Towards a broader understanding of South African consumer spending on meat

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Abstract

This paper analyses meat consumption trends in South Africa. Despite the fact that aggregate per capita meat consumption remained relatively constant during the last 34 years, significant changes were observed in the per capita consumption among different meat categories. By applying Ordinary Least Squares (OLS) and the Johansen cointegration approach to a conventional demand function, significant changes in the contributions of economic and non-economic factors towards meat demand were identified over time. From the analysis it is apparent that non-economic factors play a greater role in determining meat consumption in South Africa.

1.   Introduction

Surely a quote that holds more truth today than ever before is the one by Adam Smith, that "*consumption is the sole end and purpose of all production*". This is why this article elaborates in more detail on the factors that may or could influence the demand for red meat. Consumers will only consume those goods and products that fulfil their specific demand requirements. The globalisation process has broadened consumers' demand space, and hence created the opportunity for countries to take advantage of trade opportunities. This however, means that producers should understand the factors that affect consumers' demand behaviour and that producers should adjust accordingly.

According to Howells (2000), consumers worldwide are becoming more demanding about what they want, and this is evident from the switch from "quantity" to "quality" issues. The form in which consumption is taking place is changing. This is expressed in a number of ways, for example, increased interest in food safety, greater concern for environmental and animal welfare issues, increased importance of eating quality and the greater role of food services.

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This paper analyses South African meat demand in order to quantify the effect of non-economic factors on the demand for meat. In the next section, an overview of similar international demand analysis is presented, which is followed by a brief description of the methodological framework of the analysis in the third section. The data used and statistical properties thereof are described in the fourth section, followed by a discussion of the results of the analysis in the fifth section. In the final section of the paper some concluding remarks are made.

2.   The changing meat consumer in the 21st century

Duffy (1999) and Huston (2000) state that there has been no shortage of analysis of the factors influencing demand for meat in general by consumers. Duffy (1999) is of the opinion that the simple relationship of price and consumption no longer applies. Huston (2000) goes further and calls into question the ability of price movements alone to explain problems relating to meat demand. He argues that there are several forces at work in the market place that undermine "red" meat demand, namely (i) perceptions that meat is old-fashioned and boring with questionable safety, (ii) perceptions among consumers that meat is too difficult and time-consuming to prepare, (iii) questions surrounding meat's healthfulness (specifically concerns about fat and cholesterol) and (iv) prices too high for some consumers to justify its purchase (leading them to select a product that they perceive has better value).

Duffy (1999) identified two broad classifications for factors that influence the demand for meat, namely economic and non-economic factors. Economic factors, on the one hand, include income and price. In other words, consumers will generally increase their consumption of meat when real income increases, whilst consumption will decline when price relative to other meats rises. Non-economic factors, on the other hand, include issues pertaining to health and safety, convenience, quality, animal welfare and the environment.

Taking into account the above, Quinn (1999) is of the opinion that the meat industry worldwide is living in the past, instead of looking to the future. He states that the past was characterized by managed markets, with largely captive customers and endlessly rising demand. In the future, customers will call the shots, and the businesses that succeed will be those who recognize this fact and who act on it. This is echoed by Smith (1999), who states that to be "consumer-driven" means that beef, pork and lamb producers can no longer merely produce what they (individually or collectively) think is best (or easiest, or most economical, etc.) and expect the world to come begging for more; instead, it means that at each critical juncture in the beef, pork and lamb

production sequence, consideration must be given to what consumers want and are willing to buy.

Finally, Smith (1999) and Quinn (1999) summarize the factors that need to be accounted for to turn around the depressed state of red meat demand. These factors are discussed below.

Properties which influence consumer demand for processed (prepared) beef, pork and lamb products include:

(a) **Novelty** (new and different, changed in form, modernized, with added value);

(b) **Quality** (taste, tenderness, physical attractiveness, storage stability);

(c) **Simplicity** (quick, fast, time-saving, uncomplicated);

(d) **Convenience** (easy to prepare, easy to serve, easy to clean up after);

(e) **Safety** (bacteriologically safe, chemically safe); and

(f) **Consistency** (similarity in appearance from purchase to purchase, similar in performance from preparation to preparation, similar palatability from eating experience to eating experience).

Properties that influence consumer demand for fresh (unprocessed/unprepared) beef, pork and lamb include:

(a) **Quality** (taste, tenderness, physical attractiveness, storage stability);

(b) **Consistency** (similarity in appearance from purchase to purchase, similar palatability from eating experience to eating experience);

(c) **Safety** (bacteriologically safe, chemically safe); and;

(d) **Caring attitude** (by producers, about the environment and animal welfare).

Bansback (1995) attempted to identify the influence of price, income and other factors (non-economic in nature) on the demand for red meat in the United Kingdom (UK) and other European Union (EU) countries. The results of his analysis are shown in Table 1. For the period 1955 to 1979, price and income factors explained a higher proportion of changes in red meat consumption than in the period 1975 to 1994. Bansback (1995) concludes that non-price/income factors are becoming more important and that traditional forms of demand

analysis by economists are now less satisfactory than in the past. Furthermore, industry efforts such as promotion programmes, quality assurance measures, new product development and product quality improvement, can also influence consumption.

Table 1:   Influence of economic and non-economic factors on red meat consumption changes (1955-1994)

Meat category	% Contribution	United Kingdom		Other EU	
		1955-79	1975-94	1955-79	1955-79
Beef & veal	Price and income	73	55	95	68
	Others	27	45	5	32
Mutton	Price and income	49	43	84	58
	Others	51	57	16	42
Pork meat	Price and income	79	60	98	55
	Others	21	40	2	45

Source: Bansback (1995).

Since the 1970s, meat consumption in South Africa has remained relatively stable, at around 41 kg per head per year. However, the composition of consumption changed considerably in this time. The per capita white meat consumption tripled from 7.7 kg in the early 70s to 21.2 kg per year in the early 2000s. The consumption of beef and veal, and mutton declined from 23.1 kg and 7.1 kg respectively to 13.64 kg and 3.4 kg per head per year. The consumption of pork remained relatively constant at around 3 kg per head per year.

Table 2 shows real per capita expenditure on red meat for 1993, 1999 and 2003 only. The methodology used to calculate the real per capita expenditure on red meats is similar to that used by Nieuwoudt (1998). It is clear from Table 2 that real per capita expenditure on beef, pork and sheep meat declined after 1993 for all population groups. Exceptions are expenditure by Asians on pork and the expenditure by rural blacks on all three meat groups. The largest decline in total real per capita expenditure was experienced by sheep meat (52.7%), followed by beef (47.1%) and then pork (41.6%).

Regarding total expenditure on all meats during 2003[2] (including chicken and game), 40.5% was spent on beef, 34.4% on chicken, 17.2% on sheep meat, 6.8% on pork and a mere 1% on game. Regarding population groups, Asians had the strongest preference for sheep meat, spending 43% of their total meat budgets on sheep meat, while they spent 32.3% of their meat budgets on

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[2] *Note that, due to the lack of comparative data for 1993 and 1999 for chicken and game, these are not included in Table 2.*

chicken, 19% on beef and 4.5% on pork. All other populations groups (urban and rural blacks, coloureds and whites) spent the largest portions of their meat budgets on beef. The expenditure share of black people on beef and chicken are 43% and 40.6% respectively, whereas the expenditure share of coloured people is more evenly spread between beef (32%), chicken (31.8%) and sheep meat (29%). In the case of whites, their strongest preference is for beef (41%), followed by sheep meat (23%), chicken (21.3%) and pork (13.2%).

Table 2:   Real per capita expenditure on red meat in South Africa (1993 = base year)

Meat group	Year	Population group					
		Asians	Blacks (urban)	Blacks (rural)	Coloureds	Whites	Total population
Beef	1993	R179.80	R223.00	R 53.60	R203.60	R540.40	R187.60
	1999	R111.90	R132.20	R 69.60	R102.30	R315.30	R123.40
	2003	R 87.40	R 83.70	R 83.70	R 91.70	R235.70	R101.60
Sheep	1993	R396.30	R 65.50	R 15.70	R158.20	R303.60	R 91.30
	1999	R286.00	R 30.60	R 30.60	R124.90	R192.20	R 63.00
	2003	R196.00	R 21.00	R 21.00	R 85.60	R131.80	R 43.20
Pork	1993	R 17.80	R 18.30	R 4.40	R 33.50	R139.90	R 29.40
	1999	R 29.40	R 12.30	R 12.30	R 27.30	R110.20	R 25.00
	2003	R 20.10	R 8.40	R 8.40	R 18.70	R 75.50	R 17.10
Chicken	2003	R145.98	R 78.41	R 78.41	R 92.70	R121.75	R 86.15
Game	2003	R 2.46	R 1.69	R 1.69	R 2.29	R 7.87	R 2.45

Source: Own calculations from BMR (2003).

Two important questions arise. Firstly, it is important to understand why aggregate meat consumption remained relatively constant during the period 1970 to 2003 despite the fact that real per capita income in the country increased. Secondly, what were the major reasons for consumption changes among individual meat categories? Conventional economic demand analysis, based on utility theory, focuses on understanding these two questions. According to this model, demand for a commodity is determined by five factors, namely: consumers' disposable incomes, the own price of the commodity in question, the price of other related commodities, changes in the size and structure of the population and tastes and preferences of consumers.

3.   Estimating drivers of change in meat consumption, based on Bansback's methodological approach

For purposes of comparison, this study used the same methodology used by Bansback (1995) to estimate the drivers of change in meat consumption in

South Africa. Annual time series data of meat[3] consumption and prices between 1970 and 2003 provided by the NDA (2005) were used in the analysis. Information on real per capita income was obtained from the South African Reserve Bank (2005). Nominal meat prices were deflated by means of the Consumer Price Index (CPI) for meat. The relative prices used in the model were calculated as percentages of a specific meat price compared to the aggregate prices of all four meats.

The analysis is based on the simple demand function model, shown in Equation 1, which defines consumption as a function of own price, relative prices and income.

$$y_t = a_t + b_t x_1 + c_t x_2 + d_t x_3 + e_t \qquad (1)$$

where:

- y_t = per capita meat consumption
- x_1 = own price
- x_2 = relative price of the commodity in terms of other related commodities
- x_3 = consumers' income
- e_t = error term

Non-economic factors are not specified in the demand equation, but are implicitly assumed to be equivalent to the residual percentage. The method takes into account the size of each effect, regardless of its statistical significance. In this way the effect of other factors is determined after the percentage contributions of own price, relative price and income have been estimated. Table 3 reports the relative importance of economic and non-economic factors to demand for meat in South Africa for the periods 1970-1988 and 1985-2003. The results show that non-economic factors explain a higher proportion of changes in all meat consumption categories (except for white meat consumption) that took place in the later period (1985-2003) than in the earlier period (1970-1988). In the case of white meat, the reason could be the fact that consumption of white meat and income are both positively correlated with time. However, cognisance should be taken of the fact that the analysis is not underpinned by an evaluation of the data characteristics, and hence the analysis cannot be used to draw definite conclusions regarding reasons for changes in meat consumption. Moreover, models that contain non-stationary variables will often result in spurious regressions, i.e. indicating the existence

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[3] *Including beef, veal, mutton, pork and white meat.*

of statistically significant relationships where there are none. Thus, in order to apply appropriate time series estimation techniques successfully it is important to understand the univariate properties of the data (Fedderke, 2000), which is the issue considered in the next section.

Table 3:   Influence of economic and non-economic factors on red meat consumption changes using conventional analysis (1970-2003)

Meat Category	% Contribution	1970-1988	1985-2003
Beef & veal	Price and income	85	70
	Others	15	30
Mutton	Price and income	59	16
	Others	41	84
Pork meat	Price and income	33	29
	Others	67	71
White meat	Price and income	86	95
	Others	14	5

Source: Own analysis.

3.   Statistical properties of the variables

A central assumption of the classical normal linear regression model is that the observations are independently sampled, thus a stochastic process. In the case of economic time series data, this assumption is generally violated by the fact that observations are connected in all kinds of ways, by factors such as inflation. Fedderke (2000) defines a stationary process by the fact that the distribution of the random error term must be the same throughout the whole distribution, i.e. constant mean and constant variance. Intuitively, time should not matter in a stationary process. Any series that contains a long-term trend is, by definition, non-stationary.

It is thus clear that each time series variable to be employed in a model must be tested for its time series characteristics, i.e. whether it is stationary or not. In this analysis the augmented Dickey-Fuller (ADF) test for unit root is used. The number of time lags, which, in this case, is five, can be selected on the basis of the minimum values of the Akaike Information Criteria (AIC) statistics. The result of the test is reported in Table 4. In the second, third and fourth columns test statistics are provided for variables in their levels, first difference and second difference, respectively. The result suggests that the null hypothesis of a unit root in the time series cannot be rejected at the 5% level of significance in variable levels, except for the variable for the consumption of pork, i.e. no time series appear to be stationary in variable levels, except the variable for the consumption of pork. Except for the income variable, which needs to be

differenced twice in order to render it stationary, all variables are stationary when transformed into their first difference and can be characterized as integrated order one.

Table 4:   ADF unit root tests of variables

Variables	Test statistics for variables in levels	Tests statistics for variables in first differenced form	Test statistics for variables in second differenced form
Beef consumption	-0.17391	-3.0774	-
Mutton consumption	-0.46002	-3.4823	-
Poultry consumption	0.27478	-3.1905	-
Pork consumption	-3.5227	-3.1732	-
Beef price	-0.48954	-3.5939	-
Mutton price	-1.71920	-3.2346	-
Poultry price	0.12317	-3.6144	-
Pork price	-1.000	-4.5931	-
Relative beef price		-3.9799	-
Relative mutton price		-5.0428	-
Relative poultry price		-3.4185	-
Relative pork price		-3.3558	-
Per capita income	-1.1130	-2.0409	-4.1961

Note: 95% critical values for the augmented Dickey-Fuller statistic are -2.9706, -2.9750 and -2.9798 when variables are in levels, differenced one and differenced twice respectively.

4.   Empirical results

Since the variables used in the regression analysis in Section 3 are not stationary in levels, a cointegration analysis was performed using the Johansen approach, to examine the relative importance of non-economic factors in determining meat consumption. Cointegration tests among the variables used in the above model require testing for the existence of unit root for each variable. If these variables share a common stochastic trend and their first or second difference is stationary, then they can be cointegrated.

Table 5 shows the relative importance of economic and non-economic factors using conventional demand equation by means of cointegration analysis for two successive periods, i.e. 1970 to 1988 and 1985 to 2003. Four case scenarios were analysed. In Case 1 (for all meat categories), estimates show the cointegration between consumption and the economic factors, i.e. own price, income and relative price. Cases 2, 3 and 4 estimate the cointegration between consumption and own price, consumption and income and consumption and relative prices, respectively.

More specifically, for beef in Case 1, a unique cointegrating vector was identified for the period as a whole, as well as for the period 1970-1988, with a R^2 of 36% and 7%, respectively. This implies that a stronger relation was found between the quantity demanded and the economic factors for the period as whole, than for the first period. For the period 1985 to 2003 there is no evidence of a unique cointegrating vector, implying that there are not enough evidence to suggest a long-term relationship between the variables under investigation for the specific period. From the econometric analysis above it can be concluded that, despite the fact that a relatively strong relation exists between the variables for the whole period, the economic factors prove to be more important in the first period than in the second, i.e. the non-economic factors are therefore becoming more and more important.

Table 5: Influence of economic and non-economic factors on red meat consumption changes using conventional analysis (1970-2003)

Meat Category	Case	Existence of cointegration		
		Whole period (1970-2003)	Earlier period (1970-1988)	Later period (1985-2003)
Beef	1	Present (36%)	Present (7%)	Absent
	2	Present (24%) negative relation	Present (40%) negative relation	Present (26%) negative relation
	3	Present (10%)	Absent	Absent
	4	Absent	Absent	Absent
Mutton	1	Present (54%)	Present (28%)	Present (38%)
	2	Present (12%) negative relation	Present (42%) negative relation	Present (25%) negative relation
	3	Present (47%)	Present (46%)	Present (42%)
	4	Present (21%) negative relation	Present (40%) negative relation	Present (30%) negative relation
Poultry	1	Present (37%)	Present (38%)	Present (27%)
	2	Present (30%) negative relation	Present (40%) negative relation	Present (29%) negative relation
	3	Absent	Present (40%)	Present (16%)
	4	Absent	Present (8%)	Absent
Pork	1	Absent	Absent	Absent
	2	Present (21%) negative relation	Present (19%) negative relation	Present (16%) negative relation
	3	Present (21%)	Absent	Absent
	4	Absent	Absent	Absent

Note: R^2 is shown in brackets.

For Case 2, where the consumption of a specific meat and the corresponding own price are the two variables under investigation, a negative relation was found for all four meat products (corresponding to the law of demand). As in the beef example explained above, the relation between quantity and own price is identified and proven to be stronger in the earlier period (1970-88) than in the later period (1985-2003). As above, these stronger relations in the earlier periods imply that the importance of non-economic factors for meat consumption in the country increased during the later periods. However the specific non-economic factors (i.e. issues pertaining to health and safety, convenience, quality, animal welfare and the environment) were not specified individually, but rather as a group. The remaining two cases, Cases 3 and 4 for the other three meat products can be interpreted in the same way.

5.   Conclusion

The overall conclusion from the two types of conventional analysis is that the effects of non-economic factors are becoming more important than in the past. This means that it is imperative for the meat industry to understand these factors and particular consumer attitudes and preferences if they are to influence meat consumption/demand.

In conclusion, it can be stated that research pertaining to consumer-oriented production should receive more attention. This is not only important from a South African point of view, but also from an international point of view. Access to the international market is only possible if tastes and preferences of consumers abroad are understood properly. Then, and only then, would it be worthwhile to promote South African products internationally. In other words, there is a need to determine whether South African meat products appeal to consumers domestically, and also abroad. This can only be determined by proper market research that encompasses issues such as product characteristics, form and place utilities of consumers, food safety requirements, etc. Neglecting to achieve this end will be detrimental to all parties involved in the meat industry, e.g. research pertaining to veterinary issues will imply a waste of valuable research resources in a declining industry. Assuming that consumers represent the sole end and purpose of all production will have the opposite result.

Acknowledging new trends and influences in meat consumption would, however, not mean that the battle has been won. As mentioned, the red meat supply chain must also be considered. For instance, a large number of animals are kept by the non-commercial sector, though this sector contributes very little to output. This state of affairs requires urgent attention. For example, the

non-commercial sector can contribute significantly to improved continuity of meat production, which is currently a problem as far as exports are concerned.

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