

Demand for beef in Malaysia: preference for quantity, quality or lean?

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Abstract: Using the Malaysian Household Expenditure Survey 2004/2005 data, this study investigated Malaysian consumers' preference for beef quantity, quality, and lean beef. Demand and price models that incorporated consumer socio-economic variables were estimated via two-stage least squares (2SLS). This study showed that Malaysian consumers tend to demand for more quantity rather than quality of beef products. Malaysian consumers are also more responsive to price changes rather than fat reduction in beef products. It is more profitable for beef market players to increase their production as Malaysian consumers are expected to consume increasing amounts of beef products.

Keywords: Beef, quantity, quality, fat trimming

INTRODUCTION

The Malaysian diet has undergone significant changes over the years. The diet change is characterized by a dramatic diminished consumption of rice and preference for higher-value and –protein livestock products. Statistically, per capita consumption of rice has decreased from 121 kg in 1961 to 70.8 kg in 2003 while per capita consumption of meat has increased from 13.2 kg in 1961 to 48.5 kg in 2003 (FAO, 2007). With rising income, it is projected that Malaysian consumers will further diversify their diets with more livestock products in their food basket (Ishida *et al.*, 2003; Nik Mustapha *et al.* 2000; Tey *et al.*, 2007).

Typically, economists attribute such dietary diversification to income, prices, and urbanization changes. A change in the degree of government participation has brought a rapid development in the domestic agri-food systems. In the Ninth Malaysian Plan, the Malaysian government targets to increase the production of beef and mutton in order to reduce the dependence on imports. As per capita consumption (0.5 kg in 2003) of mutton is very low, more attention is paid to the beef market. Statistically, per capita consumption of beef increased from 2.3 kg to 5.8 kg within 1961-2003 (FAO, 2007). Due to the all-time high price of beef that is controlled by a cartel, the government also plans to open the beef market to

more foreign producers, particularly halal abattoirs. Both initiatives are expected to make beef products more affordable and bring a significant change in the quantity of beef purchase and consumption.

Recent previous studies (Ishida *et al.*, 2003; Nik Mustapha *et al.*, 2000; Tey *et al.*, 2007) focused more on Malaysians' demand for aggregate meat in Malaysia. Specifically, early previous studies (Baharumshah, 1993; Baharumshah and Mohamed, 1993; Nik Mustapha *et al.*, 1994) estimated expenditure elasticities for individual meat products. Baharumshah (1993), Baharumshah and Mohamed (1993), and Nik Mustapha *et al.* (1994) reported expenditure elasticities of 0.992, 0.061, and 0.86 for beef and 1.292, 1.432, and 0.88 for poultry, respectively. They suggested that Malaysian consumers are likely to increase more of their poultry consumption compared to beef in response to income growth.

In real fact, per capita consumption of poultry was much higher at 33.8 kg compared to per capita consumption of 5.8 kg for beef in 2003 (FAO, 2007). The high per capita consumption of poultry relative to beef is not only because poultry is the cheapest form of meat available and homogeneous to all races in Malaysia but is also reflective of consumer health concerns. This is probably well explained by Clancy (1986) who stated that there are relationships between saturated fats and nutrition and health, highlighting the

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possible health diseases due to the consumption of beef. Mounting health-concerns are seen as the main drivers in persuading western consumers to reduce or avoid red meat consumption (Gao and Shonkwiler, 1993; McCracken, 1994).

Increased health awareness has motivated western beef producers to produce modern lean or organic red meat, which is trimmed of visible fat. In an attempt to answer the question whether it is profitable for American beef producers to adopt fat reduction strategies, Unnevehr and Bard (1993) and Wang *et al.* (1996) suggested that consumers are willing to pay more for removing fat in beef. However, Shongwe *et al.* (2007) found that more affluent consumers in South Africa are willing to pay for additional external fat due to their traditional cooking style. These differing findings indicate that it is a fallacy to assume that international trends are applicable to another country's situation, especially those countries with different cultures and traditions that may influence consumers' dietary patterns.

This brief introductory background indicates that consumer demand for beef has changed because consumers derive utility (satisfaction) from the quality characteristics of beef. This, in simple terms, is the result of a comparison between the real and the desired characteristics. Utility appraisal is critical to determine a consumer's decision to repurchase the beef. Anderson and Ferguson (2001) pointed out that consumers emphasize quality as the top priority in making a decision to purchase beef. Similar results were reported by Taljaard *et al.* (2006) that factors other than economic ones are becoming more important to consumers when purchasing red meat. Though quality attribute is increasingly critical as a selling point, Capps and Schmitz (1991) and Wang *et al.* (1996) found that consumers are more likely to favor quantity over quality.

The domestic beef market is also postulated to be characterized by a variety of qualities in future. This assumption is made on the basis that consumers do not only make decisions on how much to purchase but also on quality. Hsu *et al.* (2001) recognized that the demand for product quality is increasingly important as a component in food purchase process. Hence, it is important for beef producers and traders to gain a better understanding on consumers' preference to offer desirable beef products. In view of this, the objective of this study was to investigate the Malaysian consumers' preference for beef quantity, quality, and lean by using the Malaysian Household Expenditure Survey 2004/2005 data.

MATERIALS AND METHODS

Estimation procedures

Based on the approach used by Capps and Schmitz (1991) and Wang *et al.* (1996), the demand for beef was determined by total meat expenditure, beef price, prices of other meat products, and socio-demographic variables. The linear empirical functional form can be expressed as:

$$\log(Q_{bf}) = \alpha_0 + \alpha_1 \log(EXP) + \alpha_2 \log(P_{bf}) + \sum_{i=1}^n \alpha_{i+2} \log(P_i) + \sum_{j=1}^m \alpha_{n+j+2} D_j + e \quad (1)$$

where Q_{bf} and P_{bf} are the quantity and price of beef respectively, EXP is the aggregate meat expenditure, P_i is the price of i th meat (pork, mutton, poultry, and other meats), D is a set of demographic variables (household size, urban dummy, Malay dummy, Chinese dummy, and Indian dummy), α 's are parameters to be estimated, and e is the error term. Referring to LaFrance (1986), α_i is beef expenditure elasticity with respect to aggregate meat expenditure and α_2 is own-price elasticity for beef.

Based on the hedonic methodology and the procedure used by Houthakker (1952) and Deaton (1988), the beef price was assumed to be determined by the fat content of beef and socio-demographic characteristics. The empirical specification is expressed as:

$$\log(P_{bf}) = \beta_0 + \beta_1 \log(FAT) + \beta_2 \log(TOTFD) + \sum_{j=1}^d \beta_{2+j} D_j + e \quad (2)$$

where FAT is fat content of beef, $TOTFD$ is total food expenditures, D is a vector of the consumer demographic variables mentioned earlier, β 's are parameters to be estimated, and e is the error term. Based on the procedure of Houthakker (1952), β_1 and β_2 are the fat and quality elasticities of the beef price respectively.

LaFrance (1986) suggested that it is plausible to use the functional forms above as it is linear in its parameters, robust to model misspecification, and elasticities appear as parameters. Equations (1) and (2) can be estimated by the two-stage least squares (2SLS) procedure. According to Wang *et al.* (1996), two comparisons can be made from the models. Firstly, a comparison between expenditure and quality elasticities will show consumers' preference

for quantity or quality. Secondly, a comparison between own-price and fat elasticities in absolute values will show whether lean meat is favored by consumers.

Data

The Household Expenditure Survey 2004/2005 data was collected from July 2004 to July 2005 by the Malaysian Department of Statistics. The survey consists of food and non-food expenditures and socio-economic information on 14,084 households in Malaysia. The analysis included households who did not consume beef during the survey period. This is because there are substitution and complementary factors between beef and other meats which might have affected the beef purchasing decision.

The study also focused on analyses based on total respondents, lower-income and higher-income groups. Categorization of the income groups was done based on the mean per capita monthly income (RM537.7). Respondents that recorded per capita monthly income below and above the mean are categorized as lower- and higher-income groups, respectively.

Price of beef vary according to cut, country-of-origin, festive season, and location of the market in Malaysia. Prices of domestic bred beef in rural regions during non-festive season are cheaper than imported meat or those available at supermarkets/hypermarkets in urban regions. Table 1 presents interesting figures on the distribution of ethnics in this study. Generally, Malay consumers consume more beef than other ethnics. Due to religion and belief, only a small proportion of Chinese and Indians consume beef. Hence, this study is expected to show higher demand for beef in rural regions based on the statistics that Malay consumers are the majority in rural regions.

The selected socio-demographic variables were household size, urbanization region, and race of household head. Definitions of these and other main variables (meat expenditure, total food cost, fat content of beef, beef consumption, and prices of the five meats) and their selected sample statistics are presented in Table 2.

RESULTS AND DISCUSSION

Table 3 presents the regression results for the demand equations. The R-square values ranged from 0.5431 to 0.5917, which is acceptable for analyses of cross-sectional data (Wang *et al.*, 1996). All the parameters are significant across the cases, except for the price of other meats. Attention was given to the estimates of beef expenditure elasticity with respect to aggregate meat expenditure and price elasticities. The expenditure elasticities were used as proxies for income elasticities of demand for quantity of beef. The estimated expenditure elasticities for beef were inelastic, showing that beef is a normal good to Malaysian consumers. On average, the own-price elasticities ranged from -0.8245 to -0.8316, demonstrating that the demand for beef was generally inelastic.

With respect to income groups, the estimated expenditure elasticities for beef were 0.7829 and 0.7619 in lower- and higher income consumers, respectively. Though there was no big difference between the income groups, the estimates of expenditure elasticity declined as the income bracket of consumers increased. This is rationalized by economic theory that luxury goods sooner or later become normal goods when per capita income approaches an affluent level.

Similarly, there was no distinctive difference between the estimates of own-price elasticity of

Table 1: Percentage distribution of ethnics in Malaysia

	Lower-income Group		Higher-income Group		Total	
	Rural (N=3903)	Urban (N=5574)	Rural (N=714)	Urban (N=3893)	Rural (N=4617)	Urban (N=9467)
Malay	72	56	68	40	72	49
Chinese	8	19	18	44	9	29
Indian	3	7	3	7	3	7
Others	17	18	11	9	16	15

Source: Household Expenditure Survey 2004/2005.

Table 2: Variable definition and selected sample statistics

Variable	Definition	Lower-income Group (N=9477)		Higher-income Group (N=4607)		Total (N=14084)	
		Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation
Q_{beef}	Quantity of beef purchased	0.2012	0.1604	0.3890	0.2780	0.2626	0.1958
EXP (RM/month)	Per capita expenditure on five meat commodities	9.8578	9.6804	18.5035	17.1178	12.6859	10.4980
TOTFD (RM/month)	Per capita total food expenditures	81.5148	38.3641	142.6020	101.9910	101.4970	72.2071
FAT (g)	Fat contents per lb. of beef	15.2672	13.1666	28.0554	20.2506	19.4503	10.8214
P_{bf} (RM)	Price of beef	10.7415	4.1046	10.5161	3.9727	10.6678	4.0632
P_{pork} (RM)	Price of pork	8.4790	0.8038	8.6951	1.0182	8.5497	0.8855
P_{mutton} (RM)	Price of mutton	10.3465	0.1553	10.3553	0.1590	10.3494	0.1566
P_{poultry} (RM)	Price of poultry	5.6232	0.3722	5.6775	0.3795	5.6409	0.3755
$P_{\text{othermeats}}$ (RM)	Price of other meats	11.5025	0.0344	11.5029	0.0387	11.5027	0.0359
HHSIZE	Household size	4.9000	2.1960	3.2200	1.8010	4.3500	2.2210
URBAN	1 if household resides in urban region, 0 otherwise.	0.5900	0.4920	0.8500	0.3620	0.6700	0.4690
MALAY	1 if household head is Malay, 0 otherwise. Base = household head is other race/ethnic	0.6300	0.4840	0.4400	0.4970	0.5700	0.4960
CHINESE	1 if household head is Chinese, 0 otherwise. Base = household head is other race/ethnic	0.1500	0.3520	0.4000	0.4890	0.2300	0.4190
INDIAN	1 if household head is Indian, 0 otherwise. Base = household head is other race/ethnic	0.0500	0.2280	0.0600	0.2430	0.0600	0.2330

Source: Household Expenditure Survey 2004/2005.

beef between lower- (-0.8245) and higher-income (-0.8316) consumers. However, the higher-income (-0.8316) group was found to be slightly more responsive to beef price change than lower-income (-0.8245) consumers. This is probably due to the fact the higher-income consumers favor higher-value (expensive) hybrid or imported beef than lower-value domestic bred beef/buffalo meat, which is the most affordable beef to the lower-income consumers. This suggests that higher-income consumers may seek the lower-value beef as a substitute for the higher-value beef in response to price changes in the higher-value beef.

Per capita demand for beef declined as household size increased due to the economies of

scale enjoyed as household size expands or large households may consume more variety of meats owing to possible taste differences. In accordance with *priori* expectations, the results showed that consumers in rural region consume more beef than those in urban region. This can be attributed to the distribution of ethnics wherein Malay consumers are the majority in rural regions. This is supported by the findings that Malay consumers tend to demand for more beef than other ethnics.

Table 4 presents the estimation results of the beef price equations by 2SLS procedure. The beef price equations had R-square values ranging from 0.057 to 0.0411. Cox and Wohlgenant (1986) used a similar specification for the prices of vegetables and

Table 3: Estimation results of the beef demand equations by 2SLS

Variable	Demand Equation					
	Lower-income Group		Higher-income Group		Total	
	Coefficient	(Std. Error)	Coefficient	(Std. Error)	Coefficient	(Std. Error)
Intercept	5.9897	(9.2629)	12.7905	(10.5547)	8.0982	(6.8467)
Log(<i>EXP</i>)	0.7829	(0.0137)***	0.7619	(0.0216)***	0.7845	(0.0113)***
Log(<i>P_{bf}</i>)	-0.8245	(0.0190)***	-0.8316	(0.0319)***	-0.8283	(0.0164)***
Log(<i>P_{pork}</i>)	-1.1311	(0.1516)***	-1.4393	(0.1830)***	-1.2802	(0.1153)***
Log(<i>P_{mutton}</i>)	-1.1453	(0.7437)*	-2.6769	(1.1539)**	-1.6178	(0.6260)***
Log(<i>P_{poultry}</i>)	0.9171	(0.1749)***	0.2075	(0.2657)	0.6809	(0.1460)***
Log(<i>P_{othermeats}</i>)	-1.3008	(3.7172)	-1.8120	(4.1920)	-1.4098	(2.7382)
Log(household size)	-0.2810	(0.0229)***	-0.2324	(0.0332)***	-0.2836	(0.0181)***
Urban dummy	-0.0522	(0.0200)***	-0.0875	(0.0437)**	-0.0445	(0.0181)**
Malay dummy	0.1878	(0.0320)***	0.1883	(0.0580)***	0.1886	(0.0282)***
Chinese dummy	-0.2161	(0.0462)***	-0.0935	(0.0629)	-0.1341	(0.0354)***
Indian dummy	-0.0761	(0.0865)	-0.0585	(0.1227)	-0.0270	(0.0703)
R-square	0.5785		0.5431		0.5917	

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

obtained R-square values of 0.05, 0.03, and 0.04 for fresh, canned, and frozen vegetables, respectively. Regarding the very low R-square values, they commented that the quality impact on price was small for vegetables. The low R-square of the beef price equations in this study may suggest that fat is not an important feature in quality characteristics of beef in Malaysia.

The aggregate food expenditures are used as proxies of quality elasticity based on the assumption that beef quality is related to food expenditures more directly than to income (Wang *et al.*, 1996). The parameters for food expenditures in the price equations are statistically significant and positive, ranging from 0.0171 to 0.0513. Specifically, the higher-income group (0.0513) tend to demand higher-priced beef products (which are always considered of higher quality) than the lower-income group (0.0171). This is consistent with the findings of Black (1952) and Wang *et al.* (1996).

On the other hand, the estimates of fat elasticity with respect to price are statistically significant and negative, varying from -0.0636 to -0.0935. Unnevehr and Bard (1993) and Wang *et al.* (1996) also found that fat is negatively valued. Overall, Malaysian consumers (-0.0843) show a willingness to pay for fat reduction in beef. Interestingly, the lower-income consumers (-0.0935) are more willing to pay higher price than higher-income consumers (-0.0636) with regards to fat

reduction in beef products. This may be because the lower-income consumers currently consume more of the lower-value beef that contains richer saturated fat and they tend to increase the purchase of higher-value beef (which is believed to contain lesser fat) as they move into the higher income bracket.

The estimates of household size are negative and significant. Cox and Wohlgenant (1986) suggested that it is due to economies of scale. Consumers with larger household size tend to pay low prices for beef products so that they can have a larger quantity of beef for consumption. Counter to expectation, there was statistically no significant link between price of beef and dummy variables. The results showed that Chinese consumers are more willing to pay for higher-priced (quality) beef products than other ethnics.

By comparing the estimates of expenditure and quality elasticities, they suggest that Malaysian consumers tend to substitute quality by quantity in their demand for beef. Specifically, the lower-income consumers are expected to increase their demand for quantity of beef more responsively than higher-income consumers. Other things remaining constant, the comparison between own-price and fat elasticities shows that Malaysian consumers are more responsive to price change than fat reduction in beef products.

Table 4: Estimation results of the beef price equations by 2SLS

Variable	Price Equation					
	Lower-income Group		Higher-income Group		Total	
	Coefficient	(Std. Error)	Coefficient	(Std. Error)	Coefficient	(Std. Error)
Intercept	3.0208	(0.0898)***	2.6892	(0.1222)***	2.9550	(0.0677)***
Log (TOTFD)	0.0171	(0.0178)*	0.0513	(0.0222)**	0.0219	(0.0129)*
Log (FAT)	-0.0935	(0.0074)***	-0.0636	(0.0108)***	-0.0843	(0.0061)***
Log(household size)	-0.1093	(0.0163)***	-0.1015	(0.0209)***	-0.1022	(0.0127)***
Urban dummy	0.0063	(0.0130)	0.0394	(0.0254)	0.0086	(0.0114)
Malay dummy	-0.0062	(0.0213)	0.0037	(0.0358)	-0.0062	(0.0183)
Chinese dummy	0.0838	(0.0296)***	0.0441	(0.0382)	0.0531	(0.0224)**
Indian dummy	0.0758	(0.0591)	-0.0167	(0.0737)	0.0341	(0.0458)
R-square	0.0570		0.0411		0.0486	

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

CONCLUSIONS

The Malaysian government's initiatives are expected to make beef more affordable and subsequently bring a significant change in the consumption of beef. The domestic beef market is also postulated to provide a variety of qualities in future. It implies that in future the market of the beef industry will be increasingly competitive, where producers and market players will face a major challenge to comply and meet the demands of more complex and health conscious consumers. Firstly, this study shows that both the estimated expenditure and own-price elasticities of demand for beef are inelastic. The estimates of quality and fat elasticities are positive and negative, respectively. Secondly, this study indicates that consumers tend to demand more for quantity than quality of beef, which is further illustrated by the skeptical profitability of offering lean meat in Malaysia.

There might be some tradeoffs among the beef products. For example, lower-income consumers currently purchase more of the lower-value domestic bred/buffalo meat but they tend to increase their demand for higher-value hybrid/imported beef as their income increases. By contrast, higher-income consumers presently consume more of the higher-value beef and they tend to seek the lower-value beef as substitute when they face income shocks. Hence, it is reasonable to suggest that beef producers should not focus too much on the development of quality-enhancing programmes or adopt fat reduction strategies to improve beef demand in Malaysia but it is rather more profitable to increase production as Malaysian consumers are expected to consume more beef.

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