QUALITY INCENTIVES FOR SELECTED FOOD PRODUCTS

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ABSTRACT

The increasing income has demanded more various and better quality of agricultural products in the market. The society with better living standard also demanded a more comfortable shopping environment. This paper aims to investigate if the food price is influenced by the product characteristics and shopping environment. The hedonic price function model was used to analyze the influence of product characteristics and shopping ennvirontment to the price.

As the sample case, rice, mungbean and peanuts have been selected. The data were collected from the retailers in Jakarta. The result showed that the product characteristics and shopping environment influenced the prices of rice, mungbean and peanuts. The implication of this study is the consumers are willing to pay higher price in order to get better quality and more comfortable shopping environment.

Keywords *: product characteristics, quality, price*

INTRODUCTION

In Indonesia, significant changes have occurred in the production and marketing of rice and secondary crops, especially in Java. The development of markets for rice, mungbean, and peanuts has been characterized by increasing commercialization and increasing product differentiation associated with product attributes, qualities or characteristics.

This research is a selective assessment of the scope for improvement in the efficiency of food markets, by looking at the financial rewards for specific improvements in quality. If these quality characteristics are identified and their contribution to price estimated quantitatively, the qualities with high or low customer preference would be known. This information has important implication for the development of effective and efficient grading standards and market transactions as well as for the welfare of market participants in general.

ECONOMIC BACKGROUND

Hayenga et al. (1985), Unnevehr (1986), Ladd and Suvannunt (1987), McDonald and Schroeder (2003), Holt et al. (2004), and Dhuyvetter et al. (2005) observed that customers' willingness to pay for various prices for sub-sets of product class are related to the presence or absence of certain attributes of the product. The theory underlying the model draws on household production framework of Becker (1965) and Muth (1966), and the product characteristics approach of Lancaster (1966).

Becker and Muth present the idea that households are both consumers and producers of goods. The Muth and Becker model assumes non-joint individual production functions,

$$z_i = f_i(x_i, t_i, C_i) \quad i = 1,2,\dots,m$$

Where Z_i is the quantity of the i[th] commodity produced by the sub-vector of market goods x_i, and t_i represents units of household time, and C_i is vector of production parameters, representing technology and the household environment.

The idea presented by Lancaster involves examination of the characteristics properties of goods as they affect consumer's preferences instead of consideration of the good itself. In lancaster's model it is assumed that each market good possesses a vector of characteristics (or qualities) that are objectively defined by all producers and consumers. Consumers purchase and consume combinations of goods and the level of utility attained is derived from the sum of characteristics belonging to these goods. According to Lancaster the production function has the linear form:

$$z_i = \sum_j c_{ij} x_j$$

With c_{ij} being defined as the quantity of the i^{th} characteristic contained in one unit of the j^{th} market good. Lancaster writes the individual utility function as,

$$U = U(z_1, z_2, \ldots, z_j)$$

Where z_j is the total amount of characteristics j obtained by the consumer. The consumer chooses quantities of continuously variable commodities to maximize utility subject to the consumption technology and the budget constraint

$$Max\ U(z)$$
$$S.T.\ z = Cx$$
$$y \geq Px$$
$$z, x \geq 0$$

where
z is the vector (z_j)
C is the matrix (C_{ij})
y is consumer's income
P is a vector of commodity price (p_i)
x is a vector (x_i)

Lucas (1975) provides a brief summary of how Lancaster came up with a solution. This program has a solution for the optimal bundle of characteristics (z^*). Lancaster suggests the most efficient way of obtaining any given bundle of characteristics, such as (z^*). This is given by the solution to the problem:

$$Min\ Px$$
$$S.T.\ Cx \geq z^*$$
$$x \geq 0$$

The dual of above problem is

$$Max\ \rho z^*$$
$$S.T.\ \rho C \leq P$$

Where ρ are the shadow prices characteristics. For constraints which are binding in the solution of above problem

$$P^a = \rho C^a$$

Where P^a is the solution sub-vector of P, and C^a is the solution sub-matrix of C. The result is a linear specification of hedonic price function.

Lancaster's model has provided a useful framework for theorizing about product quality markets and greatly stimulated interest in modeling the demand for quality. The Lancaster model suffers from a number of limitations because of the restrictiveness of the assumptions (i.e. the consumer's welfare is independent of the distribution of characteristics among goods, and its dependence on linear combination of consumption levels). However, it is obvious that utility may depend on the distribution of characteristics among products, and consumption relating goods to characteristics may not be linear. These issues have been addressed thoroughly by Hendler (1975), and Lucas (1975). A further limitation of the

Lancaster model is that it is formulated in terms of objectively measurable characteristics. Socio-psychological aspects of shopping environments, which sometimes have no direct relationship with physical characteristics of goods, have not generally been taken into account.

Related to the household production function, there are several approaches to measure the effects of quality differences on market behavior. Quality differences among market goods have been of some interest to economists at least since the work of Waugh (1928) on vegetable prices. The hedonic price function approach appears to have its beginning in the simultaneous papers of Houthakker (1957) and Theil (1952), where market prices were specified as a linear function of a scalar level quality, which was assumed to be available in the market in a continuum. This assumption is not always suitable for analyzing issues about the changes in the range of qualities offered to a consumer.

DATA AND EMPIRICAL MODEL

According to Lucas (1975) a general form of the hedonic price function can be written:

$$P_i = P(C_{i1}, \dots \dots, C_{ij}, e_i)$$

$$i = 1, \dots \dots, i;$$

and $j = 1, \dots \dots \dots, j$

Where

P_i is the market price of i^{th} commodity

C_{ij} is the amount of the j^{th} characteristic per unit of i^{th} commodity

e_i is the disturbance term

The regression coefficients provide information about the consumer's marginal valuation of quality improvement with respect to each individual characteristic. Price may be regarded as a bundle of characteristics of a product which identifies for consumer a stable market value which typifies products with a known characteristics mix. Two categories of product characteristics may be distinguished, those which are objectively measurable, such as the size, percentage of broken grains, percentage of foreign matter content, percentage of off-color grains, and percentage of shrunken grains; and characteristics which satisfy subjective perception such as the shopping environment. The consumer is assumed to attach a certain weight to each characteristic.

The empirical part of this exercise is based on the cross-sectional data from retail outlet in Jakarta. The data on product characteristics were acquired from samples of products collected from the sellers. Samples were taken of each grade of products offered by randomly chosen sellers. Price and variety of characteristics of the products were recorded for each sample.

The empirical form of the equation to be estimated may be written as:

$$P_g = \propto + \sum \beta_i C_i + \sum \beta_k Z_k + e_g$$

Where

P_g is the price per kilogram

C_i are measurable characteristics, such as;

1. Size (mm)
2. Shape (ratio length/width)
3. Split (%)
4. Off-color (%)
5. Broken (%)
6. Foreign matters (%)
7. Chalkiness (%)
8. Shrunken (%)

Z_k are non-measurable characteristics, such as;

1. Supermarket or non-supermarket ($Z_{11} = 1$ if supermarket, and $Z_{11} = 0$ otherwise)
2. Packaged and un-packaged ($Z_{12} = 1$ if packaged, and $Z_{12} = 0$ otherwise)

α, β_i, and β_k are regression coefficients

ε_g are stochastic errors

It is hypothesized that the presence of defects such as broken grains, foreign matter (dirt), split, off-color, and shrunken grains result in price discounts. Since consumers may be influenced not only by products characteristics but also by characteristics of the shopping environment, variable accounting for type of retailer and packaging were included in the model.

THE RESULT

Estimates of implicit prices of the quality characteristics of selected commodities are presented in Table 1. The implicit price represents the change in the food price for a one unit change in the characteristics. The quality attributes included explain a large proportion of price variation in all three foods at retail level, indicating that characteristic variables included in the model provide good indicators of consumer preferences. The signs and significance, particularly for size and shape variables, of characteristics vary among commodities.

The rice data did not have enough samples which were off-color or with foreign matters content to derived with confidence an implicit price for these characteristics. Preference for good quality products, except split characteristic for peanut, have the expected sign in retail level, but preferences for size and shape attributes vary. The reduction in off-color and shrunken content in peanut and mungbean are rewarded significantly. The implicit prices of foreign matters content in the commodities are not statistically significant; clearly no pay-off could be identified for reducing dirt content.

Table1. Parameter Estimate of Product Characteristics

Characteristics	Parameter Estimates		
	Peanut	Mungbean	Rice
1. Size	-6.75 (-0.10)	-783.00 (-7.24)	245.48 (1.16)
2. Shape	65.97 (0.86)	31.18 (1.63)	-42.76 (-1.82)
3. Split	1.86 (0.44)	-33.24 (-13.95)	n.a
4. Off-color	-31.05 (-3.84)	-2.21 (-2.32)	n.a
5. Foreign matters	-2.27 (-0.18)	-2.71 (-0.65)	n.a
6. Shrunken	-13.41 (-5.63)	-4.33 (-1.67)	n.a
7. Broken	n.a	n.a	-3.08 (-2.10)
8. Chalky	n.a	n.a	-9.19 (-5.34)
9. Supermarket	173.46 (4.74)	150.07 (13.22)	188.22 (11.23)
10. Packaged	45.57 (1.29)	150.07 (13.22)	188.22 (11.23)
11. Constant	1794.09 (13.24)	1966.09 (34.38)	959.96 (8.50)
R^2	0.82	0.95	0.82
F-value	50.74	169.01	108.11
N	63	90	141

Note: ( ): t-value; and n.a = not applicable

The consumers pay premium for better shopping environment (supermarket style and packaging). Both types of retail style and packaging variables play a significant role in consumer purchase decision and contribute to the value of the product. The impact of shopping environment on price was tested using F-test (Gujarati, 2003):

$$F_{m,n-k-l} = \frac{(RSS_0 - RSS_1)/M}{RSS_1/(n-k-l)}$$

Where, RSS_0 is the sum of squares of residuals from constraint model where the coefficient of the variables the effect of which is tested is set to zero. RSS_1 is the sum of squares of the residuals from the unconstrained model. M is the number of restriction, n is the number of observations, and k is the number of regressors. The null hypothesis $H_0: \beta_c = \gamma_k = 0$ (where $c = 1$ and $k = 1$) was tested against an alternative hypothesis $H_1: \beta_c = \gamma_k \neq 0$.

Based on F-test statistics the null hypothesis that the type of retailer and packaging variables has no impact on the level of retail price was rejected at the five percent level of significance (Table 2). These findings suggest that consumers ascribe significantly different values to similar products purchased at different type of retailer. It appears that consumers do differentiate among apparently similar commodities on the basis of type of retailer. This perception seems to be related to the belief that some retailers offer better quality than others.

Table 2. F-test for the Effect of Shopping Environment on Price

Description	RSS_0	RSS_1	M	$n-k-1$	$F-stat$
			Peanut		
Supermarket test	1074511.65	441947.91	1	82	117.36
Packaged test	441947.91	433029.12	1	81	1.66
			Mungbean		
Supermarket test	287926.31	66928.92	1	55	181.61
Packaged Test	66928.92	29495.91	1	54	68.53
			Rice		
Supermarket test	2629070.87	1322255.06	1	135	133.42
Packaged Test	1322255.06	681011.91	1	134	126.18

CONCLUSION

The objective of this exercise was to test the simple hypotheses about the components of retail price in Jakarta of selected commodities (peanut, mungbean, and rice). To achieve this objective, hedonic price functions were estimated which take into account characteristics of grain size, shape, and percent content of dirt and damage, and characteristics of shopping environment. The result of this analysis strengthens the view that retail prices of foods are related to a range of characteristics which are not necessarily the same for each commodity. The outcome of this simple exercise into implicit values of foods characteristics is consistent with the view that there is scope to improve food markets by looking at the specific improvement in quality for which premium exist.

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