Will consumers pay for less fat on beef cuts? The case in Bloemfontein, South Africa

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Abstract

There is increasing evidence that most of the fear expressed by consumers in terms of the link between cholesterol in the diet and heart disease is, amongst others, related to the amount of fat in red meat and dairy produce. The result is that many consumers are cutting back on, if not avoiding, red meat products. A major challenge ahead of the beef industry is to supply a product that complies with the demands of more sophisticated and health conscious consumers. But, even if the beef industry could respond positively to consumers' needs, it is uncertain whether consumers would pay more for beef containing less fat.

In this paper the willingness of consumers to pay for less fat in selected beef cuts (T-bone and rump) was investigated with a log-linear hedonic price model. The results showed that more affluent consumers in Bloemfontein were (i) willing to pay for additional external fat (this was contrary to expectations). This was attributable to the culture of food consumption and traditional cooking style (braai). The result does not imply that the amount of external fat can be unlimited, but rather that current external fat levels are desired by consumers; (ii) seam fat had a negative impact on prices of the selected beef cuts in Bloemfontein indicating that reducing the amount of a less desired attribute could shift the demand curve outward; (iii) marbling fat did not have a significant impact on prices of selected cuts in Bloemfontein; and (iv) cuts classified as bone-in was discounted by consumers in Bloemfontein. The study further found that one can't merely assume that international trends are applicable to the South African situation, but this needs further research. It is hence proposed that a similar study is conducted for South Africa as a whole.

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1. Introduction

The link between cholesterol in the diet and heart disease was discovered in 1963, when clinical studies linked cholesterol in the diet to cholesterol in the blood and mechanisms that damage arteries. Consumers received this information from many sources, including physicians, neighbours and the popular press (Brown and Schrader, 1990). According to Cameron (2005) most of the fear expressed by consumers is related to the fat in red meat and dairy produce. There has been a growing awareness among individuals that cholesterol found in animal fat could reduce life expectancy, i.e. elevated levels of cholesterol in blood are associated with an increased risk of coronary heart disease and stroke.

Bansback (1995) states that red meat is perceived by some to be a fat-rich food. Although this does not apply to modern lean red meat, trimmed of visible fat, these perceptions still remain. From the 1970s onwards health-concerns have succeeded in persuading consumers to cut down on, if not avoid red meat (Gao and Shonkwiler, 1993; McCracken, 1994). In a survey carried out by Woodward (1988), cited by Bansback (1995) on a structured sample of British consumers, health concerns and price factors ranked as the main issues amongst consumers who changed their consumption habits.

Kinnucan, Xiao, Hsia and Jackson (1997) state that health concerns may play an important role in explaining meat consumption patterns, as suggested by the magnitude of the estimated health information elasticity of -0.583. Poultry appears to have benefited from the dissemination of cholesterol-related health information, largely at the expense of beef. Thus, relatively small percentage changes in health information induced much larger changes in poultry consumption than equally small percentage changes in poultry prices.

Taking cognizance of the aforementioned, a major challenge ahead of the beef industry internationally (and in South Africa) is the ability of this industry to supply a product that complies with the demands of more sophisticated and health conscious consumers. Even if the beef industry could respond positively to consumers' needs, it is uncertain whether consumers would pay more for beef containing less fat.

Consumer preferences could vary by beef product and fat location. For example, marbling (intramuscular fat) contributes to palatability and taste, but seam fat creates tough pockets of gristle. External fats could contribute to palatability, but consumers may view it as unattractive waste. Consumer preferences for characteristics of beef products have important implications for the promotion of beef, the grading system, and changes in the characteristics of cattle by genetic improvement (Unnvehr and Bard, 1993).

In an attempt to answer the question whether the South African beef industry and retailers should adopt fat reduction strategies as a way of improving beef demand, this study tests the hypothesis that consumers value beef fat according to beef product type and fat location in the cut. An empirical model will be presented on the basis of literature about demand for quality characteristics.

2. (Beef) Quality and Consumer Behaviour

Umberger (2004) argues that quality is a rather ambiguous term, meaning different things to different people, depending upon their preferences for the various attributes of a product. Consumers tend to use multiple attributes to evaluate the quality of, and subsequently determine their preference for, one food product over another. When evaluating food product quality, consumers use both intrinsic and extrinsic quality cues.

The question "What is meat quality?" has conjured up many definitions in the scientific literature, including "fitness for use, the ability to satisfy a need, meeting specified demands, the degree of excellence at a reasonable price, and the totality of features and characteristics of a product that bear on its ability to satisfy stated or implied needs" (Gray, Gomaa and Buckley, 1996). Quality can be understood as the relationship between the real and the desired properties of a product or as a measure of the satisfaction of the consumer (Ingr, 1989).

Meat quality is the measure of traits that are sought and valued by the consumer. If it is to be used in a relatively intact form, such as steaks or roasts, meat is considered to be of high quality if it is attractive in both raw and cooked appearance, appetizing, nutritious, wholesome and palatable in its final prepared state. If it is to be utilized in any of a wide variety of processed meat products, its quality is largely determined by its many functional roles: water binding, emulsifying power, viscosity improvement, gel formation, formability, adhesion, dispersion, fibre and film formation, stabilization, fat binding, flavour development and texture. The assessment of quality is thus strongly influenced

by the end use to which the material will be put; meat of high quality for one purpose may be of quite low quality for another. It is appropriate to confine the term "meat quality" to those attributes that determine the desirability of intact cuts, and to employ it in this narrower sense of eating quality (Price and Schweigert, 1987).

The critical point of meat quality appraisal occurs when the consumer eats the product, and it is this outcome, with views of colour, healthiness and price, that determines the decision to repurchase (Boleman, Miller, Taylor, Cross, Wheeler, Koohmaraie, Shackelford, Miller, West, Johnson and Savell, 1997).

According to Hoffmann (1990) as cited by Schonfeldt (1998) one of the best known and most quoted definitions of meat quality is the following: "Quality can best be defined as that which the public likes best and for which they are prepared to pay more than average prices."

Dimensions of quality are commonly categorized into search, experience and credence characteristics, depending on when the consumer can ascertain a quality; a search quality (like the appearance of a piece of meat) can be evaluated before the purchase, an experience quality (like the taste of the meat) can only be evaluated after the purchase, and a credence quality (like the healthiness of the meat) can, under normal circumstances, not be evaluated by the average consumer at all, but is a question of faith and trust in the information provided. In order to make a choice, the consumer will develop expectations about quality, but it is only after consumption that experienced quality can be determined, and even this is limited in the case of credence characteristics like the healthiness of a product (Grunert, Bredahl and Brunso, 2004).

Grunert (1997) points out that overall quality is described by a set of characteristics. Food products are described by a large number of characteristics, but the degree of satisfaction obtained from consuming the product is often only loosely related to the cues available in the purchase situation. The most important concrete product characteristics on which consumers base their quality evaluation are fat content and colour. Fat is generally negative, and this applies to all aspects of fat.

According to Issanchou (1996), at the point of purchase, consumers will use visible fat (external and internal) as cue for health quality. Beliefs about healthiness are formed from information provided by sources such as friends, magazines and nutritionists' recommendations. Concerning meat, nutritionists

have advised consumers, especially in the US, to reduce their consumption of saturated fat to avoid heart and coronary diseases and cancer, by reducing beef intake.

Anderson and Ferguson (2001) point out that consumer demands for beef have changed, presently they emphasize quality as the top priority. Similar results have been found by Taljaard, Jooste and Asfaha (2006) for South Africa that show that factors other than economic factors (e.g. price of the product) are becoming more important to consumers when purchasing red meat. The challenge faced by the beef industry is that higher quality must be balanced against the need to reduce waste associated with external fat. In order to meet quality demands, some cattle have to be fed for longer, which has negative consequences as excess external fat amounts (back fat) increase rapidly. Current market signals emphasize a desire for high quality beef while limiting external fat to acceptable levels.

3. Related Studies on International Quality Models

Menkhaus, Colin, Whipple and Field (1993) investigated selected perceived characteristics, which affect the quality perception or overall opinion of beef using time series data collected from two US cities in 1989. An ordered probit technique was used to estimate a model relating perceived beef characteristics, including health, convenience, appeal, and merchandising attributes, to the quality perception of beef. The results indicated that concerns pertaining to cholesterol, calorie content, artificial ingredients, convenience characteristics, price and how it is displayed in the store adversely affected the quality perception of beef.

In a study that focused on the impact of trimming excess fat from beef by examining the relationship between consumer perception of fat and demand for beef, Wang, Fletcher, Carley and Chern (1995) employed a hedonic model using cross-sectional data from the 1987 – 88 nationwide food consumption survey in the US. The beef price was assumed to be determined by the fat content of beef and socio-demographic characteristics. The results of this study suggested that consumers are willing to pay a higher price for reducing fat content in beef. Moreover, the estimated fat elasticity was larger than the own price elasticity of beef demand in absolute magnitude, indicating that the beef industry in the US could potentially achieve higher profits if more fat is trimmed of beef cuts.

Finke (1997) tried to answer the question "How do we value fat? The case of ground beef" covering the periods 1977 – 1978 and 1987 – 1988 containing data on quantity and money value paid, from which price estimates were obtained. They used a hedonic model to capture the variation in price that coincides with variations in nutrient content. This study concluded that price varied negatively with the ratio of fat to protein and that leaner meat is more expensive. In both surveyed periods consumers were willing to pay premiums to reduce the fat content in their ground beef. In addition, higher income households demanded more lean ground meat than poorer households.

Unnevehr and Bard (1993) estimated a hedonic model to estimate consumers' willingness to pay for different fat characteristics. The study used data from the National Beef Basket Survey in the US. The model consisted of six explanatory variables, i.e. it included two dummy variables to capture price variation that may occur due to time of sampling and difference in location, while the other four variables are physical measures of quality (different fat types and the presence of bones). The results of this study suggest that consumers value reductions in the external fat on almost all beef table cuts and reductions in seam fat for chuck and round cuts. The presence of bone in the cut reduces value sharply and higher levels of marbling were preferred for loin steaks, but not for chuck roasts.

In this study a similar approach as the one followed by Unnevehr and Bard (1993) was followed with specific reference to selected beef cuts in Bloemfontein.

4. Methodology

Wahl, Shi and Mittelhammer (1995) explain that hedonic price analysis has been used widely to study consumers' implicit valuations of food product characteristics. This was also echoed by Latvala (2003) who states that the hedonic price model is the most used method for studies dealing with food quality characteristics. Consumers derive utility or satisfaction from the characteristics that goods possess, rather than the goods themselves (Becker, 1965; Lancaster, 1966; Rosen, 1974 and Lucas, 1975).

The total amount of utility a consumer enjoys from his/her purchase of products depends on the total amounts of product characteristics purchased (Ladd and Suvannunt, 1976). Let x_{oj} be the total amount of the j^{th} product characteristic provided to the consumer by consumption of all products. Let x_{ij} be the quantity

of the j^{th} characteristic provided by one unit of product i. And let q_i represent the quantity of the i^{th} product consumed. If there are n products and each of the first m product characteristics is provided by several products, but each product also provides a unique characteristic provided by no other product, then total consumption of each characteristic can be expressed as a function of quantities of products consumed and of consumption input-output coefficients:

$$x_{oj} = \int_j (q_1, q_2, ..., q_n, x_{1j}, x_{2j}, ..., x_{nj}) \quad [1]$$

for $j = 1,2,...,m$ and

$$x_{om+i} = \int_{m+i} (q_i, x_{im+i}) \quad \text{for } i = 1,2,...,n.$$

The consumer's utility function is expressed as:

$$U = U(x_{01}, x_{02}..., x_{om}, x_{om+1,...,} x_{om+n}) \quad [2]$$

Because each x_{oj} is a function of the $q_i's$ and the x_{ij}'s,

$$U = U(q_1, q_2, ..., q_n, x_{11,}, x_{12}, ..., x_{1m}, x_{21...}, x_{nm}, ..., x_{nm+n}) \quad [3]$$

It is assumed that consumers can vary only the $q_i's$. The magnitudes of the $x_{ij}'s,$ are parameters to the consumer, i.e. their magnitudes are determined by producers.

The consumer is assumed to maximize equation [2] subject to the budget constraint.

$$\sum_I P_I q_i = I \quad [4]$$

Where p_i is the fixed price paid for the i^{th} product and I is the budget constraint. The consumer selects the values of the q_i that maximize the Lagrangian.

$$L = U(x_{01,} x_{02,...,} x_{om+n}) - \lambda(\sum_i p_i q_i - I) \quad [5]$$

According to Ladd and Suvannunt (1976), the consumer is viewed as selecting the combination of the total product characteristics that maximizes utility. Choices of products are based on their different characteristics. Because the $x_{oj}'s$ are functions of the $q_i's$ compound function rules for differentiating U must be used:

$$\partial L / \partial q_i = 0 = \sum (\partial U / \partial x_{oj})(\partial x_{oj} / \partial q_i) + (\partial U / \partial x_{om+i})(\partial x_{omi} / \partial q_i) - \lambda p_i \qquad [6]$$

The marginal utility of income is $\lambda : \lambda = \partial U / \partial I$. Substituting this expression into equation (6) and solving for p_i yields:

$$p_i = \sum (\partial x_{oj} / \partial q_i)[(\partial U / \partial x_{oj}) / (\partial U / \partial I)] + (\partial x_{om+i} / \partial q_i)[(\partial U / \partial x_{om+i}) / (\partial U / \partial I)] \qquad [7]$$

The marginal yield of the j^{th} product characteristic by the i^{th} product is $\partial x_{oj} / \partial q_i$. The marginal yield of the i^{th} product's unique characteristic is $\partial x_{om+1} / \partial q_i$. In the bracketed terms, $\partial U / \partial x_{oj}$ is the marginal utility of the j^{th} product characteristic, and $\partial U / \partial I$ is the marginal utility of income. Their ratio is the marginal rate of substitution between income and the j^{th} product characteristic. By equation [4] income equals total expenditure. Therefore, the bracketed term can be interpreted as the marginal rate of substitution between expenditure and the j^{th} product characteristic, i.e. the (marginal) implicit or imputed price paid for the j^{th} product characteristic. Consequently $(\partial U / \partial X_{OJ}) / (\partial U / \partial I) = \partial I / \partial x_{oj} = \partial E / \partial x_{oj}$, can be written, where E = total expenditure on all products. Assume each unit of each product supplies one unit of it's own unique characteristic. Then $\partial x_{om+i} / \partial q_i = 1$, and equation [7] becomes

$$p_i = \sum_j (\partial x_{oj} / \partial q_i)(\partial E / \partial x_{oj}) + \partial E / \partial x_{om+i} \qquad [8]$$

5. Data used

This study generated data through purchase of beef samples at 16 spatially separated (geographically demarcated) supermarkets in Bloemfontein, between March and April 2005. The team that developed the data collection protocols included a meat scientist, a sociologist and an agricultural economist. Samples were collected almost every Saturday morning, only during normal business days and not during promotions or "specials" days.

A list of all Bloemfontein supermarkets with butchery units was obtained from the Department of Veterinary Health. The supermarkets were then stratified according to geographical location: Bloemfontein North, South, East and West. A pre-survey study was conducted to elicit information pertaining to the type of meat sold at the supermarket. The results indicated that all the Bloemfontein East

supermarkets (i.e. those closest to informal settlements and the predominantly black townships) sell only fore-quarter beef cuts; consequently these outlets were excluded from the study because hind-quarter beef cuts (T-bone and rump steak) were essential for the study.

It is important to note that the design of the study does not allow for the findings to be generalized to all meat consumers in Bloemfontein, and particularly to the lower living standard measure (LSM) levels, who because of historical reasons, happen to be predominantly black. Following the rise of the black elite and the black and upcoming professionals ("buppies"), more than two million "working class" (predominantly black) South Africans had entered LSM levels five and six by 2005 (South African Institute of Race Relations 2006: 249). However, LSM levels one to four (defined as poverty levels) still represent 42% of the population, down from 48% in 1998 (South African Institute of Race Relations 2006: 249). A closer analysis of LSM data reveals that more than 80% of South Africans in LSM levels one to four earn less than R2 499 per month, while more than 95% of them are black. As for Bloemfontein, in 2004, 34% of all households had an income of less than R30 000 per year (and thus fell into LSM levels one to four). In the case of the black population, however, the equivalent proportion was 44.7%, down from 59.1% in 1998 (Global Insight Southern Africa 2004).
In this study, no attempt has been made to distinguish between consumers purchasing at various supermarkets, since financial constraints did not allow for a big enough sample to compare between sub-groups. The supermarkets selling the selected beef-cuts that were selected in terms of the multi-stage cluster sampling method, all happen to be located in the formerly predominantly white neigbourhoods of Bloemfontein. These neigbourhoods are mainly spread across the northern, western and southern parts of the city. The fact that supermarkets in the eastern parts of Bloemfontein did not sell the selected beef-cuts (and thus were ruled out from the sample), in all likelihood suggests that red-meat consumers purchasing at these supermarkets (as a function of their lower LSM levels) probably opt for more affordable fore-quarter beef cuts. Although no specific attempt was made to distinguish between race, or even to sample with the intention to use race as an independent variable in the data analysis, the geographic distribution and eventual selection of supermarkets in the sample (based on their selling of hind-quarter beef cuts) in all likelihood meant that the profile of the consumers purchasing hind-quarter beef cuts at these supermarkets would largely fit that of the more-affluent, still predominantly white consumer. The findings should therefore be seen as an indication of the red meat preferences of the more affluent consumer sector (i.e. LSM levels 5 and higher) in Bloemfontein. Having said that, it should be realized that the growth of the black

middle class (and thus LSM levels 5 and 6) over the past few years is quickly changing the historical profile of the middle class in South Africa, as indicated above.

Information on the number of carcasses sold per month was also obtained from each supermarket, to enable computation of sample size per outlet (See Appendix A, Table A.1). The sales percentage for each outlet was computed, based on the total overall sales of carcasses. To calculate the sample size per supermarket, the sales percentage of each outlet was multiplied by the total sample size of 308 beef cuts. The supermarket's sales percentage was used to ensure that each supermarket was proportionately represented in the total sample. The fresh cuts were then randomly purchased in proportion to each supermarket's sales percentage. An average sample of 45 beef cuts were purchased each week for laboratory analysis.

Each beef cut was weighed to determine its mass in grams. The subcutaneous (external) fat on all T-bone and rump steaks were measured by ruler to determine the average fat thickness of each cut. Fat was measured in at least three locations on each cut to calculate the average thickness. Cuts that had no external fat were recorded as such. Beef cuts were then subjected to knife dissection to determine the percentage of separable subcutaneous (external) fat, intermuscular (seam) fat, lean meat, bone (if present) and connective tissue. Dissection data were used to determine the total fatness of cuts. Separable lean meat from each cut was finely minced and thoroughly mixed from which a sample was randomly selected for chemical fat determination.

Extraction of total fats from the muscle was performed quantitatively according to Folch, Lees and Sloane-Stanley (1957) method, using chloroform and methanol in a ratio of 2:1. The extracts were dried under vacuum in a rotary evaporator and further dried overnight in a vacuum oven at 50^{o}C with phosphorus pentoxide as moisture absorbent. Total extractable fat content (EFC) was determined by weighing and expressed as percent fat (w/w) per 100g tissue.

6. Model Specification

The theoretical and methodological approaches used by Unnevehr and Bard (1993) were used to estimate a hedonic price model to analyse consumers' marginal willingness to pay for different fat characteristics in selected beef cuts in Bloemfontein, South Africa. The hedonic price model defines product price as a function of external fat, seam fat, marbling fat and bone-in.

Theory does not provide a basis for selecting a particular functional form for hedonic pricing models. In this paper, a log-linear functional form was used to estimate the hedonic price function. The linear form restricts the premiums and discounts to be constant in cents per kilogram and the parameters indicate change in price, given a one percent change in the independent variable. The advantage of the log-linear functional form is that the parameters are directly interpretable and thus the results are easier to explain. The empirical hedonic price model is denoted as follows:

$$InP = \beta_0 + \beta_1 T1 + \beta_2 LCT + \beta_3 B1 + \beta_4 InFATHIN + \beta_5 InSMFTWT + \beta_6 InMARBPCT + u$$

Where: P is price per kg; *T*I is a dummy which equals 1 for the March samples, 0 otherwise; *LCT* is a dummy which equals 1 if the sample is from Northern locations; 0 otherwise; *B*I is a dummy which equals 1 if the beef cut is bone-in, 0 otherwise; *FATHIN* is external fat thickness in centimetres; *SMFTWT* is the weight (kg) of the cut consisting of seam fat; *MARBPCT* is the intramuscular fat (%); and u is a random error.

The last four variables are physical measures of quality and the coefficients give the marginal implicit prices of these quality characteristics.

The hedonic model above requires the implicit assumption that all price variation is due to differences in quality characteristics. In this sample, price variation may also occur due to time of sampling and location. Another, assumption is that consumers found in a specific location use the supermarkets located in that particular location. Thus, the empirical model includes dummy variables for these factors. The above equation was estimated for each of the two product categories of beef cuts (i.e. bone-in cuts, namely T-bone and boneless cuts, namely rump).

6.1 Estimation procedure

The model was estimated using the EViews econometric software package, using ordinary least squares (OLS). A correlation matrix was also constructed to test for the correlation between the different variables using Simitar software.

Unnevehr and Bard (1993) point out that heteroskedasticity is often a problem in hedonic price estimation; in this case a White test was performed to test for the presence of heteroskedasticity. The White's test detected a heteroscedasticity

problem. To correct for it, the model was re-estimated using Weighted Least Squares procedure.

7. Results

7.1 Price variability

The results pertaining to price variability indicated that there was a statistically significant difference in prices between beef cuts with bones (T-bone) and without bone (rump); the mean difference was statistically significant at the 5 percent level of significance and positive (see Table 1). There was also a statistically significant difference in bone-in cuts between different locations. Three conclusions emerged from the analysis. Firstly, within the same location, beef cuts with and without bones had significantly different prices. Secondly, prices of bone-in cuts in the two specified locations were significantly different from each other with a negative sign. This implied that bone-in cuts realised lower prices in the more affluent location. Thirdly, there was no significant difference in prices of beef without bones between the south, western and the northern locations of Bloemfontein.

Table 1: Beef market prices with and without bone cuts in different locations (R/Kg)

	Average price of bone-in cuts	Average price of boneless cuts	Mean difference=0
South and west	42.08	52.61	**10.53****
North	39.24	53.17	**13.93****
Mean difference=0	**-2.84****	0.56	

** significant at 5%

The analysis to determine whether there was any difference in prices of beef cuts over the period that cuts were bought revealed that prices were statistically not significantly different from each other.

7.2 Hedonic prices

Before the estimated log-linear model was estimated a residual plot was conducted to remove possible outliers from the data. This procedure indicated

10-values that were outside the normal range of the data, which were then removed.

The results of the log-linear hedonic price model are shown in Table 2. These results were obtained by a step-by-step insignificant variable deletion method to improve the prediction power of the model. The variables were deleted based on their level of significance; the most insignificant, namely the marbling variable, was deleted first, followed by location and then month.

The results for the model indicated a coefficient of determination of 0.515, suggesting that beef characteristics, overall, explain 51 percent of the variation in price, reflecting a reasonable degree of explanatory power for the set of data. The F-value of 100.7 as a measure of the overall significance of the estimated hedonic price model and a test of significance of the coefficient of determination was highly significant, which implied that the variation in beef price was strongly influenced by the specified explanatory variables.

Recall that coefficients on continuous variables represent the marginal implicit values to a one unit increase in the content of those characteristics. Due to the log-linear specification, the coefficients of the variables can be interpreted as percent premiums or discounts per percent unit change in their measurement values. Coefficients on the qualitative variables represent the premium and discounts associated with moving from one attribute level to another.

Table 2: Regression results

Variables	**Coefficients**	**t-ratio**
Intercept	3.849	75.595*
FATHIN	0.045	2.55 *
SMFTWT	-0.025	-2.34**
B1	-0.23	-13.477*
Adjusted R^2	**0.515**	
D – Watson	**1.823**	
F-value	**100.7**	

* significant at 1%; ** significant at 5%

- ***FATHIN***

FATHIN represents the external fat thickness of the beef cut in centimeters. The hypothesis is that, the thicker the subcutaneous fat on the beef cut, the less preferred it would be among consumers because it may be viewed as unattractive waste. The coefficient for the external fat was, however, statistically significant and positive; this is contrary to expectations. The results suggested that an increase of one percent in external fat thickness increased the average beef price by 0.045 percent. This can be explained by the fact that external fat was valued by the beef consumer in Bloemfontein based on their culture of food consumption and traditional cooking style (braai). The type of beef cuts used in the study is most popular for braai; a certain level of external fat is needed to prevent the beef cuts from becoming dry and tough. The result did not imply that the amount of external fat could be unlimited, but rather that current external fat levels were desired by consumers.

- ***SMFTWT***

SMFTWT is the seam fat variable (fats found between muscles). Seam fats are not an appropriate physical attribute of beef cuts, therefore the bigger the visible fats, the more consumers avoid it. The hypothesis is that the bigger the seam fat chunk, the more it is likely to be avoided by consumers. This is most likely due to the fact that seam fats create tough pockets of gristle and are considered by consumers to be unattractive waste. Too much seam fat on beef cuts causes the consumer to physically remove it from the cut.

It was expected that consumers would discount prices with an increase in seam fat. This was confirmed by the negative sign of the *SMFTWT* variable that was significant at the 5 percent level. Thus, the result indicated that an additional percent of total seam fat discounted the average beef price by 0.025 percent.

- ***B*I**

*B*I is a bone-in dummy variable that is equal to one when the beef cut is classified as being bone-in and zero if it has no bone. It is hypothesized that a bone-in beef cut will be discounted since the bone is regarded as wastage.

The results confirmed the hypothesis; the sign of the coefficient for *B*I (bone-in) was negative and highly significant at the 1 percent level of significance. This

implied that the presence of a bone in a beef cut would result in consumers discounting such cuts.

8. Summary and conclusion

This paper investigated consumers' marginal willingness to pay for different fat characteristics in selected beef cuts in Bloemfontein, South Africa. The relevance of this is due to an increasing awareness by consumers of the potential dangers of consuming animal fats, which could cause consumers to find alternative sources of protein. The end result would be a decline in red meat demand and hence low prices. It is therefore vitally important to get a better understanding of consumers' preferences pertaining to different types of animal fats.

A hedonic price model was used to estimate the impact of different fat attributes of selected beef cuts. The results can be summarised as follows:

- Contrary to expectation consumers in Bloemfontein were willing to pay for additional external fat. This can be explained by the fact that external fat was valued by the beef consumer in Bloemfontein based on their culture of food consumption and traditional cooking style (braai). The result does not imply that the amount of external fat can be unlimited, but rather that current external fat levels were desired by consumers.

- Seam fat had a negative impact on prices of the selected beef cuts in Bloemfontein. This suggests that presentation of cuts on shelves might have to change, i.e. removal of excessive seam fat. This study did not consider the cost implications of such actions, but rather provided a guideline to processors and retailers of the attributes less wanted. The result as far as seam fat was concerned indicated that reducing the amount of a less desired attribute could shift the demand curve outward.

- Marbling fat did not have a significant impact on prices of selected cuts in Bloemfontein. This can be explained by the fact that consumers in Bloemfontein (and most probably in South Africa) did not account for the degree of marbling when the decision to buy beef was made. Moreover, cattle in South Africa are slaughtered at a relatively young age before marbling could develop to a significant degree, and hence consumers are not accustomed to marbling.

As cited in the paper, similar studies overseas found that consumers discriminate against external and seam fat, whilst results are mixed for marbling. This study found that consumers in Bloemfontein only discriminated against seam fat. It therefore appears that one can't merely assume that international trends are applicable to the South African situation, but this needs further research. It is hence proposed that a similar study is conducted for South Africa as a whole.

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Appendix A:

Table A.1: Region, the supermarkets surveyed, their percentage of sales and sample size

Area	No.	Name of retailer	No. of Carcasses per month	(%) of total carcasses	Sample size
North	1	Pick'n Pay	20	5.0	15
	2	Heuwelsig Kwik Spar	10	2.5	8
South	1	Checkers Hyperama	56	14.0	43
	2	Kays Supermarket	20	5.0	15
	3	Pick 'n Pay Hyper	60	15.0	46
	4	Uitsig Rite Value	3	0.8	2
	5	Vrystaat Spar	12	3.0	9
West	1	Checkers	48	12.0	38
	2	Eric Spar supermarket (Universitas)	12	3.0	9
	3	Eric Spar supermarket (Langenhoven park)	12	3.0	9
	4	Royce's Pick 'n Pay	36	9.0	28
	5	Pick n' Pay	48	12	38
	6	Pick 'n Pay family supermarket	30	7.5	23
	7	Kwik Spar supermarket	12	3	9
	8	Shoprite	8	2	6
	9	Friendly Spar supermarket	8	2	6
		Total	**400**	**100**	**308**