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HOW TRANSACTION COSTS INFLUENCE CATTLE MARKETING DECISIONS IN THE NORTHERN COMMUNAL AREAS OF NAMIBIA

P. de Bruyn, J.N. de Bruyn, N. Vink and J.F. Kirsten[1]

In this article a non-linear dynamic model is applied to determine the influence of transaction costs on the marketing decisions of cattle owners in the Northern Communal Areas of Namibia. The article tests the hypothesis that a producer's choice between alternative marketing options is influenced by transaction costs. The study shows that a number of transaction cost variables (herd size, distance from auction points, information and risk) have a significant effect on the proportion sold to Meatco and thus indirectly on the choice of marketing channels.

1. INTRODUCTION

Cattle owners in the Northern Communal Areas (NCA) of Namibia can sell their animals into the 'informal' or indigenous market, or they can sell to the government-owned parastatal, Meatco. Exports from the NCA are constrained by the veterinary cordon fence whereby both animals and the slaughtered meat has to be quarantined before leaving the area as a precaution against diseases such as foot-and-mouth. The main consumer market in the NCA is in the central areas. Cattle marketed in the NCA originate from the western and eastern extremes as well as from cross-border trade with Angola. Meatco operates two modern abattoirs in the NCA, while slaughtering and marketing facilities in the informal marketing chain are rudimentary. Meatco buys cattle at various buying points stretched over the whole of the communal areas from West to East. The cattle are transported from these buying points to quarantine camps a considerable distance away from the abattoirs where the cattle are ultimately slaughtered. A detailed analysis (Vink *et al*, 1999) shows that Meatco operates at a loss in these areas, hence cattle owners' decisions to sell are important to a more efficient design of the Meatco operations.

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When selling cattle in the NCA, owners can choose to sell all, a proportion or none through a particular channel. This article departs from the assumption that the decision to sell in the informal market, the formal market or a combination depends on the transaction costs incurred during the sale of the animal. These costs include direct selling costs as well as the cost of gathering information relevant to the final decision and the risk involved in realising an expected price, i.e. transactions costs. Formally, transaction costs also include post-sale costs of contract monitoring. As the typical transaction in the NCA is a once-off matter, post-sale costs can be ignored. Data were collected from a survey of livestock owners in the NCA. The possible channels that were identified include sales to Meatco, sales to livestock traders and the slaughtering of cattle for the sale of meat.

In this article a non-linear dynamic model is applied to determine the influence of transaction costs on the decisions of cattle owners. Similar to the study by Hobbs (1997) of cattle marketing in the United Kingdom, this article also tests the hypothesis that a producer's choice between alternative marketing options (in this case selling to Meatco or to the informal trader) is influenced by transaction costs. The biggest challenge for this research is that the level of economic development as well as the institutional setting are totally different. The article initially addresses the theoretical foundations of transaction costs in marketing, then describes the model and the data and finally discusses the results from the analysis.

2. A MODEL TO MEASURE TRANSACTION COSTS IN MARKETING

Transaction cost economics recognises that transactions do not occur in a frictionless environment (Coase, 1992). However, this model has been criticised for its lack of empirical support (Cheung, 1998). Unlike physical production costs, transaction costs are not easy to separate from other managerial costs. The complex nature of institutions means that their operating costs are not easy to quantify (Hobbs, 1997). Transaction costs in marketing and processing in Africa typically arise because market prices do not fully reflect true costs and returns to participation for all market actors (Delgado, 1999).

Cheung (1998) suggests that the measurement of transaction costs can be accomplished by ranking the preferences of different observers, or in these case cattle owners. If, *ceteris paribus*, a particular type of transaction cost is higher in situation A than in situation B, and different individuals consistently

specify the same ranking whenever the two situations are observed, then transaction costs are measurable (Cheung, 1998).

Transaction costs are incurred in an interactive system. In a general interactive system, within the framework of contemporary knowledge, there are different phases, namely creation, evolution and destruction (Thom, 1975; Winfree, 1980; Thomson, 1982; Casti, 1989; Cohen & Stewart, 1994). Within the system, structural stability and non-stability form an important paradigm in the changing process to different phases (Woodcock & Davis, 1978; Casti, 1989). This dynamic process is difficult to put into mathematical form, even if it is possible to measure attributes (variables) within each of the three phases over time (Woodcock & Davis, 1978; Thomson, 1982). The reason is quite simple. When three and more variables interact dynamically, the mathematical solutions tend to be complex with a level of uncertainty in the outcome (Thomson, 1982). Statistical methods have been used to try and overcome this problem, but these do not take dynamic changes and directions (vectors) into account. Regression techniques also measure only direction and not the magnitude of the changes (vectors). Due to the interactions between the different measurable variables there is a tendency for each phase to form an equilibrium that is related to a multivariate normal density distribution within a deterministic border, also known as an attractor in system dynamics or deterministic chaos (Thom, 1975; Cohen & Stewart, 1994). Natural equilibrium is not a completely closed system and external interference causes disturbances resulting in dynamic vector changing effects.

An incremental state simulation model was developed in Visual Basic 5 to model the effect of transaction costs on the decisions of cattle owners. The model is based on goal sorting and grouping orientation to simulate the dynamic vector changes in the deterministic chaotic area. Each variable produces a cause and effect column within the Non Linear Dynamic Model vector matrix. The vector direction, that is the positive and negative change, was controlled by the goal orientated sorting process. In general the vector changes describe the non-linear dynamic vector effects over the goal variables. The dynamic matrix vector increases the degrees of freedom to n^2 (where n = the number of variables), and in this process more information is obtained from the data. In this example the degrees of freedom for the total of 18 goals were $18*n^2$. In this process 18 non-linear dynamic vector matrices and their changes over the goals 1-2,2-3,3-4...17-18 (each with n^2 degrees of freedom) were formed. The vector matrix in Table 1 is an example of the dynamic vector sum of changes over all the goals (from 1 to 18 as vector effects), given the cause for the variables in an increasing mode. This method has frequently been tested against conventional multi-variant statistical methods. In complex

Table 1: The NLDM matrix [X increasing - cause]

Effect

	Y	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13	X14	X15	X16	X17	X18	X19	X20	X21	X22	X23	X24	X25	X26	X27	X28	X29	X30
Y	10000	21	75	-39	206	62	-78	86	2123	8298	917	177	1916	340	1460	623	63	879	1839	1091	366	1079	118	66	63	424	374	314	274	731	344
X1	-40	358	-41	41	-76	-24	22	-2	-52	-55	-61	-44	-53	-62	11	-5	16	-52	-72	17	-56	-74	-38	107	16	-62	-62	-48	-76	-64	-74
X2	4	-5	58	-30	10	2	-3	13	2	4	-1	-13	0	-7	-1	-3	-13	-12	1	-14	-8	-5	10	0	-13	-3	-4	-5	-7	-2	-5
X3	4	46	-70	1220	-11	-51	-18	-65	1	-1	41	5	-17	16	-5	-3	-12	-2	7	31	-7	9	-51	3	-12	22	17	6	19	20	10
X4	112	-68	73	-54	563	100	3	-5	140	190	232	122	174	195	9	91	-11	150	258	45	174	167	83	-42	-11	213	220	93	183	195	235
X5	-33	-7	-1	-15	-46	1080	700	-41	-30	-33	1	-48	-56	-71	-47	1	-48	50	-65	117	-48	1	109	-63	-48	-73	-71	-52	-71	-73	-71
X6	-78	32	-30	-57	-44	138	8430	-34	-82	-84	28	-42	6	-73	-14	103	-44	2	-59	139	-71	-62	8	-41	-44	-73	-73	-48	-69	-86	-73
X7	59	-7	30	-54	50	-28	-34	258	58	58	40	-5	35	28	54	32	25	17	51	6	35	43	-48	49	25	39	39	16	33	54	37
X8	10	2	-3	-2	11	4	-5	5	31	31	15	11	4	11	4	2	0	8	10	10	16	15	0	7	0	17	17	10	16	17	17
X9	10	2	-3	-2	12	3	-7	5	31	32	14	10	3	12	3	-1	0	7	10	7	17	15	0	8	0	18	18	11	17	18	18
X10	130	-58	-26	46	261	237	97	-4	221	188	1527	101	356	137	78	586	-33	993	676	873	89	760	29	-51	-33	122	122	29	68	110	144
X11	-25	-55	-44	-11	274	32	108	-55	135	135	289	795	269	573	56	220	153	410	270	224	416	188	147	-48	153	457	605	234	399	259	678
X12	20	-28	11	-17	54	23	14	14	34	30	78	26	125	47	32	73	-4	88	94	57	30	61	6	-20	-4	40	40	1	22	38	48
X13	-6	-24	-5	12	56	0	-15	-11	10	10	36	84	75	137	1	10	21	52	46	10	79	51	18	-16	21	102	105	47	-6	93	126
X14	12	22	-2	-8	-6	5	8	13	2	2	0	-1	13	-4	63	25	12	13	2	23	7	2	-8	10	12	0	0	4	-6	-3	-5
X15	31	18	-3	-12	20	43	45	36	29	26	66	2	88	2	78	188	2	83	52	90	11	43	-11	8	2	5	6	6	-11	7	3
X16	-16	1	-14	14	-14	-15	2	1	-15	-15	-18	21	-15	9	3	-12	58	-9	-15	-12	19	-15	-13	5	58	9	11	32	16	8	5
X17	43	-14	5	-9	44	51	19	4	55	47	123	50	107	50	54	102	13	183	111	107	47	129	4	-16	13	48	51	17	32	52	58
X18	73	-43	35	-27	123	37	1	12	99	97	162	75	162	96	53	103	-5	165	214	93	76	151	17	-32	-5	88	92	41	75	85	108
X19	9	16	-7	4	18	47	61	-9	9	4	50	22	58	15	31	80	5	78	47	115	11	29	7	-6	5	10	14	10	-8	7	14
X20	-5	-1	-3	-3	-1	1	5	-4	-3	-3	-3	20	-2	5	3	1	10	3	-2	1	21	-2	-3	-3	10	3	5	20	5	1	5
X21	69	-22	-2	-8	72	30	-2	15	90	83	123	49	97	70	32	68	10	145	121	86	54	168	6	-7	10	67	69	32	64	81	80
X22	-24	-7	31	-15	-8	63	32	-29	-17	-17	-21	-14	-21	-11	-26	-11	-14	-4	-21	-13	-25	-13	168	-15	-14	-23	-22	-24	-33	-31	-22
X23	-32	58	-17	15	-36	-29	-14	19	-27	-24	-35	-26	-29	-26	5	-11	25	-28	-34	-21	-26	-33	-26	116	25	-35	-34	-24	-34	-22	-34
X24	-27	-7	-17	16	-1	-20	1	-1	-14	-14	-12	68	-9	58	5	-18	111	2	-8	-18	61	-8	-14	3	111	58	63	61	68	48	58
X25	-17	-10	-7	11	13	-16	-5	-2	-3	-3	2	47	4	55	-3	-15	52	7	5	-15	42	5	-6	-3	52	58	58	36	58	44	58
X26	-17	-10	-7	11	14	-9	-1	-4	-3	-3	4	58	4	55	-3	-9	42	11	5	-10	53	5	-3	-13	42	55	58	46	58	37	58
X27	-7	-5	-5	2	-4	-2	4	-4	-5	-5	-6	15	-5	4	0	-2	9	0	-5	-2	15	-4	-7	-5	9	3	4	32	10	5	4
X28	-24	-28	-16	16	60	-19	-9	3	9	9	22	111	31	132	-2	-8	89	43	39	-9	101	39	-9	-11	89	125	132	66	163	133	153
X29	-9	-20	2	12	34	-12	-14	0	7	7	27	46	20	73	-8	-6	36	27	25	-5	57	20	-1	-1	36	68	68	43	68	84	74
X30	-21	-36	-14	24	64	-16	-17	-7	30	30	34	126	44	166	1	-4	74	48	44	-6	135	52	-6	-13	74	155	163	102	184	146	184

studies the conventional analysis cannot produce satisfactory solutions due to the restrictions in their assumptions (Zimmerman, 1984; Barndorff-Nielsen *et al*, 1994; De Bruyn & Lourens, 1997).

3. THE DATA

A sample of 80 households in the Kavango, Caprivi and North Central Regions of Namibia were interviewed by means of a structured questionnaire. Most of the transaction cost variables covered in the questionnaire can be divided into three main groups, i.e. information, negotiation and monitoring or enforcement costs. Measuring transaction costs has always been problematic. As indicated earlier the complex nature of economic institutions mean that the costs of their operation are not easy to quantify. Thus, we follow a procedure similar to that of Hobbs (1997) by letting the respondents rank the extent of constraints and problems in the marketing of their cattle.

4. INTERPRETATION OF THE RESULTS

Table 2 shows the variables that were included in this study.

Table 2: An explanation of the variables

	Variable	Variable question	Measurement
Y	Proportion of cattle sold to MEATCO		Proportion
X1	Area	Caprivi =1, Mukwe = 2, Okahao = 3, Okongo = 4, Onesi = 5, Ruacana = 6, Rundu = 7	Area
X2	Age		Age of farmer
X3	Education		Years formal education +1
X4	Cattle herd size		Average size of cattle herd
X5	Sheep flock size		Average size of sheep flock + 1
X6	Goat flock size		Average size of goat flock + 1
X7	Time spent tending livestock		Percentage of time spent tending livestock
X8	Price uncertainty MEATCO	Is the prices offered by MEATCO known before arriving at the buying point?	NA =1, No=2, Yes=3
X9	MEATCO price information cost	Did you spend time discovering likely MEATCO price prior to sale? (hours)	NA=1, No=2, Yes=3

	Variable	Variable question	Measurement
X10	Transportation costs (MEATCO)	Cost of transporting stock to the MEATCO buying	NA=1, 0 0r <1=2, or Km + 2
X11	Transportation costs (Own sales)	Cost of transporting stock to the local market or distance to the local market?	NA=1, 0 0r <1=2, or Km + 2
X12	Auction transportation effort	Is transport to the MEATCO buying points a problem?	NA = 1, No problem =2, Minor problem = 3, Problem = 4, Significant problem = 5, Major problem = 6
X13	Direct sale transportation effort (Own sales)	Is transport to the local market a problem?	NA = 1, No problem =2, Minor problem = 3, Problem = 4, Significant problem = 5, Major problem = 6
X14	Frequency of MEATCO sales. (per year)	How many times per year does MEATCO visit the local buying point?	NA = 1, 1-2 times = 2, 3-4 times =3, 5-6 times =4, 7-8 times = 5, 9-10 times = 6, 11-12 times = 7
X15	Time spent at buying point. (hours)	How many hours do you spend at the MEATCO buying point?	NA = 1, 1-2 hours = 2, 3-4 hours = 3, 5-6 hours = 4, 7-8 hours = 5, 9-10 hours = 6
X16	Direct cost of own sale.	Is a fee is payable to slaughter and sell at the local market?	NA = 1, No = 2, Yes = 3
X17	Unequal bargaining power. (MEATCO)	Does having to take whatever price MEATCO offers, present a problem?	NA = 1, No problem =2, Minor problem = 3, Problem = 4, Significant problem = 5, Major problem = 6
X18	Risk of non-sale. (MEATCO)	Is the risk that animals will be not be bought and have to be transported back to your home a problem?	NA = 1, No problem =2, Minor problem = 3, Problem = 4, Significant problem = 5, Major problem = 6
X19	Auction shrinkage loss	Is the loss of weight of animals, through herding to the buying point, a problem?	NA = 1, No problem =2, Minor problem = 3, Problem = 4, Significant problem = 5, Major problem = 6
X20	Direct sale shrinkage loss (own sales)	Is the loss of weight of animals, through herding to the local market, a problem?	NA = 1, No problem =2, Minor problem = 3, Problem = 4, Significant problem = 5, Major problem = 6
X21	Grade uncertainty (MEATCO)	Is it a problem that cattle may not be graded as expected when selling to MEATCO?	NA = 1, No problem =2, Minor problem = 3, Problem = 4, Significant problem = 5, Major problem = 6

	Variable	Variable question	Measurement
X22	Grade uncertainty (Traders/livestock speculators)	Are your predictions of livestock prices, compared to the final selling price,?	NA =1, always lower = 2, often lower = 3, equal = 4, often higher = 5, always higher = 6? (1-5)
X23	Grade uncertainty (butcher)	Are your predictions of carcass prices, compared to the final selling price?	NA =1, always lower = 2, often lower = 3, equal = 4, often higher = 5, always higher = 6? (1-5)
X24	Time to complete sale (own sales) days	How many days does it take to sell your meat? (days)	NA = 1, 0 = 2, 1-2 = 3, 3-4 = 4
X25	Slaughtering cost (own sales)	Do you have people you pay to slaughter for you?	NA =1, No = 2, Yes = 3
X26	Support cost (own sales)	Do you have people that help you sell meat?	NA = 1, No = 2, Yes = 3
X27	Refrigeration cost of direct sale (own sales)	Are refrigeration facilities available on or close to the market? And if it is available do you use it.	NA = 1, No = 2, Yes = 3
X28	Credit for customers (own sales) (1-5)	Do you sell meat to small traders and customers on credit?	NA = 1, Never = 2, Almost never = 3, Sometimes = 4, Often = 5, Always = 6
X29	Time for credit payment (own sales)	If you supply meat on credit, how many days on average does it take to be paid?	NA =1, < 30 = 2, 30-60 = 3, 60-90 = 4
X30	Discount for customers (own sales)	Do you provide a discount to small traders or customers for large sales? (1-5)	NA = 1, Never = 2, Almost never = 3, Sometimes = 4, Often = 5, Always = 6

Area (X1)

Each of the research sites where questionnaires were completed was allocated a number between 1 and 7. These areas include Caprivi (1), Mukwe (2), Okahao (3), Okongo (4), Onesi (5), Ruacana (6), and Rundu (7). A possible concern is the size of the research area, and therefore how representative the results can be for a specific area. However, In the NLDM model cross-referencing is applied to test if the data is representational. The first step is to rank the variables according to their influence on the dependent variable (**Y**). Referring to Figure 1, it can clearly be seen that **X9** has by far the largest influence on **Y**, continuing to **X1** with the smallest influence. The influence of

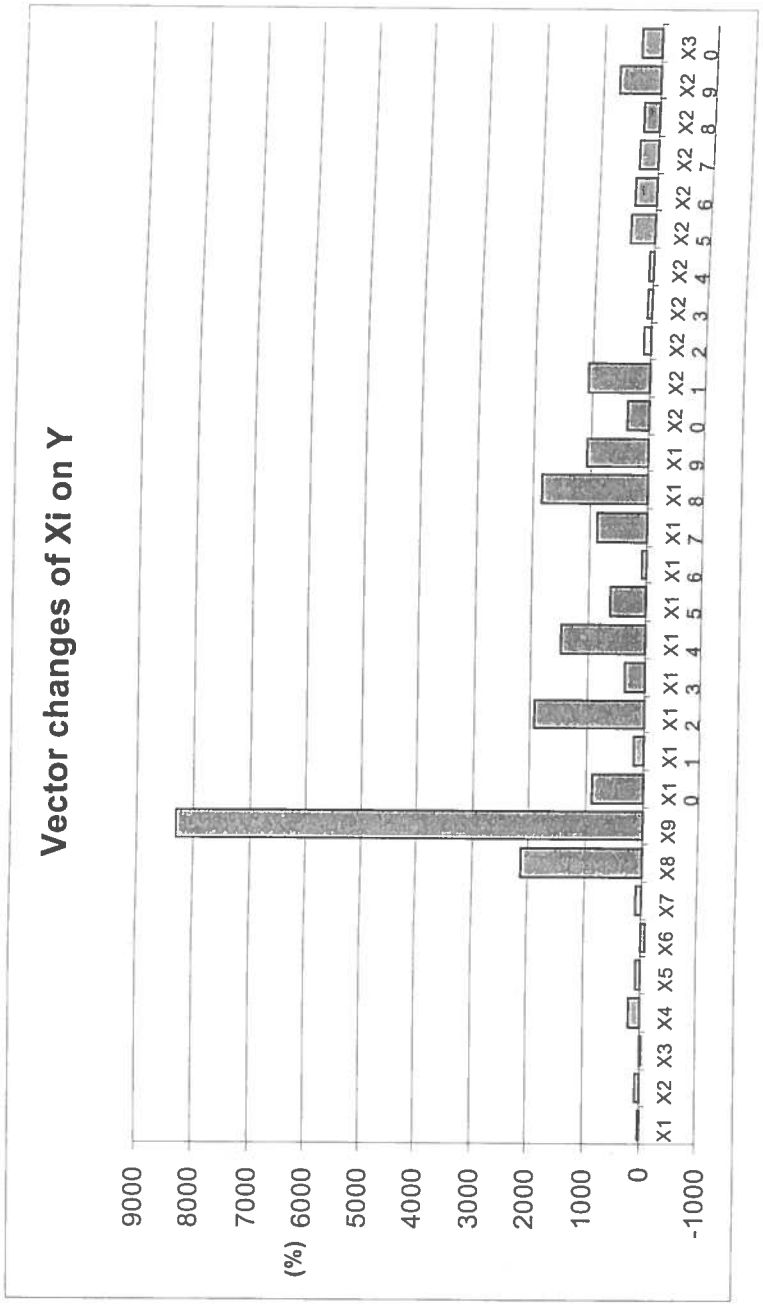

Figure 1: Vector changes of Xi on Y (Vertical axis indicates % deviation)

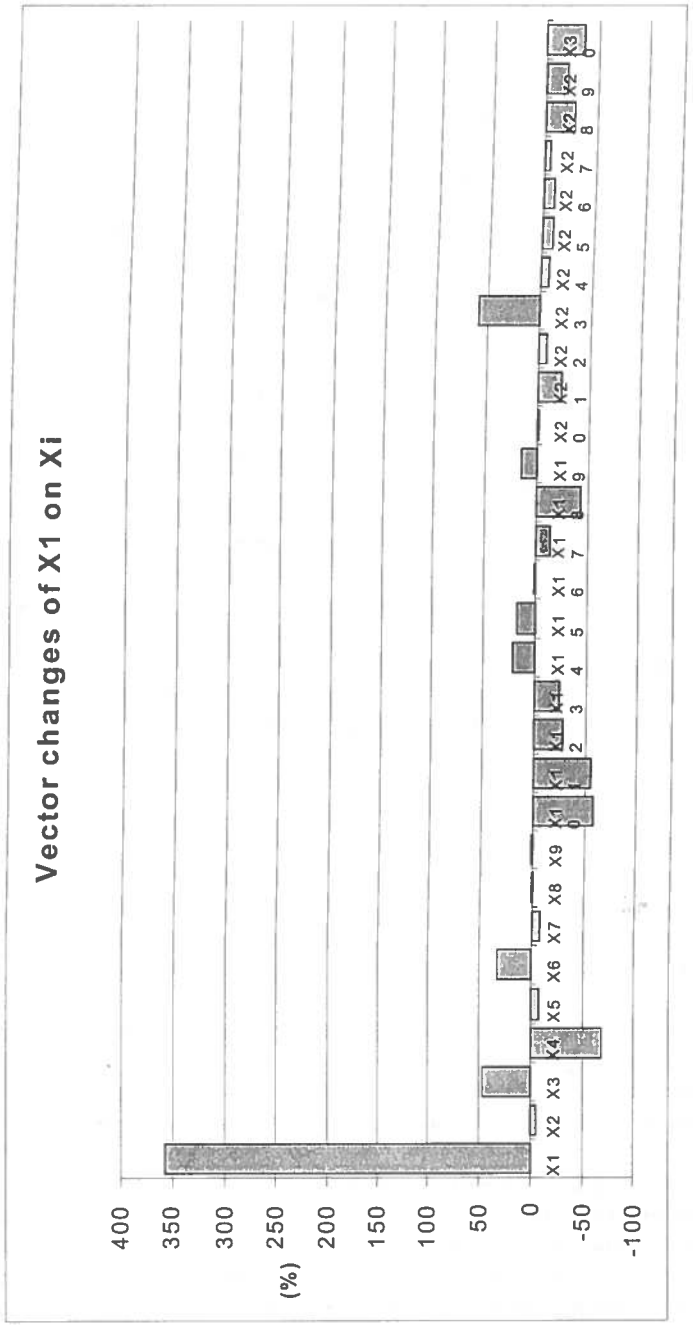

Figure 2: The vector values of X1 on X10 (Vertical axis indicates % deviation)

an increase in **X1** on itself must then be tested against its influence, along the ranking order, on **X2** to **X30**. The higher a variable is ranked the more stable it should be over the possible values for **X1**, to be representative. The vector of **X1** on **X1** is 358% where as **X1** on **X9** is 2%. Therefore over area 1 to 7, variable **X9** remains relatively stable, and thus is representative. Applying the same methodology, it is clear that the above argument is also true for the remaining variables (see Figure 2 for a graphical presentation).

It can thus be stated that variable **X2** to **X30** remains stable over areas 1 to 7 and therefore the results are representative.

If **X1** increases between 1 and 7 there is a 21% increase in the proportion of animals sold to Meatco. Therefore moving from one area to another, there is an average difference of 21% in the proportion sold to Meatco. The difference of 21% can be explained as follows. Firstly, this difference is quite natural considering the large distances between areas and expanse of the total research area. Secondly, there is an average difference of -76% in the size of cattle herds between areas. Thirdly, as one moves across areas there is an average difference of 22% in the size of goat flocks and an average difference of -24% in the size of sheep flocks. Further, as can be seen from Figure 1, **X1** has a rather small influence on **Y**, relative to the other variables.

Age of farmer (X2) and years of formal education (X3)

The age of the respondents varied from 24 years of age to 79 years of age, with the majority between the ages of 40 to 50. Years of formal education varied between 0 and 15 years, with an average of 6 years.

With an increase in age, the data show an increase of 75% in the propensity to sell cattle to Meatco. This corresponds very well with years of formal education **X3**. As age increases, years of formal education decreases by 70%.

Furthermore, as years of formal education increases, the proportion of animals sold to Meatco decreases by 39%. Thus it can be postulated that younger farmers with more formal education have an information cost advantage that allows them to explore other options in the marketing of their cattle.

If however, one compares the influence of **X2** and **X3** on **Y** relative to the other variables (see Figure 1), it is debatable how large this cost advantage is. The possible information cost advantage can be put further in perspective by comparing what happens to cattle herd size when **X2** and **X3** increase. With an increase in age, cattle herd size increases by 73%, and with an increase in years

of formal education there is a corresponding decrease in herd sizes of 54%. Thus older farmers sell proportionally more cattle to Meatco, simply because they have more cattle to sell.

Average size of cattle herd (X4)

The cattle herd size in the data varied between 6 and 150, with an average of herd size of 52 animals. An increase in herd size leads to a corresponding increase in the proportion of cattle sold to Meatco. A possible reason for this is that Meatco is a more suitable marketing channel for owners with large herds that want to sell large quantities of animals at once.

An interesting fact that comes to light is that with an increase in herd size, there is an increase in transportation cost to Meatco buying points (261%) and to informal markets (274%). Transport cost is measured in kilometres to the buying point for practical reasons. Thus, larger herd owners tend to be situated further from the main marketing points. This corresponds well with variable **X18** (risk of non-sale to Meatco). With an increase in herd size (and therefore distance to the buying point) the risk of non-sale, as rated by the respondents, increases by 123%. This is verified by **X10** (transport cost to Meatco buying points) where when the distance increases (as measured over all respondents), the risk of non-sale to Meatco increases by 162%.

Average size of sheep flock (X5) and average size of goat flock (X6)

Sheep flock sizes varied between 0 and 27, with an average size of only 2, while goat flock sizes varied between 0 and 58 with an average size of 22. With an increase in sheep herd sizes there is an increase in **Y** of 62%. This can be explained by the fact that with an increase in **X5**, there is a corresponding increase in cattle herd size of 100%. Further with an increase in goat herd size, there is a decrease in the proportion of cattle sold to Meatco of 78%.

With an increase in goat flock size, there is a decrease in the proportion of cattle sold to Meatco of 78%. It is highly probable that thus result is caused by more factors than mere market share competition between cattle and goats. The rational for this statement lies in the following: Firstly,the corresponding **X10** value for **X4** and **X6** is 261% and 97% respectively. Secondly the corresponding **X11** value for **X4** and **X6** is 274% and 108% respectively. In both these cases the vector difference between the two values is roughly half. Thus farmers with larger goat flock live much closer to the Meatco buying points and informal markets. Further with and increase in goat herd size there is no significant change in cattle herd sizes and a increase in sheep herd size. These

farmers are thus more diversified and able to spread their risk. Having other livestock to generate income, and easier access to markets, gives these farmers the choice of only selling to Meatco if they perceive it as the best option.

Percentage of time spent tending livestock (X7)

The percentage of time spent tending livestock varies greatly from 1 to 100%, with an average of 61%. An increase in **X7** causes an increase in **Y** of 86 %. Further, with an increase in **X7** there is no significant increase (or decrease) in the size of cattle herds. Thus percentage time spent tending livestock does not necessarily indicate the size of a farmer's enterprise.

Price uncertainty Meatco (X8) and Meatco price information cost (X9)

Price uncertainty was measured by asking respondents if they knew what prices Meatco was offering, before taking their cattle to the buying point. When **X8** increased from 2 (negative) to 3 (positive), the resultant increase in Y was an astonishing 2123%. Thus the cost of acquiring price information has a very large effect on the proportion of cattle sold to Meatco.

An increase in **X8** is also associated with an increase in the distance from the buying point **(X10)** of 221%, the risk of non-sale **(X18)** of 99%, grade uncertainty **(X21)** of 90% and herd size **(X4)** of 140%. Thus farmers further away from the buying point have a higher risk of non-sale and grade uncertainty, have larger herds, and will invest in time and effort to find price information.

The variable **X9** denotes if farmers have spent time finding likely Meatco prices, therefore if they incurred information costs. A movement from no to yes in this regard has an influence on **Y** of an even more astonishing 8298%. An increase in **X9** also has the same effect on **X4, X10, X18,** and **X21** as an increase in **X8**.

Thus, the cost of obtaining price information has the greatest impact in explaining the proportion of cattle sold to Meatco and thus the producers' choice of marketing channel. This can be seen from Figure 1.

Transport cost (Meatco) (X10)

Transport cost was measured in distance to the buying point, because this is practical information that was known to most respondents. The information was verified by measuring the distance from stated point of origin to the

buying point. The distances measured on maps were also used where respondents did not know the distance to the buying point. In the data gathered, distances varied from less than 1 km to 75 km. While these distances are short in comparison with those recorded by the fieldworkers in their daily reports, the longer distances are mostly travelled by traders, and not producers, who were the target of this survey.

An increase in the distance to the buying point resulted in an increase of the order of 917% in sales to Meatco. From a logical point of view this does not make sense, because larger distances normally mean greater transport cost and therefore a disincentive to sell to Meatco. The increase in distance with a resultant increase in sales to Meatco, however corresponds well with variable **X4** (cattle herd size). As was discussed above, an increase in cattle herd size resulted in an increase in **Y** of 206%. Further, with an increase in herd size there was a corresponding increase in the distance that had to be travelled to the Meatco buying point.

It is therefore probable that herd size in combination with transport cost plays a distinctive role in the choice of marketing channel. A probable paradigm could be constructed as follows; larger herd owners will want to sell larger lots of cattle at once, relative to the smaller producers. It is also known that the owners of smaller herds tend to sell only in times when they need the cash, while owners of large herds are more likely to sell for commercial reasons, and therefore to sell the younger and leaner animals preferred by Meatco. There is also a greater chance of variability in quality in larger lots. It is known that Meatco buys cattle per weight and is less conscious of quality than butchers would be. A butcher would be more quality conscious, because buying a single animal is a large capital outlay for him or her. Finally, informal butchers seldom buy more than one animal at a time. A farmer who quickly wants to improve his cash flow by selling a relatively large number of cattle will, therefore, rather sell to Meatco where he knows all his cattle will be bought at once.

An increase in the distance to the buying point also has a significant influence on variables **X17, X18** and **X21**. Unequal bargaining power, **(X17)** as rated by farmers in respect to Meatco, increases by 123%. The risk of non-sale to Meatco **(X18)** increases with 162% and grade uncertainty **(X21)** increases by 123%. These effects suggest that there is an information cost associated with the distance that producers are located from the main marketing points.

Transport cost (own sales) (X11)

The same assumption, i.e. that distance travelled is equal to transport cost, was again made in estimating this variable. The range of values was between 1km and 50km, with an average distance of 4km. This average is much lower than the average for Meatco sales of 10km. It can, therefore, be assumed that over all the respondents the distance that they have to travel to the informal market is less than to the Meatco buying points.

When **X11** increases there is a small increase in Meatco sales of 177%. The reason for this is that, with an increase in **X11,** there is again a resultant increase in herd size. Further, it is also now known that farmers with larger herds have a preference to sell to Meatco.

A further explanation for the above result can be found in the alternate cost of a marketing channel. An increasing X11 results in an increase in **X24, X28** and **X30**. The time it takes to finish selling meat **(X24)** increases by 68%, the occurrence of selling meat on credit **(X28)** increases by 111% and the frequency of providing a discount to customers **(X30)** increases by 126%. All these variables make the cost of using a particular marketing channel higher, and therefore alternative channels become more attractive.

Auction transport effort (X12)

Auction transport effort is an additional variable to measure the transport cost involved in selling to Meatco. This is necessary to firstly capture those added costs that were not taken in account in variable **X10** (the transport cost to Meatco), and secondly to test the assumption that distance is equal to transport cost.

The assumption of distance equalling cost is roughly verified by the fact that an increase in transport effort causes an increase in **X10** of 356%. An increase in transport effort is also associated with an increase in herd size (174%).

In addition, time spent at the buying point **(X15)** increases by 88%, unequal bargaining power **(X17)** with 107%, risk of non-sale **(X18)** by 162% and grade uncertainty **(X21)** by 97%. Thus the fact that information costs and transport costs are positively associated is again confirmed.

Direct sale transport effort (X13)

Variable **X13** is a measure of the effort in transport associated with the farmer slaughtering his cattle and selling the meat at the local market. An increase in **X13** causes a 340% increase in sales to Meatco. Again, transport effort is related to transport cost **(X11),** with an associated increase of 573%. The increase in variable **X4** (herd size) also indicates a relationship between herd size and transport effort.

It is interesting to note that with an increase in transport effort, there is an increase in the frequency of credit **(X28)** and discounts extended to customers buying meat from farmers **(X30).**

Frequency of Meatco sales per year (X14)

The frequency of Meatco sales was sourced from the farmers and not from official Meatco data, because the farmers' opinions capture a certain amount of information cost. An increase in variable **X14** caused an increase of 1460% in the proportion of cattle sold to Meatco.

That an amount of information cost is captured in variable **X14** can be seen in the fact that **X12** (transport effort), **X17** (unequal bargaining power) and X18 (risk of non-sale) only increase with 32%, 54% and 53% respectively.

The variable **X14** further has the 5th highest influence on the proportion of cattle sold to Meatco of all the variables in the data sample (see Figure 1).

Time spent at the buying point (X15)

With an increase in **X15** there is a corresponding increase in the proportion of cattle sold to Meatco of 623%. This can be attributed to farmers first waiting to see at what price cattle are sold before they actually decide to sell. The purpose of waiting can thus be seen as an information cost. This assumption is strengthened by the fact that unequal bargaining power **(X17)** and risk of non-sale **(X18)** increases by 102% and 103% respectively. Cattle herd size **(X4),** transport cost **(X10)** and auction transport effort **(X12)** correspondingly increase by 91%, 586% and 73%.

Direct cost of own sale (X16)

The direct cost of own sales is the cost of selling at a particular market. This cost manifests in the fee that is payable to the person that owns or controls the

market. An increase in **X16** caused a small increase of 63 % in the number of cattle sold to Meatco. The direct cost of own sales therefore has an insignificant influence on the choice of marketing channel.

Unequal bargaining power (X17)

An increase of 879% occurs in **Y** if **X17** increases. The corresponding **X4** (herd size) and **X10** (transport cost) variable also increased with 150% and 993% respectively. Therefore large livestock owners that are situated far from the buying point still sell to Meatco even if they feel that they have unequal bargaining power. A possible reason for this has already been discussed above (see variable **X10**).

Risk of non-sale (X18)

If the risk of non-sale increases the proportion of sales to Meatco increases by 1839%. The corresponding **X4** (herd size) and **X10** (transport cost) increases by 285% and 6765% respectively. Thus large livestock owners tend to sell to Meatco even if there is a high risk of non-sale. This is strengthened by the fact that the corresponding grade uncertainty variable **(X21)** increases by 121%.

Auction shrinkage loss (X19)

When auction shrinkage loss increases, there is an increase in sales to Meatco of 1091% and transport cost of 873%. Even though an increase in Meatco sales does not sound logical, it is supported by the large increase in transport cost (distance) of 873% (see discussion under variable **X10** for a possible scenario).

Direct sales shrinkage loss (X20)

An increase in direct sale shrinkage loss results in an increase in **Y** (proportion sold to Meatco) of 366%. This result is supported by an increase in **X4** (herd size) of 174% and in **X11** (transport cost of own sales) of 416%. Thus higher cost in the own sales marketing channel causes producers to sell proportionally more to Meatco.

Grade uncertainty Meatco (X21)

As with Variables **X17** to **X19,** there is a large increase (1079%) in the proportion of sales to Meatco with an increase in **X21**. This is accompanied by an increase in **X4, X10, X17, X18** and **X21** of 167%, 760%, 129% 151% and 168% respectively.

Taking the above into account, the only conclusion that can be reached (as elsewhere), is that large livestock owners still sell large numbers to Meatco even if they perceive the risk to be high.

Grade uncertainty (Traders) (X22)

Proportionally 118% more cattle are sold to Meatco with an increase in the grade uncertainty associated with livestock traders. The corresponding values for the other variable is relatively small, and it can thus be stated that **X22** has a low interaction with the other variables.

With an increase in **X23,** there is a small increase in the proportion of cattle sold to Meatco. As with **X22** there is very little interaction between **X23** and the rest of the variables. Because of the low interaction it can be stated that the risk associated with grade uncertainty is independent of the other variables.

It is also interesting to note that the vector values for **X2** (age of farmer) and **X3** (years of formal education), corresponding with the grade uncertainty variables (**X20** to **X23**), remain relatively stable. Thus the respondents in the study understand the concept of grade and therefore grade uncertainty is a product of risk.

Grade uncertainty (Butcher) (X23)

With an increase in **X23,** there is a small increase in the proportion of cattle sold to Meatco. As with **X22** there is very little interaction between **X23** and the rest of the variables.

Time to complete sale (X24)

If the time to complete the sale of own meat increases, there is a small increase in the number of cattle sold to Meatco of 63%. The only significant corresponding variable increase is **X11** (transport costs for own sales) with 153%. Thus, farmers who have travelled further seem to be more risk averse, especially if the sale is not concluded speedily.

Slaughtering cost (X25)

An increase in slaughtering cost of own sales results in a significant increase in the proportion of cattle sold to Meatco of 424%. This is accompanied by an increase in **X4** (average size of cattle herd) of 213% and an increase in **X11** (transport costs for own sales) of 457%. Therefore, farmers with large herds

and high transport costs will rather sell to Meatco if there is slaughtering costs involved with own sales.

Support cost of own sales (X26)

Support cost is the measure of the cost incurred in the process of selling fresh or cooked meat. In most cases these costs manifest in the employing of people to help sell meat, to cook meat and to gather fire wood. With an increase in support cost there is an increase in sales to Meatco of 374%. Further, there is an increase in **X4** (herd size) and **X11** (transport cost) of 220% and 605% respectively. Thus the same argument for variable **X25** can be argued for **X26**.

Refrigeration cost of own sales (X27)

An increase in **X27** has a resultant increase in **Y** of 314%. There is also a corresponding increase in **X11** (transport cost) of 234%. It is thus possible that farmers would be prepared to travel further to informal markets that have refrigeration facilities. The availability of refrigeration facilities directly influences the net receipts by meat sellers, as they often have to sell meat at lower prices (e.g. by selling on credit or giving discounts) when the meat starts to get old.

Credit to customer's (X28)

When there is an increase in the frequency of credit extended to customers, the proportion of Meatco sales increases by 274%. This increase is accompanied by a corresponding increase in the frequency of discounts for regular customer's **(X30)**. Further with an increase in the frequency of credit, the waiting period for credit repayment increase by 68%, and hence the risk of extending credit becomes higher.

Time for credit payment (X29)

If the time that customers take to repay credit increases, there is a relatively large increase in the sales to Meatco of 731%. The corresponding **X4** (herd size) and **X11** (transport cost) are of a magnitude of 195% and 259% respectively. Thus farmers with large herds, which are situated further from the informal markets, have a longer waiting period for credit repayment, if the frequency of credit is increased. They therefore have an incentive rather to sell to Meatco. Thus **X29** has a significant influence on the choice of marketing channel.

Discount for Customers (X30)

An increase in the frequency of discount to customers results in an increase in sales to Meatco of 344%. There is also a corresponding increase in **X4**, **X11** and **X28** of 235%, 678% and 153%, respectively. Therefore farmers that have larger herds and are situated further from markets are adverse to credit and discounts and would rather sell to Meatco.

5. CONCLUSION

Transaction cost variables have a significant effect on the proportion of cattle sold to Meatco, and thus indirectly on the choice of marketing channels. To identify single variables that have the most significant influence is, however, difficult because of the interaction between variables.

First, the result that emerges most frequently is that farmers with larger herds are situated far from the Meatco buying points. They also prefer selling to Meatco even though they associate this marketing channel with high risk. It is also clear that where owners have taken steps to mitigate these risks, sales to Meatco have increased.

Second, variable **X9** (price information cost) has a four times greater influence on **Y** than the second most influential variable **X8** (price uncertainty). This is a clear indication that information costs are perhaps the most important transaction costs. Further, although **X8, X12, X14** and **X18** have high interactions with other variables, they all measure some type of information cost, and their highest interactions are between themselves. It is therefore plausible to also include them as significantly influential. It can thus be stated that an important factor in the choice of marketing channel (especially the Meatco marketing channel) is price information cost, - thus commonly perceived as fixed transaction cost.

Third, the risk-associated cost of the alternative marketing channels has a notable effect on the percentage of sales to Meatco. The foremost of these are the risk of extending credit, the availability of refrigeration at markets and the opportunity cost of giving discounts to customers.

Possible recommendations that follow are that Meatco should move its buying operations closer to the larger cattle herd owners and focus on them as a group. Some type of information distribution can remedy information cost that has a significant influence on the proportion of sales to Meatco. Examples of information circulation include radio broadcasts, promotion through

extension officers and poster advertisement. The information could include expected price data and the times and places of cattle sales. Finally, informal markets need to be reformed and upgraded (i.e. refrigeration facilities) to make them more accessible to those who prefer selling in the informal market.

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