INSTITUTIONAL INNOVATION TO INCREASE FARMERS' REVENUE: A CASE STUDY OF SMALL SCALE FARMING IN SHEEP TRANSKEI REGION, SOUTH AFRICA

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ABSTRACT

Commercial producers, brokers, exporters and spinners dominate the wool supply chain in South Africa. Until recently smallholder farmers in the Transkei region had limited access to a profitable market outlet for their wool. In response, the South African wool industry has taken the initiative to help local farmers by building shearing sheds, under which the local association can bulk the wool and trade directly with the brokers. More direct access to the wool brokers is a prerequisite for the farmer to develop a viable business. This article investigates on the effect of membership in the local shearing shed association on the farmers' revenue. A two-step regression model of the gross margin is used to analyse whether farmers selling through the local association have better financial records as compared to those who sell their wool to local traders. This article exemplifies how institutional innovation through local marketing associations can contribute to economic development in poor rural areas.

Keywords: Rural development, institutional innovation, South Africa, Heckman procedure, transaction costs.

INTRODUCTION

The World Bank considers South Africa as an upper middle income country (World Bank, 2002). It however still caries with it the marks of the past Apartheid legacy, during which parts of the society were restricted from access to markets, infrastructure and education (Carter & May, 1999). The former homelands are economically far behind. This has resulted in pockets of poverty that are in many respects comparable to other developing regions in the world. The eradication of poverty and economic development in the deprived areas is high on the political agenda in South Africa (South African Yearbook 2000/2001, 2000). In terms of agriculture, the main strategic objective of the South African government is to provide "equitable access and participation in a globally competitive, profitable and sustainable agricultural sector contributing to a better life for all" (NDA, 2001). The production of 52,671Mt of greasy wool places South Africa seventh on the world market of wool (FAOStat, 2002). Nationally, the production of wool represented about 1% of the total agricultural production in terms of gross value (millions of Rand[1]) in 1998 (calculations from National Department of Agriculture in South African Yearbook 2000/2001, 2001).

This paper presents a case study of the income effects of improved commercialisation opportunities of wool from the rural areas of the former Transkei homeland. The wool sold on the auctions is merely supplied by the commercial farmers. In the past, the wool in the Transkei region was either not harvested or sold to local traders at very low prices. The South African wool sector has taken the initiative to help the smallholder farmers by building a shearing shed, giving market guidance and providing training on production practices.

[1] R stands for Rand (average exchange rate 2000: 1US$=6.9465 Rand; in 2001: 8.6011 Rand).

The wool sector believes that production in the Transkei region could evolve to a viable business if current production and marketing constraints are overcome.

Yet, there is a major difference between the marketing of wool on commercial farms and the marketing of the small scale farmers in the former Transkei. The wool on commercial farms is sheared on the farm and traded through brokers on the auction. The investments needed to access the brokers on an individual basis may be too high a smallholder. Both asset specificity and uncertainty combined with the low frequency of exchange, raise the transaction costs that make the individual marketing of wool by small-scale farmers in the Transkei region unprofitable. As a consequence, the farmer either sells the wool to a trader, or joins other farmers in a cluster. Farmers benefit from selling to the trader because of direct and immediate payment, thus reducing uncertainty. The uncertainty and physical costs arising from grading, sorting, packaging and transport are borne by the trader. Hence, traders pay the farmer a low price (the effect of moral hazard falls on one contracting party who will attach a risk premium to the price (Williamson, 1971)).

In the alternative setting of the shearing sheds and its association, the shed clusters the farmers around the use of technology that is too difficult to access or too expensive to buy on an individual basis (Schmitz & Ndavi, 1991). By clustering, the farmers bulk the harvest, post-harvest and marketing activities. By doing so, information, negotiation and control costs are decreased. A disadvantage is, however, that farmers are only paid afterwards because the selling price of the wool depends on the brokers' price received. This explains why not all farmers join the local wool growers association.

The aim of this paper is to test whether the farmers who have chosen for collaboration in the marketing project, experience a significant and positive impact on their revenue. In the next section, the framework for analysis and method are explained. The analysis consists of specifying and estimating a two-step treatment effects model. Finally, findings are discussed and conclusions are set forth.

TRANSACTION COSTS ANALYSIS

Framework and data collection

The framework for analysis builds on the transaction cost economics approach. It has been recognised that transaction costs are difficult to calculate for two reasons, namely (Masten, 1996): first, transaction costs are not easily observed. Furthermore it is not possible to calculate hypothetical transaction costs for organisational forms that are not chosen. Therefore, transaction costs that a single firm can face in alternative organisational arrangements cannot be quantified ex-ante. Second, the data needed to compare the organisational forms are not easily quantifiable (Masten, 1996).

Because of the difficulty of assigning a price to the attributes of transactions, and under the assumption that the organizational arrangements are chosen to economize the transaction costs, empirical research that aims to apply a direct measure of the costs is scarce (Williamson, 1995). The application of a comparative institutional approach is more general. According to Williamson (1995), discrete institutional alternatives should be compared. Therefore, the attributes of the transactions are to be defined, and the incentive and adaptive attributes of the alternative governance structure described (Williamson, 1995). To analyse the impact of a shearing shed and its association on the smallholder farmers' revenue, both marketing channels (local traders versus shearing shed) available to the smallholder farmer are be compared.

This article build on data collected through a farm survey conducted in three villages in the Transkei region: Luzie, Xume and Mhlahlane during August and September 2000. Xume and Luzie are beneficiaries of the LandCare project of the National Department of Agriculture, which provide funds for building and equipping the shearing shed. In Xume, a local wool growers association was formed and a shearing shed built, but up to date, the shed is not used. The shearing shed and its association in Luzie are very active, and are considered as very successful. The farmers in Mhlahlane are not a beneficiary of the project, so that they do not receive any specific support in the wool production.

A list of sheep farmers was not available, so that the respondents were selected through a non-probability sampling method. Sampling units were selected through convenience and judgement of the interviewers. Households were visited house-to-house, farm-to-farm, and farmer gatherings were organised. All interviews were executed personally and translation was done by local extension officers.

A total of 105 farmers were interviewed (18 in Mhahlane, 47 in Xume and 40 in Luzie), of whom 38 were member of a shearing shed. Gender distribution within the sample was 70/30 female/male.

Model specification

In order to investigate the local association participation decision and its impact on farm revenue, a treatment effects model is specified. Without adjustment, the evaluation of the performance of an institutional arrangement by least-squares estimates may bias the effect of governance and yield significant attributes, which actually do not have an influence (Heckman, 1979). Maddala (1983) warns for selectivity bias by presenting the example of a simple dummy variable regression of the estimation of income as a function of the participation decisions (college education in this case). Hereby, a self-selection bias emerged because the choice to attend a college is itself determined by the expected income. Similarly, Greene (2000) proposes a two-step estimation of the treatment effects to rule out the self-selected nature of program participation decisions. Masten (1996) proposes two solutions to this problem: firstly to defeat the selection procedure, and secondly to control for selection by introducing a two-stage estimation in order to control for the selection bias in the structural equation. The latter option was applied to estimate the influence of independent variables on the gross margin[2] of farmers in the Transkei region. Firstly, the participation decision is modelled as a binary choice problem. Second, farm income is linearly regressed on explanatory variables, including the inverse Mills ratio, which originates from the binary dependent variable model.

This two-step approach is similar to the approach set forth by Key & Mc Bride (2001) and Warning & Key (2002) in their study of the effect of contracts on farm income. The approach follows Maddala (1983) and Greene (2000) and has been applied to comparing institutional arrangements by Masten *et al.* (1991). Masten *et al.* (1991) further mention applications in Lee (1976) and Nelson (1977).

In our specific case, higher income from wool production may not necessarily be directly attributed to the local association participation decision. This means that there may be unobservable factors (e.g. managerial skills or previous experience) that increase both the probability of local association participation and the income. Furthermore, the farmers who choose to participate in the local association can be considered as more seriously concerned with the wool business. Therefore, it could happen that the choice of participating in the local association goes hand in hand with increased investment and/or increased production. This would result in an overestimation of the estimator of the dummy of program participation in a linear dummy-variable regression (Greene, 2000). Therefore, it is necessary to check for self-selectivity bias in the estimation of the effect of membership of the local association on the gross margin, which is done through the two-step procedure.

In the first step, a program participation model is estimated to account for non-observable factors influencing program participation (Greene, 2000). Since the participation decision is a dichotomous choice problem, it can be modelled either by a probit, logit or tobit model, of which the results yield an inverse Mills ratio for each case (i.e. farmers) (Greene, 2000).

In the second step, this inverse Mills' ratio is entered as an explanatory variable in the linear dummy-variable regression of the gross margin as dependent variable. If the resulting estimator of the inverse Mills ratio is significant, the coefficient of the dummy of program participation is biased (Warning & Key, 2002). Furthermore, the linear regression of the gross margin earnings will give an indication of the importance of the contributing independent factors.

The empirical specification of the shearing shed participation and income effect problem takes the following form:

$$y_i = \beta X_i + \delta C_i + \varepsilon_i \ , \qquad (1)$$

where y_i is gross margin, X_i denote the explanatory variables that influence gross margin, and C_i is the dummy variable indicating the program participation decision (binary choice).

[2] Gross margins are calculated for the farmers' sheep enterprises, based on output and input data provided by the farmers. The gross margin is defined as: "the gross income minus direct variable costs incurred in the production process" (Kay, 1981; FAO, 1985; Norman *et al.*, 1985; Makeham, 1986).

In case of self-selection, the least square estimator δ will be biased, i.e. overestimating the effect of shearing shed participation.

The expected difference in gross margin between the members and non-members of the shearing shed is:

$$E[Y_i/C_i = 1] - E[Y_i/C_i = 0] = \delta + \rho\sigma_E\left[\frac{-\phi_i}{\Phi_i(1-\Phi_i)}\right] \qquad (2)$$

The factor $\lambda(-\gamma W_i) = \frac{-\phi(\gamma W_i)}{1-\Phi(\gamma W_i)}$ is defined as the inverse Mills' ratio.

It has been chosen to regress the gross margin per sheep over the inputs and outputs per sheep, the number of sheep and the dummy of program participation. We are especially interested in the significance and coefficient of the latter indicator, to show the income effect of the membership of the local association. The objective is therefore not to analyse all explanatory variables, but to focus on the influence on the membership of the local association.

EMPIRICAL RESULTS

Probit model

In line with the previous assumptions from the transaction cost framework, the explanatory variables W_i that entered the probit analysis are access to an active shed (0= shed not active, 1= shed active), respondent gender (0 = male, 1 = female), number of cattle owned by the farmer, sheep breed (0 = local breed, 1 = Dohne Merino), whether the farmer followed a training course (0 = no, 1 = yes), amount of wool sold in kg and the amount of wool harvested per sheep (kg/sheep). The estimated model is highly significant with a Chi-square of 42.244 (p-value = 0.000) and the LRI[3] of the probit estimation is 30.7%. Results are neither detailed nor reported in this paper, since for the present analysis, we are mainly interested in the calculation of the inverse Mills ratio.

Linear regression model

A linear regression model was estimated to assess the influence of the independent variables, including the inverse Mills' ratio from the probit model, on the gross margin of the sheep farming per sheep as dependent variable (n = 93)[4]. Explanatory variables are on the cost side: the medical costs (R per sheep), labour costs (R per sheep) and costs for restocking (R per sheep), and the revenues from the sales of sheep (R per sheep) with the amount of wool produced (kg per sheep) on the income side. The number of sheep is included in the model to investigate the scale effects. A dummy variable for the membership of the local association and the inverse Mills ratio should indicate the importance of the new marketing channel to the gross margin of the sheep production. Costs for extra feeding and shearing were not chosen as independent variables because it would cause a bias due to autocollinearity as both variables are highly correlated with other variables in the model. Furthermore, both are minor costs to most farmers.

The linear regression yields a R-square of 98.7% (Adjusted R-square: 98.6%). The F-test yielded 797.2 (p-value =0.000). Parameter t-tests indicate that the estimate of the inverse Mills' ratio in the regression model is statistically equal to zero. This means that the estimate of the local association participation decision dummy is not biased by non-controllable variables, and hence, it is not overestimated (Warning & Key, 2002). The significant and positive estimate of membership of the local association stresses the importance of the efficient marketing of the wool. Membership of the local association will increase the gross margin of the sheep production by R6.475 per sheep (Table 1).

[3] The likelihood ratio index was computed as a measure of goodness of fit (see Greene, 2000 for details).

[4] The gross margin reported takes into account the sales of wool and sheep, the veterinary costs, costs of extra feeding, labour costs and costs for restocking the flock. The outliers of farmers with an extremely high or low gross margin were excluded from the analysis, while two more cases were excluded for reasons of missing observations on any of the explanatory variables.

Table 1.Coefficients, Standard Error, Standardized Coefficient (Beta) and significance of the regression of the gross margin of sheep production (R/sheep) (n=93).

Variable	Unstandardised		t-value	p-value
	Estimate	Standard error		
Constant	-3.666	1.270	-2.887	0.005
Sheep bought per sheep (R/sheep)	-1.034	0.023	-44.975	0.000
Medical costs per sheep (R/sheep)	-1.013	0.057	-17.737	0.000
Sales of sheep per sheep (R/sheep)	1.019	0.017	58.699	0.000
Labour costs per sheep (R/sheep)	-0.102	0.022	-4.711	0.000
Kg wool per sheep (kg/sheep)	2.718	0.477	5.701	0.000
Sheep	-0.014	0.008	-1.326	0.188
Local association membership	6.475	2.671	2.424	0.017
Inverse Mills ratio	-1.427	1.663	-0.858	0.393
Statistics:				
n= 93 R^2= 98.7% R^2a= 98.6% F = 979.197 Sig.= 0.000				

DISCUSSION AND CONCLUSION

Adding value to a tradable product is to be accomplished by adherence of smallholder farmers to a better-organised and more productive marketing chain (Staal *et al.*, 1997; Readon & Barrett, 2000). The empirical analysis shows that if smallholder farmers get access to a better market in an alternative, more efficient supply chain, they can benefit from the higher selling price.

Dijkstra *et al.* (2001) categorise the reasons for success of a new actor in a market channel by effectiveness reasons, efficiency reasons and equity reasons. First, the shearing shed has the potential to increase the effectiveness of marketing because by bulking the produce the average transaction costs are lowered. The average cost of asset accumulation decreases. The bargaining power of the cluster is higher and access to information is better and cheaper. Furthermore, it will decrease uncertainty caused by the disguised information and there is less risk of opportunistic behaviour by the buyer (Williamson, 1971, 1996). In the cluster, the firms can expand and integrate the organisation of the marketing of wool. The extra transaction costs that this would incur, are less than the costs of the same transaction by means of an exchange on the spot market (Coase, 1937). Vertical integration of the marketing of wool and selling directly to the brokers by the cluster of farmers under the auspices of the shearing shed, will be more effective and justified by the lower transaction costs (Williamson, 1971).

Second, clustering the harvest and post-harvest handling and the marketing, may increase efficiency. Schmitz & Ndavi (1999) advocate that clustering enhances collective efficiency. This is the sum of passive and active collective efficiency, defined as the competitive advantage derived from respectively external economies and joint action. Joint action will substantially decrease the average costs of harvest, post-harvest and transport of wool. Bales of wool can only be collected if sufficient sheep are shorn. Even if the farmer members of the local association don't present higher technical efficiency, their revenue from wool is higher, resulting in a higher allocative efficiency (D'Haese *et al.*, 2001).

Third, the shearing shed, by virtue of bulking the wool produced, will increase equity and increase the bargaining power of the farmers (Dijkstra *et al.*, 2001). As wool production by the individual farmer is low, the brokers are not interested in contracting with them. The bulking of the wool at the level of the shearing shed attract the brokers. Farmers as a group are less at risk from opportunistic behaviour by the buyer, who would otherwise dictate the contract (Williamson, 1971). Hence the farmer becomes able under the auspices of the shearing shed to bargain and haggle for the sales contract. The organisation of the local association also entails costs and time. These are new transaction costs that should be taken into account. Yet, it can be argued that the opportunity costs of time of the farmer is low compared to the benefits of the shearing shed. It is clear that the farmer members of the local wool growers' association and therefore the beneficiaries of a better marketing channel. The building of the shearing shed is an example of a state intervention with the objective to act as a catalyst to complement the market and correct for market failures. It enhances trade through decreasing uncertainty and creating benefits from asset specificity. It gives the farmers new incentives to produce and increase the trade frequency.

The building of a shearing shed and the promotion of a local association has the potential to promote and sustain economic development in the poor rural areas, by increasing the farmers' income and generating producer and consumer linkages to the benefit of the community.

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