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DEMAND ANALYSES OF RICE IN MALAYSIA

by

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Abstract

As a typical developing Asian county, the growth in per capita income generally brings to diversification in Malaysians food basket. The most significant observation is the falling in per capita consumption of rice with continuous growth of demand for wheat based products. The objective of this study is to estimate the demand elasticities of rice in Malaysia, focusing whether rice is an inferior good. By using data from Household Expenditure Survey 2004/2005, this study obtains demand elasticities of rice, as well as for other 11 food items via Linear Approximate Almost Ideal Demand System (LA/AIDS) and Quadratic Almost Ideal Demand System (QUAIDS). The empirical results indicate that income elasticity of demand for rice (0.7104) is the highest compared to other food items in the LA/AIDS model, while income elasticity of demand for wheat (0.5087) is higher than rice (0.4712). Both of the income elasticities of demand for rice suggest that rice is not an inferior good in Malaysia. However, by comparing both estimates of demand elasticities and adjusted R^2s, the QUAIDS model provides more plausible results than the LA/AIDS model.

Keywords: *Rice, Wheat, Inferior Good, Linear Approximate Almost Ideal Demand System, Quadratic Almost Ideal Demand System, Income Elasticity*

JEL code: Q11, D12

1.0 Introduction

The growth in per capita income generally brings to diversification in food basket. There have been increasing per capita consumption of wheat and meats (particularly poultry) and decreasing per capita consumption of the important staple food, rice in Malaysia. Statistically, annual per capita consumption of rice has decreased from 121kg in 1960 to 70.8kg in 2003. Such phenomenon arouses the concern whether rice is a normal or inferior food. Malaysian agricultural policy would be misdirected without a thorough study of the characteristic. Instead of the falling per capita consumption of rice, Ninth Malaysian Plan's target is to increase the production of paddy from 2400 metric tonnes in 2005 to 3202 metric tonnes in 2010.

With such effort, self-sufficiency level in rice is expected to increase from 72 per cent in 2005 to 90 per cent in 2010. However, the goal to have higher self-sufficiency level in rice always has conflict with other policy objectives of maintaining low food prices and

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high farm income (Chern, 2000). Therefore, Malaysian government has been subsidizing to lowering price of rice. Yet, the pricing strategy has not been good enough in correspond to increasing demand for wheat, the closest substitute to rice that Malaysians rely heavily on imports.

The objective of this study is to estimate the demand elasticities of rice in Malaysia. This is in regards to the income elasticity of demand for rice that shows as the income increases, whether per capita rice consumption goes up or down. Also, this is to study the own-price elasticity of demand for rice that shows how consumers react to the price change of rice. Understanding of these demand elasticities is able to shed more light for demand assessment of rice and further assists in drawing agricultural policy in Malaysia.

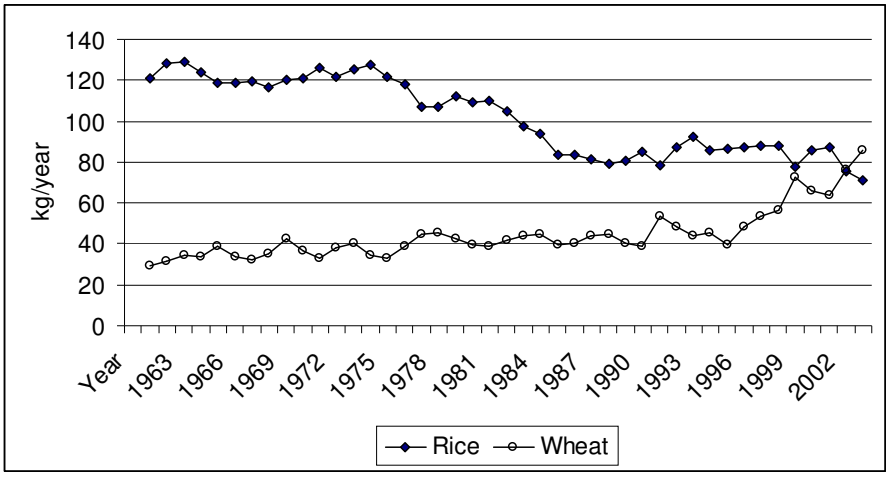
2.0 Background

Changes of diets with economic development and increasing per capita incomes have been well documented in Blandford (1984), Garnaut and Ma (1992), Mitchell *et al.* (1997) and Wu and Wu (1997). Figures 1 and 2 illustrate the annual per capita consumption of rice, wheat and meats in Malaysia from 1960 to 2003. As per capita income of Malaysians grew from very low levels after independence, there was an increase in consumption of the basic staple (rice), which was to curb the malnutrition associated with poverty.

Increasing per capita income led to diversification in food basket. According to Kumar (1997), diversification in the food basket will improve the quality of life by adding to the nutritional status and welfare of the population. With diversification, consumers are exposed to a wider choice of foods and shifts in dietary pattern. It is observed that per capita consumption of rice started to decline and while per capita consumption of wheat started to increase in 1970's. In the same period, the consumption of cheapest protein-rich meat, poultry started to increase from very low levels.

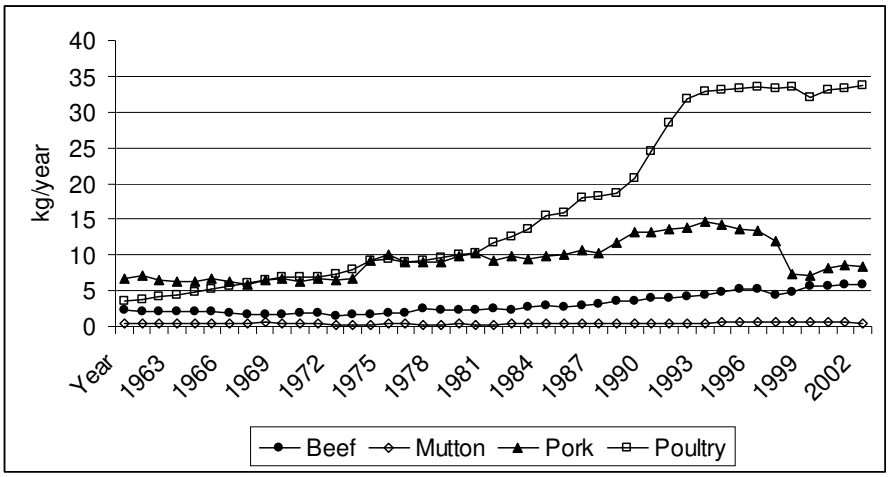
As per capita income approached higher levels within 1980's-2000's, the role that rice as the main staple food and caloric provider was offset even more significantly by growth in per capita consumption of wheat. Continuous increase in per capita consumption of poultry experienced its peak in early 1990's while stronger purchasing power (mainly because of higher per capita income) has seen steady increase in per capita consumption of higher value meat product, beef.

Figure 1: Annual per capita consumption of rice and wheat in Malaysia, 1960-2003



Source: Food and Agriculture Organization of the United Nations, 2007.

Figure 2: Annual per capita consumption of meats in Malaysia, 1960-2003



Source: Food and Agriculture Organization of the United Nations, 2007.

3.0 Demand Elasticities in Previous Studies

There is significant difference in the estimated income elasticities for rice by using time-series and cross-sectional data. Table 1 presents the estimated income elasticities obtained from cross-sectional data. Using cross-sectional data, Ishida *et al.* (2003) and FAPRI (2007) found that the Engel elasticities for rice demand are positive in Malaysia. Most noteworthy is the study by Ishida *et al.* (2003) that focused on the changes in food consumption in Malaysia over time. The estimated positive Engel elasticities for rice suggest that rice has been a normal good over time.

However, the study by Ishida *et al.* (2003) only utilized the data collected in West Malaysia. Omitting the sample population in East Malaysia may have the Engel elasticities of rice underestimated. This is because the income level of residence in East Malaysia is generally lower than West Malaysia. Probably that is the reason that the estimated Engel elasticities for rice are relatively low compared to other food items, which is always interpreted in a way that the position of rice as a staple food is decreasing and substituted by cereal based products.

In order to probe the indication mentioned earlier, it is interesting to investigate the actual income elasticities rather than expenditure or Engel elasticities for the various food items. In fact, most of the previous studies (Ishida *et al.*, 2003; Radam *et al.*, 2005; and Baharumshah and Mohamed, 1993) got the demand elasticities for food items against the hypothesis as laid down in "Engel's law". "Engel's law" explains that as income rises, the proportion of income spent on food falls, even if actual expenditure on food rises. In other words, income elasticity of demand for food is expected to be less than 1[iv].

[iv] As explained by Holcomb *et al.* (1995), note that $w = pq / y$ w, where p is price of food and q is the quantity of food, respectively. According to Engel's law, $\partial w / \partial y < 0$. But, $\partial w / \partial y = (p / y)(\partial q / \partial y) - (w / y)$. Then $p(\partial q / \partial y) < w$ under the condition that $\partial w / \partial y < 0$. Hence, $\eta < 1$, where η is income elasticity.

Table 1: Estimated expenditure elasticities of foods in Malaysia, using cross-sectional data

	Engel[a] / Expenditure[b & c] / Income[d] Elasticity				
Food Item	**1973**	**1980**	**1990**	**1993/1994**	**2000**
Cereal	-	-	0.67[b]	-	-
Rice	0.34[a]	0.42[a]	-	0.27[a]	0.09[d]
Bread and other cereals	0.74[a]	0.68[a]	-	0.66[a]	-
Meat	1.42[a]	1.06[a]	1.08[b]	0.97[a]	-
Beef	-	-	0.91[c]	-	-
Mutton	-	-	1.12[c]	-	-
Chicken	-	-	1.43[c]	-	-
Pork	-	-	1.15[c]	-	-
Fish	0.67[a]	0.53[a]	0.70[b]	0.49[a]	-
Milk and eggs	0.96[a]	0.75[a]	1.22[b]	0.66[a]	-
Oils and fats	0.78[a]	0.67[a]	1.63[b]	0.64[a]	-
Butter	-	-	-	-	0.50[d]
Cheese	-	-	-	-	0.5[d]
Fruits and vegetables	0.86[a]	0.68[a]	-	0.74[a]	-
Fruits	-	-	1.37[b]	-	-
Vegetables	-	-	0.05[b]	-	-
Sugar	0.21[a]	0.29[a]	1.92[b]	-0.06[a]	-
Others	0.88[a]	0.75[a]	1.62[b]	0.95[a]	-

Notes:
[a]Ishida *et al*., 2003
[b]Radam *et al.*, 2005
[c]Baharumshah and Mohamed, 1993
[d]FAPRI, 2007

Table 2 presents the estimated income elasticities obtained from time series data. Like previous time series studies (Baharumshah, 1980; Ishida, 1995; and Nik Faud, 1993), Asian Development Bank (1988), Ito *et al.* (1989), and Huang *et al. (*1991) found that the income elasticities for rice demand are negative in Malaysia. It is observed that the estimates of negative income elasticities for rice are increasingly higher over the years as per capita income increases. In line with this, Huang and Bouis (1996) argued that such estimated elasticities from aggregate time series data are simply the correlation between decreasing per capita consumption of rice and increasing per capita income, not a true demand relationship.

Huang and Bouis (1996) pointed out the real cause for the declining per capita consumption of rice is the rural-urban migration, which is often related to changing lifestyle that leads to change in food intake. Other than that, the declining trend may also have been caused by aging population, westernization of Malaysians' diet, health consciousness, awareness of food safety and other demographic and socio-economic factors.

According to Chern (2000), if rice is an inferior good, then there should be a tendency for rice consumption to be negatively associated with the household income level at any given point in time. Also, if rice is an inferior good, it can then be observed that rice consumption becomes zero when increasing per capita income of Malaysians approaches a certain affluence level. Such expectation totally defeats the meaning of rice as the most

important staple food to Malaysians and government's plan to increase production of paddy. Thus, it is rationalized that rice is still a normal good in Malaysia.

Table 2: Estimated income elasticities of rice in Malaysia, using time series data

Year	Ito *et al.*[e]	ADB[f]	Huang *et al.*[g]
1961	0.328	-	-0.047
1962	0.290	-	-0.064
1963	0.283	-	-0.067
1964	0.206	-	-0.089
1965	0.110	-	-0.103
1966	0.073	-	-0.113
1967	0.113	-	-0.106
1968	0.090	-	-0.115
1969	-0.060	-	-0.142
1970	-0.064	-	-0.157
1971	-0.086	-	-0.162
1972	-0.124	-	-0.176
1973	-0.281	-	-0.200
1974	-0.290	-0.100	-0.211
1975	-0.200		-0.193
1976	-0.367		-0.219
1977	-0.429		-0.247
1978	-0.497		-0.279
1979	-0.589		-0.301
1980	-0.625		-0.335
1981	-0.599		-0.338
1982	-0.598		-0.338
1983	-0.630		-0.345
1984	-0.671		-0.355
1985	-	-	-0.350
1986	-	-	-0.305
1987	-	-	-0.306
1988	-	-	-0.349

Notes:
[e]Ito *et al*., 1989
[f]Asian Development Bank (ADB), 1988
[g]Huang *et al.*, 1991

4.0 Review of Econometric Models

As a summary for previous section, to date, several studies have previously estimated food demand systems in Malaysia using either pooled aggregate data (Ito *et al*., 1989; ADB, 1988; Huang *et al.*, 1991) or cross-sectional data (Ishida *et al*., 2003; Radam *et al.*, 2005; Baharumshah and Mohamed, 1993; Baharumshah, 1993; Mustapha, 1994; Mustapha *et al.*, 1999, 2000, 2001; FAPRI, 2007). The analyses using aggregate time series data are different from those using cross-sectional data.

There are numerous findings that show incorporation of demographic variables enhances the performance of demand analysis. However, little attention has been paid in the demographic effects in the studies of food demand in Malaysia. The main reason to incorporate demographic effects into a demand function is to achieve better estimates of elasticities (Muellbuaer, 1977). Pollak and Wales (1981) and Lewbel (1985) proposed general methods to incorporate demographic effects into theoretically plausible demand

systems. The techniques are famously applied by Chern *et al.* (2003) in all of the demand analysis models.

However, it is still uncertain which model specification is most preferable in analyzing the food demand system in Malaysia. Started with the study by Baharumshah (1993) that applied Linear Approximate Almost Ideal Demand System (LA/AIDS), the model has been remained its popularity in most of the studies (Radam *et al.*, 2005; Baharumshah and Mohamed, 1993; Mustapha, 1994; Mustapha *et al.*, 1999, 2000, 2001) of demand analysis in Malaysia.

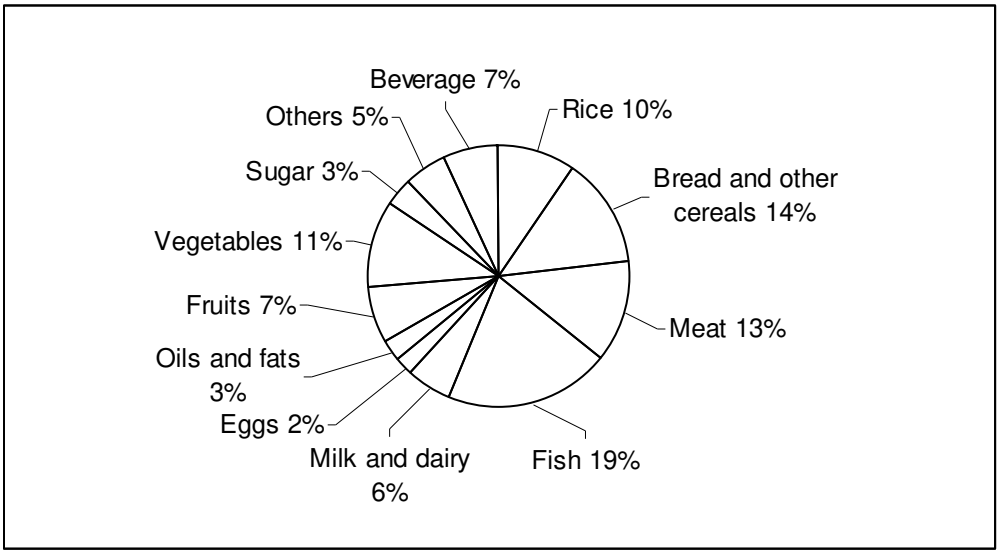
On another hand, Chern (1997) showed notable differences of estimated results between the Linear Expenditure System (LES) and LA/AIDS. Chern (2000) compared the performance of the AIDS and LA/AIDS. Liu and Chern (2001) compared Working-Leser form, the LES, Quadratic Expenditure System (QES), and LA/AIDS and concluded that LES or LA/AIDS are preferred in terms of prediction ability. Further to such findings, Cranfield *et al.* (2002) probed the performance of models even deeper by comparing the LES and Almost Ideal Demand System (AIDS) with several rank three systems (An Implicitly Direct Additive Demand System - AIDADS, Quadratic Almost Ideal Demand System – QUAIDS, and the QES) in predicting food demands. The study showed that the full rank QES, AIDADS and QUAIDS do indeed out-perform the LES and AIDS. Liu (2003) found that QUAIDS is superior to the AIDS. This is because QUAIDS has properties of both a flexible form (Fisher *et al.*, 2001) and a nonlinear Engel function, which is more appropriate to household data (Banks *et al.*, 1997). Thus, this study chooses both LA/AIDS and QUAIDS with incorporation of demographic variables to estimate demand elasticities and further determine which demand system performs better.

5.0 Data Description

This study utilizes the data in Household Expenditure Survey 2004/2005. Household Expenditure Survey 2004/2005 conducted by the Department of Statistics is consumer expenditure surveys in Malaysia. The survey consisted of a random sample of 14,084 households throughout Malaysia.

Figure 3 shows the food expenditure shares for twelve aggregate food groups at home in Malaysia in 2004/2005. Fish share in Malaysia were significantly highest among all. This is mainly attributed by the high prices of fish and oceanic products in the Malaysian market. This is followed by expenditure shares on bread and other cereals and meat while the shares of vegetables and fruits were relatively low compared with other major foods. Bread and other cereals share is significantly higher than rice share. This probably is a direct implication of the decreasing importance of rise as staple food in Malaysia.

Figure 3: Food expenditure shares at home in Malaysia, 2004/2005.



Source: Household Expenditure Survey 2004/2005.

One of the major problems in analyzing demand using cross-sectional household expenditure data is encountering zero consumption. Zero consumption happened when many households did not purchase various foods during the survey period. Table 3 presents the percentage of households with zero consumption at home in Malaysia in 2004/2005. It shows that many households did not purchase oils and fats, milk and dairy, and eggs during the survey period. Zero consumption of rice and meat were about the same. Bread and other cereals are significantly lowest. This observation further illustrates the increasing importance of wheat and cereal based products in Malaysians daily intake compared to rice.

Table 3: Percentage of Households with zero consumption, 2004/2005

Food Item	%
Rice	10.17
Bread and other cereals	0.96
Meat	10.66
Fish	5.37
Milk and dairy	19.09
Eggs	18.14
Oils and fats	19.87
Fruits	8.89
Vegetables	4.69
Sugar	7.99
Others	8.82
Beverage	8.09

6.0 Methodology

For estimating demand elasticities, previous studies in Malaysia (Radam *et al.*, 2005; Baharumshah and Mohamed, 1993; Mustapha, 1994; Mustapha *et al.*, 1999, 2000, 2001) typically analyzed a complete demand system using one-step approach. The most appropriate procedure is to estimate the first-stage demand system, where the household makes decisions on how much of their total income is to be allocated for food and non-food goods consumption, conditional on household characteristics. Due to data limitation, previous study (Dey, 2000) used expenditure of non-food items as the proxy for the price

index of non-food items in order to consider the substitution relationship between food and non-food items. However, as consumers averagely allocated biggest share of expenditure budget for non-food items, the substitution effect by non-food items for food may have been overestimated. Thus, this procedure is replaced by an Engel function, following the suggestion by Chern (2000). The Engel function is useful to derive income elasticity from expenditure elasticity.

The Working-Leser of Engel function can be expressed as:

$$s = \alpha_0 + \alpha_1 \log X + \beta \log P + \sum_k \gamma_k H_k + \varepsilon \quad (1)$$

The quadratic form of Engel function can be expressed as:

$$\log x = \alpha_0 + \alpha_1 \log X + \alpha_2 (\log X)^2 + \beta \log P + \sum_k \gamma_k H_k + \varepsilon \quad (2)$$

where s = Expenditure share of aggregate food,

x = Total expenditures of the aggregate food,

X = Total expenditures of food and non-food consumer goods and services,

P = Stone price index for the twelve foods, and

ε is random disturbances assumed with zero mean and constant variance.

H_k includes dummy variable where $k \in 8$

AGE = age of household head,

HHSIZE = household size,

URBAN = dummy variable for household that resided in urban area,

EMPLOYED = dummy variable for household head who was employed,

MALE = dummy variable for household head who is male,

MALAY = dummy variable for household head who is Malay,

CHINESE = dummy variable for household head who is Chinese,

INDIAN = dummy variable for household head who is Indian,

SARAWAK = dummy variable for household that resided in Sarawak, and

PENINSUL = dummy variable for household that resided in Peninsular Malaysia.

The quadratic form of Engel function is also useful to validate whether the QUAIDS model properly applies to food demand analysis in Malaysia. As suggested by Banks *et al.* (1997), the Working-Leser form is chosen since it satisfies the adding-up property. Following Deaton and Muellbauer (1980a), equation (1) and (2) are estimated independently utilizing the ordinary least squares estimator (OLS).

From equation (1), following the formulae and procedures of Chern (2000), the income elasticity of demand for aggregate food can be derived as,

. $$e_y^{LA} = \frac{\partial x}{\partial X} \frac{X}{x} \quad (3)$$

From Blundell *et al.* (1993), the responsiveness of expenditure on aggregate food by income change in equation (2) can be computed as,

$$e_y^{QU} = \alpha_1 + 2\alpha_2 \log X \quad (4)$$

In order to overcome zero consumption problems, this study adopts two-step estimator used by Heien and Wessells (1990). Heien and Wessells (1990) extended Heckman's sample selection model to evaluate the inverse Mills ratio (IMR). The use of IMRs are also incorporated into the model to correct the possible bias created by the presence of zero consumption. Linear and quadratic form of probit regressions is computed in order to estimate the probability that a given household consumes the food item in question.

These regressions are used to estimate the IMRs for each household, which is used as an instrument in the second stage LA/AIDS and QUAIDS respectively.

The LA/AIDS model for the 12 food items can be estimated as follows:

$$w_i = \alpha_i + \sum_j \gamma_{ij} \log(p_j) + \beta 1_i \log(x/P) + \sum_k \gamma_k H_k + \theta_i imr_i + \mu_i \quad (5)$$

The QUAIDS model for the 12 food items can be estimated as follows:

$$w_i = \alpha_i + \sum_j \gamma_{ij} \log(p_j) + \beta 1_i \log(x/P) + \beta 2_i (\log(x/P))^2 + \sum_k \gamma_k H_k + \theta_i imr_i + \mu_i \quad (6)$$

where i, j = 1, 2, ……., 12 food groups; w_i is the budget share of the *i*th food item; p is the price of the *i*th food item, and other variables are the same as previously mentioned. The adding up, homogeneity and symmetry restrictions are imposed for both LA/AIDS and QUAIDS models.

Following the formulae and procedures of Green and Alston (1990), the demand elasticities of LA/AIDS can be computed at sample means as follows:
Expenditure elasticities

$$e_i^{LA/AIDS} = \frac{\beta 1_i}{w_i} + 1 \quad (7)$$

Marshallian measures of price elasticities

$$e_{ij}^{LA/AIDS} = -\delta_{ij} + \left(\frac{\gamma_{ij}}{\overline{w_i}}\right) - \left(\frac{\beta 1_i}{\overline{w_i}}\right)\overline{w_j} \qquad \forall i, j = 1..., n \quad (8)$$

where δ_{ij} is the Kronecker delta that is unity if $i = j$ and zero otherwise.
From Blundell *et al.* (1993), the demand elasticities of QUAIDS can be computed as,
Expenditure elasticities

$$e_i^{QUAIDS} = \beta 1_i + \frac{2 * \beta 2_i \log(x)}{\overline{w_i}} + 1 \quad (9)$$

Price elasticities

$$e_{ij}^{QUAIDS} = -\frac{\gamma_{ij}}{\overline{w_i}} - \left[\beta 1_i + 2 * \beta 2_i \log(x)\right]\frac{\overline{w_j}}{\overline{w_i}} - \delta_{ij} \qquad \forall i, j = 1..., n \quad (10)$$

Following the formulae of Chern (2000), the income elasticities of demand for aggregate food from equation (3) and (4) are useful to convert the expenditure elasticities from AIDS and QUAIDS to income elasticites for food items respectively.
Income elasticity on the basis of LA/AIDS model can be computed as,

$$\eta_i^{LA/AIDS} = e_i^{LA} * e_i^{LA/AIDS} \quad (11)$$

Income elasticity on the basis of QUAIDS model can be computed as,

$$\eta_i^{QUAIDS} = e_i^{QU} * e_i^{QUAIDS} \quad (12)$$

7.0 Empirical Results

Both of the Working-Leser and quadratic form of Engel function allow a direct test on the hypotheses of Engel's law. As the dependent variable is the logarithm of monthly expenditure on food, quadratic form of Engel function shows that food expenditures are an increasing function of income. Consistent with the expectation, the Working-Leser regression reported negative and statistically significant coefficient for the logarithm of

monthly income. It shows that the shares of income spent on food are inversely related to income level, where poorer households devote higher shares of income to food than richer households. The Working-Leser and quadratic form of Engel function reported that households of bigger family size devoted a higher share of income to food and spent more on food than households of small family size respectively.

At the mean time, quadratic form of Engel function is useful to determine whether or not the demand system in Malaysia is quadratic in log income. Thus, more attention is paid to the coefficients, α_2, of quadratic in log income in this analysis. Specifically, it is to test the hypothesis of $\alpha_2 = 0$ against $\alpha_2 \neq 0$. The estimated α_2 is statistically different from zero at the 0.01 level. This result shows that the demand function is a non-linear Engel curve. As a result, the QUAIDS is appropriate to be used in the analysis of food demand in this study.

Table 4: Regression results for Engel curve analyses

Variable	Working-Leser Coefficient (Std. Error)	Quadratic form Coefficient (Std. Error)
Intercept	0.722	-3.003
	(0.016)***	(0.228)***
Log (Total expenditure)	-0.111	1.487
	(0.001)***	(0.071)***
Log (Total expenditure)* Log (Total expenditure)	-	-0.084
	-	(0.006)***
Log (age)	0.075	0.477
	(0.003)***	(0.016)***
Log (household size)	0.024	0.018
	(0.002)***	(0.009)**
Urban	-0.027	-0.105
	(0.002)***	(0.010)***
Employed	0.005	0.066
	(0.002)**	(0.013)***
Male	-0.005	-0.079
	(0.002)**	(0.013)***
Malay	-0.029	-0.124
	(0.003)***	(0.017)***
Chinese	-0.018	-0.069
	(0.003)***	(0.018)***
Indian	-0.024	-0.087
	(0.005)***	(0.025)***
Peninsular Malaysia	-0.023	-0.105
	(0.003)***	(0.017)***
Sarawak	-0.010	0.004
	(0.004)***	(0.019)
R^2	0.43	0.30

Note: Significance levels are denoted by *** for 1%, ** for 5%, and * for 10%.

The estimated income elasticities for aggregate food expenditure are presented in Table 5. It clearly shows that Working-Leser form yielded higher elasticity of income for aggregate food than quadratic form. The estimated income elastiticies obtained from the Engel functions would be used to convert the expenditure elasticities for individual food items, which to be estimated from the LA/AIDS and QUAIDS.

Table 5: Estimated income elasticity for total food expenditure in Malaysia, 2004/2005

Working-Leser	0.553433
Quadratic	0.469105

In order to determine which demand system performs better, appendix tables 1 and 2 present the regression results for LA/AIDS and QUAIDS respectively. Generally, all estimations of QUAIDS yielded higher R^2 values than LA/AIDS. In LA/AIDS model, the R^2 values vary from 0.0661 for other foods to 0.3467 for milk and dairy. The R^2 values in QUAIDS model are higher than LA/AIDS model's, varying from 0.0662 for other foods to 0.3470 for milk and dairy. Another focus is paid to the food expenditure variable in QUAIDS. The food expenditure variable ($\beta 1_i$) and its square term ($\beta 2_i$) are significant in most of the items regression, except other foods. This suggests that the responses of these food items expenditures to changes in food expenditure are significantly non-linear.

Price and expenditure elasticities are the center focus in demand analysis. Table 6 depicts the own-price and expenditure elasticities estimated from LA/AIDS and QUAIDS. Both models produced very similar estimates of own-price elasticities. Both models reported that own-price elasticities of demand for rice (-1.9751, -1.9672) are elastic while own-price elasticities of demand for bread and other cereals (-0.9418, -0.9425) are inelastic.

The estimated expenditure elasticity of demand for individual food item in LA/AIDS ranges from 0.7418 for milk to dairy to 1.2836 for rice, while QUAIDS estimated expenditure elasticity ranges from 0.9640 for oils and fats to 1.1172 for beverage. One distinct difference between the LA/AIDS and QUAIDS models is that the LA/AIDS model yielded higher expenditure elasticity of demand for rice (1.2836) than other food items, especially meat (1.0212) and fish (0.9685), while QUAIDS model produced similar expenditure elasticities of demand for rice (0.9810), meat (0.9761), and fish (0.9772).

The LA/AIDS specification produced lower expenditure elasticity of demand for bread and other cereals (0.7790) than rice (1.2836). This result is not consistent with the expectation, which historical experience has shown that as income increases, Malaysians would substitute wheat based products for rice. Reasonably, the QUAIDS specification reported higher expenditure elasticity of demand for bread and other cereals (1.0591) than rice (0.9810). Thus, the QUAIDS appears to yield more plausible food demand elasticities than the LA/AIDS model in Malaysia.

Table 6: Estimated expenditure and own-price elasticities for food items, Malaysia

Food	LA/AIDS		QUAIDS	
	Own-price	Expenditure	Own-price	Expenditure
Rice	-1.9751	1.2836	-1.9672	0.9810
Bread and other cereals	-0.9418	0.7790	-0.9425	1.0591
Meat	-1.0695	1.0212	-1.0688	0.9761
Fish	-0.8432	0.9685	-0.8467	0.9772
Milk and dairy	-0.5163	0.7418	-0.5162	1.0096
Eggs	-1.4252	1.1122	-1.4282	0.9680
Oils and fats	-1.1967	1.1255	-1.1954	0.9640
Fruits	-1.0646	1.0606	-1.0640	0.9655
Vegetables	-1.1271	1.1759	-1.1274	0.9753
Sugar	-1.0477	0.9788	-1.0453	0.9821
Others	-0.9665	0.8789	-0.9662	0.9802
Beverage	-1.3432	0.9913	-1.3456	1.1172

Most of the studies (Ishida *et al*., 2003; Radam *et al.*, 2005; and Baharumshah and Mohamed, 1993) of food demand in Malaysia used the expenditure elasticity as the proxy for income elasticity. By doing so, some of the foods were regarded as luxury goods due to the more than unity expenditure elasticities. As laid down in the hypothesis of Engel's law, foods are normal goods, thus, the income elasticity must be less than one. By multiplying the estimated individual expenditure elasticity with income elasticity for total food expenditure, table 7 presents the estimated income elasticities for food items in Malaysia. All of the estimated income elasticities are less than unity. However, the observations are similar like those discussed in the earlier section of expenditure elasticities.

It comes to the concern whether it is reasonable to have higher income elasticity of demand for rice (0.7104, 0.4712) than meat (0.5652, 0.4688) in both models. Chern (2000) suggested that the best way to gain insight of this phenomenon is to compare the price of the foods in the data. From the Household Expenditure Survey 2004/2005, the average price of rice is RM3.11/kg, with normal rice and fragrant rice priced at RM1.74/kg and RM2.50 respectively. The average price of meat is RM3.11/kg, with beef, poultry and mutton priced at RM16.90/kg, RM5.44 and RM11.00 respectively. In relevance to the effect of price and affordability, it is observed that Malaysians consumed as much as much as 5kg of rice (mostly attributed by lower quality normal rice) and 2.84kg of meat monthly. With these statistics, it is noteworthy that the income elasticities are estimated on a basis of at-home consumption only. As Malaysians tend to consume lesser rice but more meat and fish on the basis of food away from home, it harmonizes the estimates of higher income elasticity of demand for rice than meat on the basis of at-home consumption in this study.

Table 7: Estimated income elasticities for food items, Malaysia

Food	LA/AIDS	QUAIDS
Rice	0.7104	0.4712
Bread and other cereals	0.4311	0.5087
Meat	0.5652	0.4688
Fish	0.5360	0.4693
Milk and dairy	0.4105	0.4849
Eggs	0.6155	0.4649
Oils and fats	0.6229	0.4630
Fruits	0.5870	0.4638
Vegetables	0.6508	0.4685
Sugar	0.5417	0.4717
Others	0.4864	0.4708
Beverage	0.5486	0.5366

8.0 Conclusions

By utilizing data from Household Expenditure Survey 2004/2005, this section first summarizes the applicability of the LA/AIDS and QUAIDS models in Malaysia. The adjusted R^2s show that the performance of the QUAIDS model is better than the LA/AIDS model. The QUAIDS also yielded more reasonable and plausible estimated demand elasticities, especially of higher income elasticities for bread and other cereals than rice that is more consistent with the researchers' expectation.

The positive expenditure and income elasticities both indicate that rice is not an inferior good in Malaysia. Thus, higher per capita income will induce higher demand for rice. Given positive forecasts of healthy growth in Malaysian economic, income effect alone may not strong enough to yield a definite increasing trend of rice consumption. Other factors, namely urbanization and westernization in taste and preference are likely to offset the effect of income in shaping consumption of rice. The decrease in rice consumption is always accompanied with an increase in demand for wheat based products and meat.

As an extension to the discussion of urbanization impacts above, the follows discuss more about the results of dummy urban variable in appendix tables 1 and 2. The regression results of rice indicate that Malaysians in urban areas devoted lower share of food expenditure on rice compared to those in rural areas. Contrary, the regression results of bread and other cereals and meat indicate that Malaysians in urban areas devoted higher share of food expenditure on bread and other cereals and meat compared to those in rural areas.

Since rice is suggested not an inferior good, in order to curb such vulnerable scenario of decreasing demand for rice due to urbanization and taste and preference, rice based agri-food industry players may want to consider to offer rice in other processed or convenient forms, rather than ordinary rice as physically seen rice in Malaysia.

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Appendix 1: Maximum likelihood estimates of LA/AIDS

	Rice	Bread & other cereals	Meat	Fish	Milk & dairy	Eggs	Oils & fats	Fruits	Vegetables	Sugar	Others	Beverage
Intercept	-0.0114	0.4489	0.0183	0.0541	0.0771	0.0257	0.0157	0.0391	0.03	0.0569	0.0732	0.0758
	(0.0063)*	(0.0100)***	(0.0078)**	(0.0091)***	(0.0060)***	(0.0021)***	(0.0025)***	(0.0065)***	(0.0054)***	(0.0032)***	(0.0084)***	-
log (price of rice)	-0.0916	0.0784	-0.0106	-0.0287	-0.0126	0.007	-0.002	0.0253	-0.0032	0.0037	0.0095	0.0248
	(0.0029)***	(0.0046)***	(0.0037)***	(0.0043)***	(0.0028)***	(0.0009)***	(0.0011)*	(0.0029)***	-0.0024	(0.0014)***	(0.0038)**	-
log (price of bread and other cereals)	0.0038	0.0038	-0.0015	-0.0033	-0.0004	-0.0008	-0.0003	0.0018	0.0044	-0.0021	-0.0061	0.0008
	(0.0009)***	-	-0.0014	(0.0016)**	-0.001	(0.0003)**	-0.0004	-0.0011	(0.0009)***	(0.0005)***	(0.0014)***	-
log (price of meat)	0.024	-0.0084	-0.0084	-0.0115	-0.0062	0.0009	0.0019	0.0061	-0.0049	0.0046	-0.0085	0.0105
	(0.0020)***	(0.0018)***	-	(0.0030)***	(0.0020)***	-0.0007	(0.0008)**	(0.0021)***	(0.0017)***	(0.0010)***	(0.0027)***	-
log (price of fish)	0.0088	-0.061	0.0302	0.0302	0.0024	0.0063	0.0075	-0.0098	0.0063	-0.0047	-0.0002	-0.016
	(0.0027)***	(0.0043)***	(0.0026)***	-	-0.0026	(0.0009)***	(0.0011)***	(0.0027)***	(0.0023)***	(0.0013)***	-0.0036	-
log (price of milk and dairy)	-0.0004	-0.022	-0.0054	0.0267	0.0267	-0.0018	-0.0008	-0.0056	0.0059	-0.0034	-0.0065	-0.0134
	-0.0009	(0.0014)***	(0.0011)***	(0.0007)***	-	(0.0003)***	(0.0003)**	(0.0009)***	(0.0007)***	(0.0004)***	(0.0012)***	-
log (price of eggs)	0.0196	-0.03	0.0085	0.0402	-0.0092	-0.0092	0.0017	-0.0085	0.0073	-0.0023	-0.0032	-0.0149
	(0.0021)***	(0.0034)***	(0.0027)***	(0.0032)***	(0.0007)***	-	(0.0008)**	(0.0022)***	(0.0018)***	(0.0011)**	-0.0028	-
log (price of oils and fats)	0.0035	0.0117	-0.0023	-0.0112	-0.0003	-0.0055	-0.0055	0.0043	-0.0016	0.0012	0.0035	0.0024
	(0.0008)***	(0.0013)***	(0.0010)**	(0.0012)***	-0.0008	(0.0002)***	-	(0.0008)***	(0.0007)**	(0.0004)***	(0.0010)***	-
log (price of fruits)	0.014	-0.0107	0.002	0.0041	0.0002	0.0013	-0.0041	-0.0041	0.0004	0.0006	-0.0005	-0.0031
	(0.0012)***	(0.0020)***	-0.0016	(0.0019)**	-0.0012	(0.0004)***	(0.0004)***	-	-0.0011	-0.0006	-0.0016	-
log (price of vegetables)	0.015	0.0207	-0.0075	-0.0314	0.0019	0.0011	0.0046	-0.0116	-0.0116	0.0055	-0.0113	0.0246
	(0.0022)***	(0.0035)***	(0.0028)***	(0.0032)***	-0.0022	-0.0007	(0.0009)***	(0.0014)***	-	(0.0011)***	(0.0029)***	-
log (price of sugar)	-0.0063	0.0149	-0.002	-0.011	-0.0005	0	-0.0019	0.0068	-0.0017	-0.0017	0.0194	-0.0162
	(0.0007)***	(0.0011)***	(0.0010)**	(0.0011)***	-0.0007	-0.0002	(0.0003)***	(0.0008)***	(0.0003)***	-	(0.0011)***	-
log (price of others)	-0.0019	0.0138	-0.0065	-0.0199	-0.0004	-0.0005	-0.0023	0.0017	-0.0112	0.0014	0.0014	0.0241
	(0.0008)**	(0.0014)***	(0.0011)***	(0.0013)***	-0.0008	-0.0003	(0.0003)***	(0.0009)*	(0.0007)***	(0.0004)***	-	-

log (price of beverage)	0.0114	-0.0113	0.0035	0.0159	-0.0016	0.0012	0.0013	-0.0063	0.0098	-0.0028	0.0024	-0.0235
	-	-	-	-	-	-	-	-	-	-	-	-
log (x/P)	0.0274	-0.0303	0.0027	-0.0063	-0.0147	0.0024	0.0036	0.0041	0.0188	-0.0007	-0.0065	-0.0006
	(0.0009)***	(0.0014)***	(0.0012)**	(0.0013)***	(0.0009)***	(0.0003)***	(0.0003)***	(0.0009)***	(0.0008)***	(0.0004)*	(0.0012)***	-
Log (age)	0.0001	-0.0011	0.0005	0.0013	-0.0006	-0.0001	0	0.0003	0.0004	-0.0002	0.0001	-0.0006
	(0.0000)**	(0.0001)***	(0.0001)***	(0.0001)***	(0.0000)***	(0.0000)***	0	(0.0000)***	(0.0000)***	(0.0000)***	-0.0001	-
Log (household size)	0.0028	-0.0096	0.0043	0.003	0.0018	0	0.0002	-0.0022	0.0017	0.0003	0.0015	-0.0038
	(0.0003)***	(0.0004)***	(0.0003)***	(0.0004)***	(0.0003)***	-0.0001	(0.0001)**	(0.0003)***	(0.0002)***	(0.0001)*	(0.0003)***	-
Urban	-0.016	0.0102	0.0071	-0.009	0.0069	-0.0001	-0.0003	0.0046	-0.0089	-0.0002	-0.001	0.0066
	(0.0012)***	(0.0020)***	(0.0016)***	(0.0019)***	(0.0012)***	-0.0004	-0.0005	(0.0013)***	(0.0011)***	-0.0006	-0.0016	-
Employed	0.004	-0.0193	0.0087	0.0076	-0.0048	-0.0009	-0.0001	0.0097	0.0029	0.0012	-0.0009	-0.0081
	(0.0016)**	(0.0026)***	(0.0021)***	(0.0024)***	(0.0016)***	(0.0005)*	-0.0006	(0.0016)***	(0.0014)**	-0.0008	-0.0021	-
Male	-0.0002	-0.0046	0.0042	0.0043	0.0037	-0.0008	-0.0007	-0.0003	-0.0046	-0.0035	-0.0007	0.0032
	-0.0016	(0.0026)*	(0.0021)**	(0.0024)*	(0.0016)**	(0.0005)*	-0.0006	-0.0016	(0.0014)***	(0.0008)***	-0.0021	-
Malay	-0.0176	0.015	-0.0046	0.019	0.0051	-0.0035	0.0025	0.006	-0.0217	0.0045	0.0002	-0.0049
	(0.0020)***	(0.0033)***	(0.0026)*	(0.0031)***	(0.0020)**	(0.0007)***	(0.0008)***	(0.0021)***	(0.0017)***	(0.0010)***	-0.0027	-
Chinese	-0.0363	0.0011	0.0361	-0.0096	0.0042	-0.0063	0.0023	0.0194	0.0064	-0.0061	-0.0086	-0.0027
	(0.0021)***	-0.0035	(0.0028)***	(0.0032)***	(0.0021)**	(0.0007)***	(0.0008)***	(0.0022)***	(0.0018)***	(0.0011)***	(0.0028)***	-
Indian	-0.0182	-0.0174	-0.0073	-0.007	0.0193	-0.007	0.0084	-0.0003	0.0198	-0.0016	0.0178	-0.0066
	(0.0030)***	(0.0049)***	(0.0039)*	-0.0046	(0.0030)***	(0.0010)***	(0.0012)***	-0.0031	(0.0026)***	-0.0015	(0.0040)***	-
Peninsular Malaysia	-0.0474	-0.0029	0.0122	0.0401	0.0069	-0.0062	-0.0022	0.0192	0.0034	-0.0055	-0.0095	-0.008
	(0.0021)***	-0.0034	(0.0028)***	(0.0032)***	(0.0021)***	(0.0007)***	(0.0008)***	(0.0022)***	(0.0018)*	(0.0010)***	(0.0028)***	-
Sarawak	-0.0225	-0.0216	0.0566	-0.0088	0.0022	-0.0028	-0.0019	0.007	0.0114	-0.0038	-0.0204	0.0045
	(0.0023)***	(0.0037)***	(0.0030)***	(0.0035)**	-0.0023	(0.0007)***	(0.0009)**	(0.0024)***	(0.0020)***	(0.0011)***	(0.0030)***	-
IMR	0.0852	0.1235	0.0732	0.0706	0.0649	0.0281	0.033	0.0512	0.0655	0.0391	0.0385	-0.6729
	(0.0061)***	(0.0068)***	(0.0029)***	(0.0040)***	(0.0013)***	(0.0005)***	(0.0008)***	(0.0021)***	(0.0032)***	(0.0012)***	(0.0027)***	-
Adjusted R^2	0.3123	0.2336	0.1722	0.2010	0.3467	0.2167	0.2275	0.1248	0.2138	0.1258	0.0661	-

Note: Significance levels are denoted by *** for 1%, ** for 5%, and * for 10%.

Appendix 2: Maximum likelihood estimates of QUAIDS

	Rice	Bread & other cereals	Meat	Fish	Milk & dairy	Eggs	Oils & fats	Fruits	Vegetables	Sugar	Others	Beverage
Intercept	-0.0190	0.4705	0.0123	0.0479	0.0791	0.0246	0.0139	0.0347	0.0221	0.0560	0.0721	0.1857
	(0.0064)***	(0.0100)***	(0.0079)	(0.0093)***	(0.0061)***	(0.0021)***	(0.0025)***	(0.0066)***	(0.0055)***	(0.0032)***	(0.0085)***	-
log (price of rice)	-0.0909	0.0762	-0.0101	-0.0281	-0.0127	0.0071	-0.0018	0.0258	-0.0023	0.0038	0.0097	0.0234
	(0.0029)***	(0.0046)***	(0.0037)***	(0.0043)***	(0.0028)***	(0.0009)***	(0.0011)	(0.0029)***	(0.0024)	(0.0014)***	(0.0038)**	-
log (price of bread and other cereals)	0.0038	0.0038	-0.0014	-0.0033	-0.0005	-0.0008	-0.0003	0.0018	0.0045	-0.0021	-0.0061	0.0006
	(0.0009)***	-	(0.0014)	(0.0016)**	(0.0010)	(0.0003)**	(0.0004)	(0.0011)*	(0.0009)***	(0.0005)***	(0.0014)***	-
log (price of meat)	0.0239	-0.0083	-0.0083	-0.0115	-0.0062	0.0009	0.0019	0.0060	-0.0050	0.0046	-0.0085	0.0106
	(0.0020)***	(0.0018)***	-	(0.0030)***	(0.0020)***	(0.0007)	(0.0008)**	(0.0021)***	(0.0017)***	(0.0010)***	(0.0027)***	-
log (price of fish)	0.0079	-0.0585	0.0294	0.0294	0.0027	0.0062	0.0072	-0.0103	0.0054	-0.0048	-0.0004	-0.0144
	(0.0027)***	(0.0043)***	(0.0026)***	-	(0.0026)	(0.0009)***	(0.0011)***	(0.0027)***	(0.0023)**	(0.0013)***	(0.0036)	-
log (price of milk and dairy)	-0.0003	-0.0222	-0.0053	0.0267	0.0267	-0.0018	-0.0008	-0.0055	0.0060	-0.0034	-0.0065	-0.0136
	(0.0009)	(0.0014)***	(0.0011)***	(0.0007)***	-	(0.0003)***	(0.0003)**	(0.0009)***	(0.0007)***	(0.0004)***	(0.0012)***	-
log (price of eggs)	0.0190	-0.0283	0.0080	0.0397	-0.0092	-0.0092	0.0015	-0.0088	0.0066	-0.0023	-0.0033	-0.0138
	(0.0021)***	(0.0034)***	(0.0027)***	(0.0032)***	(0.0007)***	-	(0.0008)*	(0.0022)***	(0.0018)***	(0.0011)**	(0.0028)	-
log (price of oils and fats)	0.0037	0.0111	-0.0022	-0.0110	-0.0004	-0.0055	-0.0055	0.0044	-0.0014	0.0012	0.0035	0.0020
	(0.0008)***	(0.0013)***	(0.0010)**	(0.0012)***	(0.0008)	(0.0002)***	-	(0.0008)***	(0.0007)**	(0.0004)***	(0.0010)***	-
log (price of fruits)	0.0141	-0.0109	0.0020	0.0041	0.0002	0.0013	-0.0041	-0.0041	0.0005	0.0006	-0.0005	-0.0033
	(0.0012)***	(0.0020)***	(0.0016)	(0.0019)**	(0.0012)	(0.0004)***	(0.0004)***	-	(0.0011)	(0.0006)	(0.0016)	-
log (price of vegetables)	0.0150	0.0209	-0.0076	-0.0315	0.0019	0.0011	0.0046	-0.0117	-0.0117	0.0055	-0.0114	0.0247
	(0.0022)***	(0.0035)***	(0.0028)***	(0.0032)***	(0.0022)	(0.0007)	(0.0009)***	(0.0014)***	-	(0.0011)***	(0.0029)***	-
log (price of sugar)	-0.0060	0.0144	-0.0018	-0.0108	-0.0005	0.0000	-0.0019	0.0069	-0.0016	-0.0016	0.0195	-0.0165
	(0.0007)***	(0.0011)***	(0.0010)*	(0.0011)***	(0.0007)	(0.0002)	(0.0003)***	(0.0008)***	(0.0003)***	-	(0.0011)***	-
log (price of others)	-0.0017	0.0133	-0.0063	-0.0197	-0.0004	-0.0004	-0.0022	0.0018	-0.0110	0.0015	0.0015	0.0238
	(0.0008)**	(0.0014)***	(0.0011)***	(0.0013)***	(0.0008)	(0.0003)	(0.0003)***	(0.0009)***	(0.0007)***	(0.0004)***	-	-

log (price of beverage)	0.0115	-0.0115	0.0035	0.0160	-0.0016	0.0012	0.0013	-0.0063	0.0099	-0.0028	0.0024	-0.0236
	-	-	-	-	-	-	-	-	-	-	-	-
log (x/P)	0.0321	-0.0436	0.0063	-0.0025	-0.0161	0.0032	0.0047	0.0068	0.0238	-0.0001	-0.0058	-0.0088
	(0.0011)***	(0.0017)***	(0.0014)***	(0.0016)	(0.0011)***	(0.0004)***	(0.0004)***	(0.0011)***	(0.0009)***	(0.0005)	(0.0014)***	-
log (x/P)*log (x/P)	-0.0006	0.0016	-0.0004	-0.0005	0.0002	-0.0001	-0.0001	-0.0003	-0.0006	-0.0001	-0.0001	0.0010
	(0.0001)***	(0.0001)***	0.0001)***	(0.0001)***	(0.0001)**	(0.0000)***	(0.0000)***	(0.0001)***	(0.0001)***	(0.0000)*	(0.0001)	-
Log (age)	0.0001	-0.0011	0.0005	0.0013	-0.0006	-0.0001	0.0000	0.0003	0.0004	-0.0002	0.0001	-0.0006
	(0.0000)*	(0.0001)***	(0.0001)***	(0.0001)***	(0.0000)***	(0.0000)***	(0.0000)	(0.0000)***	(0.0000)***	(0.0000)***	(0.0001)	-
Log (household size)	0.0029	-0.0097	0.0043	0.0030	0.0018	0.0000	0.0002	-0.0022	0.0018	0.0003	0.0015	-0.0039
	(0.0003)***	(0.0004)***	(0.0003)***	(0.0004)***	(0.0003)***	(0.0001)	(0.0001)**	(0.0003)***	(0.0002)***	(0.0001)**	(0.0003)***	-
Urban	-0.0160	0.0102	0.0071	-0.0090	0.0069	-0.0001	-0.0003	0.0046	-0.0089	-0.0002	-0.0010	0.0066
	(0.0012)***	(0.0020)***	(0.0016)***	(0.0019)***	(0.0012)***	(0.0004)	(0.0005)	(0.0013)***	(0.0011)***	(0.0006)	(0.0016)	-
Employed	0.0037	-0.0182	0.0084	0.0072	-0.0047	-0.0009	-0.0002	0.0095	0.0025	0.0011	-0.0009	-0.0074
	(0.0016)**	(0.0026)***	(0.0021)***	(0.0024)***	(0.0016)***	(0.0005)*	(0.0006)	(0.0016)***	(0.0014)*	(0.0008)	(0.0021)	-
Male	0.0000	-0.0051	0.0044	0.0044	0.0036	-0.0008	-0.0006	-0.0002	-0.0044	-0.0035	-0.0007	0.0029
	(0.0016)	(0.0025)**	(0.0021)**	(0.0024)*	(0.0016)**	(0.0005)	(0.0006)	(0.0016)	(0.0013)***	(0.0008)***	(0.0021)	-
Malay	-0.0173	0.0143	-0.0044	0.0192	0.0050	-0.0035	0.0025	0.0061	-0.0214	0.0046	0.0003	-0.0053
	(0.0020)***	(0.0032)***	(0.0026)*	(0.0031)***	(0.0020)**	(0.0007)***	(0.0008)***	(0.0021)***	(0.0017)***	0.0010)***	(0.0027)	-
Chinese	-0.0361	0.0007	0.0363	-0.0095	0.0042	-0.0063	0.0024	0.0195	0.0066	-0.0061	-0.0085	-0.0029
	(0.0021)***	(0.0034)	(0.0028)***	(0.0032)***	(0.0021)**	(0.0007)***	(0.0008)***	(0.0022)***	(0.0018)***	(0.0011)***	(0.0028)***	-
Indian	-0.0181	-0.0178	-0.0071	-0.0069	0.0193	-0.0070	0.0084	-0.0002	0.0200	-0.0016	0.0179	-0.0069
	(0.0030)***	(0.0049)***	(0.0039)*	(0.0046)	(0.0030)***	(0.0010)***	(0.0012)***	(0.0031)	(0.0026)***	(0.0015)	(0.0040)***	-
Peninsular Malaysia	-0.0471	-0.0037	0.0124	0.0403	0.0068	-0.0062	-0.0021	0.0193	0.0037	-0.0055	-0.0095	-0.0085
	(0.0021)***	(0.0034)	(0.0028)***	(0.0032)***	(0.0021)***	(0.0007)***	(0.0008)***	(0.0022)***	(0.0018)**	(0.0010)***	(0.0028)***	-
Sarawak	-0.0224	-0.0218	0.0567	-0.0087	0.0022	-0.0028	-0.0019	0.0071	0.0115	-0.0038	-0.0203	0.0044
	(0.0023)***	(0.0037)***	(0.0030)***	(0.0035)**	(0.0023)	(0.0007)***	(0.0009)**	(0.0024)***	(0.0020)***	(0.0011)***	(0.0030)***	-
IMR	0.0846	0.1248	0.0734	0.0706	0.0649	0.0281	0.0330	0.0510	0.0652	0.0390	0.0385	-0.6730
	(0.0061)***	(0.0068)***	(0.0029)***	(0.0040)***	(0.0013)***	(0.0005)***	(0.0008)***	(0.0021)***	(0.0031)***	(0.0012)***	(0.0027)***	-
Adjusted R^2	0.3152	0.2429	0.1734	0.2019	0.3470	0.2177	0.2285	0.1257	0.2183	0.1260	0.0662	-

Note: Significance levels are denoted by *** for 1%, ** for 5%, and * for 10%.