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Full Length Research Paper

The influence of incentives in eliminating hypothetical bias: Evidence from a choice-based conjoint experiment for beef products in Iringa and Mbeya Regions in Tanzania

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Consumer responses were observed for a within-sample comparison of preference and willingness-to-pay (WTP) estimates for tenderness, leanness, freshness and hygiene for beef products from finished cattle and non-finished cattle (status quo). This comparison was conducted through two sessions of repeated choice-based conjoint experiments (CBC), starting with a hypothetical choice-based conjoint (HCBC) experiment that involved cheap talk only followed by a real choice-based conjoint (RCBC) experiment that involved the actual purchase of experimental products with real money. Consumers prefer more tender, less fatty, chilled beef and clean retailing premises, regardless of the choice session; however, the estimated coefficients were not equal (p<0.001). The selection was motivated by alternatives in HCBC where finished beef constituted 76% of all choices made. The selection of finished beef dropped to 67% in RCBC where consumers were sensitive to the price and quality content of alternative products. Consumers overestimate the WTP for hygiene in HCBC (p=0.014); however, there are no significant differences in WTP estimates for other attributes. Therefore, it is concluded that monetary incentives can reduce hypothetical choice bias and provide more trustworthy WTP estimates for all attributes.

Key words: Beef, finishing, chilling, hygiene, tenderness, preferences, willingness to pay.

INTRODUCTION

The development and shaping of the beef industry depend on customer desires and preferences for various ranges of beef quality attributes. The importance of beef consumers in the entire beef industry worldwide has necessitated the measuring of information concerning consumer preferences and willingness to pay (WTP) for attributes of interest, such as freshness, tenderness, fat content and safety or hygiene, using the conjoint technique as an appropriate marketing research tool because it reflects the real market scenario (Hensher et al., 2005). The technique has recently been adopted in market research in developing countries, including Tanzania (Jabbar et al., 2010; Nandonde et al., 2013a).

Intuitively, conjoint experiments have suffered from consumer bias to the extent of losing financial meaningful to marketers particularly when the experiment is basically too hypothetical for consumer to put cognitive effort into their decisions as they make choices out of habit (Dawnay and Shah, 2005; Lusk et al., 2008; Alfenes et al., 2009). This issue has led to the reframing of choice experiments by conducting field-oriented experiments where real subjects can be found instead of the typical laboratory experiments that involve mainly students (List 2011). In addition, such incentives as cheap talk scripts and real purchase arrangements of the products provide

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chances for accruing more truthful information from consumers (Lusk, 2003; Alfenes et al., 2006; Lusk and Shroeder, 2004; Lusk et al., 2008; Genon et al., 2011). The use of purchase arrangements with real money provides a baseline to differentiate between hypothetical and real choices (Carlsson and Martinsson, 2001; Ding, 2007). According to Alfenes et al. (2006), using real money in choice-based experiments might be favoured because it reflects a common practise in most retail markets whereby sellers post the price and consumers choose which product to buy.

Nevertheless, the reframing of the choice session and the extent of bias to CBC is relatively complicated because in certain cases, no bias has been observed, and in certain other cases, substantial differences have been observed (Carlsson and Martinsson, 2001; Chowdhury et al., 2009). These ambiguities could be attributed to the type of product in question, the exposure of respondents to choice experiments and the bargain technique to reflect the rational decision in the respondents' choices (Carlsson and Martinson, 2001; Chowdhury et al., 2009; Ginon et al., 2011; Cecchi and Bulte, 2013). This issue has created the need for researchers to understand the potential differences that exist in hypothetical and real choice set ups (List, 2006). This quest is conducted not only for the sake of understanding the presence of choice bias and its influence on the implicit price measures but also to find the necessity of conducting such relatively expensive real choice experiments in countries such as Tanzania where beef consumers/respondents are not exposed to such a methodology compared to ordinary surveys using questionnaires. Previous conjoint studies from Tanzania have been dedicated to findings regarding monetary incentives (Alphonce and Alfenes, 2012; Nandonde et al., 2013a; Nandonde et al., 2013b) while studies regarding beef product in nearby countries mostly have been too hypothetical to address the differences (Jabbar et al., 2010). This paper is aimed at examining the presence of hypothetical bias and its consequences on the willingness-to-pay estimates for quality-improving beef attributes of freshness, leanness, tenderness and hygiene of retailing outlets in the Iringa and Mbeya Regions in Tanzania (Figure 1).

MATERIALS AND METHODS

Econometric modelling of choice experiments

The conceptual foundation of choice experiments relies on Lancaster's theory of value, which proposes that utilities for goods and services can be decomposed into separate utilities for their characteristics or attributes (Lancaster, 1966), and random utility theory, which explains the dominance judgments made between a pair of offering (Thurstone, 1927). Within this framework, subjects (consumers) choose among alternatives according to a utility function that comprises two components (Equation 1).

$$U_{ni} = V_{ni} \pm \varepsilon_{ni} \ , \qquad (1)$$

Where U_{ni} is the utility obtained by individual n by selecting alternative i from a finite set of J alternatives in choice set C in situation t. V_{ni} represents the systematic component of the utility (the indirect utility), which is a function of the attributes of an alternative [V_{ni} = f (X_{ni})]; X_{ni} is the vector of alternative i. ε_{ni} is the random term. Therefore, the individual n will choose alternative i if it's utility is higher than that of its alternative k within the same choice set; hence, his probability (P_{ni}) is shown in Equation 2.

$$P_{ni} = \Pr ob(V_{ni} + \varepsilon_{ni}) > V_{nj} + \varepsilon_{nk} : \forall_k \in C \qquad (2)$$

Various logit probabilistic models are used in analysing choice experiment data, such as the hybrid conditional logit models, the random coefficient models, the hierarchical Bayes model and the latent class model, depending on the extent of the model to reveal more preference heterogeneity compared to ordinary or basic probabilistic models that assume that consumers are homogenous in their selection or preferences (Kallas et al., 2007 and Ortega et al., 2010). The hybrid condition logit model or the random effect logistic model are preferred as basic models in handling repeated choice data and allow flexibility through the interaction of the subjects' socio-economic characteristics through the indirect utility function (Radder and le-Roux, 2005; Kallas et al., 2007; Hole 2008).

Product alternatives and attributes for experimental design

Our experiment was designed based on the on-going situation on the ground, where most beef is sourced from a local unimproved (non-finished) production system, which was treated as the status quo. The assumption was that both local and cross-breed cattle can be improved to produce the same quality beef with respect to tenderness; however, a difference might arise regarding the possibility of having higher adipose fat content from local cattle compared to crossbred cattle. The full factorial of $2^2 \times 3^2 \times 5^1 = 180$ choice combinations was reduced to 10 (Table 1). With the exception of hygiene of retailing outlet, attributes attached to beef itself that count for over 85% of all attributes were presented to consumers in their real forms using actual beef products stored in a refrigerator and a visible photo display of a whole carcass. The experiments employed the prevailing market price for the status quo beef for the

Figure 1. Map of Iringa and Mbeya Regions with the specific study areas.

meat-on-bone (Mchanganyiko) cut basis, while the price for finished beef was suggested on the same basis by key informants who were prominent beef dealers and cattle finishers in Iringa and Mbeya Regions.

Choice implementation and data analysis

Six experiments were conducted, specifically, one in each rural area (Mafinga and Tunduma Townships) and two in each urban centre (Iringa Municipal and Mbeya City) in February and March 2012 (Figure 1). The experiments were conducted in two sessions in one day starting with HCBC, whereby the cheap talk technique was used to ensure that consumers are sincere about what they are supposed to do and avoid haphazard responses (Lusk et al., 2007). The second session was conducted for RCBC whereby in addition to a cheap talk script; consumers were obliged to purchase one of the ten choices made using their own money (Ding, 2007; Nandonde et al., 2013a, Nandonde et al., 2013b). The experiments were conducted on weekends (Saturday and/or Sunday) and all sessions took 2 to 3 h with a 30 min break in between sessions. The filled-in choice forms were submitted to the researcher by the respondents before proceeding with the next session, and the subjects were not aware of the upcoming session. Consumers were given adequate time to concentrate on the choice by not asking them about their socio-economic background because this information was gathered after the completion of the choice experiments. Choice data

Table 1. Choice alternatives with attributes and attribute levels.

Attributes	Choice alternatives for beef with attribute levels		
	Non-finished	**Local finished**	**Crossbred finished**
1. Chilling	Chilled	Chilled	Chilled
	Not Chilled	Not Chilled	Not Chilled
2. Adipose fat content	Medium	Medium	Low
	High	High	Medium
3. Tenderness	Low	Medium	Medium
	Medium	High	High
4. Hygiene of outlet	Clean	Clean	Clean
	Not clean	Not clean	Not clean
5. Price (Tshs/kg)	4,500.00	5,000.00	6,000.00
	5,000.00	5,500.00	6,500.00

Table 2. Parameter (utility) estimates from choice sessions and pooled data.

Choice	Choice experiment session				Pool	
	Hypothetical		Real			
	Coefficient	**P-Value**	**Coefficient**	**P-value**	**Coefficient**	**P-value**
Chilled	0.431	0.000	0.331	0.000	0.378	0.000
Medium fat	0.419	0.000	0.423	0.000	0.415	0.000
High fat	-0.117	0.178	-0.066	0.457	-0.096	0.121
Medium tender	0.229	0.002	0.159	0.020	0.188	0.000
High tender	0.444	0.000	0.37	0.000	0.399	0.000
Clean	0.752	0.000	0.417	0.000	0.578	0.000
Price (x1000Tshs)	0.171	0.000	-0.317	0.000	-0.074	0.024
Constant (ASC)	-2.69	0.000	0.23	0.412	-1.203	0.000
Log likelihood*	-5588.58		-5724.8		-11387	
Respondents (n)	308		308		616	
Observations	9240		9240		18480	

*Log likelihood Ratio test = $-2[\ln L_{pool} - (\ln L_{hypothetical} + \ln L_{real})] = 146.97 \sim \chi^2_7$.

were stored in spreadsheets and analysed using a panel logistic regression in STATA 12 for utility model estimation. The model estimates were used to calculate the WTP and its standard error using the Jackknife procedure with the *nlcom* command in STATA (Hole, 2007). Detailed information on respondents' socio-economic characteristics can be found in Nandonde et al. (2013b). For the focus of the present paper we only considered interaction of product attributes with consumer's gender, age, income and residence.

RESULTS AND DISCUSSION

Preferences regarding product attributes and price

The utility model estimates for all attributes in two choice sessions and the pooled (combined) data are shown in Table 2. The preference directions for non-price attributes were the same in all choice sessions, indicating that consumers prefer chilled, medium adipose fat, medium tender and high tender beef sold in clean premises, regardless of whether the experimental set up was hypothetical or real. This result also implies the existence of one extreme favourite regarding eating and safety attributes. This finding might be attributable to the involvement of authentic consumers as opposed to typical laboratory experiments where students or less experienced consumers are involved in making choices (List, 2011).

The market attribute (price) at hand had a positive and a negative coefficient in hypothetical and real choices, respectively, and both coefficients are significant (Table

Table 3. Choice responses for different beef alternative sources.

Choice session	Statistic summary	Source of cattle for the carcass			Total
		Local non finished	Local finished	Crossbred finished	
Hypothetical	Observations	3080	3080	3080	9240
	Choices made	748	1187	1145	3080
	% of choices made	24.29	38.54	37.18	100.00
Real purchase	Observations	3080	3080	3080	9240
	Choices made	1018	1204	858	3080
	% of choices made	33.05	39.09	27.86	100.00

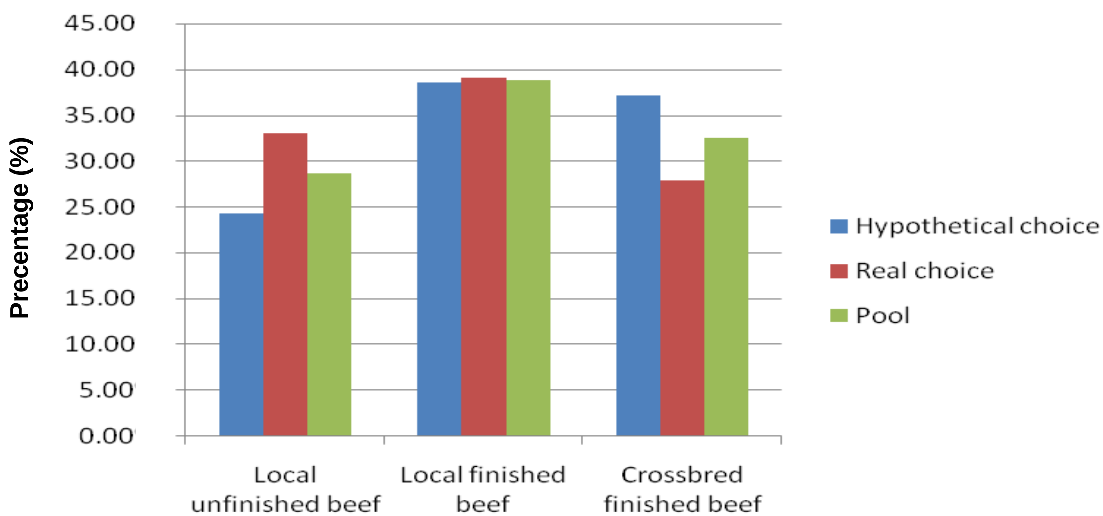

Figure 2. Percentage of selected alternatives in two choice sessions with pooled data.

2). This result implies that beef product with higher prices had a higher chance of being chosen in hypothetical choices and that the price was affordable for most consumers. Despite the directional similarity and differences of non-price and price attributes, respectively, the log likelihood ratio test shows that the magnitudes of the estimated coefficients in two choice sessions were not equal ($p<0.05$), thus rejecting the null hypothesis of equal coefficients. This result is different from the findings obtained by Carlsson and Martinnson (2001) regarding public goods.

The direction of the coefficient of the alternative specific constant (ASC) parameter (Table 2) does not have a meaningful interpretation in our case; however, its significance in HCBC implies that consumers made their choices motivated by alternative sources rather than by its quality contents. The ASC in connection with the positive price coefficient in HCBC indicates that finished beef was highly preferred to non finished beef. In HCBC, choices made for beef from local finished cattle and crossbred finished cattle outnumbered the status quo (Table 3 and Figure 2). This result was different in RCBC, where choices were made with respect to attributes and consumers were sensitive to price (Table 2), as also indicated by the sharp increase and decrease of the percentage of choices made for the status quo and crossbred finished cattle with a slight increase of finished local cattle (Figure 2). This finding is in keeping with reports from researchers (Ding, 2007; Lusk et al., 2008; Miller et al., 2011; Cecchi and Bulte, 2013), suggesting that consumers become more price sensitive and expose their true behavioural experience in the choice of the product and price bargaining under real market pressure.

Cheap talk has been found not to exert adequate pressure on subjects to reveal their true preference for price compared to when real money was involved. This result is similar to the finding by Chowdhury et al. (2009). In the context of preference direction, it is the price that was adversely affected compared to other attributes that remain almost constant. This result implies that the utility of the price depends on the nature of the choice session and consumers do not appear to be genuinely concerned

Table 4. Implicit price (WTP) estimates for different sessions and the pooled data.

Variable	Choice session						Pool		
	Hypothetical			Real					
Attribute	WTP[1]	se	P-value	WTP[1]	se	P-value	WTP[1]	se	P-value
Chilled	2518	733	0.001	1059	211	0.000	5089	2298	0.027
Medium fat	2453	613	0.000	1335	372	0.000	5589	2854	0.050
High fat	-685	634	0.280	-208	264	0.430	-1287	693	0.063
Medium tender	1339	650	0.039	501	203	0.014	2534	1098	0.021
High tender	2598	1009	0.010	1168	227	0.000	5374	2160	0.013
Clean outlet	4396	1225	0.000	1316	241	0.000	7781	3475	0.025

WTP[1], estimates are in Tanzania shillings.

Table 5. Comparison of WTP estimate differences.

Attribute	Difference (%)[I]	Two sample t test[II]		Pooled t test[III]	
		t value	P- value	t value	P- value
Chilled	57.98	1.9280	0.0562	0.3174	>0.05
Medium adipose fat	45.58	1.5592	0.1175	0.1959	>0.05
High adipose fat	69.63	0.6946	0.4876	0.3441	>0.05
Medium tender	62.58	1.2304	0.2189	0.3816	>0.05
High tender	55.04	1.3827	0.1673	0.3310	>0.05
Clean retail outlet	70.06	2.4670	0.0139	0.4431	>0.05

[I] Actual value difference for WTP estimates in HCBC and RCBC only. [II]WTP estimate comparison for HCBC and RCBC only and as independent treatments. [III]t test determined with the inclusion of pooled variance.

in no-purchase situations.

Willingness to pay

As expected, differences in coefficient estimates had a direct impact on the estimated WTP (Table 4). The decrease of the coefficients for attributes in RCBC had automatically lowered consumers' marginal WTP (Table 5). However, in view of the t test for pooled variance with the assumption of independence of the choice session, none of the estimated WTP differences of an attribute was significant (Table 5), which implies a non WTP overestimation. This finding is similar to findings by Carlsson and Martinson (2001). By comparing two sessions as two independent treatments without considering the pooled variance, there was a different WTP estimation for hygiene (p=0.0139), implying an overestimation for the clean retail outlet attribute. This finding is different from that of Carlsson and Martinsson (2001) but is in line with other studies (Voelckner, 2006; Lusk et al., 2007; Alfenes et al., 2009), suggesting that consumers tend to overestimate their WTP in a hypothetical choice scenario. However, the overestimation of the clean retailing attribute in our case might be due to a too imaginary presentation of the hygiene attribute in the experimental set up because there was no visible reference for a clean and unclean outlet compared to other attributes that were directly attached to beef and that were presented virtually in real form through actual beef cuts (Nandonde et al., 2013a).

The log likelihood ratio test in a choice model with the inclusion of socio-economic characteristics had shown coefficient inequalities ($P<0.05$) and a bias toward finished beef, as in the case when the analysis involves attributes and price only (Table 6). There was a general consistency in terms of the preference for chilled beef exhibited by female and more educated consumers, whereas urban residents had shown a preference for high fat beef in the hypothetical choice session; however, urban residents disfavoured the same choice in the real choice sessions. The observation on interactive utility estimates in real choices is similar to those addressed by Nandonde et al. (2013b), which implies that some behavioural differences are indeed contributed by consumer characteristics and might affect the willingness to pay for a specific attribute.

CONCLUSIONS

There is a choice bias in HCBC; however, this bias does not affect all estimated WTPs. Socio-economic characteristics of respondents contribute to the firmness

Table 6. Choice estimates with socio-economic characteristics.

Variable	**Hypothetical**		**Real**		**Pool**	
Choice	**Coef.**	**P>|z|**	**Coef.**	**P>|z|**	**Coef.**	**P>|z|**
Chilled	0.208	0.085	0.065	0.587	0.133	0.116
Medium fat	0.354	0.017	0.706	0.000	0.517	0.000
High fat	0.090	0.594	0.250	0.133	0.159	0.176
Medium tender	0.264	0.079	0.214	0.140	0.233	0.024
High tender	0.162	0.309	-0.081	0.608	0.038	0.733
Hygiene	1.058	0.000	0.435	0.000	0.737	0.000
Chilled x Age	-0.106	0.253	-0.184	0.045	-0.142	0.028
Chilled x Gender	0.355	0.000	0.283	0.002	0.316	0.000
Chilled x Education	0.205	0.043	0.328	0.001	0.261	0.000
Chilled x Income	-0.225	0.025	-0.153	0.122	-0.184	0.009
Chilled x Residence	0.117	0.238	0.142	0.145	0.127	0.065
Medium fat x Age	-0.012	0.913	-0.066	0.531	-0.039	0.600
Medium fat x Gender	-0.320	0.002	-0.012	0.909	-0.161	0.026
Medium fat x Education	-0.076	0.515	-0.344	0.003	-0.204	0.013
Medium fat x Income	0.029	0.798	-0.019	0.867	0.005	0.950
Medium fat x Residence	0.395	0.001	-0.021	0.849	0.181	0.022
High fat x Age	-0.011	0.927	0.153	0.187	0.073	0.375
High fat x Gender	-0.451	0.000	0.086	0.447	-0.171	0.034
High fat x Education	-0.475	0.000	-0.516	0.000	-0.482	0.000
High fat x Income	0.136	0.299	0.119	0.343	0.125	0.165
High fat x Residence	0.378	0.003	-0.264	0.031	0.042	0.632
Medium tender x Age	0.183	0.095	0.026	0.811	0.101	0.187
Medium tender x Gender	0.086	0.422	-0.229	0.029	-0.071	0.339
Medium tender x Education	-0.020	0.866	0.034	0.773	0.005	0.955
Medium tender x Income	0.058	0.626	0.022	0.850	0.036	0.662
Medium tender x Residence	-0.269	0.022	0.039	0.736	-0.114	0.158
High tender x Age	0.308	0.007	0.134	0.239	0.217	0.007
High tender x Gender	0.122	0.271	-0.105	0.343	0.008	0.917
High tender x Education	0.212	0.089	0.446	0.000	0.320	0.000
High tender x Income	0.128	0.295	0.078	0.523	0.101	0.243
High tender x Residence	-0.185	0.127	0.184	0.131	-0.002	0.980
Hygiene x Age	-0.267	0.004	0.036	0.695	-0.113	0.080
Hygiene x Gender	0.075	0.405	-0.042	0.638	0.015	0.809
Hygiene x Education	0.040	0.693	0.052	0.604	0.043	0.546
Hygiene x Income	-0.038	0.705	0.054	0.587	0.009	0.900
Hygiene x Residence	-0.293	0.003	-0.106	0.273	-0.196	0.004
Price (x 1000 Tshs)	0.169	0.000	-0.322	0.000	0.000	0.019
ASC	-2.704	0.000	0.239	0.395	-1.193	0.000
Log likelihood*		-5545.8		-5680.91		-11325
Participants		308		308		616
Observations		9240		9240		18480

*Log likelihood Ratio test = $-2[\ln L_{pool} - (\ln L_{hypothetical} + \ln L_{real})] = 98.29 \sim \chi^2_{38}$.

of their decisions. RCBC can eliminate bias and exhibit the true preference for both price and non-price attributes. Further consumer behavioural studies should be conducted by employing advanced analytical models, such as latent class and mixed logit models, to capture more heterogeneity regarding consumers' preferences and willingness to pay.

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