

The Economic Estimation of the Domestic Demand for Poultry Meat in South Africa with Special Reference to Broiler Meat

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ABSTRACT The objectives of the study were to identify factors that affect the demand of broiler meat; to determine their significant effect on the demand of broiler meat; and to estimate the short-run and long-run elasticity of broiler meat demand in South Africa. A Log-linear model was applied on time series data spanning from 1971 to 2012. The main findings revealed that the major determinants of broiler meat demand include price of broiler meat, price of beef, price of pork, price of mutton and the level of income. The regression results revealed that broiler meat demand was inelastic with respect to the price of broiler meat. The results further indicated that short run is price elasticity of demand for broiler meat was inelastic in the short-run and is elastic in the long-run.

INTRODUCTION

Meat, from which the bulk of animal protein is drawn, is an essential part of many peoples' diet (Ompoy and Prantilla 2013). In South Africa, the poultry industry contributes significantly towards poverty alleviation and employment creation. Broiler meat is the most consumed meat type in the country and it also serves as the cheapest protein source to the growing population (South African Poultry Association (SAPA) 2006). Currently, the demand for broiler meat outstrips supply. Therefore, this calls for a rise in the importation of broiler meat from other countries to supplement the supply that is low in the country. Consumption and production of broiler meat has increased by 73.6 percent and 63.9 percent respectively during the period between 2000 and 2013. The low broiler meat prices as compared to other meat types augment its consumption by all income groups. However, SAPA (2006) postulated that the rise in broiler meat consumption is also attributed to the response of the broiler industry to the needs of consumers and food services through value-added, brand name and convenience products. There are various economic and non-economic factors that affect broiler meat consumption in South Africa. Radder and Le Roux (2005) revealed that non-economic factors such as health, sensory variable, social interaction familiarity and habit, psychographics and demographics influence

poultry demand. While on the other hand the economic factors include prices, promotion and distribution of poultry meat.

Economic growth is perceived as one of the factors that influence poultry demand in South Africa. Economic growth improves consumer's standards of living, as a result they become more health conscious and move towards protein filled diets. Global Agricultural Information Network (GAIN) (2012) suggested that the improvement of marketing in the poultry industry has attracted many consumers into the industry.

Research Objectives

The objectives of the study were to identify factors that affect the demand of broiler meat and to find out whether variations in economic factors have any substantial impact on broiler meat demand in South Africa. The study also seeks to estimate short-run and long-run elasticities of broiler meat demand.

Literature Review

The poultry industry has contributed immensely to the livelihoods of rural people and the nation at large. Findings obtained by SAPA (2006) showed that poultry meat is consumed more by all income groups as compared to other meat types. This might be attributed to the fact that it is much more affordable and healthy. Poul-

try meat is commonly valued as a cheap source of protein (Radder and Le Roux 2005) and is perceived to be healthy as compared to other meat types such as red meat, since it has saturated fats.

A study by Radder and Le Roux (2005) revealed that non-economic factors such as health, sensory variable, social interaction familiarity and habit, psychographics and demographics influence the demand of poultry. While, on the other hand, economic factors includes prices, promotion and distribution of poultry meat.

In spite of the affordable prices of broiler meat, poultry meat industry is perceived as an industry that responds to the needs of consumers and food service providers. Economic growth influences the demand of broiler meat in South Africa. In other words, economic growth improves the living standards of consumers as a result they move towards protein-filled diet. Marketing in the poultry industry is also improving immensely and this has attracted more consumers to the poultry industry (GAIN 2012).

Findings obtained by Magdelaine et al. (2008) in a study on the main factors affecting the demand of poultry meat, revealed that low and competitive pricing of poultry are some of the factors contributing to high poultry demand. The study further revealed that the absence of cultural or religious obstacles, and dietary and nutritional value are the core factors influencing the demand of poultry meat. The study also revealed that preparation time and diversification of places of demand also contributes to the higher demand of broiler meat. Poultry meat is perceived as convenient, healthy affordable source of protein (Business Monitor International (BMI) 2013).

Various methods have been used to specify demand systems in literature, but the most prominent method is the Almost Ideal Demand system (AIDS) which was developed by Deaton and Muellbauer (1980). The AIDS is a versatile system capable of studying various facets of food demand and its numerous components (Abdul Wadud 2006). Several studies have used this method during the past 20 years including Burton et al. (1996), Tiffin and Tiffin (1999), Karagiannis et al. (2000), Taljaard (2004), and Ompoy and Prantilla (2013).

Ompoy and Prantilla (2013) estimated the demand and income elasticities for meat (beef,

broiler chicken, and pork) of the Philippines from 1994 to 2009, using the Source-Differentiated Almost Ideal Demand System (SDAIDS). The results showed that domestic production accounted for 94 percent of the total supply for beef, broiler chicken, and pork, while imported meat accounted for only 6 percent.

Hassan (2013) applied a multistage almost ideal demand system on beef demand in Colombia and discovered that price elasticity of demand for beef (-0.24), chicken (0.16) and pork (-0.02) in the short run, while in the long run price elasticity of demand for beef (-1.95), pork (-0.09) and chicken (-0.03). The study further indicated that the total expenditure elasticity demand for beef was 1.78 in the long run and 0.03 in the short run.

METHODOLOGY

Data Source

The data used in the study was obtained from the department of Agriculture Forestry and Fisheries under Directorate Agricultural Statistics and Economic Analysis. Time series data spanning from 1971 to 2012 were collected to estimate the demand of broiler meat in South Africa. E-views 8 statistical software was used to do the analysis.

The Econometric Model

Log-linear model is one of the most prominent analytical techniques used to estimate demand for agricultural products. The approach is widely utilised in agriculture to estimate demand by numerous researchers (Tahaq and Hahn 2012; Hassan 2013).

The general model is specified as;

$$\ln Y_i = \beta_0 (P_c^{b_1}) (P_B^{b_2}) (P_P^{b_3}) (P_M^{b_4}) (I^{b_5}) (t^{b_6})$$

In order to transform the function into linear form, natural logarithms are used as follows (see Table 1):

$$\ln Y_i = \beta_0 + \beta_1 \ln P_C + \beta_2 \ln P_B + \beta_3 \ln P_P + \beta_4 \ln P_M + \beta_5 \ln I + \beta_6 \ln t + D + U_i$$

The dummy variable was introduced to capture the effect of policy changes that took place when South Africa became a democratic country in 1994, with years before and after independence taking the value of 0 and 1 respectively.

Table 1: Description of variables and units of measurement

Variable	Description and units	Expected outcome
Y_i	Demand for broiler meat (kg)	Dependent variable
B_0	Intercepts	+
prC	Real price of broiler meat (R/kg)	-
PrB	Real price of beef (R/kg)	+
prP	Real price of pork (R/kg)	+
prM	Real price of mutton (R/kg)	+
I	Real income per capita (R)	+
T	Trend	
D	Dummy variable	
U_t	Disturbance term	

The Properties of Log-Linear Model

A log-linear model is a mathematical formula that takes the form of a function whose logarithm is a first-degree polynomial function of the parameters of the model, which makes it possible to apply linear regression. The most appealing aspect of the Log transformed function is the fact that the estimated coefficients can be directly interpreted as short-run elasticities. This method is sufficient enough to estimate the receptiveness of the quantity demanded in broiler meat. The log-linear model measures the interaction between a set of independent variables (own price, price of broiler meat substitutes and also the income) and a dependent variable (broiler meat demand).

RESULTS

The log-linear regression results are presented in Table 2. The dependent variable is broiler

Table 2: Regression results of the log-linear model

Variable	Coefficient	Std. error	t-Statistic	Prob.
c	-25.557	15.593	-1.6389	0.1107
Poultry	-0.216	0.098	-2.4909	0.0179**
Income	0.710	0.0725	2.4003	0.0222**
Mutton	0.0656	0.151	0.4331	0.6678
Pork	0.468	0.195	2.4446	0.02**
Beef	0.078	0.126	0.6188	0.0541*
Trend	0.205	0.0545	3.75061	0.0007**
Policy	-0.652	0.4621	-1.4118	0.1674

Dependent variable: Demand of Broiler meat
 ***, **, *: Significant at 1%, 5% and 10% level respectively.
 Adjusted R- Squared: = 0.798
 Note: All variables are in logarithmic form

meat demand and the independent variables are; price of broiler meat; prices of beef, pork and mutton as close substitutes; income, trend and a dummy variable to capture policy changes. The broiler demand series was tested for any structural breaks to examine whether a change in policies had a significant effect on broiler demand. The chow test method was used and the results confirm that no structural breaks were realized.

Results of the econometric estimation indicate that the model best fits the data as the independent variables explain 79 percent of changes in the dependent variable. The estimation results show that the estimated coefficient for the time trend variable is positive and statistically significant. Holding all other factors constant, the estimated growth in broiler meat consumed is 0.2 kilograms per year.

The estimated coefficient for the policy variable and price of mutton do not appear to be significantly different from zero. This does not necessarily suggest that price of mutton and policy changes are irrelevant to the analysis of the demand for broiler meat in South Africa. The result may reflect that the data does not have sufficient variability to produce precise estimates. The estimated coefficient for the price of broiler meat is negative signed and with a value of 0.216 and the t-statistic suggests that the coefficient is significantly different from zero (Table 3). This result agrees with our initial expectations. The coefficient for the price of beef is positive with a value of 0.077 and significant at 1 percent level. This indicates that an increase in the price of beef will be followed by an increase in the demand of broiler meat. This result is consistent with economic theory.

Table 3: Demand elasticities of the explanatory variables

Variable	Short-run	Long-run
Price of broiler	-0.216	-0.95
Price of beef	0.077	0.711
Price of mutton	0.066	0.712
Price of pork	0.468	0.530
Income	0.71	1.355

The estimated coefficient for the price of pork is positive with a value of 0.468 and significant at 1 percent level. This result may imply that an increase in the price of pork would result to an increase in the demand for broiler meat by 0.468.

The income variable is significant at 5 percent level with a coefficient of 0.7103. This implies that an increase in income by 1 percent will be followed by an increase in broiler demand by 0.7103 percent.

DISCUSSION

The Price of Broiler

The small value of the broiler price coefficient signifies that an increase in the price of the broiler meat will not essentially reduce the quantity of broiler meat demanded. These results are in line with findings obtained by Bhati (1987) who also noted that own price elasticity of demand for chicken meat is -0.35 and that of poultry meat is -0.36. In a study conducted in Ghana, Mensah and Bannor (2015) observed that own price of broiler meat significantly affected the demand for locally produced poultry meat.

The Price of Beef

Beef meat is a close substitute of broiler meat therefore; if beef meat becomes expensive, consumers will prefer broiler meat which is more affordable. This finding is in line with microeconomic theory which states that in the estimation of a demand equation the price of substitutes will affect the dependent variable positively as this is a close substitute. The low coefficient suggests that if the price of beef increases the effect on quantity of broiler meat consumed will be relatively low.

The Price of Pork

A positive coefficient of pork price may possibly suggest that an increase in the price of pork would result to an increase in the demand for broiler meat. However, such inference cannot hold in cases where pork meat is not consumed due to religious reason and not necessarily due to price increases. This result agrees with the findings obtained by Tahaq and Hahn (2012) who suggested that poultry meat is a close substitute of pork, sheep and offal.

Income Level

The coefficient of the income variable indicates that an increase in income will be followed

by an increase in broiler demand. The results are consistent with findings obtained by Ompoy and Prantilla (2013) who documented that as income increases people tend to consume more broiler meat indicating that broiler meat is an important commodity in most household diets. The high coefficient signifies that income is a vital variable influencing broiler meat demand in South Africa. Mensah and Bannor (2015) also obtained similar results when they suggested that an increase in income positively affects the demand for broiler meat.

Diagnostic Checking

The validity of the model was confirmed by utilising relevant diagnostic tests. The Jarque-Bera test statistic of 0.351 and its associated p value of 0.744 shows that the model is normally distributed, the Breusch-Godfrey test for serial correlation also confirms the validity of the model with an F-statistic of 0.568 and its associated p-value of 0.217.

Estimated Elasticity's

Table 3 presents own price elasticity of broiler demand, cross price elasticity of demand and income elasticity of demand on consumption of broiler meat in South Africa. The table displays short and long-run elasticities for the period between 1971 and 2012.

The short-run own price elasticity of demand for broiler meat is 0.152 which is relatively a small value signifying that an increase in the price of broiler meat will not necessarily reduce the quantity of broiler meat demanded. This means that the demand for broiler meat is relatively inelastic to its own price. These findings indicate that volatility in broiler meat prices will not likely cause any major shifts in broiler meat demand in the short-run. However, in the Long-run the demand for broiler meat is very elastic to its own price with a value of 1.05. This is an important observation and occurs due to the fact that in the short-run some demand factors are fixed, whilst in the long-run all factors are variable. The cross price elasticities of broiler demand are all inelastic in the short-run but they become relatively elastic in the long-run. Both the short-run and long-run income elasticities with respect to broiler meat demand are highly elastic signifying that income has a greater effect on the

demand for broiler meat. Income elasticities in both the short and long-run are 1.787 and 2.755 respectively.

The price elasticities ranged from 0.152 to 0.190 in the short-run, while in the long-run the elasticities ranged from 0.530 to 1.05 signifying that behavioral adaptation serve a significant role on the demand of broiler. These results are consistent with the findings obtained by Hassan (2013) who also noted that beef (0.24), poultry (0.16) and pork (0.02) were inelastic in the short-run.

CONCLUSION

Based on the findings of this study certain inferences can be drawn. This study found that broiler demand in South Africa does not respond well to price changes in the short-run; however the demand is more responsive in the long-run. This implies that broiler consumers respond better to price changes in the long-run than in the short-run. This signifies that behavioural adaptation serves a significant role in price changes. Both the short-run and long-run income elasticities with respect to broiler meat demand are highly elastic and significant. This signifies that income has a greater effect in explaining changes in broiler meat demand compared to the other factors. These results agree with the outcomes observed in other studies. The cross price elasticities are all inelastic in the short-run and elastic in the long-run. These findings suggest that changes in the price of a substitute product of broiler meat in the short-run will not essentially affect the demand for broiler meat. However, the effect will only be realised over a period of time.

RECOMMENDATIONS

It is on the basis of these results that the study recommends that more research be undertaken in order to understand the nature of broiler meat industry in South Africa before any policy development is made. The study for the time being, also recommends that the Department of Agriculture provide a policy instrument such as subsidies on animal feeds, purposefully to encourage more farmers in broiler production. This recommendation will increase production in pursue to respond to the high demand for broiler meat in the country.

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