{5}$$

Totally differentiating (3)-(5) with respect to R, Z, k, Pr, Ql and Q2 we get:

$$D \begin{vmatrix} dR \\ dZ \\ dk \end{vmatrix} = \begin{vmatrix} k \\ 0 \\ R \end{vmatrix} dPr + \begin{vmatrix} 0 \\ k \\ Z \end{vmatrix} dPz + \begin{vmatrix} -Ux - Q1RUxx \\ -Q2RUxc \\ 0 \end{vmatrix} dQ1$$

$$+ \begin{vmatrix} -Q_1ZU1cx \\ -Uc - Q2ZUcc \\ 0 \end{vmatrix} dQ2 \tag{6}$$

where,

$$D = \begin{vmatrix} Q1^2Uxx & Q1Q2Uxc & -Pr \\ Q2Q1Ucx & Q2^2Ucc & -Pz \\ -Pr & -Pz & 0 \end{vmatrix}$$

or,

$$D = (2PrPzQlQ2Uxc - Pr2Q22\ Ucc - Pz2\ Q1^2\ Uxx) > 0. \tag{7}$$

Thus from (6) we get :

$$dR/dPr = 1/D \begin{vmatrix} k & Q1Q2Uxc & -Pr \\ 0 & Q_2^2 \, Uccc & Pz \\ R & -Pz & 0 \end{vmatrix}$$

= !/D(-kPz2-RQlQ$_2$PzUxc+RQ22PrUcc). (8)

$$dR/dQ1 = 1/D \begin{vmatrix} -Ux-Q1RUxx & Q1Q2Uxc & -Pr \\ -Q2RUxc & Q2^2Ucc & Pz \\ 0 & -Pz & 0 \end{vmatrix}$$

= 1/JD [(Ux+RQlUxx)Pz2-RQ2PrPzUxc]

= 1/D [(kPr/Ql)Pz2+RQlPz2Uxx-RQ^{2}PrPzUxc+

+(RQr) (2PrPzQlQ2Uxc-Pr2Q22Ucc~Pz2Q12Uxx)-

-(R/Q1)D]

= (1/D) [(kPrPz2/Ql) - (RPr2Q22 Ucc/Ql)+ RQ2PrPzUxc-

-(R/QDD]

= (Pr/Q1D) (kPz2-RPrQ2Ucc+RQlQ2PzUxc)-(R/Ql)

= -(PrdR/QldPr)-(R/Ql). (9)

Similarly

$$dZ/dQ2 = -(PzdZ/Q2dPz) - (Z/Q2). \qquad (10)$$

(9) and (10) may be written as,

$$dR/dQl = -(PrdRR/QldPrR) - (R/Ql) \qquad (11)$$

and

$$dZ/dQ2 = -(PzdZZ/Q2dPzZ) - (Z/Q2). \qquad (12)$$

Factoring out R/Ql from (11), and Z/Q2 from (12) we get,

$$dR/dQl = -(R/Ql)[(dRPr/dPrR)+l] \qquad (13)$$

and

$$dZ/dQ2 = -(Z/Q2)[(dZPz/dPzZ)+1] \qquad (14)$$

Hence from (13) and (14) it may be concluded that,

$$(dR/dQl) >, =, < O \text{ with} (dRPr/dPrR) <, =, > -l \qquad (15)$$

and

$$(dZ/dQ2) >, =, < 0 \text{ with} (dZPz/dPzZ) <, =, > -1 \qquad (16)$$

(15) implies that the relationship between the demand of a product (i. e. R) and its quality (i.e.Ql) depends on the elasticity of demand for product. The relationship is positive (negative) if demand is elastic (inelastic). Similarly (16) shows the relationship between the demand of a product (i.e.Z) that discounts a characteristic, and its quality (i.e.Q2).

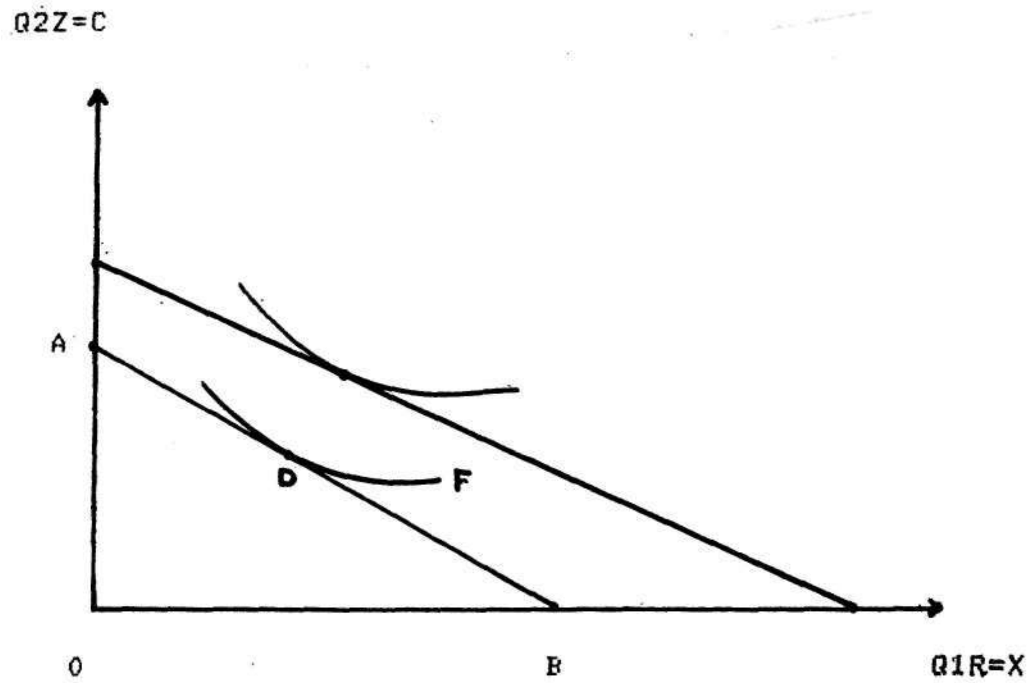

Figure 1

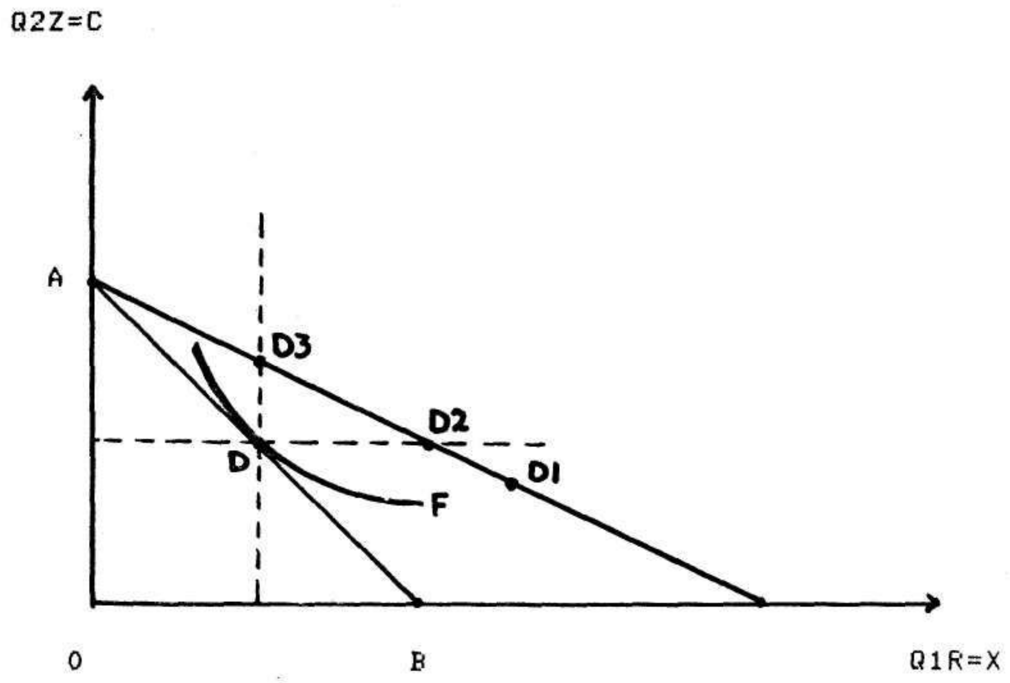

Figure 2

III. A DIAGRAMMATIC EXPLANATION

With $Px=Pr/Q1$, $Pc=Pz/Q2$, $Ql = X/R$, and $Q2 = C/Z$ the budget line may be written as $1= PrR+PzZ = PxX+PcC$ and be represented by AB in Figure 1. F is the consumer's indifference curve who is initially at equilibrium at point D. Thus points and B stand for $X = I/Px$ and $C = I/P_c$ respectively. Now we may keep Pr and Py constant and allow Px and Pz to vary. A decrease in Px increases X and Ql. A decrease in Pz decreases Pz which increases C and Q2. With such price decreases, the buyer gets more for his income, since AB and F move rightwards to a parallel or nonparallel position, depending upon the magnitude of each price decrease.

The same result could be achieved with Px constant and Py variable. A decrease in Py may free income if the amount of Y, used for R, remains unchanged. This new income may be used to buy more X which will improve Ql.

In Figure 2 only Px is allowed to vary and thus a Px decrease rotates AB around A to the right. If the buyer is initially at D then the price decrease may move him to Dl, or to D2, or to a point between D2 and D3. These movements are associated with elastic, unitary elastic, and inelastic demands respectively. The new solution will call for increased, constant, and decreased expenditures on R if it is located at Dl, D2, and between D2 and D3 respectively. Thus it depends on the elasticity of demand whether or not the consumer would be willing to spend more on a product of better quality.

IV. SUMMARY

In this paper we have examined the relationship between «vertical» quality and demand. Our model is in the same spirit with Murphy's, but at the same time, it modifies his argument by making it intuitively more meaningful and more heuristic.

It was found, firstly, that quality and demand of a product are related positively (negatively) if demand is elastic (inelastic). Secondly, it was shown that by manipulating quality through implicit prices-prices other than those the buyer faces in the market-the buyer's utility may be improved.

Given Abbott's classification of qualities we would like to conclude by noting that the approach presented here is not complete since it only discusses the «vertical» concept. The enrichement of our approach with the other two concetps. namely the «horizontal» and the «innovational», is left to further extensions.

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